DRAINAGE ANALYSIS

FOR Washington Street

LOCATED IN FRANKLIN, MASSACHUSETTS

PREPARED FOR Franklin Flex Space, LLC 13 Clovelly Road Wellesley, MA

PREPARED BY
UNITED CONSULTANTS, INC.
850 FRANKLIN STREET, SUITE 11D
WRENTHAM, MA. 02093

CARLOS A. QUINTAL CIVIL No. 30812

DATE: June 28, 2021 Revised: November 22, 2021

Table of Contents

Appendix A - Narrative Description

Appendix B - Pre-Development vs. Post Development Rate and Volume of Runoff

Appendix C - Pre-development Drainage Analysis

Appendix D - Post-development Drainage Analysis

Appendix E - Manufacturers Stormceptor and CDS TSS Removal Rates

and TSS Removal Worksheet

Appendix F - Permeability Calculations and SCS Soil Map and Information

Appendix G - Pond Drain Time – 100 year storm

Appendix H - Checklist for Designers

Appendix I - Storm-water Management Checklist

Appendix J - Operation and Maintenance Plan, Stormwater Facilities Plan and Yearly

Inspection and Maintenance Log

Appendix K - Illicit Discharge Statement

Appendix L - Watershed Plans (Entire Site) Rear

APPENDIX A

I. DESCRIPTION

This report is offered in support of the stormwater management system designed for the "Site Plan – Washington Street" located in Franklin, Massachusetts. The primary goals of this system are to collect the stormwater runoff generated by the impervious building and parking area and treat it prior to discharge to the three on-site underground infiltration ponds. Additionally, there is a developed area located between Washington Street and the site which includes houses, driveways, lawn areas and wooded areas. This offsite area will be captured in the three proposed trench drains and will be piped to the underground infiltration ponds.

The three building roofs will not have any gutters or downspouts and will have roofs that slope to the rear of the buildings. Stormwater from the roofs will be directed to the trench drains.

The parking areas will be captured in catch basins and water quality units. The catch basins will be piped to water quality units and all the catchment structures will discharge to the three underground infiltration ponds.

Both the pre-development and post-development storm-water conditions flowing to the downgradient wetland are summarized in Appendix B. This design will allow for the reduction of the rate and volume of runoff at the downgradient wetland. The required volume of storm-water infiltration as required by the Massachusetts State Storm-water Standards has been provided. The stormwater system has also been designed to comply with the Town of Franklin Stormwater Regulations.

II. Purpose

The purpose of this report is to examine the hydrological and hydraulic aspects of the proposed "Washington Street" Site Plan. This report was developed for review by the Town of Franklin Planning Board, Conservation Commission and Zoning Board of Appeal to obtain the necessary permits to allow the project to proceed.

This report considers the overall hydrological impact of proposed, additional development upon the local watersheds with specific emphasis directed toward the adjacent and immediate downstream areas. The hydrology and criteria are consistent with the Town of Franklin Planning Board, Conservation Commission and the Massachusetts Department of Environmental Protection Storm Water Management Policies.

III. Pre-Development Conditions

The site consists of four parcels of land that were combined to create a parcel with 6.15 acres of land. One of the four parcels was formerly a railroad right of way. The site is currently vacant. There is also a right of way which will have a portion of the proposed driveway located within it. There is an existing easement for the overhead power transmission lines that cross the site.

The upland soils for the site were taken from the soil survey of Norfolk and Suffolk counties. The soils are classified as Hinckley Loamy Sand which has a hydrologic soil group A. Soil testing was conducted on the site to confirm the soil types and to determine permeability rates. See the soils information and permeability test results located in Appendix F. Seven permeability test were conducted on the site with two being located approximate to the three proposed underground infiltration ponds.

Utilizing a Hydrocad computer model the pre-development and post development conditions were calculated. The proposed development is located in an area with the Hinckley soils which led us to utilize a HSG of A (Hinckley) for the pre-development and post-development modeling. A comparison of the pre-development vs. post development rate and volume of runoff can be found in Appendix B.

IV. Post Development Conditions

The proposed development will consist of the construction of three buildings with vehicle parking areas. A storm-water systems has been proposed for the site. This storm-water system will have catch basin, water quality units and three trench drains to capture the stormwater. Additional water quality units will be included in line of the stormwater system to provide the required water quality treatment. Three underground infiltration ponds will also be constructed.

The underground infiltration pond 1 will provide storm-water infiltration for the entrance driveway, the parking area located to the south of building 1 and a portion of the larger parking area. CB 5 will be a Stormceptor WQU and DMH 3 will be a CDS WQU. Underground infiltration pond 2 will provide storm-water infiltration for buildings 1 and 2, and a portion of the larger parking area. CB 8 and CB9 will be a Stormceptor WQU's and DMH 7 will be a CDS WQU. Underground infiltration pond 3 will provide storm-water infiltration for building 3, and a portion of the larger parking area. CB 10 will be a Stormceptor WQU CB 14 will be a CDS WQU.

A municipal water connection and utility connections are proposed for the site. A septic system will be provided. The project will utilize a single driveway entrance from Washington Street. Utilizing the same computer model as the existing conditions we have modeled the changes in surfaces and ground cover and have calculated the post development conditions.

All calculations for the above have been included in this report. Pre-development calculations are located in Appendix C. Post-development calculations are located in Appendix D.

V. Conclusion

Storm-water from building and the proposed parking areas will be captured by catch basins, trench drains and water quality units then piped to the drain manholes and water quality units then through a manifold and into the underground infiltration ponds 1, 2 and 3. The comparison in Appendix B summarizes the rate and volumes of runoff leaving the site in both the pre-development and post-development conditions. This comparison indicates that there is not an increase in the rate or volume of runoff during the 2-year 10-year or 100-year storm events.

VI. Stormwater Management Standards

LID Measures

- Ground water infiltration is proposed to mimic pre-development conditions.

Standard 1: No New Untreated Discharges

No new untreated discharges are proposed.

Stormwater from the entrance driveway and parking areas will be captured in catch basins and grated water quality units. The catch basins will be directed to water quality units. This treatment in the water quality units will precede discharge into ponds 1, 2 or 3. See appendix E for TSS Removal Worksheets.

Standard 2: Peak Rate Attenuation

The drainage system has been designed to match or slightly reduce the rate of storm-water runoff from the site when comparing the pre-development conditions to the post development conditions. See Appendix B of this report for a summary of the design storms.

Standard 3: Recharge

- Soil testing has been completed. See Appendix F or this report.
- Ponds 1, 2 and 3 were designed based on the Static Method method.
- The required water recharge volume has been provided.

- Front site area Hinckley Soils Use A soils
 - A soils -0.60 inches x 136.999 sq. ft. impervious = 6.850 cubic feet
 - Total storage required 6,536 cubic feet
- Storage provided in Pond 1 = 4,513 cubic feet.
 - Storage provided in Pond 2 = 13,057cubic feet
 - Storage provided in Pond 3 = 5,077 cubic feet
 - Total storage provided = 23,097
 - The three Recharge systems have been designed to store and infiltrate the required recharge volume.
- See Appendix G for a summary of drain times for Ponds 1, 2 and 3. Ponds 1, 2 and 3 are drained down by hour 24.3 (Ponds 1 and 2) and 24.2 (Pond 3). This is less than the 72 hours as provided in the Stormwater management standards Chapter 5.
- The drainage system has been designed to infiltrate the required water recharge volume. The soil report provides the depths of test pits and the indication of ESHGW based on the elevation of the bottom of the permeability test pits or observed groundwater.

Standard 4: Water Quality

- The owner will include the necessary restrictions in the building lease agreements. The owner will be responsible for compliance with standard four requirements.
- Refer to sheet 6 for the Inspection and Maintenance Schedule and the Operation and Maintenance Schedule and refer to Appendix I for the O&M.
- See Appendix E for the Manufactures Stormceptor and CDS Unit TSS removal rates. IT should be noted that the flow rated to the WQU were revised and the rates are lower than originally proposed. The original Manufactures reports have been included. The site is located within a zone II. Ponds 1, 2 and 3 have rapid soil infiltration rates. This led to the Stormceptor units and the CDS units being modeled with a 1 inch WQV.
- The proposed project will include four Stormceptor Water Quality Unit and three CDS water quality units all of which will provide TSS removal. The summary of the Manufacturers Predicted Net Annual results as well as the TSS Removal Worksheet are included in Appendix E.

Standard 5: Land uses with higher potential pollutant loads

Not Applicable

Standard 6: Critical Areas

Zone II – Water Quality Volume – 1 inch.

Standard 7: Re-developments and Other Projects

Not Applicable

Standard 8: Construction Period Pollution Prevention and Erosion Sedimentation Control

- Refer to sheet 6 for the Inspection and Maintenance Schedule and the Operation and Maintenance Schedule.
- The project will be covered by a NPDES Construction General Permit.

Standard 9: Operation and Maintenance Plan

- Refer to sheet 6 for the Inspection and Maintenance Schedule and the Operation and Maintenance Schedule.
- The owner will be responsible for the storm-water management system, implementation of the operation and maintenance, the maintenance costs, and completion of the maintenance logs.
- Refer to sheet 6 for the Inspection and Maintenance Schedule and the Operation and Maintenance Schedule.

- Refer to Appendix J for the Operation and Maintenance Plan.

Standard 10: Prohibition of Illicit Discharges

- Owner to be responsible for compliance with avoiding illicit discharges. The owner or owner's representative will provide a signed illicit discharge statement with the application for a stormwater permit from the Town of Franklin DPW.
- The site will be connected to an onsite soil absorption system.

APPENDIX B

Pre-Development vs. Post Development Rate and Volume of Runoff

This analysis was prepared to show the summary of the pre-development and post development rate and volume of runoff as required by the Town of Franklin Storm-water Requirements.

The pre-development watershed areas were combined in Sub-catchment 1S and the post-development watersheds and ponds were combined in Link 1L. The below is a summary of the studied storm events:

2 year storn	m event (CFS)		2 year storm event (A.F.)			
Pre		Post	Pre		Post	
1S	VS	1L	1S	VS	1L	
0.00		0.00	0.000		0.000	
•	rm event (CFS)		10 year storm	event (A.F.)	
Pre		Post	Pre		Post	
1S	VS	1L	1S	VS	1L	
0.04		0.00	0.031		0.002	
•	orm event (CFS)		100 year storn	n event	(A.F.)	
Pre		Post	Pre		Post	
1S	VS	1L	1S	VS	1L	
1.24		1.11	0.353		0.094	

A reduction in the rate and volume of runoff has been realized with the proposed storm-water systems.

APPENDIX C



Reach

(Subcat)



Prepared by {enter your company name here} 7/8/2021 HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC Drainage Diagram for UC1502-PRE

Area Listing (all nodes)

Area (acres)	<u>CN</u>	Description (subcats)
8.920	30	Woods, Good, HSG A (1S)
1.795	39	>75% Grass cover, Good, HSG A (1S)
0.394	98	Paved parking & roofs (1S)
-		
11.110		

2 YR PRE-DEVELOPMENT

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 1 8/24/2021

Subcatchment 1S: 1 S

Runoff

0.00 cfs @ 0.00 hrs, Volume=

0.000 af, Depth= 0.00"

	А	rea (sf)	CN D	escription		
-	***************************************	17,166			ing & roofs	
		78,207				ood, HSG A
		888,572			od, HSG A	
-						
		83,945		Veighted A	•	
	4	66,779	-	ervious Ar		
		17,166	Ir	npervious	Area	
	Тс	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	Description
***	5.4	50	0.1540	0.15	(013)	Shoot Flour
	J. 4	30	0.1040	0.15		Sheet Flow,
	1.9	223	0.1540	1.96		Woods: Light underbrush n= 0.400 P2= 3.25"
	1.5	220	0.1040	1.50		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.7	45	0.0444	1.05		Shallow Concentrated Flow,
	0.7	40	U.U -1-1-1	1.00		Woodland Kv= 5.0 fps
	0.3	23	0.0869	1.47		Shallow Concentrated Flow,
	0.5	25	0.0009	1.47		Woodland Kv= 5.0 fps
	0.6	66	0.1212	1.74		•
	0.0	00	0.1212	1.7-4		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.4	51	0.1851	2.15		Shallow Concentrated Flow,
	0.4	J-4	0.1001	2.10		Woodland Kv= 5.0 fps
	0.2	36	0.2777	2.63		Shallow Concentrated Flow,
	0.2	50	0.2111	2.03		
	0.3	39	0.1500	1.94		Woodland Kv= 5.0 fps Shallow Concentrated Flow,
	0.5	39	0.1500	1.34		
-			T-6-1			Woodland Kv= 5.0 fps
	9.8	536	Total			

10 YR PRE-DEVELOPMENT

Page 2

8/24/2021

Subcatchment 1S: 1 S

Runoff = 0.04 cfs @ 17.17 hrs, Volume=

0.031 af, Depth= 0.03"

	Aı	ea (sf)	CN D	escription		
		17,166			ing & roofs	
		78,207 88,572			od, HSG A	ood, HSG A
		83,945		Veighted A		
		66,779		ervious Ar		
		17,166	lr	npervious	Area	
	Тс	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	5.4	50	0.1540	0.15		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
	1.9	223	0.1540	1.96		Shallow Concentrated Flow,
	0.7	AE	0.0444	1 05		Woodland Kv= 5.0 fps
	0.7	45	0.0444	1.05		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.3	23	0.0869	1.47		Shallow Concentrated Flow,
	0.0		0.000			Woodland Kv= 5.0 fps
	0.6	66	0.1212	1.74		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.4	54	0.1851	2.15		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.2	36	0.2777	2.63		Shallow Concentrated Flow,
	0.0	20	0.4500	4.04		Woodland Kv= 5.0 fps
	0.3	39	0.1500	1.94		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
-		E00	Total			vvoodiand (V= 5.0 lps
	9.8	536	Total			

100 YR PRE-DEVELOPMENT

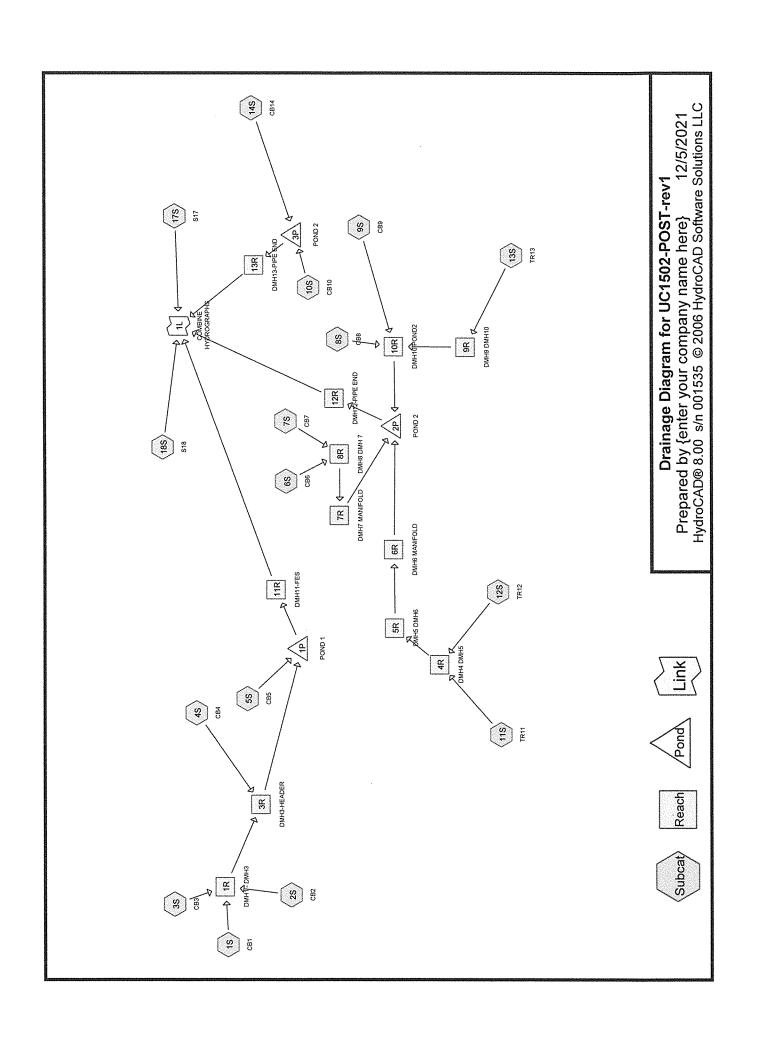
Page 3 8/24/2021

Subcatchment 1S: 1 S

Runoff = 1.24 cfs @ 12.46 hrs, Volume= 0.353 af, Depth= 0.38"

	Ar	ea (sf)	CN D	escription		
		17,166			ing & roofs	1 1100 A
		78,207 88,572			s cover, Go od, HSG A	ood, HSG A
		83,945		veighted A		
		66,779		ervious Ar	•	
		17,166	Ir	npervious	Area	
	Тс	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	Description
••••	5.4	50	0.1540	0.15		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
	1.9	223	0.1540	1.96		Shallow Concentrated Flow,
	0.7	45	0.0444	1.05		Woodland Kv= 5.0 fps Shallow Concentrated Flow,
	0.7	40	0.0444	1.00		Woodland Kv= 5.0 fps
	0.3	23	0.0869	1.47		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.6	66	0.1212	1.74		Shallow Concentrated Flow,
		- 4	0.4054	0.45		Woodland Kv= 5.0 fps
	0.4	54	0.1851	2.15		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.2	36	0.2777	2.63		Shallow Concentrated Flow,
	0.2	00	0.2777	2.00		Woodland Kv= 5.0 fps
	0.3	39	0.1500	1.94		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	9.8	536	Total			

APPENDIX D



Area Listing (all nodes)

Area (acres)	<u>CN</u>	Description (subcats)
4.349	30	Woods, Good, HSG A (2S,5S,8S,10S,11S,12S,13S,17S,18S)
3.198	39	>75% Grass cover, Good, HSG A (1S,2S,3S,5S,8S,10S,11S,12S,13S,14S,17S,18S)
3.604	98	Paved parking & roofs (1S,2S,3S,4S,5S,6S,7S,8S,9S,10S,11S,12S,13S,14S)

11.151		

Post-Development Area is 0.041

longer thous pre-Development Area

Due to elimination of wall and grading
at electric company property

2 YR POST-DEVELOPMENT

Page 1 12/5/2021

Subcatchment 1S: CB1

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.14 cfs @ 12.20 hrs, Volume=

0.020 af, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 2YR Rainfall=3.25"

Ar	ea (sf)	CN D	escription		
	9,043			ng & roofs	
	18,146	39 >	75% Gras	s cover, Go	ood, HSG A
	27,189	59 V	Veighted A	verage	
	18,146	Р	ervious Ar	ea	
	9,043 Imperviou				
Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0					Direct Entry, Min TC
0.3	79	0.0100	4.91	3.86	Circular Channel (pipe),
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
6.3	79	Total			

Subcatchment 2S: CB2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.04 cfs @ 12.35 hrs, Volume=

0.008 af, Depth= 0.24"

Area (sf)	CN	Description				
4,842	98	Paved parking & roofs				
7,887	39	>75% Grass cover, Good, HSG A				
3,942	30	Woods, Good, HSG A				
16,671	54	Weighted Average				
11,829		Pervious Area				
4,842		Impervious Area				

(1	Tc min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	5.1	48	0.1670	0.16		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
	0.1	18	0.2220	2.36		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.2	22	0.0900	2.10		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	0.1	12	0.0420	1.43		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	0.4	70	0.0200	2.87		Shallow Concentrated Flow,
						Paved Kv= 20.3 fps
	0.1					Direct Entry, Min TC
	0.2	48	0.0100	4.91	3.86	11 7 //
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
						n= 0.012 Concrete pipe, finished
-	6.2	218	Total			

Subcatchment 3S: CB3

[49] Hint: Tc<2dt may require smaller dt

0.38 cfs @ 12.10 hrs, Volume= Runoff

0.029 af, Depth= 1.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 2YR Rainfall=3.25"

Area (s	f) CN	Description	[
7,31	7 98	98 Paved parking & roofs							
3,10	3 39	>75% Gras	s cover, Go	ood, HSG A					
10,42	10,420 80 Weighted Average								
3,10	3	Pervious A	rea						
7,31	7	Impervious	Area						
Tc Leng	•	ope Velocity t/ft) (ft/sec)	Capacity (cfs)	Description					
6.0 0.0	8 0.01	100 4.91	3.86	Direct Entry, MIN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished					
6.0	8 Tota	əl							

Subcatchment 4S: CB4

[49] Hint: Tc<2dt may require smaller dt

0.36 cfs @ 12.09 hrs, Volume= Runoff

0.029 af, Depth> 2.82"

A	rea (sf)	CN E	escription		
	5,376	98 F	aved park	ing & roofs	
	5,376	Impervious Area			
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	31	0.0100	4.91	3.86	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
6.1	31	Total			

Subcatchment 5S: CB5

[49] Hint: Tc<2dt may require smaller dt

0.17 cfs @ 12.14 hrs, Volume= 0.019 af, Depth= 0.54" Runoff

Α	rea (sf)	CN D	escription							
	8,247 98 Paved parking & roofs									
	2,985 39 >75% Grass cover, Good, HSG A									
	6,808 30 Woods, Good, HSG A									
	18,040		√eighted A							
	9,793		ervious Ar							
	8,247	Ir	npervious	Area						
Тс	Length	Slope	Velocity	Capacity	Description					
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	·					
5.0	50	0.1830	0.17		Sheet Flow,					
					Woods: Light underbrush n= 0.400 P2= 3.25"					
0.7	92	0.1830	2.14		Shallow Concentrated Flow,					
					Woodland Kv= 5.0 fps					
0.4	45	0.1360	1.84		Shallow Concentrated Flow,					
	40	4 0000	7.00		Woodland Kv= 5.0 fps					
0.0	10	1.0000	7.00		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps					
0.4	72	0.0200	2.87		Shallow Concentrated Flow,					
0.4	12	0.0200	2.07		Paved Kv= 20.3 fps					
0.3	60	0.0320	3.63		Shallow Concentrated Flow,					
0.5	00	0.0020	0.00		Paved Kv= 20.3 fps					
0.3	101	0.0100	4.91	3.86	•					
0.0		3.0.00			Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'					
					n= 0.012 Concrete pipe, finished					
7.1	430	Total								

Page 4 12/5/2021

Subcatchment 6S: CB6

[49] Hint: Tc<2dt may require smaller dt

Runoff

0.74 cfs @ 12.09 hrs, Volume=

0.060 af, Depth> 2.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 2YR Rainfall=3.25"

	A	rea (sf)	CN	Description		
		11,020	98	Paved park	ing & roofs	
		11,020		Impervious	Area	
	Tc (min)	Length (feet)	Slope (ft/ft)	•	Capacity (cfs)	Description
-	6.0 0.0	3	0.0200	6.95	5.46	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
_	6.0	3	Total			

Subcatchment 7S: CB7

[49] Hint: Tc<2dt may require smaller dt

Runoff

0.50 cfs @ 12.10 hrs, Volume=

0.041 af, Depth> 2.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 2YR Rainfall=3.25"

A	rea (sf)	CN E	Description		
	7,497	98 F	Paved park	ing & roofs	
	7,497	-	mpervious	Area	
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0 0.4	120	0.0100	4.91	3.86	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
6.4	120	Total			

Subcatchment 8S: CB8

[49] Hint: Tc<2dt may require smaller dt

Runoff

0.11 cfs @ 12.35 hrs, Volume=

0.020 af, Depth= 0.30"

Α	rea (sf)	CN D	escription		
	12,116			ing & roofs	
	8,994				ood, HSG A
	14,308	30 V	<u>/oods, Go</u>	<u>od, HSG A</u>	
	35,418	56 V	Veighted A	verage	
	23,302	P	ervious Ar	ea	
	12,116	In	npervious	Area	
				.	
Tc	Length	Slope	Velocity		Description
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	(cfs)	
5.4	50	0.1540	0.15		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
2.1	248	0.1540	1.96		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
0.0	10	1.0000	7.00		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
1.2	73	0.0210	1.01		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
0.4	77	0.0270	3.34		Shallow Concentrated Flow,
			0.50	7 10	Paved Kv= 20.3 fps
0.1	31	0.0374	9.50	7.46	Circular Channel (pipe),
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
9.2	489	Total			

Subcatchment 9S: CB9

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.62 cfs @ 12.10 hrs, Volume= 0.050 af, Depth> 2.82"

Α	rea (sf)	CN E	escription		
	9,254	98 F	aved park	ing & roofs	
	9,254 Impervious Area				
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0 0.3	116	0.0100	5.90	4.63	Direct Entry, M IN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
6.3	116	Total			

Page 6 12/5/2021

Subcatchment 10S: CB10

[49] Hint: Tc<2dt may require smaller dt

0.25 cfs @ 12.13 hrs, Volume= 0.025 af, Depth= 0.58" Runoff

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 2YR Rainfall=3.25"

 A	rea (sf)	CN D	escription							
	10,776	98 F	98 Paved parking & roofs							
	1,709	39 >	75% Gras	s cover, Go	ood, HSG A					
	9,781	30 V	Voods, Go	od, HSG A						
 	22,266	64 V	Veighted A	verage						
	11,490	F	Pervious Ar	ea						
	10,776	lı	mpervious	Area						
Tc	Length	Slope	Velocity	Capacity	Description					
 (min)	(feet)	(ft/ft)	(ft/sec)	(cfs)						
6.0					Direct Entry, MIN. TC					
0.0	15	0.0400	9.83	7.72						
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'					
 					n= 0.012 Concrete pipe, finished					
 6.0	15	Total								

Subcatchment 11S: TR11

[49] Hint: Tc<2dt may require smaller dt

0.22 cfs @ 12.24 hrs, Volume= Runoff

0.034 af, Depth= 0.36"

Area (sf)	CN	Description
17,178	98	Paved parking & roofs
25,172	39	>75% Grass cover, Good, HSG A
7,847	30	Woods, Good, HSG A
50,197	58	Weighted Average
33,019		Pervious Area
17,178		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.9	50	0.2020	0.17		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
0.2	31	0.2020	2.25		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.2	30	0.1610	2.81		Shallow Concentrated Flow,
0.2	30	0.1010	2.01		Short Grass Pasture Kv= 7.0 fps
0.1	16	0.1250	2.47		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
0.1	15	0.0590	3.64		Shallow Concentrated Flow,
					Grassed Waterway Kv= 15.0 fps
0.3	19	0.0590	1.21		Shallow Concentrated Flow,
	4.0		2.04		Woodland Kv= 5.0 fps
0.1	19	0.3160	2.81		Shallow Concentrated Flow,
0.0	40	0.0400	0.70		Woodland Kv= 5.0 fps
0.2	10	0.0100	0.70		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.0	7	0.1420	2.64		Shallow Concentrated Flow,
0.0	1	0.1420	2.04		Short Grass Pasture Kv= 7.0 fps
1.0	246	0.0050	4.17	3.28	•
1.0	2.40	0.0000	1	0.20	Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.010 PVC, smooth interior
7.1	443	Total			

Subcatchment 12S: TR12

[49] Hint: Tc<2dt may require smaller dt

0.08 cfs @ 12.45 hrs, Volume= 0.025 af, Depth= 0.16" Runoff

A	rea (sf)	CN D	escription		
	20,701	98 P	aved parki	ing & roofs	
	27,521	39 >	75% Grass	s cover, Go	ood, HSG A
	32,521	30 V	Voods, Go	od, HSG A	
	80,743	51 V	Veighted A	verage	
	60,042	P	ervious Ar	ea	
	20,701	lr	npervious	Area	
Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0					Direct Entry, MIN. TC.
1.1	274	0.0050	4.17	3.28	Circular Channel (pipe),
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.010 PVC, smooth interior
7.1	274	Total			

Page 8 12/5/2021

Subcatchment 13S: TR13

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.05 cfs @ 12.49 hrs, Volume=

0.018 af, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 2YR Rainfall=3.25"

A	rea (sf)	CN D	escription		
	18,951	98 P	aved parki	ng & roofs	
	14,429	39 >	75% Grass	s cover, Go	ood, HSG A
	36,229	30 V	Voods, Go	od, HSG A	
	69,609	50 V	Veighted A	verage	
	50,658	Р	ervious Ar	ea	
	18,951	Ir	npervious	Area	
Тс	Length	Slope	Velocity	Capacity	Description
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	(cfs)	
2.8	50	0.1170	0.30		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.25"
0.3	48	0.1170	2.39		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
1.8	185	0.1170	1.71		Shallow Concentrated Flow,
	_		0.00		Woodland Kv= 5.0 fps
0.0	9	0.2220	3.30		Shallow Concentrated Flow,
0.4	40	0.4000	0.04		Short Grass Pasture Kv= 7.0 fps
0.1	18	0.1000	2.21		Shallow Concentrated Flow,
4.0					Short Grass Pasture Kv= 7.0 fps
1.0	226	0.0050	4 17	2 20	Direct Entry, Min TC Circular Channel (pipe),
0.9	226	0.0050	4.17	3.28	Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.010 PVC, smooth interior
		T-4-1			11- 0.010 F VO, SINOULI IIILEIIOI
6.9	536	Total			

Subcatchment 14S: CB14

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.87 cfs @ 12.10 hrs, Volume=

0.066 af, Depth> 1.88"

Area (sf)	CN	Description
 14,656	98	Paved parking & roofs
3,692	39	>75% Grass cover, Good, HSG A
 18,348	86	Weighted Average
3,692		Pervious Area
14,656		Impervious Area

Page 9 12/5/2021

	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
•	6.0 0.1	25	0.0100	4.91	3.86	Direct Entry, MIN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
-	6.1	25	Total			

Subcatchment 17S: S17

[45] Hint: Runoff=Zero

Runoff

0.00 cfs @ 8.00 hrs, Volume=

0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 2YR Rainfall=3.25"

,	Area (sf)	CN D	escription						
	21,239	39 >	9 >75% Grass cover, Good, HSG A						
	67,689	89 30 Woods, Good, HSG A							
***************************************	88,928	32 V	Veighted A	verage					
	88,928	P	ervious Ar	ea					
				0	Description				
To		Slope	Velocity	Capacity	Description				
<u>(min</u>	(feet)	(ft/ft)	(ft/sec)	(cfs)					
11.1	50	0.0254	0.07		Sheet Flow,				
					Woods: Light underbrush n= 0.400 P2= 3.25"				
0.3	13	0.0254	0.80		Shallow Concentrated Flow,				
-					Woodland Kv= 5.0 fps				
0.5	74	0.2160	2.32		Shallow Concentrated Flow,				
0.0					Woodland Kv= 5.0 fps				
0.7	49	0.0510	1.13		Shallow Concentrated Flow,				
0.,	,,,	0.00.0			Woodland Kv= 5.0 fps				
12.6	186	Total							

Subcatchment 18S: S18

[49] Hint: Tc<2dt may require smaller dt

[45] Hint: Runoff=Zero

Runoff

0.00 cfs @ 8.00 hrs, Volume=

0.000 af, Depth= 0.00"

	Area (sf)	CN	Description
***************************************	4,448	39	>75% Grass cover, Good, HSG A
	10,309	30	Woods, Good, HSG A
•	14,757	33	Weighted Average
	14,757		Pervious Area

Тс	Length	Slope	Velocity	Capacity	Description
 (min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
 0.6	13	0.3080	0.34		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.25"
1.2	17	0.1180	0.24		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.25"
0.4	4	0.5000	0.15		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
0.5	16	0.7690	0.51		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.25"
0.1	57	0.8770	6.56		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
3.2					Direct Entry, Min TC
0.1	44	0.0250	7.77	6.10	
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
6.1	151	Total			

Reach 1R: DMH1 - DMH3

[52] Hint: Inlet conditions not evaluated

Inflow Area = 1.246 ac, Inflow Depth = 0.55" for 2YR event Inflow = 0.52 cfs @ 12.12 hrs, Volume= 0.057 af

Outflow = 0.50 cfs @ 12.13 hrs, Volume= 0.057 af, Atten= 3%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Max. Velocity= 3.49 fps, Min. Travel Time= 0.3 min Avg. Velocity = 1.52 fps, Avg. Travel Time= 0.7 min

Peak Storage= 10 cf @ 12.13 hrs, Average Depth at Peak Storage= 0.24' Bank-Full Depth= 1.00', Capacity at Bank-Full= 4.03 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 67.0' Slope= 0.0109 '/' Inlet Invert= 255.08', Outlet Invert= 254.35'



HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Reach 3R: DMH3-HEADER

[52] Hint: Inlet conditions not evaluated

[82] Warning: Early inflow requires earlier time span

[85] Warning: Oscillations may require Finer Routing>1

[61] Hint: Submerged 23% of Reach 1R bottom

Inflow Area =

1.370 ac, Inflow Depth > 0.75" for 2YR event

Inflow

0.85 cfs @ 12.12 hrs, Volume=

0.086 af

Outflow

0.85 cfs @ 12.12 hrs, Volume=

0.086 af, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 5.01 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.06 fps, Avg. Travel Time= 0.2 min

Peak Storage= 4 cf @ 12.12 hrs, Average Depth at Peak Storage= 0.27' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.41 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 22.0' Slope= 0.0136 '/'

Inlet Invert= 254.25', Outlet Invert= 253.95'



Reach 4R: DMH4 DMH5

[52] Hint: Inlet conditions not evaluated

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow Area =

3.006 ac, Inflow Depth = 0.24" for 2YR event

Inflow

0.26 cfs @ 12.36 hrs, Volume=

0.059 af

Outflow

0.27 cfs @ 12.38 hrs, Volume=

0.059 af, Atten= 0%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 4.15 fps, Min. Travel Time= 0.3 min

Avg. Velocity = 2.49 fps, Avg. Travel Time= 0.5 min

Peak Storage= 5 cf @ 12.38 hrs, Average Depth at Peak Storage= 0.14'

Bank-Full Depth= 1.00', Capacity at Bank-Full= 6.69 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished

Length= 72.0' Slope= 0.0300 '/'

Inlet Invert= 256.46', Outlet Invert= 254.30'



Reach 5R: DMH5 DMH6

[52] Hint: Inlet conditions not evaluated

[61] Hint: Submerged 1% of Reach 4R bottom

Inflow Area =

3.006 ac, Inflow Depth = 0.24" for 2YR event

Inflow

0.27 cfs @ 12.38 hrs, Volume=

0.059 af

Outflow

0.27 cfs @ 12.38 hrs, Volume=

0.059 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 4.62 fps, Min. Travel Time= 0.2 min

Avg. Velocity = 2.76 fps, Avg. Travel Time= 0.4 min

Peak Storage= 3 cf @ 12.38 hrs, Average Depth at Peak Storage= 0.13'

Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.78 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished

Length= 60.0' Slope= 0.0407 '/'

Inlet Invert= 254.20', Outlet Invert= 251.76'



Reach 6R: DMH6 MANIFOLD

[52] Hint: Inlet conditions not evaluated

[61] Hint: Submerged 2% of Reach 5R bottom

Inflow Area =

3.006 ac, Inflow Depth = 0.24" for 2YR event

Inflow

0.27 cfs @ 12.38 hrs, Volume=

0.059 af

Outflow

0.27 cfs @ 12.39 hrs, Volume=

0.059 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 4.10 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 2.45 fps, Avg. Travel Time= 0.1 min

Peak Storage= 1 cf @ 12.39 hrs, Average Depth at Peak Storage= 0.14'

Bank-Full Depth= 1.00', Capacity at Bank-Full= 6.55 cfs

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

12/5/2021

Page 13

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 18.0' Slope= 0.0200 '/' Inlet Invert= 251.66', Outlet Invert= 251.30'



Reach 7R: DMH7 MANIFOLD

[52] Hint: Inlet conditions not evaluated

[85] Warning: Oscillations may require Finer Routing>1

[61] Hint: Submerged 36% of Reach 8R bottom

Inflow Area = 0.425 ac, Inflow Depth > 2.82" for 2YR event Inflow = 1.24 cfs @ 12.10 hrs, Volume= 0.100 af

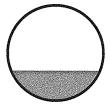
Outflow = 1.23 cfs @ 12.10 hrs, Volume= 0.100 af, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 5.77 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.16 fps, Avg. Travel Time= 0.2 min

Peak Storage= 4 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.32' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.67 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 20.0' Slope= 0.0150 '/' Inlet Invert= 251.60', Outlet Invert= 251.30'



Reach 8R: DMH8 DMH 7

[52] Hint: Inlet conditions not evaluated

[82] Warning: Early inflow requires earlier time span [85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 0.425 ac, Inflow Depth > 2.82" for 2YR event Inflow = 1.25 cfs @ 12.10 hrs, Volume= 0.100 af

Outflow = 1.24 cfs @ 12.10 hrs, Volume= 0.100 af, Atten= 1%, Lag= 0.1 min

UC1502-POST-rev1

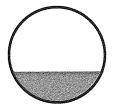
Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 14 12/5/2021

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Max. Velocity= 5.63 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.10 fps, Avg. Travel Time= 0.2 min

Peak Storage= 7 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.32' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.46 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 30.0' Slope= 0.0200 '/' Inlet Invert= 252.30', Outlet Invert= 251.70'



Reach 9R: DMH9 DMH10

[52] Hint: Inlet conditions not evaluated

Inflow Area = 1.598 ac, Inflow Depth = 0.14" for 2YR event Inflow = 0.05 cfs @ 12.49 hrs, Volume= 0.018 af

Outflow = 0.04 cfs @ 12.51 hrs, Volume= 0.018 af, Atten= 1%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Max. Velocity= 2.73 fps, Min. Travel Time= 0.6 min Avg. Velocity = 2.02 fps, Avg. Travel Time= 0.8 min

Peak Storage= 2 cf @ 12.50 hrs, Average Depth at Peak Storage= 0.05' Bank-Full Depth= 1.00'. Capacity at Bank-Full= 7.87 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 99.0' Slope= 0.0416 '/' Inlet Invert= 256.56', Outlet Invert= 252.44'



Reach 10R: DMH10 POND2

[52] Hint: Inlet conditions not evaluated

[82] Warning: Early inflow requires earlier time span [85] Warning: Oscillations may require Finer Routing>1

[61] Hint: Submerged 3% of Reach 9R bottom

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 15 12/5/2021

Inflow Area = 2.624 ac, Inflow Depth > 0.40" for 2YR event Inflow = 0.65 cfs @ 12.11 hrs, Volume= 0.089 af

Outflow = 0.64 cfs @ 12.11 hrs, Volume= 0.088 af, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Max. Velocity= 4.85 fps, Min. Travel Time= 0.2 min Avg. Velocity = 2.24 fps, Avg. Travel Time= 0.3 min

Peak Storage= 6 cf @ 12.11 hrs, Average Depth at Peak Storage= 0.23' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.74 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 47.0' Slope= 0.0221 '/' Inlet Invert= 252.34', Outlet Invert= 251.30'



Reach 11R: DMH11-FES

[52] Hint: Inlet conditions not evaluated

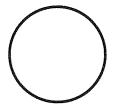
Inflow Area = 1.784 ac, Inflow Depth = 0.00" for 2YR event Inflow = 0.00 cfs @ 8.00 hrs, Volume= 0.000 af

Outflow = 0.00 cfs @ 8.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 8.00 hrs, Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.63 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 28.0' Slope= 0.0500 '/' Inlet Invert= 247.40', Outlet Invert= 246.00'



Page 16 12/5/2021

Reach 12R: DMH12-PIPE END

[52] Hint: Inlet conditions not evaluated

Inflow Area = 6.055 ac, Inflow Depth = 0.00" for 2YR event Inflow = 0.00 cfs @ 8.00 hrs, Volume= 0.000 af

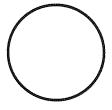
Outflow = 0.00 cfs @ 8.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 8.00 hrs, Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.72 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 20.0' Slope= 0.0400 '/' Inlet Invert= 244.80'. Outlet Invert= 244.00'



Reach 13R: DMH13-PIPE END

[52] Hint: Inlet conditions not evaluated

Inflow Area = 0.932 ac, Inflow Depth = 0.00" for 2YR event Inflow = 0.00 cfs @ 8.00 hrs, Volume= 0.000 af

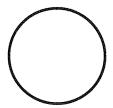
Outflow = 0.00 cfs @ 8.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 8.00 hrs, Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.72 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 17.0' Slope= 0.0400 '/' Inlet Invert= 246.68', Outlet Invert= 246.00'



Page 17 12/5/2021

Pond 1P: POND 1

Inflow Area		1.784 ac, li	nflow Depth	1 > 0.70"	for 2	YR event		
Inflow =	-	1.02 cfs @	12.12 hrs,	Volume=		0.104 af		
Outflow =	=	0.81 cfs @	12.10 hrs,	Volume=		0.104 af,	Atten= 20%,	Lag= 0.0 min
Discarded =	=	0.81 cfs @	12.10 hrs,	Volume=		0.104 af		
Primary =	=	0.00 cfs @	8.00 hrs,	Volume=		0.000 af		

Routing by Stor-Ind method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Peak Elev= 249.94' @ 12.20 hrs Surf.Area= 0.042 ac Storage= 0.002 af

Plug-Flow detention time= 1.0 min calculated for 0.104 af (100% of inflow) Center-of-Mass det. time= 1.0 min (863.4 - 862.5)

Volume	Invert	Avail.Storage	e Storage Description		
#1	249.80'	0.063 af	20.70'W x 89.00'L x 5.50'H Prismatoid		
			0.233 af Overall - 0.074 af Embedded = 0.158 af x 40.0% Voids		
#2	251.05'	0.074 af	48.0"D x 86.00'L Horizontal Cylinder x 3 Inside #1		
		0.138 af	Total Available Storage		
Device	Routing	Invert O	utlet Devices		
#1	Discarded				
		E	Excluded Surface area = 0.000 ac		

253.95' 12.0" Vert. Orifice/Grate X 2.00 C= 0.600 #2 Primary

Discarded OutFlow Max=0.81 cfs @ 12.10 hrs HW=249.89' (Free Discharge) 1=Exfiltration (Exfiltration Controls 0.81 cfs)

Primary OutFlow Max=0.00 cfs @ 8.00 hrs HW=249.80' (Free Discharge) 2=Orifice/Grate (Controls 0.00 cfs)

Pond 2P: POND 2

Inflow Area =	6.055 ac, Inflow Depth > 0.49"	for 2YR event
Inflow =	2.00 cfs @ 12.11 hrs, Volume=	0.248 af
Outflow =	1.91 cfs @ 12.13 hrs, Volume=	0.248 af, Atten= 5%, Lag= 1.3 min
Discarded =	1.91 cfs @ 12.13 hrs, Volume=	0.248 af
Primary =	0.00 cfs @ 8.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Peak Elev= 247.20' @ 12.13 hrs Surf.Area= 5,460 sf Storage= 119 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 1.0 min (857.3 - 856.3)

Volume	Invert	Avail.Storage	Storage Description
#1	247.15'	8,051 cf	27.30'W x 200.00'L x 5.50'H Prismatoid
			30,030 cf Overall - 9,902 cf Embedded = 20,128 cf x 40.0% Voids
#2	248.40'	9,902 cf	48.0"D x 197.00'L Horizontal Cylinder x 4 Inside #1
-		17,953 cf	Total Available Storage

Prepared by {enter your company name here}

Page 18 12/5/2021

HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Device	Routing	Invert	Outlet Devices
#1	Discarded	247.10'	15.200 in/hr Exfiltration over Surface area above invert
			Excluded Surface area = 0 sf
#2	Primary	251.30'	12.0" Vert. Orifice/Grate X 3.00 C= 0.600

Discarded OutFlow Max=1.92 cfs @ 12.13 hrs HW=247.20' (Free Discharge)
—1=Exfiltration (Exfiltration Controls 1.92 cfs)

Primary OutFlow Max=0.00 cfs @ 8.00 hrs HW=247.15' (Free Discharge) 2=Orifice/Grate (Controls 0.00 cfs)

Pond 3P: POND 2

[82] Warning: Early inflow requires earlier time span

Inflow Area =	0.932 ac,	Inflow Depth > 1.17"	for 2YR event		
Inflow =	1.12 cfs @	12.11 hrs, Volume=	0.091 af		
Outflow =	0.52 cfs @	12.00 hrs, Volume=	0.091 af,	Atten= 54%, La	g= 0.0 min
Discarded =	0.52 cfs @	12.00 hrs, Volume=	0.091 af		_
Primary =	0.00 cfs @	8.00 hrs, Volume=	0.000 af		

Routing by Stor-Ind method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Peak Elev= 248.59' @ 12.35 hrs Surf.Area= 2,070 sf Storage= 406 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 4.2 min (847.1 - 842.9)

Volume	Invert	Avail.Storage	Storage Description
#1	248.10'	3,091 cf	20.70'W x 100.00'L x 5.50'H Prismatoid
			11,385 cf Overall - 3,657 cf Embedded = 7,728 cf x 40.0% Voids
#2	249.35'	3,657 cf	48.0"D x 97.00'L Horizontal Cylinder x 3 Inside #1
		6,748 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices	
#1	Discarded	248.09'	10.800 in/hr Exfiltration over Surface area above invert	
			Excluded Surface area = 0 sf	
#2	Primary	252.25'	12.0" Vert. Orifice/Grate C= 0.600	

Discarded OutFlow Max=0.52 cfs @ 12.00 hrs HW=248.17' (Free Discharge) 1=Exfiltration (Exfiltration Controls 0.52 cfs)

Primary OutFlow Max=0.00 cfs @ 8.00 hrs HW=248.10' (Free Discharge) 2=Orifice/Grate (Controls 0.00 cfs)

Link 1L: COMBINE HYDROGRAPHS

Inflow Area = 11.151 ac, Inflow Depth = 0.00" for 2YR event Inflow = 0.00 cfs @ 8.00 hrs, Volume= 0.000 af

Primary = 0.00 cfs @ 8.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

10 YR POST-DEVELOPMENT

Page 1 12/5/2021

Subcatchment 1S: CB1

[49] Hint: Tc<2dt may require smaller dt

Runoff =

0.63 cfs @ 12.12 hrs, Volume=

0.056 af, Depth= 1.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 10YR Rainfall=4.70"

Aı	rea (sf)	CN D	CN Description						
	9,043		98 Paved parking & roofs						
	18,146	39 >	39 >75% Grass cover, Good, HSG A						
	27,189	59 V	Veighted A	verage					
	18,146	Р	ervious Ar	ea					
	9,043	Ir	npervious	Area					
Тс	Length	Slope	Velocity	Capacity	Description				
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)					
6.0					Direct Entry, Min TC				
0.3	79	0.0100	4.91	3.86	Circular Channel (pipe),				
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'				
					n= 0.012 Concrete pipe, finished				
6.3	79	Total							

Subcatchment 2S: CB2

[49] Hint: Tc<2dt may require smaller dt

Runoff

0.24 cfs @ 12.13 hrs, Volume=

0.025 af, Depth= 0.78"

Area (sf)	CN	Description		
4,842	98 Paved parking & roofs			
7,887	39 >75% Grass cover, Good, HSG A			
3,942	30	Woods, Good, HSG A		
16,671	1 54 Weighted Average			
11,829	Pervious Area			
4,842		Impervious Area		

Prepared by {enter your company name here}

Page 2 12/5/2021

HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
 5.1	48	0.1670	0.16		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
0.1	18	0.2220	2.36		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
0.2	22	0.0900	2.10		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0420	1.43		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
0.4	70	0.0200	2.87		Shallow Concentrated Flow,
					Paved Kv= 20.3 fps
0.1					Direct Entry, Min TC
0.2	48	0.0100	4.91	3.86	
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
 6.2	218	Total			

Subcatchment 3S: CB3

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.69 cfs @ 12.10 hrs, Volume=

0.052 af, Depth> 2.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 10YR Rainfall=4.70"

	A	rea (sf)	CN I	N Description							
		7,317	98	8 Paved parking & roofs							
		3,103	39	· · · · · · · · · · · · · · · · · · ·							
_		10,420	0 80 Weighted Average								
		3,103		Pervious Ai	ea						
		7,317		Impervious	Area						
	Tc (min)	Length (feet)	Slope (ft/ft)	•	Capacity (cfs)	Description					
_	6.0 0.0	8	0.0100	4.91	3.86	Direct Entry, MIN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished					
	6.0	8	Total								

Subcatchment 4S: CB4

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.53 cfs @ 12.09 hrs, Volume=

0.042 af, Depth> 4.13"

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 3 12/5/2021

Α	rea (sf)	CN E	escription		
	5,376	98 F	aved park	ing & roofs	
	5,376	lı	mpervious	Area	
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0 0.1	31	0.0100	4.91	3.86	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
6.1	31	Total			

Subcatchment 5S: CB5

[49] Hint: Tc<2dt may require smaller dt

0.54 cfs @ 12.12 hrs, Volume= 0.046 af, Depth= 1.32" Runoff

A	rea (sf)	CN D	escription						
	8,247	98 P	aved park	ing & roofs					
	2,985	39 >							
	6,808	30 V	√oods, Go	od, HSG A					
***************************************	18,040	63 V	Veighted A	verage					
	9,793	Р	ervious Ar	ea					
	8,247	Ir	npervious	Area					
					—				
Tc	Length	Slope	•	Capacity	Description				
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	(cfs)					
5.0	50	0.1830	0.17		Sheet Flow,				
					Woods: Light underbrush n= 0.400 P2= 3.25"				
0.7	92	0.1830	2.14		Shallow Concentrated Flow,				
	,	0.4000	4.04		Woodland Kv= 5.0 fps				
0.4	45	0.1360	1.84		Shallow Concentrated Flow,				
0.0	40	4 0000	7.00		Woodland Kv= 5.0 fps				
0.0	10	1.0000	7.00		Shallow Concentrated Flow,				
0.4	70	0.0000	2.07		Short Grass Pasture Kv= 7.0 fps				
0.4	72	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps				
0.3	60	0.0320	3.63		Shallow Concentrated Flow,				
0.3	00	0.0320	3.03		Paved Kv= 20.3 fps				
0.3	101	0.0100	4.91	3.86	•				
0.3	101	0.0100	4.91	3.00	Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'				
					n= 0.012 Concrete pipe, finished				
	400	T-4-1			11- 0.012 Condicte pipe, linished				
7.1	430	Total							

Prepared by {enter your company name here}

Page 4 12/5/2021

HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Subcatchment 6S: CB6

[49] Hint: Tc<2dt may require smaller dt

Runoff

1.08 cfs @ 12.09 hrs, Volume=

0.087 af, Depth> 4.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 10YR Rainfall=4.70"

	Α	rea (sf)	CN [Description		
_		11,020	98 F	Paved park	ing & roofs	
	11,020 Impervious Area				Area	•
	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
-	6.0 0.0	3	0.0200	6.95	5.46	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
-	6.0	3	Total			

Subcatchment 7S: CB7

[49] Hint: Tc<2dt may require smaller dt

Runoff

0.73 cfs @ 12.10 hrs, Volume=

0.059 af, Depth> 4.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 10YR Rainfall=4.70"

А	rea (sf)	CN D	escription		
	7,497	98 P	aved park	ing & roofs	
	7,497	Ir	npervious	Area	
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0 0.4	120	0.0100	4.91	3.86	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
6.4	120	Total			

Subcatchment 8S: CB8

[49] Hint: Tc<2dt may require smaller dt

Runoff

0.55 cfs @ 12.19 hrs, Volume=

0.060 af, Depth= 0.89"

Aı	rea (sf)	CN D	escription		
	12,116 8,994			ng & roofs s cover, Go	od. HSG A
	14,308			od, HSG A	
	35,418		/eighted A		
	23,302		ervious Ar		
	12,116	In	npervious	Area	
Тс	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
5.4	50	0.1540	0.15		Sheet Flow,
	` 040	0.4540	4.00		Woods: Light underbrush n= 0.400 P2= 3.25" Shallow Concentrated Flow,
2.1	248	0.1540	1.96		Woodland Kv= 5.0 fps
0.0	10	1.0000	7.00		Shallow Concentrated Flow,
0.0					Short Grass Pasture Kv= 7.0 fps
1.2	73	0.0210	1.01		Shallow Concentrated Flow,
		0.0070	0.04		Short Grass Pasture Kv= 7.0 fps Shallow Concentrated Flow,
0.4	77	0.0270	3.34		Paved Kv= 20.3 fps
0.1	31	0.0374	9.50	7.46	
0.1	J 1	3.00. 1	2.30	- · · · ·	Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
9.2	489	Total			

Subcatchment 9S: CB9

[49] Hint: Tc<2dt may require smaller dt

0.91 cfs @ 12.10 hrs, Volume= Runoff

0.073 af, Depth> 4.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 10YR Rainfall=4.70"

Aı	rea (sf)	CN E	escription		
	9,254	98 F	aved parki	ng & roofs	
9,254 Impervious Area				Area	
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0 0.3		0.0100	5.90	4.63	Direct Entry, M IN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
6.2	116	Total			

6.3 116 Total

Page 6 12/5/2021

Subcatchment 10S: CB10

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.73 cfs @ 12.11 hrs, Volume=

0.059 af, Depth= 1.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 10YR Rainfall=4.70"

A۱	rea (sf)	CN [Description						
	10,776	98 F	98 Paved parking & roofs						
	1,709	39	>75% Ġras:	s cover, Go	ood, HSG A				
	9,781	30 \	Noods, Go	<u>od, HSG A</u>					
	22,266	64 \	64 Weighted Average						
11,490 Pervious Area									
	10,776	İ	mpervious	Area					
Tc (min)	Length (feet)	Slope (ft/ft)	•	Capacity (cfs)	Description				
 6.0					Direct Entry, MIN. TC				
0.0	15	0.0400	9.83	7.72	Circular Channel (pipe),				
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'				
					n= 0.012 Concrete pipe, finished				
 6.0	15	Total							

Subcatchment 11S: TR11

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.03 cfs @ 12.15

1.03 cfs @ 12.13 hrs, Volume=

0.097 af, Depth= 1.01"

Area (sf)	CN	Description
 17,178	98	Paved parking & roofs
25,172	39	>75% Grass cover, Good, HSG A
7,847	30	Woods, Good, HSG A
 50,197	58	Weighted Average
33,019		Pervious Area
17,178		Impervious Area

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 7 12/5/2021

	Tc	Length	Slope	Velocity	Capacity	Description
	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
-	4.9	50	0.2020	0.17		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
	0.2	31	0.2020	2.25		Shallow Concentrated Flow,
		_				Woodland Kv= 5.0 fps
	0.2	30	0.1610	2.81		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	0.1	16	0.1250	2.47		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	0.1	15	0.0590	3.64		Shallow Concentrated Flow,
						Grassed Waterway Kv= 15.0 fps
	0.3	19	0.0590	1.21		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.1	19	0.3160	2.81		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.2	10	0.0100	0.70		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	0.0	7	0.1420	2.64		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	1.0	246	0.0050	4.17	3.28	
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
						n= 0.010 PVC, smooth interior
	7.1	443	Total			

Subcatchment 12S: TR12

[49] Hint: Tc<2dt may require smaller dt

0.71 cfs @ 12.20 hrs, Volume= Runoff

0.096 af, Depth= 0.62"

Ai	rea (sf)	CN E	escription		
	20,701	98 F	aved park	ing & roofs	
	27,521	39 >	75% Gras	s cover, Go	ood, HSG A
	32,521	30 V	Voods, Go	od, HSG A	
	80,743	51 V	Veighted A	verage	
	60,042	F	Pervious Ar	ea	
	20,701	l	mpervious	Area	
Tc	Length	Slope		Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0					Direct Entry, MIN. TC.
1.1	274	0.0050	4.17	3.28	
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.010 PVC, smooth interior
7.1	274	Total			

Page 8 12/5/2021

HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Subcatchment 13S: TR13

[49] Hint: Tc<2dt may require smaller dt

0.53 cfs @ 12.21 hrs, Volume= Runoff

0.076 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 10YR Rainfall=4.70"

A	rea (sf)	CN D	escription						
	18,951	98 P	aved park	ing & roofs					
	14,429	39 >	· · · · · · · · · · · · · · · · · · ·						
	36,229	30 V	Voods, Go	od, HSG A					
	69,609	50 V	Veighted A	verage					
	50,658	Р	ervious Ar	ea					
	18,951	Ir	npervious	Area					
Tc	_	Slope	Velocity	Capacity	Description				
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)					
2.8	50	0.1170	0.30		Sheet Flow,				
					Grass: Short n= 0.150 P2= 3.25"				
0.3	48	0.1170	2.39		Shallow Concentrated Flow,				
					Short Grass Pasture Kv= 7.0 fps				
1.8	185	0.1170	1.71		Shallow Concentrated Flow,				
	_				Woodland Kv= 5.0 fps				
0.0	9	0.2220	3.30		Shallow Concentrated Flow,				
		0.4000	0.04		Short Grass Pasture Kv= 7.0 fps				
0.1	18	0.1000	2.21		Shallow Concentrated Flow,				
					Short Grass Pasture Kv= 7.0 fps				
1.0		0.0050	4 47	0.00	Direct Entry, Min TC				
0.9	226	0.0050	4.17	3.28	Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'				
					n= 0.010 PVC, smooth interior				
6.9	536	Total							

Subcatchment 14S: CB14

[49] Hint: Tc<2dt may require smaller dt

1.45 cfs @ 12.10 hrs, Volume= Runoff

0.111 af, Depth> 3.17"

Area (sf) CN	Description
14,6	56 98	Paved parking & roofs
3,6	92 39	>75% Grass cover, Good, HSG A
18,3	48 86	Weighted Average
3,6	92	Pervious Area
14,6	56	Impervious Area

Prepared by {enter your company name here}

HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 9 12/5/2021

	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
-	6.0 0.1	25	0.0100	4.91	3.86	Direct Entry, MIN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
-	6.1	25	Total			

Subcatchment 17S: S17

Runoff =

0.00 cfs @ 22.95 hrs, Volume=

0.002 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 10YR Rainfall=4.70"

	A	rea (sf)	CN D	escription		
	21,239 39 >75% Grass cover, Goo					
		67,689	30 V	<u>Voods, Go</u>	<u>od, HSG A</u>	
		88,928	32 V	Veighted A	verage	
		88,928	P	ervious Ar	ea	
	Тс	Length	Slope	Velocity	Capacity	Description
_	(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
	11.1	50	0.0254	0.07		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
	0.3	13	0.0254	0.80		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.5	74	0.2160	2.32		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
	0.7	49	0.0510	1.13		Shallow Concentrated Flow,
						Woodland Kv= 5.0 fps
_	12.6	186	Total			

Subcatchment 18S: S18

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.00 cf

0.00 cfs @ 21.53 hrs, Volume=

0.001 af, Depth= 0.02"

	Area (sf)	CN	Description			
***************************************	4,448	39	>75% Grass cover, Good, HSG A			
	10,309	30	Woods, Good, HSG A			
-,	14,757	33	Weighted Average			
	14,757		Pervious Area			

Prepared by {enter your company name here}

Page 10 12/5/2021

HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
 0.6	13	0.3080	0.34		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.25"
1.2	17	0.1180	0.24		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.25"
0.4	4	0.5000	0.15		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
0.5	16	0.7690	0.51		Sheet Flow,
					Grass: Short n= 0.150 P2= 3.25"
0.1	57	0.8770	6.56		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
3.2					Direct Entry, Min TC
0.1	44	0.0250	7.77	6.10	Circular Channel (pipe), XCB1-XDMH1
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
 					n= 0.012 Concrete pipe, finished
 6.1	151	Total			

Reach 1R: DMH1 - DMH3

[52] Hint: Inlet conditions not evaluated

Inflow Area =

1.246 ac, Inflow Depth > 1.28" for 10YR event

Inflow =

1.55 cfs @ 12.11 hrs, Volume=

0.133 af

Outflow

1.51 cfs @ 12.12 hrs, Volume=

0.133 af, Atten= 3%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 4.77 fps, Min. Travel Time= 0.2 min Avg. Velocity = 1.83 fps, Avg. Travel Time= 0.6 min

Peak Storage= 22 cf @ 12.12 hrs, Average Depth at Peak Storage= 0.43' Bank-Full Depth= 1.00', Capacity at Bank-Full= 4.03 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 67.0' Slope= 0.0109 '/' Inlet Invert= 255.08', Outlet Invert= 254.35'



Reach 3R: DMH3-HEADER

[52] Hint: Inlet conditions not evaluated

[82] Warning: Early inflow requires earlier time span

[85] Warning: Oscillations may require Finer Routing>1

[61] Hint: Submerged 44% of Reach 1R bottom

Prepared by {enter your company name here}

Page 11

HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

12/5/2021

Inflow Area = 1.370 ac, Inflow Depth > 1.54" for 10YR event 2.03 cfs @ 12.11 hrs, Volume= 0.175 af

Outflow = 2.02 cfs @ 12.11 hrs, Volume= 0.175 af, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 6.38 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.51 fps, Avg. Travel Time= 0.1 min

Peak Storage= 7 cf @ 12.11 hrs, Average Depth at Peak Storage= 0.42' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.41 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 22.0' Slope= 0.0136 '/' Inlet Invert= 254.25', Outlet Invert= 253.95'



Reach 4R: DMH4 DMH5

[52] Hint: Inlet conditions not evaluated

Inflow Area = 3.006 ac, Inflow Depth = 0.77" for 10YR event Inflow = 1.75 cfs @ 12.14 hrs, Volume= 0.193 af

Outflow = 1.63 cfs @ 12.16 hrs, Volume= 0.193 af, Atten= 7%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 7.00 fps, Min. Travel Time= 0.2 min Avg. Velocity = 3.32 fps, Avg. Travel Time= 0.4 min

Peak Storage= 17 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.34' Bank-Full Depth= 1.00', Capacity at Bank-Full= 6.69 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 72.0' Slope= 0.0300 '/' Inlet Invert= 256.46', Outlet Invert= 254.30'



Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 12

12/5/2021

Reach 5R: DMH5 DMH6

[52] Hint: Inlet conditions not evaluated

[88] Warning: Qout>Qin may require Finer Routing>1

[61] Hint: Submerged 10% of Reach 4R bottom

Inflow Area = 3.006 ac, Inflow Depth = 0.77" for 10YR event Inflow = 1.63 cfs @ 12.16 hrs, Volume= 0.193 af

Outflow = 1.64 cfs @ 12.17 hrs, Volume= 0.193 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 7.83 fps, Min. Travel Time= 0.1 min Avg. Velocity = 3.70 fps, Avg. Travel Time= 0.3 min

Peak Storage= 13 cf @ 12.17 hrs, Average Depth at Peak Storage= 0.31' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.78 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 60.0' Slope= 0.0407 '/' Inlet Invert= 254.20', Outlet Invert= 251.76'



Reach 6R: DMH6 MANIFOLD

[52] Hint: Inlet conditions not evaluated

[88] Warning: Qout>Qin may require Finer Routing>1

[61] Hint: Submerged 10% of Reach 5R bottom

Inflow Area = 3.006 ac, Inflow Depth = 0.77" for 10YR event Inflow = 1.64 cfs @ 12.17 hrs, Volume= 0.193 af

Outflow = 1.64 cfs @ 12.18 hrs, Volume= 0.193 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 6.93 fps, Min. Travel Time= 0.0 min Avg. Velocity = 3.28 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.17 hrs, Average Depth at Peak Storage= 0.34' Bank-Full Depth= 1.00', Capacity at Bank-Full= 6.55 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 18.0' Slope= 0.0200 '/' Inlet Invert= 251.66', Outlet Invert= 251.30'

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 13

<u> 12/5/2021</u>



Reach 7R: DMH7 MANIFOLD

[52] Hint: Inlet conditions not evaluated

[85] Warning: Oscillations may require Finer Routing>1

[61] Hint: Submerged 48% of Reach 8R bottom

Inflow Area = 0.425 ac, Inflow Depth > 4.12" for 10YR event 1.81 cfs @ 12.10 hrs, Volume= 0.146 af

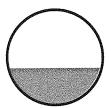
Outflow = 1.79 cfs @ 12.10 hrs, Volume= 0.146 af, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 6.41 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.42 fps, Avg. Travel Time= 0.1 min

Peak Storage= 6 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.39' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.67 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 20.0' Slope= 0.0150 '/' Inlet Invert= 251.60', Outlet Invert= 251.30'



Reach 8R: DMH8 DMH 7

[52] Hint: Inlet conditions not evaluated

[82] Warning: Early inflow requires earlier time span [85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 0.425 ac, Inflow Depth > 4.13" for 10YR event Inflow = 1.82 cfs @ 12.10 hrs, Volume= 0.146 af

Outflow = 1.81 cfs @ 12.10 hrs, Volume= 0.146 af, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity = 6.25 fps, Min. Travel Time = 0.1 min Avg. Velocity = 2.35 fps, Avg. Travel Time = 0.2 min

Type III 24-hr 10YR Rainfall=4.70"

UC1502-POST-rev1

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 14 12/5/2021

Peak Storage= 9 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.40' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.46 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 30.0' Slope= 0.0200 '/' Inlet Invert= 252.30', Outlet Invert= 251.70'



Reach 9R: DMH9 DMH10

[52] Hint: Inlet conditions not evaluated

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow Area = 1.598 ac, Inflow Depth = 0.57" for 10YR event 0.53 cfs @ 12.21 hrs, Volume= 0.076 af

Outflow = 0.54 cfs @ 12.22 hrs, Volume= 0.076 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 5.75 fps, Min. Travel Time= 0.3 min Avg. Velocity = 2.94 fps, Avg. Travel Time= 0.6 min

Peak Storage= 9 cf @ 12.21 hrs, Average Depth at Peak Storage= 0.18' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.87 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 99.0' Slope= 0.0416 '/' Inlet Invert= 256.56', Outlet Invert= 252.44'



Reach 10R: DMH10 POND2

[52] Hint: Inlet conditions not evaluated

[82] Warning: Early inflow requires earlier time span [85] Warning: Oscillations may require Finer Routing>1

1611 Hint: Submerged 7% of Reach 9R bottom

Inflow Area = 2.624 ac, Inflow Depth > 0.96" for 10YR event Inflow = 1.87 cfs @ 12.14 hrs, Volume= 0.210 af

Outflow = 1.85 cfs @ 12.14 hrs, Volume= 0.210 af, Atten= 1%, Lag= 0.3 min

Prepared by {enter your company name here} HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC Page 15

12/5/2021

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Max. Velocity= 6.44 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.82 fps, Avg. Travel Time= 0.3 min

Peak Storage= 13 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.39' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.74 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 47.0' Slope= 0.0221 '/' Inlet Invert= 252.34', Outlet Invert= 251.30'



Reach 11R: DMH11-FES

[52] Hint: Inlet conditions not evaluated

Inflow Area =

1.784 ac, Inflow Depth = 0.00" for 10YR event

Inflow =

0.00 cfs @ 8.00 hrs, Volume=

0.000 af

Outflow

8.00 hrs, Volume= 0.00 cfs @

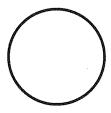
0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min

Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 8.00 hrs, Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.63 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 28.0' Slope= 0.0500 '/' Inlet Invert= 247.40', Outlet Invert= 246.00'



Reach 12R: DMH12-PIPE END

[52] Hint: Inlet conditions not evaluated

Prepared by {enter your company name here}

Page 16 12/5/2021

HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Inflow Area = 6.055 ac, Inflow Depth = 0.00" for 10YR event 0.00 cfs @ 8.00 hrs, Volume= 0.000 af

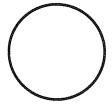
Outflow = 0.00 cfs @ 8.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 8.00 hrs, Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.72 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 20.0' Slope= 0.0400 '/' Inlet Invert= 244.80', Outlet Invert= 244.00'



Reach 13R: DMH13-PIPE END

[52] Hint: Inlet conditions not evaluated

Inflow Area = 0.932 ac, Inflow Depth = 0.00" for 10YR event

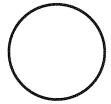
Inflow = 0.00 cfs @ 8.00 hrs, Volume= 0.000 af Outflow = 0.00 cfs @ 8.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 8.00 hrs, Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.72 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 17.0' Slope= 0.0400 '/' Inlet Invert= 246.68', Outlet Invert= 246.00'



Page 17 12/5/2021

HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Pond 1P: POND 1

Inflow Area =	1.784 ac, Inflow Depth > 1.49"	for 10YR event
Inflow =	2.56 cfs @ 12.12 hrs, Volume=	0.221 af
Outflow =		
Discarded =	0.81 cfs @ 12.00 hrs, Volume=	0.221 af
Primary =	0.00 cfs @ 8.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Peak Elev= 251.71' @ 12.51 hrs Surf.Area= 0.042 ac Storage= 0.037 af

Plug-Flow detention time= 10.0 min calculated for 0.220 af (100% of inflow) Center-of-Mass det. time= 10.0 min (860.6 - 850.6)

Volume	Invert	Avail.Storage	Storage Description
#1	249.80'	0.063 af	20.70'W x 89.00'L x 5.50'H Prismatoid
			0.233 af Overall - 0.074 af Embedded = 0.158 af x 40.0% Voids
#2	251.05'	0.074 af	48.0"D x 86.00'L Horizontal Cylinder x 3 Inside #1
		0.138 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	249.70'	19.110 in/hr Exfiltration over Surface area above invert Excluded Surface area = 0.000 ac
#2	Primary	253.95'	12.0" Vert. Orifice/Grate X 2.00 C= 0.600

Discarded OutFlow Max=0.81 cfs @ 12.00 hrs HW=250.00' (Free Discharge) 1=Exfiltration (Exfiltration Controls 0.81 cfs)

Primary OutFlow Max=0.00 cfs @ 8.00 hrs HW=249.80' (Free Discharge) 2=Orifice/Grate (Controls 0.00 cfs)

Pond 2P: POND 2

Inflow Area =	6.055 ac, Inflow Depth > 1.09"	
Inflow =	5.21 cfs @ 12.13 hrs, Volume=	0.549 af
Outflow =	1.92 cfs @ 12.00 hrs, Volume=	
Discarded =	1.92 cfs @ 12.00 hrs, Volume=	0.549 af
Primary =	0.00 cfs @ 8.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Peak Elev= 248.60' @ 12.53 hrs Surf.Area= 5,460 sf Storage= 3,263 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 7.9 min (866.2 - 858.3)

Volume	Invert	Avail.Storage	Storage Description
#1	247.15'	8,051 cf	27.30'W x 200.00'L x 5.50'H Prismatoid
			30,030 cf Overall - 9,902 cf Embedded = 20,128 cf x 40.0% Voids
#2	248.40'	9,902 cf	48.0"D x 197.00'L Horizontal Cylinder x 4 Inside #1
		17,953 cf	Total Available Storage

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 18

12/5/2021

Device	Routing	Invert	Outlet Devices
#1	Discarded	247.10'	15.200 in/hr Exfiltration over Surface area above invert
			Excluded Surface area = 0 sf
#2	Primary	251.30'	12.0" Vert. Orifice/Grate X 3.00 C= 0.600

Discarded OutFlow Max=1.92 cfs @ 12.00 hrs HW=247.24' (Free Discharge) 1=Exfiltration (Exfiltration Controls 1.92 cfs)

Primary OutFlow Max=0.00 cfs @ 8.00 hrs HW=247.15' (Free Discharge) 2=Orifice/Grate (Controls 0.00 cfs)

Pond 3P: POND 2

[82] Warning: Early inflow requires earlier time span [85] Warning: Oscillations may require Finer Routing>1

Inflow Area =	0.932 ac, Inflow Depth > 2.19"	for 10YR event
Inflow =	2.18 cfs @ 12.10 hrs, Volume=	0.170 af
Outflow =	0.52 cfs @ 11.90 hrs, Volume=	0.170 af, Atten= 76%, Lag= 0.0 min
Discarded =	0.52 cfs @ 11.90 hrs, Volume=	0.170 af
Primary =	0.00 cfs @ 8.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Peak Elev= 249.91' @ 12.53 hrs Surf.Area= 2,070 sf Storage= 1,691 cf

Plug-Flow detention time= 18.7 min calculated for 0.170 af (100% of inflow) Center-of-Mass det. time= 18.6 min (848.2 - 829.6)

Volume	Invert	Avail.Storage	Storage Description
#1	248.10'	3,091 cf	20.70'W x 100.00'L x 5.50'H Prismatoid
			11,385 cf Overall - 3,657 cf Embedded = 7,728 cf x 40.0% Voids
#2	249.35'	3,657 cf	48.0"D x 97.00'L Horizontal Cylinder x 3 Inside #1
		6.748 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	248.09'	10.800 in/hr Exfiltration over Surface area above invert
			Excluded Surface area = 0 sf
#2	Primary	252.25'	12.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.52 cfs @ 11.90 hrs HW=248.21' (Free Discharge) 1=Exfiltration (Exfiltration Controls 0.52 cfs)

Primary OutFlow Max=0.00 cfs @ 8.00 hrs HW=248.10' (Free Discharge) 2=Orifice/Grate (Controls 0.00 cfs)

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 19

12/5/2021

Link 1L: COMBINE HYDROGRAPHS

Inflow Area =

11.151 ac, Inflow Depth = 0.00" for 10YR event

Inflow =

0.002 af

Primary =

0.00 cfs @ 22.75 hrs, Volume= 0.00 cfs @ 22.75 hrs, Volume=

0.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

100 YR POST-DEVELOPMENT

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 1

12/5/2021

Subcatchment 1S: CB1

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.56 cfs @ 12.11 hrs, Volume=

0.123 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 100YR Rainfall=6.80"

Area	a (sf)	CN D	CN Description						
	,043	98 P	aved parki	ng & roofs	-1 11CC A				
18	3,146	39 >	75% Grass	s cover, Go	ood, HSG A				
27	7,189		Veighted A						
18	3,146	P	ervious Ar	ea					
	9,043 Impervious Area			Area					
Tc L	ength	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description				
6.0	79	0.0100	4.91	3.86	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished				
6.3	79	Total							

Subcatchment 2S: CB2

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.74 cfs @ 12.11 hrs, Volume=

0.061 af, Depth= 1.91"

Area (sf)	CN	Description
4,842	98	Paved parking & roofs
7,887	39	>75% Grass cover, Good, HSG A
3,942	30	Woods, Good, HSG A
16,671	54	Weighted Average
11,829		Pervious Area
4,842		Impervious Area

Page 2

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

12/	5/2021

Тс	Length	Slope	Velocity	Capacity	Description
 (min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	
5.1	48	0.1670	0.16		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
0.1	18	0.2220	2.36		Shallow Concentrated Flow,
٠					Woodland Kv= 5.0 fps
0.2	22	0.0900	2.10		Shallow Concentrated Flow,
0.2	for for	0.000			Short Grass Pasture Kv= 7.0 fps
0.1	12	0.0420	1.43		Shallow Concentrated Flow,
0.1	12-	0.0120	1.10		Short Grass Pasture Kv= 7.0 fps
0.4	70	0.0200	2.87		Shallow Concentrated Flow,
0.4	70	0.0200	2		Paved Kv= 20.3 fps
0.4					Direct Entry, Min TC
0.1			4.04	0.00	
0.2	48	0.0100	4.91	3.86	Circular Channel (pipe),
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
 6.2	218	Total			

Subcatchment 3S: CB3

[49] Hint: Tc<2dt may require smaller dt

1.17 cfs @ 12.10 hrs, Volume= Runoff

0.089 af, Depth> 4.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 100YR Rainfall=6.80"

Ar	ea (sf)	CN E	Description							
	7,317									
	3,103	39 >	75% Gras	s cover, Go	ood, HSG A					
	10,420	80 V	Veighted A	verage						
	3,103	F	Pervious Ar	ea						
	7,317	1	mpervious	Area						
Tc iin)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description					
 6.0 0.0	8	0.0100	4.91	3.86	Direct Entry, MIN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished					
 6.0	8	Total								

Subcatchment 4S: CB4

[49] Hint: Tc<2dt may require smaller dt

0.77 cfs @ 12.09 hrs, Volume= Runoff

0.062 af, Depth> 6.01"

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 3 12/5/2021

	Area (sf)		escription		
	5,376	98 P	aved park	ing & roofs	
	5,376	lr	npervious	Area	
To (min		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0 0.	Ó	0.0100	4.91	3.86	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
6.	1 31	Total			

Subcatchment 5S: CB5

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.20 cfs @ 12.12 hrs, Volume=

0.095 af, Depth= 2.75"

Ar	ea (sf)	CN D	escription							
	8,247	98 P	Paved parking & roofs							
	2,985		39 >75% Grass cover, Good, HSG A 30 Woods, Good, HSG A							
	6,808									
	18,040		/eighted A							
	9,793	•	ervious Ar							
	8,247	In	npervious	Area						
Tc	Length	Slope	Velocity	Capacity	Description					
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	,					
5.0	50	0.1830	0.17		Sheet Flow,					
5.0	50	0.1000	0		Woods: Light underbrush n= 0.400 P2= 3.25"					
0.7	92	0.1830	2.14		Shallow Concentrated Flow,					
0.7	72	0.1000			Woodland Kv= 5.0 fps					
0.4	45	0.1360	1.84		Shallow Concentrated Flow,					
0.4	70	0.1000			Woodland Kv= 5.0 fps					
0.0	10	1.0000	7.00		Shallow Concentrated Flow,					
0.0	10	1.0000			Short Grass Pasture Kv= 7.0 fps					
0.4	72	0.0200	2.87		Shallow Concentrated Flow,					
U. 4	12	0.0200	2.0.		Paved Kv= 20.3 fps					
0.3	60	0.0320	3.63		Shallow Concentrated Flow,					
0.5	00	0.0020	0.00		Paved Kv= 20.3 fps					
0.3	101	0.0100	4.91	3.86	Circular Channel (pipe),					
0.5	101	0.0100			Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'					
					n= 0.012 Concrete pipe, finished					
-7 A	420	Total								
7.1	430	lulai								

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 4

12/5/2021

Subcatchment 6S: CB6

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.57 cfs @ 12.09 hrs, Volume=

0.127 af, Depth> 6.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 100YR Rainfall=6.80"

		rea (sf)		escription		
		11,020			ing & roofs	
		11,020	ır	npervious	Area	
(Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
· · · · · · · · · · · · · · · · · · ·	6.0 0.0	3	0.0200	6.95	5.46	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
	6.0	3	Total			

Subcatchment 7S: CB7

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.06 cfs @ 12.10 hrs, Volume=

0.086 af, Depth> 6.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 100YR Rainfall=6.80"

A۱	rea (sf)		escription		
	7,497	98 P	aved park	ing & roofs	
	7,497	Ir	npervious	Area	
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0 0.4	120	0.0100	4.91	3.86	Direct Entry, Min TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
6.4	120	Total			

Subcatchment 8S: CB8

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.56 cfs @ 12.15 hrs, Volume=

0.142 af, Depth= 2.09"

12/5/2021

Aı	rea (sf)	CN D	escription		
	12,116	98 P	aved parki	ng & roofs	
	8,994				od, HSG A
	14,308	30 V	/oods, Go	od, HSG A	
	35,418		/eighted A	_	
	23,302	•	ervious Ar		
	12,116	In	npervious	Area	
Tc	Length	Slope	Velocity	Capacity	Description
(min)	(feet)	(ft/ft)	(ft/sec)	(cfs)	2000 pt. 01.
5.4	50	0.1540	0.15		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
2.1	248	0.1540	1.96		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
0.0	10	1.0000	7.00		Shallow Concentrated Flow,
4.0	70	0.0040	4.04		Short Grass Pasture Kv= 7.0 fps Shallow Concentrated Flow,
1.2	73	0.0210	1.01		Short Grass Pasture Kv= 7.0 fps
0.4	77	0.0270	3.34		Shallow Concentrated Flow,
U. -1	11	0.0210	0.04		Paved Kv= 20.3 fps
0.1	31	0.0374	9.50	7.46	Circular Channel (pipe),
	Ţ,				Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
9.2	489	Total			

Subcatchment 9S: CB9

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.32 cfs @ 12.10 hrs, Volume=

0.106 af, Depth> 6.01"

P	rea (sf)	CN D	escription		
	9,254	98 P	aved park	ing & roofs	
	9,254	lr	npervious	Area	
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0 0.3	116	0.0100	5.90	4.63	Direct Entry, M IN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
6.3	116	Total			

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 6

12/5/2021

Subcatchment 10S: CB10

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.59 cfs @ 12.11 hrs, Volume=

0.121 af, Depth= 2.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 100YR Rainfall=6.80"

Aı	rea (sf)	CN D	escription		
	10,776	98 F	aved park	ing & roofs	
	1,709	39 >	75% Grass	s cover, Go	ood, HSG A
	9,781	30 V	Voods, Go	od, HSG A	
	22,266	64 V	Veighted A	verage	
	11,490	F	ervious Ar	ea	
	10,776	Impervious Area			
Tc	Length	Slope	Velocity	Capacity	Description
<u>(min)</u>	(feet)	(ft/ft)	(ft/sec)	(cfs)	
6.0					Direct Entry, MIN. TC
0.0	15	0.0400	9.83	7.72	Circular Channel (pipe),
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.012 Concrete pipe, finished
6.0	15	Total			

Subcatchment 11S: TR11

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.68 cfs @ 12.12 hrs, Volume=

0.218 af, Depth= 2.27"

Area (s	f) CN	Description
17,17	8 98	Paved parking & roofs
25,17	2 39	>75% Grass cover, Good, HSG A
7,84	7 30	Woods, Good, HSG A
50,19	7 58	Weighted Average
33,01	9	Pervious Area
17,17	'8	Impervious Area

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 7

12/5/2021

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
 4.9	50	0.2020	0.17		Sheet Flow,
					Woods: Light underbrush n= 0.400 P2= 3.25"
0.2	31	0.2020	2.25		Shallow Concentrated Flow,
0.0	20	0.4040	0.04		Woodland Kv= 5.0 fps Shallow Concentrated Flow,
0.2	30	0.1610	2.81		Short Grass Pasture Kv= 7.0 fps
0.1	16	0.1250	2.47	,	Shallow Concentrated Flow,
0.1	10	0.1200	···		Short Grass Pasture Kv= 7.0 fps
0.1	15	0.0590	3.64		Shallow Concentrated Flow,
					Grassed Waterway Kv= 15.0 fps
0.3	19	0.0590	1.21		Shallow Concentrated Flow,
					Woodland Kv= 5.0 fps
0.1	19	0.3160	2.81		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
0.0	10	0.0100	0.70		Shallow Concentrated Flow,
0.2	10	0.0100	0.70		Short Grass Pasture Kv= 7.0 fps
0.0	7	0.1420	2.64		Shallow Concentrated Flow,
0.0	•	•			Short Grass Pasture Kv= 7.0 fps
1.0	246	0.0050	4.17	3.28	Circular Channel (pipe), TRENCH DRAIN 11
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
			<u>,,,</u>		n= 0.010 PVC, smooth interior
7.1	443	Total			

Subcatchment 12S: TR12

[49] Hint: Tc<2dt may require smaller dt

2.85 cfs @ 12.13 hrs, Volume= Runoff

0.254 af, Depth= 1.64"

A	Area (sf)	CN E	escription						
	20,701			ing & roofs					
	27,521	39 >							
	32,521	30 V	Voods, Go	od, HSG A					
	80,743	51 V	Veighted A	verage					
	60,042	F	Pervious Ar	ea					
	20,701		mpervious	Area					
Tc (min)		Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description				
6.0					Direct Entry, MIN. TC.				
1.1		0.0050	4.17	3.28	Circular Channel (pipe),				
					Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'				
					n= 0.010 PVC, smooth interior				
7 1	274	Total							

Page 8 12/5/2021

HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Subcatchment 13S: TR13

[49] Hint: Tc<2dt may require smaller dt

Runoff =

2.30 cfs @ 12.13 hrs, Volume=

0.207 af, Depth= 1.56"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 100YR Rainfall=6.80"

	Area	(sf)	CN D	escription						
	18,	951	98 P	98 Paved parking & roofs						
	14,	429	39 >75% Grass cover, Good, HSG A							
	36,	229	30 V	loods, Go	od, HSG A					
	69,	609	50 V	Veighted A	verage					
	50,	658	Р	ervious Ar	ea					
	18,	951	Ir	npervious	Area					
T	c Le	ength	Slope	Velocity	Capacity	Description				
<u>(mi</u>	ገ) ((feet)	(ft/ft)	(ft/sec)	(cfs)					
2	.8	50	0.1170	0.30		Sheet Flow,				
						Grass: Short n= 0.150 P2= 3.25"				
0	.3	48	0.1170	2.39		Shallow Concentrated Flow,				
						Short Grass Pasture Kv= 7.0 fps				
1	.8	185	0.1170	1.71		Shallow Concentrated Flow,				
						Woodland Kv= 5.0 fps				
0	.0	9	0.2220	3.30		Shallow Concentrated Flow,				
						Short Grass Pasture Kv= 7.0 fps				
0	.1	18	0.1000	2.21		Shallow Concentrated Flow,				
						Short Grass Pasture Kv= 7.0 fps				
	.0					Direct Entry, Min TC				
0	.9	226	0.0050	4.17	3.28					
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'				
***************************************						n= 0.010 PVC, smooth interior				
6	.9	536	Total							

Subcatchment 14S: CB14

[49] Hint: Tc<2dt may require smaller dt

Runoff

2.31 cfs @ 12.10 hrs, Volume=

0.179 af, Depth> 5.09"

 Area (sf)	CN	Description
 14,656	98	Paved parking & roofs
3,692	39	>75% Grass cover, Good, HSG A
 18,348	86	Weighted Average
3,692		Pervious Area
14,656		Impervious Area

Prepared by {enter your company name here}

Page 9

HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

12/5/2021

	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
•	6.0 0.1	25	0.0100	4.91	3.86	Direct Entry, MIN. TC Circular Channel (pipe), Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
•	6.1	25	Total			

Subcatchment 17S: S17

Runoff =

0.09 cfs @ 12.62 hrs, Volume=

0.046 af, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Type III 24-hr 100YR Rainfall=6.80"

	Α	rea (sf)	CN D	escription		
_		21,239 67,689			s cover, Go od, HSG A	ood, HSG A
-		88,928 88,928	32 V	Veighted A Pervious Ar	verage	
	Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
-	11.1	50	0.0254	0.07		Sheet Flow,
	0.3	13	0.0254	0.80		Woods: Light underbrush n= 0.400 P2= 3.25" Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.5	74	0.2160	2.32		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
	0.7	49	0.0510	1.13		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
_	12.6	186	Total			

Subcatchment 18S: S18

[49] Hint: Tc<2dt may require smaller dt

Runoff =

0.03 cfs @ 12.44 hrs, Volume=

0.009 af, Depth= 0.33"

	Area (sf)	CN	Description
	4,448	39	>75% Grass cover, Good, HSG A
	10,309	30	Woods, Good, HSG A
***************************************	14,757	33	Weighted Average
	14,757		Pervious Area

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 10 12/5/2021

(Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
	0.6	13	0.3080	0.34		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.25"
	1.2	17	0.1180	0.24		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.25"
	0.4	4	0.5000	0.15		Sheet Flow,
						Woods: Light underbrush n= 0.400 P2= 3.25"
	0.5	16	0.7690	0.51		Sheet Flow,
						Grass: Short n= 0.150 P2= 3.25"
	0.1	57	0.8770	6.56		Shallow Concentrated Flow,
						Short Grass Pasture Kv= 7.0 fps
	3.2					Direct Entry, Min TC
	0.1	44	0.0250	7.77	6.10	Circular Channel (pipe), XCB1-XDMH1
						Diam= 12.0" Area= 0.8 sf Perim= 3.1' r= 0.25'
						n= 0.012 Concrete pipe, finished
	6.1	151	Total			

Reach 1R: DMH1 - DMH3

[52] Hint: Inlet conditions not evaluated

[82] Warning: Early inflow requires earlier time span

[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 1.246 ac, Inflow Depth > 2.63" for 100YR event Inflow = 3.47 cfs @ 12.11 hrs, Volume= 0.273 af

Outflow = 3.40 cfs @ 12.11 hrs, Volume= 0.273 af, Atten= 2%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity = 5.76 fps, Min. Travel Time = 0.2 min Avg. Velocity = 2.25 fps, Avg. Travel Time = 0.5 min

Peak Storage= 40 cf @ 12.11 hrs, Average Depth at Peak Storage= 0.71' Bank-Full Depth= 1.00', Capacity at Bank-Full= 4.03 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 67.0' Slope= 0.0109 '/' Inlet Invert= 255.08', Outlet Invert= 254.35'



Prepared by {enter your company name here}
HvdroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 11

12/5/2021

Reach 3R: DMH3-HEADER

[52] Hint: Inlet conditions not evaluated

[82] Warning: Early inflow requires earlier time span [85] Warning: Oscillations may require Finer Routing>1

[61] Hint: Submerged 76% of Reach 1R bottom

Inflow Area = 1.370 ac, Inflow Depth > 2.94" for 100YR event Inflow = 4.16 cfs @ 12.11 hrs, Volume= 0.335 af

Outflow = 4.14 cfs @ 12.11 hrs, Volume= 0.335 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 7.59 fps, Min. Travel Time= 0.0 min Avg. Velocity = 2.99 fps, Avg. Travel Time= 0.1 min

Peak Storage= 12 cf @ 12.11 hrs, Average Depth at Peak Storage= 0.66' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.41 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 22.0' Slope= 0.0136 '/' Inlet Invert= 254.25', Outlet Invert= 253.95'



Reach 4R: DMH4 DMH5

[52] Hint: Inlet conditions not evaluated

[85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 3.006 ac, Inflow Depth = 1:88" for 100YR event Inflow = 5.52 cfs @ 12.12 hrs, Volume= 0.472 af

Outflow = 5.44 cfs @ 12.13 hrs, Volume= 0.472 af, Atten= 2%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 9.46 fps, Min. Travel Time= 0.1 min Avg. Velocity = 4.05 fps, Avg. Travel Time= 0.3 min

Peak Storage= 42 cf @ 12.13 hrs, Average Depth at Peak Storage= 0.69' Bank-Full Depth= 1.00', Capacity at Bank-Full= 6.69 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 72.0' Slope= 0.0300 '/' Inlet Invert= 256.46', Outlet Invert= 254.30'

Prepared by {enter your company name here} HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC Page 12

12/5/2021



Reach 5R: DMH5 DMH6

[52] Hint: Inlet conditions not evaluated

[61] Hint: Submerged 23% of Reach 4R bottom

Inflow Area =

3.006 ac, Inflow Depth = 1.88"

for 100YR event

Inflow

5.44 cfs @ 12.13 hrs, Volume=

0.472 af

Outflow

5.38 cfs @ 12.13 hrs, Volume=

0.472 af, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 10.65 fps, Min. Travel Time= 0.1 min Avg. Velocity = 4.51 fps, Avg. Travel Time= 0.2 min

Peak Storage= 30 cf @ 12.13 hrs, Average Depth at Peak Storage= 0.61'

Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.78 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished

Length= 60.0' Slope= 0.0407 '/'

Inlet Invert= 254.20', Outlet Invert= 251.76'



Reach 6R: DMH6 MANIFOLD

[52] Hint: Inlet conditions not evaluated

[61] Hint: Submerged 24% of Reach 5R bottom

Inflow Area =

3.006 ac, Inflow Depth = 1.88" for 100YR event

Inflow

5.38 cfs @ 12.13 hrs, Volume=

0.472 af

Outflow

5.36 cfs @ 12.13 hrs, Volume=

0.472 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 9.26 fps. Min. Travel Time= 0.0 min

Avg. Velocity = 3.99 fps, Avg. Travel Time= 0.1 min

Peak Storage= 10 cf @ 12.13 hrs, Average Depth at Peak Storage= 0.69'

Bank-Full Depth= 1.00', Capacity at Bank-Full= 6.55 cfs

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 13 12/5/2021

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 18.0' Slope= 0.0200 '/' Inlet Invert= 251.66', Outlet Invert= 251.30'



Reach 7R: DMH7 MANIFOLD

[52] Hint: Inlet conditions not evaluated

[85] Warning: Oscillations may require Finer Routing>1

[61] Hint: Submerged 63% of Reach 8R bottom

Inflow Area = 0.425 ac, Inflow Depth > 6.00" for 100YR event Inflow = 2.62 cfs @ 12.10 hrs, Volume= 0.213 af

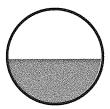
Outflow = 2.60 cfs @ 12.10 hrs, Volume= 0.213 af, Atten= 1%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 7.07 fps, Min. Travel Time= 0.0 min Avg. Velocity = 2.70 fps, Avg. Travel Time= 0.1 min

Peak Storage= 7 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.48' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.67 cfs

12.0" Diameter Pipe, n= 0.010 PVC, smooth interior Length= 20.0' Slope= 0.0150 '/' Inlet Invert= 251.60'. Outlet Invert= 251.30'



Reach 8R: DMH8 DMH 7

[52] Hint: Inlet conditions not evaluated

[82] Warning: Early inflow requires earlier time span [85] Warning: Oscillations may require Finer Routing>1

Inflow Area = 0.425 ac, Inflow Depth > 6.01" for 100YR event lnflow = 2.64 cfs @ 12.10 hrs, Volume= 0.213 af

Outflow = 2.62 cfs @ 12.10 hrs, Volume= 0.213 af, Atten= 0%, Lag= 0.1 min

Type III 24-hr 100YR Rainfall=6.80"

UC1502-POST-rev1

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

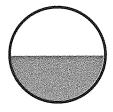
Page 14

12/5/2021

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Max. Velocity= 6.89 fps, Min. Travel Time= 0.1 min Avg. Velocity = 2.63 fps, Avg. Travel Time= 0.2 min

Peak Storage= 11 cf @ 12.10 hrs, Average Depth at Peak Storage= 0.49' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.46 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 30.0' Slope= 0.0200 '/' Inlet Invert= 252.30', Outlet Invert= 251.70'



Reach 9R: DMH9 DMH10

[52] Hint: Inlet conditions not evaluated

Inflow Area = 1.598 ac, Inflow Depth = 1.56" for 100YR event Inflow = 2.30 cfs @ 12.13 hrs, Volume= 0.207 af

Outflow = 2.25 cfs @ 12.13 hrs, Volume= 0.207 af, Atten= 2%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Max. Velocity= 8.60 fps, Min. Travel Time= 0.2 min Avg. Velocity = 3.73 fps, Avg. Travel Time= 0.4 min

Peak Storage= 26 cf @ 12.13 hrs, Average Depth at Peak Storage= 0.37' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.87 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 99.0' Slope= 0.0416 '/' Inlet Invert= 256.56', Outlet Invert= 252.44'



Reach 10R: DMH10 POND2

[52] Hint: Inlet conditions not evaluated

[82] Warning: Early inflow requires earlier time span [85] Warning: Oscillations may require Finer Routing>1

[61] Hint: Submerged 15% of Reach 9R bottom

Prepared by {enter your company name here}

Page 15 12/5/2021

HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Inflow Area = 2.624 ac, Inflow Depth > 2.08" for 100YR event Inflow = 5.06 cfs @ 12.13 hrs, Volume= 0.455 af

Outflow = 5.01 cfs @ 12.13 hrs, Volume= 0.455 af, Atten= 1%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 8.21 fps, Min. Travel Time= 0.1 min Avg. Velocity = 3.43 fps, Avg. Travel Time= 0.2 min

Peak Storage= 29 cf @ 12.13 hrs, Average Depth at Peak Storage= 0.72' Bank-Full Depth= 1.00', Capacity at Bank-Full= 5.74 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 47.0' Slope= 0.0221 '/' Inlet Invert= 252.34', Outlet Invert= 251.30'



Reach 11R: DMH11-FES

[52] Hint: Inlet conditions not evaluated

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow Area = 1.784 ac, Inflow Depth = 0.15" for 100YR event Inflow = 0.98 cfs @ 12.50 hrs, Volume= 0.022 af

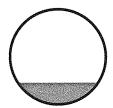
Outflow = 0.99 cfs @ 12.50 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Max. Velocity= 7.32 fps, Min. Travel Time= 0.1 min

Avg. Velocity = 4.37 fps, Avg. Travel Time= 0.1 min

Peak Storage= 4 cf @ 12.50 hrs, Average Depth at Peak Storage= 0.23' Bank-Full Depth= 1.00', Capacity at Bank-Full= 8.63 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 28.0' Slope= 0.0500 '/' Inlet Invert= 247.40', Outlet Invert= 246.00'



Page 16

12/5/2021

Reach 12R: DMH12-PIPE END

[52] Hint: Inlet conditions not evaluated

[88] Warning: Qout>Qin may require Finer Routing>1

Inflow Area = 6.055 ac, Inflow Depth = 0.03" for 100YR event Inflow = 0.48 cfs @ 12.73 hrs, Volume= 0.016 af

Outflow = 0.48 cfs @ 12.73 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 5.44 fps, Min. Travel Time= 0.1 min Avg. Velocity = 4.14 fps, Avg. Travel Time= 0.1 min

Peak Storage= 2 cf @ 12.73 hrs, Average Depth at Peak Storage= 0.17' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.72 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 20.0' Slope= 0.0400 '/' Inlet Invert= 244.80', Outlet Invert= 244.00'



Reach 13R: DMH13-PIPE END

[52] Hint: Inlet conditions not evaluated

Inflow Area = 0.932 ac, Inflow Depth = 0.00" for 100YR event Inflow = 0.00 cfs @ 8.00 hrs, Volume= 0.000 af

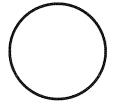
Outflow = 0.00 cfs @ 8.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 8.00 hrs, Average Depth at Peak Storage= 0.00' Bank-Full Depth= 1.00', Capacity at Bank-Full= 7.72 cfs

12.0" Diameter Pipe, n= 0.012 Concrete pipe, finished Length= 17.0' Slope= 0.0400 '/' Inlet Invert= 246.68', Outlet Invert= 246.00'



#2

Primary

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 17

12/5/2021

Pond 1P: POND 1

[62] Warning: Submerged 5% of Reach 3R inlet

Inflow Area = 1.784 ac, Inflow Depth > 2.89" for 100YR event
Inflow = 5.34 cfs @ 12.11 hrs, Volume= 0.430 af
Outflow = 1.80 cfs @ 12.50 hrs, Volume= 0.430 af, Atten= 66%, Lag= 23.1 min
Discarded = 0.98 cfs @ 12.50 hrs, Volume= 0.408 af
Primary = 0.98 cfs @ 12.50 hrs, Volume= 0.022 af

Routing by Stor-Ind method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Peak Elev= 254.30' @ 12.50 hrs Surf.Area= 0.042 ac Storage= 0.115 af

Plug-Flow detention time= 39.1 min calculated for 0.429 af (100% of inflow) Center-of-Mass det. time= 38.9 min (876.6 - 837.7)

Volume	Invert	Avail.Storage	Storage Description		
#1	249.80'	0.063 af	20.70'W x 89.00'L x 5.50'H Prismatoid		
			0.233 af Overall - 0.074 af Embedded = 0.158 af \times 40.0% Voids		
#2	251.05'	0.074 af	48.0"D x 86.00'L Horizontal Cylinder x 3 Inside #1		
		0.138 af	Total Available Storage		
Device	Routing	Invert O	utlet Devices		
#1	Discarded	249.70' 1	9.110 in/hr Exfiltration over Surface area above invert		
		E	xcluded Surface area = 0.000 ac		

253.95' 12.0" Vert. Orifice/Grate X 2.00 C= 0.600

Discarded OutFlow Max=0.81 cfs @ 11.80 hrs HW=249.95' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.81 cfs)

Primary OutFlow Max=0.96 cfs @ 12.50 hrs HW=254.30' (Free Discharge) 2=Orifice/Grate (Orifice Controls 0.96 cfs @ 2.00 fps)

Pond 2P: POND 2

[61] Hint: Submerged 53% of Reach 6R bottom[61] Hint: Submerged 63% of Reach 7R bottom[61] Hint: Submerged 18% of Reach 10R bottom

Inflow Area = 6.055 ac, Inflow Depth > 2.26" for 100YR event
Inflow = 12.90 cfs @ 12.12 hrs, Volume= 1.140 af
Outflow = 2.40 cfs @ 12.73 hrs, Volume= 1.140 af, Atten= 81%, Lag= 36.6 min
Discarded = 1.92 cfs @ 11.80 hrs, Volume= 1.124 af
Primary = 0.48 cfs @ 12.73 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Peak Elev= 251.49' @ 12.73 hrs Surf.Area= 5,460 sf Storage= 14,415 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow) Center-of-Mass det. time= 55.7 min (904.8 - 849.1)

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Page 18

12/5/2021

Volume	Invert	Avail.Storage	Storage Description
#1	247.15'	8,051 cf	27.30'W x 200.00'L x 5.50'H Prismatoid
			$30,030 \text{ cf Overall - } 9,902 \text{ cf Embedded = } 20,128 \text{ cf } \times 40.0\% \text{ Voids}$
#2	248.40'	9,902 cf	48.0"D x 197.00'L Horizontal Cylinder x 4 Inside #1
		17 953 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	247.10'	15.200 in/hr Exfiltration over Surface area above invert
			Excluded Surface area = 0 sf
#2	Primary	251.30'	12.0" Vert. Orifice/Grate X 3.00 C= 0.600

Discarded OutFlow Max=1.92 cfs @ 11.80 hrs HW=247.24' (Free Discharge) 1=Exfiltration (Exfiltration Controls 1.92 cfs)

Primary OutFlow Max=0.45 cfs @ 12.73 hrs HW=251.49' (Free Discharge) 2=Orifice/Grate (Orifice Controls 0.45 cfs @ 1.47 fps)

Pond 3P: POND 2

[82] Warning: Early inflow requires earlier time span [85] Warning: Oscillations may require Finer Routing>1

Inflow Area =	0.932 ac, Inflow Depth > 3.86"	for 100YR event
Inflow =	3.89 cfs @ 12.10 hrs, Volume=	0.300 af
Outflow =	0.52 cfs @ 11.70 hrs, Volume=	0.300 af, Atten= 87%, Lag= 0.0 min
Discarded =	0.52 cfs @ 11.70 hrs, Volume=	0.300 af
Primary =	0.00 cfs @ 8.00 hrs, Volume=	0.000 af

Routing by Stor-Ind method, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs Peak Elev= 251.67' @ 12.75 hrs Surf.Area= 2,070 sf Storage= 4,279 cf

Plug-Flow detention time= 60.7 min calculated for 0.300 af (100% of inflow) Center-of-Mass det. time= 60.6 min (879.0 - 818.5)

Volume	Invert	Avail.Storage	Storage Description
#1	248.10'	3,091 cf	20.70'W x 100.00'L x 5.50'H Prismatoid
			11,385 cf Overall - 3,657 cf Embedded = 7,728 cf x 40.0% Voids
#2	249.35'	3,657 cf	48.0"D x 97.00'L Horizontal Cylinder x 3 Inside #1
		6,748 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	248.09'	10.800 in/hr Exfiltration over Surface area above invert
			Excluded Surface area = 0 sf
#2	Primary	252.25'	12.0" Vert. Orifice/Grate C= 0.600

Discarded OutFlow Max=0.52 cfs @ 11.70 hrs HW=248.19' (Free Discharge) **1=Exfiltration** (Exfiltration Controls 0.52 cfs)

Primary OutFlow Max=0.00 cfs @ 8.00 hrs HW=248.10' (Free Discharge) 2=Orifice/Grate (Controls 0.00 cfs)

Prepared by {enter your company name here} HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC Page 19

12/5/2021

Link 1L: COMBINE HYDROGRAPHS

11.151 ac, Inflow Depth = 0.10" for 100YR event Inflow Area = 0.094 af Inflow =

1.11 cfs @ 12.53 hrs, Volume= 1.11 cfs @ 12.53 hrs, Volume= Primary = 0.094 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 8.00-36.00 hrs, dt= 0.10 hrs

APPENDIX E

Project:

Washington St

Location:

Franklin, MA

Prepared For:

United Consultants / Rick Goodreau



Purpose:

To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

Reference:

Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure:

Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi²/watershed inches (csm/in).

Compute Q Rate using the following equation:

Q = (qu) (A) (WQV)

where:

Q = flow rate associated with first 1" of runoff qu = the unit peak discharge, in csm/in.

A = impervious surface drainage area (in square miles)

WQV = water quality volume in watershed inches (1" in this case)

Structure	Impv.	Α	t _c	t _c	WQV	~~/~~~/:\	0 (-e-)
Name	(acres)	(miles²)	(min)	(hr)	(in)	qu (csm/in.)	Q (cfs)
DMH 3	0.59	0.0009219	5.0	0.083	1.00	795.00	0.73
CB 5	0.19	0.0002953	5.0	0.083	1.00	795.00	0.28
DMH 7	0.45	0.0006984	5.0	0.083	1.00	795.00	0,56
CB 8	0.31	0.0004813	5.0	0.083	1.00	795.00	0.38
CB 9	0.19	0.0002891	5.0	0.083	1.00	795.00	0.23
CB 10	0.41	0.0006375	5.0	0.083	1.00	795.00	0.51
							100





Brief Stormceptor Sizing Report - CB #5

	Project Informa	ition & Location	
Project Name	Washington St	Project Number	685246
City	Franklin	State/ Province	Massachusetts
Country	United States of America	Date	8/31/2021
esignes Information		EOR Information (o)	ational)
Name	Jim Lyons	Name	Rick Goodreau
Company	Contech ES	Company	United Consultants
Phone #	413-246-5151	Phone #	508-922-1063
Email	jlyons@conteches.com	Email	rick@uci850.com

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	CB #5	
Target TSS Removal (%)	80	
TSS Removal (%) Provided	94	
Recommended Stormceptor Model	STC 450i	

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stermiceptor Siz	ing Summary
Stormceptor Model	% TSS Removal Provided
STC 450i	94
STC 900	97
STC 1200	97
STC 1800	97
STC 2400	98
STC 3600	98
STC 4800	99
STC 6000	99
STC 7200	99
STC 11000	99
STC 13000	99
STC 16000	100





Drainage	Area	Water Qua	ility Objective	
Total Area (acres)	0.19	TSS Removal (%)	80.0
Imperviousness %	100.0	Runoff Volume Capt	ure (%)	
Rainfa		Oil Spill Capture Volu	me (Gal)	
Station Name	BLUE HILL	Peak Conveyed Flow R	Rate (CFS)	
State/Province	Massachusetts	Water Quality Flow Ra	ate (CFS)	0.23
Station ID #	0736	Up Stre	am Storage	
Years of Records	58	Storage (ac-ft)	Discha	rge (cfs)
Latitude	42°12'44"N	0.000	0.0	000
Longitude	71°6'53"W	Up Stream	Flow Diversion	in
		Max. Flow to Stormce	ptor (cfs)	

	cle Size Distribution cted PSD defines TS	
	OK-110	
Particle Diameter (microns)	Distribution %	Specific Gravity
1.0	0.0	2.65
53.0	3.0	2.65
75.0	15.0	2.65
88.0	25.0	2.65
106.0	41.0	2.65
125.0	15.0	2.65
150.0	1.0	2.65
212.0	0.0	2.65

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit: https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX





Brief Stormceptor Sizing Report - CB #8

	Project Informa	ation & Location	
Project Name	Washington St	Project Number	685246
City	Franklin	State/ Province	Massachusetts
Country	United States of America	Date	8/31/2021
Designer Information		EOR Information (op	tional)
Name	Jim Lyons	Name	Rick Goodreau
Company	Contech ES	Company	United Consultants
Phone #	413-246-5151	Phone #	508-922-1063
Email	jlyons@conteches.com	Email	rick@uci850.com

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	CB #8	
Target TSS Removal (%)	80	
TSS Removal (%) Provided	91	
Recommended Stormceptor Model	STC 450i	

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Siz	ing Summary
Stormceptor Model	% TSS Removal Provided
STC 450)	91
STC 900	95
STC 1200	96
STC 1800	96
STC 2400	97
STC 3600	97
STC 4800	98
STC 6000	98
STC 7200	99
STC 11000	99
STC 13000	99
STC 16000	99





Drainage	Ali/ea	Water Qua	ility Objective	
Total Area (acres)	0.31	TSS Removal (%)		80.0
Imperviousness %	100.0	Runoff Volume Capture (%)		
Rainfa		Oil Spill Capture Volu	me (Gal)	***************************************
Station Name	BLUE HILL	Peak Conveyed Flow Rate (CFS)		
State/Province	Massachusetts	Water Quality Flow Rate (CFS)		0.23
Station ID #	0736	Up Stre	am Storage	
Years of Records	58	Storage (ac-ft)	Discha	rge (cfs)
Latitude	42°12'44"N	0.000 0.000		000
Longitude	71°6'53"W	Up Stream	Flow Diversion	II.
		Max. Flow to Stormceptor (cfs)		

Particle Size Distribution (PSD) The selected PSD defines TSS removal				
	OK-110			
Particle Diameter (microns)	Distribution %	Specific Gravity		
1.0	0.0	2.65		
53.0	3.0	2.65		
75.0	15.0	2.65		
88.0	25.0	2.65		
106.0	41.0	2.65		
125.0	15.0	2.65		
150.0	1.0	2.65		
212.0	0.0	2.65		

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit: https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX





Brief Stormceptor Sizing Report - CB #9

	Project Informa	ntion & Location	
Project Name	Washington St	Project Number	685246
City	Franklin	State/ Province	Massachusetts
Country	United States of America	Date	8/31/2021
Designer Information		EOR Information (optional)
Name	Jim Lyons	Name	Rick Goodreau
Company	Contech ES	Company	United Consultants
Phone #	413-246-5151	Phone #	508-922-1063
Email	jlyons@conteches.com	Email	rick@uci850.com

Stormwater Treatment Recommendation

The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	CB #9	
Target TSS Removal (%)	80	
TSS Removal (%) Provided	94	
Recommended Stormceptor Model	STC 450i	

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizi	ng Summary
Stormceptor Model	% TSS Removal Provided
STC 450i	.94
STC 900	97
STC 1200	97
STC 1800	97
STC 2400	98
STC 3600	98
STC 4800	99
STC 6000	99
STC 7200	99
STC 11000	99
STC 13000	99
STC 16000	100





Drainage	Arrea	Water Qua	lity Objective	
Total Area (acres)	0.19	TSS Removal (9	%)	80.0
Imperviousness %	100.0	Runoff Volume Capture (%)		
Rainfe		Oil Spill Capture Volu	me (Gal)	
Station Name	BLUE HILL	Peak Conveyed Flow Rate (CFS)		
State/Province	Massachusetts	Water Quality Flow Rate (CFS)		0.23
Station ID #	0736	Up Stre	am Storage	
Years of Records	58	Storage (ac-ft)	Discha	rge (cfs)
Latitude	42°12'44"N	0.000	.0.	000
Longitude	71°6'53"W	Up Stream	Flow Diversion	ini
		Max. Flow to Stormce	ptor (cfs)	

Particle Size Distribution (PSD) The selected PSD defines TSS removal				
	OK-110			
Particle Diameter (microns)	Distribution %	Specific Gravity		
1.0	0.0	2.65		
53.0	3.0	2.65		
75.0	15.0	2.65		
88.0	25.0	2.65		
106.0	41.0	2.65		
125.0	15.0	2.65		
150.0	1.0	2.65		
212.0	0.0	2.65		

Melies

- · Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.

 • For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design
- assistance.

For Stormceptor Specifications and Drawings Please Visit: https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX





CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

WASHINGTON ST FRANKLIN, MA

0.59 ac Area

Unit Site Designation

DMH 3

Weighted C

0.9

Rainfall Station #

68

5 min CDS Model 1515-3

CDS Treatment Capacity

1.0 cfs

<u>Rainfall</u> <u>Intensity¹</u> (in/hr)	Percent Rainfall Volume ¹	<u>Cumulative</u> <u>Rainfall Volume</u>	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	9.3%	9.3%	0.01	0.01	9.3
0.04	9.5%	18.8%	. 0.02	0.02	9.5
0.06	8.7%	27.5%	0.03	0.03	8.7
0.08	10.1%	37.6%	0.04	0.04	10.0
0.10	7.2%	44.8%	0.05	0.05	7.1
0.12	6.0%	50.8%	0.06	0.06	5.9
0.14	6.3%	57.1%	0.07	0.07	6.2
0.16	5.6%	62.7%	0.08	0.08	5.4
0.18	4.7%	67.4%	0.10	0.10	4.5
0.20	3.6%	71.0%	0.11	0.11	3.5
0.25	8.2%	79.1%	0.13	0.13	7.8
0.50	14.9%	94.0%	0.27	0.27	13.2
0.75	3.2%	97.3%	0.40	0.40	2.7
1.00	1.2%	98.5%	0.53	0.53	0.9
1.50	0.7%	99.2%	0.80	0.80	0.5
2.00	0.8%	100.0%	1.06	1.00	0.4
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					95.6

Removal Efficiency Adjustment² = 6.5% Predicted % Annual Rainfall Treated = 93.5% Predicted Net Annual Load Removal Efficiency = 89.1%

^{1 -} Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA 2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.





CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

WASHINGTON ST FRANKLIN, MA

Area

0.45 ac

Unit Site Designation

DMH 7

Weighted C

0.9

Rainfall Station #

68

5 min

1515-3 CDS Model

CDS Treatment Capacity

1.0 cfs

Rainfall Intensity ¹ (in/hr)	Percent Rainfall Volume ¹	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	9.3%	9.3%	0.01	0.01	9.3
0.04	9.5%	18.8%	0.02	0.02	9.5
0.06	8.7%	27.5%	0.02	0.02	8.7
0.08	10.1%	37.6%	0.03	0.03	10.1
0.10	7.2%	44.8%	0.04	0.04	7.1
0.12	6.0%	50.8%	0.05	0.05	6.0
0.14	6.3%	57.1%	0.06	0.06	6.2
0.16	5.6%	62.7%	0.06	0.06	5.5
0.18	4.7%	67.4%	0.07	0.07	4.6
0.20	3.6%	71.0%	0.08	0.08	3.5
0.25	8.2%	79.1%	0.10	0.10	7.9
0.50	14.9%	94.0%	0.20	0.20	13.7
0.75	3.2%	97.3%	0.30	0.30	2.8
1.00	1.2%	98.5%	0.40	0.40	1.0
1.50	0.7%	99.2%	0.60	0.60	0.5
2.00	0.8%	100.0%	0.80	0.80	0.5
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					96.9

Removal Efficiency Adjustment² = Predicted % Annual Rainfall Treated =

6.5%

Predicted Net Annual Load Removal Efficiency =

93.5% 90.5%

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.





CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION BASED ON THE RATIONAL RAINFALL METHOD

WASHINGTON ST FRANKLIN, MA

Area 0.41 ac

Unit Site Designation CI

CB 10

Weighted C

CDS Model

0.9

Rainfall Station #

68

 t_c 5 min odel 1515-3

0

CDS Treatment Capacity

1.0 cfs

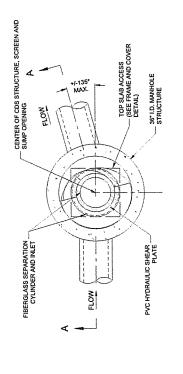
Rainfall Intensity ¹ (in/hr)	Percent Rainfall Volume ¹	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.02	9.3%	9.3%	0.01	0.01	9.3
0.04	9.5%	18.8%	0.01	0.01	9.5
0.06	8.7%	27.5%	0.02	0.02	8.7
0.08	10.1%	37.6%	0.03	0.03	10.1
0.10	7.2%	44.8%	0.04	0.04	7.1
0.12	6.0%	50.8%	0.04	0.04	6.0
0.14	6.3%	57.1%	0.05	0.05	6.2
0.16	5.6%	62.7%	0.06	0.06	5.5
0.18	4.7%	67.4%	0.07	0.07	4.6
0.20	3.6%	71.0%	0.07	0.07	3.5
0.25	8.2%	79.1%	0.09	0.09	7.9
0.50	14.9%	94.0%	0.18	0.18	13.8
0.75	3.2%	97.3%	0.28	0.28	2.8
1.00	1.2%	98.5%	0.37	0.37	1.0
1.50	0.7%	99.2%	0.55	0.55	0.5
2.00	0.8%	100.0%	0.73	0.73	0.5
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					97.3
•				, '	

Removal Efficiency Adjustment² = 6.5%
Predicted % Annual Rainfall Treated = 93.5%

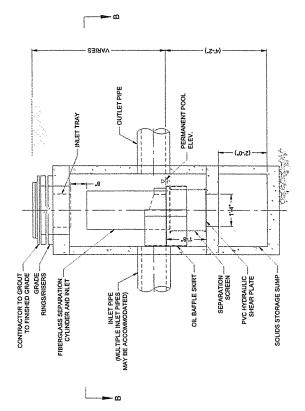
Predicted Net Annual Load Removal Efficiency = 90.8%

1 - Based on 10 years of rainfall data from NCDC station 736, Blue Hill, Norfolk County, MA

^{2 -} Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.



PLAN VIEW B-B







CDS1515-3-C DESIGN NOTES

CDS1515-3-C RATED TREATMENT CAPACITY IS 1.0 CFS, OR PER LOCAL REGULATIONS.

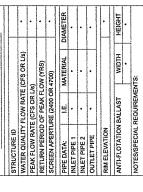
THE STANDARD CDS1616-3-C WITH GRATED INLET CONFIGURATION IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW, SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION

GRATED INLET WITH INLET PIPE OR PIPES GRATED INLET ONLY (NO INLET PIPE)

DATA REQUIREMENTS SITE SPECIFIC

INLET TRAY



24" X 24" FRAME AND GRATE

(MAY VARY) NOT TO SCALE

· PER ENGINEER OF RECORD

CONTRICHOUTE ALL MATCHER, IS VILLE STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTRICT YOUR CONTRICH ENGINEERED

2. DAY SITE SPECIFIC DRAWNINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTRICT YOUR CONTRICH ENGINEERED

3. DAYS WITH STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWNING.

4. STRUCTURE SHALL WET ARSHALD MATCH DRAWNING WITH ALL DESIGN DATA AND INFORMATION CONTRIBUTION OF TO CONTRIGHT OR TO CONTRIGHT ON STRUCTURE SHALL BE IN ACCORDANGE METH ACCORDANGE AND THE CONTRICT ON TO CONTRIGHT ON STRUCTURE SHALL MET DATA THE CONTRICT ON THE OWNER ELEVATION AT OR BELOW.

4. STRUCTURE SHALL BE ELEVATION AT OR SHALL ASSUMING EAPTH COVER OF "O'C." AND GROUNDWATER ELEVATION AT OR BELOW.

5. FREQUIRED, PROF HYDRAULU SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MANTENDER.

6. DAS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.

NETALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, ANDOR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE
SPECIFIED BY ENGNEER OF FEGCORD.

SPECIFIED BY ENGNEER OF FEGCORD.

C. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LITTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.

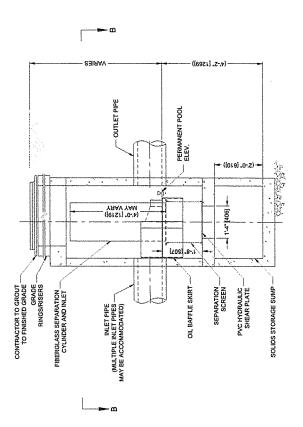
C. CONTRACTOR TO NETALL, AND SEALAN ESTAMEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.

C. CONTRACTOR TO PROVIDE. INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE
C. CONTRACTOR TO THE APPROVED IN SERVING SENOR TO SASURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS
SUCREMENDED THAN ALL, LORING SECON PIPE INVERTS MINIMUM. IT IS

echES.com 400, West Chester, OH 45069 CAN TECH. www.contechEi 9025 Centre Pointe Dr., Suite 400, 1 809-338-1122 513-645-7000

ONLINE CDS STANDARD DETAIL CDS1515-3-C

CENTER OF CDS STRUCTURE, SCREEN AND SUMP OPENING TOP SLAB ACCESS (SEE FRAME AND COVER DETAIL) 36" [914] I.D. MANHOLE STRUCTURE PLAN VIEW B-B N.T.S. FIBERGLASS SEPARATION CYLINDER AND INLET PVC HYDRAULIC SHEAR PLATE FLOW ∢



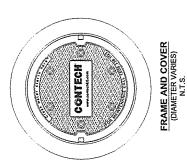


B

CDS1515-3-C DESIGN NOTES

CDS1515-3-C RATED TREATMENT CAPACITY IS 1.0 CFS, OR PER LOCAL REGULATIONS.

THE STANDARD CDS1515-3-C CONFIGURATION IS SHOWN.



WATER QUALITY FLOW RATE (CFS OR L/s)	FLOW RAT	E (CFS OR L/s)	- 1
PEAK FLOW RATE (CFS OR US)	E (CFS OR I	Js)	- 1
RETURN PERIOD OF PEAK FLOW (YRS)	OF PEAK F	LOW (YRS)	
SCREEN APERTURE (2400 OR 4700)	RE (2400 O	R 4700)	
PIPE DATA:	J.	MATERIAL	
INLET PIPE 1	•	٠	
INLET PIPE 2			
OUTLET PIPE		•	
RIM ELEVATION			1
ANTI-FLOTATION BALLAST	BALLAST	HTDIW	
		•	_
NOTES/SPECIAL REQUIREMENTS:	REGUIREM	ENTS:	

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID

HEIGHT

· PER ENGINEER OF RECORD

- GENERAL NOTES

 1. CONTRICT TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.

 1. CONTRICT TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.

 2. CONTRICT TO PROVIDE ALL WATER STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LIC REPRESENTATION. E. WANCOMORE SEASON.

 5. COS WATER COLVENT STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.

 CONTRIANCIPOR TO CONFINM STRUCTURE MEMBER REQUIREMENTS OF PROJECT.

 1. THE OUTLE PIPE SHALL MEET AASHTO HISOLOAD RATING, ASSUMING EARTH COVER OF 0. 2. AND GROUNDWATER ELEVATION AT, OR BELOW,

 1. THE OUTLE PIPE SHALL MEET AASHTO HISOLOAD RATING, ASSUMING EARTH COVER OF 0. 2. AND GROUNDWATER ELEVATION AT, OR BELOW,

 AASHTO MAG AND BE CAST WITH THE CONTECH LOGO.

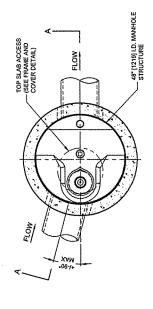
 5. FREQUIRED, PIC HYDRAULIC SHEAR TO PLANTE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS
 - NECESSARY DURING MAINTENANCE CLEANING. 6. CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

- THES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS MERIS ARE GROUTED. INSTALLATION NOTES

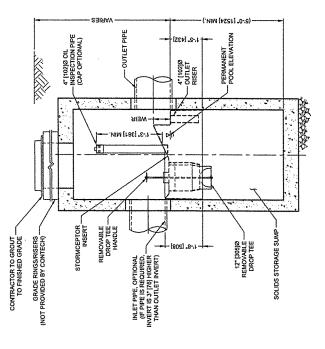
 A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE
 SPECIFIED BY ENGINEER OF RECORD.
 B. CONTRACTIOR TO PROVIDE LEGIONARIN WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
 C. CONTRACTIOR TO INSTALL JOINT SEALANT RETWIEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
 D. CONTRACTIOR TO PROVIDE, INSTALL, AND GROUT RILET AND CUTLET PIPE(S), MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE
 C. CONTRACTIOR TO TAKE APPROPRIET REACHERS TO ASSURE UNIT SWATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS
 E. CONTRACTIOR TO TAKE APPROPRIET REACHERS TO ASSURE UNIT SWATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS
 SUCCESSION.
 - CDS1515-3-C



ONLINE CDS STANDARD DETAIL



PLAN VIEW TOP SLAB NOT SHOWN



SECTION A-A

Stormceptor.

STORMCEPTOR DESIGN NOTES

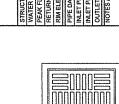
THE STANDARD STC4S0I CONFIGURATION WITH RQUIND, SOLID FRAME AND COVER, AND INLET PIPE IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

CONFIGURATION DESCRIPTION

GRATED INLET WITH INLET PIPE OR PIPES GRATED INLET ONLY (NO INLET PIPE)

CURB INLET ONLY (NO INLET PIPE)

CURB INLET WITH INLET PIPE OR PIPES



CONTECH

INVERT MATERIAL DIAMETER DATA REQUIREMENTS STRUCTURE ID WATER QUALITY FLOW RATE (cfs [Us])

SITE SPECIFIC

FRAME AND COVER (MAY VARY) NOT TO SCALE

FRAME AND GRATE (MAY VARY) NOT TO SCALE

- GENERAL MOTES

 1. CONTECNTO PROVIDE ALL MATERIALS INNESS NOTED OTHERWISE.

 1. CONTECNTO PROVIDE ALL MATERIALS INNESS NOTED OTHERWISE.

 2. SOLUTIONS LLC REPRESENTATIVE. WANG CONTECNT BE INACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS STAMMICE TO CONTRACT GOALD STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS STAMMICE TOWN TRUCTURE SHALL MET AAARTO INSOLUTION STRUCTURE SHALL MET AAARTO INSOLUTION SATING, ASSUMING EARTH COVER OF V. 2' (S) OIL AND SROUNDWATER ELEVATION AND AND DE CAST WITH THE CONTECNT OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.

 5. STORMED SHALL BE PRESENTED SATING CONFIRM THE CONTECNT ON AS THE CONFIDENCE OF SECOND TO CONFIRM ACTUAL GROUNDWATER ELEVATION.

 6. ALTERNATE UNITS ARE SHOWN IN MALLMETERS (FIND).

- INSTALLATION NOTES

 A. ANY SUB-BASE, BACKRILL DEPTH, AND/OR NATF-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE
 SPECIFED BY ENGINEER OF RECORD.
 B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SHERICENT LIFTING AND REACHT TO LIFT AND SET THE STORMCEPTOR MANHOLE
 STRUCTURE.
 C. CONTRACTOR TO NETALL, AND TESTALAN THE SECTIONS AND ASSENBLE STRUCTURE.
 C. CONTRACTOR TO NETALL, AND GROUT INLETTAL AND OUTLET PIPE(S). MATCH PIPE NUTFILE SIGNAL AND GROUT INLETTAL AND SHOWN ALL PIPE
 D. CONTRACTOR TO PROVIDE. INSTALL, AND GROUT INLETTAL SHE SIGNAL AND OUTLET PIPE(S). MATCH PIPE OF CONTRACTOR TO PARE AND PROPERTY SHOWN. ALL PIPE
 E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSINGE UNIT IS WATER TIGHT, HOLDING WATER TO FLOW LIME INVERT MINIMUM. IT IS
 SUGGESTED THAT ALL JOHN'S BELOW THE INVERTS SINGE BROADTED.



STORMCEPTOR STANDARD DETAIL **STC450i**

- 1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
 - 2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
 - 3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
- 4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
 - 5. Total TSS Removal = Sum All Values in Column D

	•		Iī		I					
	Ш.	Remaining	Load (C-D)						Separate Form Needs to be Completed for Each Outlet or BMP Train	n previous BMP (E)
	Q	Amount	Removed (B*C)	Section Control of the Control of th						*Equals remaining load from previous BMP (E)
	O.	Starting TSS	Load*	1.00					Total TSS Removal =	•
Weshingrow	@	TSS Removal	Rate ¹	9 49	September 1988				Total T	
Location: [<		BMP ¹	012680						Project: Prepared By: Date:
	•			j 99	orksh			Calc		
					lsvo	Rem	SST			

INSTRUCTIONS:

- 1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
 - 2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
 - 3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row 4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
- 5. Total TSS Removal = Sum All Values in Column D

	Ш.	Remaining	Load (C-D)	73	and the second of the second o				Separate Form Needs to be Completed for Each Outlet or BMP Train	n previous BMP (E)
	Q	Amount	Removed (B*C)			88				*Equals remaining load from previous BMP (E)
	O.	Starting TSS	Load*	1.00					Total TSS Removal =	
Location:	В	TSS Removal	Rate ¹	662		<i>M</i>			Total T	
Location:	<		BMP ¹	27 Papan	242 CONTE					Project: Prepared By: Date:
				j 99		Remo	se i ulatio	Calc		
					10,10	- ~ d	JJL			

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed 1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

APPENDIX F



Head #1

Rezervoir Type (enter "1" for Combrod and "2" for inner reservoir):
Enter water Head Height ("H" in cm);
Enter the Borehole Radius ("a" in cm);

Enter the soft texture structure category (enter one of the below numbers):

1. Compared of Vinora to recognizing or other materials cost as possible rate of terror formation on the profile rate of terror formation of the structure of terror formation of the compared terror costs of the compared terror costs of the costs of terror costs.

May smartned polytime days through amount about high instruction through and this speeds. Her aligning in cut for greatly instructed to agree for a region.

Godfer, and Rissolves very, 1954 also epituric central highita difference of suck and degree and for principle of very, in the operity, of

... 0.36 ··· C 0.80315 C 11.0356 Stoody State Rate of Water Level Change ("R" In cm/min); 18,8000

HANKER CONTROL
WANKER CONTROL
3.32E-04 m/sec
7.84E-01 inchrio 9.22E-02 (C) C=1

Resutt Input

Support: вз@ко/тексив сот

Head #2

Enter the soft texture-attracture category (enter one of the below numbers): Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):

Enter water Kead Holpht ("H" in cm):

Enter the Borehole Radius ("a" in cm):

Copparish Windowski, Operatorski, mannik Gabin Smith Apparish and Devel, Johnson, and mannish self-city, ex-sequence of popular in the medical place of orbit and authorizing their service form specific visits.

Two Head Method

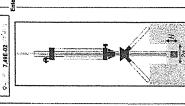
Average

decidentation of pasts from their transport come, who explodes

instructional installers with the substance framewhy even with controllers on a controller or the controllers with providing a present of the treatment view of terminal and presents in substance.

Stoady State Rate of Water Level Change ("R" in amimin); 23.6000

Fig. m. 2.07E-02 cm/soc ####### cm/min 2.07E-04 m/ses 4.89E-01 inch/min 8.18E-03 inch/sec 5.76E-02 77 7. . . . 0,36 6 × 1,28754 6 × 13,501



Calculation formally related to excelend and week-had articled. Where F is ready-time that $F_{\rm ch}$, $F_{\rm ch}$, $F_{\rm ch}$ in the initiated by decoler considering viewal, $C_{\rm ch}$ is foll rather three potential (noise), the post partial relative $F_{\rm ch}$ is the first back of water establishment element from Table $F_{\rm ch}$ is the relation of the province of the first constant from Table $F_{\rm ch}$.

	4.2.16 4.70 (2.3.1) (2.3.1) 4.20 H	$G_1 = \frac{H_1^2 G_1}{\pi (2H_1 H_1^2 H_2 - H_1^2 G_1)} + \alpha^2 (H_1 G_1 - H_2 G_2)$	$\frac{H_1C_2}{35.22} = \frac{G_1 = \pi(2H_1H_1(H_1 - H_1) + \pi^2(H_1C_1 - H_2C_1))}{25.22}$	35.23 No. 77 6,03 ° 6,03.	$G_1 = \frac{(2H) + a^2C_2/G_1}{2A(2H/H_2/H_2 - H_1 - H_1) + a^2(H_2 - H_2 - H_2)}$	$c_{1,1,6} = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2)H_2 + H_1 + a^2(H_1C_1 + H_2C_1)}$	40 = 6:01 = 6:02
Q = R × 35.22	Q: = R; × 2.16		6, - 8, × 85.22	Q. 4. R. v. 35.23		Q = R × 236	Walter Commen
One Head. Combined Reservoir	One Head. Janes Reversols		Two Head.	Menden Producent	A the contract of the last of	Two Head. Itaner Reservoir	

Wateha correct that the
4,77E-02 (17) 1.11

-	n 5	m	•							0.36	18,8000	23.0000	1.95	0.828	0.50316	1,28754	0.00498	0.00397	0.05569	0.02415	PHANTHA C
Reservolr Type (enlet "1" for Combined and "2" for finnet reservoir):	Enter the first water Head Height ("H1" in cm); Enter the second water Head Height ("H2" in cm);	Enter the Borehole Radius ("a" in cm):	Enter the soil texture-structure category (enter one of the below numbers):	1. Compared Studylers of while per alger decided to	Assembling and also my insulations of matter positive of the control of the control of the control of the first of the control	updataphraping debackling sate less caust	3. Mod studier dages formataya the application algorithms from	programmer in doze and his remain. Her subogy project the proof a supply and the properties.	4. Supplied and processing of the policy of the control of the con	29	Steady State Rate of Water Level Chango ("R1" in cm/min); 1	Steady State Rate of Water Level Change ("R2" in cm/min); 2	***	0.0	, si	e.		3	0 m fg	0 (19)	######################################
2,70E-02 cm/ses			7,48E-02.777.7	0.000	=	ąl		The second secon		andre a	je k			## IDS	. 20	Andreas of the second s		ane of fall of water in teservou	et, a' it Macroteople capillary ed in bosehole (em) . H, it the	***************************************	134 (10)

Soll Texture-Structure Category	(can)		ARCONO DEN
Compacted Statemether chycy or ship materials such as middle caps and laster, lacunities or material redinents, etc.	0.01	$C_1 = \left(\frac{H_{1,0}}{2.102 + 0.1134^{13} H_{1,0}}\right)^{3.15}$ $C_2 = \left(\frac{H_{1,0}}{2.102 + 0.1134^{13} H_{1,0}}\right)$	Combin Can
Soils which are both fine textured (clayey or shity) and unstructured; tasy elto include some fine famid.	70°0	$\hat{z}_1 = \left(\frac{B_{1/6}}{1.992 + 0.0311^{12} c_0^{-1}}\right)^{-0.13}$	Tw.
Most structured soils from chay though hours; also includes unstructured ancilons and fine stands. The congrey most frequently applicable for agricultural soils.	6.13	$\mathcal{L}_{1} = \left(\frac{H_{1/6}}{2.074 + 0.0931 H_{1/6}}\right)^{3.14}$ $\mathcal{L}_{2} = \left(\frac{H_{1/6}}{2.014 + 0.0941 H_{1/6}}\right)^{3.14}$	and a second
Cours and gavely rands; may also include some highly structured soft with large and/or numerous cracks, matter poets, etc.	0.36	$S_{i} = \left(\frac{H_{i}/G}{2.074 + 0.0034 H_{i}/G}\right)^{C-1}$ $C_{i} = \left(\frac{H_{i}/G}{2.074 + 0.093 (H_{i}/G)}\right)^{C-1}$	France

Guelph Permeameter Data Sheet

Investigator:		in the same		Date:	r Land F
Location:		a Para	Test Id	: /***** * * * * * * * * * * * * * * * *	
Depth of hole:	60"	Radius:	. * 1.4	(standard calcs a	ssume 3 cm radius)
Reservoirs used of	luring test	(check one):			
Reservoir constan					

	Water	level in w	ell = 5 cn	n
Time t (min)	Dt (min)	Water level in reservoir h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt
0		20		
2/3	grander of the second of the s	Z	g same Caraman	1.3.7
129	0.23	300	. 50	7 7
111	. Y. 17. 27.		*** *****	So o
1563		¥ ye v Sa	er.	1,4
11/	2723	Ne George C. C.		in . we
1200	3.75 3.75	٠.)		21,4
1:4	<u> </u>		***************************************	1/4, 3
: * * 5°		6.7		27.4
	074	100 100	. ,	18.9
2175		·2;)		
	1 1 2 mg	V	:	28.7
Steady rate	e for 3 conse	cutive reading	rs (R1).	12.3

	Water	level in v	vell = 10 c	m
Time t (min)	Dt (min)	Water level in reservoi r	D <i>h</i> (cm)	Rate of change Dh/ Dt
0		April 1 gerale Process		
112	0,0	The gray	\$	*** 5
1 20 sum.	m 127	**************************************	20	12.20
1.3	D . 7 6.	49		
v [†] 'dee'	0.002	45		13,7
* * * *	O .575	50	1	122,1
11深	p.72	55	<i>1</i> 5	22,7
11.51	t = t		5	21,4
1,500	0.10		<,	13,7
7359	000	20	estate es	21.4
	9,00	7-5	مسيريو فدور	

Comments:

resident of the second of the

Steady rate for 3 consecutive readings (R_2) :

FIELD DATA SHEET		SECTION 1: SITE INFORMATION
te <u>Ginner</u> Investigato	r	
te Location		muje Dalin
minant Soil Type(s)	1. 1	the state of the s
te Map:	Soil Prof	ile Description (horizon depth, structure, color, etc.):
March 1 Comment	Depth	Description
		10 mm 10 mm 10 4826 10 mm 10 mm 10 45 45 45 5
resence of special soil nduration, compacted la	yers, etc.):	vegetation, etc.):



Result Imput

Support signalmoisture.com Head #2

Reservoir Type (enter "1" for Combined and "2" for inner reservoir);
Enter water Head Holght ("H" in cm):
Enter the Boreholo Radius ("a" in cm):

3.64E-02 cm/sec 2.48E+00 cm/min 3.94E-04 m/s 8.60E-01 inch/min 1.43E-02 inch/sec

0. 7 101E-01 (minute)

- Effect the soil texture-structure category (enler one of the below rounders);

) transported, trusting less, depond the memory and entransfer and addition, categories in our condemons of

) to state and endemonitaries in our condemons of

) to state and endemonitaries or our condemons of

 outside and endemonitaries.
 - Statistical fine that deprivately types, doctables united for endotes of factors. Note of spring month frequently.
- ing budette agradientivolo. 1. Trapajo et diposoly varity may also mittali varity bijlity. ergysinek sis varbango aratko mienicase i ens, morrigosy, etc.

Steady State Rate of Water Level Change ("R" in cm/min); 33.600

C = 1,28764 C = 19,7232 572 5 3.03E-02 ####### 3.03E-04 7.18E-01 1.19E-02

15. A 426E-02 cm/sec shiffshift commo 4.26E-04 m/sec shiftshift inch/sec 1.68E-02 inch/sec

... 90'38 € - 0,80315 Ģ - 14,1467

Steady State Rate of Water Level Change ("R" in cm/min); 24.1006

Meet smaller, becaution chart tetrapillating about distribution of medium and fine cards. Providing appropriate and applicable to explain the cards of a subspict providing application of a consequent growth and applicable about the representation of the cardinal problem.

Entit the soft texture-structure category (enter one of the below numbers):

1. cutterer 4, structure to equilibries of the below numbers):

1. cutterer 4, structure to equilibries or numbers of the effect of the effect of the enterthing of the enterthing the enterthing the effect of the enterthing the en

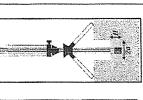
Reservoir Type (enter "1" for Combined and "2" for inner reservoir):

Enter water Hoad Height ("H" in em):

Enter the Borchole Radius ("a" in em):

Head #1

45. 7 1,18E-01 AND 24.



	b			(1)	20
•		***	2 cm/sec	of inchima 01 inchima 02 inchisec	32(11/2001)

Obdome benefic rated on a pp facts. When Bin the face were healthings, and Bin the remoderer involve, the na. A settlement of a management of the face benefit of the remoderation for a conservation of a face of the remoderation of the face benefit of the remoderation of the face benefit of the face benefit of the face benefit of the face of

Soft Texture-Structure Category	(cm.,)	Shape Factor	
Compared Structure/fes.clayey.or ally marrials such as baddli caps and linest, lacusting or mains reliment, etc.		$C_1 = \left(\frac{H_{1,0}}{2.107 + 0.110^{(H_{1,0})}}\right)^{(11)}$ $C_2 = \left(\frac{H_{1,0}}{2.107 + 0.110^{(H_{1,0})}}\right)$	Cennin
Soli which are hald the textured (clayey or siby) and unstrustured, may also indivel some fine sands.	0.02	$\mathcal{E}_1 = \left(\frac{H_{1/\alpha}}{1.992 + 0.0011^{14} I_{1/\alpha}}\right)^{1.11}$ $\mathcal{E}_2 = \left(\frac{H_{1/\alpha}}{1.997 + 0.0011^{14} I_{1/\alpha}}\right)^{1.11}$	Comp
Most structured stolk from clays through teams; also includes autoructured medium and fine stands. The consegor, most deepwortly applicable for agricultural solfs.	9.12	$C_{i} = \left(\frac{H_{i,a}}{2.07 + 0.093 (^{11}_{i})_{a}}\right)^{1/2} \cdot \frac{1}{1},$ $C_{i} = \left(\frac{H_{i,a}}{2.094 + 0.093 (^{11}_{i})_{a}}\right)^{1/2} \cdot \frac{1}{1},$	
Course and garety sands: may also include rome bighly structured foils with large andfor manerous reacts, marce powes, etc.	97'9	$\zeta_1 = \left(\frac{H_{1,0}}{2.074 + 0.093 \sqrt{H_{1,0}}}\right)^{1/4}$ $\zeta_2 = \left(\frac{H_{2,0}}{2.024 + 0.093 \sqrt{H_{2,0}}}\right)$	- m

505E-04 carisec 3.03E-02 caritin 5.06E-08 invisec 1.19E-02 backing 1.99E-04 inchisec

6, 0.05569 6, 0.02415

€; ○ 0,00397

1,916.02 (0.00)

One Head, Combined Reservoir	Q. to. K, × 35.27	$h_{l,s} = \frac{G \cdot Q_1}{2\pi H_1^2 + \pi \sigma(G_1 + 2\pi \left(\frac{H_1}{2}\right))}$
Oue Head, Jener Reservoir	Q, = Å, < 2.18	φ., "(Jr.H; + πο. ξ.j.)ο" + Jr.H;
		$G_1 = \frac{H_2 \xi_1}{\pi(2H_1 H_2^2(H_2 + H_1) + a^2(H_1 \xi_2 + H_2 \xi_1))}$
Two Head,	Q1 = R1 = 35.27	$b_1 \stackrel{H}{=} v_1(2B_1B_2/B_1 + B_1) + v_2(B_1C_2 + B_1C_2)$
Compared Reserves	Q: = R; × 35.23	$K_{f,s} = G_{f}Q_{f,s} = G_{f}Q_{f}$
TABLE DE LES CONTRACTOR DE LA CONTRACTOR	enemphataurement over 16 visi	$G_{1} = \sum_{i} \frac{(2H_{i} + n^{2}C_{2})c_{1}}{(2H_{i}H_{i}(H_{i} - H_{i}) + a^{2}(H_{i}C_{i} - H_{2}C_{j}))}$
Two Head, Jenes Reservoir	$Q_1 = R_1 > 2.16$	$G_{1} \approx \frac{(2H_{1}^{2} + a^{\dagger}C_{1})t}{2\pi(2H_{1}H_{2}^{2}H_{1}^{2} - H_{1}^{2} + a^{\dagger}H_{1}C_{1}^{2} - H_{2}C_{1})}$
	Q: = K; 1.2.16	φ = 6χ0, = 6.0;

Two Head Method

Average

		- - - -				-			0.36	24,1000	33.0	0.8676	1.2098	0.80316	1.28754	0.00496
Reservoit Type (enter '1" for Combined and "2" for timer reservoil): 1 Enter the first water Head Height ("Ht" in cm): 6 Enter the second water Head Height ("Ht" in cm): 10	Enter the Borehole Radius ("a" in cm):	Enter the soil texture-structure category (enter one of the below numbers):	 Regranded, Mindalan loca, Neumon alby highware sizely in amilification and filters, famouting of interencedements, etc. 	 Specialistic nergos non frathentiglapez or safej era metten pried page akonstrate juste free sands. 	c. Most emetarnsheels treasibles desirigly feating who embedes	any month diversional for each the catalog from the governor	applyment for agree shorest sole. 4. Court war 3 provides satisfactions are large soler tagels.	structured soon with tager and be represented by the control of		Steady State Rate of Water Level Change ("R1" in cm/min): 24.1000	Steady State of Water Level Change ("R2" in cmirmin):	8 3	8 8	e.	c,	***************************************

Guelph Permeameter Data Sheet

Investigator:		5 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	····	Date: <u>/3 / / / @ /</u>
Location:	* 2: - (Angine.	Test Id	d: <u>/ ^ - 4</u>
Depth of hole:_	54.	Radius:	1 7 1	(standard calcs assume 3 cm radius)
Reservoirs used	during test	(check one):	Combined:_	Inner only:
Reservoir cons	tant used:	51220	5 ₀ Pk	

	Water le	evel in we	ell = 5 cn	a
Time t (min)	D <i>t</i> (min)	Water level in reservoir h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt
Ø.	·	(1.1.)		
	0./3	Maria Salah	6~***	27 B
4 67 53 4 6 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	9.13	30	522	79,73
A may have	218	Section 1	40. 15.	27 54
;	Ø . T.	40	t _a	21.0
	878	\$ 1 · · ·	5	27.3
	eng eng Eng signifika	4. 1.	0.44 7g	73,1
	pay the to	F	,**	250
	67	4 m		100
1136	1 Table 1	55	Mary Carlo	24.1
1750	jihong Milit Merindan	90	Ś	P 5, 0
2/11		Marine St.	<u>.</u>	P*9, 1
Steady ra	te for 3 conse	cutive readir	igs (R1):	*** . /

Time		Water level in		Rate o
t	Dt	reservoi	D h	_
(min)	(min)	r	(cm)	Dh/ D
		h (cm)		
2		e e e e e e e e e		
:/0	013		10	So a
	0.29	đ.	:0	37.5
	0,13	4 %	Same of the same o	
11 4	p./5	SD	<u> </u>	33.
15/	0 13	55	<u></u>	33.
1:00	6,75	in the second	3	33.
1,10	19 Fg	, ar		
648	en, / The	agi pa a	\$30 \$40	32.
1:54	P 15	ÿ \$		1772

Cton dr. mate	for 3 consec		(D)	8 ₁ , 0 ₁

Comments:

K. . 0.86 informa 516 in/a.

GP FIELD DATA SHEET		SECTION 1: SITE INFORMATION
Date <u>Share</u> Investigator_		<u> </u>
Site Location	, in The	olejkoh (
Dominant Soil Type(s)	yde so	
Site Map:	Soil Prof	ile Description (horizon depth, structure, color, etc.):
Comment of	Depth	Description
Presence of special soil coinduration, compacted layer	onditions (mess, etc.):	ottling, water table depth, hardpan,
Comments and Notes (topogra	aphy, slope,	vegetation, etc.):



Result	

Head #1

Reservolt Type (enter "1" for Combined and "2" for inner reservolt): Enter water Head Height ("H" in cm): Enter the Borehofe Redus ("a" in cm):

- Enter the soil texture-structure category (enter one of the bolow numbors): teablicative ender in September is in intrinseduced with subsigious and poil fanction playing playing a still and apopulatively one also entitle some tare saids.
- Control and grow Whendy they also methods correctedly experiments selve and other magnetical corrects. In properties of several contrasticts of applicative for applicable rates de-

Most smortanch east from clops ann ophthomographes restration contenting dans from east from east the content of the process.

Standy State Rate of Water Level Change ("R" in cm/min): 27.3000

Kir 4.82E-02 cm/sec ####### cm/nin 4.82E-04 m/sec ###### inch/nin 1.90E-02 inch/sec (1) 0,36 visi C = 0,80315 Q ≈ 16,0251

Support al Bsolmosture.com

Head #2

-	2	•
Reservoir Type fenter "1" for Combined and "2" for know reservoir);	Enter water Head Holght ("H" in cm): 10	Enter the Borchole Radius ("a" in cm);

K. . 3,76E-02 Average

Enter the soil texture structure category (enter one of the below numbers):

- megaping Kinnyan-besitherporioliginari denomination of seath rigorial from sentence or memor ediments, etc.
 kas and an annihermorpus galesporioligin or a de la compara de la constante de la compara de la constante de la compara de la comp
- Movementing to be from the sounds to a test of sections and transfer to a section of the section o spinoate for agricultual solo. 1. It barea end pracht samts may also endade some brotherenesses en engage en engage. Processes godd large en tiger este entre sold tacks, it are processes.

Ky v. 2.70E-02 cm/sec ###### cm/rin 2.70E-04 n/tes 6.38E-01 inch/rin 1.06E-02 inch/rec Ca. " 7.50E-02 (m.) fear C - 1,28754 C - 17,01 Steady State Rate of Water Level Chango ("K" in cm/min); 30,0000 0.36

= 1

Cafallakin formulat ritinal ne czechod and wechend antikeds. Whate h is insolventer net of fill of water in verweit (exp. k., p. sok damand hydraute czolowejey (ext.), e. d. xxl) anner dan patennia (exp.), v. u. Marcetopy, capillary hydroparacz (form They, h. i. Dombet radiu (exp.), f. v. fir fill bed, of war excibited w berelog (ans.), f. p. tha speak hand of ware exalizated in portal fram and f. s. knyw frow (form 1562.).

Continue maint hands wage from C. When Monte law were produced in the first word, a work as well of the first hands of the monte of performance of the first hands of the monte of performed performed in the first hands of the monte of the first hands of the fir

1,346-01 (1.7) (1.7)

2

 $C_1 = \left(\frac{H_{1/4}}{2.10V + 0.118(H_{1/4})}\right)^{-1}$ $C_2 = \left(\frac{H_{1/4}}{2.10V + 0.118(H_{1/4})}\right)^{-1}$

0.01

Comparted, Structure-less, claying of oilty materials such as handfill caps and hints, lacustime or morities sediments, etc.

Soll Trature-Saucture Calegory

Shape Factor

 $C_{z} = \left(\frac{H_{z/a}}{1.992 + 0.091(^{14}/a)}\right)^{2}$ $C_{z} = \left(\frac{H_{z/a}}{1.992 + 0.091(^{14}/a)}\right)^{2}$

0.01

Soils which me both fine textured (clayey or silty) and unstructured; may also include come fine rands.

BRENINK CNYSOC BRENINK CNYNN BIRKHER NYSOC BIRKERE NOONNN BREEFER NOONNN

6, 0.02415

4 18

er 19

2.87E-02

$h_{j_1} = \frac{c_1 \cdot c_1}{2\pi H_2^2 + 3\pi c_2^2 + 3\pi \left(\frac{H_2}{2}\right)}$ $c_2 \cdot c_3$	4" " (2nH; 4 no C,)a' + 2nH,	$a_1 = a(2H_1H_2)H_2 - H_1) + a^2(H_1C_2 - H_2G_3)$	6; 10, 12, 13, 14; 11; 14; 14; 14; 14; 15; 14; 15; 15; 15; 15; 15; 15; 15; 15; 15; 15	$N_{f,e} = G_2Q_3 - G_1Q_3$	$6_1 = \frac{(2H_1^2H_2^2G_2 + \sigma^2G_3)G_3}{2\pi(2H_1^2H_2^2G_2 + H_3^2 + H_3^2 + H_3^2 + H_3^2G_3)}$	$6. = \frac{(3H + 3^2G_1)^2}{2\pi (3H)H_2(H + H + H^2)^2}$	Φ. = (fr.Q) ~ 6,Q;
Q, n. R, v. 55.22	Q1 to A1 x 2.16		Q, = R, + 35.22	Q; n B; x 35.22		Q. = E. × 2.56	Qr er Ry x delte
One Head, Constined Reserveir	One Head. Inner Reservoir		Two Head,	Colleges Kristven		Two Head.	

.

 $C_{1} = \left(\frac{M_{1}}{2.074 + 0.093(H_{1}_{G})}\right)$ $C_{2} = \left(\frac{H_{2}_{1}}{2.074 + 0.093(H_{1}_{G})}\right)$

0.13

Most structured rolls from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural rolls.

 $S_1 = \left(\frac{B_1/g}{2.073 + 0.0931(B_1/g)}\right)$ $C_2 = \left(\frac{B_2/g}{2.073 + 0.0931(B_1/g)}\right)$

Coarse and gravely sends; may also include some highly structured soils with large and/or manorous eracks, macro pares, etc.

386	Two Head Method	
3.76E-02 cm/sec	Reservoir Type (enter "1" for Combined and "2" for kiner reservoir):	÷
2,26E-00 cm/min 3,76E-04 m/s 8,88E-01 inch/min	Enter the first water Head Height ("H1" in cm); Enter the second water Head Height ("H2" in cm);	∞ ₽
1.48E-02 inclvised	Enter the Borehole Radius ("a" in cm):	•
1.04E-01 (7.7/2.1)	Finer the soil texture-structure category (enter one of the below numbers):	7
	1 Compact d, Minister less, dainy at object offs not take	
	Amodally ago and kneer, far activate or the approximation of the control of the c	
*	and the control of the property of the control of t	
	3. Most preciation self-from slovy trength lastrig, the probability	
V-134	misportured inschanared him sacts. The excepting most horizoned to	ie.
	application of a strength of a contract of a contraction	
		,
		0,36
je)	Steady State Rate of Water Level Change ("Rf" in cnumin):	27,3000
	Steady State Rats of Water Level Chango ("R2" in cm/min):	30,0000
	* 50	0.9828
i.	n Gi	1.08
202	é.	0,60315
		1,28754
		0.00496
darper of water to reservoir		0.00397
is Macroscopic capillary		0,05569

Guelph Permeameter Data Sheet

Investigator: QQ /R/	<u> </u>	Date: 6/16/8/
Location: Mars. 31.	- Fora will Test Id	I: Day - B
Depth of hole: 45%	Radius: ৪ 🗷 🖂	(standard calcs assume 3 cm radius)
Reservoirs used during test	(check one): Combined:_	Inner only:
Reservoir constant used:	35.77	

	Water le	evel in we	ll = 5 cn	1
Time t (min)	D <i>t</i> (min)	Water level in reservoir h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt
O.	-	30		
:08	p. (\$	25	500	
1/5	2004	\$0	200 m	55,0
123	or in	35	And the second	29,3
of the said	n./0	40	sett.	30.0
1215	0.00	al in	A comment	05.0
; * A.	m 15	16, 3 g	\$1.00 \$1.00	
400	100 g 100 g	gara yayan Sanasir		10.0
1/12	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	٥0	City Land	1:21
17 2 B	a 13	ć- <u>(</u> 5,	15	72.3
1129	0.18	14 a2	14 T	29,3
1/53	043	75	**************************************	200 Jan 1
Steady m	te for 3 cons	ecutive readi	195 (R1).	

Water level in well = 10 cm							
Time t (min)	D <i>t</i> (min)	Water level in reservoi r h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt			
0		20					
125°	500	à W	ggirk fari. Distriction Beginningswell	50.0			
111	0.1	\$5.70	gard Admir except	50,0			
120	e 15	7 5, 48		The state of the s			
170	0,12	40					
1110	m // 🤄	4.5	All and				
15/3	81,10	50	garja sama Marija Marija jama	7,000			
1,00	e. j J.	55	year Constant	The Art			
1/10	64.70	. A	- Car - Ca - Ca - Ca - Ca - Ca - Ca - Ca - Ca	Projets			
1:20	010	55	Agentina Grand Sand	125 6			
1170	017	960	E.	To the second			
1140	07/3	tarray Espera	greeniges (17) Standard _{eng} Standard (17)	3000			

Steady rate for 3 consecutive readings (R₂):

Comments:

Kg = 0.888/4/min = 53, 3 11/6/

GP FIELD DATA SHEET		SECTION 1: SITE INFORMATION
Date <u>Marie Investigator</u>		
Site Leastion	\mathbb{F}_{i}	Track Brief
Dominant Soil Type(s)		Market Committee
Site Map:	Soil Pro	file Description (horizon depth, structure, color, etc.):
PT-5	Depth	Description
	rs, etc.):	nottling, water table depth, hardpan, vegetation, etc.):



Head #1

sommonstruck Guelph Permeameter Calculations

Result ☐ Input

Reservoir Typo (enter "1" for Combined and "2" for inner reservoir): Enter water Hosti Height ("H" in om): Enter the Borehole Radius ("a" in om):

- r the soil texture-structure callegory (enter one of the below numbers): 3.3.

 1. Compacting, furniture few, clayer or sity numbers or the solution of the feature of the solution of the feature of numbers observationed in soils.

 2. Soft which are both the restate of taken you with and
- unstructured medium air Hine sands. The category modificationity applicable for agricultural scale. astricitized; may also include some tine souds Most structured with from clays through learns also metatric
- situatized sols with large anifor numerous cracks, marrispens, etc. $\mathbf{d} = \mathbf{\ell}$ carse and geavely small, may also include some highly

Steady State Rate of Water Level Change ("R" in en/min): 4.4500

K. 7.86E-03 cavised 4.71E-01 carbina 7.86E-05 arbood 1.88E-01 inchina 3.09E-03 inchina C = 0,80315 Q = 2,61215 " 2.18E-02 (C) (C) 0.36

Hend #2

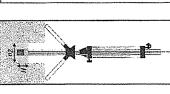
Support ab@solmcisture.com

Reservoir Type (enter "i" for Combined and "2" for Inner reservoir): Enter water Head Height ("H" in cm): Enter the Borehole Radius ("a" in cm): so# texture-structure category (enter one of the below numbers): 4 o z →

- Compared, Senature less, that you sity materials such as a cellel tape and liners, beaution or material cellerants etc.
 Cols which are soft fine technical library or neW and arrietarest, may alter metude spine fire satisfic
- productions and almost for same. The category most frequently Atost structured stells from day; through intens, abrandades
- stractured sola sudscharge und/or num-dusus cracks, incorropeds, est Contractive Meaning stage also exclude some highly speciate for generatural spice

Steady State Rate of Water Level Chango ("R" in um/min): 5.3000

#. . € = 1,28764 Ø = 3,1111 0.36



K_{ij} = 4.77E-03 cm/sec 2.86E-01 cm/nin 4.77E-05 m/ses 1.13E-01 inch/nin 1.88E-03 inch/sec 1.336-02 (16)

Calculation faitudes related to envelocal and two-head anabods. Where it is recolystic time of fail of water in reservi-rienty, i.g., is seed actuated by detailed considering (oriest, de., at 500 limite), time potential (eq.), i.e. it is failwayed to length prosenter (from 1998), it is limited to fail to fail is that the fail of water included in bordools (en), i.e. is the reconsistent of water established in bordools (en), and it is failed in the offeren of the many in the consistency of the process thread of water established in bordools (en) and Cu schape force of them Table 7.

		The state of the s
One Head. Combined Reserveir	r 0; = R; - 15.22	$K_{I_{J}} = 2\pi M_{I}^{2} + m\pi^{2}C_{I} + 2\pi \left(\frac{H_{I}}{\sigma^{2}}\right)$
One Head, laner Reservoir	Q1 = K1 - 2.1n	$\Phi_{r,s} = \frac{2\pi H_1^2 + \pi n^2 C_1^2 a^2 + 2n H_2}{2\pi H_1^2 + \pi n^2 C_1^2 a^2 + 2n H_2}$
		$a_1 = \{20, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0$
Two Head.	25 - 81 x 35.22	$a_1 = a_1 2 h_1 h_2 h_1 - h_1 a_2 + a_2 h_1 c_1 - h_1 c_1 d_2$
Combined Reservels	4, m Rg x 85.70	$E_{\ell_s} = G_s Q_s = G_s Q_s$
	And the second s	$\phi = (3H_1 + H_2) + H_2 + H$
Two Head	Q1 - B1 x 234	$6. \approx \frac{(20) + 4^2 G/6}{2 (20) + 4 (4) + 4^2 G/6} = 4 (6)$
	S. 44. 4 0.10	4_ = 6,9, - 6,9.

Most structured rolls from clays through fostus, also includes matricutured aridium and fine suich. The category nest frequently applicable for apricultural total

0.13

 $\frac{c_{1} = \left(\frac{H_{1/q}}{2.074 + 0.093 \cdot H_{1/q}}\right)}{\frac{H_{1/q}}{H_{1/q}}},$ $c_{2} = \left(\frac{H_{1/q}}{2.074 + 0.093 \cdot H_{1/q}}\right)$

Soils which are both fine textured (clayey or othy) and unsurversed; may also include some fine eards.

0.01

 $\zeta_{1} = \left(\frac{H_{1/6}}{1.992 + 0.991(H_{1/6})}\right)$

Consteared gravely sande; may also include some highly structured soils with large and/or numerous cracks: macro potes, etc.

0.36

 $\frac{G_{1} = \left(\frac{H_{1/d}}{2.974 + 0.0931 H_{1/d}}\right)}{\left(\frac{H_{1/d}}{2.974 + 0.0931 H_{1/d}}\right)^{3}}$ $G_{2} = \left(\frac{H_{1/d}}{2.974 + 0.093 H_{1/d}}\right)^{3}$

Compared kinactureless, chysy or silty materials such as landful caps and libers, lacustime or made rediments, etc.

0.01

 $C_{1} = \left(\frac{Shpp_{1} Kadoy}{H_{1}/o}\right) \left(\frac{H_{1}/o}{2.102 + 0.118(H_{1}/o)}\right) \left(\frac{H_{1}/o}{1.102 + 0.116(H_{1}/o)}\right)$ $C_{2} = \left(\frac{H_{1}/o}{2.102 + 0.116(H_{1}/o)}\right)$

Soll Tealure-Structure Category.

(cm3)

. Column femaler which to supervise of Ware House for some gentleger may the other constraint matter plants. A Column female with a based some and control of the column and column competers of the material some column and column an

Two Head Method

Average

Reservoir Type (enter "1" for Combined and "2" for inner reservoir):

Enter the first water Head Height ("Hi" is cm): Enter the second water Head Height ("H2" in cm): **5** 5

K₊ == 8.31E.03 cm/sec 3.79E.01 cm/min 8.31E.05 m/s 1.48E.01 inch/min 2.48E.03 inch/sec

= 1.75E-02 AD/ADD

Enter the Borshole Radius ("a" in cm):

soft exture-structure category (enter one of the below numbers):

Compared, Structure less, days y et elle morroberta leu-bould caps and horry, facustione or maine ordinents, etc.
 Sole days have not blook teamer dishayey or also or to

instructured, may also enlede some her soods

Me it structured scale from days through learns; also includes unstructured measium and time sands. The conegray resist financials

appfeable for appositural adds.

compared soft-entitlage and h a constraint tracks, and masses, etc. Course and groundy sands, may also include some tegrity.

0.30

Steady State Rate of Water Level Change ("R2" in cm/min): 5,3000 Steady State Rate of Water Level Change ("R1" in cmimin): 4.4500

0,80315 0.1908

0.00496 1.28754

0,00397

0.05569

.7 0.02415

####### crryinin ######## richthin ######## inchthin ######## inchthin

4.31E-03

Guelph Permeameter Data Sheet

Investigator:	40/04				Date: 6/16/21
Location: 12/22	of the staff	Fire.	1883 T.	Test Id	: <u>f </u>
Depth of hole:_	40"	Radius:_		<u>(.1</u>	(standard calcs assume 3 cm radius)
Reservoirs used	during test	(check on	e): Con	nbined:	Inner only:
Reservoir const	ant used: 🗍	3 mg 12	ergae Politikasing		

	Water l	evel in we	ll = 5 cn	1
Time t (min)	D <i>t</i> (min)	Water level in reservoir h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt
ರ್				
/29	<i>⇔</i> (-5	23	arri,	2, 3
// 5°	0.93	30	and the second	
	14. 14. 88. 14. 15. 18.		<u>.</u>	5,1
3:40	1.10		general mening manifold	
	1.03	\$1.00 m	90 Y 1 S 2	4.3
	1.0	200	C.	40 J (100)
7,00	1.20	55	E	4.8
8, ans		60	45	1.24
91/5	1.12	(S. T.	257	1.3
10: A	17 3	7:0		3.9
1.15	A wa	res /	*	4.1
Steady ra	ite for 3 cons	ecutive readi	ngs (R ₁):	4.45

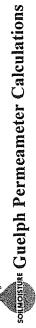
	Water	level in w	yell = 10 cm	l
Time t (min)	Dt (min)	Water level in reservoi r h (cm)	D <i>h</i> (cm)	Rate of change
Ö		17		
	0,55	20	tong the topic	5.5
1138	0,92	25		E. C.
2:25	0,95		5	art though
1/18	0.28	strong Section	American Mariana American American	5,7
4116	in the	40	garanto Bossilia Lacarton	5.8
5,72	0,93	45	#konord Frankis \$1 majorit?	5.4
Giph.		4.0	#1 3 3	Sil
W. 1803		And France	grand to the	5,4
8.50	\$ 0.3		residence sound	5,2
ETSA	9 ,99	6.5		5/2
	9,35	200	gggown: Edings North	
10,5	0.33	many man	fictions engine engine	5.4
				

Steady rate for 3 consecutive readings (R_2) :

Comments:

Ky = 0. 149 Inhain = 3.94 11/2-

GP FIELD DATA SHEET		SECTION 1: SITE INFORMATION
Date <u>Giran</u> Investigator <u> </u>		
Site Location	<u></u>	Maria Cara
Dominant Soil Type(s)	1	San San Carlos San
Site Map:	Soil Pro	ofile Description (horizon depth, , structure, color, etc.):
Fry C	Depth	Description
		54-1848 - 15 54-9846 - 15 54-9846 - 15
Presence of special soil con induration, compacted layers Comments and Notes (topograp	, etc.):	mottling, water table depth, hardpan





Average

Support, ali@solimoisture.com

Head #2

inter "1" for Combined and "2" for lines reservoir); Enter water Head Helph ("H" in cm); Enter the Botebole Radius ("a" in cm);

ructure category (enter one of the bolow numbors): nithers reactions ago promiting ago includes an ending adout of the continue o and gravely sames and on latter cost edges. gen, strenger bey, zhoeg er eig materrik end as and laver, landines er maties exbrevits, ett as Lavergtetes technischlageg strakt ett ett mag alst entsete strengter entb

State Rate of Water Level Change ("R" in cm/min): 16,7000

Ki; ≈ 1.50E-02 cm/sec 9.02E-01 cm/min 1.50E-04 m/ses 3.55E-01 inch/min 8.92E-03 inch/min Or. " 4,16E.02(min) C = 1,28764 C = 9,8029 0.3\$

N_{1,1} = 2.15E-02 cm/sec 1.29E+06 cm/min 2.16E-04 m/s 6.07E-01 inch/mi 8.45E-03 inch/se 5.96E-02 (***)

Cakulation formuli (cm.v), K ₁₁ is Soil minister knath parameter (from Tide steeped flead of water errabli	a hydrauls conductivity (e th. 2), c it Borthele esdist etch in tweethele (esdist	Calculassi Rezgias rebasd to onches dack wechesd auchods. Where Pi i integratint and of this divart in remova March parametric distance and status conductory (crast, b. c. 18 minht Entry potential (cra's), s.' is Materiosys copilisate March parametric article, s. is therefor trides (cm.), hij the fifth table of same established in banchest (cm.), H. is the steeped lead of water errobitated in Swaled (cm) and Csi Saupe forter (from Tros 2).
One Ilvad, Combined Reservoir	Q, = R, < 35.22	$S_{II} = \frac{51 \times Q_1}{2\pi h_0^2 + \pi n^2 G_1 + 2\pi \left(\frac{H_1}{R_1}\right)}$ $G_1 \times Q_2$
One Heart Inner Reserveit	Q, n fi, v 2.16	$\Phi_{\pi^{+}\pi^{-}}(2\pi H_{1}+\pi a^{+}G)a^{+}+2\pi B_{2}$
		$G_1 = \frac{H_1 G_1}{\pi (2H_1 H_1 (H_2 - H_1) + \pi^2 (H_1 G_2 - H_1 G_1))}$
Two Head.	Q1 - R1 - 35.22	$G_1 = \tau(2H_1H_1,H_2 - H_1) + \pi^*(H_2G_1 - H_1G_1)$
Continued Reservoir	Q: v. A; v. 35.22	$K_{fi} = G_2Q_2 = G_2Q_1$
The second control of the last second control of the second contro	197	$G_1 = \frac{(2H_1^2 + a^2C_2)c_4}{2\pi(2H_1H_1(H_2 - H_1) + a^2(H_1^2C_3 - H_2c_4))}$
Two Head.	Q1 = B1 x 2.16	$G_{s} = \frac{(2H_1^2 + a^2C_1)C_2}{3\pi(2H_1H_2)H_2 + H_1) + a^2(H_1C_1 + H_2C_1)}$
	Q1 to 10 x 2.10	ψ _{eq} ≈ 62Q ₁ − 62Q ₂

Enter the Stat water Head Height ("Hit" in cm); 3 Enter the second water Head Height ("Hit" in cm); 30 Enter the sed texture-attracture category (enter one of the below numbers); 4 1 Campair or, Vinstignellor, slippy on sky nest rule water. 2 Movertherer and the control of the selection of the below numbers); 4 3 Movertherer and the control of the selection o	Two He	Fwo Head Method Received Twee fenter "1" for Combined and "2" for have reserved):	r inner reservoir):	2
6.26 0.26 16.200 16.200 1.500 1.500 1.200		Enter the first water Head He	100	
16.006 16.0000 16.000 16.000 16.000 16.000 16.000 16.000 16.000 16.000 16.0000 16.000 16.000 16.000 16.000 16.000 16.000 16.000 16.000 16.0000 16.000 16.000 16.000 16.000 16.000 16.000 16.000 16.000 16.0000 16.00		Enter the Borehole A	adlus ("a" in cm):	
16.200 16	2	f texture-structure category (enter one of the		
Style beggin with the form which or with the contribution of the c		 Current of Production, days at NPP in different distribution for 	system's such as Smerts, etc.	
Fig. 10 (a) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c		 Stab gebigt are teachers teatured blavers to another turns may also appear asserting with 	the second secon	
0,36 (6,5000 1,95 0,5012 0,5012 0,5012 0,0012 0,0019 0,001		1. Block thurthered took from down then high-	sing abe redudes	
0,36 16,7000 1,95 0,5012 0,5012 1,25764 1,25764 0,00319 0,0031		instruction of more than the charge. Boke all	gety myst frequentic	
0,26 16,500 1,55 0,501 0,501 1,2376 1,2376 0,0049 0,00413 0,00		4. Common Agraph with, tray alcouring	e san e buglit	
		STREET CONTRACTOR OF THE STREET CONTRACTOR OF		
		Stady State Rate of Water Level Change	("R1" in cm/min): 16.8	2000
0,5688 0,6612 0,80315 1,28754 0,00496 0,00496 0,002418 88867887 0,055689 9,002418		Sleady State Rate of Water Level Change	("RZ" in cm/min): 16.3	2000
0.6012 0.80315 1.25754 0.00498 0.00559 0.02415 8886888 8886888 8886888 8886888				0.85
0.80315 1.25754 0.00498 0.00588 0.02418 8886888 8886888 8886888 8886888 8886888			.,	012
1,25754 0,00498 0,005509 0,02568 0,02413 0,02413 0,02413				9315
0.00498 0.00397 0.05668 0.02413 8####################################		1		5754
0.06569 0.02413 0.02413 8####### ########		<u>.</u>		0496
0.05568 0.02413 8###### ######## ####################				0397
0.02415 BHURRES BRYSHES BEKNERTE BEKNERTE				6999
***************************************				2418
				WHEN CIN'S BC WHEN CIN'MA WHEN TH'S BC WHEN THE BC

Reservoir Type (enter "1" for Combined and "2" for kneer reservoir); 6 Enter water thand Height ("1" in cm); 6 Enter the Borehole Radius ("2" in cm); 3	Reservoir Type (er
Frier the actifecture structure category (enter one of the below numbers):	frier the soll texture-stn
Compacted, Structure bas, dayou ceedly makerials such as	1 1009003
specialities are great transforment in an armone or dominates educations	* Selection of the sele
7 In the contract to the free trades of states are soften and	Application of
about a training state with mediate report from particle	Southerner.
which extends the the transfer that extends the state of	: Magazina
mateuroperst merdeare and free conds. Very adepted your frequency that	papagasaas
spitzado los apis alterationis	April 1997 for
all the sections and greatery sections, they also makinder occurs they also the section of	********
and threely soft soft darpe position commercials cracks, the copies of	*********
Stendy State Rate of Water Level Change ("R" in cm/mhs): 16.8000	Steady
(15) 90'0 (10)	
0.00016	-
C 1 9,2146	
Ki.: 2.79E-02 cm/soc	
ATREASED CITYAN	
8.59E-01 inchwin	
TOTAL CONTRACT	

Soll Texture-Structure Category	(r, (cm.))	Shape Factor	s presid mead a
Compacted, Structure-less, chayey or ship materials such as bandfill cape, and imers. Increming or marine sedments, etc.	0.01	$\zeta_1 = \left(\frac{B_{1/n}}{2.102 + 0.118(B_{1/n})}\right)_{4.15}$ $\zeta_2 = \left(\frac{1.102 + 0.118(B_{1/n})}{3.102 + 0.116(B_{1/n})}\right)_{4.15}$	Cembined
Soit which are both far textred (chyey or sily) and unerscenets, may also jecture room fire saids.	0.04	$\xi_1 = \left(\frac{H_1}{1.952 + 0.0911H^2(z_0)}\right)^{(34)}$ $\xi_2 = \left(\frac{H_2}{1.952 + 0.0911H^2(z_0)}\right)$	Two
Most stretund seit from chyr through boune, abe inchoto marinerared medium and face raide. The cangay ment frequently applicable for agricultual totls.	0.13	$\mathcal{L}_{1,n}\left(\frac{H_{1,0}}{\sqrt{2074+0.093(H_{1,0})}}\right)^{C11}$ $\mathcal{L}_{2,n}\left(\frac{H_{1,0}}{\sqrt{2074+0.093(H_{1,0})}}\right)$	
Courrand gravely tands; may also include some highly structured soils with large and/or tumereus enach, marto pores, etc.	0.36	$\zeta_1 = \left(\frac{H_1'_{\ell_1}}{so^2 + so^{93}(H_{\ell_2})}\right)^{p-1}$ $\zeta_2 = \left(\frac{H_2'_{\ell_2}}{so^2 + so^{93}(H_{\ell_2})}\right)$	Inor R

Guelph Permeameter Data Sheet

Investigator: CAR TO A CO	Date: <u>46 4</u>
Location: (1) (1) (2) (2) (1) (1) (1)	Test Id:
Depth of hole: Radius: Radius:	(standard calcs assume 3 cm radius)
Reservoirs used during test (check one): Con	nbined: Inner only:
Reservoir constant used:	

Water level in well = 5 cm					
Time t (min)	D <i>t</i> (min)	Water level in reservoir h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt	
0		12.5			
* :	A."	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ا الميل br>الميل الميل ا	10.2	
\$ 5 A.S.			Ž.	4 4	
1751		*:1.* : : : : : : : : : : : : : : : : : : :	#10 1	78 2	
11/2	a t	10	Elementa Elementa S	16 2	
		45	5	18.9	
11.19	# 12 13	880 july 1	JAN J		
ST PA	a en	165 115	4°.	15,53	
	\$ 1 1050	(2) (2)	200		
35.14		20 m	2000 1000	17.6	
The St.	gha Sagar	1, 1, 3	\$1.7 1.2.1 1.4.1	1	
Service of the servic	grade the second	05 a 4 5	C	15,3	
Steady	ate for 3 cons	ecutive read	ings (R1):	15.3	

Water level in well = 10 cm						
Time t (min)	D <i>t</i> (min)	Water level in reservoi r	D <i>h</i> (cm)	Rate of change Dh/ Dt		
2,						
1/17	9.15	Ş: *Q	g Million gun vivin	31.61		
# 1 P		1.7 (4.8)	<u>) (</u>	27.0		
117	0.3		.53	12, 24		
1100	j	4.3	end The The	15,50		
1.	o : i		€1 -	N. Z		
J. Fa		And the	Sang.	4,0		
1 200	85,28	#5 25	#50 \$100 100			
#17 / 5°		1364	1 in	15.0		
	0.30		2,5000 5 c 8 c/5	1 . W		
erige e 1770 Vily 1880	9 X 4.	1,50		15 1.3		
3710		in the second se	provide Erick	10.7		
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				1/2 7		

Steady rate for 3 consecutive readings (\mathbf{R}_2):

Comments:

15 00.500 Million 30. 10.

rager ...

GP FIELD DATA SHEET		SECTION 1: SITE INFORMATION
Date <u>Gir, St.</u> Investigator		
Site Location	<u>F</u>	stranje Baku
Dominant Soil Type(s)		Barbara Arabara da Barbara da Bar
Site Map:	Soil Pro	file Description (horizon depth, structure, color, etc.):
27==	Depth	Description
	72 A B B B B B B B B B B B B B B B B B B	21/2 / 10 / 10 3/3 SL = 2, 5 / 10 4/4 So, 2 / 60 m/ 25 / 4/4
Presence of special soil induration, compacted lay Comments and Notes (topog	ers, etc.):	nottling, water table depth, hardpan



ulat
Calc
leameter
eam
erm
ph F
િ

Result Input

Support, af@schnosture.com tions

Head #2

Reservolr Type (enter "1" for Combined and "2" for inner reservolr):
Enter water Head Height ("H" in cm):

Head #1

Steady State Rate of Water Level Change ("R1" in cm/min); 23,3000 Steady State Rate of Waler Lovel Change ("R2" in cm/min): $\,$ 25.7000 $\,$ 1.95 $\,$ 0.5388 $\,$

(AND THE STATE OF T
€ 18,8469	E. C. 2.68E-02 cm/sec ###### cm/nin 2.68E-04 m/ses 6.11E-01 m/ch/nin 1.02E-02 m/ch/sec 6 7.18E-02/m/sec	

dieget Calculation formulas related to operated and two-kead methods. Where R is standy-state case of fall of water in reservoir	Control Conference (em. Y. K.), in Soil additional production of furth to the form manner to the form of the form	ingly abstance (time) and the control of the contr
er yeard bength	200000	

E. MERRIER CONTON MERRIERE CONTON MERRIERE INCOC MERRIERE INCONTON MERRIERE INCONTON MERRIERE INCONTON

... 0.02415

6 0,00486

0,80315 1,28754

9: = 1.0332

€ ≈ 0.00397

62 = 0.05569

2.18E-02 (17,75.3)

$K_{f,s} = \sum_{i \in \{1, 1, 2, 2, 3, 3, 4, 3, 3, 4, 4, 3, 3, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4, 4,$	4. " (2018; 1 no 26, 10" + 20 B	$a_1 = \frac{H_1 c_1}{\pi (2H_1 H_2 (H_2 - H_1) + a^2 (H_1 c_2 - H_2 c_1))}$	$G_1 = \frac{H_1 C_1}{\pi_1^2 (2H_1 H_1^2 (H_1 - H_1)^{1+\alpha^2} (H_1 C_1 - H_1 C_1))}$	$R_{12} = G_1Q_2 = G_1Q_3$	$G_3 = \frac{(2H_0^2 + a^2C_2)\zeta_1}{2\pi(2H_1H_1GH_2 - H_1) + a^2(H_1C_2 - H_1G_1)}$	$G_4 = \frac{(2H_1^2 + e^2C_4)\mathcal{L}_2}{2\pi(2H_1H_1^2(H_2 + H_1) + e^2(H_1C_2 + H_2C_3))}$	4 to 6.0, - 6.0;
Q1 22 R2 v 35.22	Q. v. A. v. 2.16		Q1 - 16, x 35.22	Q2 = R2 × 35.22		Q. = A, × 2.16	Q: = K; × 2.16
One Head, Combined Reservoir	Onr Head. Inner Reservolr		Two Head,		enterente de la companya de la comp	Two Head, June Been of	HOLDEN SHIP

d and "2" for Inner reservalt): 1 vater Head Height ("H" in cm): 10 9 Borehole Radius ("a" in cm): 3	15. 11. 3.35E-02 cm/sec 2.91E-00 cm/min 3.35E-04 m/s 7.91E-01 fm/min
er one of the below numbers);	
se you supplied the fall of	φ 9.30E-02 (επίπ.α)
at the armone spatial and distriction of the spatial and distr	
not brieve of or compliance	
As that any of factors, who encoled the	. 1720
do the steppe expettements	4
y a legist of contract triple y	
namerous teares, mortingials, éta	777.10
Level Change ("R" in cm/min): 28,7099	
-(** 96'0 - 1.);	
C 128754	
F 2.68E-02 cm/rec	
2.56E-04 m/ses	
6.11E-01 methrin 4.02E-02 instrum	# B

Enter the Borehole Radius ("a" in cm): 3

Enter the second water Head Height ("H1" in cm): Enter the second water Head Height ("H2" in cm):

Reservolt Type (enter "1" for Combined and "2" for finer reservolt):

Two Head Method

Average

	Tabuth sometime standards confirmed the same of the conference
Enter the soil texture-affocture category (enter one of the below numbers):	Euror tile son textere-americal femal
1. Create of the time beg, chapper ofly majorady class as	2 Contracted Structure for State
The second secon	The state of the s
2. Society appropriate heads from temperature of the person all the next	A many which are hours for the
anathoushings may able or dustry upon have outed.	section through they also purface some
. Specialization of solid transition the might buring documentalists	1. Meet structures reds frame bales
motivations and an elemental film sands. Her category most brapports	Annual form and product to delight to an
apple able for appropriately dispute.	and to apply the appropriate the second seco
Applied restrict orderly are sufficiently from the property of the second section of the section of the second section of the section of th	to seam of ment prairies to the sample, may also
structural sode godbil ago andifar ourostous cracks, bractegalis, ob-	duction of new terms of the foreign terms of the second
Steady State Rate of Water Level Change ("R" in antimin): 21,3990	Steady State Rate of Water Let
2000 9800 - 100	
81808/G S V	-
43,6774	
E.j. * 4.11E.02 cm/aso	

servoir): 1 'in cm): 5 'in cm): 3	Reservoir Type (enter "1" for Combined and "2" for inner reservoir); 1 Enter water Neod Height ("1" in cm); 10 Enter the Borehola Radius ("a" in cm); 3	12 ·
mbers): 4	Enter the soli texture-structure category (enter one of the below numbers):	
tirken.	3 - Compacting American hose chapter of advancements scale as	į. Č
F 42	an all difficults and beginning the gold training that more of the states and in the states and in the states that it denotes of goldspay on said places.	
	specificant and entitle and the property of the second sec	
ata fades.). What sportames reds framedally than a factor advantable dow	
the quests	where the contract makes the contract of the c	
	बाह्य हेन अहीर महिल्ला होता होता है।	
*****	5 Contract and paintly sunds, may also include house highly	
rejetty zh	described exist with high apollogic manor our track, its displaying	
sm/min): 23,3000	Steady State Rate of Water Level Chango ("R" in cm/min); 28,7000	
, cr. 90'0		
200000	1,28754	
0 - 13,6771	6 18,8469	
2 4 44E A3 constant	E 2.68E-02 cm/kec	
SERVICE COUNTY	BHTMM COVING	
4.11E-04 m/sec	2,56E-04 m/ses	
9.72E-01 inch/min 1.82E-02 inclv/tec	6.11E-01 iner/min 1.02E-02 iner/soc	E 0
Gr. = 1.34E.01 (ca) ^{1-(c)}	\$5.00 TABEQ2(177) E. II	
	The second control of	

Enter the Borehole Radius ("a" in cm);	
structure category (enler one of the below numbers):	Enter the soli texture-structure category
where finitely the least daying a sky materials cuttlem.	3 Temported, Amenie ha
policies de la como la desposição dos sensituras do claritações, acida	and the special ferrors, be out
application (see), from teaching (1) spens or olds) and	7 North Wards are destricted to
endy many advices dudic copies from secular.	satisfication of may also purface
structured substrate chips through Pairs, donorshades	1 thet stratums telchar
ees mediam and line cands. Here, alogery posit he question	and bose an adversary to replace and for
the appropriate state of a pole.	applicable for agree floreinstein
es anné aga apolés es profes, anuas, alsos matériales quaesas hagitiles	And the second parameter of
Look gathlings audita naportoas teaths, macrepals, ob	ether Sahet Segres auth barger atta

ð	(emth), K _{fr} , fength para
Condition formate stated to stage forms of Where Reside fast water head logar may Residence and some revisite get	om, a v bondok noku nad 7. a vinterrepe repluci kapa katterbak u denda stooding to he nd bekentistiku supprij En one bed metical och Centrito be rekolomi kilo far har fra dendas, G, and G, ar rekolared. Zong et sl., 1902

THE RESERVE THE PARTY OF THE PA	
Compared Strutum-fets, clayey or ally marrials such as hadulf caps and lants, lacustrine or mather 0.01 tedinams, etc.	$C_{2,2}\left(\frac{H_{1,\alpha}}{2.102 + 0.118(H_{1,\alpha})}\right)^{1.11}$ $C_{2,2}\left(\frac{H_{1,\alpha}}{2.102 + 0.118(H_{1,\alpha})}\right)$
Solds, which are both fine rectured (clarys, or silty) and o,031 ventured: may also frethels some fine seaths.	$\zeta_1 = \left(\frac{H_1/a}{1.932 + 0.091(H_1/a)}\right)^{1.112}$ $\zeta_2 = \left(\frac{H_1/a}{1.992 + 0.091(H_2/a)}\right)^{1.112}$
Most structured solls form clays through loams, alto friends a unstructured medium, and fine study. The 0.12 testropy most frequently applicable for agricultural folls.	$C_1 = \left(\frac{H_{1/6}}{2.074 + 0.093(H_{1/6})}\right)^{0.11}$ $C_2 = \left(\frac{H_{1/6}}{2.054 + 0.093(H_{1/6})}\right)^{0.11}$
Coarre and gavely sands; may also include some lighty structured, soft with large and/or muserous cracks; 0.16 maten protes, etc.	$C_1 = \left(\frac{H_{1/6}}{2.023 + 0.0031^{(H_{1/6})}}\right)^{-1.2}$ $C_2 = \left(\frac{H_{1/6}}{2.023 + 0.0031^{(H_{1/6})}}\right)^{-1.2}$

GP FIELD DATA			SECTION 1: SITE INFORMATION
Date Oliveria	Investigator		. 4
Site Location.			
Dominant Soil	Type(s)		
	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		
Site Map:		texture,	ile Description (horizon depth, structure, color, etc.):
	<u>"</u>	Depth	Description
			5,1-104P. 1/2
			SL, -7, 548 4/4
		1 0	400000000000000000000000000000000000000
]	Sand & Grand 2,544/4
			
		1	
]	
Presence of spinduration, co	pecial soil ompacted lay	conditions (mo	ttling, water table depth, hardpan
Comments and i	Notes (topog	raphy, slope,	vegetation, etc.):

Guelph Permeameter Data Sheet

Dep Res	oth of hole ervoirs us ervoir cor	ed during	Rad test (chec	k one): C	t Id: (standard cadd: Inner		– 3 cm radius)	
Time t (min)	Water I Dt (min)	Water level in reservoir h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt	Time t (min)	Dt (min)	Water level in reservoi r h (cm)	Dh (cm)	Rate of change
<i>-</i>		20			-23		7193		
'oğı		erra ye. A isang	u La	bylo, r,	; # · · · ·	0.08	100	*	, , , , , ,
			# 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		1 1 3		Styles.	gene Stell Specific	18,0
	1.13	2 15	3 77	Phy (b	1 2 4	p. 15	> 8	The state of the s	29 2
45 1	0,78	ತ೨	-2 -30		100	c. 1 13		65	
		Note to the second	2	3	1.13	25,215	A 5.		378.24
			6.5	1 1 1	1 1	3 13	50		14.2
115		Ang y	, t 1		112.1	0.48	, 60°, 90°,		23, 2
€ 1 4.3 € 1 43	18 1 Sec.	Established	a***		137	2 1 mg	₹ 3.5 G W 5.7	15	
	\$*************************************	ij ne	5		1/23	10.75	And the second	graf u r	29.3
		***		5 . s	11 11 11	0,75	Contraction of the contraction o	All Sand	60 10
1, 1, 1	@ [13]	*44	g	- * · · :	124 \$	7 15	209 (2011)	jasen 2004	1

Comments:

Steady rate for 3 consecutive readings (R_1) :

Les De Friedon Land State of Hilliam

Steady rate for 3 consecutive readings (R_2) :

28,3



Reservoir Type (enter "1" for Combined and "2" for inner reservoir):
Enter water Head Height ("H" in cm):
Enter the Borehole Radius ("a" in cm):

- Enter the soil texturestructure category (enter one of the below numbers): 4

 1. Compacted, Structure-levs, clayey or sity materials such as knotfill caps and lines, lacustrine or marine sydiments, etc. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
 - unstructured medium and fine sands. The category most frequently 3. Most structured soils from clays through loams; also includes applicable for agricultural soils.
- structured soils with large and/or numerous cracks, macropors, etc. 4. Coarse and gravely sands; may also include some highly

Steady State Rate of Water Level Change ("R" in cm/min): 7,6900

		α'π 0.36 cm''.		C = 0,80315	Q ≈ 4,51403		K ₁₁ = ####### cm/sec	####### cm/min	###### m/sac	###### Inctvinin	####### inctvsoc	
200 Year 352	W I	10	100 100	2. 2. 20 Mg	18 0 16 do	350t 68k	0.642 9.8	26.8% 9.0		859 - 3	5 4 55	St. 3.14

Result Input

- 2 -Reservoir Type (enter "1" for Combined and "2" for inner reservoir); Enter water Head Height ("H" in cm): Enter the Borehole Radius ("a" in cm):

Two Head Method

Average

Support: ali@solimoisture.com

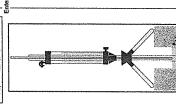
Head #2

Enter the soil texture-structure category (enter one of the below numbers): Compacted, Structure-levs, clayey or sity materials such as familial raps and liners, lacustrine or marine sediments, etc. 2. Soils which are both fine textured (clayer or sitty) and

unstructured medium and fine sands. The category most frequently 3. Most structured soils from days through learns; also includes unstructured; may also include some fine sands.

 Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macroports, etc. applicable for agricultoral soils.

1000 1000			(f = 0,36 (CH) ²)		C = 1,28754	Q = 11,0063		Nr. = ###### cm/sec	###### cm/min	\$#####################################	###### inct//min	###### inch/sec	,
9.72 1.7 1.7 1.7 1.7 1.7 1.7 1.7 1.7													
	98. Type 3972	9	1:	Acc 2,7333	0.26	1,2164	CO 04: 1,2167	1,2875	\$1000 p	1 2825	10.756	1 (90%)	9849 6



Calculation formulas related to one-hand and two-hand methods. Where R is steady-stated (cm)s, R_p, Is Soft native thy patential (conductivity (cms), R_p = 18 Soft native flux patential (cm) length parameter (50) asturence hydratulic conductivity (cm)s, R_p = 18 the first hand of water establish recorded head of water established in bottchek (cm) and Cfs Shape factor (from Tabe 2).

Ky = ####### cm/soc ####### m/soc ####### inch/min ####### inch/min ####### inch/soc

(cm//mm)

$K_{f,t} = \frac{C_1 \times Q_1}{2AH_1^2 + n\alpha^2 C_1 + 2n\left(\frac{H_1}{\alpha^2}\right)}$	$\Phi_{n} = \frac{1}{(2\pi H_i^2 + \pi a^2 C_i)a^i + 2\pi H_i}$	$G_1 = \frac{H_2G_3}{a(2H_1H_2(H_2 - H_1) + a^2(H_1G_2 - H_2G_2))}$	$G_{z} = \frac{H_{1}C_{z}}{\pi(2H_{1}H_{2}(H_{z} - H_{1}) + a^{2}(H_{1}C_{z} - H_{2}C_{z}))}$	$K_{f,s} = G_2Q_2 - G_1Q_3$	$G_3 = \frac{(2H_1^2 + a^2C_2)G_1}{2\pi(2H_1H_2(H_1 - H_1) + a^2(H_1C_1 - H_2C_1))}$	$G_4 = \frac{(2H_1^2 H_2^2 G_1^2)G_2^2}{2\pi(2H_1^2 H_2^2 G_1^2 + H_1^2 G_1^2)}$	
Q; = R̂ ₁ × 35,22	$Q_1 = \overline{R}_1 \times 2.16$		$Q_1 = \tilde{R}_1 \times 35.22$	Q2 = R2 × 35.22		$Q_1 = \tilde{R}_1 \times 2.16$	$Q_2 = R_2 \times 2.16$
One Head, Combined Reservoir	One Head, Inner Reservoir		Two Head,	Combined Reservoir		Two Head,	HOATSCAN DITH

Reservoir Type (enter "1" for Combined and "2" for inner reservoir):	Enter the first water Head Height ("H1" in cm): Enter the second water Head Height ("H2" in cm):	Enter the Borehole Radius ("a" in cm): 3	i Enter the soil texture-structure category (enter one of the below numbers): 4	1. Compacted, Structure-less, clayey or sity materials such as	landfill caps and boots, lacustrine or marine sediments, etc. 2. Soils which are both fine textured (clayey or silty) and	unstructured; may also include some line sands.	3. Most structured soils from clays through loams, also includes	instructured medium and time sands. The category most frequently applicable for agricultural soils.	4. Coarse and gravely sands; may also include some highly	structured soils with large and/or numerous cracks, macropors, etc	(f) = 0,36	Steady State Rate of Water Level Change ("R1" in cm/min): 7,0900	Steady State Rate of Water Level Change ("R2" in cm/min); 1875500	Q; ≈ 0.27684	$Q_2 = 0.875$	C, m 0.80315	Qu. 1982 - 2 (6 C. * 1,28754	3000 - 3	2 of the second		9000	3	0,0000		10 10 10 10 10 10 10 10 10 10 10 10 10 1
Kr. = 1.52E-02 cm/sec 9.14E-01 cm/min		6.00E-03 inch/sec	4.43E-04 (***).mm;			ą.						¥.		? 		* <u>2d</u>				ite rate of fall of water in reservoir	m1/8), a' is Macroscopic capillaty	lished in borehole (cm), Hz is the		(6	$c_1 + 2\pi \left(\frac{H_1}{a^2} \right)$

(f) 0,36 (CD)

Shape Factor

0.01

Compacted, Structure-less, clayey or slity materials such as landfill caps and liners, lacustrine or martine sediments, etc.

Soll Texture-Structure Category

0.04

Soils which are both fine textured (clayey or silty) and unstructured, may also include some fine sands.

0.12

Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.

0.36

Coarse and gravely sands; may also include some highly structured soils with large and/or numerous eracks, numero potes, etc.

(cm/mm)

11

$\sum_{i} \pi H_i^2 + \pi a^2 C$ $\Phi_m = \frac{C_1 \times C_1 \times C_2}{(2\pi H_1^2 + \pi a^2 C)}$	$G_1 = \frac{H_2G_1}{\pi(2H_1H_2(H_2 - H_1) + \alpha^2(H_1G_2)}$ $G_2 = \frac{H_2G_2}{\pi(2H_1H_2(H_2 - H_1) + \alpha^2(H_1G_2)}$	$K_{IJ} = G_2 Q_2 - G_1 Q_2$ $G_3 = \frac{(2H_2^2 + a^2 C_2) G_3}{2\pi (2H_1 H_2 (H_1 - H_2) + a^2 (H_1 C_2) G_3)}$	$G_{i} = \frac{(2H_{i})^{2}(4\pi^{2} - H_{i})^{2}}{(2H_{i}^{2} + \pi^{2}C_{i})C_{2}}$	$2\pi(2H_1H_2(H_2-H_1)+a^*(H_1C)$ $\phi_m = G_1Q_1-G_4Q_2$	ANTERONOMINATION OF THE PROPERTY OF THE PROPER
$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_1 \times 2.16$	$Q_1 = \hat{R}_1 \times 35.22$		$Q_1 = \tilde{R}_1 \times 2.16$	$Q_2 = \vec{R}_2 \times 2.16$	
One Head, Combined Reservoir One Head, Inner Reservoir	Two Head, Combined Reservoir		Two Head	Inner Reservoir	Nonces muse connected manages and consequences and property of the control of the
$C_1 = \frac{(2.102 + 0.118(H^2/n^2))}{(2.102 + 0.118(H^2/n^2))}$ $C_2 = \left(\frac{H^2/n^2}{2.102 + 0.118(H^2/n^2)}\right)$	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091(^{H_1}/a)}\right)^{6.613}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091(^{H_2}/a)}\right)$	$C_1 = \left(\frac{H_1/\alpha}{2.074 + 0.093(H_1/\alpha)}\right)^{0.55+}$ $\left(\frac{H_2/\alpha}{H_2/\alpha}\right)^{0.55+}$	$C_2 = \left(\frac{1}{2.074 + 0.093(^{H_2}/a)}\right)$	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093(H_2/a)}\right)^{0.73}$	$c_2 = \left(\frac{1}{2.074 + 0.093(^{H2}/_G)}\right)$

Guelph Permeameter Data Sheet

Investigator: CAO & RG	Date: <u>X/23/2/</u>
Location: Washington ST +	'
	3 cm (standard cales assume 3 cm radius)
	e): Combined: 🗸 Inner only:
Reservoir constant used: 35 2	

	Water l	evel in we	ell = 5 cm	l
Time t (min)	D <i>t</i> (min)	Water level in reservoir h (cm)	D <i>h</i> (cm)	Rate of change Dh/ Dt
0		51		
0:25	0.42	25	4	9,60
1:02	0.62	30	5	8.11
1:40	0.63	35	5	7.89
2:59	1.32	45	10	7.58
3:38	0.65	50	5	7.69
4:18	0.65	55	5	7.69
5:01	0.72	60	5	6.98
5:33	0.53	65	.5	9,38
6:15	0.70	70	5	7.14
6;52	0.62	7.5	3	8.1 i
Steady rat	e for 3 conse	cutive readin	gs (R ₁):	7.69

	Water	level in w	vell = 10 cm	1
Time t (min)	Dt (min)	Water level in reservoi r h (cm)	D <i>h</i> (cm)	Rate of change
0		·30		
0:41	0.68	45	15	21.95
0.58	0.28	50	5	17.65
1:13		55	5	20.00
t:30	0.28	60	5	17.65
1:46	0.27	65	5	18,75
2:02	0.27) 0	ځ	18.75
2:30	D.30	75	S	16.67

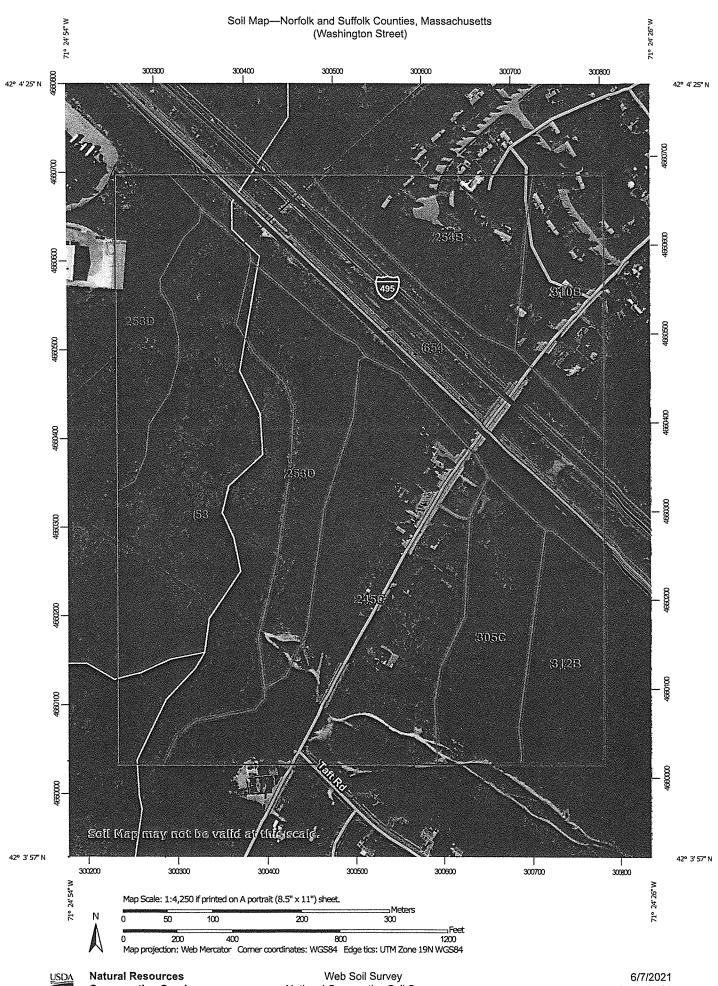
18.75

Comments:

Kg=0,36 m/min = 21.6 m/fr

Steady rate for 3 consecutive readings (R_2) :

P FIELD DATA SHEET		SECTION 1: SITE INFORMATION
	2005 (OU)	INDIL & RICK GOUDEEN!
ite Location <u>304 112/ASH/10</u>		
Dominant Soil Type(s) <u>Bro</u> c	KLEY 100	CHY JAND
5ite Map: 79-10	Soil Profi texture, s	le Description (horizon depth, structure, color, etc.):
	Depth	Description
	10" B 40" CI 24" CZ	503501L 503501L 516RAVEL L. SEG water 6 124"
Presence of special soil conduration, compacted layer	onditions (more, etc.):	ottling, water table depth, hardpan
water Accepting a	@ 124 t	
Comments and Notes (topogr	aphy, slope,	vegetation, etc.):



MAP LEGEND

Area of In	Area of Interest (AOI)	(III)	Spoil Area
	Area of Interest (AOI)	Ø.	Stony Spot
Soils	on the Dobots	8	Very Stony Spot
] ;	Soil Map Unit Fing	ž.o	Wet Spot
)	Coll Map Oils Lines	<	Other
2	Soil Map Unit Points	;	Special Line Featu
Special	Special Point Features		- -
9	Blowout	Water Features	fures
Ø	Borrow Pit		Streams and Cana
į	i	Transportation	ation
莱	Clay Spot	Ī	Rails
٥	Closed Depression	}	Interstate Highway
凌	Gravel Pit	And Market	US Routes
7.0	Gravelly Spot		Major Roads

rres

als.

Local Roads Major Koads

Aerial Photography Background

Marsh or swamp

-:4 (0) 0 3

Lava Flow

Landfill

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot Sandy Spot

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed misunderstanding of the detail of mapping and accuracy of soil Enlargement of maps beyond the scale of mapping can cause

Please rely on the bar scale on each map sheet for map measurements.

Web Soil Survey URL:

Source of Map: Natural Resources Conservation Service

Coordinate System: Web Mercator (EPSG:3857)

S

distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts accurate calculations of distance or area are required. This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts Version 16, Jun 11, 2020 Survey Area Data:

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger. Date(s) aerial images were photographed: Jul 5, 2019—Jul 8,

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Severely Eroded Spot

Slide or Slip

Sinkhole

. 3 Sodic Spot

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of A01
53	Freetown muck, ponded, 0 to 1 percent slopes	20.1	22.2%
245C	Hinckley loamy sand, 8 to 15 percent slopes	19.0	21.0%
253D	Hinckley loamy sand, 15 to 35 percent slopes	12.1	13.4%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	6.8	7.5%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	6.5	7.2%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	5.7	6.3%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	5.1	5.7%
654	Udorthents, loamy	15.1	16.7%
Totals for Area of Interest		90.4	100,0%

Norfolk and Suffolk Counties, Massachusetts

245C—Hinckley loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svm9

Elevation: 0 to 1,480 feet

Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 240 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Hinckley and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Outwash deltas, kame terraces, outwash plains, kames,

eskers, moraines, outwash terraces

Landform position (two-dimensional): Shoulder, toeslope, footslope,

backslope

Landform position (three-dimensional): Nose slope, side slope,

crest, head slope, riser

Down-slope shape: Convex, concave, linear

Across-slope shape: Concave, linear, convex

Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 8 inches: loamy sand

Bw1 - 8 to 11 inches: gravelly loamy sand Bw2 - 11 to 16 inches: gravelly loamy sand BC - 16 to 19 inches: very gravelly loamy sand

C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash

Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent

Landform: Eskers, moraines, outwash terraces, outwash plains,

kames

Landform position (two-dimensional): Shoulder, backslope,

footslope, toeslope

Landform position (three-dimensional): Side slope, head slope,

nose slope, crest, riser Down-slope shape: Convex

Across-slope shape: Convex Hydric soil rating: No

Windsor

Percent of map unit: 5 percent

Landform: Moraines, kame terraces, outwash plains, outwash

terraces, outwash deltas, kames, eskers

Landform position (two-dimensional): Shoulder, backslope,

footslope, toeslope

Landform position (three-dimensional): Nose slope, side slope,

crest, head slope, riser

Down-slope shape: Convex, linear, concave Across-slope shape: Linear, convex, concave

Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent

Landform: Outwash terraces, kame terraces, outwash plains,

moraines, outwash deltas

Landform position (two-dimensional): Backslope, footslope

Landform position (three-dimensional): Base slope, tread

Down-slope shape: Concave, linear

Across-slope shape: Linear, concave

Hydric soil rating: No

Data Source Information

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts

Survey Area Data: Version 16, Jun 11, 2020

Norfolk and Suffolk Counties, Massachusetts

253D—Hinckley loamy sand, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2svmd

Elevation: 0 to 860 feet

Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 240 days

Farmland classification: Not prime farmland

Map Unit Composition

Hinckley and similar soils: 85 percent Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of

the mapunit.

Description of Hinckley

Setting

Landform: Outwash plains, kames, eskers, moraines, outwash terraces, outwash deltas, kame terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Crest, nose slope, side

slope, head slope, riser

Down-slope shape: Concave, convex, linear Across-slope shape: Linear, convex, concave

Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material

A - 1 to 8 inches: loamy sand

Bw1 - 8 to 11 inches: gravelly loamy sand Bw2 - 11 to 16 inches: gravelly loamy sand BC - 16 to 19 inches: very gravelly loamy sand

C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 15 to 35 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Very low

Capacity of the most limiting layer to transmit water

(Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 6e

Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash

Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 10 percent

Landform: Moraines, kame terraces, outwash plains, outwash

terraces, outwash deltas, kames, eskers Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Nose slope, crest, side

slope, head slope, riser

Down-slope shape: Convex, linear, concave Across-slope shape: Convex, linear, concave

Hydric soil rating: No

Merrimac

Percent of map unit: 3 percent

Landform: Kames, eskers, moraines, outwash terraces, outwash

plains, kame terraces

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, crest, head

slope, nose slope, riser

Down-slope shape: Convex, concave, linear Across-slope shape: Concave, convex, linear

Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent

Landform: Moraines, outwash terraces, kame terraces, outwash

plains, outwash deltas

Landform position (two-dimensional): Backslope, footslope,

toeslope

Landform position (three-dimensional): Base slope, tread

Down-slope shape: Linear, concave Across-slope shape: Concave, linear

Hydric soil rating: No

Data Source Information

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts

Survey Area Data: Version 16, Jun 11, 2020

APPENDIX G

Hydrograph for Pond 1P: POND 1 (continued)

Time	Inflow	Storage	Elevation	Outflow	Discarded	Primary
(hours)	(cfs)	(acre-feet)	(feet)	(cfs)	(cfs)	(cfs)
23.60	0.08	0.000	249.81	0.08	0.08	0.00
23.70	0.08	0.000	249.81	0.08	0.08	0.00
23.80 23.90	0.08 0.08	0.000	249.81 249.81	0.08 0.08	0.08 0.08	0.00
24.00	0.08	0.000	249.81	0.08	0.08	0.00 0.00
24.00	0.08	0.000	249.80	0.05	0.05	0.00
24.20	0.04	0.000	249.80	0.03	0.03	0.00
24.30	0.00	0.000	249.80	0.00	0.00	0.00
24.40	0.00	0.000	249.80	0.00	0.00	0.00
24.50	0.00	0.000	249.80	0.00	0.00	0.00
24.60	0.00	0.000	249.80	0.00	0.00	0.00
24.70	0.00	0.000	249.80	0.00	0.00	0.00
24.80	0.00	0.000	249.80	0.00	0.00	0.00
24.90	0.00	0.000	249.80	0.00	0.00	0.00
25.00	0.00	0.000	249.80	0.00	0.00	0.00
25.10	0.00	0.000	249.80	0.00	0.00	0.00
25.20	0.00	0.000	249.80	0.00	0.00	0.00
25.30	0.00	0.000	249.80	0.00	0.00	0.00
25.40	0.00	0.000	249.80	0.00	0.00	0.00
25.50	0.00	0.000	249.80	0.00	0.00	0.00
25.60	0.00	0.000	249.80	0.00	0.00	0.00
25.70 25.80	0.00 0.00	0.000 0.000	249.80 249.80	0.00 0.00	0.00 0.00	0.00 0.00
25.90	0.00	0.000	249.80	0.00	0.00	0.00
26.00	0.00	0.000	249.80	0.00	0.00	0.00
26.10	0.00	0.000	249.80	0.00	0.00	0.00
26.20	0.00	0.000	249.80	0.00	0.00	0.00
26.30	0.00	0.000	249.80	0.00	0.00	0.00
26.40	0.00	0.000	249.80	0.00	0.00	0.00
26.50	0.00	0.000	249.80	0.00	0.00	0.00
26.60	0.00	0.000	249.80	0.00	0.00	0.00
26.70	0.00	0.000	249.80	0.00	0.00	0.00
26.80	0.00	0.000	249.80	0.00	0.00	0.00
26.90	0.00	0.000	249.80	0.00	0.00	0.00
27.00	0.00	0.000	249.80	0.00	0.00	0.00
27.10	0.00	0.000	249.80	0.00	0.00	0.00
27.20	0.00	0.000	249.80	0.00	0.00	0.00
27.30 27.40	0.00 0.00	0.000 0.000	249.80 249.80	0.00	0.00	0.00
27. 4 0 27.50	0.00	0.000	249.80 249.80	0.00 0.00	0.00 0.00	0.00 0.00
27.60	0.00	0.000	249.80	0.00	0.00	0.00
27.70	0.00	0.000	249.80	0.00	0.00	0.00
27.80	0.00	0.000	249.80	0.00	0.00	0.00
27.90	0.00	0.000	249.80	0.00	0.00	0.00
28.00	0.00	0.000	249.80	0.00	0.00	0.00
28.10	0.00	0.000	249.80	0.00	0.00	0.00
28.20	0.00	0.000	249.80	0.00	0.00	0.00
28.30	0.00	0.000	249.80	0.00	0.00	0.00
28.40	0.00	0.000	249.80	0.00	0.00	0.00
28.50	0.00	0.000	249.80	0.00	0.00	0.00
28.60	0.00	0.000	249.80	0.00	0.00	0.00
28.70	0.00	0.000	249.80	0.00	0.00	0.00

Page 10 12/5/2021

30715 0.00 3/11 00 1000 @ 2000 11yaroo715 Conware Colutions EEG

Hydrograph for Pond 2P: POND 2 (continued)

Time	Inflam	Ctorono		Outflow	Disported	Drimorry
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
23.60	0.24	15	247.16	0.24	0.24	0.00
23.70	0.24	15	247.16	0.24	0.24	0.00
23.80	0.23	15	247.16	0.23	0.23	0.00
23.90	0.23	14	247.16	0.23	0.23	0.00
24.00	0.23	14	247.16	0.23	0.23	0.00
24.10	0.14	10	247.15	0.16	0.16	0.00
24.20	0.03	3	247.15	0.05	0.05	0.00
24.30	0.00	0	247.15 247.15	0.00	0.00 0.00	0.00
24.40 24.50	0.00 0.00	0	247.15	0.00 0.00	0.00	0.00
24.60	0.00	0	247.15	0.00	0.00	0.00
24.70	0.00	Õ	247.15	0.00	0.00	0.00
24.80	0.00	Ō	247.15	0.00	0.00	0.00
24.90	0.00	0	247.15	0.00	0.00	0.00
25.00	0.00	0	247.15	0.00	0.00	0.00
25.10	0.00	0	247.15	0.00	0.00	0.00
25.20	0.00	0	247.15	0.00	0.00	0.00
25.30	0.00	0	247.15	0.00	0.00	0.00
25.40	0.00	0	247.15	0.00	0.00	0.00
25.50 25.60	0.00 0.00	0	247.15 247.15	0.00 0.00	0.00 0.00	0.00 0.00
25.70	0.00	0	247.15	0.00	0.00	0.00
25.80	0.00	Ö	247.15	0.00	0.00	0.00
25.90	0.00	Ö	247.15	0.00	0.00	0.00
26.00	0.00	0	247.15	0.00	0.00	0.00
26.10	0.00	0	247.15	0.00	0.00	0.00
26.20	0.00	0	247.15	0.00	0.00	0.00
26.30	0.00	0	247.15	0.00	0.00	0.00
26.40	0.00	0	247.15	0.00	0.00	0.00
26.50	0.00	0	247.15	0.00	0.00	0.00
26.60 26.70	0.00 0.00	0	247.15 247.15	0.00 0.00	0.00 0.00	0.00 0.00
26.70	0.00	0	247.15	0.00	0.00	0.00
26.90	0.00	Ö	247.15	0.00	0.00	0.00
27.00	0.00	Ö	247.15	0.00	0.00	0.00
27.10	0.00	0	247.15	0.00	0.00	0.00
27.20	0.00	0	247.15	0.00	0.00	0.00
27.30	0.00	0	247.15	0.00	0.00	0.00
27.40	0.00	0	247.15	0.00	0.00	0.00
27.50	0.00	0	247.15	0.00	0.00	0.00
27.60	0.00	0	247.15 247.15	0.00 0.00	0.00 0.00	0.00 0.00
27.70 27.80	0.00 0.00	0	247.15 247.15	0.00	0.00	0.00
27.90	0.00	0	247.15	0.00	0.00	0.00
28.00	0.00	ő	247.15	0.00	0.00	0.00
28.10	0.00	ő	247.15	0.00	0.00	0.00
28.20	0.00	0	247.15	0.00	0.00	0.00
28.30	0.00	0	247.15	0.00	0.00	0.00
28.40	0.00	0	247.15	0.00	0.00	0.00
28.50	0.00	0	247.15	0.00	0.00	0.00
28.60	0.00	0	247.15	0.00	0.00	0.00
28.70	0.00	0	247.15	0.00	0.00	0.00

Prepared by {enter your company name here}
HydroCAD® 8.00 s/n 001535 © 2006 HydroCAD Software Solutions LLC

Hydrograph for Pond 3P: POND 2 (continued)

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
23.60	0.05	4	248.11	0.05	0.05	0.00
23.70	0.05	4	248.11	0.05	0.05	0.00
23.80	0.05	4	248.11	0.05	0.05	0.00
23.90	0.05	4	248.11	0.05	0.05	0.00
24.00	0.05	4	248.10	0.05	0.05	0.00
24.10	0.02	2	248.10	0.03	0.03	0.00
24.20	0.00	0	248.10	0.00	0.00	0.00
24.30	0.00	0	248.10	0.00	0.00	0.00
24.40	0.00	0	248.10	0.00	0.00	0.00
24.50	0.00	0	248.10	0.00	0.00	0.00
24.60	0.00	0	248.10	0.00	0.00	0.00
24.70	0.00 0.00	0	248.10 248.10	0.00 0.00	0.00 0.00	0.00 0.00
24.80 24.90	0.00	0	248.10	0.00	0.00	0.00
25.00	0.00	0	248.10	0.00	0.00	0.00
25.00	0.00	0	248.10	0.00	0.00	0.00
25.20	0.00	ő	248.10	0.00	0.00	0.00
25.30	0.00	Ö	248.10	0.00	0.00	0.00
25.40	0.00	Ō	248.10	0.00	0.00	0.00
25.50	0.00	0	248.10	0.00	0.00	0.00
25.60	0.00	0	248.10	0.00	0.00	0.00
25.70	0.00	0	248.10	0.00	0.00	0.00
25.80	0.00	0	248.10	0.00	0.00	0.00
25.90	0.00	0	248.10	0.00	0.00	0.00
26.00	0.00	0	248.10	0.00	0.00	0.00
26.10	0.00	0	248.10	0.00	0.00	0.00
26.20	0.00	0	248.10	0.00	0.00	0.00
26.30	0.00	0	248.10	0.00	0.00	0.00
26.40	0.00	0	248.10	0.00 0.00	0.00 0.00	0.00 0.00
26.50 26.60	0.00 0.00	0	248.10 248.10	0.00	0.00	0.00
26.70	0.00	0	248.10	0.00	0.00	0.00
26.80	0.00	ő	248.10	0.00	0.00	0.00
26.90	0.00	ő	248.10	0.00	0.00	0.00
27.00	0.00	ō	248.10	0.00	0.00	0.00
27.10	0.00	0	248.10	0.00	0.00	0.00
27.20	0.00	0	248.10	0.00	0.00	0.00
27.30	0.00	0	248.10	0.00	0.00	0.00
27.40	0.00	0	248.10	0.00	0.00	0.00
27.50	0.00	0	248.10	0.00	0.00	0.00
27.60	0.00	0	248.10	0.00	0.00	0.00
27.70	0.00	0		0.00	0.00	0.00
27.80	0.00	0	248.10	0.00	0.00	0.00
27.90	0.00	0	248.10	0.00	0.00	0.00
28.00	0.00 0.00	0	248.10 248.10	0.00 0.00	0.00 0.00	0.00 0.00
28.10 28.20	0.00	0		0.00	0.00	0.00
28.30	0.00	0		0.00	0.00	0.00
28.40	0.00	ő		0.00	0.00	0.00
28.50	0.00	Ö		0.00	0.00	0.00
28.60	0.00	Ō		0.00	0.00	0.00
28.70	0.00	0		0.00	0.00	0.00

APPENDIX H

CHECKLIST FOR DESIGNERS

GOALS and NEEDS addressed:

- 1. Create a visually appealing community
- 2. Stabilize and increase property values
- 3. Encourage low impact development
- 4. Preserve the Town's historic and cultural heritage
- 5. Protect Franklin's natural environment, including habitat, water resources, and ecosystem services

' FRANKLIN POLICY:

- Subdivision plans and site plans for all forms of development shall adhere to the principles of environmental
- and aesthetic compatibility and energy-efficient design.

BEST DEVELOPMENT PRACTICES The site plan should be designed to address the following to the maximum extent practicable	Incorporated into Project?
Unique natural features have been preserved (the development program should either avoid altering or showcase significant natural features)	
Native vegetation planted in disturbed areas as needed to enhance or restore habitat	<u>i</u>
Historic and cultural resources have been preserved (the development program should either avoid altering or showcase significant historic and cultural features)	
Clearing, grading, and building placement consider viewsheds	
Cut and fill have been minimized	
Buildings blend into the natural topography	
Buildings are oriented to the sun and wind for maximum energy efficiency Vegetated protection from northwest (winter) winds is provided Deciduous species planted or retained close to the East, South and West building edges	
Conforms to §185-31 of the Town of Franklin Zoning Code and/ or Chapter 300 of the Town of Franklin Subdivision Regulations	

w/weirer

Stormwater Management

GOALS and NEEDS addressed:

- 1. Protect local and regional wetlands and water bodies
- 2. Maximize groundwater recharge to retain a viable local groundwater supply
- 3. Minimize pollutants in stormwater runoff

FRANKLIN POLICIES:

- (A) All new development and redevelopment projects in Franklin shall meet the following stormwater management performance standards.
 - i. Post-development peak discharge rates and volumes from the site shall not exceed predevelopment peak discharge rates and volumes from the site.
 - ii. The stormwater management system shall remove at least 80% of the average annual load of total suspended solids (TSS), at least 80% of the phosphorus loading and at least 60% of nitrogen loading from the post-development stormwater created on site.
 - iii. All drainage facilities proposed shall utilize best management practices as outlined in the Massachusetts Stormwater Management Standards.
 - iv. All sites will have an Operation and Maintenance plan to insure future compliance.
 - (B) Non-structural stormwater management systems should be used wherever site conditions allow

BEST DEVELOPMENT PRACTICES The site plan should be designed to address the following to the maximum extent practicable	Incorporated into Project?
Vegetated swales (recommended to convey runoff from roadways & parking lots)	
Vegetated filter strips (recommended to filter and infiltrate runoff from roadways, parking lots, and driveways; use along roadsides and parking lots)	
Constructed wetlands (preferred method for stormwater retention & pollutant removal)	
Bioretention cells (rain gardens) (recommended on residential lots and parking lot islands)	
Pervious paving surfaces (recommended in overflow parking and low-traffic areas)	
Sediment Forebays (use in combination with other BDP)	
Roof gardens (encouraged on flat or gently sloped commercial and industrial rooftops)	
Retention/Detention basins (may be used in series with other practices to provide pre-treatment)	2
Recharge Systems (suitable for all areas of development)	
Drain pipe/catch basin systems (as required to collect runoff when other systems are not practical)	The second secon
If utilizing drain pipe and/or catch basin systems, have you documented that other systems are infeasible?	

GOALS and NEEDS addressed:

- 1. Minimize clearing and regrading;
- 2. Prevent erosion and sedimentation.

• FRANKLIN POLICIES:

- (A) Any proposed project on a previously undeveloped site shall accommodate the development program in
 a way that minimizes clearing and re-grading, especially in areas of steep slopes, erosion-prone soils, or
 sensitive vegetation. For redevelopment projects, the site plan shall concentrate development in previously disturbed areas to the extent possible.
- (B) As a condition of approval, every proposed project shall submit and adhere to an erosion control plan that
 addresses soil stabilization, sediment retention, perimeter protection, construction scheduling, traffic area
 stabilization and dust control.
- (C) If the proposed project is in an area under conservation jurisdiction, the project will require permitting deemed appropriate by the Conservation Commission.

	BEST DEVELOPMENT PRACTICES The site plan should be designed to address the following to the maximum extent practicable.	Incorporated intoProject?
	Clearing and re-grading have been minimized	
	Plan identifies sensitive areas to be protected and areas that are suitable for development	3
ı	Conservation Permits have been obtained (when applicable)	U SS
ľ	The erosion and sedimentation control plan addresses:	
	Soil stabilization	
	(cover or stabilize erodible surfaces not in immediate use)	
	• Sediment retention	
I	(runoff interceptors and sediment traps/ponds)	
	• Perimeter protection (vegetated buffers, compost socks or straw wattles at limit of work)	
l	Construction scheduling	l cr
l	(minimize disturbed area at any given time)	
	Traffic area stabilization	
	(crushed rock or similar at construction vehicle entrance and parking areas)	The state of the s
	• Dust control	
	(plan for stabilizing dry, dust-prone surfaces when necessary)	and the state of t
	• Vegetation	
	(preserve existing vegetation and/or identify areas to be revegetated including proposed	
	planting species, quantity and planting specifications)	

Landscape Design

Checklist for Designers

GOALS and NEEDS addressed:

- 1. Stabilize water use at a sustainable level
- 2. Create landscapes that minimize habitat destruction and maximize habitat value
- 3. Encourage the development of landscapes that provide environmental quality and visual relief through the planting of native or naturalized species

• FRANKLIN POLICIES:

- (A) Site plans and landscape plans for all proposed projects shall take appropriate steps, as outlined in the
 Guidebook, to minimize water use for irrigation and to allow for natural recharge of groundwater.
- Landscape plans shall follow the guidelines in the Guidebook for selecting species that are most appropriate to the site conditions.
- (B) Native and habitat-creating species shall be used in all landscape plans to the maximum extent possible while still meeting the site's landscaping needs. Invasive species may not be planted in Franklin under any
- condition. Refer to the Massachusetts Prohibited Plant list for more information.
- (C) Actively promote the Town of Franklin's Water Conservation Measures.

BEST DEVELOPMENT PRACTICES The site plan must address all of the following principles.	Incorporated into Project?
Retain and Recharge water on site (install bio-retention cells, vegetated filter strips and minimize lawn areas where feasible)	La Viriania.
Preserve natural vegetation to the maximum extent practicable	
Irrigation system is water efficient (if an in-ground irrigation system is proposed, it is a water efficient system with timers and automatic sensors to prevent overwatering)	
Preserve soil permeability (minimize disturbing existing landscapes. Prepare new planting beds in accordance to the Planting Bed Guidelines on p. 13, and install 1-2" of shredded pine bark mulch on new planting areas)	
Minimize the use of turf grass (when applicable, reduce the size of the lawn area; instead, plant a bio-retention cell, use alternative, drought tolerant groundcover)	
Specify variety of native and naturalized species (species from the plant list have been incorporated into the landscape design, and no invasive species are used. Refer to the Plant Species Section and the Massachusetts Prohibited Plant List)	
Species are appropriate to the soil, site, and microclimate conditions (select appropriate species from the plant list in this guidebook)	

APPENDIX I



Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.





A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals. This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

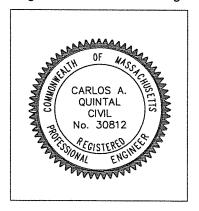
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Longterm Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



Checklist

	eject Type: Is the application for new development, redevelopment, or a mix of new and evelopment?
\boxtimes	New development
	Redevelopment
	Mix of New Development and Redevelopment



Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued) LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project: ☐ No disturbance to any Wetland Resource Areas Site Design Practices (e.g. clustered development, reduced frontage setbacks) Reduced Impervious Area (Redevelopment Only) Minimizing disturbance to existing trees and shrubs ☐ LID Site Design Credit Requested: Credit 1 Credit 2 Credit 3 Use of "country drainage" versus curb and gutter conveyance and pipe ☐ Bioretention Cells (includes Rain Gardens) ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs) ☐ Treebox Filter ☐ Water Quality Swale Grass Channel ☐ Green Roof Other (describe): Standard 1: No New Untreated Discharges

- Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Massachusetts Department of Environmental ProtectionBureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued)

•			
Sta	andard 2: Peak Rate Attenuation		
	Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding. Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.		
\boxtimes	Calculations provided to show that post-development peak discharge rates do not exceed pre- development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24- hour storm.		
Sta	andard 3: Recharge		
\boxtimes	Soil Analysis provided.		
\boxtimes	Required Recharge Volume calculation	provided.	
	Required Recharge volume reduced thro	ough use of the LID site Design Credits.	
\boxtimes	Sizing the infiltration, BMPs is based on	the following method: Check the method used.	
		☐ Dynamic Field¹	
\boxtimes	Runoff from all impervious areas at the s	ite discharging to the infiltration BMP.	
	Runoff from all impervious areas at the sare provided showing that the drainage agenerate the required recharge volume.	ite is <i>not</i> discharging to the infiltration BMP and calculations area contributing runoff to the infiltration BMPs is sufficient to	
\boxtimes	Recharge BMPs have been sized to infil	trate the Required Recharge Volume.	
	Recharge BMPs have been sized to infil extent practicable for the following reason	rate the Required Recharge Volume <i>only</i> to the maximum n:	
	☐ Site is comprised solely of C and D s	soils and/or bedrock at the land surface	
	M.G.L. c. 21E sites pursuant to 310	CMR 40.0000	
	☐ Solid Waste Landfill pursuant to 310	CMR 19.000	
	Project is otherwise subject to Storm practicable.	water Management Standards only to the maximum extent	
\boxtimes	Calculations showing that the infiltration	BMPs will drain in 72 hours are provided.	
	Property includes a M.G.L. c. 21E site of	a solid waste landfill and a mounding analysis is included.	

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Massachusetts Department of Environmental Protection Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Ch	ecklist (continued)
Sta	ndard 3: Recharge (continued)
	The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
	Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.
Sta	ndard 4: Water Quality
	ELong-Term Pollution Prevention Plan typically includes the following: Good housekeeping practices; Provisions for storing materials and waste products inside or under cover; Vehicle washing controls; Requirements for routine inspections and maintenance of stormwater BMPs; Spill prevention and response plans; Provisions for maintenance of lawns, gardens, and other landscaped areas; Requirements for storage and use of fertilizers, herbicides, and pesticides; Pet waste management provisions; Provisions for operation and management of septic systems; Provisions for solid waste management; Snow disposal and plowing plans relative to Wetland Resource Areas; Winter Road Salt and/or Sand Use and Storage restrictions; Street sweeping schedules; Provisions for prevention of illicit discharges to the stormwater management system; Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL; Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan; List of Emergency contacts for implementing Long-Term Pollution Prevention Plan. A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent. Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge: is within the Zone II or Interim Wellhead Protection Area
	is near or to other critical areas
	is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
	involves runoff from land uses with higher potential pollutant loads.
	The Required Water Quality Volume is reduced through use of the LID site Design Credits.
\boxtimes	Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Massachusetts Department of Environmental Protection Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Cr	necklist (continued)
Sta	ndard 4: Water Quality (continued)
\boxtimes	The BMP is sized (and calculations provided) based on:
	☐ The ½" or 1" Water Quality Volume or
	The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
\boxtimes	The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
	A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.
Sta	ndard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)
	The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report. The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted <i>prior to</i> the discharge of stormwater to the post-construction stormwater BMPs.
	The NPDES Multi-Sector General Permit does <i>not</i> cover the land use.
	LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
	All exposure has been eliminated.
	All exposure has <i>not</i> been eliminated and all BMPs selected are on MassDEP LUHPPL list.
	The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.
Sta	ndard 6: Critical Areas
\boxtimes	The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
X	Critical areas and BMPs are identified in the Stormwater Report.



Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued) Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable ☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a: Limited Project ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area. Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff ☐ Bike Path and/or Foot Path Redevelopment Project Redevelopment portion of mix of new and redevelopment. Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report. The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule:
- Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

Checklist (continued) Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued) ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has not been included in the Stormwater Report but will be submitted before land disturbance begins. ☐ The project is *not* covered by a NPDES Construction General Permit. The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report. The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins. Standard 9: Operation and Maintenance Plan The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information: Name of the stormwater management system owners; Party responsible for operation and maintenance; Schedule for implementation of routine and non-routine maintenance tasks; ☑ Plan showing the location of all stormwater BMPs maintenance access areas; Description and delineation of public safety features: □ Estimated operation and maintenance budget; and □ Operation and Maintenance Log Form. The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions: A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs; A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions. Standard 10: Prohibition of Illicit Discharges The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges; An Illicit Discharge Compliance Statement is attached; NO Illicit Discharge Compliance Statement is attached but will be submitted prior to the discharge of any stormwater to post-construction BMPs.

APPENDIX J

Operation and Maintenance Plan

Good House Keeping Measures

- 1. The parking area and driveway will receive the minimum amount of sand and salt. Snow will be stored at the locations shown on the site plan.
- 2. The site consists of mulch with trees, turf lawn, conservation and wildlife planting areas and existing wooded areas. These areas will be assessed by the owner's landscape professional to determine the minimum amounts of fertilizers, herbicides and pesticides necessary and shall only apply the minimums necessary.
- 3. The site will be stabilized with landscaped areas with mulch, conservation and wildlife areas and turf lawn. This will improve the existing site coverage.

Long Term Pollution Prevention Plan

The owner shall employ good housekeeping measures, which include removing trash and debris from the site, keeping trash in receptacles and complying with the long term operation and maintenance plan.

The owner does not plan to store materials or waste products on the site.

The owner will not allow vehicles to be washed on site.

The owner will have routine inspections and maintenance completed for the Storm-water BMP's. See sheet 6 for details and schedule.

The owner will hire a licensed company to deal with any spills that may occur on the site.

The owner will employ a landscape professional to determine and apply the minimum amounts of fertilizers, herbicides and pesticides.

The site is serviced by Town water.

An onsite septic system has been proposed which will be designed and installed in compliance with Title V.

Floor drains are proposed and will b connected to Industrial Waste Water Holding Tanks.

The owner will apply the minimum amount of sand and salt necessary. The parking area will be swept immediately following the last winter sanding.

Sand piles will not be stored on site.

Operation and Maintenance Plan

An operation and maintenance schedule for the construction period and the post-development period has been provided on sheet6.

During the construction period and after completion the Owner, shall be responsible for the operation and maintenance of the site and the drainage system.

Upon completion of the construction work the property owner shall be responsible for the maintenance of the drainage facilities.

The yearly estimated operation and maintenance budget is \$4,500.00

Yearly Inspection and Maintenance Log

Page 1

Panther Way Franklin, Massachusetts

Stormceptor – Inspect 4 Times per year Remove sediment when it reaches a depth of eight inches. Remove hydrocarbons and debris when discovered.					
Date:	Performed By: Performed By: Performed By: Performed By: Performed By: S:				
Maint	ground Pond 1 – 4 times per year nance Preventative Maintenance – twice a year Inspect to insure proper functioning – after major storm events for three months after completion of construction, twice per year thereafter and when there is a discharge through the high outlet. Inspect and clean pre-treatment devices – twice per year and after major storm events.				
Date:	Performed By: Performed By: Performed By: Performed By: Performed By: S:				
<u>Pond</u>	— 4 times per year Maintenance Preventative Maintenance – twice a year Inspect to insure proper functioning – after major storm events for three months after completion of construction, twice per year thereafter and when there is a discharge through the high outlet. Mow the buffer area, side slopes, remove trash and debris, remove grass clippings and accumulated organic matter – twice per year Inspect and clean pre-treatment devices – twice per year and after major storm events.				
Date: Date:	Performed By: Performed By: Performed By: Performed By: Performed By:				

Pond 3 - 4 times per year

- Maintenance Preventative Maintenance twice a year
- <u>Inspect to insure proper functioning after major storm events for three months after completion</u> of construction, twice per year thereafter and when there is a discharge through the high outlet.
- Mow the buffer area, side slopes, remove trash and debris, remove grass clippings and accumulated organic matter twice per year
- Inspect and clean pre-treatment devices twice per year and after major storm events.

Date:	Performed By:	
Date:	Performed By:	
Date:	Performed By:	
Date:	Performed By:	
Notes:		
Landscape Area Inspection – 4	times per year	
Date:	Performed By:	
Notes:		

APPENDIX K

In Compliance with DEP Storm-water Management Standard 10

Washington Street – Franklin MA Map 304 Parcel 64

No Illicit discharges to the storm-water management system, including wastewater discharges and discharges of storm-water contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease are proposed and shall not be allowed.

The site map located in Appendix I shall be part of this Illicit Discharge Compliance Statement.

Franklin Flex Space, LLC, owner, will be the responsible party.

Authorize Signatory

Franklin Flex Space, LLC,

In Compliance with DEP Storm-water Management Standard 10

Washington Street – Franklin MA Map 304 Parcels 64 and 64-001

No Illicit discharges to the storm-water management system, including wastewater discharges and discharges of storm-water contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease are proposed and shall not be allowed.

The site map located in Appendix I shall be part of this Illicit Discharge Compliance Statement.

Franklin Flex Space, LLC, owner, will be the responsible party.

Authorize Signatory Franklin Flex Space, LLC,

APPENDIX L