Tewksbury Substation

VETCO

Tewksbury No. 22A

MA Electric

New England Power Company electrical plant (205 Washington Street)

Railroad (1 Railroad Street)

ST Tenn Gas

MBTA Railroad

New England Power Company electrical plant (257 Old Boston Road; also listed as Dock Street)

Material storage yards (133, 143, and 153 Clinton Street)

Material storage yard/residential property (123 Clinton Street)

Residential property (75 Hillman Street)

Hillman Street

Emerald Iron Works, Inc. (11 Rockland Street)

Multi-tenant commercial buildings (36 Hillman Street)

Clinton Street

Washington Street

Power Company Road

MA Electric

Boston Road

Legend

Subject Property

Parcel Boundary

Substations

Rail Lines

Natural Gas Pipelines

Electricity Transmission Lines

300   0   300
SCALE IN FEET

Notes:
1. Imagery provided through Langan's subscription to Nearmap.com. Flown on 4/22/2024.
2. All locations of site reconnaissance observations are approximate.
3. Parcel data provided by MassGIS.
4. Groundwater flow direction inferred from review of topographic maps.
5. Utility data provided through Langan's subscription to Rextag.
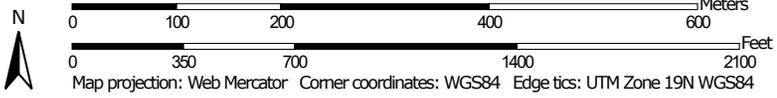
LANGAN

Langan Engineering and Environmental Services, Inc.

100 Cambridge Street, Suite 1310
Boston, MA 02114

T: 617.824.9100   F: 617.824.9101
www.langan.com

Project
73 HILLMAN STREET

TEWKSBURY

MIDDLESEX COUNTY   MA

Figure Title
NEARBY PROPERTIES MAP

Project No.
151043401

Date
7/24/2024

Scale
1" = 300 feet

Drawn By
TO

Figure
3

© 2024 Langan

Path: \\langan.com\data\BOS\data4\151043401\Project Data\ArcGIS\APRX\73 Hillman St - 151043401\73 Hillman St - 151043401.aprx

Custom Soil Resource Report
Map—Hydrologic Soil Group

Map Scale: 1:7,210 if printed on A landscape (11" x 8.5") sheet.

Soil Map may not be valid at this scale.

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D

- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 24, Aug 27, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	A/D	2.1	1.1%
32B	Wareham loamy fine sand, 0 to 5 percent slopes	A/D	4.9	2.5%
52A	Freetown muck, 0 to 1 percent slopes	B/D	56.2	28.3%
255A	Windsor loamy sand, 0 to 3 percent slopes	A	47.7	24.0%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	7.4	3.7%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	A	4.7	2.3%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B	39.8	20.0%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	1.2	0.6%
653	Udorthents, sandy		2.4	1.2%
655	Udorthents, wet substratum		14.2	7.2%
656	Udorthents-Urban land complex		17.8	9.0%
Totals for Area of Interest			**198.5**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX B

Existing Stormwater Discharge Calculations

LANGAN

OAA Atlas 1   Volume 10, Version 3
Location name: Tewksbury, Massachusetts USA*
Latitude: 42.6202°, Longitude: -71.2433°
Elevation: 122 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tab lar

PD -based p int precipitation frequency estimates with 90% confidence intervals (in inches)[1]

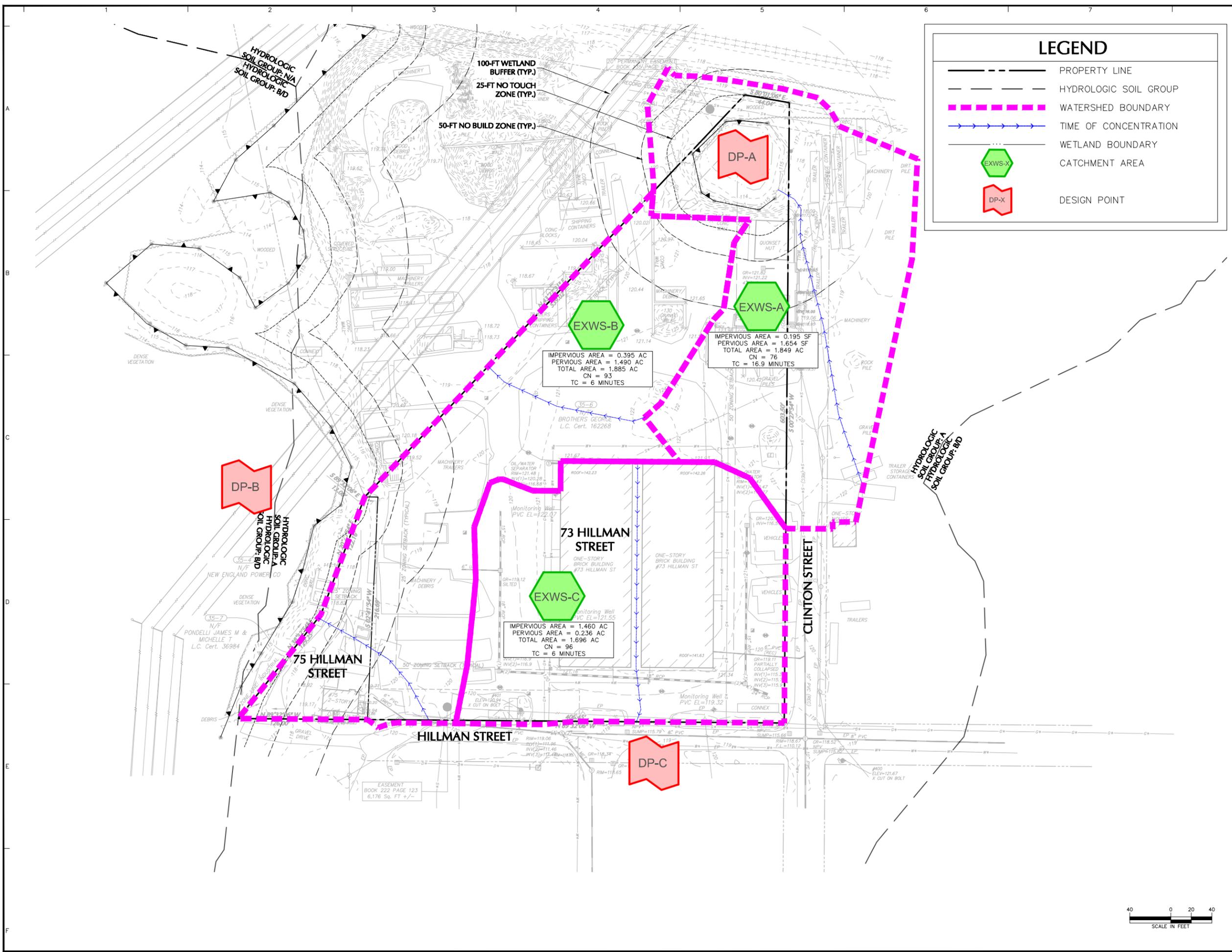| Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.31 (0.249-0.389)	0.375 (0.297-0.465)	0.475 (0.375-0.591)	0.558 (0.438-0.697)	0.673 (0.510-0.877)	0.759 (0.562-1.01)	0.849 (0.609-1.17)	0.951 (0.644-1.34)	1.10 (0.713-1.60)	1.22 (0.771-1.80)
10-min	0.445 (0.353-0.551)	0.532 (0.421-0.659)	0.674 (0.532-0.838)	0.791 (0.621-0.989)	0.953 (0.722-1.24)	1.08 (0.797-1.43)	1.20 (0.863-1.66)	1.35 (0.912-1.90)	1.56 (1.01-2.26)	1.72 (1.09-2.56)
15-min	0.523 (0.415-0.648)	0.626 (0.495-0.775)	0.793 (0.626-0.987)	0.932 (0.730-1.16)	1.12 (0.849-1.46)	1.26 (0.936-1.68)	1.42 (1.02-1.95)	1.59 (1.07-2.23)	1.83 (1.19-2.66)	2.03 (1.28-3.01)
30-min	0.718 (0.569-0.889)	0.858 (0.680-1.06)	1.09 (0.859-1.35)	1.28 (1.00-1.60)	1.54 (1.17-2.01)	1.74 (1.29-2.32)	1.95 (1.40-2.68)	2.18 (1.48-3.07)	2.52 (1.64-3.66)	2.80 (1.77-4.15)
60-min	0.912 (0.723-1.13)	1.09 (0.864-1.35)	1.38 (1.09-1.72)	1.63 (1.28-2.03)	1.96 (1.49-2.56)	2.21 (1.64-2.95)	2.48 (1.78-3.42)	2.78 (1.88-3.91)	3.2 (2.08-4.67)	3.56 (2.26-5.28)
2-hr	1.16 (0.930-1.43)	1.41 (1.12-1.73)	1.81 (1.44-2.23)	2.14 (1.69-2.65)	2.59 (1.98-3.37)	2.93 (2.19-3.90)	3.29 (2.40-4.56)	3.73 (2.54-5.22)	4.4 (2.87-6.37)	4.99 (3.16-7.34)
3-hr	1.34 (1.08-1.64)	1.63 (1.31-2.00)	2.10 (1.68-2.58)	2.49 (1.98-3.08)	3.03 (2.33-3.94)	3.43 (2.58-4.55)	3.86 (2.83-5.35)	4.40 (2.99-6.13)	5.2 (3.41-7.54)	5.96 (3.79-8.74)
6-hr	1.71 (1.39-2.08)	2.09 (1.69-2.54)	2.71 (2.18-3.31)	3.22 (2.57-3.95)	3.92 (3.04-5.06)	4.44 (3.36-5.86)	5.00 (3.69-6.90)	5.72 (3.91-7.92)	6.83 (4.47-9.78)	7.81 (4.98-11.4)
12-hr	2.16 (1.76-2.61)	2.64 (2.15-3.19)	3.43 (2.78-4.16)	4.08 (3.29-4.98)	4.98 (3.88-6.37)	5.64 (4.30-7.39)	6.36 (4.71-8.70)	7.26 (4.98-9.98)	8.65 (5.68-12.3)	9.86 (6.31-14.3)
24-hr	2.57 (2.11-3.08)	3.18 (2.61-3.81)	4.17 (3.41-5.02)	4.99 (4.06-6.05)	6.12 (4.81-7.80)	6.96 (5.34-9.07)	7.87 (5.87-10.7)	9.02 (6.21-12.3)	10.8 (7.12-15.3)	12.4 (7.94-17.8)
2-day	2.89 (2.40-3.45)	3.64 (3.01-4.34)	4.85 (4.00-5.81)	5.86 (4.80-7.06)	7.25 (5.74-9.20)	8.27 (6.41-10.7)	9.39 (7.08-12.8)	10.8 (7.50-14.7)	13.2 (8.70-18.5)	15.2 (9.80-21.7)
3-day	3.17 (2.64-3.76)	3.97 (3.30-4.71)	5.27 (4.37-6.28)	6.35 (5.23-7.61)	7.84 (6.24-9.91)	8.93 (6.95-11.6)	10.1 (7.67-13.7)	11.7 (8.12-15.8)	14.2 (9.42-19.9)	16.4 (10.6-23.4)
4-day	3.44 (2.88-4.07)	4.26 (3.56-5.05)	5.60 (4.66-6.66)	6.72 (5.55-8.03)	8.25 (6.58-10.4)	9.37 (7.31-12.1)	10.6 (8.05-14.4)	12.2 (8.50-16.5)	14.8 (9.84-20.7)	17.1 (11.1-24.3)
7-day	4.18 (3.52-4.92)	5.03 (4.23-5.93)	6.42 (5.38-7.59)	7.58 (6.30-9.01)	9.18 (7.36-11.5)	10.3 (8.10-13.2)	11.6 (8.84-15.6)	13.3 (9.28-17.8)	15.9 (10.6-22.1)	18.3 (11.8-25.7)
10-day	4.85 (4.10-5.69)	5.73 (4.84-6.72)	7.16 (6.02-8.44)	8.36 (6.97-9.89)	9.99 (8.03-12.4)	11.2 (8.78-14.2)	12.5 (9.50-16.6)	14.2 (9.93-18.9)	16.8 (11.2-23.1)	19.0 (12.3-26.7)
20-day	6.79 (5.79-7.90)	7.75 (6.60-9.04)	9.33 (7.91-10.9)	10.6 (8.96-12.5)	12.4 (10.0-15.2)	13.8 (10.8-17.2)	15.2 (11.5-19.7)	16.8 (11.9-22.3)	19.2 (12.9-26.2)	2 .1 (13.7-29.4)
30-day	8.41 (7.21-9.75)	9.45 (8.08-11.0)	11.1 (9.50-13.0)	12.6 (10.6-14.7)	14.5 (11.7-17.6)	16.0 (12.6-19.8)	17.5 (13.1-22.3)	19.1 (13.5-25.1)	21.2 (14.3-28.9)	22.9 (14.9-31.8)
45-day	10.5 (9.02-12.1)	11.6 (9.97-13.4)	13.4 (11.5-15.6)	15.0 (12.7-17.4)	17.1 (13.8-20.5)	18.7 (14.7-22.9)	20.3 (15.2-25.6)	21.8 (15.5-28.6)	23.8 (16.1-32.3)	25.3 (16.5-35.0)
60-day	12.2 (10.6-14.1)	13.4 (11.6-15.5)	15.4 (13.2-17.8)	17.0 (14.5-19.7)	19.2 (15.6-23.0)	20.9 (16.5-25.6)	22.6 (17.0-28.4)	24.2 (17.3-31.5)	26. (17.7-35.2)	27.4 (17.9-37.8)

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

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

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

LEGEND

———— · —— · ——	PROPERTY LINE
———— ————	HYDROLOGIC SOIL GROUP
▬ ▬ ▬ ▬	WATERSHED BOUNDARY
→→→→→	TIME OF CONCENTRATION
———— ···· ————	WETLAND BOUNDARY
EXWS-X (hexagon)	CATCHMENT AREA
DP-X (pennant)	DESIGN POINT

DP-A

EXWS-A
IMPERVIOUS AREA = 0.195 SF
PERVIOUS AREA = 1.654 SF
TOTAL AREA = 1.849 AC
CN = 76
TC = 16.9 MINUTES

EXWS-B
IMPERVIOUS AREA = 0.395 AC
PERVIOUS AREA = 1.490 AC
TOTAL AREA = 1.885 AC
CN = 93
TC = 6 MINUTES

DP-B

73 HILLMAN STREET
ONE-STORY
BRICK BUILDING
#73 HILLMAN ST

EXWS-C
IMPERVIOUS AREA = 1.460 AC
PERVIOUS AREA = 0.236 AC
TOTAL AREA = 1.696 AC
CN = 96
TC = 6 MINUTES

75 HILLMAN STREET

HILLMAN STREET

CLINTON STREET

DP-C

100-FT WETLAND BUFFER (TYP.)
25-FT NO TOUCH ZONE (TYP.)
50-FT NO BUILD ZONE (TYP.)

HYDROLOGIC SOIL GROUP: N/A
HYDROLOGIC SOIL GROUP: B/D
HYDROLOGIC SOIL GROUP: A
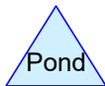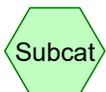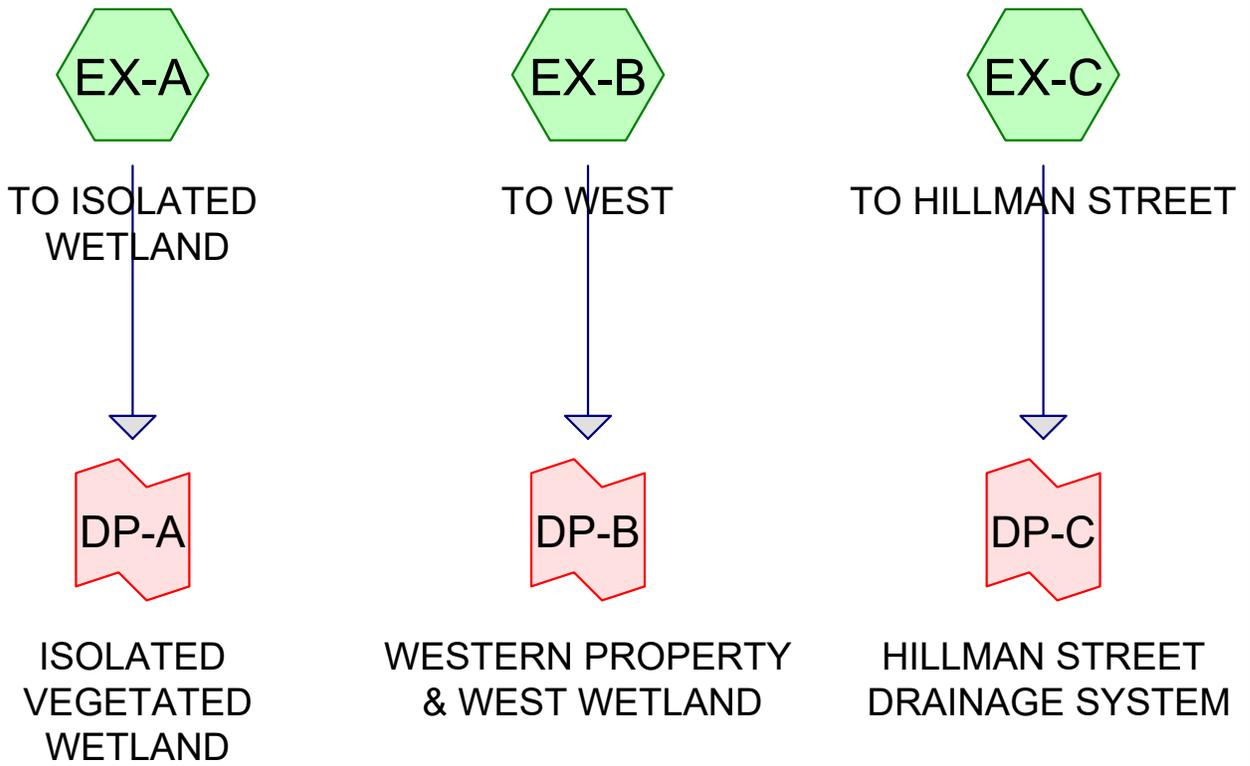HYDROLOGIC SOIL GROUP: B/D

LANGAN
Langan Engineering and
Environmental Services, LLC.

100 Cambridge Street, Suite 1310
Boston, MA 02114

T: 617.824.9100   F: 617.824.9101   www.langan.com

Project
HILLMAN ENERGY CENTER
BATTERY ENERGY STORAGE
SYSTEM

TEWKSBURY
MIDDLESEX COUNTY   MASSACHUSETTS

Drawing Title

EXISTING
WATERSHED MAP

Date	Description	No.
	Revisions	

Project No.	Exhibit
151043401	
Date	
02/03/2025	**EXWS**
Drawn By	
MPG	
Checked By	
HH	

SCALE IN FEET
40   0   20   40

Date: 3/12/2025 Time: 10:44 User: jdahan Style Table: Langan.stb Layout: EXWS Document Code: EX-151043401-0201-WS101-0101

EX-A

TO ISOLATED
WETLAND

EX-B

TO WEST

EX-C

TO HILLMAN STREET

DP-A

ISOLATED
VEGETATED
WETLAND

DP-B

WESTERN PROPERTY
& WEST WETLAND

DP-C

HILLMAN STREET
DRAINAGE SYSTEM

Subcat   Reach   Pond   Link

Routing Diagram for Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering, Printed 3/13/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Hillman Tewksbury - Existing Conditions

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	Type III 24-hr		Default	24.00	1	3.18	2
2	10-yr	Type III 24-hr		Default	24.00	1	4.99	2
3	25-yr	Type III 24-hr		Default	24.00	1	6.12	2
4	50-yr	Type III 24-hr		Default	24.00	1	6.96	2
5	100-yr	Type III 24-hr		Default	24.00	1	7.87	2

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.143	39	>75% Grass cover, Good, HSG A (EX-A, EX-B, EX-C)
2.849	96	Gravel surface, HSG A (EX-A, EX-B, EX-C)
2.050	98	Impervious surface, HSG A (EX-A, EX-B, EX-C)
0.315	30	Woods, Good, HSG A (EX-A)
0.073	32	Woods/grass comb., Good, HSG A (EX-B)
5.430	**91**	**TOTAL AREA**

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-A: TO ISOLATED Runoff Area=1.849 ac 10.55% Impervious Runoff Depth=1.59"
Flow Length=304' Tc=16.9 min CN=83 Runoff=2.47 cfs 0.245 af

Subcatchment EX-B: TO WEST Runoff Area=1.885 ac 20.95% Impervious Runoff Depth=2.43"
Flow Length=152' Tc=6.0 min CN=93 Runoff=5.08 cfs 0.381 af

Subcatchment EX-C: TO HILLMAN STREET Runoff Area=1.696 ac 86.08% Impervious Runoff Depth=2.73"
Flow Length=254' Tc=6.0 min CN=96 Runoff=4.94 cfs 0.386 af

Link DP-A: ISOLATED VEGETATED WETLAND Inflow=2.47 cfs 0.245 af
Primary=2.47 cfs 0.245 af

Link DP-B: WESTERN PROPERTY & WEST WETLAND Inflow=5.08 cfs 0.381 af
Primary=5.08 cfs 0.381 af

Link DP-C: HILLMAN STREET DRAINAGE SYSTEM Inflow=4.94 cfs 0.386 af
Primary=4.94 cfs 0.386 af

Total Runoff Area = 5.430 ac   Runoff Volume = 1.012 af   Average Runoff Depth = 2.24"
62.25% Pervious = 3.380 ac   37.75% Impervious = 2.050 ac

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment EX-A: TO ISOLATED WETLAND

Runoff   =   2.47 cfs @ 12.24 hrs, Volume=   0.245 af, Depth= 1.59"
   Routed to Link DP-A : ISOLATED VEGETATED WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.18"

	Area (ac)	CN	Description
	0.315	30	Woods, Good, HSG A
	1.283	96	Gravel surface, HSG A
*	0.195	98	Impervious surface, HSG A
	0.056	39	>75% Grass cover, Good, HSG A
	1.849	83	Weighted Average
	1.654		89.45% Pervious Area
	0.195		10.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, SF-A**
					Woods: Light underbrush n= 0.400 P2= 3.18"
0.3	20	0.0500	1.12		**Shallow Concentrated Flow, SCF-1**
					Woodland Kv= 5.0 fps
2.9	87	0.0100	0.50		**Shallow Concentrated Flow, SCF-2**
					Woodland Kv= 5.0 fps
0.9	88	0.0110	1.69		**Shallow Concentrated Flow, SCF-3**
					Unpaved Kv= 16.1 fps
0.4	50	0.0200	2.28		**Shallow Concentrated Flow, SCF-4**
					Unpaved Kv= 16.1 fps
0.0	9	0.2800	3.70		**Shallow Concentrated Flow, SCF-5**
					Short Grass Pasture Kv= 7.0 fps
16.9	304				Total

Summary for Subcatchment EX-B: TO WEST

Runoff   =   5.08 cfs @ 12.09 hrs, Volume=   0.381 af, Depth= 2.43"
   Routed to Link DP-B : WESTERN PROPERTY & WEST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.18"

	Area (ac)	CN	Description
	1.370	96	Gravel surface, HSG A
*	0.395	98	Impervious surface, HSG A
	0.047	39	>75% Grass cover, Good, HSG A
	0.073	32	Woods/grass comb., Good, HSG A
	1.885	93	Weighted Average
	1.490		79.05% Pervious Area
	0.395		20.95% Impervious Area

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	36	0.0090	0.24		**Sheet Flow, SF-B**
					Fallow n= 0.050 P2= 3.18"
1.7	47	0.0090	0.47		**Shallow Concentrated Flow, SCF-1**
					Woodland Kv= 5.0 fps
0.3	30	0.0090	1.53		**Shallow Concentrated Flow, SCF-2**
					Unpaved Kv= 16.1 fps
0.2	30	0.0200	2.28		**Shallow Concentrated Flow, SCF-3**
					Unpaved Kv= 16.1 fps
0.2	9	0.0200	0.99		**Shallow Concentrated Flow, SCF-4**
					Short Grass Pasture Kv= 7.0 fps
4.9	152				Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment EX-C: TO HILLMAN STREET

Runoff   =   4.94 cfs @ 12.09 hrs, Volume=   0.386 af, Depth= 2.73"
    Routed to Link DP-C : HILLMAN STREET DRAINAGE SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.18"

	Area (ac)	CN	Description
	0.040	39	>75% Grass cover, Good, HSG A
	0.196	96	Gravel surface, HSG A
*	1.460	98	Impervious surface, HSG A
	1.696	96	Weighted Average
	0.236		13.92% Pervious Area
	1.460		86.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.69		**Sheet Flow, SF-C**
					Smooth surfaces n= 0.011 P2= 3.18"
2.2	150	0.0050	1.14		**Shallow Concentrated Flow, SCF-1**
					Unpaved Kv= 16.1 fps
0.2	54	0.0370	3.90		**Shallow Concentrated Flow, SCF-2**
					Paved Kv= 20.3 fps
3.6	254				Total, Increased to minimum Tc = 6.0 min

Summary for Link DP-A: ISOLATED VEGETATED WETLAND

Inflow Area =   1.849 ac, 10.55% Impervious, Inflow Depth = 1.59"   for 2-yr event
Inflow   =   2.47 cfs @ 12.24 hrs, Volume=   0.245 af
Primary   =   2.47 cfs @ 12.24 hrs, Volume=   0.245 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Summary for Link DP-B: WESTERN PROPERTY & WEST WETLAND

Inflow Area =   1.885 ac, 20.95% Impervious, Inflow Depth = 2.43"   for 2-yr event
Inflow   =   5.08 cfs @ 12.09 hrs, Volume=   0.381 af
Primary   =   5.08 cfs @ 12.09 hrs, Volume=   0.381 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link DP-C: HILLMAN STREET DRAINAGE SYSTEM

Inflow Area =   1.696 ac, 86.08% Impervious, Inflow Depth = 2.73"   for 2-yr event
Inflow   =   4.94 cfs @ 12.09 hrs, Volume=   0.386 af
Primary   =   4.94 cfs @ 12.09 hrs, Volume=   0.386 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering   Printed 3/13/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 8

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-A: TO ISOLATED   Runoff Area=1.849 ac 10.55% Impervious Runoff Depth=3.17"
Flow Length=304' Tc=16.9 min CN=83 Runoff=4.91 cfs 0.488 af

Subcatchment EX-B: TO WEST   Runoff Area=1.885 ac 20.95% Impervious Runoff Depth=4.19"
Flow Length=152' Tc=6.0 min CN=93 Runoff=8.50 cfs 0.658 af

Subcatchment EX-C: TO HILLMAN STREET Runoff Area=1.696 ac 86.08% Impervious Runoff Depth=4.52"
Flow Length=254' Tc=6.0 min CN=96 Runoff=7.95 cfs 0.639 af

Link DP-A: ISOLATED VEGETATED WETLAND   Inflow=4.91 cfs 0.488 af
Primary=4.91 cfs 0.488 af

Link DP-B: WESTERN PROPERTY & WEST WETLAND   Inflow=8.50 cfs 0.658 af
Primary=8.50 cfs 0.658 af

Link DP-C: HILLMAN STREET DRAINAGE SYSTEM   Inflow=7.95 cfs 0.639 af
Primary=7.95 cfs 0.639 af

Total Runoff Area = 5.430 ac   Runoff Volume = 1.785 af   Average Runoff Depth = 3.94"
62.25% Pervious = 3.380 ac   37.75% Impervious = 2.050 ac

Hillman Energy Center, LLC
Attachment B - Supplemental
EFSB 25-08
Page 27 of 215

Hillman Energy Center
Type III 24-hr 10-yr Rainfall=4.99"
Printed 3/13/2025
Page 9

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment EX-A: TO ISOLATED WETLAND

Runoff   =   4.91 cfs @ 12.23 hrs, Volume=   0.488 af, Depth= 3.17"
    Routed to Link DP-A : ISOLATED VEGETATED WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.99"

	Area (ac)	CN	Description
	0.315	30	Woods, Good, HSG A
	1.283	96	Gravel surface, HSG A
*	0.195	98	Impervious surface, HSG A
	0.056	39	>75% Grass cover, Good, HSG A
	1.849	83	Weighted Average
	1.654		89.45% Pervious Area
	0.195		10.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, SF-A**
					Woods: Light underbrush n= 0.400 P2= 3.18"
0.3	20	0.0500	1.12		**Shallow Concentrated Flow, SCF-1**
					Woodland Kv= 5.0 fps
2.9	87	0.0100	0.50		**Shallow Concentrated Flow, SCF-2**
					Woodland Kv= 5.0 fps
0.9	88	0.0110	1.69		**Shallow Concentrated Flow, SCF-3**
					Unpaved Kv= 16.1 fps
0.4	50	0.0200	2.28		**Shallow Concentrated Flow, SCF-4**
					Unpaved Kv= 16.1 fps
0.0	9	0.2800	3.70		**Shallow Concentrated Flow, SCF-5**
					Short Grass Pasture Kv= 7.0 fps
16.9	304				Total

Summary for Subcatchment EX-B: TO WEST

Runoff   =   8.50 cfs @ 12.09 hrs, Volume=   0.658 af, Depth= 4.19"
    Routed to Link DP-B : WESTERN PROPERTY & WEST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.99"

	Area (ac)	CN	Description
	1.370	96	Gravel surface, HSG A
*	0.395	98	Impervious surface, HSG A
	0.047	39	>75% Grass cover, Good, HSG A
	0.073	32	Woods/grass comb., Good, HSG A
	1.885	93	Weighted Average
	1.490		79.05% Pervious Area
	0.395		20.95% Impervious Area

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	36	0.0090	0.24		**Sheet Flow, SF-B** Fallow n= 0.050 P2= 3.18"
1.7	47	0.0090	0.47		**Shallow Concentrated Flow, SCF-1** Woodland Kv= 5.0 fps
0.3	30	0.0090	1.53		**Shallow Concentrated Flow, SCF-2** Unpaved Kv= 16.1 fps
0.2	30	0.0200	2.28		**Shallow Concentrated Flow, SCF-3** Unpaved Kv= 16.1 fps
0.2	9	0.0200	0.99		**Shallow Concentrated Flow, SCF-4** Short Grass Pasture Kv= 7.0 fps
4.9	152				Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment EX-C: TO HILLMAN STREET

Runoff   =   7.95 cfs @ 12.09 hrs, Volume=   0.639 af, Depth= 4.52"
     Routed to Link DP-C : HILLMAN STREET DRAINAGE SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.99"

	Area (ac)	CN	Description
	0.040	39	>75% Grass cover, Good, HSG A
	0.196	96	Gravel surface, HSG A
*	1.460	98	Impervious surface, HSG A
	1.696	96	Weighted Average
	0.236		13.92% Pervious Area
	1.460		86.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.69		**Sheet Flow, SF-C** Smooth surfaces n= 0.011 P2= 3.18"
2.2	150	0.0050	1.14		**Shallow Concentrated Flow, SCF-1** Unpaved Kv= 16.1 fps
0.2	54	0.0370	3.90		**Shallow Concentrated Flow, SCF-2** Paved Kv= 20.3 fps
3.6	254				Total, Increased to minimum Tc = 6.0 min

Summary for Link DP-A: ISOLATED VEGETATED WETLAND

Inflow Area =   1.849 ac, 10.55% Impervious, Inflow Depth = 3.17"   for 10-yr event
Inflow   =   4.91 cfs @ 12.23 hrs, Volume=   0.488 af
Primary   =   4.91 cfs @ 12.23 hrs, Volume=   0.488 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Summary for Link DP-B: WESTERN PROPERTY & WEST WETLAND

Inflow Area =   1.885 ac, 20.95% Impervious, Inflow Depth = 4.19"   for 10-yr event
Inflow   =   8.50 cfs @   12.09 hrs, Volume=   0.658 af
Primary   =   8.50 cfs @   12.09 hrs, Volume=   0.658 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link DP-C: HILLMAN STREET DRAINAGE SYSTEM

Inflow Area =   1.696 ac, 86.08% Impervious, Inflow Depth = 4.52"   for 10-yr event
Inflow   =   7.95 cfs @   12.09 hrs, Volume=   0.639 af
Primary   =   7.95 cfs @   12.09 hrs, Volume=   0.639 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-A: TO ISOLATED Runoff Area=1.849 ac 10.55% Impervious Runoff Depth=4.20"
Flow Length=304' Tc=16.9 min CN=83 Runoff=6.48 cfs 0.648 af

Subcatchment EX-B: TO WEST Runoff Area=1.885 ac 20.95% Impervious Runoff Depth=5.30"
Flow Length=152' Tc=6.0 min CN=93 Runoff=10.61 cfs 0.833 af

Subcatchment EX-C: TO HILLMAN STREET Runoff Area=1.696 ac 86.08% Impervious Runoff Depth=5.65"
Flow Length=254' Tc=6.0 min CN=96 Runoff=9.82 cfs 0.798 af

Link DP-A: ISOLATED VEGETATED WETLAND Inflow=6.48 cfs 0.648 af
Primary=6.48 cfs 0.648 af

Link DP-B: WESTERN PROPERTY & WEST WETLAND Inflow=10.61 cfs 0.833 af
Primary=10.61 cfs 0.833 af

Link DP-C: HILLMAN STREET DRAINAGE SYSTEM Inflow=9.82 cfs 0.798 af
Primary=9.82 cfs 0.798 af

Total Runoff Area = 5.430 ac   Runoff Volume = 2.278 af   Average Runoff Depth = 5.04"
62.25% Pervious = 3.380 ac   37.75% Impervious = 2.050 ac

Hillman Energy Center, LLC
Attachment B - Supplemental
EFSB 25-08
Page 31 of 215

Hillman Energy Center
Type III 24-hr 25-yr Rainfall=6.12"

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment EX-A: TO ISOLATED WETLAND

Runoff   =   6.48 cfs @ 12.23 hrs, Volume=   0.648 af, Depth= 4.20"
   Routed to Link DP-A : ISOLATED VEGETATED WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.12"

	Area (ac)	CN	Description
	0.315	30	Woods, Good, HSG A
	1.283	96	Gravel surface, HSG A
*	0.195	98	Impervious surface, HSG A
	0.056	39	>75% Grass cover, Good, HSG A
	1.849	83	Weighted Average
	1.654		89.45% Pervious Area
	0.195		10.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, SF-A**
					Woods: Light underbrush n= 0.400 P2= 3.18"
0.3	20	0.0500	1.12		**Shallow Concentrated Flow, SCF-1**
					Woodland Kv= 5.0 fps
2.9	87	0.0100	0.50		**Shallow Concentrated Flow, SCF-2**
					Woodland Kv= 5.0 fps
0.9	88	0.0110	1.69		**Shallow Concentrated Flow, SCF-3**
					Unpaved Kv= 16.1 fps
0.4	50	0.0200	2.28		**Shallow Concentrated Flow, SCF-4**
					Unpaved Kv= 16.1 fps
0.0	9	0.2800	3.70		**Shallow Concentrated Flow, SCF-5**
					Short Grass Pasture Kv= 7.0 fps
16.9	304				Total

Summary for Subcatchment EX-B: TO WEST

Runoff   =   10.61 cfs @ 12.09 hrs, Volume=   0.833 af, Depth= 5.30"
   Routed to Link DP-B : WESTERN PROPERTY & WEST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.12"

	Area (ac)	CN	Description
	1.370	96	Gravel surface, HSG A
*	0.395	98	Impervious surface, HSG A
	0.047	39	>75% Grass cover, Good, HSG A
	0.073	32	Woods/grass comb., Good, HSG A
	1.885	93	Weighted Average
	1.490		79.05% Pervious Area
	0.395		20.95% Impervious Area

Hillman Tewksbury - Existing Conditions

Prepared by Langan Engineering

Printed 3/13/2025

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	36	0.0090	0.24		**Sheet Flow, SF-B**
					Fallow n= 0.050 P2= 3.18"
1.7	47	0.0090	0.47		**Shallow Concentrated Flow, SCF-1**
					Woodland Kv= 5.0 fps
0.3	30	0.0090	1.53		**Shallow Concentrated Flow, SCF-2**
					Unpaved Kv= 16.1 fps
0.2	30	0.0200	2.28		**Shallow Concentrated Flow, SCF-3**
					Unpaved Kv= 16.1 fps
0.2	9	0.0200	0.99		**Shallow Concentrated Flow, SCF-4**
					Short Grass Pasture Kv= 7.0 fps
4.9	152				Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment EX-C: TO HILLMAN STREET

Runoff   =   9.82 cfs @ 12.09 hrs, Volume=   0.798 af, Depth= 5.65"
   Routed to Link DP-C : HILLMAN STREET DRAINAGE SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.12"

	Area (ac)	CN	Description
	0.040	39	>75% Grass cover, Good, HSG A
	0.196	96	Gravel surface, HSG A
*	1.460	98	Impervious surface, HSG A
	1.696	96	Weighted Average
	0.236		13.92% Pervious Area
	1.460		86.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.69		**Sheet Flow, SF-C**
					Smooth surfaces n= 0.011 P2= 3.18"
2.2	150	0.0050	1.14		**Shallow Concentrated Flow, SCF-1**
					Unpaved Kv= 16.1 fps
0.2	54	0.0370	3.90		**Shallow Concentrated Flow, SCF-2**
					Paved Kv= 20.3 fps
3.6	254				Total, Increased to minimum Tc = 6.0 min

Summary for Link DP-A: ISOLATED VEGETATED WETLAND

Inflow Area =   1.849 ac, 10.55% Impervious, Inflow Depth = 4.20"   for 25-yr event
Inflow   =   6.48 cfs @ 12.23 hrs, Volume=   0.648 af
Primary   =   6.48 cfs @ 12.23 hrs, Volume=   0.648 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Summary for Link DP-B: WESTERN PROPERTY & WEST WETLAND

Inflow Area =   1.885 ac, 20.95% Impervious, Inflow Depth = 5.30"   for 25-yr event
Inflow   =   10.61 cfs @ 12.09 hrs, Volume=   0.833 af
Primary   =   10.61 cfs @ 12.09 hrs, Volume=   0.833 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link DP-C: HILLMAN STREET DRAINAGE SYSTEM

Inflow Area =   1.696 ac, 86.08% Impervious, Inflow Depth = 5.65"   for 25-yr event
Inflow   =   9.82 cfs @ 12.09 hrs, Volume=   0.798 af
Primary   =   9.82 cfs @ 12.09 hrs, Volume=   0.798 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-A: TO ISOLATED   Runoff Area=1.849 ac   10.55% Impervious   Runoff Depth=4.99"
Flow Length=304'   Tc=16.9 min   CN=83   Runoff=7.65 cfs 0.769 af

Subcatchment EX-B: TO WEST   Runoff Area=1.885 ac   20.95% Impervious   Runoff Depth=6.13"
Flow Length=152'   Tc=6.0 min   CN=93   Runoff=12.17 cfs 0.963 af

Subcatchment EX-C: TO HILLMAN STREET Runoff Area=1.696 ac   86.08% Impervious   Runoff Depth=6.48"
Flow Length=254'   Tc=6.0 min   CN=96   Runoff=11.21 cfs 0.916 af

Link DP-A: ISOLATED VEGETATED WETLAND   Inflow=7.65 cfs 0.769 af
Primary=7.65 cfs 0.769 af

Link DP-B: WESTERN PROPERTY & WEST WETLAND   Inflow=12.17 cfs 0.963 af
Primary=12.17 cfs 0.963 af

Link DP-C: HILLMAN STREET DRAINAGE SYSTEM   Inflow=11.21 cfs 0.916 af
Primary=11.21 cfs 0.916 af

Total Runoff Area = 5.430 ac   Runoff Volume = 2.648 af   Average Runoff Depth = 5.85"
62.25% Pervious = 3.380 ac   37.75% Impervious = 2.050 ac

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment EX-A: TO ISOLATED WETLAND

Runoff   =   7.65 cfs @ 12.23 hrs, Volume=   0.769 af, Depth= 4.99"
    Routed to Link DP-A : ISOLATED VEGETATED WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.96"

Area (ac)	CN	Description
0.315	30	Woods, Good, HSG A
1.283	96	Gravel surface, HSG A
* 0.195	98	Impervious surface, HSG A
0.056	39	>75% Grass cover, Good, HSG A
1.849	83	Weighted Average
1.654		89.45% Pervious Area
0.195		10.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, SF-A**
					Woods: Light underbrush n= 0.400 P2= 3.18"
0.3	20	0.0500	1.12		**Shallow Concentrated Flow, SCF-1**
					Woodland Kv= 5.0 fps
2.9	87	0.0100	0.50		**Shallow Concentrated Flow, SCF-2**
					Woodland Kv= 5.0 fps
0.9	88	0.0110	1.69		**Shallow Concentrated Flow, SCF-3**
					Unpaved Kv= 16.1 fps
0.4	50	0.0200	2.28		**Shallow Concentrated Flow, SCF-4**
					Unpaved Kv= 16.1 fps
0.0	9	0.2800	3.70		**Shallow Concentrated Flow, SCF-5**
					Short Grass Pasture Kv= 7.0 fps
16.9	304				Total

Summary for Subcatchment EX-B: TO WEST

Runoff   =   12.17 cfs @ 12.09 hrs, Volume=   0.963 af, Depth= 6.13"
    Routed to Link DP-B : WESTERN PROPERTY & WEST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.96"

Area (ac)	CN	Description
1.370	96	Gravel surface, HSG A
* 0.395	98	Impervious surface, HSG A
0.047	39	>75% Grass cover, Good, HSG A
0.073	32	Woods/grass comb., Good, HSG A
1.885	93	Weighted Average
1.490		79.05% Pervious Area
0.395		20.95% Impervious Area

Hillman Tewksbury - Existing Conditions

Prepared by Langan Engineering

HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	36	0.0090	0.24		**Sheet Flow, SF-B** Fallow n= 0.050 P2= 3.18"
1.7	47	0.0090	0.47		**Shallow Concentrated Flow, SCF-1** Woodland Kv= 5.0 fps
0.3	30	0.0090	1.53		**Shallow Concentrated Flow, SCF-2** Unpaved Kv= 16.1 fps
0.2	30	0.0200	2.28		**Shallow Concentrated Flow, SCF-3** Unpaved Kv= 16.1 fps
0.2	9	0.0200	0.99		**Shallow Concentrated Flow, SCF-4** Short Grass Pasture Kv= 7.0 fps
4.9	152				Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment EX-C: TO HILLMAN STREET

Runoff   =   11.21 cfs @ 12.09 hrs, Volume=   0.916 af, Depth= 6.48"
    Routed to Link DP-C : HILLMAN STREET DRAINAGE SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.96"

	Area (ac)	CN	Description
	0.040	39	>75% Grass cover, Good, HSG A
	0.196	96	Gravel surface, HSG A
*	1.460	98	Impervious surface, HSG A
	1.696	96	Weighted Average
	0.236		13.92% Pervious Area
	1.460		86.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.69		**Sheet Flow, SF-C** Smooth surfaces n= 0.011 P2= 3.18"
2.2	150	0.0050	1.14		**Shallow Concentrated Flow, SCF-1** Unpaved Kv= 16.1 fps
0.2	54	0.0370	3.90		**Shallow Concentrated Flow, SCF-2** Paved Kv= 20.3 fps
3.6	254				Total, Increased to minimum Tc = 6.0 min

Summary for Link DP-A: ISOLATED VEGETATED WETLAND

Inflow Area =   1.849 ac, 10.55% Impervious, Inflow Depth = 4.99"   for 50-yr event
Inflow   =   7.65 cfs @ 12.23 hrs, Volume=   0.769 af
Primary   =   7.65 cfs @ 12.23 hrs, Volume=   0.769 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Summary for Link DP-B: WESTERN PROPERTY & WEST WETLAND

Inflow Area =   1.885 ac, 20.95% Impervious, Inflow Depth = 6.13"   for 50-yr event
Inflow   =   12.17 cfs @ 12.09 hrs, Volume=   0.963 af
Primary   =   12.17 cfs @ 12.09 hrs, Volume=   0.963 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link DP-C: HILLMAN STREET DRAINAGE SYSTEM

Inflow Area =   1.696 ac, 86.08% Impervious, Inflow Depth = 6.48"   for 50-yr event
Inflow   =   11.21 cfs @ 12.09 hrs, Volume=   0.916 af
Primary   =   11.21 cfs @ 12.09 hrs, Volume=   0.916 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Existing Conditions
Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment EX-A: TO ISOLATED Runoff Area=1.849 ac 10.55% Impervious Runoff Depth=5.85"
Flow Length=304' Tc=16.9 min CN=83 Runoff=8.92 cfs 0.902 af

Subcatchment EX-B: TO WEST Runoff Area=1.885 ac 20.95% Impervious Runoff Depth=7.03"
Flow Length=152' Tc=6.0 min CN=93 Runoff=13.86 cfs 1.105 af

Subcatchment EX-C: TO HILLMAN STREET Runoff Area=1.696 ac 86.08% Impervious Runoff Depth=7.39"
Flow Length=254' Tc=6.0 min CN=96 Runoff=12.70 cfs 1.045 af

Link DP-A: ISOLATED VEGETATED WETLAND Inflow=8.92 cfs 0.902 af
Primary=8.92 cfs 0.902 af

Link DP-B: WESTERN PROPERTY & WEST WETLAND Inflow=13.86 cfs 1.105 af
Primary=13.86 cfs 1.105 af

Link DP-C: HILLMAN STREET DRAINAGE SYSTEM Inflow=12.70 cfs 1.045 af
Primary=12.70 cfs 1.045 af

Total Runoff Area = 5.430 ac Runoff Volume = 3.051 af Average Runoff Depth = 6.74"
62.25% Pervious = 3.380 ac 37.75% Impervious = 2.050 ac

Hillman Tewksbury - Existing Conditions

Prepared by Langan Engineering

Summary for Subcatchment EX-A: TO ISOLATED WETLAND

Runoff   =   8.92 cfs @ 12.23 hrs, Volume=   0.902 af, Depth= 5.85"
    Routed to Link DP-A : ISOLATED VEGETATED WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.87"

Area (ac)	CN	Description
0.315	30	Woods, Good, HSG A
1.283	96	Gravel surface, HSG A
* 0.195	98	Impervious surface, HSG A
0.056	39	>75% Grass cover, Good, HSG A
1.849	83	Weighted Average
1.654		89.45% Pervious Area
0.195		10.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, SF-A**
					Woods: Light underbrush n= 0.400 P2= 3.18"
0.3	20	0.0500	1.12		**Shallow Concentrated Flow, SCF-1**
					Woodland Kv= 5.0 fps
2.9	87	0.0100	0.50		**Shallow Concentrated Flow, SCF-2**
					Woodland Kv= 5.0 fps
0.9	88	0.0110	1.69		**Shallow Concentrated Flow, SCF-3**
					Unpaved Kv= 16.1 fps
0.4	50	0.0200	2.28		**Shallow Concentrated Flow, SCF-4**
					Unpaved Kv= 16.1 fps
0.0	9	0.2800	3.70		**Shallow Concentrated Flow, SCF-5**
					Short Grass Pasture Kv= 7.0 fps
16.9	304				Total

Summary for Subcatchment EX-B: TO WEST

Runoff   =   13.86 cfs @ 12.09 hrs, Volume=   1.105 af, Depth= 7.03"
    Routed to Link DP-B : WESTERN PROPERTY & WEST WETLAND

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.87"

Area (ac)	CN	Description
1.370	96	Gravel surface, HSG A
* 0.395	98	Impervious surface, HSG A
0.047	39	>75% Grass cover, Good, HSG A
0.073	32	Woods/grass comb., Good, HSG A
1.885	93	Weighted Average
1.490		79.05% Pervious Area
0.395		20.95% Impervious Area

Hillman Tewksbury - Existing Conditions   *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering   Printed 3/13/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 22

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.5	36	0.0090	0.24		**Sheet Flow, SF-B**
					Fallow n= 0.050 P2= 3.18"
1.7	47	0.0090	0.47		**Shallow Concentrated Flow, SCF-1**
					Woodland Kv= 5.0 fps
0.3	30	0.0090	1.53		**Shallow Concentrated Flow, SCF-2**
					Unpaved Kv= 16.1 fps
0.2	30	0.0200	2.28		**Shallow Concentrated Flow, SCF-3**
					Unpaved Kv= 16.1 fps
0.2	9	0.0200	0.99		**Shallow Concentrated Flow, SCF-4**
					Short Grass Pasture Kv= 7.0 fps
4.9	152				Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment EX-C: TO HILLMAN STREET

Runoff   =   12.70 cfs @ 12.09 hrs, Volume=   1.045 af, Depth= 7.39"
     Routed to Link DP-C : HILLMAN STREET DRAINAGE SYSTEM

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.87"

	Area (ac)	CN	Description
	0.040	39	>75% Grass cover, Good, HSG A
	0.196	96	Gravel surface, HSG A
*	1.460	98	Impervious surface, HSG A
	1.696	96	Weighted Average
	0.236		13.92% Pervious Area
	1.460		86.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.69		**Sheet Flow, SF-C**
					Smooth surfaces n= 0.011 P2= 3.18"
2.2	150	0.0050	1.14		**Shallow Concentrated Flow, SCF-1**
					Unpaved Kv= 16.1 fps
0.2	54	0.0370	3.90		**Shallow Concentrated Flow, SCF-2**
					Paved Kv= 20.3 fps
3.6	254				Total, Increased to minimum Tc = 6.0 min

Summary for Link DP-A: ISOLATED VEGETATED WETLAND

Inflow Area =   1.849 ac, 10.55% Impervious, Inflow Depth = 5.85"   for 100-yr event
Inflow   =   8.92 cfs @ 12.23 hrs, Volume=   0.902 af
Primary   =   8.92 cfs @ 12.23 hrs, Volume=   0.902 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Existing Conditions
Type III 24-hr 100-yr Rainfall=7.87"
Prepared by Langan Engineering
Printed 3/13/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC
Page 23

Summary for Link DP-B: WESTERN PROPERTY & WEST WETLAND

Inflow Area =   1.885 ac, 20.95% Impervious, Inflow Depth = 7.03"   for 100-yr event
Inflow   =   13.86 cfs @ 12.09 hrs, Volume=   1.105 af
Primary   =   13.86 cfs @ 12.09 hrs, Volume=   1.105 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link DP-C: HILLMAN STREET DRAINAGE SYSTEM

Inflow Area =   1.696 ac, 86.08% Impervious, Inflow Depth = 7.39"   for 100-yr event
Inflow   =   12.70 cfs @ 12.09 hrs, Volume=   1.045 af
Primary   =   12.70 cfs @ 12.09 hrs, Volume=   1.045 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

APPENDIX C

Proposed Stormwater Discharge Calculations

LANGAN

1/17/25, 10:13 AM

Precipitation Frequency Data Server

Hillman Energy Center, LLC
Attachment B - Supplemental
EFSB 25-08
Page 43 of 215

OAA Atlas 1   Volume 10, Version 3
Location name: Tewksbury, Massachusetts USA*
Latitude: 42.6202°, Longitude: -71.2433°
Elevation: 122 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tab lar

PD -based p int precipitation frequency estimates with 90% confidence intervals (in inches)[1]

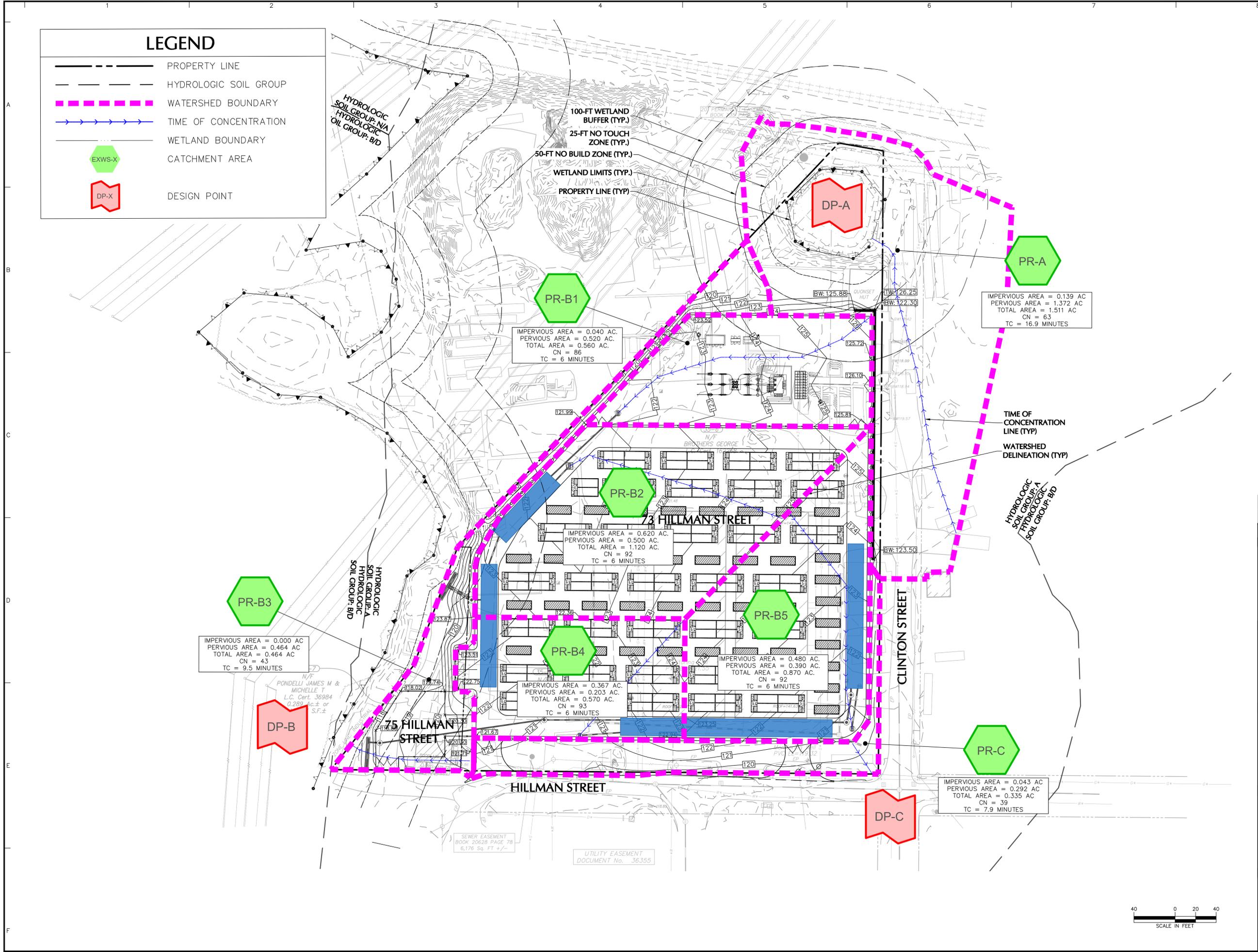| Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.31 (0.249-0.389)	0.375 (0.297-0.465)	0.475 (0.375-0.591)	0.558 (0.438-0.697)	0.673 (0.510-0.877)	0.759 (0.562-1.01)	0.849 (0.609-1.17)	0.951 (0.644-1.34)	1.10 (0.713-1.60)	1.22 (0.771-1.80)
10-min	0.445 (0.353-0.551)	0.532 (0.421-0.659)	0.674 (0.532-0.838)	0.791 (0.621-0.989)	0.953 (0.722-1.24)	1.08 (0.797-1.43)	1.20 (0.863-1.66)	1.35 (0.912-1.90)	1.56 (1.01-2.26)	1.72 (1.09-2.56)
15-min	0.523 (0.415-0.648)	0.626 (0.495-0.775)	0.793 (0.626-0.987)	0.932 (0.730-1.16)	1.12 (0.849-1.46)	1.26 (0.936-1.68)	1.42 (1.02-1.95)	1.59 (1.07-2.23)	1.83 (1.19-2.66)	2.03 (1.28-3.01)
30-min	0.718 (0.569-0.889)	0.858 (0.680-1.06)	1.09 (0.859-1.35)	1.28 (1.00-1.60)	1.54 (1.17-2.01)	1.74 (1.29-2.32)	1.95 (1.40-2.68)	2.18 (1.48-3.07)	2.52 (1.64-3.66)	2.80 (1.77-4.15)
60-min	0.912 (0.723-1.13)	1.09 (0.864-1.35)	1.38 (1.09-1.72)	1.63 (1.28-2.03)	1.96 (1.49-2.56)	2.21 (1.64-2.95)	2.48 (1.78-3.42)	2.78 (1.88-3.91)	3.2 (2.08-4.67)	3.56 (2.26-5.28)
2-hr	1.16 (0.930-1.43)	1.41 (1.12-1.73)	1.81 (1.44-2.23)	2.14 (1.69-2.65)	2.59 (1.98-3.37)	2.93 (2.19-3.90)	3.29 (2.40-4.56)	3.73 (2.54-5.22)	4.4 (2.87-6.37)	4.99 (3.16-7.34)
3-hr	1.34 (1.08-1.64)	1.63 (1.31-2.00)	2.10 (1.68-2.58)	2.49 (1.98-3.08)	3.03 (2.33-3.94)	3.43 (2.58-4.55)	3.86 (2.83-5.35)	4.40 (2.99-6.13)	5.2 (3.41-7.54)	5.96 (3.79-8.74)
6-hr	1.71 (1.39-2.08)	2.09 (1.69-2.54)	2.71 (2.18-3.31)	3.22 (2.57-3.95)	3.92 (3.04-5.06)	4.44 (3.36-5.86)	5.00 (3.69-6.90)	5.72 (3.91-7.92)	6.83 (4.47-9.78)	7.81 (4.98-11.4)
12-hr	2.16 (1.76-2.61)	2.64 (2.15-3.19)	3.43 (2.78-4.16)	4.08 (3.29-4.98)	4.98 (3.88-6.37)	5.64 (4.30-7.39)	6.36 (4.71-8.70)	7.26 (4.98-9.98)	8.65 (5.68-12.3)	9.86 (6.31-14.3)
24-hr	2.57 (2.11-3.08)	3.18 (2.61-3.81)	4.17 (3.41-5.02)	4.99 (4.06-6.05)	6.12 (4.81-7.80)	6.96 (5.34-9.07)	7.87 (5.87-10.7)	9.02 (6.21-12.3)	10.8 (7.12-15.3)	12.4 (7.94-17.8)
2-day	2.89 (2.40-3.45)	3.64 (3.01-4.34)	4.85 (4.00-5.81)	5.86 (4.80-7.06)	7.25 (5.74-9.20)	8.27 (6.41-10.7)	9.39 (7.08-12.8)	10.8 (7.50-14.7)	13.2 (8.70-18.5)	15.2 (9.80-21.7)
3-day	3.17 (2.64-3.76)	3.97 (3.30-4.71)	5.27 (4.37-6.28)	6.35 (5.23-7.61)	7.84 (6.24-9.91)	8.93 (6.95-11.6)	10.1 (7.67-13.7)	11.7 (8.12-15.8)	14.2 (9.42-19.9)	16.4 (10.6-23.4)
4-day	3.44 (2.88-4.07)	4.26 (3.56-5.05)	5.60 (4.66-6.66)	6.72 (5.55-8.03)	8.25 (6.58-10.4)	9.37 (7.31-12.1)	10.6 (8.05-14.4)	12.2 (8.50-16.5)	14.8 (9.84-20.7)	17.1 (11.1-24.3)
7-day	4.18 (3.52-4.92)	5.03 (4.23-5.93)	6.42 (5.38-7.59)	7.58 (6.30-9.01)	9.18 (7.36-11.5)	10.3 (8.10-13.2)	11.6 (8.84-15.6)	13.3 (9.28-17.8)	15.9 (10.6-22.1)	18.3 (11.8-25.7)
10-day	4.85 (4.10-5.69)	5.73 (4.84-6.72)	7.16 (6.02-8.44)	8.36 (6.97-9.89)	9.99 (8.03-12.4)	11.2 (8.78-14.2)	12.5 (9.50-16.6)	14.2 (9.93-18.9)	16.8 (11.2-23.1)	19.0 (12.3-26.7)
20-day	6.79 (5.79-7.90)	7.75 (6.60-9.04)	9.33 (7.91-10.9)	10.6 (8.96-12.5)	12.4 (10.0-15.2)	13.8 (10.8-17.2)	15.2 (11.5-19.7)	16.8 (11.9-22.3)	19.2 (12.9-26.2)	2 .1 (13.7-29.4)
30-day	8.41 (7.21-9.75)	9.45 (8.08-11.0)	11.1 (9.50-13.0)	12.6 (10.6-14.7)	14.5 (11.7-17.6)	16.0 (12.6-19.8)	17.5 (13.1-22.3)	19.1 (13.5-25.1)	21.2 (14.3-28.9)	22.9 (14.9-31.8)
45-day	10.5 (9.02-12.1)	11.6 (9.97-13.4)	13.4 (11.5-15.6)	15.0 (12.7-17.4)	17.1 (13.8-20.5)	18.7 (14.7-22.9)	20.3 (15.2-25.6)	21.8 (15.5-28.6)	23.8 (16.1-32.3)	25.3 (16.5-35.0)
60-day	12.2 (10.6-14.1)	13.4 (11.6-15.5)	15.4 (13.2-17.8)	17.0 (14.5-19.7)	19.2 (15.6-23.0)	20.9 (16.5-25.6)	22.6 (17.0-28.4)	24.2 (17.3-31.5)	26. (17.7-35.2)	27.4 (17.9-37.8)

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

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

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

LEGEND

————— —·—·—	PROPERTY LINE
————— —————	HYDROLOGIC SOIL GROUP
▰▰▰▰▰	WATERSHED BOUNDARY
›————›———›—	TIME OF CONCENTRATION
—————————	WETLAND BOUNDARY
EXWS-X (green hexagon)	CATCHMENT AREA
DP-X (red flag)	DESIGN POINT

100-FT WETLAND BUFFER (TYP.)
25-FT NO TOUCH ZONE (TYP.)
50-FT NO BUILD ZONE (TYP.)
WETLAND LIMITS (TYP.)
PROPERTY LINE (TYP)

HYDROLOGIC SOIL GROUP: N/A
HYDROLOGIC SOIL GROUP: B/D

DP-A

PR-A
IMPERVIOUS AREA = 0.139 AC
PERVIOUS AREA = 1.372 AC
TOTAL AREA = 1.511 AC
CN = 63
TC = 16.9 MINUTES

PR-B1
IMPERVIOUS AREA = 0.040 AC.
PERVIOUS AREA = 0.520 AC.
TOTAL AREA = 0.560 AC.
CN = 86
TC = 6 MINUTES

TIME OF CONCENTRATION LINE (TYP)

WATERSHED DELINEATION (TYP)

HYDROLOGIC SOIL GROUP: A
HYDROLOGIC SOIL GROUP: B/D

N/F
BROTHERS GEORGE

PR-B2

73 HILLMAN STREET
IMPERVIOUS AREA = 0.620 AC.
PERVIOUS AREA = 0.500 AC.
TOTAL AREA = 1.120 AC.
CN = 92
TC = 6 MINUTES

CLINTON STREET

HYDROLOGIC SOIL GROUP: A
HYDROLOGIC SOIL GROUP: B/D

PR-B3
IMPERVIOUS AREA = 0.000 AC
PERVIOUS AREA = 0.464 AC
TOTAL AREA = 0.464 AC
CN = 43
TC = 9.5 MINUTES

PR-B5
IMPERVIOUS AREA = 0.480 AC.
PERVIOUS AREA = 0.390 AC.
TOTAL AREA = 0.870 AC.
CN = 92
TC = 6 MINUTES

PR-B4
IMPERVIOUS AREA = 0.367 AC.
PERVIOUS AREA = 0.203 AC.
TOTAL AREA = 0.570 AC.
CN = 93
TC = 6 MINUTES

N/F
PONDELLI JAMES M &
MICHELLE T
L.C. Cert. 36984
0.280 Ac.± or
S.F.±

DP-B

75 HILLMAN STREET

PR-C
IMPERVIOUS AREA = 0.043 AC
PERVIOUS AREA = 0.292 AC
TOTAL AREA = 0.335 AC
CN = 39
TC = 7.9 MINUTES

HILLMAN STREET

DP-C

SEWER EASEMENT
BOOK 20628 PAGE 78
6,176 Sq. FT +/-

UTILITY EASEMENT
DOCUMENT No. 36355

40 0 20 40
SCALE IN FEET

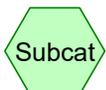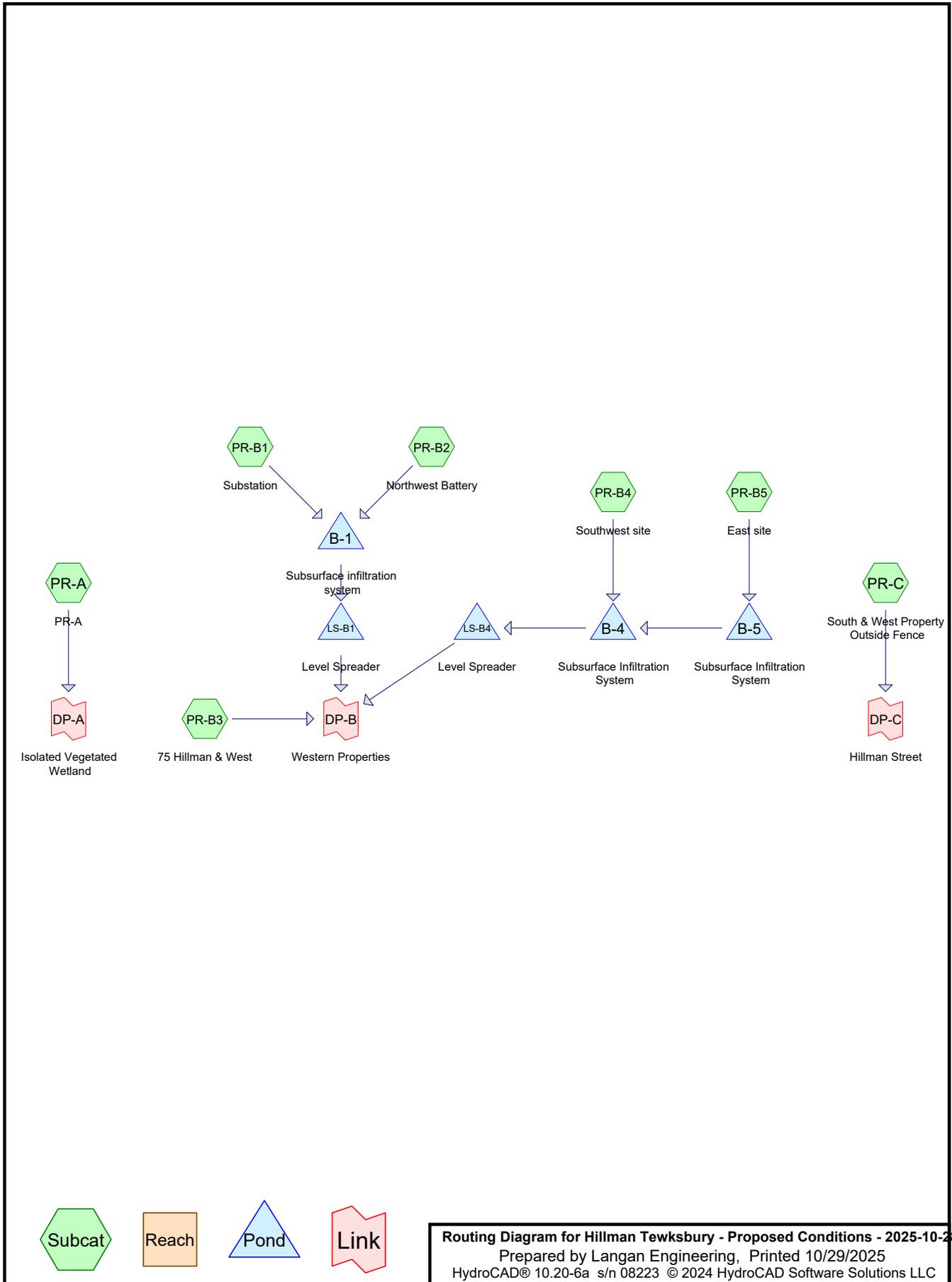| Date	Description	No.
11/05/25	UPDATE 30% DESIGN DRAWINGS	1

Revisions

LANGAN
Langan Engineering and
Environmental Services, LLC.

100 Cambridge Street, Suite 1310
Boston, MA 02114

T: 617.824.9100   F: 617.824.9101   www.langan.com

Project

**HILLMAN ENERGY CENTER
BATTERY ENERGY STORAGE
SYSTEM**

TEWKSBURY

MIDDLESEX COUNTY   MASSACHUSETTS

Drawing Title

**PROPOSED
WATERSHED MAP**

Project No.	Exhibit
151043401	
Date	**PRWS**
03/26/2025	
Drawn By	
MPG	
Checked By	
HH	

PR-B1
Substation

PR-B2
Northwest Battery

PR-B4
Southwest site

PR-B5
East site

B-1
Subsurface infiltration system

PR-A
PR-A

LS-B1
Level Spreader

LS-B4
Level Spreader

B-4
Subsurface Infiltration System

B-5
Subsurface Infiltration System

PR-C
South & West Property Outside Fence

DP-A
Isolated Vegetated Wetland

PR-B3
75 Hillman & West

DP-B
Western Properties

DP-C
Hillman Street

Subcat   Reach   Pond   Link

Routing Diagram for Hillman Tewksbury - Proposed Conditions - 2025-10-28
Prepared by Langan Engineering, Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Hillman Tewksbury - Proposed Conditions - 2025-10-28

Prepared by Langan Engineering

Printed 10/29/2025

HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Page 2

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	Type III 24-hr		Default	24.00	1	3.18	2
2	10-yr	Type III 24-hr		Default	24.00	1	4.99	2
3	25-yr	Type III 24-hr		Default	24.00	1	6.12	2
4	50-yr	Type III 24-hr		Default	24.00	1	6.96	2
5	100-yr	Type III 24-hr		Default	24.00	1	7.87	2

Hillman Tewksbury - Proposed Conditions - 2025-10-28

Prepared by Langan Engineering

HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.071	39	>75% Grass cover, Good, HSG A (PR-A, PR-B3)
2.456	85	Gravel surface, HSG A (PR-A, PR-B1, PR-B2, PR-B3, PR-B4, PR-B5)
0.182	98	Impervious Surface, HSG A (PR-A, PR-C)
0.899	30	Meadow, non-grazed, HSG A (PR-A, PR-B3, PR-C)
1.467	98	Paved parking, HSG A (PR-B2, PR-B4, PR-B5)
0.040	98	Paved surface, HSG A (PR-B1)
0.315	30	Woods, Good, HSG A (PR-A)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 4

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PR-A: PR-A   Runoff Area=1.511 ac   9.20% Impervious   Runoff Depth=0.51"
                                             Flow Length=304'   Tc=16.9 min   CN=63   Runoff=0.46 cfs 0.064 af

Subcatchment PR-B1: Substation   Runoff Area=0.560 ac   7.14% Impervious   Runoff Depth=1.82"
                                             Flow Length=273'   Tc=6.0 min   CN=86   Runoff=1.17 cfs 0.085 af

Subcatchment PR-B2: Northwest Battery   Runoff Area=1.120 ac   55.36% Impervious   Runoff Depth=2.33"
                                   Flow Length=338'   Slope=0.0170 '/'   Tc=6.0 min   CN=92   Runoff=2.93 cfs 0.218 af

Subcatchment PR-B3: 75 Hillman & West   Runoff Area=0.464 ac   0.00% Impervious   Runoff Depth=0.02"
                                             Flow Length=118'   Tc=9.5 min   CN=43   Runoff=0.00 cfs 0.001 af

Subcatchment PR-B4: Southwest site   Runoff Area=0.570 ac   64.39% Impervious   Runoff Depth=2.43"
                                   Flow Length=154'   Slope=0.0250 '/'   Tc=6.0 min   CN=93   Runoff=1.54 cfs 0.115 af

Subcatchment PR-B5: East site   Runoff Area=0.870 ac   55.17% Impervious   Runoff Depth=2.33"
                                             Flow Length=236'   Tc=6.0 min   CN=92   Runoff=2.27 cfs 0.169 af

Subcatchment PR-C: South & West   Runoff Area=0.335 ac   12.84% Impervious   Runoff Depth=0.00"
                                   Flow Length=35'   Slope=0.0110 '/'   Tc=7.9 min   CN=39   Runoff=0.00 cfs 0.000 af

Pond B-1: Subsurface infiltration system   Peak Elev=119.84' Storage=5,467 cf Inflow=4.09 cfs 0.302 af
                          Discarded=0.37 cfs 0.299 af Primary=0.12 cfs 0.003 af Outflow=0.49 cfs 0.303 af

Pond B-4: Subsurface Infiltration System   Peak Elev=116.74' Storage=1,523 cf Inflow=1.54 cfs 0.115 af
                          Discarded=0.24 cfs 0.115 af Primary=0.00 cfs 0.000 af Outflow=0.24 cfs 0.115 af

Pond B-5: Subsurface Infiltration System   Peak Elev=118.89' Storage=2,989 cf Inflow=2.27 cfs 0.169 af
                          Discarded=0.22 cfs 0.169 af Primary=0.00 cfs 0.000 af Outflow=0.22 cfs 0.169 af

Pond LS-B1: Level Spreader   Peak Elev=117.52' Storage=101 cf Inflow=0.12 cfs 0.003 af
                                                                          Outflow=0.13 cfs 0.001 af

Pond LS-B4: Level Spreader   Peak Elev=114.95' Storage=0 cf Inflow=0.00 cfs 0.000 af
                                                                          Outflow=0.00 cfs 0.000 af

Link DP-A: Isolated Vegetated Wetland   Inflow=0.46 cfs 0.064 af
                                                                          Primary=0.46 cfs 0.064 af

Link DP-B: Western Properties   Inflow=0.13 cfs 0.002 af
                                                                          Primary=0.13 cfs 0.002 af

Link DP-C: Hillman Street   Inflow=0.00 cfs 0.000 af
                                                                          Primary=0.00 cfs 0.000 af

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 2-yr Rainfall=3.18"*

Summary for Subcatchment PR-A: PR-A

Runoff   =   0.46 cfs @ 12.31 hrs, Volume=   0.064 af, Depth= 0.51"
    Routed to Link DP-A : Isolated Vegetated Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.18"

Area (ac)	CN	Description
0.315	30	Woods, Good, HSG A
* 0.733	85	Gravel surface, HSG A
0.056	39	>75% Grass cover, Good, HSG A
* 0.139	98	Impervious Surface, HSG A
0.268	30	Meadow, non-grazed, HSG A
1.511	63	Weighted Average
1.372		90.80% Pervious Area
0.139		9.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, SF-A**
					Woods: Light underbrush n= 0.400 P2= 3.18"
0.3	20	0.0500	1.12		**Shallow Concentrated Flow, SCF-1**
					Woodland Kv= 5.0 fps
2.9	87	0.0100	0.50		**Shallow Concentrated Flow, SCF-2**
					Woodland Kv= 5.0 fps
0.9	88	0.0110	1.69		**Shallow Concentrated Flow, SCF-3**
					Unpaved Kv= 16.1 fps
0.4	50	0.0200	2.28		**Shallow Concentrated Flow, SCF-4**
					Unpaved Kv= 16.1 fps
0.0	9	0.2800	3.70		**Shallow Concentrated Flow, SCF-5**
					Short Grass Pasture Kv= 7.0 fps
16.9	304	Total			

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 2-yr Rainfall=3.18"*

Summary for Subcatchment PR-B1: Substation

Runoff   =   1.17 cfs @ 12.09 hrs, Volume=   0.085 af, Depth= 1.82"
     Routed to Pond B-1 : Subsurface infiltration system

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.18"

	Area (ac)	CN	Description
*	0.520	85	Gravel surface, HSG A
*	0.040	98	Paved surface, HSG A
	0.560	86	Weighted Average
	0.520		92.86% Pervious Area
	0.040		7.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.19		**Sheet Flow, Crushed Stone**
					Smooth surfaces n= 0.011 P2= 3.18"
0.8	107	0.0200	2.28		**Shallow Concentrated Flow, SCF-1**
					Unpaved Kv= 16.1 fps
1.2	116	0.0100	1.61		**Shallow Concentrated Flow, SCF-2**
					Unpaved Kv= 16.1 fps
2.7	273				Total, Increased to minimum Tc = 6.0 min

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 7

Summary for Subcatchment PR-B2: Northwest Battery

Runoff   =   2.93 cfs @ 12.09 hrs, Volume=   0.218 af, Depth= 2.33"
     Routed to Pond B-1 : Subsurface infiltration system

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.18"

	Area (ac)	CN	Description
	0.620	98	Paved parking, HSG A
*	0.500	85	Gravel surface, HSG A
	1.120	92	Weighted Average
	0.500		44.64% Pervious Area
	0.620		55.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0170	1.12		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
2.2	272	0.0170	2.10		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
0.1	16	0.0170	2.65		**Shallow Concentrated Flow, Road**
					Paved Kv= 20.3 fps
3.0	338		Total, Increased to minimum Tc = 6.0 min		

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering
Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC
Page 8

Summary for Subcatchment PR-B3: 75 Hillman & West

Runoff = 0.00 cfs @ 17.31 hrs, Volume= 0.001 af, Depth= 0.02"
Routed to Link DP-B : Western Properties

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.18"

Area (ac)	CN	Description
0.015	39	>75% Grass cover, Good, HSG A
0.339	30	Meadow, non-grazed, HSG A
* 0.110	85	Gravel surface, HSG A
0.464	43	Weighted Average
0.464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0170	0.09		**Sheet Flow, SF** Grass: Dense n= 0.240 P2= 3.18"
0.2	10	0.0170	0.91		**Shallow Concentrated Flow, SCF-1** Short Grass Pasture Kv= 7.0 fps
0.1	9	0.0470	1.52		**Shallow Concentrated Flow, SCF-2** Short Grass Pasture Kv= 7.0 fps
0.1	21	0.0371	3.10		**Shallow Concentrated Flow, Gravel Surface** Unpaved Kv= 16.1 fps
0.3	28	0.0540	1.63		**Shallow Concentrated Flow, SCF-3** Short Grass Pasture Kv= 7.0 fps
9.5	118				Total

Summary for Subcatchment PR-B4: Southwest site

Runoff   =   1.54 cfs @ 12.09 hrs, Volume=   0.115 af, Depth= 2.43"
    Routed to Pond B-4 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.18"

	Area (ac)	CN	Description
*	0.203	85	Gravel surface, HSG A
	0.367	98	Paved parking, HSG A
	0.570	93	Weighted Average
	0.203		35.61% Pervious Area
	0.367		64.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.31		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
0.7	104	0.0250	2.55		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
1.3	154				Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment PR-B5: East site

Runoff   =   2.27 cfs @ 12.09 hrs, Volume=   0.169 af, Depth= 2.33"
     Routed to Pond B-5 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.18"

Area (ac)	CN	Description
* 0.390	85	Gravel surface, HSG A
0.480	98	Paved parking, HSG A
0.870	92	Weighted Average
0.390		44.83% Pervious Area
0.480		55.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.31		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
0.3	41	0.0250	2.55		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
0.8	145	0.0200	2.87		**Shallow Concentrated Flow, Road**
					Paved Kv= 20.3 fps
1.7	236				Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment PR-C: South & West Property Outside Fence

Runoff   =   0.00 cfs @ 23.99 hrs, Volume=   0.000 af, Depth= 0.00"
     Routed to Link DP-C : Hillman Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.18"

	Area (ac)	CN	Description
	0.292	30	Meadow, non-grazed, HSG A
*	0.043	98	Impervious Surface, HSG A
	0.335	39	Weighted Average
	0.292		87.16% Pervious Area
	0.043		12.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	35	0.0110	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.18"

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 12

Summary for Pond B-1: Subsurface infiltration system

Inflow Area =   1.680 ac, 39.29% Impervious, Inflow Depth = 2.16"   for 2-yr event
Inflow   =   4.09 cfs @ 12.09 hrs, Volume=   0.302 af
Outflow   =   0.49 cfs @ 12.77 hrs, Volume=   0.303 af, Atten= 88%, Lag= 40.6 min
Discarded   =   0.37 cfs @ 12.77 hrs, Volume=   0.299 af
Primary   =   0.12 cfs @ 12.77 hrs, Volume=   0.003 af
   Routed to Pond LS-B1 : Level Spreader

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 119.84' @ 12.77 hrs Surf.Area= 3,269 sf Storage= 5,467 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 151.4 min (956.4 - 804.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	117.80'	950 cf	**15.50'W x 119.00'L x 3.00'H Field A**
			5,534 cf Overall - 3,159 cf Embedded = 2,374 cf x 40.0% Voids
#2A	117.80'	3,038 cf	**StormTank 25 Series 24"** x 351 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			351 Chambers in 9 Rows
#3B	117.80'	682 cf	**18.50'W x 77.00'L x 2.50'H Field B**
			3,561 cf Overall - 1,856 cf Embedded = 1,705 cf x 40.0% Voids
#4B	117.80'	1,770 cf	**StormTank 25 Series 18"** x 275 Inside #3
			Inside= 18.0"W x 18.0"H => 2.15 sf x 3.00'L = 6.4 cf
			Outside= 18.0"W x 18.0"H => 2.25 sf x 3.00'L = 6.8 cf
			275 Chambers in 11 Rows
		6,440 cf	Total Available Storage

   Storage Group A created with Chamber Wizard
   Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**15.0" Round Culvert X 2.00**
			L= 24.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.00' / 115.80' S= 0.0500 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	119.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	117.80'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 115.80'

Discarded OutFlow Max=0.37 cfs @ 12.77 hrs HW=119.84'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.37 cfs)

Primary OutFlow Max=0.12 cfs @ 12.77 hrs HW=119.84' TW=116.36'   (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.12 cfs of 17.58 cfs potential flow)
   └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.12 cfs @ 0.63 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 2-yr Rainfall=3.18"*

Prepared by Langan Engineering   Printed 10/29/2025

HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 13

Pond B-1: Subsurface infiltration system - Chamber Wizard Field A

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)

Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

39 Chambers/Row x 3.00' Long = 117.00' Row Length +12.0" End Stone x 2 = 119.00' Base Length
9 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 15.50' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

351 Chambers x 8.7 cf = 3,038.3 cf Chamber Storage
351 Chambers x 9.0 cf = 3,159.0 cf Displacement

5,533.5 cf Field - 3,159.0 cf Chambers = 2,374.5 cf Stone x 40.0% Voids = 949.8 cf Stone Storage

Chamber Storage + Stone Storage = 3,988.1 cf = 0.092 af
Overall Storage Efficiency = 72.1%
Overall System Size = 119.00' x 15.50' x 3.00'

351 Chambers
204.9 cy Field
87.9 cy Stone

Pond B-1: Subsurface infiltration system - Chamber Wizard Field B

Chamber Model = StormTank 25 Series 18" (StormTank Module 25 Series)
Inside= 18.0"W x 18.0"H => 2.15 sf x 3.00'L = 6.4 cf
Outside= 18.0"W x 18.0"H => 2.25 sf x 3.00'L = 6.8 cf

25 Chambers/Row x 3.00' Long = 75.00' Row Length +12.0" End Stone x 2 = 77.00' Base Length
11 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 18.50' Base Width
18.0" Chamber Height + 12.0" Stone Cover = 2.50' Field Height

275 Chambers x 6.4 cf = 1,769.9 cf Chamber Storage
275 Chambers x 6.8 cf = 1,856.3 cf Displacement

3,561.3 cf Field - 1,856.3 cf Chambers = 1,705.0 cf Stone x 40.0% Voids = 682.0 cf Stone Storage

Chamber Storage + Stone Storage = 2,451.9 cf = 0.056 af
Overall Storage Efficiency = 68.9%
Overall System Size = 77.00' x 18.50' x 2.50'

275 Chambers
131.9 cy Field
63.1 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 2-yr Rainfall=3.18"*

Summary for Pond B-4: Subsurface Infiltration System

Inflow Area =   1.440 ac, 58.82% Impervious, Inflow Depth = 0.96"   for 2-yr event
Inflow   =   1.54 cfs @ 12.09 hrs, Volume=   0.115 af
Outflow   =   0.24 cfs @ 12.58 hrs, Volume=   0.115 af, Atten= 84%, Lag= 29.4 min
Discarded =   0.24 cfs @ 12.58 hrs, Volume=   0.115 af
Primary   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af
    Routed to Pond LS-B4 : Level Spreader

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 116.74' @ 12.58 hrs   Surf.Area= 3,502 sf   Storage= 1,523 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 42.4 min (835.3 - 792.9)

Volume	Invert	Avail.Storage	Storage Description
#1B	116.25'	1,754 cf	**17.00'W x 206.00'L x 3.00'H Field B**
			10,506 cf Overall - 6,120 cf Embedded = 4,386 cf x 40.0% Voids
#2B	116.25'	5,886 cf	**StormTank 25 Series 24"** x 680 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			680 Chambers in 10 Rows
		7,641 cf	Total Available Storage

   Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.06'	**15.0" Round Culvert**
			L= 164.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.06' / 115.45' S= 0.0098 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	118.50'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	116.25'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 114.20'

Discarded OutFlow Max=0.24 cfs @ 12.58 hrs HW=116.74' (Free Discharge)
 └─**3=Exfiltration** (Controls 0.24 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=116.25' TW=114.95' (Dynamic Tailwater)
 └─**1=Culvert** (Controls 0.00 cfs)
   └─**2=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering
Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC
Page 16

Pond B-4: Subsurface Infiltration System - Chamber Wizard Field B

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

68 Chambers/Row x 3.00' Long = 204.00' Row Length +12.0" End Stone x 2 = 206.00' Base Length
10 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 17.00' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

680 Chambers x 8.7 cf = 5,886.2 cf Chamber Storage
680 Chambers x 9.0 cf = 6,120.0 cf Displacement

10,506.0 cf Field - 6,120.0 cf Chambers = 4,386.0 cf Stone x 40.0% Voids = 1,754.4 cf Stone Storage

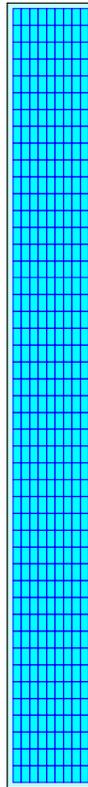Chamber Storage + Stone Storage = 7,640.6 cf = 0.175 af
Overall Storage Efficiency = 72.7%
Overall System Size = 206.00' x 17.00' x 3.00'

680 Chambers
389.1 cy Field
162.4 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 17

Summary for Pond B-5: Subsurface Infiltration System

Inflow Area =   0.870 ac, 55.17% Impervious, Inflow Depth = 2.33"   for 2-yr event
Inflow   =   2.27 cfs @ 12.09 hrs, Volume=   0.169 af
Outflow   =   0.22 cfs @ 12.97 hrs, Volume=   0.169 af, Atten= 91%, Lag= 53.0 min
Discarded =   0.22 cfs @ 12.97 hrs, Volume=   0.169 af
Primary   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af
    Routed to Pond B-4 : Subsurface Infiltration System

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 118.89' @ 12.97 hrs   Surf.Area= 2,170 sf   Storage= 2,989 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 130.6 min (928.6 - 798.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	117.33'	1,114 cf	**15.50'W x 140.00'L x 3.00'H Field A**
			6,510 cf Overall - 3,726 cf Embedded = 2,784 cf x 40.0% Voids
#2A	117.33'	3,584 cf	**StormTank 25 Series 24"** x 414 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			414 Chambers in 9 Rows
		4,697 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.33'	**18.0" Round Culvert**
			L= 40.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.33' / 117.00' S= 0.0082 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	119.30'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	117.33'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 115.33'

Discarded OutFlow Max=0.22 cfs @ 12.97 hrs HW=118.89'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.22 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=117.33' TW=116.25'   (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)
  └─**2=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)

Pond B-5: Subsurface Infiltration System - Chamber Wizard Field A

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

46 Chambers/Row x 3.00' Long = 138.00' Row Length +12.0" End Stone x 2 = 140.00' Base Length
9 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 15.50' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

414 Chambers x 8.7 cf = 3,583.7 cf Chamber Storage
414 Chambers x 9.0 cf = 3,726.0 cf Displacement

6,510.0 cf Field - 3,726.0 cf Chambers = 2,784.0 cf Stone x 40.0% Voids = 1,113.6 cf Stone Storage

Chamber Storage + Stone Storage = 4,697.3 cf = 0.108 af
Overall Storage Efficiency = 72.2%
Overall System Size = 140.00' x 15.50' x 3.00'

414 Chambers
241.1 cy Field
103.1 cy Stone

Summary for Pond LS-B1: Level Spreader

Inflow Area = 1.680 ac, 39.29% Impervious, Inflow Depth = 0.02" for 2-yr event
Inflow = 0.12 cfs @ 12.77 hrs, Volume= 0.003 af
Outflow = 0.13 cfs @ 12.95 hrs, Volume= 0.001 af, Atten= 0%, Lag= 11.0 min
Primary = 0.13 cfs @ 12.95 hrs, Volume= 0.001 af
     Routed to Link DP-B : Western Properties

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 117.52' @ 12.95 hrs Surf.Area= 180 sf Storage= 101 cf

Plug-Flow detention time= 17.9 min calculated for 0.001 af (30% of inflow)
Center-of-Mass det. time= 9.6 min (780.1 - 770.4)

Volume	Invert	Avail.Storage	Storage Description
#1	115.30'	65 cf	**3.00'W x 30.00'L x 2.20'H Prismatoid**
			198 cf Overall - 34 cf Embedded = 164 cf x 40.0% Voids
#2	117.50'	90 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	115.80'	34 cf	**15.0" Round Pipe Storage** Inside #1
			L= 28.0'
		190 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
117.50	90	0	0
118.50	90	90	90

Device	Routing	Invert	Outlet Devices
#1	Primary	117.50'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68
			2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.13 cfs @ 12.95 hrs HW=117.51' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 0.13 cfs @ 0.30 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 20

Summary for Pond LS-B4: Level Spreader

Inflow Area =   1.440 ac, 58.82% Impervious, Inflow Depth = 0.00"   for 2-yr event
Inflow   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af
Outflow   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af, Atten= 0%, Lag= 0.0 min
Primary   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af
      Routed to Link DP-B : Western Properties

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 114.95' @ 0.00 hrs   Surf.Area= 90 sf   Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	114.95'	65 cf	**3.00'W x 30.00'L x 2.20'H Prismatoid**
			198 cf Overall - 34 cf Embedded = 164 cf x 40.0% Voids
#2	117.15'	90 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	115.45'	34 cf	**15.0" Round Pipe Storage** Inside #1
			L= 28.0'
		190 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
117.15	90	0	0
118.15	90	90	90

Device	Routing	Invert	Outlet Devices
#1	Primary	117.15'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68
			2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=114.95' TW=0.00'   (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP-A: Isolated Vegetated Wetland

Inflow Area =   1.511 ac,   9.20% Impervious, Inflow Depth =   0.51"   for 2-yr event
Inflow   =   0.46 cfs @   12.31 hrs, Volume=   0.064 af
Primary   =   0.46 cfs @   12.31 hrs, Volume=   0.064 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link DP-B: Western Properties

Inflow Area =   3.584 ac, 42.05% Impervious, Inflow Depth =   0.01"   for 2-yr event
Inflow   =   0.13 cfs @   12.95 hrs, Volume=   0.002 af
Primary   =   0.13 cfs @   12.95 hrs, Volume=   0.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 23

Summary for Link DP-C: Hillman Street

Inflow Area =   0.335 ac, 12.84% Impervious, Inflow Depth = 0.00"   for 2-yr event
Inflow   =   0.00 cfs @ 23.99 hrs, Volume=   0.000 af
Primary   =   0.00 cfs @ 23.99 hrs, Volume=   0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*

Prepared by Langan Engineering   Printed 10/29/2025

HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 24

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PR-A: PR-A
Runoff Area=1.511 ac 9.20% Impervious Runoff Depth=1.50"
Flow Length=304' Tc=16.9 min CN=63 Runoff=1.77 cfs 0.189 af

Subcatchment PR-B1: Substation
Runoff Area=0.560 ac 7.14% Impervious Runoff Depth=3.46"
Flow Length=273' Tc=6.0 min CN=86 Runoff=2.19 cfs 0.161 af

Subcatchment PR-B2: Northwest Battery
Runoff Area=1.120 ac 55.36% Impervious Runoff Depth=4.08"
Flow Length=338' Slope=0.0170 '/' Tc=6.0 min CN=92 Runoff=4.97 cfs 0.381 af

Subcatchment PR-B3: 75 Hillman & West
Runoff Area=0.464 ac 0.00% Impervious Runoff Depth=0.35"
Flow Length=118' Tc=9.5 min CN=43 Runoff=0.06 cfs 0.014 af

Subcatchment PR-B4: Southwest site
Runoff Area=0.570 ac 64.39% Impervious Runoff Depth=4.19"
Flow Length=154' Slope=0.0250 '/' Tc=6.0 min CN=93 Runoff=2.57 cfs 0.199 af

Subcatchment PR-B5: East site
Runoff Area=0.870 ac 55.17% Impervious Runoff Depth=4.08"
Flow Length=236' Tc=6.0 min CN=92 Runoff=3.86 cfs 0.296 af

Subcatchment PR-C: South & West
Runoff Area=0.335 ac 12.84% Impervious Runoff Depth=0.20"
Flow Length=35' Slope=0.0110 '/' Tc=7.9 min CN=39 Runoff=0.01 cfs 0.006 af

Pond B-1: Subsurface infiltration system
Peak Elev=120.33' Storage=6,093 cf Inflow=7.16 cfs 0.542 af
Discarded=0.41 cfs 0.388 af Primary=6.17 cfs 0.154 af Outflow=6.58 cfs 0.542 af

Pond B-4: Subsurface Infiltration System
Peak Elev=117.90' Storage=5,132 cf Inflow=3.96 cfs 0.253 af
Discarded=0.35 cfs 0.253 af Primary=0.00 cfs 0.000 af Outflow=0.35 cfs 0.253 af

Pond B-5: Subsurface Infiltration System
Peak Elev=119.59' Storage=4,058 cf Inflow=3.86 cfs 0.296 af
Discarded=0.26 cfs 0.242 af Primary=2.53 cfs 0.054 af Outflow=2.79 cfs 0.296 af

Pond LS-B1: Level Spreader
Peak Elev=117.71' Storage=119 cf Inflow=6.17 cfs 0.154 af
Outflow=7.30 cfs 0.152 af

Pond LS-B4: Level Spreader
Peak Elev=114.95' Storage=0 cf Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Link DP-A: Isolated Vegetated Wetland
Inflow=1.77 cfs 0.189 af
Primary=1.77 cfs 0.189 af

Link DP-B: Western Properties
Inflow=7.32 cfs 0.166 af
Primary=7.32 cfs 0.166 af

Link DP-C: Hillman Street
Inflow=0.01 cfs 0.006 af
Primary=0.01 cfs 0.006 af

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 25

Summary for Subcatchment PR-A: PR-A

Runoff   =   1.77 cfs @ 12.26 hrs, Volume=   0.189 af, Depth= 1.50"
      Routed to Link DP-A : Isolated Vegetated Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.99"

	Area (ac)	CN	Description
	0.315	30	Woods, Good, HSG A
*	0.733	85	Gravel surface, HSG A
	0.056	39	>75% Grass cover, Good, HSG A
*	0.139	98	Impervious Surface, HSG A
	0.268	30	Meadow, non-grazed, HSG A
	1.511	63	Weighted Average
	1.372		90.80% Pervious Area
	0.139		9.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, SF-A**
					Woods: Light underbrush n= 0.400 P2= 3.18"
0.3	20	0.0500	1.12		**Shallow Concentrated Flow, SCF-1**
					Woodland Kv= 5.0 fps
2.9	87	0.0100	0.50		**Shallow Concentrated Flow, SCF-2**
					Woodland Kv= 5.0 fps
0.9	88	0.0110	1.69		**Shallow Concentrated Flow, SCF-3**
					Unpaved Kv= 16.1 fps
0.4	50	0.0200	2.28		**Shallow Concentrated Flow, SCF-4**
					Unpaved Kv= 16.1 fps
0.0	9	0.2800	3.70		**Shallow Concentrated Flow, SCF-5**
					Short Grass Pasture Kv= 7.0 fps
16.9	304				Total

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*

Summary for Subcatchment PR-B1: Substation

Runoff   =   2.19 cfs @ 12.09 hrs, Volume=   0.161 af, Depth= 3.46"
     Routed to Pond B-1 : Subsurface infiltration system

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.99"

	Area (ac)	CN	Description
*	0.520	85	Gravel surface, HSG A
*	0.040	98	Paved surface, HSG A
	0.560	86	Weighted Average
	0.520		92.86% Pervious Area
	0.040		7.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.19		**Sheet Flow, Crushed Stone**
					Smooth surfaces n= 0.011 P2= 3.18"
0.8	107	0.0200	2.28		**Shallow Concentrated Flow, SCF-1**
					Unpaved Kv= 16.1 fps
1.2	116	0.0100	1.61		**Shallow Concentrated Flow, SCF-2**
					Unpaved Kv= 16.1 fps
2.7	273				Total, Increased to minimum Tc = 6.0 min

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*

Summary for Subcatchment PR-B2: Northwest Battery

Runoff   =   4.97 cfs @ 12.09 hrs, Volume=   0.381 af, Depth= 4.08"
    Routed to Pond B-1 : Subsurface infiltration system

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.99"

	Area (ac)	CN	Description
	0.620	98	Paved parking, HSG A
*	0.500	85	Gravel surface, HSG A
	1.120	92	Weighted Average
	0.500		44.64% Pervious Area
	0.620		55.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0170	1.12		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
2.2	272	0.0170	2.10		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
0.1	16	0.0170	2.65		**Shallow Concentrated Flow, Road**
					Paved Kv= 20.3 fps
3.0	338		Total, Increased to minimum Tc = 6.0 min		

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 28

Summary for Subcatchment PR-B3: 75 Hillman & West

Runoff = 0.06 cfs @ 12.41 hrs, Volume= 0.014 af, Depth= 0.35"
     Routed to Link DP-B : Western Properties

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.99"

	Area (ac)	CN	Description
	0.015	39	>75% Grass cover, Good, HSG A
	0.339	30	Meadow, non-grazed, HSG A
*	0.110	85	Gravel surface, HSG A
	0.464	43	Weighted Average
	0.464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0170	0.09		**Sheet Flow, SF**
					Grass: Dense n= 0.240 P2= 3.18"
0.2	10	0.0170	0.91		**Shallow Concentrated Flow, SCF-1**
					Short Grass Pasture Kv= 7.0 fps
0.1	9	0.0470	1.52		**Shallow Concentrated Flow, SCF-2**
					Short Grass Pasture Kv= 7.0 fps
0.1	21	0.0371	3.10		**Shallow Concentrated Flow, Gravel Surface**
					Unpaved Kv= 16.1 fps
0.3	28	0.0540	1.63		**Shallow Concentrated Flow, SCF-3**
					Short Grass Pasture Kv= 7.0 fps
9.5	118	Total			

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*
Prepared by Langan Engineering
Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC
Page 29

Summary for Subcatchment PR-B4: Southwest site

Runoff   =   2.57 cfs @ 12.09 hrs, Volume=   0.199 af, Depth= 4.19"
    Routed to Pond B-4 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.99"

Area (ac)	CN	Description
* 0.203	85	Gravel surface, HSG A
0.367	98	Paved parking, HSG A
0.570	93	Weighted Average
0.203		35.61% Pervious Area
0.367		64.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.31		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
0.7	104	0.0250	2.55		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
1.3	154				Total, Increased to minimum Tc = 6.0 min

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*

Summary for Subcatchment PR-B5: East site

Runoff   =   3.86 cfs @ 12.09 hrs, Volume=   0.296 af, Depth= 4.08"
    Routed to Pond B-5 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.99"

Area (ac)	CN	Description
* 0.390	85	Gravel surface, HSG A
0.480	98	Paved parking, HSG A
0.870	92	Weighted Average
0.390		44.83% Pervious Area
0.480		55.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.31		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
0.3	41	0.0250	2.55		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
0.8	145	0.0200	2.87		**Shallow Concentrated Flow, Road**
					Paved Kv= 20.3 fps
1.7	236				Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment PR-C: South & West Property Outside Fence

Runoff   =   0.01 cfs @ 12.51 hrs, Volume=   0.006 af, Depth= 0.20"
      Routed to Link DP-C : Hillman Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=4.99"

	Area (ac)	CN	Description
	0.292	30	Meadow, non-grazed, HSG A
*	0.043	98	Impervious Surface, HSG A
	0.335	39	Weighted Average
	0.292		87.16% Pervious Area
	0.043		12.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	35	0.0110	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.18"

Summary for Pond B-1: Subsurface infiltration system

Inflow Area =   1.680 ac, 39.29% Impervious, Inflow Depth = 3.87"   for 10-yr event
Inflow   =   7.16 cfs @ 12.09 hrs, Volume=   0.542 af
Outflow   =   6.58 cfs @ 12.15 hrs, Volume=   0.542 af, Atten= 8%, Lag= 3.7 min
Discarded =   0.41 cfs @ 12.15 hrs, Volume=   0.388 af
Primary   =   6.17 cfs @ 12.15 hrs, Volume=   0.154 af
     Routed to Pond LS-B1 : Level Spreader

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 120.33' @ 12.15 hrs   Surf.Area= 3,269 sf   Storage= 6,093 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 117.2 min (906.4 - 789.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	117.80'	950 cf	**15.50'W x 119.00'L x 3.00'H Field A**
			5,534 cf Overall - 3,159 cf Embedded = 2,374 cf x 40.0% Voids
#2A	117.80'	3,038 cf	**StormTank 25 Series 24"** x 351 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			351 Chambers in 9 Rows
#3B	117.80'	682 cf	**18.50'W x 77.00'L x 2.50'H Field B**
			3,561 cf Overall - 1,856 cf Embedded = 1,705 cf x 40.0% Voids
#4B	117.80'	1,770 cf	**StormTank 25 Series 18"** x 275 Inside #3
			Inside= 18.0"W x 18.0"H => 2.15 sf x 3.00'L = 6.4 cf
			Outside= 18.0"W x 18.0"H => 2.25 sf x 3.00'L = 6.8 cf
			275 Chambers in 11 Rows
		6,440 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**15.0" Round Culvert X 2.00**
			L= 24.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.00' / 115.80' S= 0.0500 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	119.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	117.80'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 115.80'

Discarded OutFlow Max=0.41 cfs @ 12.15 hrs HW=120.33'   (Free Discharge)
└—**3=Exfiltration** (Controls 0.41 cfs)

Primary OutFlow Max=6.14 cfs @ 12.15 hrs HW=120.33' TW=117.71'   (Dynamic Tailwater)
└—**1=Culvert** (Passes 6.14 cfs of 19.11 cfs potential flow)
  └—**2=Sharp-Crested Rectangular Weir**(Weir Controls 6.14 cfs @ 2.38 fps)

Pond B-1: Subsurface infiltration system - Chamber Wizard Field A

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

39 Chambers/Row x 3.00' Long = 117.00' Row Length +12.0" End Stone x 2 = 119.00' Base Length
9 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 15.50' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

351 Chambers x 8.7 cf = 3,038.3 cf Chamber Storage
351 Chambers x 9.0 cf = 3,159.0 cf Displacement

5,533.5 cf Field - 3,159.0 cf Chambers = 2,374.5 cf Stone x 40.0% Voids = 949.8 cf Stone Storage

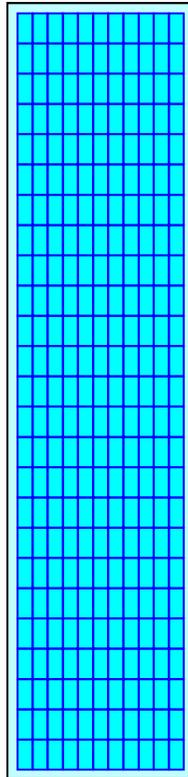Chamber Storage + Stone Storage = 3,988.1 cf = 0.092 af
Overall Storage Efficiency = 72.1%
Overall System Size = 119.00' x 15.50' x 3.00'

351 Chambers
204.9 cy Field
87.9 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 34

Pond B-1: Subsurface infiltration system - Chamber Wizard Field B

Chamber Model = StormTank 25 Series 18" (StormTank Module 25 Series)
Inside= 18.0"W x 18.0"H => 2.15 sf x 3.00'L = 6.4 cf
Outside= 18.0"W x 18.0"H => 2.25 sf x 3.00'L = 6.8 cf

25 Chambers/Row x 3.00' Long = 75.00' Row Length +12.0" End Stone x 2 = 77.00' Base Length
11 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 18.50' Base Width
18.0" Chamber Height + 12.0" Stone Cover = 2.50' Field Height

275 Chambers x 6.4 cf = 1,769.9 cf Chamber Storage
275 Chambers x 6.8 cf = 1,856.3 cf Displacement

3,561.3 cf Field - 1,856.3 cf Chambers = 1,705.0 cf Stone x 40.0% Voids = 682.0 cf Stone Storage

Chamber Storage + Stone Storage = 2,451.9 cf = 0.056 af
Overall Storage Efficiency = 68.9%
Overall System Size = 77.00' x 18.50' x 2.50'

275 Chambers
131.9 cy Field
63.1 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 35

Summary for Pond B-4: Subsurface Infiltration System

Inflow Area =   1.440 ac, 58.82% Impervious, Inflow Depth = 2.11"   for 10-yr event
Inflow   =   3.96 cfs @   12.20 hrs, Volume=   0.253 af
Outflow   =   0.35 cfs @   12.99 hrs, Volume=   0.253 af, Atten= 91%, Lag= 47.1 min
Discarded =   0.35 cfs @   12.99 hrs, Volume=   0.253 af
Primary   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af
     Routed to Pond LS-B4 : Level Spreader

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 117.90' @ 12.99 hrs   Surf.Area= 3,502 sf   Storage= 5,132 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 130.7 min (902.2 - 771.5)

Volume	Invert	Avail.Storage	Storage Description
#1B	116.25'	1,754 cf	**17.00'W x 206.00'L x 3.00'H Field B**
			10,506 cf Overall - 6,120 cf Embedded = 4,386 cf x 40.0% Voids
#2B	116.25'	5,886 cf	**StormTank 25 Series 24"** x 680 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			680 Chambers in 10 Rows
		7,641 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.06'	**15.0" Round Culvert**
			L= 164.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.06' / 115.45' S= 0.0098 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	118.50'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	116.25'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 114.20'

Discarded OutFlow Max=0.35 cfs @ 12.99 hrs HW=117.89'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.35 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=116.25' TW=114.95'   (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)
  └─**2=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*
Prepared by Langan Engineering
Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC
Page 36

Pond B-4: Subsurface Infiltration System - Chamber Wizard Field B

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

68 Chambers/Row x 3.00' Long = 204.00' Row Length +12.0" End Stone x 2 = 206.00' Base Length
10 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 17.00' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

680 Chambers x 8.7 cf = 5,886.2 cf Chamber Storage
680 Chambers x 9.0 cf = 6,120.0 cf Displacement

10,506.0 cf Field - 6,120.0 cf Chambers = 4,386.0 cf Stone x 40.0% Voids = 1,754.4 cf Stone Storage

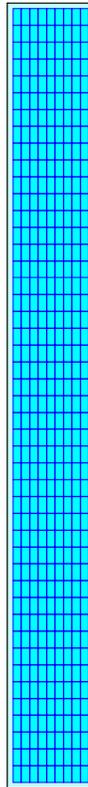Chamber Storage + Stone Storage = 7,640.6 cf = 0.175 af
Overall Storage Efficiency = 72.7%
Overall System Size = 206.00' x 17.00' x 3.00'

680 Chambers
389.1 cy Field
162.4 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*

Prepared by Langan Engineering
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC

Summary for Pond B-5: Subsurface Infiltration System

Inflow Area =   0.870 ac, 55.17% Impervious, Inflow Depth = 4.08"   for 10-yr event
Inflow   =   3.86 cfs @ 12.09 hrs, Volume=   0.296 af
Outflow   =   2.79 cfs @ 12.21 hrs, Volume=   0.296 af, Atten= 28%, Lag= 7.4 min
Discarded =   0.26 cfs @ 12.21 hrs, Volume=   0.242 af
Primary   =   2.53 cfs @ 12.21 hrs, Volume=   0.054 af
     Routed to Pond B-4 : Subsurface Infiltration System

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 119.59' @ 12.21 hrs   Surf.Area= 2,170 sf   Storage= 4,058 cf

Plug-Flow detention time= 132.5 min calculated for 0.296 af (100% of inflow)
Center-of-Mass det. time= 132.6 min (915.4 - 782.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	117.33'	1,114 cf	**15.50'W x 140.00'L x 3.00'H Field A**
			6,510 cf Overall - 3,726 cf Embedded = 2,784 cf x 40.0% Voids
#2A	117.33'	3,584 cf	**StormTank 25 Series 24"** x 414 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			414 Chambers in 9 Rows
		4,697 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.33'	**18.0" Round Culvert**
			L= 40.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.33' / 117.00' S= 0.0082 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	119.30'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	117.33'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 115.33'

Discarded OutFlow Max=0.26 cfs @ 12.21 hrs HW=119.57'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.26 cfs)

Primary OutFlow Max=2.28 cfs @ 12.21 hrs HW=119.57' TW=117.13'   (Dynamic Tailwater)
└─**1=Culvert** (Passes 2.28 cfs of 9.82 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir**(Weir Controls 2.28 cfs @ 1.70 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 38

Pond B-5: Subsurface Infiltration System - Chamber Wizard Field A

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

46 Chambers/Row x 3.00' Long = 138.00' Row Length +12.0" End Stone x 2 = 140.00' Base Length
9 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 15.50' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

414 Chambers x 8.7 cf = 3,583.7 cf Chamber Storage
414 Chambers x 9.0 cf = 3,726.0 cf Displacement

6,510.0 cf Field - 3,726.0 cf Chambers = 2,784.0 cf Stone x 40.0% Voids = 1,113.6 cf Stone Storage

Chamber Storage + Stone Storage = 4,697.3 cf = 0.108 af
Overall Storage Efficiency = 72.2%
Overall System Size = 140.00' x 15.50' x 3.00'

414 Chambers
241.1 cy Field
103.1 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 39

Summary for Pond LS-B1: Level Spreader

Inflow Area =   1.680 ac, 39.29% Impervious, Inflow Depth =   1.10"   for 10-yr event
Inflow   =   6.17 cfs @   12.15 hrs, Volume=   0.154 af
Outflow   =   7.30 cfs @   12.15 hrs, Volume=   0.152 af, Atten= 0%, Lag= 0.0 min
Primary   =   7.30 cfs @   12.15 hrs, Volume=   0.152 af
   Routed to Link DP-B : Western Properties

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 117.71' @ 12.15 hrs   Surf.Area= 180 sf   Storage= 119 cf

Plug-Flow detention time= 1.8 min calculated for 0.152 af (98% of inflow)
Center-of-Mass det. time= 0.4 min (745.8 - 745.4)

Volume	Invert	Avail.Storage	Storage Description
#1	115.30'	65 cf	**3.00'W x 30.00'L x 2.20'H Prismatoid**
			198 cf Overall - 34 cf Embedded = 164 cf x 40.0% Voids
#2	117.50'	90 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	115.80'	34 cf	**15.0" Round Pipe Storage** Inside #1
			L= 28.0'
		190 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
117.50	90	0	0
118.50	90	90	90

Device	Routing	Invert	Outlet Devices
#1	Primary	117.50'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68
			2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=7.22 cfs @ 12.15 hrs HW=117.71' TW=0.00'   (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 7.22 cfs @ 1.13 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 40

Summary for Pond LS-B4: Level Spreader

Inflow Area =   1.440 ac, 58.82% Impervious, Inflow Depth = 0.00"   for 10-yr event
Inflow   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af
Outflow   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af, Atten= 0%, Lag= 0.0 min
Primary   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af
      Routed to Link DP-B : Western Properties

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 114.95' @ 0.00 hrs   Surf.Area= 90 sf   Storage= 0 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	114.95'	65 cf	**3.00'W x 30.00'L x 2.20'H Prismatoid**
			198 cf Overall - 34 cf Embedded = 164 cf x 40.0% Voids
#2	117.15'	90 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	115.45'	34 cf	**15.0" Round Pipe Storage** Inside #1
			L= 28.0'
		190 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
117.15	90	0	0
118.15	90	90	90

Device	Routing	Invert	Outlet Devices
#1	Primary	117.15'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68
			2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=114.95' TW=0.00'   (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*

Summary for Link DP-A: Isolated Vegetated Wetland

Inflow Area =   1.511 ac,   9.20% Impervious, Inflow Depth =   1.50"   for 10-yr event
Inflow   =   1.77 cfs @   12.26 hrs, Volume=   0.189 af
Primary   =   1.77 cfs @   12.26 hrs, Volume=   0.189 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 10-yr Rainfall=4.99"*

Summary for Link DP-B: Western Properties

Inflow Area =   3.584 ac, 42.05% Impervious, Inflow Depth =   0.55"   for 10-yr event
Inflow   =   7.32 cfs @   12.15 hrs, Volume=   0.166 af
Primary   =   7.32 cfs @   12.15 hrs, Volume=   0.166 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link DP-C: Hillman Street

Inflow Area =   0.335 ac, 12.84% Impervious, Inflow Depth =   0.20"   for 10-yr event
Inflow   =   0.01 cfs @   12.51 hrs, Volume=   0.006 af
Primary   =   0.01 cfs @   12.51 hrs, Volume=   0.006 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 44

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR-A: PR-A   Runoff Area=1.511 ac 9.20% Impervious Runoff Depth=2.26"
Flow Length=304' Tc=16.9 min CN=63 Runoff=2.77 cfs 0.285 af

SubcatchmentPR-B1: Substation   Runoff Area=0.560 ac 7.14% Impervious Runoff Depth=4.52"
Flow Length=273' Tc=6.0 min CN=86 Runoff=2.83 cfs 0.211 af

SubcatchmentPR-B2: Northwest Battery   Runoff Area=1.120 ac 55.36% Impervious Runoff Depth=5.19"
Flow Length=338' Slope=0.0170 '/' Tc=6.0 min CN=92 Runoff=6.23 cfs 0.484 af

SubcatchmentPR-B3: 75 Hillman & West   Runoff Area=0.464 ac 0.00% Impervious Runoff Depth=0.72"
Flow Length=118' Tc=9.5 min CN=43 Runoff=0.18 cfs 0.028 af

SubcatchmentPR-B4: Southwest site   Runoff Area=0.570 ac 64.39% Impervious Runoff Depth=5.30"
Flow Length=154' Slope=0.0250 '/' Tc=6.0 min CN=93 Runoff=3.21 cfs 0.252 af

SubcatchmentPR-B5: East site   Runoff Area=0.870 ac 55.17% Impervious Runoff Depth=5.19"
Flow Length=236' Tc=6.0 min CN=92 Runoff=4.84 cfs 0.376 af

SubcatchmentPR-C: South & West   Runoff Area=0.335 ac 12.84% Impervious Runoff Depth=0.48"
Flow Length=35' Slope=0.0110 '/' Tc=7.9 min CN=39 Runoff=0.07 cfs 0.013 af

Pond B-1: Subsurface infiltration system   Peak Elev=120.47' Storage=6,195 cf Inflow=9.06 cfs 0.695 af
Discarded=0.43 cfs 0.431 af Primary=8.69 cfs 0.265 af Outflow=9.12 cfs 0.696 af

Pond B-4: Subsurface Infiltration System   Peak Elev=118.72' Storage=6,895 cf Inflow=7.99 cfs 0.360 af
Discarded=0.43 cfs 0.324 af Primary=1.65 cfs 0.036 af Outflow=2.08 cfs 0.360 af

Pond B-5: Subsurface Infiltration System   Peak Elev=119.77' Storage=4,211 cf Inflow=4.84 cfs 0.376 af
Discarded=0.27 cfs 0.268 af Primary=4.93 cfs 0.108 af Outflow=5.20 cfs 0.376 af

Pond LS-B1: Level Spreader   Peak Elev=117.73' Storage=121 cf Inflow=8.69 cfs 0.265 af
Outflow=8.25 cfs 0.262 af

Pond LS-B4: Level Spreader   Peak Elev=117.26' Storage=110 cf Inflow=1.65 cfs 0.036 af
Outflow=2.68 cfs 0.034 af

Link DP-A: Isolated Vegetated Wetland   Inflow=2.77 cfs 0.285 af
Primary=2.77 cfs 0.285 af

Link DP-B: Western Properties   Inflow=8.69 cfs 0.324 af
Primary=8.69 cfs 0.324 af

Link DP-C: Hillman Street   Inflow=0.07 cfs 0.013 af
Primary=0.07 cfs 0.013 af

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*

Summary for Subcatchment PR-A: PR-A

Runoff   =   2.77 cfs @ 12.25 hrs, Volume=   0.285 af, Depth= 2.26"
    Routed to Link DP-A : Isolated Vegetated Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.12"

Area (ac)		CN	Description
	0.315	30	Woods, Good, HSG A
*	0.733	85	Gravel surface, HSG A
	0.056	39	>75% Grass cover, Good, HSG A
*	0.139	98	Impervious Surface, HSG A
	0.268	30	Meadow, non-grazed, HSG A
	1.511	63	Weighted Average
	1.372		90.80% Pervious Area
	0.139		9.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, SF-A**
					Woods: Light underbrush n= 0.400 P2= 3.18"
0.3	20	0.0500	1.12		**Shallow Concentrated Flow, SCF-1**
					Woodland Kv= 5.0 fps
2.9	87	0.0100	0.50		**Shallow Concentrated Flow, SCF-2**
					Woodland Kv= 5.0 fps
0.9	88	0.0110	1.69		**Shallow Concentrated Flow, SCF-3**
					Unpaved Kv= 16.1 fps
0.4	50	0.0200	2.28		**Shallow Concentrated Flow, SCF-4**
					Unpaved Kv= 16.1 fps
0.0	9	0.2800	3.70		**Shallow Concentrated Flow, SCF-5**
					Short Grass Pasture Kv= 7.0 fps
16.9	304	Total			

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*

Summary for Subcatchment PR-B1: Substation

Runoff   =   2.83 cfs @ 12.09 hrs, Volume=   0.211 af, Depth= 4.52"
     Routed to Pond B-1 : Subsurface infiltration system

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.12"

	Area (ac)	CN	Description		
*	0.520	85	Gravel surface, HSG A		
*	0.040	98	Paved surface, HSG A		
	0.560	86	Weighted Average		
	0.520		92.86% Pervious Area		
	0.040		7.14% Impervious Area		

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.19		**Sheet Flow, Crushed Stone**
					Smooth surfaces n= 0.011 P2= 3.18"
0.8	107	0.0200	2.28		**Shallow Concentrated Flow, SCF-1**
					Unpaved Kv= 16.1 fps
1.2	116	0.0100	1.61		**Shallow Concentrated Flow, SCF-2**
					Unpaved Kv= 16.1 fps
2.7	273				Total, Increased to minimum Tc = 6.0 min

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*

Summary for Subcatchment PR-B2: Northwest Battery

Runoff   =   6.23 cfs @ 12.09 hrs, Volume=   0.484 af, Depth= 5.19"
    Routed to Pond B-1 : Subsurface infiltration system

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.12"

	Area (ac)	CN	Description
	0.620	98	Paved parking, HSG A
*	0.500	85	Gravel surface, HSG A
	1.120	92	Weighted Average
	0.500		44.64% Pervious Area
	0.620		55.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0170	1.12		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
2.2	272	0.0170	2.10		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
0.1	16	0.0170	2.65		**Shallow Concentrated Flow, Road**
					Paved Kv= 20.3 fps
3.0	338				Total, Increased to minimum Tc = 6.0 min

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*

Summary for Subcatchment PR-B3: 75 Hillman & West

Runoff   =   0.18 cfs @ 12.22 hrs, Volume=   0.028 af, Depth= 0.72"
    Routed to Link DP-B : Western Properties

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.12"

Area (ac)	CN	Description
0.015	39	>75% Grass cover, Good, HSG A
0.339	30	Meadow, non-grazed, HSG A
* 0.110	85	Gravel surface, HSG A
0.464	43	Weighted Average
0.464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0170	0.09		**Sheet Flow, SF**
					Grass: Dense n= 0.240 P2= 3.18"
0.2	10	0.0170	0.91		**Shallow Concentrated Flow, SCF-1**
					Short Grass Pasture Kv= 7.0 fps
0.1	9	0.0470	1.52		**Shallow Concentrated Flow, SCF-2**
					Short Grass Pasture Kv= 7.0 fps
0.1	21	0.0371	3.10		**Shallow Concentrated Flow, Gravel Surface**
					Unpaved Kv= 16.1 fps
0.3	28	0.0540	1.63		**Shallow Concentrated Flow, SCF-3**
					Short Grass Pasture Kv= 7.0 fps
9.5	118	Total			

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*

Summary for Subcatchment PR-B4: Southwest site

Runoff   =   3.21 cfs @ 12.09 hrs, Volume=   0.252 af, Depth= 5.30"
    Routed to Pond B-4 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.12"

	Area (ac)	CN	Description
*	0.203	85	Gravel surface, HSG A
	0.367	98	Paved parking, HSG A
	0.570	93	Weighted Average
	0.203		35.61% Pervious Area
	0.367		64.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.31		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
0.7	104	0.0250	2.55		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
1.3	154				Total, Increased to minimum Tc = 6.0 min

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*

Summary for Subcatchment PR-B5: East site

Runoff = 4.84 cfs @ 12.09 hrs, Volume= 0.376 af, Depth= 5.19"
  Routed to Pond B-5 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.12"

	Area (ac)	CN	Description
*	0.390	85	Gravel surface, HSG A
	0.480	98	Paved parking, HSG A
	0.870	92	Weighted Average
	0.390		44.83% Pervious Area
	0.480		55.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.31		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
0.3	41	0.0250	2.55		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
0.8	145	0.0200	2.87		**Shallow Concentrated Flow, Road**
					Paved Kv= 20.3 fps
1.7	236				Total, Increased to minimum Tc = 6.0 min

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 51

Summary for Subcatchment PR-C: South & West Property Outside Fence

Runoff   =   0.07 cfs @ 12.36 hrs, Volume=   0.013 af, Depth= 0.48"
    Routed to Link DP-C : Hillman Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.12"

	Area (ac)	CN	Description
	0.292	30	Meadow, non-grazed, HSG A
*	0.043	98	Impervious Surface, HSG A
	0.335	39	Weighted Average
	0.292		87.16% Pervious Area
	0.043		12.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	35	0.0110	0.07		**Sheet Flow,**
					Grass: Dense n= 0.240 P2= 3.18"

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*

Summary for Pond B-1: Subsurface infiltration system

Inflow Area =   1.680 ac, 39.29% Impervious, Inflow Depth = 4.97" for 25-yr event
Inflow   =   9.06 cfs @ 12.09 hrs, Volume=   0.695 af
Outflow   =   9.12 cfs @ 12.10 hrs, Volume=   0.696 af, Atten= 0%, Lag= 0.8 min
Discarded =   0.43 cfs @ 12.10 hrs, Volume=   0.431 af
Primary   =   8.69 cfs @ 12.10 hrs, Volume=   0.265 af
   Routed to Pond LS-B1 : Level Spreader

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 120.47' @ 12.10 hrs   Surf.Area= 3,269 sf   Storage= 6,195 cf

Plug-Flow detention time= 104.8 min calculated for 0.695 af (100% of inflow)
Center-of-Mass det. time= 105.2 min (887.9 - 782.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	117.80'	950 cf	**15.50'W x 119.00'L x 3.00'H Field A**
			5,534 cf Overall - 3,159 cf Embedded = 2,374 cf x 40.0% Voids
#2A	117.80'	3,038 cf	**StormTank 25 Series 24"** x 351 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			351 Chambers in 9 Rows
#3B	117.80'	682 cf	**18.50'W x 77.00'L x 2.50'H Field B**
			3,561 cf Overall - 1,856 cf Embedded = 1,705 cf x 40.0% Voids
#4B	117.80'	1,770 cf	**StormTank 25 Series 18"** x 275 Inside #3
			Inside= 18.0"W x 18.0"H => 2.15 sf x 3.00'L = 6.4 cf
			Outside= 18.0"W x 18.0"H => 2.25 sf x 3.00'L = 6.8 cf
			275 Chambers in 11 Rows
		6,440 cf	Total Available Storage

  Storage Group A created with Chamber Wizard
  Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**15.0" Round Culvert X 2.00**
			L= 24.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.00' / 115.80' S= 0.0500 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	119.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	117.80'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 115.80'

Discarded OutFlow Max=0.43 cfs @ 12.10 hrs HW=120.47'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.43 cfs)

Primary OutFlow Max=8.66 cfs @ 12.10 hrs HW=120.47' TW=117.72' (Dynamic Tailwater)
└─**1=Culvert** (Passes 8.66 cfs of 19.58 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir**(Weir Controls 8.66 cfs @ 2.67 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*
Prepared by Langan Engineering
Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC
Page 53

Pond B-1: Subsurface infiltration system - Chamber Wizard Field A

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

39 Chambers/Row x 3.00' Long = 117.00' Row Length +12.0" End Stone x 2 = 119.00' Base Length
9 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 15.50' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

351 Chambers x 8.7 cf = 3,038.3 cf Chamber Storage
351 Chambers x 9.0 cf = 3,159.0 cf Displacement

5,533.5 cf Field - 3,159.0 cf Chambers = 2,374.5 cf Stone x 40.0% Voids = 949.8 cf Stone Storage

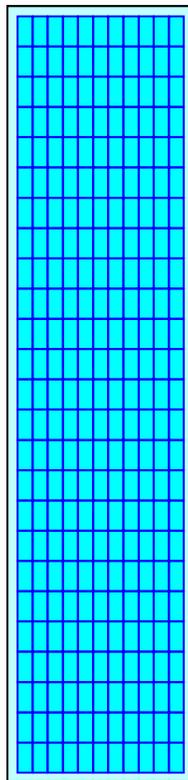Chamber Storage + Stone Storage = 3,988.1 cf = 0.092 af
Overall Storage Efficiency = 72.1%
Overall System Size = 119.00' x 15.50' x 3.00'

351 Chambers
204.9 cy Field
87.9 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 54

Pond B-1: Subsurface infiltration system - Chamber Wizard Field B

Chamber Model = StormTank 25 Series 18" (StormTank Module 25 Series)
Inside= 18.0"W x 18.0"H => 2.15 sf x 3.00'L = 6.4 cf
Outside= 18.0"W x 18.0"H => 2.25 sf x 3.00'L = 6.8 cf

25 Chambers/Row x 3.00' Long = 75.00' Row Length +12.0" End Stone x 2 = 77.00' Base Length
11 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 18.50' Base Width
18.0" Chamber Height + 12.0" Stone Cover = 2.50' Field Height

275 Chambers x 6.4 cf = 1,769.9 cf Chamber Storage
275 Chambers x 6.8 cf = 1,856.3 cf Displacement

3,561.3 cf Field - 1,856.3 cf Chambers = 1,705.0 cf Stone x 40.0% Voids = 682.0 cf Stone Storage

Chamber Storage + Stone Storage = 2,451.9 cf = 0.056 af
Overall Storage Efficiency = 68.9%
Overall System Size = 77.00' x 18.50' x 2.50'

275 Chambers
131.9 cy Field
63.1 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*

Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 55

Summary for Pond B-4: Subsurface Infiltration System

Inflow Area =   1.440 ac, 58.82% Impervious, Inflow Depth = 3.00"   for 25-yr event
Inflow   =   7.99 cfs @   12.11 hrs, Volume=   0.360 af
Outflow   =   2.08 cfs @   12.45 hrs, Volume=   0.360 af, Atten= 74%, Lag= 20.5 min
Discarded =   0.43 cfs @   12.46 hrs, Volume=   0.324 af
Primary   =   1.65 cfs @   12.45 hrs, Volume=   0.036 af
    Routed to Pond LS-B4 : Level Spreader

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 118.72' @ 12.46 hrs   Surf.Area= 3,502 sf   Storage= 6,895 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 143.0 min (907.0 - 764.0)

Volume	Invert	Avail.Storage	Storage Description
#1B	116.25'	1,754 cf	**17.00'W x 206.00'L x 3.00'H Field B**
			10,506 cf Overall - 6,120 cf Embedded = 4,386 cf x 40.0% Voids
#2B	116.25'	5,886 cf	**StormTank 25 Series 24"** x 680 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			680 Chambers in 10 Rows
		7,641 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.06'	**15.0" Round Culvert**
			L= 164.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.06' / 115.45' S= 0.0098 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	118.50'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	116.25'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 114.20'

Discarded OutFlow Max=0.43 cfs @ 12.46 hrs HW=118.72'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.43 cfs)

Primary OutFlow Max=1.62 cfs @ 12.45 hrs HW=118.72' TW=117.25'   (Dynamic Tailwater)
└─**1=Culvert** (Passes 1.62 cfs of 5.29 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir**(Weir Controls 1.62 cfs @ 1.52 fps)

Pond B-4: Subsurface Infiltration System - Chamber Wizard Field B

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

68 Chambers/Row x 3.00' Long = 204.00' Row Length +12.0" End Stone x 2 = 206.00' Base Length
10 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 17.00' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

680 Chambers x 8.7 cf = 5,886.2 cf Chamber Storage
680 Chambers x 9.0 cf = 6,120.0 cf Displacement

10,506.0 cf Field - 6,120.0 cf Chambers = 4,386.0 cf Stone x 40.0% Voids = 1,754.4 cf Stone Storage

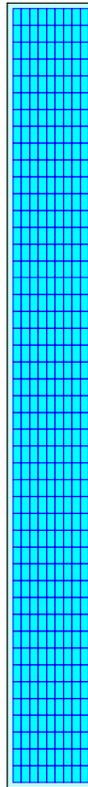Chamber Storage + Stone Storage = 7,640.6 cf = 0.175 af
Overall Storage Efficiency = 72.7%
Overall System Size = 206.00' x 17.00' x 3.00'

680 Chambers
389.1 cy Field
162.4 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 57

Summary for Pond B-5: Subsurface Infiltration System

Inflow Area =   0.870 ac, 55.17% Impervious, Inflow Depth = 5.19"   for 25-yr event
Inflow   =   4.84 cfs @ 12.09 hrs, Volume=   0.376 af
Outflow   =   5.20 cfs @ 12.12 hrs, Volume=   0.376 af, Atten= 0%, Lag= 1.9 min
Discarded =   0.27 cfs @ 12.12 hrs, Volume=   0.268 af
Primary   =   4.93 cfs @ 12.12 hrs, Volume=   0.108 af
    Routed to Pond B-4 : Subsurface Infiltration System

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 119.77' @ 12.12 hrs   Surf.Area= 2,170 sf   Storage= 4,211 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 119.7 min (896.2 - 776.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	117.33'	1,114 cf	**15.50'W x 140.00'L x 3.00'H Field A**
			6,510 cf Overall - 3,726 cf Embedded = 2,784 cf x 40.0% Voids
#2A	117.33'	3,584 cf	**StormTank 25 Series 24"** x 414 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			414 Chambers in 9 Rows
		4,697 cf	Total Available Storage

    Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.33'	**18.0" Round Culvert**
			L= 40.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.33' / 117.00' S= 0.0082 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	119.30'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	117.33'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 115.33'

Discarded OutFlow Max=0.27 cfs @ 12.12 hrs HW=119.71'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.27 cfs)

Primary OutFlow Max=4.32 cfs @ 12.12 hrs HW=119.72' TW=117.27'   (Dynamic Tailwater)
└─**1=Culvert** (Passes 4.32 cfs of 10.47 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 4.32 cfs @ 2.11 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*

Pond B-5: Subsurface Infiltration System - Chamber Wizard Field A

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

46 Chambers/Row x 3.00' Long = 138.00' Row Length +12.0" End Stone x 2 = 140.00' Base Length
9 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 15.50' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

414 Chambers x 8.7 cf = 3,583.7 cf Chamber Storage
414 Chambers x 9.0 cf = 3,726.0 cf Displacement

6,510.0 cf Field - 3,726.0 cf Chambers = 2,784.0 cf Stone x 40.0% Voids = 1,113.6 cf Stone Storage

Chamber Storage + Stone Storage = 4,697.3 cf = 0.108 af
Overall Storage Efficiency = 72.2%
Overall System Size = 140.00' x 15.50' x 3.00'

414 Chambers
241.1 cy Field
103.1 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*

Summary for Pond LS-B1: Level Spreader

Inflow Area =   1.680 ac, 39.29% Impervious, Inflow Depth = 1.89"   for 25-yr event
Inflow   =   8.69 cfs @   12.10 hrs, Volume=   0.265 af
Outflow   =   8.25 cfs @   12.15 hrs, Volume=   0.262 af, Atten= 5%, Lag= 2.9 min
Primary   =   8.25 cfs @   12.15 hrs, Volume=   0.262 af
     Routed to Link DP-B : Western Properties

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 117.73' @ 12.15 hrs   Surf.Area= 180 sf   Storage= 121 cf

Plug-Flow detention time= 1.6 min calculated for 0.262 af (99% of inflow)
Center-of-Mass det. time= 0.3 min (746.0 - 745.7)

Volume	Invert	Avail.Storage	Storage Description
#1	115.30'	65 cf	**3.00'W x 30.00'L x 2.20'H Prismatoid**
			198 cf Overall - 34 cf Embedded = 164 cf x 40.0% Voids
#2	117.50'	90 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	115.80'	34 cf	**15.0" Round Pipe Storage** Inside #1
			L= 28.0'
		190 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
117.50	90	0	0
118.50	90	90	90

Device	Routing	Invert	Outlet Devices
#1	Primary	117.50'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=8.25 cfs @ 12.15 hrs HW=117.73' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 8.25 cfs @ 1.19 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 60

Summary for Pond LS-B4: Level Spreader

Inflow Area =   1.440 ac, 58.82% Impervious, Inflow Depth = 0.30"   for 25-yr event
Inflow   =   1.65 cfs @ 12.45 hrs, Volume=   0.036 af
Outflow   =   2.68 cfs @ 12.45 hrs, Volume=   0.034 af, Atten= 0%, Lag= 0.0 min
Primary   =   2.68 cfs @ 12.45 hrs, Volume=   0.034 af
    Routed to Link DP-B : Western Properties

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 117.26' @ 12.45 hrs   Surf.Area= 180 sf   Storage= 110 cf

Plug-Flow detention time= 2.6 min calculated for 0.034 af (94% of inflow)
Center-of-Mass det. time= 0.9 min (755.6 - 754.7)

Volume	Invert	Avail.Storage	Storage Description
#1	114.95'	65 cf	**3.00'W x 30.00'L x 2.20'H Prismatoid**
			198 cf Overall - 34 cf Embedded = 164 cf x 40.0% Voids
#2	117.15'	90 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	115.45'	34 cf	**15.0" Round Pipe Storage** Inside #1
			L= 28.0'
		190 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
117.15	90	0	0
118.15	90	90	90

Device	Routing	Invert	Outlet Devices
#1	Primary	117.15'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68
			2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=2.59 cfs @ 12.45 hrs HW=117.26' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 2.59 cfs @ 0.80 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*

Summary for Link DP-A: Isolated Vegetated Wetland

Inflow Area =   1.511 ac,   9.20% Impervious, Inflow Depth = 2.26"   for 25-yr event
Inflow   =   2.77 cfs @   12.25 hrs, Volume=   0.285 af
Primary   =   2.77 cfs @   12.25 hrs, Volume=   0.285 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*

Summary for Link DP-B: Western Properties

Inflow Area =   3.584 ac, 42.05% Impervious, Inflow Depth =   1.08"   for 25-yr event
Inflow   =   8.69 cfs @   12.13 hrs, Volume=   0.324 af
Primary   =   8.69 cfs @   12.13 hrs, Volume=   0.324 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 25-yr Rainfall=6.12"*

Summary for Link DP-C: Hillman Street

Inflow Area =   0.335 ac, 12.84% Impervious, Inflow Depth =   0.48"   for 25-yr event
Inflow   =   0.07 cfs @   12.36 hrs, Volume=   0.013 af
Primary   =   0.07 cfs @   12.36 hrs, Volume=   0.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*
Prepared by Langan Engineering

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR-A: PR-A
Runoff Area=1.511 ac 9.20% Impervious Runoff Depth=2.87"
Flow Length=304' Tc=16.9 min CN=63 Runoff=3.58 cfs 0.362 af

SubcatchmentPR-B1: Substation
Runoff Area=0.560 ac 7.14% Impervious Runoff Depth=5.33"
Flow Length=273' Tc=6.0 min CN=86 Runoff=3.31 cfs 0.249 af

SubcatchmentPR-B2: Northwest Battery
Runoff Area=1.120 ac 55.36% Impervious Runoff Depth=6.02"
Flow Length=338' Slope=0.0170 '/' Tc=6.0 min CN=92 Runoff=7.16 cfs 0.561 af

SubcatchmentPR-B3: 75 Hillman & West
Runoff Area=0.464 ac 0.00% Impervious Runoff Depth=1.06"
Flow Length=118' Tc=9.5 min CN=43 Runoff=0.33 cfs 0.041 af

SubcatchmentPR-B4: Southwest site
Runoff Area=0.570 ac 64.39% Impervious Runoff Depth=6.13"
Flow Length=154' Slope=0.0250 '/' Tc=6.0 min CN=93 Runoff=3.68 cfs 0.291 af

SubcatchmentPR-B5: East site
Runoff Area=0.870 ac 55.17% Impervious Runoff Depth=6.02"
Flow Length=236' Tc=6.0 min CN=92 Runoff=5.56 cfs 0.436 af

SubcatchmentPR-C: South & West
Runoff Area=0.335 ac 12.84% Impervious Runoff Depth=0.75"
Flow Length=35' Slope=0.0110 '/' Tc=7.9 min CN=39 Runoff=0.13 cfs 0.021 af

Pond B-1: Subsurface infiltration system
Peak Elev=120.54' Storage=6,245 cf Inflow=10.47 cfs 0.810 af
Discarded=0.43 cfs 0.460 af Primary=10.01 cfs 0.350 af Outflow=10.44 cfs 0.810 af

Pond B-4: Subsurface Infiltration System
Peak Elev=118.86' Storage=7,099 cf Inflow=8.86 cfs 0.441 af
Discarded=0.44 cfs 0.348 af Primary=3.96 cfs 0.094 af Outflow=4.41 cfs 0.442 af

Pond B-5: Subsurface Infiltration System
Peak Elev=119.77' Storage=4,213 cf Inflow=5.56 cfs 0.436 af
Discarded=0.27 cfs 0.286 af Primary=5.20 cfs 0.150 af Outflow=5.47 cfs 0.436 af

Pond LS-B1: Level Spreader
Peak Elev=117.75' Storage=123 cf Inflow=10.01 cfs 0.350 af
Outflow=9.46 cfs 0.348 af

Pond LS-B4: Level Spreader
Peak Elev=117.31' Storage=114 cf Inflow=3.96 cfs 0.094 af
Outflow=4.55 cfs 0.092 af

Link DP-A: Isolated Vegetated Wetland
Inflow=3.58 cfs 0.362 af
Primary=3.58 cfs 0.362 af

Link DP-B: Western Properties
Inflow=9.63 cfs 0.481 af
Primary=9.63 cfs 0.481 af

Link DP-C: Hillman Street
Inflow=0.13 cfs 0.021 af
Primary=0.13 cfs 0.021 af

Summary for Subcatchment PR-A: PR-A

Runoff   =   3.58 cfs @ 12.25 hrs, Volume=   0.362 af, Depth= 2.87"
    Routed to Link DP-A : Isolated Vegetated Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.96"

	Area (ac)	CN	Description
	0.315	30	Woods, Good, HSG A
*	0.733	85	Gravel surface, HSG A
	0.056	39	>75% Grass cover, Good, HSG A
*	0.139	98	Impervious Surface, HSG A
	0.268	30	Meadow, non-grazed, HSG A
	1.511	63	Weighted Average
	1.372		90.80% Pervious Area
	0.139		9.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, SF-A**
					Woods: Light underbrush n= 0.400 P2= 3.18"
0.3	20	0.0500	1.12		**Shallow Concentrated Flow, SCF-1**
					Woodland Kv= 5.0 fps
2.9	87	0.0100	0.50		**Shallow Concentrated Flow, SCF-2**
					Woodland Kv= 5.0 fps
0.9	88	0.0110	1.69		**Shallow Concentrated Flow, SCF-3**
					Unpaved Kv= 16.1 fps
0.4	50	0.0200	2.28		**Shallow Concentrated Flow, SCF-4**
					Unpaved Kv= 16.1 fps
0.0	9	0.2800	3.70		**Shallow Concentrated Flow, SCF-5**
					Short Grass Pasture Kv= 7.0 fps
16.9	304	Total			

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*

Summary for Subcatchment PR-B1: Substation

Runoff   =   3.31 cfs @ 12.09 hrs, Volume=   0.249 af, Depth= 5.33"
    Routed to Pond B-1 : Subsurface infiltration system

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.96"

Area (ac)		CN	Description
*	0.520	85	Gravel surface, HSG A
*	0.040	98	Paved surface, HSG A
	0.560	86	Weighted Average
	0.520		92.86% Pervious Area
	0.040		7.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.19		**Sheet Flow, Crushed Stone**
					Smooth surfaces n= 0.011 P2= 3.18"
0.8	107	0.0200	2.28		**Shallow Concentrated Flow, SCF-1**
					Unpaved Kv= 16.1 fps
1.2	116	0.0100	1.61		**Shallow Concentrated Flow, SCF-2**
					Unpaved Kv= 16.1 fps
2.7	273				Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment PR-B2: Northwest Battery

Runoff   =   7.16 cfs @ 12.09 hrs, Volume=   0.561 af, Depth= 6.02"
    Routed to Pond B-1 : Subsurface infiltration system

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.96"

	Area (ac)	CN	Description
	0.620	98	Paved parking, HSG A
*	0.500	85	Gravel surface, HSG A
	1.120	92	Weighted Average
	0.500		44.64% Pervious Area
	0.620		55.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0170	1.12		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
2.2	272	0.0170	2.10		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
0.1	16	0.0170	2.65		**Shallow Concentrated Flow, Road**
					Paved Kv= 20.3 fps
3.0	338				Total, Increased to minimum Tc = 6.0 min

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*
Prepared by Langan Engineering　　　　　　　　　　　　　　　　　　Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC　　　　　Page 68

Summary for Subcatchment PR-B3: 75 Hillman & West

Runoff　　=　　　0.33 cfs @ 12.18 hrs, Volume=　　　　0.041 af, Depth= 1.06"
　　Routed to Link DP-B : Western Properties

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.96"

	Area (ac)	CN	Description
	0.015	39	>75% Grass cover, Good, HSG A
	0.339	30	Meadow, non-grazed, HSG A
*	0.110	85	Gravel surface, HSG A
	0.464	43	Weighted Average
	0.464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0170	0.09		**Sheet Flow, SF**
					Grass: Dense n= 0.240 P2= 3.18"
0.2	10	0.0170	0.91		**Shallow Concentrated Flow, SCF-1**
					Short Grass Pasture Kv= 7.0 fps
0.1	9	0.0470	1.52		**Shallow Concentrated Flow, SCF-2**
					Short Grass Pasture Kv= 7.0 fps
0.1	21	0.0371	3.10		**Shallow Concentrated Flow, Gravel Surface**
					Unpaved Kv= 16.1 fps
0.3	28	0.0540	1.63		**Shallow Concentrated Flow, SCF-3**
					Short Grass Pasture Kv= 7.0 fps
9.5	118	Total			

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*

Summary for Subcatchment PR-B4: Southwest site

Runoff   =   3.68 cfs @ 12.09 hrs, Volume=   0.291 af, Depth= 6.13"
        Routed to Pond B-4 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.96"

	Area (ac)	CN	Description
*	0.203	85	Gravel surface, HSG A
	0.367	98	Paved parking, HSG A
	0.570	93	Weighted Average
	0.203		35.61% Pervious Area
	0.367		64.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.31		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
0.7	104	0.0250	2.55		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
1.3	154				Total, Increased to minimum Tc = 6.0 min

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*

Summary for Subcatchment PR-B5: East site

Runoff = 5.56 cfs @ 12.09 hrs, Volume= 0.436 af, Depth= 6.02"
    Routed to Pond B-5 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.96"

	Area (ac)	CN	Description
*	0.390	85	Gravel surface, HSG A
	0.480	98	Paved parking, HSG A
	0.870	92	Weighted Average
	0.390		44.83% Pervious Area
	0.480		55.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.31		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
0.3	41	0.0250	2.55		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
0.8	145	0.0200	2.87		**Shallow Concentrated Flow, Road**
					Paved Kv= 20.3 fps
1.7	236				Total, Increased to minimum Tc = 6.0 min

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 71

Summary for Subcatchment PR-C: South & West Property Outside Fence

Runoff   =   0.13 cfs @ 12.22 hrs, Volume=   0.021 af, Depth= 0.75"
    Routed to Link DP-C : Hillman Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-yr Rainfall=6.96"

Area (ac)	CN	Description
0.292	30	Meadow, non-grazed, HSG A
* 0.043	98	Impervious Surface, HSG A
0.335	39	Weighted Average
0.292		87.16% Pervious Area
0.043		12.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	35	0.0110	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.18"

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*

Summary for Pond B-1: Subsurface infiltration system

Inflow Area =   1.680 ac, 39.29% Impervious, Inflow Depth = 5.79"   for 50-yr event
Inflow   =   10.47 cfs @ 12.09 hrs, Volume=   0.810 af
Outflow   =   10.44 cfs @ 12.10 hrs, Volume=   0.810 af, Atten= 0%, Lag= 0.7 min
Discarded =   0.43 cfs @ 12.10 hrs, Volume=   0.460 af
Primary   =   10.01 cfs @ 12.10 hrs, Volume=   0.350 af
   Routed to Pond LS-B1 : Level Spreader

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 120.54' @ 12.10 hrs   Surf.Area= 3,269 sf   Storage= 6,245 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 98.2 min (877.1 - 778.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	117.80'	950 cf	**15.50'W x 119.00'L x 3.00'H Field A**
			5,534 cf Overall - 3,159 cf Embedded = 2,374 cf x 40.0% Voids
#2A	117.80'	3,038 cf	**StormTank 25 Series 24"** x 351 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			351 Chambers in 9 Rows
#3B	117.80'	682 cf	**18.50'W x 77.00'L x 2.50'H Field B**
			3,561 cf Overall - 1,856 cf Embedded = 1,705 cf x 40.0% Voids
#4B	117.80'	1,770 cf	**StormTank 25 Series 18"** x 275 Inside #3
			Inside= 18.0"W x 18.0"H => 2.15 sf x 3.00'L = 6.4 cf
			Outside= 18.0"W x 18.0"H => 2.25 sf x 3.00'L = 6.8 cf
			275 Chambers in 11 Rows
		6,440 cf	Total Available Storage

   Storage Group A created with Chamber Wizard
   Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**15.0" Round Culvert X 2.00**
			L= 24.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.00' / 115.80' S= 0.0500 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	119.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	117.80'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 115.80'

Discarded OutFlow Max=0.43 cfs @ 12.10 hrs HW=120.53'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.43 cfs)

Primary OutFlow Max=9.97 cfs @ 12.10 hrs HW=120.53' TW=117.75' (Dynamic Tailwater)
└─**1=Culvert** (Passes 9.97 cfs of 19.73 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 9.97 cfs @ 2.80 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 73

Pond B-1: Subsurface infiltration system - Chamber Wizard Field A

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

39 Chambers/Row x 3.00' Long = 117.00' Row Length +12.0" End Stone x 2 = 119.00' Base Length
9 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 15.50' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

351 Chambers x 8.7 cf = 3,038.3 cf Chamber Storage
351 Chambers x 9.0 cf = 3,159.0 cf Displacement

5,533.5 cf Field - 3,159.0 cf Chambers = 2,374.5 cf Stone x 40.0% Voids = 949.8 cf Stone Storage
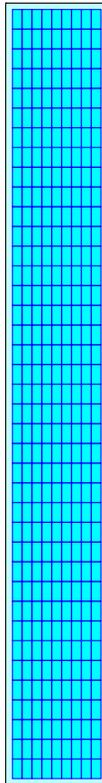
Chamber Storage + Stone Storage = 3,988.1 cf = 0.092 af
Overall Storage Efficiency = 72.1%
Overall System Size = 119.00' x 15.50' x 3.00'

351 Chambers
204.9 cy Field
87.9 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*
Prepared by Langan Engineering   Printed 10/29/2025

Pond B-1: Subsurface infiltration system - Chamber Wizard Field B

Chamber Model = StormTank 25 Series 18" (StormTank Module 25 Series)
Inside= 18.0"W x 18.0"H => 2.15 sf x 3.00'L = 6.4 cf
Outside= 18.0"W x 18.0"H => 2.25 sf x 3.00'L = 6.8 cf

25 Chambers/Row x 3.00' Long = 75.00' Row Length +12.0" End Stone x 2 = 77.00' Base Length
11 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 18.50' Base Width
18.0" Chamber Height + 12.0" Stone Cover = 2.50' Field Height

275 Chambers x 6.4 cf = 1,769.9 cf Chamber Storage
275 Chambers x 6.8 cf = 1,856.3 cf Displacement

3,561.3 cf Field - 1,856.3 cf Chambers = 1,705.0 cf Stone x 40.0% Voids = 682.0 cf Stone Storage

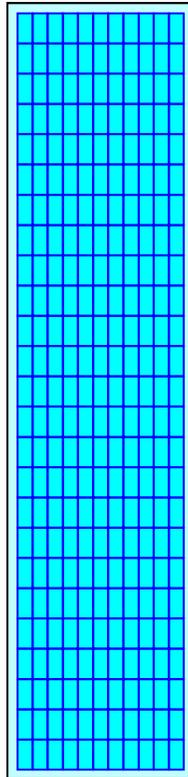Chamber Storage + Stone Storage = 2,451.9 cf = 0.056 af
Overall Storage Efficiency = 68.9%
Overall System Size = 77.00' x 18.50' x 2.50'

275 Chambers
131.9 cy Field
63.1 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 75

Summary for Pond B-4: Subsurface Infiltration System

Inflow Area =   1.440 ac, 58.82% Impervious, Inflow Depth = 3.68"   for 50-yr event
Inflow   =   8.86 cfs @ 12.09 hrs, Volume=   0.441 af
Outflow   =   4.41 cfs @ 12.27 hrs, Volume=   0.442 af, Atten= 50%, Lag= 10.8 min
Discarded =   0.44 cfs @ 12.25 hrs, Volume=   0.348 af
Primary   =   3.96 cfs @ 12.27 hrs, Volume=   0.094 af
     Routed to Pond LS-B4 : Level Spreader

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 118.86' @ 12.25 hrs   Surf.Area= 3,502 sf   Storage= 7,099 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 126.9 min (887.5 - 760.5)

Volume	Invert	Avail.Storage	Storage Description
#1B	116.25'	1,754 cf	**17.00'W x 206.00'L x 3.00'H Field B**
			10,506 cf Overall - 6,120 cf Embedded = 4,386 cf x 40.0% Voids
#2B	116.25'	5,886 cf	**StormTank 25 Series 24"** x 680 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			680 Chambers in 10 Rows
		7,641 cf	Total Available Storage

Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.06'	**15.0" Round Culvert**
			L= 164.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.06' / 115.45' S= 0.0098 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	118.50'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	116.25'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 114.20'

Discarded OutFlow Max=0.44 cfs @ 12.25 hrs HW=118.86'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.44 cfs)

Primary OutFlow Max=3.52 cfs @ 12.27 hrs HW=118.86' TW=117.28'   (Dynamic Tailwater)
└─**1=Culvert** (Passes 3.52 cfs of 5.37 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir**(Weir Controls 3.52 cfs @ 1.97 fps)

Pond B-4: Subsurface Infiltration System - Chamber Wizard Field B

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

68 Chambers/Row x 3.00' Long = 204.00' Row Length +12.0" End Stone x 2 = 206.00' Base Length
10 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 17.00' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

680 Chambers x 8.7 cf = 5,886.2 cf Chamber Storage
680 Chambers x 9.0 cf = 6,120.0 cf Displacement

10,506.0 cf Field - 6,120.0 cf Chambers = 4,386.0 cf Stone x 40.0% Voids = 1,754.4 cf Stone Storage

Chamber Storage + Stone Storage = 7,640.6 cf = 0.175 af
Overall Storage Efficiency = 72.7%
Overall System Size = 206.00' x 17.00' x 3.00'

680 Chambers
389.1 cy Field
162.4 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 77

Summary for Pond B-5: Subsurface Infiltration System

Inflow Area =   0.870 ac, 55.17% Impervious, Inflow Depth = 6.02"   for 50-yr event
Inflow   =   5.56 cfs @ 12.09 hrs, Volume=   0.436 af
Outflow   =   5.47 cfs @ 12.10 hrs, Volume=   0.436 af, Atten= 2%, Lag= 0.8 min
Discarded =   0.27 cfs @ 12.10 hrs, Volume=   0.286 af
Primary   =   5.20 cfs @ 12.10 hrs, Volume=   0.150 af
    Routed to Pond B-4 : Subsurface Infiltration System

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 119.77' @ 12.10 hrs   Surf.Area= 2,170 sf   Storage= 4,213 cf

Plug-Flow detention time= 112.2 min calculated for 0.436 af (100% of inflow)
Center-of-Mass det. time= 112.5 min (885.3 - 772.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	117.33'	1,114 cf	**15.50'W x 140.00'L x 3.00'H Field A**
			6,510 cf Overall - 3,726 cf Embedded = 2,784 cf x 40.0% Voids
#2A	117.33'	3,584 cf	**StormTank 25 Series 24"** x 414 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			414 Chambers in 9 Rows
		4,697 cf	Total Available Storage

    Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.33'	**18.0" Round Culvert**
			L= 40.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.33' / 117.00' S= 0.0082 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	119.30'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	117.33'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 115.33'

Discarded OutFlow Max=0.27 cfs @ 12.10 hrs HW=119.77'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.27 cfs)

Primary OutFlow Max=5.19 cfs @ 12.10 hrs HW=119.77' TW=117.59'   (Dynamic Tailwater)
└─**1=Culvert** (Passes 5.19 cfs of 10.70 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir**(Weir Controls 5.19 cfs @ 2.24 fps)

Pond B-5: Subsurface Infiltration System - Chamber Wizard Field A

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
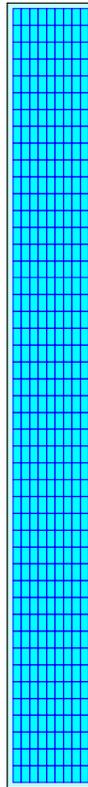Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

46 Chambers/Row x 3.00' Long = 138.00' Row Length +12.0" End Stone x 2 = 140.00' Base Length
9 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 15.50' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

414 Chambers x 8.7 cf = 3,583.7 cf Chamber Storage
414 Chambers x 9.0 cf = 3,726.0 cf Displacement

6,510.0 cf Field - 3,726.0 cf Chambers = 2,784.0 cf Stone x 40.0% Voids = 1,113.6 cf Stone Storage

Chamber Storage + Stone Storage = 4,697.3 cf = 0.108 af
Overall Storage Efficiency = 72.2%
Overall System Size = 140.00' x 15.50' x 3.00'

414 Chambers
241.1 cy Field
103.1 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 79

Summary for Pond LS-B1: Level Spreader

Inflow Area =   1.680 ac, 39.29% Impervious, Inflow Depth = 2.50"   for 50-yr event
Inflow   =   10.01 cfs @   12.10 hrs, Volume=   0.350 af
Outflow   =   9.46 cfs @   12.05 hrs, Volume=   0.348 af, Atten= 5%, Lag= 0.0 min
Primary   =   9.46 cfs @   12.05 hrs, Volume=   0.348 af
     Routed to Link DP-B : Western Properties

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 117.75' @ 12.05 hrs   Surf.Area= 180 sf   Storage= 123 cf

Plug-Flow detention time= 1.4 min calculated for 0.348 af (99% of inflow)
Center-of-Mass det. time= 0.3 min (746.6 - 746.3)

Volume	Invert	Avail.Storage	Storage Description
#1	115.30'	65 cf	**3.00'W x 30.00'L x 2.20'H Prismatoid**
			198 cf Overall - 34 cf Embedded = 164 cf x 40.0% Voids
#2	117.50'	90 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	115.80'	34 cf	**15.0" Round Pipe Storage** Inside #1
			L= 28.0'
		190 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
117.50	90	0	0
118.50	90	90	90

Device	Routing	Invert	Outlet Devices
#1	Primary	117.50'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68
			2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=9.46 cfs @ 12.05 hrs HW=117.75' TW=0.00'   (Dynamic Tailwater)
└—**1=Broad-Crested Rectangular Weir** (Weir Controls 9.46 cfs @ 1.25 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*

Summary for Pond LS-B4: Level Spreader

Inflow Area =   1.440 ac, 58.82% Impervious, Inflow Depth = 0.78"   for 50-yr event
Inflow   =   3.96 cfs @ 12.27 hrs, Volume=   0.094 af
Outflow   =   4.55 cfs @ 12.30 hrs, Volume=   0.092 af, Atten= 0%, Lag= 1.4 min
Primary   =   4.55 cfs @ 12.30 hrs, Volume=   0.092 af
    Routed to Link DP-B : Western Properties

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 117.31' @ 12.30 hrs   Surf.Area= 180 sf   Storage= 114 cf

Plug-Flow detention time= 1.5 min calculated for 0.092 af (97% of inflow)
Center-of-Mass det. time= 0.4 min (748.3 - 747.9)

Volume	Invert	Avail.Storage	Storage Description
#1	114.95'	65 cf	**3.00'W x 30.00'L x 2.20'H Prismatoid**
			198 cf Overall - 34 cf Embedded = 164 cf x 40.0% Voids
#2	117.15'	90 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	115.45'	34 cf	**15.0" Round Pipe Storage** Inside #1
			L= 28.0'
		190 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
117.15	90	0	0
118.15	90	90	90

Device	Routing	Invert	Outlet Devices
#1	Primary	117.15'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68
			2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=4.44 cfs @ 12.30 hrs HW=117.30' TW=0.00'   (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 4.44 cfs @ 0.96 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*

Summary for Link DP-A: Isolated Vegetated Wetland

Inflow Area =   1.511 ac,   9.20% Impervious, Inflow Depth = 2.87"   for 50-yr event
Inflow   =   3.58 cfs @   12.25 hrs, Volume=   0.362 af
Primary   =   3.58 cfs @   12.25 hrs, Volume=   0.362 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 82

Summary for Link DP-B: Western Properties

Inflow Area =   3.584 ac, 42.05% Impervious, Inflow Depth =   1.61"   for 50-yr event
Inflow   =   9.63 cfs @   12.15 hrs, Volume=   0.481 af
Primary   =   9.63 cfs @   12.15 hrs, Volume=   0.481 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 50-yr Rainfall=6.96"*

Summary for Link DP-C: Hillman Street

Inflow Area =   0.335 ac, 12.84% Impervious, Inflow Depth =   0.75"   for 50-yr event
Inflow   =   0.13 cfs @   12.22 hrs, Volume=   0.021 af
Primary   =   0.13 cfs @   12.22 hrs, Volume=   0.021 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC Page 84

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PR-A: PR-A
Runoff Area=1.511 ac 9.20% Impervious Runoff Depth=3.57"
Flow Length=304' Tc=16.9 min CN=63 Runoff=4.49 cfs 0.449 af

Subcatchment PR-B1: Substation
Runoff Area=0.560 ac 7.14% Impervious Runoff Depth=6.21"
Flow Length=273' Tc=6.0 min CN=86 Runoff=3.82 cfs 0.290 af

Subcatchment PR-B2: Northwest Battery
Runoff Area=1.120 ac 55.36% Impervious Runoff Depth=6.91"
Flow Length=338' Slope=0.0170 '/' Tc=6.0 min CN=92 Runoff=8.17 cfs 0.645 af

Subcatchment PR-B3: 75 Hillman & West
Runoff Area=0.464 ac 0.00% Impervious Runoff Depth=1.47"
Flow Length=118' Tc=9.5 min CN=43 Runoff=0.55 cfs 0.057 af

Subcatchment PR-B4: Southwest site
Runoff Area=0.570 ac 64.39% Impervious Runoff Depth=7.03"
Flow Length=154' Slope=0.0250 '/' Tc=6.0 min CN=93 Runoff=4.19 cfs 0.334 af

Subcatchment PR-B5: East site
Runoff Area=0.870 ac 55.17% Impervious Runoff Depth=6.91"
Flow Length=236' Tc=6.0 min CN=92 Runoff=6.35 cfs 0.501 af

Subcatchment PR-C: South & West
Runoff Area=0.335 ac 12.84% Impervious Runoff Depth=1.10"
Flow Length=35' Slope=0.0110 '/' Tc=7.9 min CN=39 Runoff=0.25 cfs 0.031 af

Pond B-1: Subsurface infiltration system
Peak Elev=120.61' Storage=6,299 cf Inflow=11.99 cfs 0.935 af
Discarded=0.44 cfs 0.489 af Primary=11.52 cfs 0.446 af Outflow=11.95 cfs 0.935 af

Pond B-4: Subsurface Infiltration System
Peak Elev=119.17' Storage=7,524 cf Inflow=10.18 cfs 0.532 af
Discarded=0.47 cfs 0.371 af Primary=6.02 cfs 0.161 af Outflow=6.49 cfs 0.532 af

Pond B-5: Subsurface Infiltration System
Peak Elev=119.82' Storage=4,256 cf Inflow=6.35 cfs 0.501 af
Discarded=0.27 cfs 0.304 af Primary=6.03 cfs 0.198 af Outflow=6.30 cfs 0.502 af

Pond LS-B1: Level Spreader
Peak Elev=117.77' Storage=125 cf Inflow=11.52 cfs 0.446 af
Outflow=11.39 cfs 0.444 af

Pond LS-B4: Level Spreader
Peak Elev=117.35' Storage=118 cf Inflow=6.02 cfs 0.161 af
Outflow=6.92 cfs 0.159 af

Link DP-A: Isolated Vegetated Wetland
Inflow=4.49 cfs 0.449 af
Primary=4.49 cfs 0.449 af

Link DP-B: Western Properties
Inflow=13.67 cfs 0.660 af
Primary=13.67 cfs 0.660 af

Link DP-C: Hillman Street
Inflow=0.25 cfs 0.031 af
Primary=0.25 cfs 0.031 af

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*

Prepared by Langan Engineering | Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC | Page 85

Summary for Subcatchment PR-A: PR-A

Runoff = 4.49 cfs @ 12.24 hrs, Volume= 0.449 af, Depth= 3.57"
  Routed to Link DP-A : Isolated Vegetated Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.87"

	Area (ac)	CN	Description
	0.315	30	Woods, Good, HSG A
*	0.733	85	Gravel surface, HSG A
	0.056	39	>75% Grass cover, Good, HSG A
*	0.139	98	Impervious Surface, HSG A
	0.268	30	Meadow, non-grazed, HSG A
	1.511	63	Weighted Average
	1.372		90.80% Pervious Area
	0.139		9.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	50	0.0200	0.07		**Sheet Flow, SF-A**
					Woods: Light underbrush n= 0.400 P2= 3.18"
0.3	20	0.0500	1.12		**Shallow Concentrated Flow, SCF-1**
					Woodland Kv= 5.0 fps
2.9	87	0.0100	0.50		**Shallow Concentrated Flow, SCF-2**
					Woodland Kv= 5.0 fps
0.9	88	0.0110	1.69		**Shallow Concentrated Flow, SCF-3**
					Unpaved Kv= 16.1 fps
0.4	50	0.0200	2.28		**Shallow Concentrated Flow, SCF-4**
					Unpaved Kv= 16.1 fps
0.0	9	0.2800	3.70		**Shallow Concentrated Flow, SCF-5**
					Short Grass Pasture Kv= 7.0 fps
16.9	304				Total

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*

Summary for Subcatchment PR-B1: Substation

Runoff   =   3.82 cfs @ 12.09 hrs, Volume=   0.290 af, Depth= 6.21"
    Routed to Pond B-1 : Subsurface infiltration system

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.87"

	Area (ac)	CN	Description
*	0.520	85	Gravel surface, HSG A
*	0.040	98	Paved surface, HSG A
	0.560	86	Weighted Average
	0.520		92.86% Pervious Area
	0.040		7.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.19		**Sheet Flow, Crushed Stone**
					Smooth surfaces n= 0.011 P2= 3.18"
0.8	107	0.0200	2.28		**Shallow Concentrated Flow, SCF-1**
					Unpaved Kv= 16.1 fps
1.2	116	0.0100	1.61		**Shallow Concentrated Flow, SCF-2**
					Unpaved Kv= 16.1 fps
2.7	273				Total, Increased to minimum Tc = 6.0 min

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 87

Summary for Subcatchment PR-B2: Northwest Battery

Runoff   =   8.17 cfs @ 12.09 hrs, Volume=   0.645 af, Depth= 6.91"
    Routed to Pond B-1 : Subsurface infiltration system

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.87"

	Area (ac)	CN	Description
	0.620	98	Paved parking, HSG A
*	0.500	85	Gravel surface, HSG A
	1.120	92	Weighted Average
	0.500		44.64% Pervious Area
	0.620		55.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0170	1.12		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
2.2	272	0.0170	2.10		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
0.1	16	0.0170	2.65		**Shallow Concentrated Flow, Road**
					Paved Kv= 20.3 fps
3.0	338				Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment PR-B3: 75 Hillman & West

Runoff   =   0.55 cfs @ 12.17 hrs, Volume=   0.057 af, Depth= 1.47"
    Routed to Link DP-B : Western Properties

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.87"

	Area (ac)	CN	Description
	0.015	39	>75% Grass cover, Good, HSG A
	0.339	30	Meadow, non-grazed, HSG A
*	0.110	85	Gravel surface, HSG A
	0.464	43	Weighted Average
	0.464		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	50	0.0170	0.09		**Sheet Flow, SF**
					Grass: Dense n= 0.240 P2= 3.18"
0.2	10	0.0170	0.91		**Shallow Concentrated Flow, SCF-1**
					Short Grass Pasture Kv= 7.0 fps
0.1	9	0.0470	1.52		**Shallow Concentrated Flow, SCF-2**
					Short Grass Pasture Kv= 7.0 fps
0.1	21	0.0371	3.10		**Shallow Concentrated Flow, Gravel Surface**
					Unpaved Kv= 16.1 fps
0.3	28	0.0540	1.63		**Shallow Concentrated Flow, SCF-3**
					Short Grass Pasture Kv= 7.0 fps
9.5	118	Total			

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering
Printed 10/29/2025

Summary for Subcatchment PR-B4: Southwest site

Runoff   =   4.19 cfs @ 12.09 hrs, Volume=   0.334 af, Depth= 7.03"
      Routed to Pond B-4 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.87"

	Area (ac)	CN	Description
*	0.203	85	Gravel surface, HSG A
	0.367	98	Paved parking, HSG A
	0.570	93	Weighted Average
	0.203		35.61% Pervious Area
	0.367		64.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.31		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
0.7	104	0.0250	2.55		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
1.3	154				Total, Increased to minimum Tc = 6.0 min

Summary for Subcatchment PR-B5: East site

Runoff   =   6.35 cfs @ 12.09 hrs, Volume=   0.501 af, Depth= 6.91"
    Routed to Pond B-5 : Subsurface Infiltration System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.87"

Area (ac)	CN	Description
* 0.390	85	Gravel surface, HSG A
0.480	98	Paved parking, HSG A
0.870	92	Weighted Average
0.390		44.83% Pervious Area
0.480		55.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0250	1.31		**Sheet Flow, Gravel**
					Smooth surfaces n= 0.011 P2= 3.18"
0.3	41	0.0250	2.55		**Shallow Concentrated Flow, Gravel**
					Unpaved Kv= 16.1 fps
0.8	145	0.0200	2.87		**Shallow Concentrated Flow, Road**
					Paved Kv= 20.3 fps
1.7	236				Total, Increased to minimum Tc = 6.0 min

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 91

Summary for Subcatchment PR-C: South & West Property Outside Fence

Runoff   =   0.25 cfs @ 12.16 hrs, Volume=   0.031 af, Depth= 1.10"
    Routed to Link DP-C : Hillman Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=7.87"

	Area (ac)	CN	Description
	0.292	30	Meadow, non-grazed, HSG A
*	0.043	98	Impervious Surface, HSG A
	0.335	39	Weighted Average
	0.292		87.16% Pervious Area
	0.043		12.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	35	0.0110	0.07		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.18"

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 92

Summary for Pond B-1: Subsurface infiltration system

Inflow Area =	1.680 ac, 39.29% Impervious, Inflow Depth = 6.68" for 100-yr event		
Inflow =	11.99 cfs @ 12.09 hrs, Volume=	0.935 af	
Outflow =	11.95 cfs @ 12.10 hrs, Volume=	0.935 af, Atten= 0%, Lag= 0.6 min	
Discarded =	0.44 cfs @ 12.10 hrs, Volume=	0.489 af	
Primary =	11.52 cfs @ 12.10 hrs, Volume=	0.446 af	

Routed to Pond LS-B1 : Level Spreader

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 120.61' @ 12.10 hrs   Surf.Area= 3,269 sf   Storage= 6,299 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 92.5 min (867.8 - 775.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	117.80'	950 cf	**15.50'W x 119.00'L x 3.00'H Field A**
			5,534 cf Overall - 3,159 cf Embedded = 2,374 cf x 40.0% Voids
#2A	117.80'	3,038 cf	**StormTank 25 Series 24"** x 351 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			351 Chambers in 9 Rows
#3B	117.80'	682 cf	**18.50'W x 77.00'L x 2.50'H Field B**
			3,561 cf Overall - 1,856 cf Embedded = 1,705 cf x 40.0% Voids
#4B	117.80'	1,770 cf	**StormTank 25 Series 18"** x 275 Inside #3
			Inside= 18.0"W x 18.0"H => 2.15 sf x 3.00'L = 6.4 cf
			Outside= 18.0"W x 18.0"H => 2.25 sf x 3.00'L = 6.8 cf
			275 Chambers in 11 Rows
		6,440 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**15.0" Round Culvert X 2.00**
			L= 24.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.00' / 115.80' S= 0.0500 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	119.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	117.80'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 115.80'

Discarded OutFlow Max=0.44 cfs @ 12.10 hrs HW=120.61' (Free Discharge)
└─**3=Exfiltration** (Controls 0.44 cfs)

Primary OutFlow Max=11.45 cfs @ 12.10 hrs HW=120.61' TW=117.77' (Dynamic Tailwater)
└─**1=Culvert** (Passes 11.45 cfs of 19.89 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 11.45 cfs @ 2.94 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 93

Pond B-1: Subsurface infiltration system - Chamber Wizard Field A

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
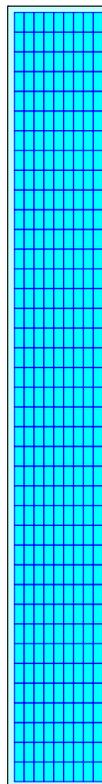Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

39 Chambers/Row x 3.00' Long = 117.00' Row Length +12.0" End Stone x 2 = 119.00' Base Length
9 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 15.50' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

351 Chambers x 8.7 cf = 3,038.3 cf Chamber Storage
351 Chambers x 9.0 cf = 3,159.0 cf Displacement

5,533.5 cf Field - 3,159.0 cf Chambers = 2,374.5 cf Stone x 40.0% Voids = 949.8 cf Stone Storage

Chamber Storage + Stone Storage = 3,988.1 cf = 0.092 af
Overall Storage Efficiency = 72.1%
Overall System Size = 119.00' x 15.50' x 3.00'

351 Chambers
204.9 cy Field
87.9 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 94

Pond B-1: Subsurface infiltration system - Chamber Wizard Field B

Chamber Model = StormTank 25 Series 18" (StormTank Module 25 Series)
Inside= 18.0"W x 18.0"H => 2.15 sf x 3.00'L = 6.4 cf
Outside= 18.0"W x 18.0"H => 2.25 sf x 3.00'L = 6.8 cf

25 Chambers/Row x 3.00' Long = 75.00' Row Length +12.0" End Stone x 2 = 77.00' Base Length
11 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 18.50' Base Width
18.0" Chamber Height + 12.0" Stone Cover = 2.50' Field Height

275 Chambers x 6.4 cf = 1,769.9 cf Chamber Storage
275 Chambers x 6.8 cf = 1,856.3 cf Displacement

3,561.3 cf Field - 1,856.3 cf Chambers = 1,705.0 cf Stone x 40.0% Voids = 682.0 cf Stone Storage

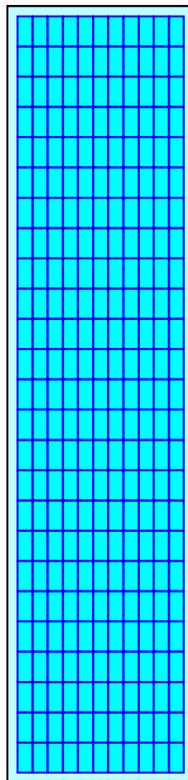Chamber Storage + Stone Storage = 2,451.9 cf = 0.056 af
Overall Storage Efficiency = 68.9%
Overall System Size = 77.00' x 18.50' x 2.50'

275 Chambers
131.9 cy Field
63.1 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 95

Summary for Pond B-4: Subsurface Infiltration System

Inflow Area =   1.440 ac, 58.82% Impervious, Inflow Depth = 4.43"   for 100-yr event
Inflow   =   10.18 cfs @ 12.10 hrs, Volume=   0.532 af
Outflow   =   6.49 cfs @ 12.22 hrs, Volume=   0.532 af, Atten= 36%, Lag= 7.6 min
Discarded =   0.47 cfs @ 12.21 hrs, Volume=   0.371 af
Primary   =   6.02 cfs @ 12.22 hrs, Volume=   0.161 af
    Routed to Pond LS-B4 : Level Spreader

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 119.17' @ 12.21 hrs   Surf.Area= 3,502 sf   Storage= 7,524 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 114.2 min (872.2 - 757.9)

Volume	Invert	Avail.Storage	Storage Description
#1B	116.25'	1,754 cf	**17.00'W x 206.00'L x 3.00'H Field B**
			10,506 cf Overall - 6,120 cf Embedded = 4,386 cf x 40.0% Voids
#2B	116.25'	5,886 cf	**StormTank 25 Series 24"** x 680 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			680 Chambers in 10 Rows
		7,641 cf	Total Available Storage

   Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.06'	**15.0" Round Culvert**
			L= 164.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.06' / 115.45' S= 0.0098 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	118.50'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	116.25'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 114.20'

Discarded OutFlow Max=0.47 cfs @ 12.21 hrs HW=119.13' (Free Discharge)
└─**3=Exfiltration** (Controls 0.47 cfs)

Primary OutFlow Max=5.69 cfs @ 12.22 hrs HW=119.11' TW=117.33' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 5.69 cfs @ 4.64 fps)
  └─**2=Sharp-Crested Rectangular Weir** (Passes 5.69 cfs of 7.62 cfs potential flow)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 96

Pond B-4: Subsurface Infiltration System - Chamber Wizard Field B

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

68 Chambers/Row x 3.00' Long = 204.00' Row Length +12.0" End Stone x 2 = 206.00' Base Length
10 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 17.00' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

680 Chambers x 8.7 cf = 5,886.2 cf Chamber Storage
680 Chambers x 9.0 cf = 6,120.0 cf Displacement

10,506.0 cf Field - 6,120.0 cf Chambers = 4,386.0 cf Stone x 40.0% Voids = 1,754.4 cf Stone Storage

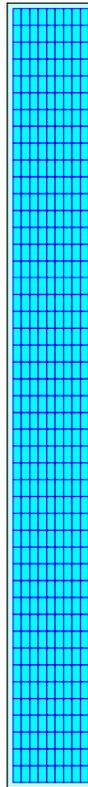Chamber Storage + Stone Storage = 7,640.6 cf = 0.175 af
Overall Storage Efficiency = 72.7%
Overall System Size = 206.00' x 17.00' x 3.00'

680 Chambers
389.1 cy Field
162.4 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 97

Summary for Pond B-5: Subsurface Infiltration System

Inflow Area =   0.870 ac, 55.17% Impervious, Inflow Depth = 6.91"   for 100-yr event
Inflow   =   6.35 cfs @ 12.09 hrs, Volume=   0.501 af
Outflow   =   6.30 cfs @ 12.10 hrs, Volume=   0.502 af, Atten= 1%, Lag= 0.9 min
Discarded   =   0.27 cfs @ 12.10 hrs, Volume=   0.304 af
Primary   =   6.03 cfs @ 12.10 hrs, Volume=   0.198 af
    Routed to Pond B-4 : Subsurface Infiltration System

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 119.82' @ 12.10 hrs   Surf.Area= 2,170 sf   Storage= 4,256 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 106.0 min (875.5 - 769.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	117.33'	1,114 cf	**15.50'W x 140.00'L x 3.00'H Field A**
			6,510 cf Overall - 3,726 cf Embedded = 2,784 cf x 40.0% Voids
#2A	117.33'	3,584 cf	**StormTank 25 Series 24"** x 414 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			414 Chambers in 9 Rows
		4,697 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.33'	**18.0" Round Culvert**
			L= 40.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.33' / 117.00' S= 0.0082 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	119.30'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	117.33'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 115.33'

Discarded OutFlow Max=0.27 cfs @ 12.10 hrs HW=119.82'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.27 cfs)

Primary OutFlow Max=5.98 cfs @ 12.10 hrs HW=119.82' TW=118.13'   (Dynamic Tailwater)
└─**1=Culvert** (Passes 5.98 cfs of 10.90 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 5.98 cfs @ 2.36 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 98

Pond B-5: Subsurface Infiltration System - Chamber Wizard Field A

Chamber Model = StormTank 25 Series 24" (StormTank Module 25 Series)
Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf

46 Chambers/Row x 3.00' Long = 138.00' Row Length +12.0" End Stone x 2 = 140.00' Base Length
9 Rows x 18.0" Wide + 12.0" Side Stone x 2 = 15.50' Base Width
24.0" Chamber Height + 12.0" Stone Cover = 3.00' Field Height

414 Chambers x 8.7 cf = 3,583.7 cf Chamber Storage
414 Chambers x 9.0 cf = 3,726.0 cf Displacement

6,510.0 cf Field - 3,726.0 cf Chambers = 2,784.0 cf Stone x 40.0% Voids = 1,113.6 cf Stone Storage

Chamber Storage + Stone Storage = 4,697.3 cf = 0.108 af
Overall Storage Efficiency = 72.2%
Overall System Size = 140.00' x 15.50' x 3.00'

414 Chambers
241.1 cy Field
103.1 cy Stone

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 99

Summary for Pond LS-B1: Level Spreader

Inflow Area =   1.680 ac, 39.29% Impervious, Inflow Depth = 3.19"   for 100-yr event
Inflow   =   11.52 cfs @ 12.10 hrs, Volume=   0.446 af
Outflow   =   11.39 cfs @ 12.07 hrs, Volume=   0.444 af, Atten= 1%, Lag= 0.0 min
Primary   =   11.39 cfs @ 12.07 hrs, Volume=   0.444 af
      Routed to Link DP-B : Western Properties

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 117.77' @ 12.05 hrs   Surf.Area= 180 sf   Storage= 125 cf

Plug-Flow detention time= 1.2 min calculated for 0.444 af (99% of inflow)
Center-of-Mass det. time= 0.3 min (747.1 - 746.9)

Volume	Invert	Avail.Storage	Storage Description
#1	115.30'	65 cf	**3.00'W x 30.00'L x 2.20'H Prismatoid**
			198 cf Overall - 34 cf Embedded = 164 cf x 40.0% Voids
#2	117.50'	90 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	115.80'	34 cf	**15.0" Round Pipe Storage** Inside #1
			L= 28.0'
		190 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
117.50	90	0	0
118.50	90	90	90

Device	Routing	Invert	Outlet Devices
#1	Primary	117.50'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68
			2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=10.73 cfs @ 12.07 hrs HW=117.77' TW=0.00'   (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 10.73 cfs @ 1.30 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 100

Summary for Pond LS-B4: Level Spreader

Inflow Area =   1.440 ac, 58.82% Impervious, Inflow Depth = 1.34"   for 100-yr event
Inflow   =   6.02 cfs @ 12.22 hrs, Volume=   0.161 af
Outflow   =   6.92 cfs @ 12.21 hrs, Volume=   0.159 af, Atten= 0%, Lag= 0.0 min
Primary   =   6.92 cfs @ 12.21 hrs, Volume=   0.159 af
      Routed to Link DP-B : Western Properties

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 117.35' @ 12.20 hrs   Surf.Area= 180 sf   Storage= 118 cf

Plug-Flow detention time= 1.3 min calculated for 0.159 af (99% of inflow)
Center-of-Mass det. time= 0.3 min (745.5 - 745.2)

Volume	Invert	Avail.Storage	Storage Description
#1	114.95'	65 cf	**3.00'W x 30.00'L x 2.20'H Prismatoid**
			198 cf Overall - 34 cf Embedded = 164 cf x 40.0% Voids
#2	117.15'	90 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
#3	115.45'	34 cf	**15.0" Round Pipe Storage** Inside #1
			L= 28.0'
		190 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
117.15	90	0	0
118.15	90	90	90

Device	Routing	Invert	Outlet Devices
#1	Primary	117.15'	**30.0' long x 3.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00
			2.50 3.00 3.50 4.00 4.50
			Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68
			2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=6.35 cfs @ 12.21 hrs HW=117.35' TW=0.00'   (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 6.35 cfs @ 1.08 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*

Summary for Link DP-A: Isolated Vegetated Wetland

Inflow Area =   1.511 ac,   9.20% Impervious, Inflow Depth = 3.57"   for 100-yr event
Inflow   =   4.49 cfs @   12.24 hrs, Volume=   0.449 af
Primary   =   4.49 cfs @   12.24 hrs, Volume=   0.449 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-6a s/n 08223 © 2024 HydroCAD Software Solutions LLC   Page 102
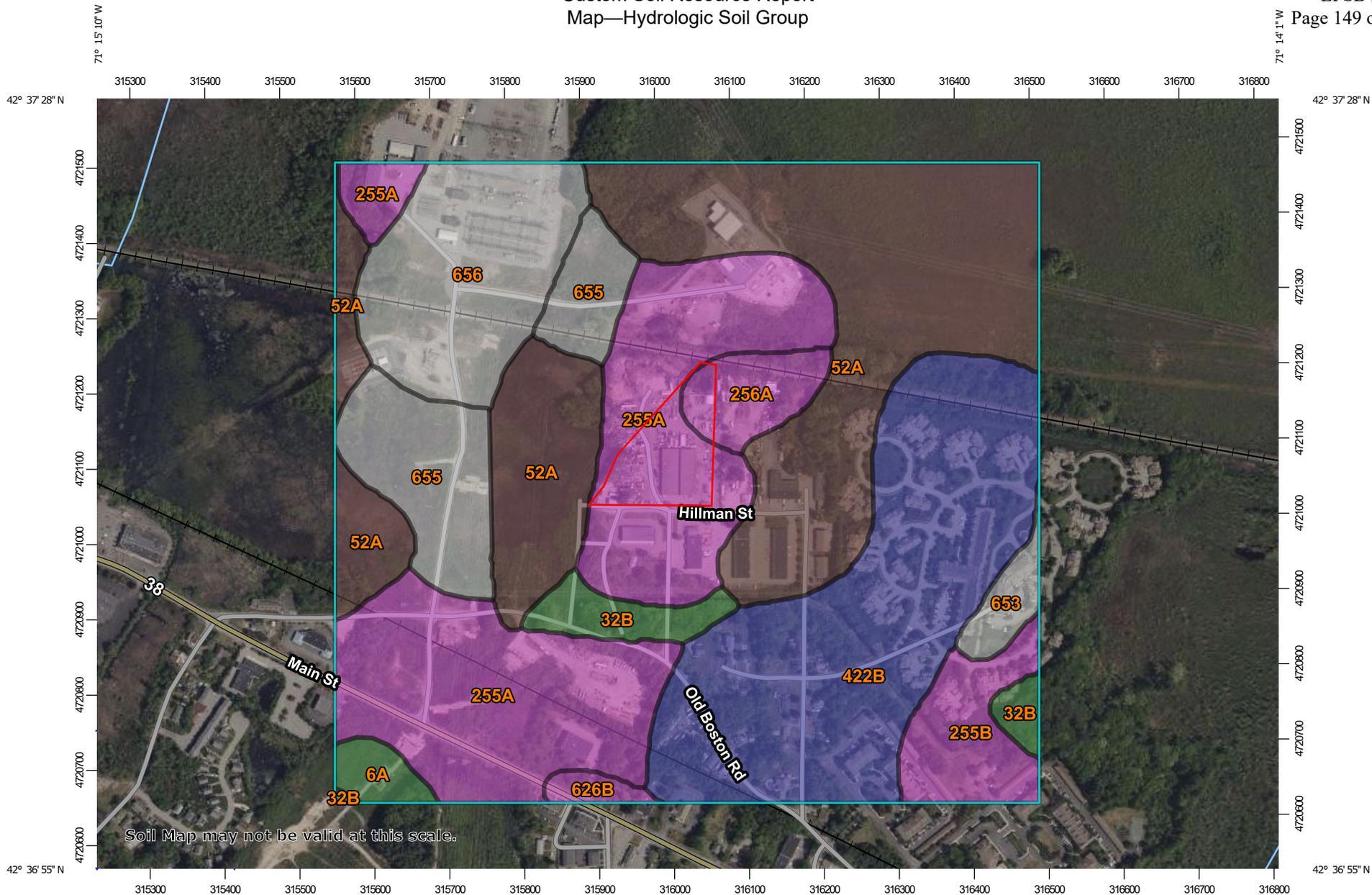
Summary for Link DP-B: Western Properties

Inflow Area =   3.584 ac, 42.05% Impervious, Inflow Depth = 2.21"   for 100-yr event
Inflow   =   13.67 cfs @ 12.19 hrs, Volume=   0.660 af
Primary   =   13.67 cfs @ 12.19 hrs, Volume=   0.660 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Hillman Tewksbury - Proposed Conditions - 2025-10-28 *Type III 24-hr 100-yr Rainfall=7.87"*

Summary for Link DP-C: Hillman Street

Inflow Area =   0.335 ac, 12.84% Impervious, Inflow Depth =   1.10"   for 100-yr event
Inflow   =   0.25 cfs @   12.16 hrs, Volume=   0.031 af
Primary   =   0.25 cfs @   12.16 hrs, Volume=   0.031 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

APPENDIX D

Soil Test Pit Logs

LANGAN

Custom Soil Resource Report
Map—Hydrologic Soil Group

Map Scale: 1:7,210 if printed on A landscape (11" x 8.5") sheet.

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

33

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D

- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- ┼┼┼ Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 24, Aug 27, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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.
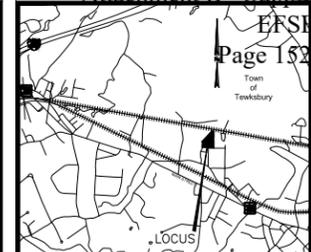
Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	A/D	2.1	1.1%
32B	Wareham loamy fine sand, 0 to 5 percent slopes	A/D	4.9	2.5%
52A	Freetown muck, 0 to 1 percent slopes	B/D	56.2	28.3%
255A	Windsor loamy sand, 0 to 3 percent slopes	A	47.7	24.0%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	7.4	3.7%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	A	4.7	2.3%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B	39.8	20.0%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	1.2	0.6%
653	Udorthents, sandy		2.4	1.2%
655	Udorthents, wet substratum		14.2	7.2%
656	Udorthents-Urban land complex		17.8	9.0%
Totals for Area of Interest			**198.5**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Locus Map
(NOT TO SCALE)

PLAN REFERENCES

1. LAND COURT PLAN 3634 A SHOWING LAND OF LOCUS IN TEWKSBURY, MA, DATED NOIVEMBER, 1911.

2. LAND COURT PLAN 3634 B SHOWING LAND OF LOCUS (PARCEL B) IN TEWKSBURY, MA, DATED JUNE 19, 1917.

3. LAND COURT PLAN 3634 C SHOWING LAND IN TEWKSBURY, MA, DATED JULY 23, 1975 AND IS LAND EXCEPTED FROM LOCUS PARCEL B IN REFERENCE 1 SHOWN AS PARCEL 1.

4. AS-BUILT SITE PLAN, PHASE 1 ROCKLAND INDUSTRIAL CONDOMINIUMS IN TEWKSBURY, MA PREPARED FOR ROCKLAND DEVELOPMENT CORP., BY CUOCO & CORMIER, INC. DATED JUNE 22, 1990 RECORDED PLAN BOOK 175, PAGE 51.

5. PLAN OF LAND IN TEWKSBURY, MA PREPARED FOR MONICA & JOYCE CHINN, BY CHARLES E. CYR, CIVIL ENGINEER DATED SEPTEMBER, 1965 RECORDED PLAN BOOK 103, PAGE 169.

STORMWATER TEST PIT LOCATION PLAN
DATE: 02/27/2025
BY: LANGAN

100' WETLAND BUFFER
WETLAND LIMIT
100-FT WETLAND BUFFER
100' WETLAND BUFFER
WETLAND LIMIT

STORMWATER TEST PIT LOCATION (TYP)

TP-4
TP-3
TP-2
TP-1

LOT AREA = 176,518 S.F.±
(4.05 AC.±)

GENERAL COMMON AREAS AND FACILITIES
(SEE DOCUMENT #132900)

LEGEND

BIT	BITUMINOUS
	BUILDING
CB	CATCH BASIN
X	CHAIN LINK FENCE
CONC	CONCRETE
CB/DH	CONCRETE BOUND/DRILL HOLE
DMH	DRAIN MANHOLE
	DECIDUOUS TREE
FF	FIRST FLOOR OR BUILDING HEIGHT
	HYDRANT
	LIGHT POLE
M	MAILBOX
	METAL POLE
MH	MISCELLANEOUS MANHOLE
OHW	OVERHEAD WIRES
SMH	SEWER MANHOLE
	SIGN
SYL	SINGLE YELLOW LINE
	TREE OR HEDGE LINE
	UTILITY POLE
	UTILITY POLE W/TRANSFORMER
	VENT PIPE
	WATER GATE
	WETLAND
	WETLAND FLAG
	EDGE OF WETLAND
	100' WETLAND BUFFER
	1 FT CONTOUR
120	5 FT CONTOUR

GENERAL NOTES

1. THIS PLAN IS BASED UPON AN ON-THE-GROUND SURVEY PERFORMED BY BSC GROUP, INC. BETWEEN JUNE 27, 2024 AND JULY XX, 2024.

2. HORIZONTAL DATUM IS BASED UPON NAD '83 AS DERIVED VIA GPS OBSERVATIONS PERFORMED BY BSC GROUP, INC. ON JULY 3, 2024.

3. VERTICAL DATUM IS BASED UPON NAVD '88 AS DERIVED VIA GPS OBSERVATIONS PERFORMED BY BSC GROUP, INC. ON JULY 27, 2024. SEE PLAN FOR TEMPORARY BENCH MARKS SET.

4. LOCUS IS LOCATED WITHIN ZONE X AS GRAPHICALLY DEPICTED ON FLOOD INSURANCE RATE MAP NUMBER 25017C0276F, EFFECTIVE DATE JULY 6, 2016.

5. LOCUS HAS DIRECT VEHICULAR AND PEDESTRIAN ACCESS TO HILLMAN STREET AND CLINTON STREET, PUBLIC STREETS IN THE TOWN OF TEWKSBURY.

6. THE PARCELS COMPRISING LOCUS FORM ONE CONTIGUOUS TRACT OF LAND, AND THERE ARE NO GAPS, GORES OR OVERLAPS.

7. WETLAND RESOURCE AREAS SHOWN HEREON WERE DELINEATED BY BSC GROUP, INC. ON

UTILITY NOTE

EXISTING UTILITIES, WHERE SHOWN HEREON, ARE APPROXIMATE. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROPERLY LOCATING AND COORDINATING ANY ON-SITE ACTIVITY WITH DIG-SAFE AND THE APPROPRIATE UTILITY COMPANY AND MAINTAINING EXISTING UTILITY SYSTEM SERVICE. DIG-SAFE SHALL BE NOTIFIED PER THE COMMONWEALTH OF MASSACHUSETTS STATUTE CHAPTER 82, SECTION 40, AT 1-888-344-7233. NO GUARANTEE IS IMPLIED OR INTENDED AS TO THE ACCURACY, LOCATION OR THAT ALL UTILITIES AND/OR SUBSURFACE STRUCTURES ARE SHOWN. THE CONTRACTOR SHALL VERIFY SIZE, LOCATION AND INVERTS OR UTILITIES AND STRUCTURES AS REQUIRED PRIOR TO THE START OF CONSTRUCTION.

TOPOGRAPHIC PLAN OF LAND

HILLMAN STREET
IN

TEWKSBURY MASSACHUSETTS
(MIDDLESEX COUNTY)

JULY 17, 2024

EXISTING CONDITIONS

REVISIONS:
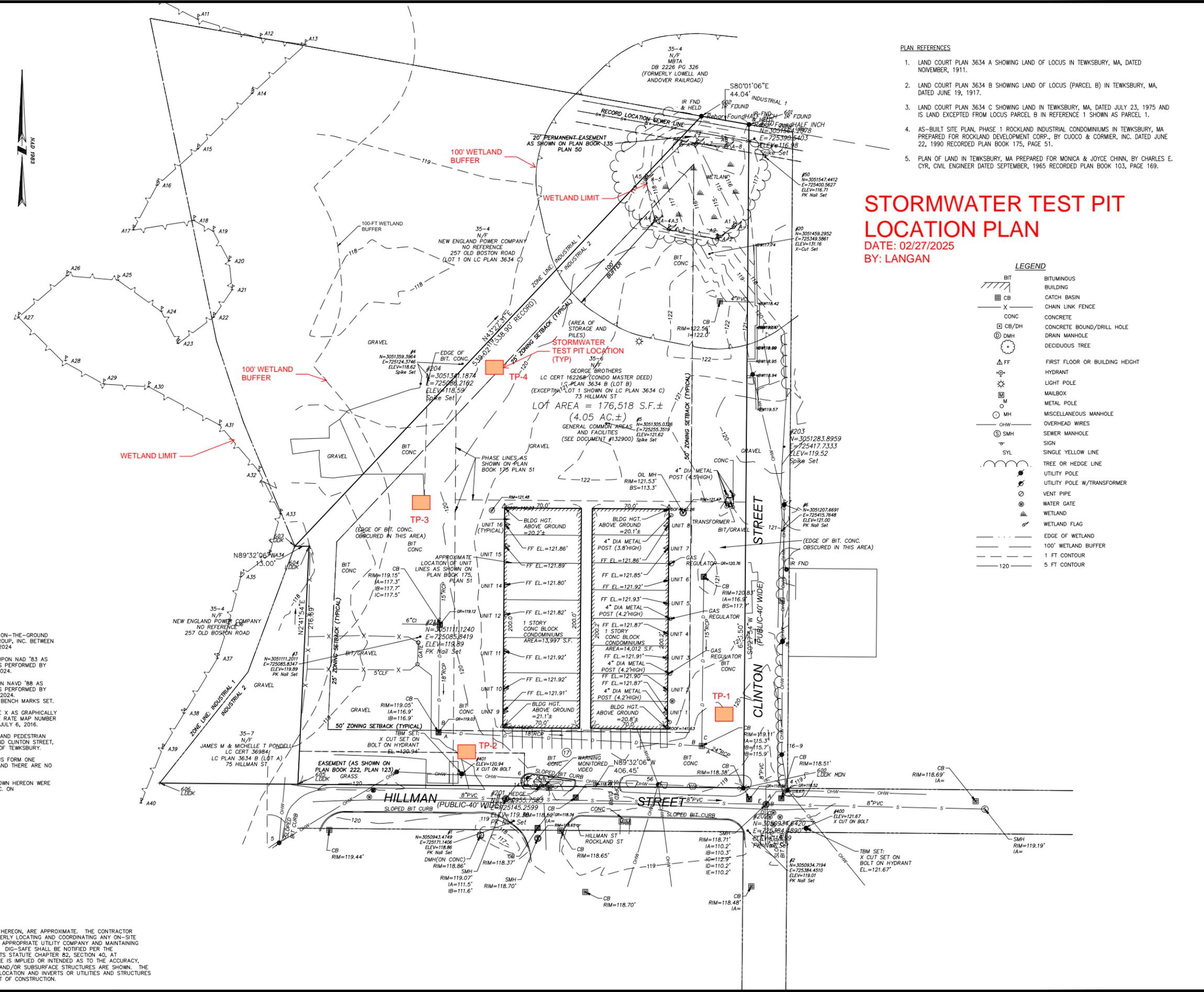| NO.	DATE	DESC.

PREPARED FOR:
EAST POINT ENERGY
310 4TH STREET N.E., 3RD FLOOR
CHARLOTTESVILLE, VA 22902

BSC GROUP
BUILD | SUPPORT | CONNECT
1 Mercantile Street, Suite 610
Worcester, Massachusetts 01608
508 792 4500

© 2024 BSC Group, Inc.

SCALE: 1" = 40'
0 20 40 80 FEET

FILE: 0085458O1EC.DWG
DWG. NO: --
JOB. NO: 0085458.01
SHEET 1 OF 1

LANGAN

Log of Test Pit **TP-01**   Sheet 1 of 1

Project	Project No.	Date
BESS Energy	151043401	2/26/2025

Location	Elevation and Datum
73 Hillman Street, Tewksbury MA	Approx. el. 120.0 (NAVD 88)

Excavation Company	Depth	Water Level - First	Water Level - Completion
F.E. French	10.0 ft	10.0 ▽	8.5 ▼

Excavation Equipment	Excavation Foreman	Field Engineer
CAT 305.5E Mini Excavator	Scott Perachi	Shawn OConnor

SYMBOL	Elev. (ft)	DESCRIPTION	Depth Scale	SAMPLE Number	Type	REMARKS
	+120.0		0			
	+119.8	ASPHALT (3in)				
		Tannish brown Gravelly medium SAND, trace cobble, trace silt (moist) [FILL]	1	S-1	GRAB	S-1 from 1ft to 1.5ft
	+118.0		2			
		Light gray fine SAND, some subrounded gravel, some silt, trace cobble (moist) [SP-SM]	3			
			4	S-2	GRAB	S-2 from 3.5ft to 4ft
			5			Orange staining at 4.67ft.
			6			
			7	S-3	GRAB	S-3 from 6.5ft to 7ft
			8			
			9			Groundwater first visible in test pit at 10ft. Water level rose in test pit to 8.5ft. Water appeared to weep into test pit at 7ft.
	+110.0	End of Test Pit at 10.0ft.	10	S-4	GRAB	S-4 from 9.5ft to 10ft
						Test pit bottom at 10ft. Test pit backfilled to grade in 1ft lifts and tamped with the excavator bucket to grade. Vibratory plate compactor used at 1ft below grade. Cold patch used to seal test pit at grade.
			11			
			12			
			13			
			14			
			15			
			16			
			17			
			18			
			19			
			20			

LANGAN

Log of Test Pit **TP-02**　　　　　Sheet 1 of 1

Project	Project No.	Date
BESS Energy	151043401	2/26/2025

Location	Elevation and Datum
73 Hillman Street, Tewksbury MA	Approx. el. 119.2 (NAVD 88)

Excavation Company	Depth	Water Level - First	Water Level - Completion
F.E. French	10.0 ft	8.0 ▽	8.0 ▼

Excavation Equipment	Excavation Foreman	Field Engineer
CAT 305.5E Mini Excavator	Scott Perachi	Shawn OConnor

SYMBOL	Elev. (ft)	DESCRIPTION	Depth Scale	SAMPLE Number	Type	REMARKS
	+119.2		0			
	+119.0	ASPHALT (3in)				
		Tannish brown Gravelly medium SAND, trace cobble, trace silt (moist) [FILL]		S-1	GRAB	S-1 from 0.5ft to 1ft
			1			
			2	S-2	GRAB	S-2 from 2ft to 2.5ft
			3			
			4			
			5	S-3	GRAB	S-3 from 4.5ft to 5ft
						Orange staining at 5ft. Broken black irrigation line at 5.5ft. Abandoned per property owner.
	+113.8			S-4	GRAB	S-4 from 5.5ft to 6ft
		Light gray fine SAND, some subrounded gravel, some silt, trace cobble (moist) [SP-SM]	6			
			7			
			8 ▽	S-5	GRAB	S-5 from 7.5ft to 8ft
						Groundwater first visible in test pit at 8ft. Water level remained at 8ft.
			9			
			10	S-6	GRAB	S-6 from 9.5ft to 10ft
	+109.2	End of Test Pit at 10.0ft.				Test pit bottom at 10ft. Test pit backfilled to grade in 1 lifts and tamped with the excavator bucket to grade. Vibratory plate compactor used at 1ft below grade. Top 2ft of test pit replaced with dense grade fill.
			11			
			12			
			13			
			14			
			15			
			16			
			17			
			18			
			19			
			20			

LANGAN

Log of Test Pit **TP-03**   Sheet 1 of 1

Project	Project No.	Date
BESS Energy	151043401	2/26/2025

Location	Elevation and Datum
73 Hillman Street, Tewksbury MA	Approx. el. 119.8 (NAVD 88)

Excavation Company	Depth	Water Level - First	Water Level - Completion
F.E. French	8.0 ft	7.0 ▽	6.0 ▼

Excavation Equipment	Excavation Foreman	Field Engineer
CAT 305.5E Mini Excavator	Scott Perachi	Shawn OConnor

SYMBOL	Elev. (ft)	DESCRIPTION	Depth Scale	SAMPLE Number	Type	REMARKS
	+119.8					
	+119.5	ASPHALT (3in)	0			
		Gray Gravelly medium SAND, trace cobble, trace silt, woody vegetation, brick (moist) [FILL]		S-1	GRAB	S-1 from 0.5ft to 1ft
	+116.8		3			
		Light gray medium SAND, trace subrounded gravel, trace silt (moist) [SP-SM]	4			Orange staining at 4ft.
				S-2	GRAB	S-2 from 4.5ft to 5ft
			6 ▽			Groundwater first visible in test pit at 7ft. Water level rose in test pit to 6ft.
			7 ▽			
				S-3	GRAB	S-3 from 7.5ft to 8ft.
	+111.8	End of Test Pit at 8.0ft.	8			Test pit bottom at 8ft. Test pit backfilled to grade in 1ft lifts and tamped with the excavator bucket. Vibratory plate compactor used at 1ft below grade. Cold patch used to seal test pit at grade.

LANGAN

Log of Test Pit **TP-04** Sheet 1 of 1

Project	Project No.	Date
BESS Energy	151043401	2/26/2025

Location	Elevation and Datum
73 Hillman Street, Tewksbury MA	Approx. el. 119.2 (NAVD 88)

Excavation Company	Depth	Water Level - First	Water Level - Completion
F.E. French	10.0 ft	9.0 ▽	7.0 ▼

Excavation Equipment	Excavation Foreman	Field Engineer
CAT 305.5E Mini Excavator	Scott Perachi	Shawn OConnor

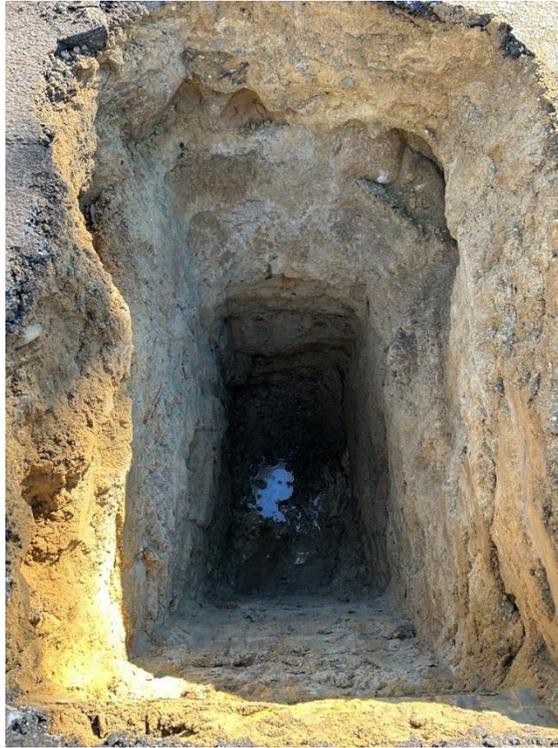| SYMBOL	Elev. (ft)	DESCRIPTION	Depth Scale	SAMPLE Number	Type	REMARKS
	+119.2		0	S-1	GRAB	S-1 from 0ft to 0.5ft
		Gray Gravelly medium SAND, trace cobble, brick, woody vegetation, metal, nylon, roots (moist) [FILL]				
			2	S-2	GRAB	S-2 from 2.5ft to 3ft
	+114.8	Tannish brown medium SAND, trace surrounded gravel, trace silt (moist) [SP-SM]	5			Orange staining at 5.5ft.
			6	S-3	GRAB	S-3 from 6ft to 6.5ft
			7			Groundwater first visible in test pit at 9ft. Water level rose in test pit to 7ft.
	+109.2	End of Test Pit at 10.0ft.	10	S-4	GRAB	S-4 from 9.5ft to 10ft. Test pit bottom at 10ft. Test pit backfilled to grade in 1ft lifts and tamped with the excavator bucket. Top 2ft of test pit replaced with dense grade fill.
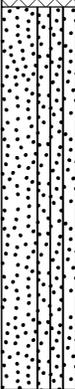
BESS Energy - Epsilon
Tewksbury, MA
Langan Project No. 151043401

Hillman Energy Center, LLC
Attachment B - Supplemental
EFSB 25-08
26 February 2025 Page 157 of 215
Page 1 of 7

Photo 1: General View of Excavated Test Pit TP-01

Photo 2: Test Pit TP-01 Sidewall

LANGAN

BESS Energy - Epsilon
Tewksbury, MA
Langan Project No. 151043401

Hillman Energy Center, LLC
Attachment B - Supplemental
EFSB 25-08
26 February 2025 Page 158 of 215
Page 2 of 7

Photo 3: Test Pit TP-01 Soil Stockpile

Photo 4: General View of Excavated Test Pit TP-02

LANGAN

BESS Energy - Epsilon
Tewksbury, MA
Langan Project No. 151043401

Photo 5: Test Pit TP-02 Sidewall

Photo 6: Test Pit TP-02 Soil Stockpile

LANGAN

BESS Energy - Epsilon
Tewksbury, MA
Langan Project No. 151043401

Hillman Energy Center, LLC
Attachment B - Supplemental
EFSB 25-08
Page 160 of 215
26 February 2025
Page 4 of 7
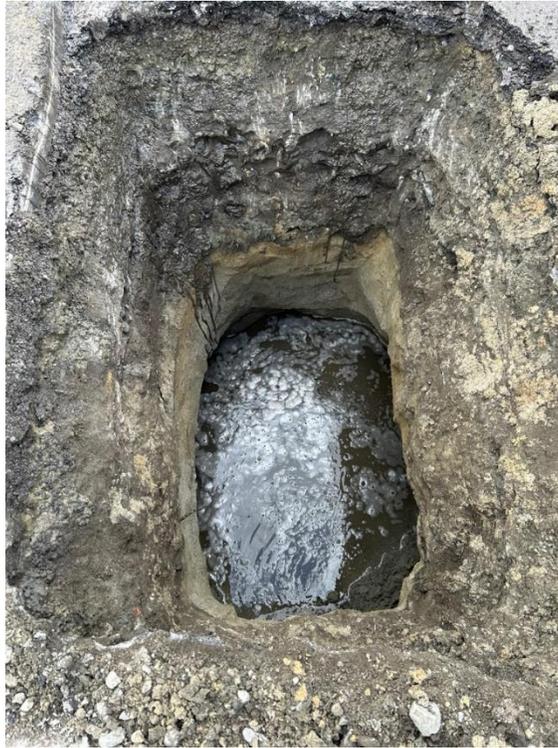
Photo 7: General View of Excavated Test Pit TP-03

Photo 8: Test Pit TP-03 Sidewall

LANGAN

BESS Energy - Epsilon
Tewksbury, MA
Langan Project No. 151043401

Hillman Energy Center, LLC
Attachment B - Supplemental
EFSB 25-08
26 February 2025   Page 161 of 215
Page 5 of 7

Photo 9: Test Pit TP-03 Soil Stockpile

Photo 10: Test Pit TP-03 Fill Debris

LANGAN

BESS Energy - Epsilon
Tewksbury, MA
Langan Project No. 151043401

Photo 11: General View of Excavated Test Pit TP-04

Photo 12: Test Pit TP-04 Sidewall

LANGAN

BESS Energy - Epsilon
Tewksbury, MA
Langan Project No. 151043401

Hillman Energy Center, LLC
Attachment B - Supplemental
EFSB 25-08
26 February 2025 Page 163 of 215
Page 7 of 7

Photo 13: Test Pit TP-04 Soil Stockpile

Photo 14: Test Pit TP-04 Fill Debris

APPENDIX E

TSS Removal Worksheets

LANGAN

LANGAN

TSS Removal Calculation Worksheet

100 Cambridge Street
Boston, MA 02114

Project Name:	**Hillman Energy Center**	Sheet:	**1 of 1**
Project Number:	**151043401**	Date:	**29-Oct-2025**
Location:	**Tewksbury MA**	Computed by:	**HH**
Discharge Point:	**DP-B**	Checked by:	
Drainage Area(s):	**PR B-1, PR B-2, PR B-4, PR B-5 (Pre-Treatment)**		

A	B	C	D	E
BMP*	**TSS Removal Rate***	**Starting TSS Load****	**Amount Removed (C*D)**	**Remaining Load (D-E)**
Water Quality Unit	**80%**	**1.00**	**0.80**	**0.20**
	0%	**0.20**	**0.00**	**0.20**
	0%	**0.20**	**0.00**	**0.20**
	0%	**0.20**	**0.00**	**0.20**
	0%	**0.20**	**0.00**	**0.20**

* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1.
Removal rates for proprietary devices are from approved studies and/or manufacturer data (attach study or data source, or remove this sentence if not applicable).
** Equals remaining load from previous BMP (E)

Treatment Train TSS Removal =	**80%**

LANGAN

TSS Removal Calculation Worksheet

100 Cambridge Street
Boston, MA 02114

Project Name:	**Hillman Energy Center**	Sheet:	**1 of 1**
Project Number:	**151043401**	Date:	**29-Oct-2025**
Location:	**Tewksbury MA**	Computed by:	**HH**
Discharge Point:	**DP-B**	Checked by:	
Drainage Area(s):	**PR B-2, PR B-4, PR B-5**		

A	B	C	D	E
BMP*	**TSS Removal Rate***	**Starting TSS Load****	**Amount Removed (C*D)**	**Remaining Load (D-E)**
Subsurface Infiltration Structure	**80%**	**1.00**	**0.80**	**0.20**
	0%	**0.20**	**0.00**	**0.20**
	0%	**0.20**	**0.00**	**0.20**
	0%	**0.20**	**0.00**	**0.20**
	0%	**0.20**	**0.00**	**0.20**

* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1.
Removal rates for proprietary devices are from approved studies and/or manufacturer data (attach study or data source, or remove this sentence if not applicable).
** Equals remaining load from previous BMP (E)

Treatment Train TSS Removal = | **80%** |

NJCAT TECHNOLOGY VERIFICATION
(See Disclaimer in Section 1.2)

First Defense® HC Stormwater Treatment Device

Removal Efficiency of Suspended Sediment for Varying Particle Size Distributions

Hydro International

September, 2016
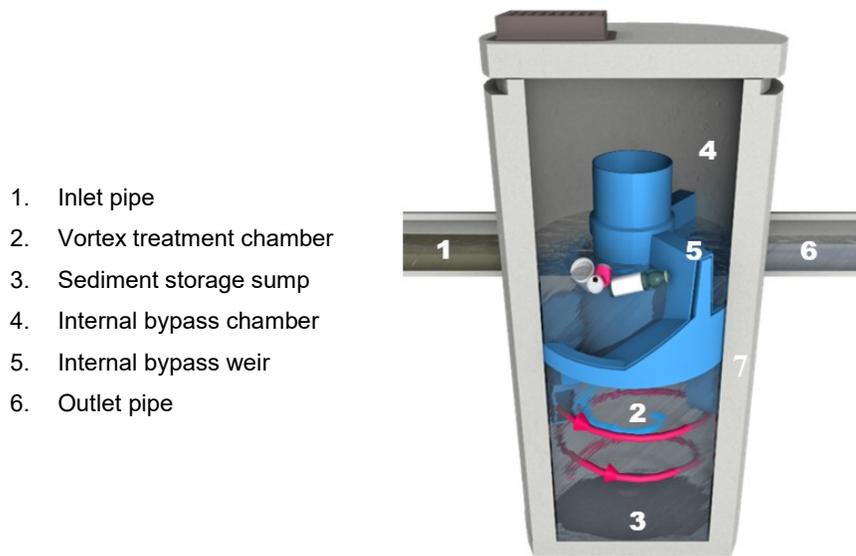**(Expanded Section 4.4 February 2017)**

1. Inlet pipe
2. Vortex treatment chamber
3. Sediment storage sump
4. Internal bypass chamber
5. Internal bypass weir
6. Outlet pipe

Figure 1 First Defense® HC

The FDHC is available in the standard model sizes shown in **Table 1.**

Table 1 First Defense® HC Model Size Range

First Defense® HC Model	Manhole Diameter (ft)	Hydraulic Capacity (cfs)	Maximum Pipe Diameter (in)	Oil Storage Capacity (gal)	Sediment Storage Capacity (yd³)
3-ft	3-ft	15	18	125	0.4
4-ft	4-ft	18	24	191	0.7
5-ft	5-ft	20	24	300	1.1
6-ft	6-ft	32	30	496	1.6
8-ft	8-ft	50	48	1,120	2.8

3.   First Defense® HC Performance Evaluation

The objective of this performance evaluation was to determine the Total Suspended Solids removal efficiencies of the FDHC within specific particle sizes ranges when tested with the NJDEP-specified test sediment, which ranges from 1 μm to 1000 μm in diameter. The test setup and procedures were conducted in accordance with the New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device dated January 25, 2013.

The testing was conducted on a 4-ft FDHC at Hydro International's laboratory in Portland, Maine. In compliance with the requirement that the performance evaluation be independent, all testing and set-up was conducted under the supervision of third party witnesses from FB Environmental Associates, Inc. FB Environmental is a Portland, Maine based environmental

4

engineering consultancy with prior experience serving as the independent observer for several hydrodynamic separator laboratory testing programs.

Hydro followed the sediment analysis methods as required by the ETV-Canada protocol, which uses the New Jersey Particle Size Distribution as a test blend, for analyzing the feed sediment and the sediment in the effluent water quality samples. The ETV-Canada procedure was written by a panel of independent governing bodies, independent testing laboratories and manufacturers. The procedure requires that the influent determinations be based on the ASTM D422-63 method because of the test blend's broad spectrum of particle sizes. This method, which uses a hydrometer, was deemed the best fit to analyze concentrations at particle sizes at the specified cut points, though one of the limitations of the method is its accurateness below 20 micron. For the effluent, however, the assumption is that much of the coarse material (>250 microns) has been removed and therefore the ISO 13320 (2009) method is preferable because laser diffraction is more accurate at analyzing fines (at many different cut points) than a hydrometer.

All water quality samples were collected, labeled and sealed under the direct supervision of the independent observer from FB Environmental. Maine Environmental Laboratory in Yarmouth, Maine conducted the water quality analysis and Microtrac, Inc. of York, Pennsylvania conducted the particle size distribution analysis.

3.1   Test Unit

The test unit was a 4-ft FDHC comprised of full scale, commercially available 4-ft FDHC internal components installed in a 4-ft round plastic manhole chamber consistent in all key dimensions with the precast chambers used for commercial sales (**Figure 2**). Both the inlet and outlet pipe diameters of the test model were 24 inches, which is the standard pipe size for a 4-ft FDHC.

Table 13 Removal Efficiency for Particles Larger Than ("down to") 50 μm

Flow Rate	0.38 cfs		0.75 cfs		1.13 cfs		1.5 cfs		1.88 cfs	
Range (μm)	Influent (g)	Effluent (g)	Influent (g)	Effluent (g)	Influent (g)	Effluent (g)	Influent (g)	Effluent (g)	Influent (g)	Effluent (g)
500 to 1,000	202.6	0	229.4	0	244.0	0	287.1	0	308.4	0
250 to 500	303.8	0	344.2	0	366.0	0	430.6	0	462.5	0
150 to 250	506.4	2.2	573.6	2.9	610.0	0	717.7	4.3	770.9	21.4
100 to 150	957.1	20.1	1,084.1	27.7	1,153.0	19.0	1,356.4	42.5	1457.0	58.1
75 to 100	359.5	23.7	407.3	33.5	433.1	28.5	509.5	50.8	547.3	70.1
50 to 75	238.0	63.3	269.6	89.6	286.7	79.7	337.3	133.4	362.3	175.6
Sum	2,567.4	109.3	2,908.2	153.7	3,092.8	127.2	3,638.6	231	3,908.4	325.2
Efficiency	95.7%		94.7%		95.9%		93.7%		91.7%	

Table 14 Removal Efficiency for Particles 50 μm – 150 μm

Flow Rate	0.38 cfs		0.75 cfs		1.13 cfs		1.5 cfs		1.88 cfs	
Range (μm)	Influent (g)	Effluent (g)	Influent (g)	Effluent (g)	Influent (g)	Effluent (g)	Influent (g)	Effluent (g)	Influent (g)	Effluent (g)
100 to 150	957.1	20.1	1,084.1	27.7	1,153.0	19.0	1,356.4	42.5	1457.0	58.1
75 to 100	359.5	23.7	407.3	33.5	433.1	28.5	509.5	50.8	547.3	70.1
50 to 75	238.0	63.3	269.6	89.6	286.7	79.7	337.3	133.4	362.3	175.6
Sum	1,554.6	107.1	1,761.0	150.8	1,872.8	127.2	2,203.2	226.7	2,366.6	303.8
Efficiency	93.1%		91.4%		93.2%		89.7%		87.2%	

5.   Conclusions

Performance testing of a 4-ft diameter FDHC was completed using test procedures that complied with the New Jersey Department of Environmental Protection Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device dated January 25, 2013.

Additional effluent particle size analysis was also completed at five flow rates and compared to the test sediment particle size distribution to evaluate the performance of the FDHC based on seven particle size bands: 500-1000 μm, 250-500 μm, 150-250 μm, 100-150 μm, 75-100 μm, and 50-100 μm and 1- 50 μm. Five different flow test runs were completed to report removal efficiencies for the entire distribution, for the entire distribution less particles finer than 50 μm, for particles in the 50-150 μm range, and by particle size band.

As shown in **Figure 11**, the effluent particle size analysis showed that the FDHC removed greater than 80% of test sediment in the particle size bands larger than 75-100 μm for all tested

20

flow rates between 0.38 cfs and 1.88 cfs. The removal efficiency was greater than 60% for the test sediment in the particle size band 50-100 μm for flow rates up to 1.5 cfs and greater than 50% at the maximum flow rate tested. For particles in the range of 1-50 μm, the removal efficiency ranged from 25.5% at the lowest tested flow rate to zero at flow rates above 1.13 cfs.
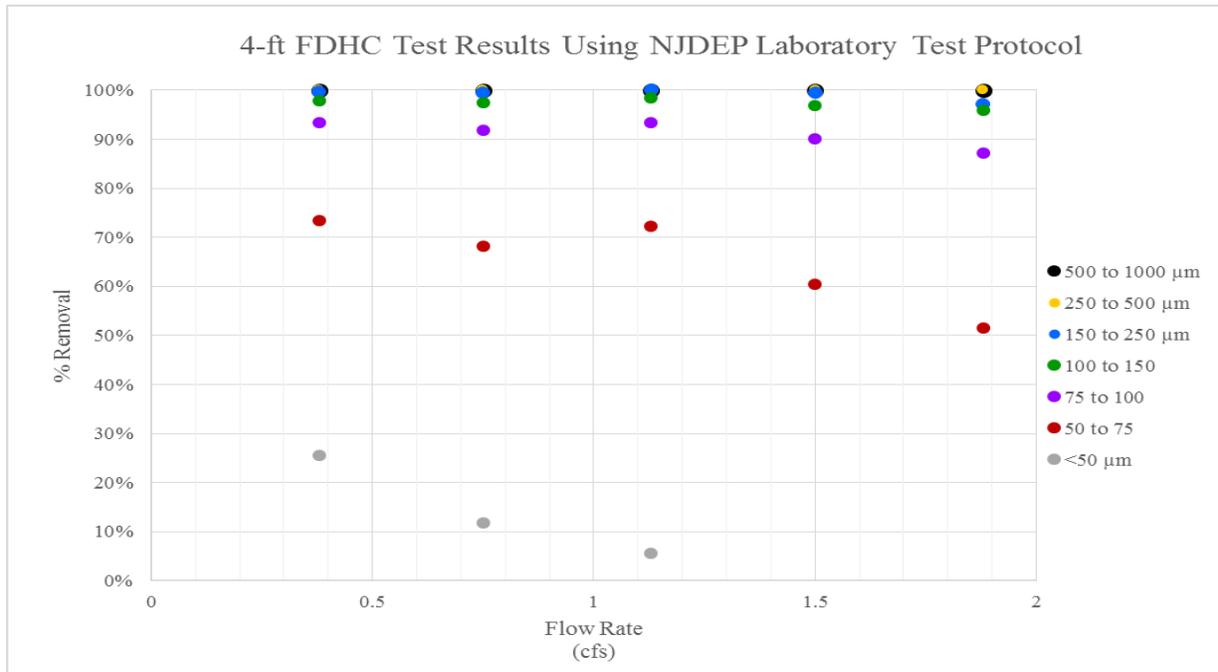

Figure 11 FDHC Particle Size Band Removal Rates vs Flow Rate

As shown in **Figure 12**, the effluent particle size analysis demonstrates the FDHC is capable of removing greater than 90% of the test sediment for all particles larger than (or "down to") 50 μm at all the tested flow rates.

21
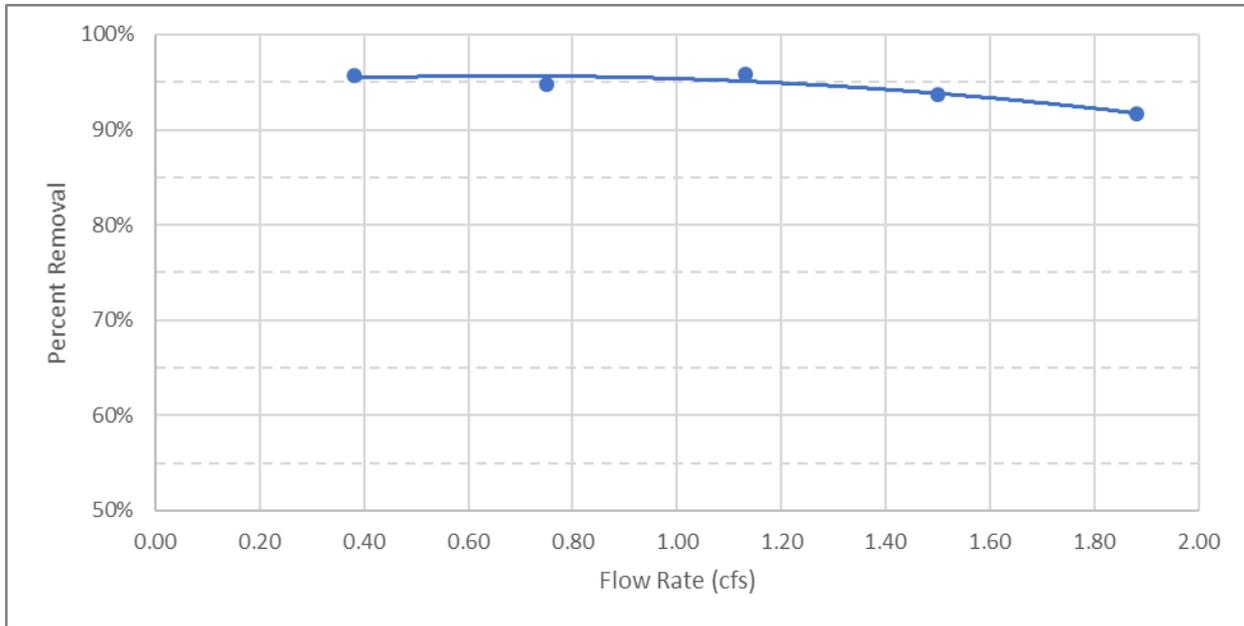
Figure 12 FDHC Removal Efficiency for Particles Larger Than ('down to") 50 μm

As shown in **Figure 13**, the effluent particle size analysis demonstrates the FDHC can remove greater than 85% of the test sediment for particles between 50 and 150 microns at all the tested flow rates.
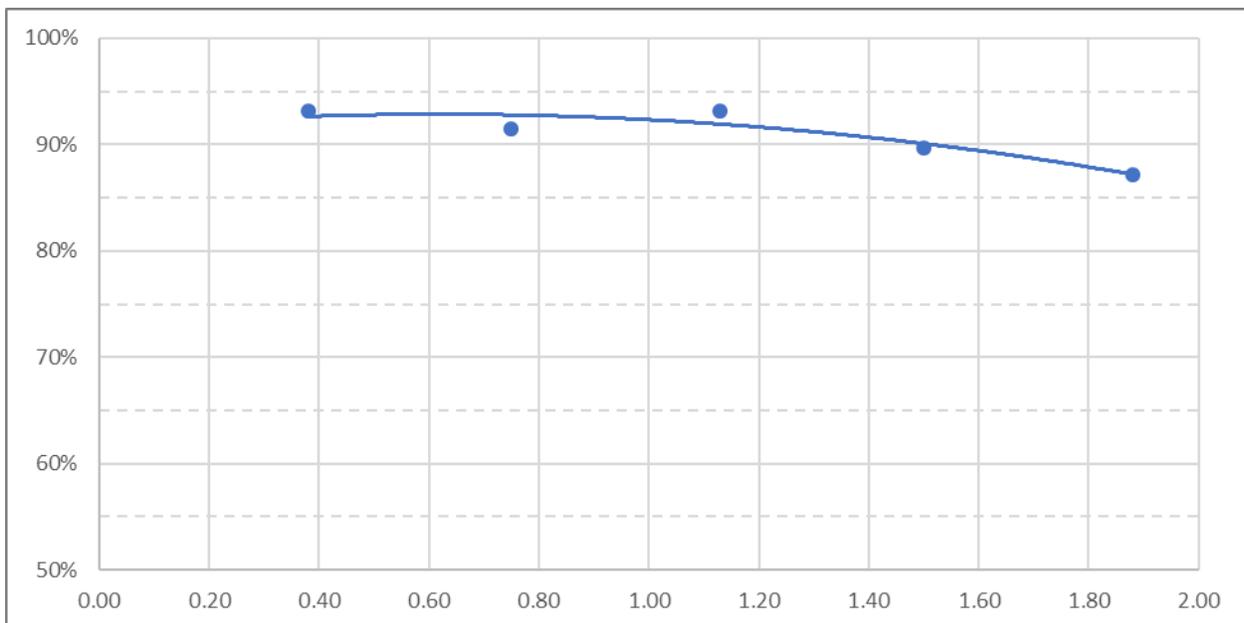

Figure 13 FDHC Removal Efficiency for Particles 50-150 μm

22

APPENDIX F

Recharge, Draindown, **WQV** Calculations

LANGAN

Standard 3: Recharge

Total Impervious Coverage Site	67,929 sf	*1.559 ac*
Impervious Coverage HSG-A	67,929 sf	*0.00 ac*
Impervious Coverage HSG-B	sf	*0.000 ac*
Impervious Coverage HSG-C	0 sf	*0.00 ac*
Impervious Coverage HSG-D	0 sf	*0.00 ac*

Total Impervious Site Area Draining to Recharge Facilities	65,633 sf	*1.507 ac*
% Site Impervious Area Draining to Recharge Facilities		97%
Recharge Adjustment = Site Impervious / Imp Draining to Recharge Facilities =		1.03

HSG	F (in)	A_{Imp} (sf)	Rv (cf)
A	0.60	67,929	3,396
B	0.35	0	0
C	0.25	0	0
D	0.10	0	0
Total Required Recharge Volume, Rv			**3,396**
Adjusted Total Required Recharge			**3,515**

Total Recharge Volume Provided	**15,836**

Hillman Tewksbury - Proposed Conditions - 2025-10-28 - *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-7a s/n 08223 © 2025 HydroCAD Software Solutions LLC   Page 1

Summary for Pond B-1: Subsurface infiltration system

Inflow Area =   1.680 ac, 39.29% Impervious, Inflow Depth = 2.16"   for 2-yr event
Inflow   =   4.09 cfs @ 12.09 hrs, Volume=   0.302 af
Outflow   =   0.49 cfs @ 12.77 hrs, Volume=   0.303 af, Atten= 88%, Lag= 40.6 min
Discarded =   0.37 cfs @ 12.77 hrs, Volume=   0.299 af
Primary   =   0.12 cfs @ 12.77 hrs, Volume=   0.003 af
     Routed to Pond LS-B1 : Level Spreader

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 119.84' @ 12.77 hrs   Surf.Area= 3,269 sf   Storage= 5,467 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 151.4 min (956.4 - 804.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	117.80'	950 cf	**15.50'W x 119.00'L x 3.00'H Field A**
			5,534 cf Overall - 3,159 cf Embedded = 2,374 cf x 40.0% Voids
#2A	117.80'	3,038 cf	**StormTank 25 Series 24"** x 351 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			351 Chambers in 9 Rows
#3B	117.80'	682 cf	**18.50'W x 77.00'L x 2.50'H Field B**
			3,561 cf Overall - 1,856 cf Embedded = 1,705 cf x 40.0% Voids
#4B	117.80'	1,770 cf	**StormTank 25 Series 18"** x 275 Inside #3
			Inside= 18.0"W x 18.0"H => 2.15 sf x 3.00'L = 6.4 cf
			Outside= 18.0"W x 18.0"H => 2.25 sf x 3.00'L = 6.8 cf
			275 Chambers in 11 Rows
		6,440 cf	Total Available Storage

Storage Group A created with Chamber Wizard
Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**15.0" Round Culvert X 2.00**
			L= 24.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.00' / 115.80' S= 0.0500 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	119.80'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	117.80'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 115.80'

Discarded OutFlow Max=0.37 cfs @ 12.77 hrs HW=119.84'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.37 cfs)

Primary OutFlow Max=0.12 cfs @ 12.77 hrs HW=119.84' TW=116.36'   (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.12 cfs of 17.58 cfs potential flow)
  └─**2=Sharp-Crested Rectangular Weir** (Weir Controls 0.12 cfs @ 0.63 fps)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 - *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-7a s/n 08223 © 2025 HydroCAD Software Solutions LLC   Page 2

Stage-Area-Storage for Pond B-1: Subsurface infiltration system

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
117.80	**3,269**	0	120.40	3,269	6,145
117.85	3,269	144	120.45	3,269	6,182
117.90	3,269	288	120.50	3,269	6,219
117.95	3,269	432	120.55	3,269	6,256
118.00	3,269	576	120.60	3,269	6,293
118.05	3,269	720	120.65	3,269	6,329
118.10	3,269	864	120.70	3,269	6,366
118.15	3,269	1,008	120.75	3,269	6,403
118.20	3,269	1,152	120.80	3,269	**6,440**
118.25	3,269	1,296			
118.30	3,269	1,440			
118.35	3,269	1,584			
118.40	3,269	1,728			
118.45	3,269	1,872			
118.50	3,269	2,016			
118.55	3,269	2,160			
118.60	3,269	2,304			
118.65	3,269	2,448			
118.70	3,269	2,592			
118.75	3,269	2,736			
118.80	3,269	2,880			
118.85	3,269	3,024			
118.90	3,269	3,168			
118.95	3,269	3,312			
119.00	3,269	3,456			
119.05	3,269	3,600			
119.10	3,269	3,744			
119.15	3,269	3,888			
119.20	3,269	4,032			
119.25	3,269	4,176			
119.30	3,269	4,320			
119.35	3,269	4,430			
119.40	3,269	4,539			
119.45	3,269	4,649			
119.50	3,269	4,759			
119.55	3,269	4,869			
119.60	3,269	4,978			
119.65	3,269	5,088			
119.70	3,269	5,198			
119.75	3,269	5,308			
119.80	3,269	5,417			
119.85	3,269	5,483			
119.90	3,269	5,548			
119.95	3,269	5,614			
120.00	3,269	5,679			
120.05	3,269	5,744			
120.10	3,269	5,810			
120.15	3,269	5,875			
120.20	3,269	5,940			
120.25	3,269	6,006			
120.30	3,269	6,071			
120.35	3,269	6,108			

Hillman Tewksbury - Proposed Conditions - 2025-10-28 - *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-7a s/n 08223 © 2025 HydroCAD Software Solutions LLC   Page 3

Summary for Pond B-4: Subsurface Infiltration System

Inflow Area =   1.440 ac, 58.82% Impervious, Inflow Depth = 0.96"   for 2-yr event
Inflow   =   1.54 cfs @ 12.09 hrs, Volume=   0.115 af
Outflow   =   0.24 cfs @ 12.58 hrs, Volume=   0.115 af, Atten= 84%, Lag= 29.4 min
Discarded =   0.24 cfs @ 12.58 hrs, Volume=   0.115 af
Primary   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af
     Routed to Pond LS-B4 : Level Spreader

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 116.74' @ 12.58 hrs   Surf.Area= 3,502 sf   Storage= 1,523 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 42.4 min (835.3 - 792.9)

Volume	Invert	Avail.Storage	Storage Description
#1B	116.25'	1,754 cf	**17.00'W x 206.00'L x 3.00'H Field B**
			10,506 cf Overall - 6,120 cf Embedded = 4,386 cf x 40.0% Voids
#2B	116.25'	5,886 cf	**StormTank 25 Series 24"** x 680 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			680 Chambers in 10 Rows
		7,641 cf	Total Available Storage

   Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.00'	**15.0" Round Culvert**
			L= 170.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.00' / 115.30' S= 0.0100 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	118.50'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	116.25'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 114.20'

Discarded OutFlow Max=0.24 cfs @ 12.58 hrs HW=116.74'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.24 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=116.25' TW=114.80'   (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)
  └─**2=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 - *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-7a s/n 08223 © 2025 HydroCAD Software Solutions LLC   Page 4

Stage-Area-Storage for Pond B-4: Subsurface Infiltration System

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
116.25	**3,502**	0	118.85	3,502	7,080
116.30	3,502	156	118.90	3,502	7,150
116.35	3,502	312	118.95	3,502	7,220
116.40	3,502	468	119.00	3,502	7,290
116.45	3,502	624	119.05	3,502	7,360
116.50	3,502	780	119.10	3,502	7,430
116.55	3,502	936	119.15	3,502	7,501
116.60	3,502	1,092	119.20	3,502	7,571
116.65	3,502	1,248	119.25	3,502	**7,641**
116.70	3,502	1,404			
116.75	3,502	1,560			
116.80	3,502	1,716			
116.85	3,502	1,872			
116.90	3,502	2,028			
116.95	3,502	2,184			
117.00	3,502	2,340			
117.05	3,502	2,496			
117.10	3,502	2,652			
117.15	3,502	2,808			
117.20	3,502	2,964			
117.25	3,502	3,120			
117.30	3,502	3,276			
117.35	3,502	3,432			
117.40	3,502	3,588			
117.45	3,502	3,744			
117.50	3,502	3,900			
117.55	3,502	4,056			
117.60	3,502	4,212			
117.65	3,502	4,368			
117.70	3,502	4,524			
117.75	3,502	4,680			
117.80	3,502	4,836			
117.85	3,502	4,992			
117.90	3,502	5,148			
117.95	3,502	5,304			
118.00	3,502	5,460			
118.05	3,502	5,616			
118.10	3,502	5,772			
118.15	3,502	5,928			
118.20	3,502	6,084			
118.25	3,502	6,240			
118.30	3,502	6,310			
118.35	3,502	6,380			
118.40	3,502	6,450			
118.45	3,502	6,520			
118.50	3,502	6,590			
118.55	3,502	6,660			
118.60	3,502	6,730			
118.65	3,502	6,800			
118.70	3,502	6,870			
118.75	3,502	6,940			
118.80	3,502	7,010			

Hillman Tewksbury - Proposed Conditions - 2025-10-28 - *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-7a s/n 08223 © 2025 HydroCAD Software Solutions LLC   Page 5

Summary for Pond B-5: Subsurface Infiltration System

Inflow Area =   0.870 ac, 55.17% Impervious, Inflow Depth = 2.33"   for 2-yr event
Inflow   =   2.27 cfs @   12.09 hrs, Volume=   0.169 af
Outflow   =   0.22 cfs @   12.97 hrs, Volume=   0.169 af, Atten= 91%, Lag= 53.0 min
Discarded =   0.22 cfs @   12.97 hrs, Volume=   0.169 af
Primary   =   0.00 cfs @   0.00 hrs, Volume=   0.000 af
     Routed to Pond B-4 : Subsurface Infiltration System

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 118.89' @ 12.97 hrs   Surf.Area= 2,170 sf   Storage= 2,989 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 130.6 min (928.6 - 798.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	117.33'	1,114 cf	**15.50'W x 140.00'L x 3.00'H Field A**
			6,510 cf Overall - 3,726 cf Embedded = 2,784 cf x 40.0% Voids
#2A	117.33'	3,584 cf	**StormTank 25 Series 24"** x 414 Inside #1
			Inside= 18.0"W x 24.0"H => 2.89 sf x 3.00'L = 8.7 cf
			Outside= 18.0"W x 24.0"H => 3.00 sf x 3.00'L = 9.0 cf
			414 Chambers in 9 Rows
		4,697 cf	Total Available Storage

   Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	117.33'	**18.0" Round Culvert**
			L= 40.0' CPP, square edge headwall, Ke= 0.500
			Inlet / Outlet Invert= 117.33' / 117.00' S= 0.0082 '/' Cc= 0.900
			n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	119.30'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Discarded	117.33'	**2.410 in/hr Exfiltration over Surface area**
			Conductivity to Groundwater Elevation = 115.33'

Discarded OutFlow Max=0.22 cfs @ 12.97 hrs HW=118.89'   (Free Discharge)
└─**3=Exfiltration** (Controls 0.22 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=117.33' TW=116.25'   (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)
  └─**2=Sharp-Crested Rectangular Weir**(Controls 0.00 cfs)

Hillman Tewksbury - Proposed Conditions - 2025-10-28 - *Type III 24-hr 2-yr Rainfall=3.18"*
Prepared by Langan Engineering   Printed 10/29/2025
HydroCAD® 10.20-7a s/n 08223 © 2025 HydroCAD Software Solutions LLC   Page 6

Stage-Area-Storage for Pond B-5: Subsurface Infiltration System

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
117.33	**2,170**	0	119.93	2,170	4,350
117.38	2,170	96	119.98	2,170	4,393
117.43	2,170	191	120.03	2,170	4,437
117.48	2,170	287	120.08	2,170	4,480
117.53	2,170	383	120.13	2,170	4,524
117.58	2,170	479	120.18	2,170	4,567
117.63	2,170	574	120.23	2,170	4,610
117.68	2,170	670	120.28	2,170	4,654
117.73	2,170	766	120.33	2,170	**4,697**
117.78	2,170	862			
117.83	2,170	957			
117.88	2,170	1,053			
117.93	2,170	1,149			
117.98	2,170	1,245			
118.03	2,170	1,340			
118.08	2,170	1,436			
118.13	2,170	1,532			
118.18	2,170	1,627			
118.23	2,170	1,723			
118.28	2,170	1,819			
118.33	2,170	1,915			
118.38	2,170	2,010			
118.43	2,170	2,106			
118.48	2,170	2,202			
118.53	2,170	2,298			
118.58	2,170	2,393			
118.63	2,170	2,489			
118.68	2,170	2,585			
118.73	2,170	2,680			
118.78	2,170	2,776			
118.83	2,170	2,872			
118.88	2,170	2,968			
118.93	2,170	3,063			
118.98	2,170	3,159			
119.03	2,170	3,255			
119.08	2,170	3,351			
119.13	2,170	3,446			
119.18	2,170	3,542			
119.23	2,170	3,638			
119.28	2,170	3,734			
119.33	2,170	3,829			
119.38	2,170	3,873			
119.43	2,170	3,916			
119.48	2,170	3,959			
119.53	2,170	4,003			
119.58	2,170	4,046			
119.63	2,170	4,090			
119.68	2,170	4,133			
119.73	2,170	4,176			
119.78	2,170	4,220			
119.83	2,170	4,263			
119.88	2,170	4,307			

Standard 3: 72-hour Drawdown Analysis

Table 2.3.3. 1982 Rawls Rates[18]

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

$$\text{Drawdown Time} = \frac{Rv}{(K)\,(\text{Bottom Area})} \quad \text{where:}$$

Rv = Storage Volume Below Outlet [Ac-ft]
K= Infiltration Rate [in/hr]
Bottom Area= Bottom Area of Recharge System [Ac]

Infiltration System   B-1

Rv =	0.124	Ac-ft
K =	2.410	in/hr
Bottom Area =	0.075	Acres
Drawdown Time =	**8.3**	**Hours**

< 72 Hours, Design is in compliance with the standard.

Infiltration System   B-4

Rv =	0.151	Ac-ft
K =	2.410	in/hr
Bottom Area =	0.080	Acres
Drawdown Time =	**9.4**	**Hours**

< 72 Hours, Design is in compliance with the standard.

Infiltration System   B-5

Rv =	0.088	Ac-ft
K =	2.410	in/hr
Bottom Area =	0.050	Acres
Drawdown Time =	**8.8**	**Hours**

< 72 Hours, Design is in compliance with the standard.

Stormwater Quality Calculations

Calculation   Design Guideline

Stormwater Quality Volume (WQV)   Massachusetts Stormwater Handbook / MS4 Watershed
Stormwater Quality Flow (WQF)   MassDEP & Ubran Hydrology for Small Watersheds TR-55

Proposed Watershed	**B-1**

Watershed Characteristics

Total Watershed Area	0.56	ac			
Impervious Area, A_{imp}	0.04	ac	>>>	0.0001	mi^2
Time of Concentration , T_c	6	min	>>>	0.1	hr

Water Quality Volume (WQV)

$WQV = (Q_{WQV})*(A_{Imp})$

Water Quality Depth, Q_{WQV}	1.0	in
Impervious Area, A_{imp}	0.04	ac

Water Quality Volume, WQV	**0.00**	**ac-ft**	>>>	145	ft^3

Water Quality Flow (WQF)

$WQF = (q_u)* (A_{Imp})*(Q_{WQV})$

q_u = Unit Peak Discharge (csm/in)

A = drainage area (mi^2)

Water Quality Depth, Q_{WQV}	1.0	in	
CN =	86		
Tc =	0.100	hr	
Ia =	0.041		
P =	1.2	in	
Ia / P =	0.034		
Unit Peak Discharge, q_u	774	csm/in	Determine qu, using *MassDEP Standard Method to*

Water Quality Flow, WQF = **0.08** **cfs**

Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices
Figure 3 or 4 for Ia/P =0.034 for 1" Q_{WQV}

Hillman Energy Center Tewksbury, MA	BY	HH	DATE	8/1/2025	PROJ NO. 151043401
	REV		DATE		SHEET 1

Stormwater Quality Calculations

Calculation	Design Guideline
Stormwater Quality Volume (WQV)	Massachusetts Stormwater Handbook / MS4 Watershed
Stormwater Quality Flow (WQF)	MassDEP & Ubran Hydrology for Small Watersheds TR-55

Proposed Watershed	**B-2**

Watershed Characteristics

Total Watershed Area	1.12	ac			
Impervious Area, A_{imp}	0.62	ac	>>>	0.001	mi^2
Time of Concentration , T_c	6	min	>>>	0.1	hr

Water Quality Volume (WQV)

$WQV = (Q_{WQV})*(A_{Imp})$

Water Quality Depth, Q_{WQV}	1.0	in
Impervious Area, A_{imp}	0.62	ac

Water Quality Volume, WQV	**0.05**	**ac-ft**	>>>	2,251	ft^3

Water Quality Flow (WQF)

$WQF = (q_u)* (A_{Imp})*(Q_{WQV})$

q_u = Unit Peak Discharge (csm/in)

A = drainage area (mi^2)

Water Quality Depth, Q_{WQV}	1.0	in
CN =	92	
Tc =	0.100	hr
Ia =	0.041	
P =	1.2	in
Ia / P =	0.034	
Unit Peak Discharge, q_u	774	csm/in

Water Quality Flow, WQF =	**0.77**	**cfs**

Determine qu, using *MassDEP Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices* Figure 3 or 4 for Ia/P =0.034 for 1" Q_{WQV}

Hillman Energy Center Tewksbury, MA	BY	HH	DATE	8/1/2025	PROJ NO. 151043401
	REV		DATE		SHEET 2

Stormwater Quality Calculations

Calculation	Design Guideline
Stormwater Quality Volume (WQV)	Massachusetts Stormwater Handbook / MS4 Watershed
Stormwater Quality Flow (WQF)	MassDEP & Ubran Hydrology for Small Watersheds TR-55

Proposed Watershed	B-4

Watershed Characteristics

Total Watershed Area	0.57	ac			
Impervious Area, A_{imp}	0.37	ac	>>>	0.0006	mi^2
Time of Concentration , T_c	6	min	>>>	0.1	hr

Water Quality Volume (WQV)

$WQV = (Q_{WQV})*(A_{Imp})$

Water Quality Depth, Q_{WQV}	1.0	in			
Impervious Area, A_{imp}	0.37	ac			
Water Quality Volume, WQV	**0.03**	**ac-ft**	>>>	1,332	ft^3

Water Quality Flow (WQF)

$WQF = (q_u)* (A_{Imp})*(Q_{WQV})$

q_u = Unit Peak Discharge (csm/in)

A = drainage area (mi^2)

Water Quality Depth, Q_{WQV}	1.0	in	
CN =	93		
Tc =	0.100	hr	
Ia =	0.041		
P =	1.2	in	
Ia / P =	0.034		
Unit Peak Discharge, q_u	774	csm/in	Determine qu, using *MassDEP Standard Method to*
Water Quality Flow, WQF =	**0.46**	**cfs**	*Convert Required Water Quality Volume to a* *Discharge Rate for Sizing Flow Based Manufactured* *Proprietary Stormwater Treatment Practices*

Figure 3 or 4 for Ia/P =0.034 for 1" Q_{WQV}

Hillman Energy Center Tewksbury, MA	BY	HH	DATE	8/1/2025	PROJ NO. 151043401
	REV		DATE		SHEET 3

Stormwater Quality Calculations

Calculation	Design Guideline
Stormwater Quality Volume (WQV)	Massachusetts Stormwater Handbook / MS4 Watershed
Stormwater Quality Flow (WQF)	MassDEP & Ubran Hydrology for Small Watersheds TR-55

Proposed Watershed	B-5

Watershed Characteristics

Total Watershed Area	0.87	ac			
Impervious Area, A_{imp}	0.48	ac	>>>	0.0008	mi^2
Time of Concentration , T_c	6	min	>>>	0.1	hr

Water Quality Volume (WQV)

$WQV = (Q_{WQV})*(A_{Imp})$

Water Quality Depth, Q_{WQV}	1.0	in
Impervious Area, A_{imp}	0.48	ac

Water Quality Volume, WQV	0.04	**ac-ft**	>>>	1,742	ft^3

Water Quality Flow (WQF)

$WQF = (q_u)* (A_{Imp})*(Q_{WQV})$
q_u = Unit Peak Discharge (csm/in)
A = drainage area (mi^2)

Water Quality Depth, Q_{WQV}	1.0	in	
CN =	92		
Tc =	0.100	hr	
Ia =	0.041		
P =	1.2	in	
Ia / P =	0.034		
Unit Peak Discharge, q_u	774	csm/in	Determine qu, using *MassDEP Standard Method to*
			Convert Required Water Quality Volume to a
Water Quality Flow, WQF =	0.62	**cfs**	*Discharge Rate for Sizing Flow Based Manufactured*

Proprietary Stormwater Treatment Practices
Figure 3 or 4 for Ia/P =0.034 for 1" Q_{WQV}

Hillman Energy Center Tewksbury, MA	BY	HH	DATE	8/1/2025	PROJ NO. 151043401
	REV		DATE		SHEET 4

Hydro International ®

First Defense® High Capacity

A Simple Solution for your Trickiest Sites

Product Profile

The First Defense® High Capacity is an enhanced vortex separator that combines an effective stormwater treatment chamber with an integral peak flow bypass. It efficiently removes sediment total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® High Capacity is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints (**Table 1**, next page).

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for "offline" arrangements using separate junction manholes
- Proven to prevent pollutant washout at up to 450% of its treatment flow
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
- Delivered to site pre-assembled and ready for installation

Verified by NJCAT and NJDEP

Fig.1 The First Defense® High Capacity has internal components designed to efficiently capture pollutants and prevent washout at peak flows.
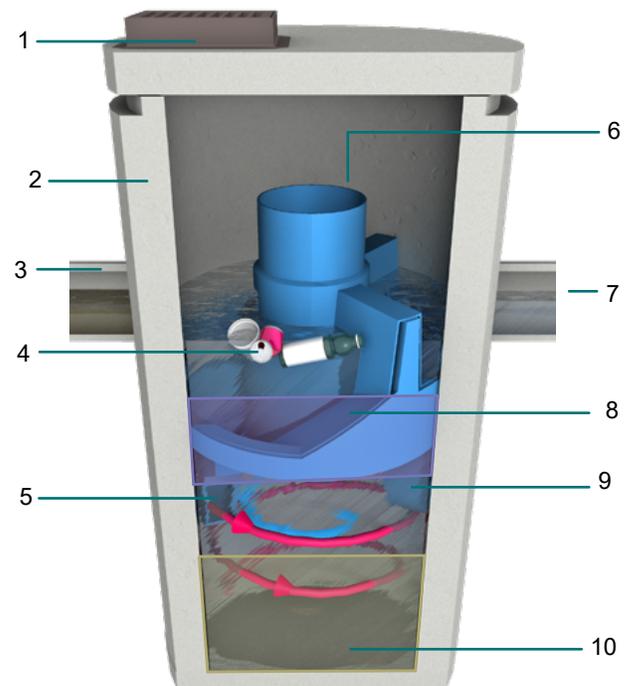
Components

1. Inlet Grate (optional)
2. Precast chamber
3. Inlet Pipe (optional)
4. Floatables Draw Off Slot (not pictured)
5. Inlet Chute
6. Internal Bypass
7. Outlet pipe
8. Oil and Floatables Storage
9. Outlet chute
10. Sediment Storage Sump

How it Works

The First Defense® High Capacity has internal components designed to remove and retain gross debris, total suspended solids (TSS) and hydrocarbons (**Fig.1**).

Contaminated stormwater runoff enters the inlet chute from a surface grate and/or inlet pipe. The inlet chute introduces flow into the chamber tangentially to create a low energy vortex flow regime (magenta arrow) that directs sediment into the sump while oils, floating trash and debris rise to the surface.

Treated stormwater exits through a submerged outlet chute located opposite to the direction of the rotating flow (blue arrow). Enhanced vortex separation is provided by forcing the rotating flow within the vessel to follow the longest path possible rather than directly from inlet to outlet.

Higher flows bypass the treatment chamber to prevent turbulence and washout of captured pollutants. An internal bypass conveys infrequent peak flows directly to the outlet eliminating the need for, and expense of, external bypass control structures. A floatables draw off slot functions to convey floatables into the treatment chamber prior to bypass.

Stormwater Solutions
hydro-int.com/firstdefensehc

First Defense® High Capacity

Sizing & Design

This adaptable online treatment system works easily with large pipes, multiple inlet pipes, inlet grates and now, contains a high capacity bypass for the conveyance of large peak flows. Designed with site flexibility in mind, the First Defense® High Capacity allows engineers to maximize available site space without compromising treatment level.
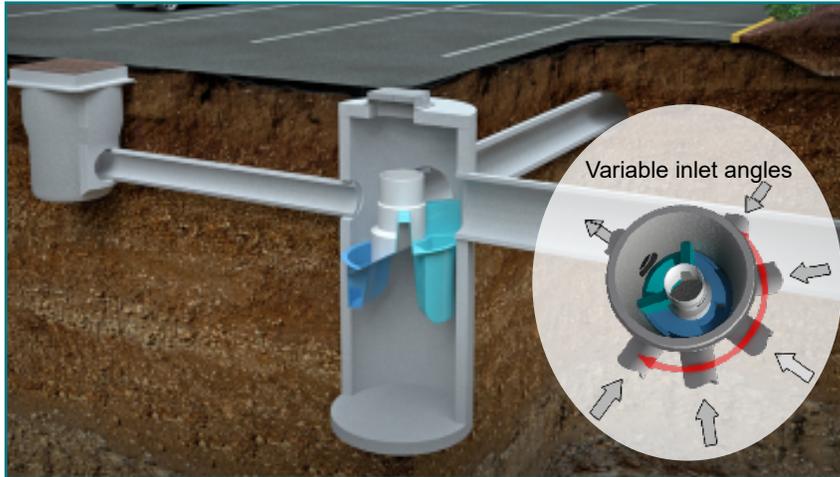

Fig 2. Works with multiple inlet pipes and grates

Variable inlet angles

Inspection and Maintenance

Nobody maintains our systems better than we do. To ensure optimal, ongoing device performance, be sure to recommend Hydro International as a preferred service and maintenance provider to your clients.

Call **1 (800) 848-2706** to schedule an inspection and cleanout or learn more at **hydro-int.com/service**

SIZING CALCULATOR FOR ENGINEERS

This simple online tool will recommend the best separator, model size and online/offline arrangement based on site-specific data entered by the user.

Go to hydro-int.com/sizing to access the tool.

Fig 3. Maintenance is done with a vactor truck

Table 1. First Defense® High Capacity Design Criteria.

First Defense® High Capacity Model Number	Diameter	Typical TSS Treatment Flow Rates		Peak Online Flow Rate	Maximum Pipe Diameter[1]	Oil Storage Capacity	Typical Sediment Storage Capacity[2]	Minimum Distance from Outlet Invert to Top of Rim[3]	Standard Distance from Outlet Invert to Sump Floor
		NJDEP Certified	110µm						
	(ft / m)	(cfs / L/s)	(cfs / L/s)	(cfs / L/s)	(in / mm)	(gal / L)	(yd³ / m³)	(ft / m)	(ft / m)
FD-3HC	3 / 0.9	0.84 / 23.7	1.06 / 30.0	15 / 424	18 / 457	125 / 473	0.4 / 0.3	2.0 - 3.5 / 0.6 - 1.0	3.71 / 1.13
FD-4HC	4 / 1.2	1.50 / 42.4	1.88 / 53.2	18 / 510	24 / 600	191 / 723	0.7 / 0.5	2.3 - 3.9 / 0.7 - 1.2	4.97 / 1.5
FD-5HC	5 / 1.5	2.35 / 66.2	2.94 / 83.2	20 / 566	24 / 600	300 / 1135	1.1 / .84	2.5 - 4.5 / 0.7 - 1.3	5.19 / 1.5
FD-6HC	6 / 1.8	3.38 / 95.7	4.23 / 119.8	32 / 906	30 / 750	496 / 1,878	1.6 / 1.2	3.0 - 5.1 / 0.9 - 1.6	5.97 / 1.8
FD-8HC	8 / 2.4	6.00 / 169.9	7.52 / 212.9	50 / 1,415	48 / 1219	1120 / 4239	2.8 / 2.1	3.0 - 6.0 / 0.9 -1.8	7.40 / 2.2

[1]Contact Hydro International when larger pipe sizes are required.
[2]Contact Hydro International when custom sediment storage capacity is required.
[3]Minimum distance for models depends on pipe diameter.

Stormwater Solutions
hydro-int.com/firstdefensehc

FDHCSS1902

APPENDIX G

Long Term Pollution Prevention Operation and Maintenance Plan

LANGAN

OPERATION AND MAINTENANCE PLAN

Long Term Pollution Prevention Operation and Maintenance Plan

for

Hillman Energy Center
73 & 75 Hillman Street
Tewksbury, Massachusetts

Parcels 96-60 and 96-61

Prepared By:

Langan Engineering and Environmental Services, Inc.
100 Cambridge Street, Suite 1310
Boston, MA 02114

Prepared For:

East Point Energy, LLC
310 4th Street NE, 3rd Floor
Charlottesville, VA 22902

March 2025
Langan Project No. 151043401

LANGAN

Operation and Maintenance Plan
73 & 75 Hillman Street, Tewksbury, MA

Long Term Pollution Prevention Operation and Maintenance Plan

The purpose of this Long-Term Pollution Prevention Operation and Maintenance Plan ("O&M") is to provide project specific information related to the long term operation, maintenance, inspection, documentation, and performance of the structural and non-structural stormwater features. Regular inspection and maintenance of the stormwater management system is necessary to ensure proper operation of the system. The following O&M has been prepared to ensure the proposed system functions as intended. This O&M plan identifies maintenance procedures, schedules, and responsible parties.

The Long-Term Pollution Prevention Operation and Maintenance Plan has been compiled in general accordance with Federal, State, and Local requirement in addition to stormwater best management practices ("BMPs").

Responsible Parties

East Point Energy LLC, or any successor of, shall be the party responsible for implementing this O&M plan.

East Point Energy, LLC
310 4th Street NE, 3rd Floor
Charlottesville, VA 22902
Contact: Tyler Rynne

Stormwater Operation and Maintenance Procedures

Procedures are obtained from the Massachusetts Stormwater Handbook. These procedures are for all structural and non-structural BMPs and are intended to eliminate or reduce the long-term soil erosion and degradation of stormwater features following construction completion. The inspection and successful implementation of all stormwater measures shall be the Property Manager's responsibility. The Property Manager is responsible for training employees to perform O&M and to provide ongoing training as needed in response to staff changes. Implement employee training program and hold session at least once a year.

Estimated Annual Costs

The estimated annual cost for the implementation of this plan is $15,000.

Stormwater Management Plan Overview

Stormwater runoff is managed on site with an underground closed pipe network, manholes, water quality units, and underground infiltration systems.

Operation and Maintenance Plan
73 & 75 Hillman Street, Tewksbury, MA

Structural Pretreatment BMPs

Proprietary Water Quality Units (Hydrodynamic Separators - Inlet Structures)

Activity	Frequency
Inspect in accordance with manufacturer requirements, but no less than twice a year following installation, and no less than once a year thereafter.	See activity
Remove sediment and other trapped pollutants at frequency or level specified by manufacturer.	See manufacturer information

- Refer to manufacturer's maintenance procedures attached to this document.

Underground Structural BMPs

Underground Infiltration Systems

Activity	Frequency
Inspect inlets	Twice a year
Remove sediment, trash and other trapped pollutants.	Annually.

- Refer to manufacturer's maintenance procedures attached to this document.

Material and Equipment Storage

Material and equipment storage shall be done in a safe and orderly fashion. All debris and waste shall be collected and disposed of offsite in a legal manner in accordance with local and federal guidelines.

Snow Removal & Storage & Deicing Materials

Snow shall be shoveled and plowed from access roads and parking areas as soon as practical during and after winter storms and stored in snow storage areas on site.

Deicing materials may be applied to areas such as site access drives and parking areas before a storm event. Alternative materials to salt, such as calcium chloride and calcium magnesium acetate should be considered. Use of salt for deicing should be minimized on site. Deicing materials should be used with discretion in accordance with standard practices and over application must be avoided. Deicing materials shall be stored inside a building.

After the winter season, all parking areas and roads shall be cleaned of sediment and debris.

Spill Control & Containment

The following measures must be implemented to minimize, control, and contain spills:
- Store chemicals inside, when applicable

Operation and Maintenance Plan
73 & 75 Hillman Street, Tewksbury, MA

- Pick up litter

- The spill shall be contained as close to the source as possible with a dike of absorbent materials from the spill cleanup equipment (such as socks, pads, pillows, or "pigs"). Additional dikes must be constructed to protect swales or other stormwater conveyances or streams. A cover or dike will shall protect any other stormwater structures such as catch basins.

- Implement employee training program and hold session at least once a year

- Identify spill control team. The name(s) of the responsible spill personnel will be posted on-site.

- Each employee will be instructed that all spills are to be reported to the spill prevention and cleanup coordinator. The supervisor will assess the incident and initiate proper containment and response procedures immediately upon notification. Workers should avoid direct contact with spilled materials during the containment procedures.

- In the event of a release of oil or hazardous waste to the storm drainage system, the person shall immediately notify the Town's Fire and Public Works Departments and the Board of Health.

- Notifications in person or by phone shall be confirmed by written notice addressed and mailed to the Town within three business days of the phone notice.

- If the discharge of prohibited materials emanates from a commercial facility, the facility owner or operator of the facility shall retain on-site a written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained in accordance with the Massachusetts Public Records Law.

Pesticides and Fertilizers

- Pesticide/Herbicide Usage – No pesticides are to be used unless a single spot treatment is required for a specific control application.

- Fertilizer usage should be avoided. If deemed necessary, slow-release fertilizer should be used. Fertilizer may be used to begin the establishment of vegetation in bare or damaged areas, but should not be applied on a regular basis unless necessary

Operation and Maintenance Plan
73 & 75 Hillman Street, Tewksbury, MA

STORMWATER MANAGEMENT SYSTEM INSPECTION AND MAINTENANCE CHECKLIST

73 & 75 Hillman Street, Tewksbury, MA		Inspector:	
Date:		Time :	Site Conditions:

Inspection & Maintenance Item	Schedule	Satisfactory? Yes (Y) or No (N)	Comments or Corrective Measures Taken
Proprietary Water Quality Units (Hydrodynamic Separators)			
Inspect per Manufacture Recommendations - **See manufacturer maintenance guide**	2x a year	Y N	
Remove Sediments and Pollutants	Level of sediment has reached 50% of sump capacity	Y N	
Underground Infiltration System			
Inspect outlet and inlet structures	2x a year	Y N	
Remove Sediments and Pollutants	Annually	Y N	

Operation and Maintenance Plan
73 & 75 Hillman Street, Tewksbury, MA

STORMWATER MANAGEMENT SYSTEM MAINTENANCE LOG FORM

73 & 75 Hillman Street, Tewksbury, MA

No.	Description of Maintenance Activity	Date	Staff or Contractor	Comments or Follow-up Items

WATER QUALITY
UNIT 1

WATER QUALITY
UNIT 2

INFILTRATION
BMP B-1A

LEVEL SPREADER
LS-B1

INFILTRATION
BMP B-1B

INFILTRATION
BMP B-5

LEVEL SPREADER
LS-B4

WATER QUALITY
UNIT 4

WATER QUALITY
UNIT 3

INFILTRATION
BMP B-4

NOT FOR CONSTRUCTION

SCALE: 1 INCH = 40 FEET

Date	Description	No.
11/03/2025	UDPATE 30% DESIGN DRAWINGS	1
	REVISIONS	
08/01/2025	UPDATED 30% DESIGN DRAWINGS	1

LANGAN

Langan Engineering and
Environmental Services, LLC.

100 Cambridge Street, Suite 1310
Boston, MA 02114

T: 617.824.9100   F: 617.824.9101   www.langan.com

Project
**HILLMAN ENERGY
CENTER BATTERY
ENERGY STORAGE
SYSTEM**
TEWKSBURY

MIDDLESEX COUNTY   MASSACHUSETTS

Drawing Title

**STORMWATER BMP
FIGURE**

Project No.
151043401

Date
3/12/2025

Drawn By
JED/MPG

Checked By
HH

Figure

FG01
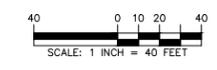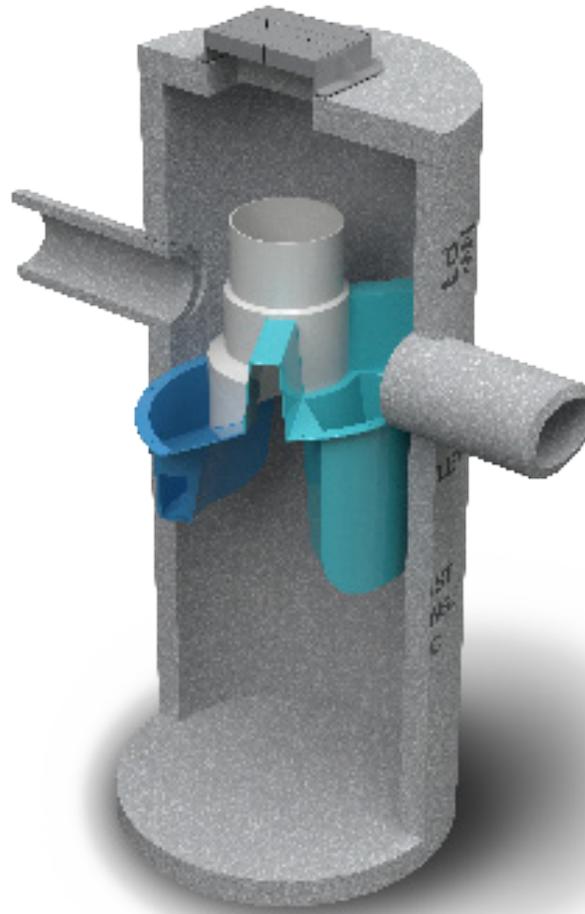
Operation and Maintenance Manual

First Defense® High Capacity and First Defense®Optimum

Vortex Separator for Stormwater Treatment

Table of Contents

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

I. First Defense® by Hydro International

Introduction

The First Defense® is an enhanced vortex separator that combines an effective and economical stormwater treatment chamber with an integral peak flow bypass. It efficiently removes total suspended solids (TSS), trash and hydrocarbons from stormwater runoff without washing out previously captured pollutants. The First Defense® is available in several model configurations to accommodate a wide range of pipe sizes, peak flows and depth constraints.

The two product models described in this guide are the First Defense® High Capacity and the First Defense® Optimum; they are inspected and maintained identically.

Operation

The First Defense® operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirement and is fabricated with durable non-corrosive components. No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants and periodic clean-outs. The First Defense® has been designed to allow for easy and safe access for inspection, monitoring and clean-out procedures. Neither entry into the unit nor removal of the internal components is necessary for maintenance, thus safety concerns related to confined-space-entry are avoided.

Pollutant Capture and Retention

The internal components of the First Defense® have been designed to optimize pollutant capture. Sediment is captured and retained in the base of the unit, while oil and floatables are stored on the water surface in the inner volume (Fig.1).

The pollutant storage volumes are isolated from the built-in bypass chamber to prevent washout during high-flow storm events. The sump of the First Defense® retains a standing water level between storm events. This ensures a quiescent flow regime at the onset of a storm, preventing resuspension and washout of pollutants captured during previous events.

Accessories such as oil absorbent pads are available for enhanced oil removal and storage. Due to the separation of the oil and floatable storage volume from the outlet, the potential for washout of stored pollutants between clean-outs is minimized.

Applications

- Stormwater treatment at the point of entry into the drainage line
- Sites constrained by space, topography or drainage profiles with limited slope and depth of cover
- Retrofit installations where stormwater treatment is placed on or tied into an existing storm drain line
- Pretreatment for filters, infiltration and storage

Advantages

- Inlet options include surface grate or multiple inlet pipes
- Integral high capacity bypass conveys large peak flows without the need for "offline" arrangements using separate junction manholes
- Long flow path through the device ensures a long residence time within the treatment chamber, enhancing pollutant settling
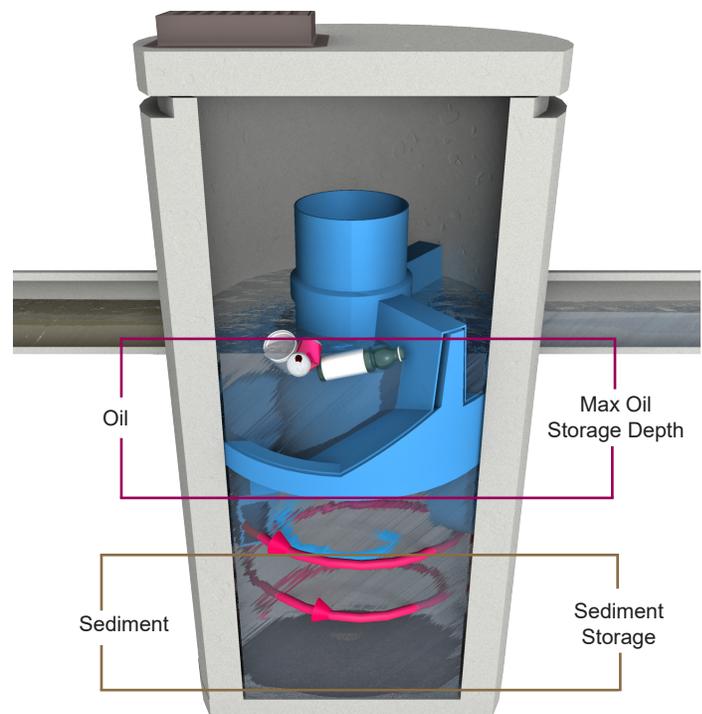- Delivered to site pre-assembled and ready for installation

Fig.1 Pollutant storage volumes in the First Defense®.

II. Model Sizes & Configurations

The First Defense® inlet and internal bypass arrangements are available in several model sizes and configurations. The components have modified geometries allowing greater design flexibility to accommodate various site constraints.

All First Defense® models include the internal components that are designed to remove and retain total suspended solids (TSS), gross solids, floatable trash and hydrocarbons (Fig.2). First Defense® model sizes (diameter) are shown in Table 1.

III. Maintenance

First Defense® Components

1. **Built-In Bypass**
2. **Inlet Pipe**
3. **Inlet Chute**
4. **Floatables Draw-off Port**
5. **Outlet Pipe**
6. **Floatables Storage**
7. **Sediment Storage**
8. **Inlet Grate or Cover**

4 (not pictured)
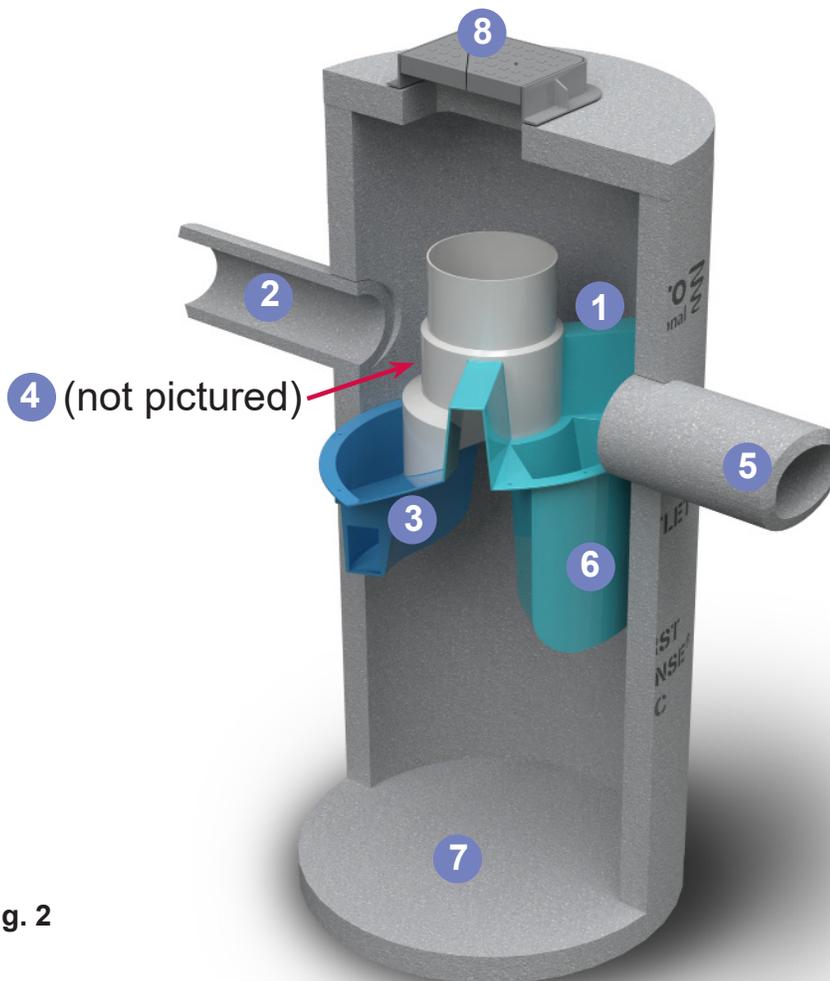
Fig. 2

First Defense® Model Sizes
(ft / m) diameter
3 / 0.9
4 / 1.2
5 / 1.5
6 / 1.8
7 / 2.1
8 / 2.4
10 / 3.0

Table 1

Page | 5

Hillman Energy Center, LLC
Attachment B - Supplemental
EFSB 25-08
First Defense® Operation and Maintenance Manual Page 189 of 215

Overview

The First Defense® protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the continuous, long-term functioning of the First Defense®. The First Defense® will capture and retain sediment and oil until the sediment and oil storage volumes are full to capacity. When sediment and oil storage capacities are reached, the First Defense® will no longer be able to store removed sediment and oil.

The First Defense® allows for easy and safe inspection, monitoring and clean-out procedures. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables. Access ports are located in the top of the manhole.

Maintenance events may include Inspection, Oil & Floatables Removal, and Sediment Removal. Maintenance events do not require entry into the First Defense®, nor do they require the internal components of the First Defense® to be removed. In the case of inspection and floatables removal, a vactor truck is not required. However, a vactor truck is required if the maintenance event is to include oil removal and/or sediment removal.

Maintenance Equipment Considerations

The internal components of the First Defense® have a centrally located circular shaft through which the sediment storage sump can be accessed with a sump vac hose. The open diameter of this access shaft is 15 inches in diameter (Fig.3). Therefore, the nozzle fitting of any vactor hose used for maintenance should be less than 15 inches in diameter.
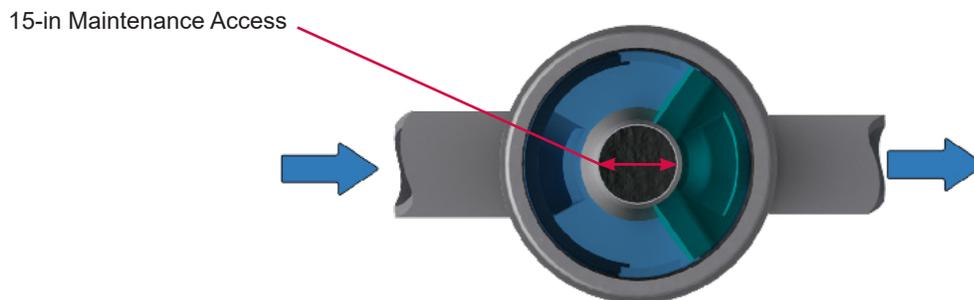

15-in Maintenance Access

Fig.3 The central opening to the sump of the First Defense®is 15 inches in diameter.

Determining Your Maintenance Schedule

The frequency of clean out is determined in the field after installation. During the first year of operation, the unit should be inspected every six months to determine the rate of sediment and floatables accumulation. A simple probe such as a Sludge-Judge® can be used to determine the level of accumulated solids stored in the sump. This information can be recorded in the maintenance log (see page 9) to establish a routine maintenance schedule.

The vactor procedure, including both sediment and oil / flotables removal, for First Defense® typically takes less than 30 minutes and removes a combined water/oil volume of about 765 gallons.

Inspection Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities. Fig.4 shows the standing water level that should be observed.

4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the components and water surface.

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel.

6. On the Maintenance Log (see page 9), record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or blockages.

7. Securely replace the grate or lid.

8. Take down safety equipment.

9. Notify Hydro International of any irregularities noted during inspection.

Floatables and Sediment Clean Out

Floatables clean out is typically done in conjunction with sediment removal. A commercially or municipally owned sump-vac is used to remove captured sediment and floatables (Fig.4).

Floatables and loose debris can also be netted with a skimmer and pole. The access port located at the top of the manhole provides unobstructed access for a vactor hose to be lowered to the base of the sump.

Scheduling

• Floatables and sump clean out are typically conducted once a year during any season.

• Floatables and sump clean out should occur as soon as possible following a spill in the contributing drainage area.

Fig.4 Floatables are removed with a vactor hose

Recommended Equipment

• Safety Equipment (traffic cones, etc)

• Crow bar or other tool to remove grate or lid

• Pole with skimmer or net (if only floatables are being removed)

• Sediment probe (such as a Sludge Judge®)

• Vactor truck (flexible hose recommended)

• First Defense® Maintenance Log

Page | 7

Hillman Energy Center, LLC
Attachment B - Supplemental
EFSB 25-08
First Defense® Operation and Maintenance Manual Page 202 of 215

Floatables and Sediment Clean Out Procedures

1. Set up any necessary safety equipment around the access port or grate of the First Defense® as stipulated by local ordinances. Safety equipment should notify passing pedestrian and road traffic that work is being done.

2. Remove the grate or lid to the manhole.

3. Without entering the vessel, look down into the chamber to inspect the inside. Make note of any irregularities.

4. Remove oil and floatables stored on the surface of the water with the vactor hose or with the skimmer or net

5. Using a sediment probe such as a Sludge Judge®, measure the depth of sediment that has collected in the sump of the vessel and record it in the Maintenance Log (page 9).

6. Once all floatables have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris off the sump floor

7. Retract the vactor hose from the vessel.

8. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components, blockages, or irregularly high or low water levels.

9. Securely replace the grate or lid.

Maintenance at a Glance

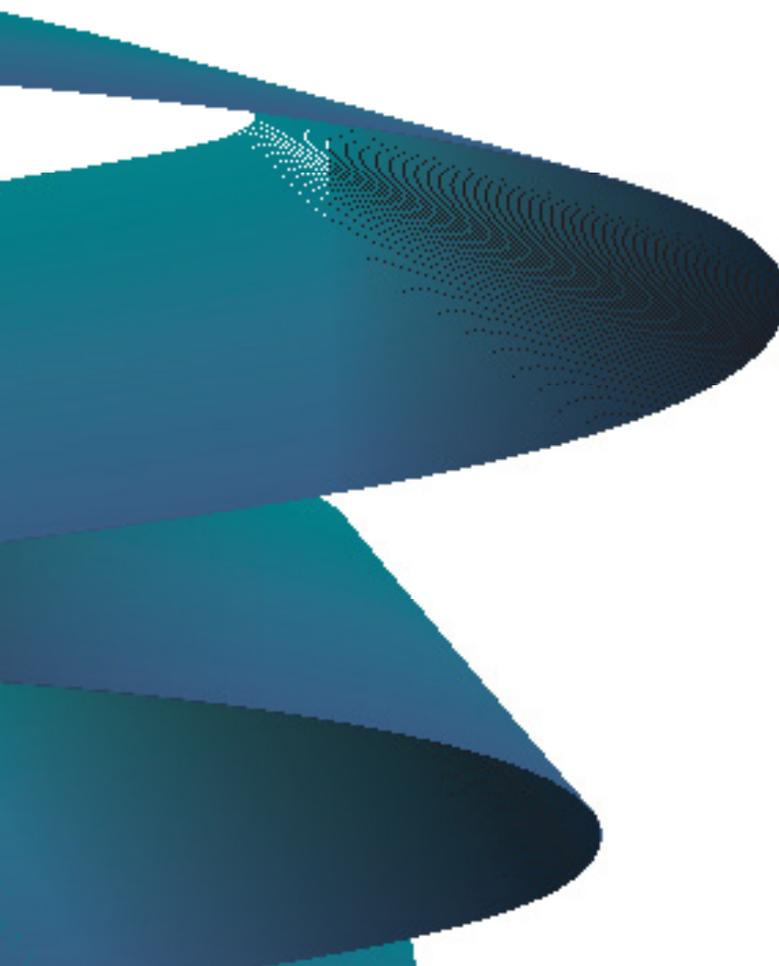|	
Inspection	- Regularly during first year of installation - Every 6 months after the first year of installation
Oil and Floatables Removal	- Once per year, with sediment removal - Following a spill in the drainage area
Sediment Removal	- Once per year or as needed - Following a spill in the drainage area
NOTE: For most clean outs the entire volume of liquid does not need to be removed from the manhole. Only remove the first few inches of oils and floatables from the water surface to reduce the total volume of liquid removed during a clean out.	

Hydro International®

First Defense® Installation Log

HYDRO INTERNATIONAL REFERENCE NUMBER:

SITE NAME:

SITE LOCATION:

OWNER:	CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: /   /

MODEL SIZE (CIRCLE ONE):   [3-FT]   [4-FT]   [5-FT]   [6-FT]   [7-FT]   [8-FT]   [10-FT]

INLET (CIRCLE ALL THAT APPLY):   GRATED INLET (CATCH BASIN)   INLET PIPE (FLOW THROUGH)

Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Hydro International®

First Defense® Inspection and Maintenance Log

Date	Initials	Depth of Floatables and Oils	Sediment Depth Measured	Volume of Sediment Removed	Site Activity and Comments

Hydro International

Stormwater Solutions

94 Hutchins Drive
Portland, ME 04102

Tel: (207) 756-6200
Fax: (207) 756-6212
stormwaterinquiry@hydro-int.com

www.hydro-int.com

Turning Water Around...®

MODULE 25 SERIES
DESIGN GUIDE

STORMTANK®
Expect Results™

A BRAND OF **BRENTWOOD**

About Brentwood

Brentwood is a global manufacturer of custom and proprietary products and systems for the construction, consumer, medical, power, transportation, and water industries. A focus on plastics innovation, coupled with diverse production capabilities and engineering expertise, has allowed Brentwood to build a strong reputation for thermoplastic molding and solutions development.

Brentwood's product and service offerings continue to grow with an ever-increasing manufacturing presence. By emphasizing customer service and working closely with clients throughout the design, engineering, and manufacturing phases of each project, Brentwood develops forward-thinking strategies to create targeted, tailored solutions.

StormTank® Module

The StormTank Module is a strong, yet lightweight, alternative to other subsurface systems and offers the largest void space (up to 97%) of any subsurface stormwater storage unit on the market. The Modules are simple to assemble on site, limiting shipping costs, installation time, and labor. Their structural PVC columns pressure fit into the polypropylene top/bottom platens, with side panels inserted around the perimeter of the system. This open design and lack of internal walls make the Module system easy to clean compared to other subsurface box structures. When properly designed, applied, installed, and maintained, the Module system has been engineered to achieve a 50-year lifespan.

Technical Support

Brentwood's knowledgeable distributor network and in-house associates emphasize customer service and support by partnering with customers to extend the process beyond physical material supply. These trained specialists are available to assist in the review of proposed systems, conversions of alternatively designed systems, or to resolve any potential concerns before, during, and after the design process. To provide the best assistance, it is recommended that associates be provided with a site plan and cross-sections that include grading, drainage structures, dimensions, etc.

10.0 INSPECTION & MAINTENANCE

Description

Proper inspection and maintenance of a subsurface stormwater storage system are vital to ensuring proper product functioning and system longevity. It is recommended that during construction the contractor takes the necessary steps to prevent sediment from entering the subsurface system. This may include the installation of a bypass pipe around the system until the site is stabilized. The contractor should install and maintain all site erosion and sediment per Best Management Practices (BMP) and local, state, and federal regulations.

Once the site is stabilized, the contractor should remove and properly dispose of erosion and sediment per BMP and all local, state, and federal regulations. Care should be taken during removal to prevent collected sediment or debris from entering the stormwater system. Once the controls are removed, the system should be flushed to remove any sediment or construction debris by following the maintenance procedure outlined below.

During the first service year, a visual inspection should be completed during and after each major rainfall event, in addition to semi-annual inspections, to establish a pattern of sediment and debris buildup. Each stormwater system is unique, and multiple criteria can affect maintenance frequency. For example, whether or not a system design includes inlet protection or a pretreatment device has a substantial effect on the system's need for maintenance. Other factors include where the runoff is coming from (hardscape, gravel, soil, etc.) and seasonal changes like autumn leaves and winter salt.

During and after the second year of service, an established annual inspection frequency, based on the information collected during the first year, should be followed. At a minimum, an inspection should be performed semi-annually. Additional inspections may be required at the change of seasons for regions that experience adverse conditions (leaves, cinders, salt, sand, etc).

Maintenance Procedures

Inspection:

1. Inspect all observation ports, inflow and outflow connections, and the discharge area.
2. Identify and log any sediment and debris accumulation, system backup, or discharge rate changes.
3. If there is a sufficient need for cleanout, contact a local cleaning company for assistance.

Cleaning:

1. If a pretreatment device is installed, follow manufacturer recommendations.
2. Using a vacuum pump truck, evacuate debris from the inflow and outflow points.
3. Flush the system with clean water, forcing debris from the system.
4. Repeat steps 2 and 3 until no debris is evident.

APPENDIX H

Groundwater Mounding Analysis

LANGAN

Groundwater Mounding Analysis Summary

LANGAN

Project Name: Hillman Energy Center
Project Number: 151043401
Location: Tewksbury, MA
Date: 10/29/2025
Computed By: HH

SW BMP Location & Description	HANTUSH INPUTS											
	Storage Volume[1]	Bottom Surface Area	Recharge Rate[2]	Vertical Permeability Rate (Rawls Rate)	Specific Yield[3]	Horizontal Hydraulic Conductivity[4]	1/2 Length of BMP	1/2 Width of BMP	Drawdown Time[5]	Drawdown Time[5]	Initial Thickness of Saturated Zone	Drawdown Time < 72 hrs
	(cf)	(sf)	(ft/day)	(in/hr)		(feet/day)	(ft)	(ft)	(hrs)	(days)	(feet)	
Infiltration System B-1	5,417	3,269	0.55	2.41	0.21	48.20	98	17	8	0.34	4.00	YES

	GROUNDWATER MOUNDING RESULTS					
	Max GW Mounding	Groundwater Elevation[7]	Reference Test Pit	BMP Bottom Elev.	Top Elev. of Mounding	Is Top Elev. Of Mounding Less Than BMP Bottom Elevation?
	(ft)	(ft)		(ft)	(ft)	
	0.614	115.80	TP-03	117.80	116.41	YES

Notes:
1. Storage Volume based on static recharge volume
2. Recharge Rate = (Storage Volume/Bottom Surface Infiltration Area)/ 3 days
3. Specific Yield for fine sand = 0.21
4. Horizontal Hydraulic Conductivity = Rawls Rate x 24 hours/day x 1 ft/12 inches x 10
5. Drawdown Time = Storage Volume/(Bottom Surface Infiltration Area x Rawls Rate)
6. Initial Thickness of Saturated Zone = Depth of Boring - Depth of Groundwater
7. Estimated seasonal high water table

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin.   More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin.   Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.

Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Conversion Table

		inch/hour	feet/day

Input Values			
0.5500	*R*	Recharge (infiltration) rate (feet/day)	0.67	1.33
0.210	Sy	Specific yield, Sy (dimensionless, between 0 and 1]		
48.20	K	Horizontal hydraulic conductivity, Kh (feet/day)*	2.00	4.00
98.000	x	1/2 length of basin (x direction, in feet)		
17.000	y	1/2 width of basin (y direction, in feet)	hours	days
0.340	t	duration of infiltration period (days)	36	1.50
4.000	hi(0)	initial thickness of saturated zone (feet)		

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

4.614	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
0.614	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.614	0
0.614	20
0.613	40
0.610	50
0.602	60
0.583	70
0.539	80
0.447	90
0.269	100
0.053	120

Re-Calculate Now

Groundwater Mounding, in feet

Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Groundwater Mounding Analysis Summary

LANGAN

Project Name: Hillman Energy Center
Project Number: 151043401
Location: Tewksbury, MA
Date: 10/29/2025
Computed By: HH

SW BMP Location & Description	HANTUSH INPUTS											
	Storage Volume[1]	Bottom Surface Area	Recharge Rate[2]	Vertical Permeability Rate (Rawls Rate)	Specific Yield[3]	Horizontal Hydraulic Conductivity[4]	1/2 Length of BMP	1/2 Width of BMP	Drawdown Time[5]	Drawdown Time[5]	Initial Thickness of Saturated Zone	Drawdown Time < 72 hrs
	(cf)	(sf)	(ft/day)	(in/hr)		(feet/day)	(ft)	(ft)	(hrs)	(days)	(feet)	
Infiltration System B-4	7,641	3,502	0.73	2.41	0.21	48.20	103	9	11	0.45	5.00	YES

	GROUNDWATER MOUNDING RESULTS					
	Max GW Mounding	Groundwater Elevation[7]	Reference Test Pit	BMP Bottom Elev.	Top Elev. of Mounding	Is Top Elev. Of Mounding Less Than BMP Bottom Elevation?
	(ft)	(ft)		(ft)	(ft)	
	0.546	114.20	TP-02	116.25	114.75	YES

Notes:
1. Storage Volume based on static recharge volume
2. Recharge Rate = (Storage Volume/Bottom Surface Infiltration Area)/ 3 days
3. Specific Yield for fine sand = 0.21
4. Horizontal Hydraulic Conductivity = Rawls Rate x 24 hours/day x 1 ft/12 inches x 10
5. Drawdown Time = Storage Volume/(Bottom Surface Infiltration Area x Rawls Rate)
6. Initial Thickness of Saturated Zone = Depth of Boring - Depth of Groundwater
7. Estimated seasonal high water table

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin.   More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin.   Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.

Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

			use consistent units (e.g. feet & days **or** inches & hours)		Conversion Table	
Input Values					inch/hour	feet/day
0.7300	*R*		Recharge (infiltration) rate (feet/day)		0.67	1.33
0.210	Sy		Specific yield, Sy (dimensionless, between 0 and 1]			
48.20	K		Horizontal hydraulic conductivity, Kh (feet/day)*		2.00	4.00
103.000	x		1/2 length of basin (x direction, in feet)			
8.500	y		1/2 width of basin (y direction, in feet)		hours	days
0.450	t		duration of infiltration period (days)		36	1.50
5.000	hi(0)		initial thickness of saturated zone (feet)			

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).
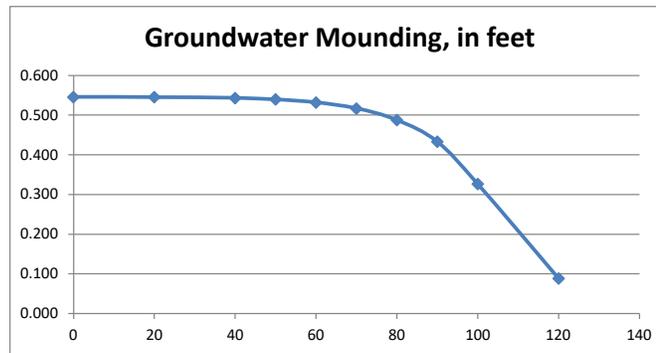
5.546	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
0.546	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.546	0
0.546	20
0.544	40
0.540	50
0.532	60
0.517	70
0.488	80
0.433	90
0.327	100
0.089	120

Re-Calculate Now

Groundwater Mounding, in feet

Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Groundwater Mounding Analysis Summary

LANGAN

Project Name: Hillman Energy Center
Project Number: 151043401
Location: Tewksbury, MA
Date: 10/29/2025
Computed By: HH

SW BMP Location & Description	HANTUSH INPUTS											
	Storage Volume[1]	Bottom Surface Area	Recharge Rate[2]	Vertical Permeability Rate (Rawls Rate)	Specific Yield[3]	Horizontal Hydraulic Conductivity[4]	1/2 Length of BMP	1/2 Width of BMP	Drawdown Time[5]	Drawdown Time[5]	Initial Thickness of Saturated Zone	Drawdown Time < 72 hrs
	(cf)	(sf)	(ft/day)	(in/hr)		(feet/day)	(ft)	(ft)	(hrs)	(days)	(feet)	
Infiltration System B-5	4,697	2,170	0.72	2.41	0.21	48.20	70	8	11	0.45	5.33	YES

	GROUNDWATER MOUNDING RESULTS					
	Max GW Mounding	Groundwater Elevation[7]	Reference Test Pit	BMP Bottom Elev.	Top Elev. of Mounding	Is Top Elev. Of Mounding Less Than BMP Bottom Elevation?
	(ft)	(ft)		(ft)	(ft)	
	0.484	114.20	TP-02	117.33	114.68	YES

Notes:
1. Storage Volume based on static recharge volume
2. Recharge Rate = (Storage Volume/Bottom Surface Infiltration Area)/ 3 days
3. Specific Yield for fine sand = 0.21
4. Horizontal Hydraulic Conductivity = Rawls Rate x 24 hours/day x 1 ft/12 inches x 10
5. Drawdown Time = Storage Volume/(Bottom Surface Infiltration Area x Rawls Rate)
6. Initial Thickness of Saturated Zone = Depth of Boring - Depth of Groundwater
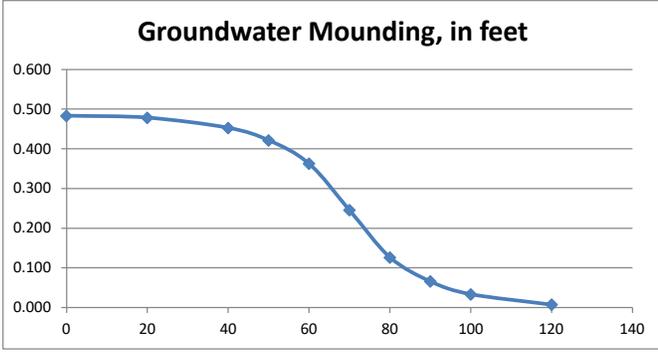7. Estimated seasonal high water table

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin.   More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin.   Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.

Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Conversion Table		
	inch/hour	feet/day

Input Values					
0.7200	R	Recharge (infiltration) rate (feet/day)	0.67	1.33	
0.210	Sy	Specific yield, Sy (dimensionless, between 0 and 1]			
48.20	K	Horizontal hydraulic conductivity, Kh (feet/day)*	2.00	4.00	In the report accompanying this spreadsheet
70.000	x	1/2 length of basin (x direction, in feet)			(USGS SIR 2010-5102), vertical soil permeability
7.750	y	1/2 width of basin (y direction, in feet)	hours	days	(ft/d) is assumed to be one-tenth horizontal
0.450	t	duration of infiltration period (days)	36	1.50	hydraulic conductivity (ft/d).
5.330	hi(0)	initial thickness of saturated zone (feet)			

5.814	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
0.484	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.484	0
0.479	20
0.453	40
0.422	50
0.363	60
0.246	70
0.127	80
0.066	90
0.034	100
0.008	120

Re-Calculate Now

Groundwater Mounding, in feet

Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.