STORMWATER REPORT

For

1441 Commercial Street
Weymouth, MA 02189

Prepared For:

Metri R. Metri
Weymouth, MA 02189

Prepared By:

FILE COPY

HARDY + MAN
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LAND DEVELOPMENT CONSULTING

1285 Washington Street
Weymouth, MA 02189

October 29, 2021

COMMONWEALTH OF MASSACHUSETTS
SHAWN P. HARDY
NO. 41650
CIVIL
REGISTERED
PROFESSIONAL ENGINEER

Existing Conditions
The subject property is an existing 32,595 square-foot lot located at 1441 Commercial Street in Weymouth, Massachusetts. The parcel is zoned business district 2 (BUS-2) and is the use is an existing gas station. Assessor's records designate the lot as Map 23, Block 311, Lot 2. The site is situated on Commercial Street, near the southeasterly intersection of Water Street and Commercial Street.

The topography of the site slopes from approximately elevation 43 at the right rear of the parcel to 29 at the front left corner. The majority of the existing lot is impervious (service station with bituminous pavement) with minor areas of gravel driveway, and landscaping.

According to test pits performed on June 25, 2021, the soils were very dry, with cobbles, a high percentage of gravel, and boulders. The soil is classified as well-drained, hydrologic group A. The site is within FEMA Flood Zone X, or Area of Minimal Flood Hazard.

Currently, no stormwater controls exist on the site and the topography directs stormwater flows overland to the front lot corner towards Commercial Street.

Proposed Conditions
The applicant proposes to construct a mixed-use building with appurtenances as depicted on the plan set titled "Site Layout 1441 Commercial Street, Weymouth, Massachusetts", dated October 25, 2021.

The first floor will consist of a restaurant with 100 seats and a 9-space parking garage. The upper floors will have a total of 24 residential units.

A retaining wall is proposed in the rear of the lot which will vary from 0.75 feet to 4.5 feet tall. The proposed grade on the site will be lower than that of the existing.

Erosion and Sedimentation Control Measures
Erosion control measures to be employed include a staked filter sock type erosion control barrier as depicted on the site plan. The barrier shall be inspected daily and kept in place until such time that disturbed areas are re-vegetated or paved and are no longer a potential source of siltation.

A stabilized gravel construction entrance is proposed to minimize tracking of sediments onto the adjacent roadway. In addition, the contractor shall utilize a combination of water and calcium chloride, as needed, to minimize the migration of dust.

Stormwater Management
The current site has no stormwater controls. The topography of the land directs stormwater flows down slope to the front of the lot which is directed to Commercial Street.

This drainage analysis utilizes TR-55 drainage guidelines, which is an industry standard for urban hydrology small watersheds. To mitigate the proposed increase in impervious area, the roof and driveway area flows are to be directed to a series of three rows by ten (3x10) Cultec 330 XLHD chambers as depicted on the proposed plan. The proposed chambers will provide approximately 2,600 cubic feet of storage. The system has been sized to reduce site runoff rate and volume for the 2, 10, 25 and 100-year design storms.

The following table depicts the peak runoff rates and volumes for the existing and proposed conditions for each storm event. For reference, HydroCAD calculations are attached to this report. For purposes of these calculations, the perimeter landscaping has not been routed through the infiltration system, as it will flow towards Commercial Street and not be captured by the stormwater controls.

Peak Discharge Rates (cfs)

	2-year	10-year	25-year	100-year
Existing Conditions	1.21	2.16	2.85	3.80
Proposed Conditions	0.26	1.06	2.34	3.81

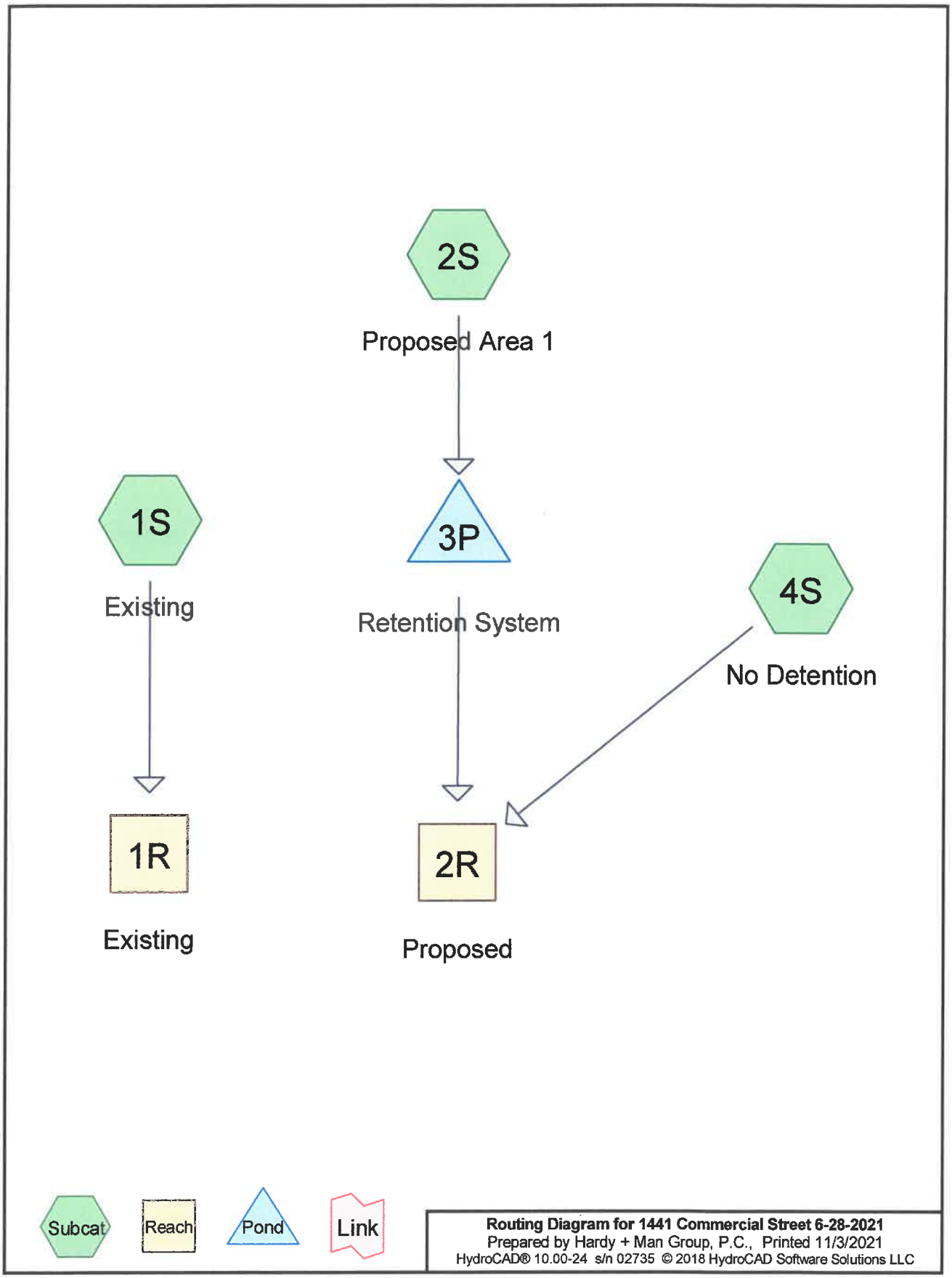
Runoff Volume (af)

	2-year	10-year	25-year	100-year
Existing Conditions	0.085	0.148	0.195	0.261
Proposed Conditions	0.012	0.044	0.070	0.109

Conclusion

The proposed stormwater design utilizes the stormwater BMPs to provide stormwater treatment and control. The stormwater management system will reduce the stormwater runoff flow rate by providing an on-site retention system. This system is composed of Cultec chambers that has been sized to capture runoff from all proposed impervious area for up to 100-year rainfall events. During construction, the proposed erosion control measures protect sedimentation from construction activities from migrating from the site onto the public street and abutting properties.

The proposed stormwater management and erosion control design of the proposed development will meet the Town of Weymouth Stormwater Ordinance.


2S
Proposed Area 1
1S
Existing
3P
Retention System
4S
No Detention
1R
Existing
2R
Proposed
Subcat
Reach
Pond
Link
Routing Diagram for 1441 Commercial Street 6-28-2021
Prepared by Hardy + Man Group, P.C., Printed 11/3/2021
HydroCAD® 10.00-24 s/n 02735 © 2018 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Runoff Area=32,595 sf 63.48% Impervious Runoff Depth=1.36"
Tc=5.0 min CN=77 Runoff=1.21 cfs 0.085 af

Subcatchment 2S: Proposed Area 1 Runoff Area=27,115 sf 100.00% Impervious Runoff Depth=3.17"
Tc=5.0 min CN=98 Runoff=2.13 cfs 0.164 af

Subcatchment 4S: No Detention Runoff Area=5,480 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.000 af

Reach 1R: Existing Inflow=1.21 cfs 0.085 af
Outflow=1.21 cfs 0.085 af

Reach 2R: Proposed Inflow=0.26 cfs 0.012 af
Outflow=0.26 cfs 0.012 af

Pond 3P: Retention System Peak Elev=27.03' Storage=1,925 cf Inflow=2.13 cfs 0.164 af
Discarded=0.26 cfs 0.152 af Primary=0.26 cfs 0.012 af Outflow=0.52 cfs 0.164 af

Total Runoff Area = 1.497 ac Runoff Volume = 0.249 af Average Runoff Depth = 2.00"
26.67% Pervious = 0.399 ac 73.33% Impervious = 1.097 ac

Summary for Subcatchment 1S: Existing

Runoff = 1.21 cfs @ 12.08 hrs, Volume= 0.085 af, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.40"

	Area (sf)	CN	Description
	2,623	98	Unconnected roofs, HSG A
	15,941	98	Paved parking, HSG A
	9,521	32	Woods/grass comb., Good, HSG A
*	2,126	98	Concrete pavement, HSG A
	2,384	76	Gravel roads, HSG A
	32,595	77	Weighted Average
	11,905		36.52% Pervious Area
	20,690		63.48% Impervious Area
	2,623		12.68% Unconnected

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

Summary for Subcatchment 2S: Proposed Area 1

Runoff = 2.13 cfs @ 12.07 hrs, Volume= 0.164 af, Depth= 3.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.40"

	Area (sf)	CN	Description
	13,469	98	Paved parking, HSG A
	9,816	98	Roofs, HSG A
*	740	98	Walkway, HSG A
	3,090	98	Paved roads w/curbs & sewers, HSG A
	27,115	98	Weighted Average
	27,115		100.00% Impervious Area

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

Summary for Subcatchment 4S: No Detention

Runoff = 0.00 cfs @ 23.45 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.40"

Area (sf)	CN	Description
5,480	39	>75% Grass cover, Good, HSG A
5,480		100.00% Pervious Area

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

Summary for Reach 1R: Existing

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

Inflow Area = 0.748 ac, 63.48% Impervious, Inflow Depth = 1.36" for 2 year event
Inflow = 1.21 cfs @ 12.08 hrs, Volume= 0.085 af
Outflow = 1.21 cfs @ 12.08 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: Proposed

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

Inflow Area = 0.748 ac, 83.19% Impervious, Inflow Depth = 0.20" for 2 year event
Inflow = 0.26 cfs @ 12.43 hrs, Volume= 0.012 af
Outflow = 0.26 cfs @ 12.43 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Pond 3P: Retention System

Inflow Area = 0.622 ac,100.00% Impervious, Inflow Depth = 3.17" for 2 year event
Inflow = 2.13 cfs @ 12.07 hrs, Volume= 0.164 af
Outflow = 0.52 cfs @ 12.43 hrs, Volume= 0.164 af, Atten= 76%, Lag= 21.9 min
Discarded = 0.26 cfs @ 12.43 hrs, Volume= 0.152 af
Primary = 0.26 cfs @ 12.43 hrs, Volume= 0.012 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 27.03' @ 12.43 hrs Surf.Area= 1,176 sf Storage= 1,925 cf

Plug-Flow detention time= 37.0 min calculated for 0.164 af (100% of inflow)
Center-of-Mass det. time= 37.0 min (791.2 - 754.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	24.70'	1,027 cf	**16.00'W x 73.50'L x 3.54'H Field A** 4,165 cf Overall - 1,598 cf Embedded = 2,567 cf x 40.0% Voids
#2A	25.20'	1,598 cf	**Cultec R-330XLHD** x 30 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
		2,625 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	24.70'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 11.00'
#2	Primary	26.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	27.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	27.58'	**1.7' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.26 cfs @ 12.43 hrs HW=27.03' (Free Discharge)
└**1=Exfiltration** (Controls 0.26 cfs)

Primary OutFlow Max=0.26 cfs @ 12.43 hrs HW=27.03' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.25 cfs @ 2.90 fps)
├**3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.58 fps)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Runoff Area=32,595 sf 63.48% Impervious Runoff Depth=2.37"
Tc=5.0 min CN=77 Runoff=2.16 cfs 0.148 af

Subcatchment 2S: Proposed Area 1 Runoff Area=27,115 sf 100.00% Impervious Runoff Depth=4.46"
Tc=5.0 min CN=98 Runoff=2.96 cfs 0.232 af

Subcatchment 4S: No Detention Runoff Area=5,480 sf 0.00% Impervious Runoff Depth=0.14"
Tc=5.0 min CN=39 Runoff=0.00 cfs 0.002 af

Reach 1R: Existing Inflow=2.16 cfs 0.148 af
Outflow=2.16 cfs 0.148 af

Reach 2R: Proposed Inflow=1.06 cfs 0.044 af
Outflow=1.06 cfs 0.044 af

Pond 3P: Retention System Peak Elev=27.74' Storage=2,389 cf Inflow=2.96 cfs 0.232 af
Discarded=0.28 cfs 0.189 af Primary=1.06 cfs 0.043 af Outflow=1.33 cfs 0.232 af

Total Runoff Area = 1.497 ac Runoff Volume = 0.381 af Average Runoff Depth = 3.06"
26.67% Pervious = 0.399 ac 73.33% Impervious = 1.097 ac

Summary for Subcatchment 1S: Existing

Runoff = 2.16 cfs @ 12.08 hrs, Volume= 0.148 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.70"

	Area (sf)	CN	Description
	2,623	98	Unconnected roofs, HSG A
	15,941	98	Paved parking, HSG A
	9,521	32	Woods/grass comb., Good, HSG A
*	2,126	98	Concrete pavement, HSG A
	2,384	76	Gravel roads, HSG A
	32,595	77	Weighted Average
	11,905		36.52% Pervious Area
	20,690		63.48% Impervious Area
	2,623		12.68% Unconnected

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

Summary for Subcatchment 2S: Proposed Area 1

Runoff = 2.96 cfs @ 12.07 hrs, Volume= 0.232 af, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.70"

	Area (sf)	CN	Description
	13,469	98	Paved parking, HSG A
	9,816	98	Roofs, HSG A
*	740	98	Walkway, HSG A
	3,090	98	Paved roads w/curbs & sewers, HSG A
	27,115	98	Weighted Average
	27,115		100.00% Impervious Area

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

Summary for Subcatchment 4S: No Detention

Runoff = 0.00 cfs @ 13.75 hrs, Volume= 0.002 af, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.70"

Area (sf)	CN	Description
5,480	39	>75% Grass cover, Good, HSG A
5,480		100.00% Pervious Area

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

Summary for Reach 1R: Existing

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

Inflow Area = 0.748 ac, 63.48% Impervious, Inflow Depth = 2.37" for 10 year event
Inflow = 2.16 cfs @ 12.08 hrs, Volume= 0.148 af
Outflow = 2.16 cfs @ 12.08 hrs, Volume= 0.148 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: Proposed

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

Inflow Area = 0.748 ac, 83.19% Impervious, Inflow Depth = 0.71" for 10 year event
Inflow = 1.06 cfs @ 12.22 hrs, Volume= 0.044 af
Outflow = 1.06 cfs @ 12.22 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Pond 3P: Retention System

Inflow Area = 0.622 ac,100.00% Impervious, Inflow Depth = 4.46" for 10 year event
Inflow = 2.96 cfs @ 12.07 hrs, Volume= 0.232 af
Outflow = 1.33 cfs @ 12.22 hrs, Volume= 0.232 af, Atten= 55%, Lag= 9.1 min
Discarded = 0.28 cfs @ 12.22 hrs, Volume= 0.189 af
Primary = 1.06 cfs @ 12.22 hrs, Volume= 0.043 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 27.74' @ 12.22 hrs Surf.Area= 1,176 sf Storage= 2,389 cf

Plug-Flow detention time= 35.2 min calculated for 0.232 af (100% of inflow)
Center-of-Mass det. time= 35.2 min (783.3 - 748.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	24.70'	1,027 cf	**16.00'W x 73.50'L x 3.54'H Field A** 4,165 cf Overall - 1,598 cf Embedded = 2,567 cf x 40.0% Voids
#2A	25.20'	1,598 cf	**Cultec R-330XLHD** x 30 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
		2,625 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	24.70'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 11.00'
#2	Primary	26.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	27.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	27.58'	**1.7' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.28 cfs @ 12.22 hrs HW=27.74' (Free Discharge)
└**1=Exfiltration** (Controls 0.28 cfs)

Primary OutFlow Max=1.06 cfs @ 12.22 hrs HW=27.74' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.44 cfs @ 4.99 fps)
├**3=Orifice/Grate** (Orifice Controls 0.32 cfs @ 3.65 fps)
└**4=Broad-Crested Rectangular Weir** (Weir Controls 0.30 cfs @ 1.12 fps)

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Runoff Area=32,595 sf 63.48% Impervious Runoff Depth=3.13"
Tc=5.0 min CN=77 Runoff=2.85 cfs 0.195 af

Subcatchment 2S: Proposed Area 1 Runoff Area=27,115 sf 100.00% Impervious Runoff Depth=5.36"
Tc=5.0 min CN=98 Runoff=3.54 cfs 0.278 af

Subcatchment 4S: No Detention Runoff Area=5,480 sf 0.00% Impervious Runoff Depth=0.34"
Tc=5.0 min CN=39 Runoff=0.01 cfs 0.004 af

Reach 1R: Existing Inflow=2.85 cfs 0.195 af
Outflow=2.85 cfs 0.195 af

Reach 2R: Proposed Inflow=2.34 cfs 0.070 af
Outflow=2.34 cfs 0.070 af

Pond 3P: Retention System Peak Elev=28.02' Storage=2,520 cf Inflow=3.54 cfs 0.278 af
Discarded=0.28 cfs 0.212 af Primary=2.34 cfs 0.067 af Outflow=2.62 cfs 0.278 af

Total Runoff Area = 1.497 ac Runoff Volume = 0.477 af Average Runoff Depth = 3.82"
26.67% Pervious = 0.399 ac 73.33% Impervious = 1.097 ac

Summary for Subcatchment 1S: Existing

Runoff = 2.85 cfs @ 12.07 hrs, Volume= 0.195 af, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=5.60"

	Area (sf)	CN	Description
	2,623	98	Unconnected roofs, HSG A
	15,941	98	Paved parking, HSG A
	9,521	32	Woods/grass comb., Good, HSG A
*	2,126	98	Concrete pavement, HSG A
	2,384	76	Gravel roads, HSG A
	32,595	77	Weighted Average
	11,905		36.52% Pervious Area
	20,690		63.48% Impervious Area
	2,623		12.68% Unconnected

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

Summary for Subcatchment 2S: Proposed Area 1

Runoff = 3.54 cfs @ 12.07 hrs, Volume= 0.278 af, Depth= 5.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=5.60"

	Area (sf)	CN	Description
	13,469	98	Paved parking, HSG A
	9,816	98	Roofs, HSG A
*	740	98	Walkway, HSG A
	3,090	98	Paved roads w/curbs & sewers, HSG A
	27,115	98	Weighted Average
	27,115		100.00% Impervious Area

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

Summary for Subcatchment 4S: No Detention

Runoff = 0.01 cfs @ 12.37 hrs, Volume= 0.004 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 year Rainfall=5.60"

Area (sf)	CN	Description
5,480	39	>75% Grass cover, Good, HSG A
5,480		100.00% Pervious Area

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

Summary for Reach 1R: Existing

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

Inflow Area = 0.748 ac, 63.48% Impervious, Inflow Depth = 3.13" for 25 year event
Inflow = 2.85 cfs @ 12.07 hrs, Volume= 0.195 af
Outflow = 2.85 cfs @ 12.07 hrs, Volume= 0.195 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: Proposed

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

Inflow Area = 0.748 ac, 83.19% Impervious, Inflow Depth = 1.12" for 25 year event
Inflow = 2.34 cfs @ 12.14 hrs, Volume= 0.070 af
Outflow = 2.34 cfs @ 12.14 hrs, Volume= 0.070 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Pond 3P: Retention System

Inflow Area = 0.622 ac,100.00% Impervious, Inflow Depth = 5.36" for 25 year event
Inflow = 3.54 cfs @ 12.07 hrs, Volume= 0.278 af
Outflow = 2.62 cfs @ 12.14 hrs, Volume= 0.278 af, Atten= 26%, Lag= 4.0 min
Discarded = 0.28 cfs @ 12.14 hrs, Volume= 0.212 af
Primary = 2.34 cfs @ 12.14 hrs, Volume= 0.067 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 28.02' @ 12.14 hrs Surf.Area= 1,176 sf Storage= 2,520 cf

Plug-Flow detention time= 33.6 min calculated for 0.278 af (100% of inflow)
Center-of-Mass det. time= 33.6 min (778.9 - 745.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	24.70'	1,027 cf	**16.00'W x 73.50'L x 3.54'H Field A** 4,165 cf Overall - 1,598 cf Embedded = 2,567 cf x 40.0% Voids
#2A	25.20'	1,598 cf	**Cultec R-330XLHD** x 30 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
		2,625 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	24.70'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 11.00'
#2	Primary	26.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	27.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	27.58'	**1.7' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.28 cfs @ 12.14 hrs HW=28.02' (Free Discharge)
└**1=Exfiltration** (Controls 0.28 cfs)

Primary OutFlow Max=2.33 cfs @ 12.14 hrs HW=28.02' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.49 cfs @ 5.60 fps)
├**3=Orifice/Grate** (Orifice Controls 0.39 cfs @ 4.44 fps)
└**4=Broad-Crested Rectangular Weir** (Weir Controls 1.45 cfs @ 1.95 fps)

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Runoff Area=32,595 sf 63.48% Impervious Runoff Depth=4.19"
Tc=5.0 min CN=77 Runoff=3.80 cfs 0.261 af

Subcatchment 2S: Proposed Area 1 Runoff Area=27,115 sf 100.00% Impervious Runoff Depth=6.56"
Tc=5.0 min CN=98 Runoff=4.30 cfs 0.340 af

Subcatchment 4S: No Detention Runoff Area=5,480 sf 0.00% Impervious Runoff Depth=0.70"
Tc=5.0 min CN=39 Runoff=0.05 cfs 0.007 af

Reach 1R: Existing Inflow=3.80 cfs 0.261 af
Outflow=3.80 cfs 0.261 af

Reach 2R: Proposed Inflow=3.81 cfs 0.109 af
Outflow=3.81 cfs 0.109 af

Pond 3P: Retention System Peak Elev=28.23' Storage=2,620 cf Inflow=4.30 cfs 0.340 af
Discarded=0.28 cfs 0.239 af Primary=3.76 cfs 0.101 af Outflow=4.05 cfs 0.340 af

Total Runoff Area = 1.497 ac Runoff Volume = 0.609 af Average Runoff Depth = 4.88"
26.67% Pervious = 0.399 ac 73.33% Impervious = 1.097 ac

Summary for Subcatchment 1S: Existing

Runoff = 3.80 cfs @ 12.07 hrs, Volume= 0.261 af, Depth= 4.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=6.80"

	Area (sf)	CN	Description
	2,623	98	Unconnected roofs, HSG A
	15,941	98	Paved parking, HSG A
	9,521	32	Woods/grass comb., Good, HSG A
*	2,126	98	Concrete pavement, HSG A
	2,384	76	Gravel roads, HSG A
	32,595	77	Weighted Average
	11,905		36.52% Pervious Area
	20,690		63.48% Impervious Area
	2,623		12.68% Unconnected

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

Summary for Subcatchment 2S: Proposed Area 1

Runoff = 4.30 cfs @ 12.07 hrs, Volume= 0.340 af, Depth= 6.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=6.80"

	Area (sf)	CN	Description
	13,469	98	Paved parking, HSG A
	9,816	98	Roofs, HSG A
*	740	98	Walkway, HSG A
	3,090	98	Paved roads w/curbs & sewers, HSG A
	27,115	98	Weighted Average
	27,115		100.00% Impervious Area

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

Summary for Subcatchment 4S: No Detention

Runoff = 0.05 cfs @ 12.13 hrs, Volume= 0.007 af, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=6.80"

Area (sf)	CN	Description
5,480	39	>75% Grass cover, Good, HSG A
5,480		100.00% Pervious Area

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

Summary for Reach 1R: Existing

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

Inflow Area = 0.748 ac, 63.48% Impervious, Inflow Depth = 4.19" for 100 year event
Inflow = 3.80 cfs @ 12.07 hrs, Volume= 0.261 af
Outflow = 3.80 cfs @ 12.07 hrs, Volume= 0.261 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Reach 2R: Proposed

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

Inflow Area = 0.748 ac, 83.19% Impervious, Inflow Depth = 1.74" for 100 year event
Inflow = 3.81 cfs @ 12.10 hrs, Volume= 0.109 af
Outflow = 3.81 cfs @ 12.10 hrs, Volume= 0.109 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Pond 3P: Retention System

Inflow Area = 0.622 ac,100.00% Impervious, Inflow Depth = 6.56" for 100 year event
Inflow = 4.30 cfs @ 12.07 hrs, Volume= 0.340 af
Outflow = 4.05 cfs @ 12.10 hrs, Volume= 0.340 af, Atten= 6%, Lag= 1.7 min
Discarded = 0.28 cfs @ 12.10 hrs, Volume= 0.239 af
Primary = 3.76 cfs @ 12.10 hrs, Volume= 0.101 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 28.23' @ 12.10 hrs Surf.Area= 1,176 sf Storage= 2,620 cf

Plug-Flow detention time= 32.5 min calculated for 0.340 af (100% of inflow)
Center-of-Mass det. time= 32.5 min (774.9 - 742.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	24.70'	1,027 cf	**16.00'W x 73.50'L x 3.54'H Field A** 4,165 cf Overall - 1,598 cf Embedded = 2,567 cf x 40.0% Voids
#2A	25.20'	1,598 cf	**Cultec R-330XLHD** x 30 Inside #1 Effective Size= 47.8"W x 30.0"H => 7.45 sf x 7.00'L = 52.2 cf Overall Size= 52.0"W x 30.5"H x 8.50'L with 1.50' Overlap Row Length Adjustment= +1.50' x 7.45 sf x 3 rows
		2,625 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	24.70'	**8.270 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 11.00'
#2	Primary	26.50'	**4.0" Vert. Orifice/Grate** C= 0.600
#3	Primary	27.00'	**4.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	27.58'	**1.7' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.28 cfs @ 12.10 hrs HW=28.23' (Free Discharge)
↑**1=Exfiltration** (Controls 0.28 cfs)

Primary OutFlow Max=3.75 cfs @ 12.10 hrs HW=28.23' (Free Discharge)
↑**2=Orifice/Grate** (Orifice Controls 0.53 cfs @ 6.02 fps)
3=Orifice/Grate (Orifice Controls 0.43 cfs @ 4.97 fps)
4=Broad-Crested Rectangular Weir (Weir Controls 2.80 cfs @ 2.53 fps)

Commonwealth of Massachusetts
City/Town of Weymouth

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP1 (Hole #) | 6/25/2021 (Date) | 8:00AM (Time) | Rain 65 (Weather) | _____ (Latitude) | _____ (Longitude)

1. Land Use: Commercial (gas station) (e.g., woodland, agricultural field, vacant lot, etc.) | little (Vegetation) | few (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 2% (Slope (%))

Description of Location: _____

2. Soil Parent Material: Urban Land | _____ (Landform) | _____ (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >200 feet | Drainage Way N/A feet | Wetlands >200 feet | Property Line +/- 40 feet | Drinking Water Well N/A feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-30	Fill										Asphalt, gravel, bricks, etc
30-120	C	CSE S	10YR 4/4	N/A			>5%	Boulders			

Additional Notes:
No mottles, no weeping & no standing water

Commonwealth of Massachusetts
City/Town of Weymouth

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP2 (Hole #) | 6/25/202 1 | 8;00 AM (Time) | Rain 65 (Weather) | Latitude | Longitude:

1. Land Use: Commercial (e.g., woodland, agricultural field, vacant lot, etc.) | little (Vegetation) | Surface Stones (e.g., cobbles, stones, boulders, etc.) | 2% (Slope (%))

Description of Location:

2. Soil Parent Material: Urban Land | Landform | Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >200 feet | Drainage Way N/A feet | Wetlands >200 feet
Property Line +/-60 feet | Drinking Water Well N/A feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-72	Fill										gravel, concrete, bricks, etc
72-132	C	CSE S	10YR 4/4	N/A			>5%	2-5			

Additional Notes:
No mottles, no weeping & no standing water observed.

Infiltration Structure Sizing Calculations

Volume of Infiltration Systems

Infiltration System (27 Cultec 330 XLHD Chambers):

Chamber Storage + Stone Storage = 2,605 cf (HydroCAD Report)

1,472 cf below outlet invert

Massachusetts Stormwater Standards - Required Recharge Volume

Rv=F x Impervious Area

Where

Rv=Required Recharged Volume

F=Target Depth Factor, for Hydrologic Soil Type A = 0.6 inches

Impervious Area= 27,115 sf

Rv=0.6 inches x 1 ft/12 inches x 27,115 sf = 1,355.8 cf

1,355.8 cf < 1,472 cf Meets Standard

Time to Infiltrate – Simple Dynamic Method

See attached HydroCAD Hydrograph indicating dewater @25 hrs

TSS Removal Rate

Parking Lot Sweeping - 5% Reduction - Overall Removal = 95% Remaining

Deep Sump Catch Basin – 25% Reduction = 71.3% (Pre-treatment) Remaining

Deep Sump Manhole – 25% Reduction = 53.4% (Pre-treatment) Remaining

Infiltration – 80% Reduction – Overall Removal = 89.3%

Stage-Area-Storage for Pond 3P: Retention System

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
24.70	**1,176**	0	27.40	1,176	2,200
24.75	1,176	24	27.45	1,176	2,232
24.80	1,176	47	27.50	1,176	2,263
24.85	1,176	71	27.55	1,176	2,292
24.90	1,176	94	27.60	1,176	2,320
24.95	1,176	118	27.65	1,176	2,346
25.00	1,176	141	27.70	1,176	2,370
25.05	1,176	165	27.75	1,176	2,394
25.10	1,176	188	27.80	1,176	2,417
25.15	1,176	212	27.85	1,176	2,441
25.20	1,176	235	27.90	1,176	2,464
25.25	1,176	284	27.95	1,176	2,488
25.30	1,176	333	28.00	1,176	2,511
25.35	1,176	382	28.05	1,176	2,535
25.40	1,176	431	28.10	1,176	2,558
25.45	1,176	479	28.15	1,176	2,582
25.50	1,176	528	28.20	1,176	**2,605**
25.55	1,176	576			
25.60	1,176	625			
25.65	1,176	673			
25.70	1,176	722			
25.75	1,176	770			
25.80	1,176	818			
25.85	1,176	866			
25.90	1,176	913			
25.95	1,176	960			
26.00	1,176	1,007			
26.05	1,176	1,054			
26.10	1,176	1,101			
26.15	1,176	1,148			
26.20	1,176	1,195			
26.25	1,176	1,241			
26.30	1,176	1,288			
26.35	1,176	1,334			
26.40	1,176	1,381			
26.45	1,176	1,426			
26.50	1,176	1,472	Storage below outlet		
26.55	1,176	1,517			
26.60	1,176	1,562			
26.65	1,176	1,606			
26.70	1,176	1,649			
26.75	1,176	1,693			
26.80	1,176	1,735			
26.85	1,176	1,778			
26.90	1,176	1,820			
26.95	1,176	1,861			
27.00	1,176	1,902			
27.05	1,176	1,942			
27.10	1,176	1,981			
27.15	1,176	2,020			
27.20	1,176	2,058			
27.25	1,176	2,095			
27.30	1,176	2,131			
27.35	1,176	2,166			

Hydrograph for Pond 3P: Retention System

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	
0.00	0.00	0	24.70	0.00	0.00	0.00	
1.00	0.01	1	24.70	0.01	0.01	0.00	
2.00	0.02	2	24.70	0.02	0.02	0.00	
3.00	0.03	2	24.71	0.03	0.03	0.00	
4.00	0.04	3	24.71	0.04	0.04	0.00	
5.00	0.05	4	24.71	0.05	0.05	0.00	
6.00	0.06	4	24.71	0.06	0.06	0.00	
7.00	0.08	6	24.71	0.08	0.08	0.00	
8.00	0.10	8	24.72	0.10	0.10	0.00	
9.00	0.15	11	24.72	0.15	0.15	0.00	
10.00	0.20	15	24.73	0.20	0.20	0.00	
11.00	0.30	110	24.93	0.23	0.23	0.00	
12.00	**2.91**	**2,062**	**27.21**	**0.66**	**0.27**	**0.40**	
13.00	**0.34**	**1,905**	**27.00**	**0.51**	**0.26**	**0.24**	
14.00	0.22	1,547	26.58	0.27	0.26	0.02	
15.00	0.16	1,303	26.32	0.25	0.25	0.00	
16.00	0.11	909	25.90	0.24	0.24	0.00	
17.00	0.09	410	25.38	0.24	0.24	0.00	
18.00	0.07	5	24.71	0.07	0.07	0.00	
19.00	0.06	5	24.71	0.06	0.06	0.00	
20.00	0.06	4	24.71	0.06	0.06	0.00	
21.00	0.05	4	24.71	0.05	0.05	0.00	
22.00	0.05	3	24.71	0.05	0.05	0.00	
23.00	0.04	3	24.71	0.04	0.04	0.00	
24.00	0.04	3	24.71	0.04	0.04	0.00	
25.00	0.00	0	24.70	0.00	0.00	0.00	De-water @ 25 Hrs.
26.00	0.00	0	24.70	0.00	0.00	0.00	
27.00	0.00	0	24.70	0.00	0.00	0.00	
28.00	0.00	0	24.70	0.00	0.00	0.00	
29.00	0.00	0	24.70	0.00	0.00	0.00	
30.00	0.00	0	24.70	0.00	0.00	0.00	
31.00	0.00	0	24.70	0.00	0.00	0.00	
32.00	0.00	0	24.70	0.00	0.00	0.00	
33.00	0.00	0	24.70	0.00	0.00	0.00	
34.00	0.00	0	24.70	0.00	0.00	0.00	
35.00	0.00	0	24.70	0.00	0.00	0.00	
36.00	0.00	0	24.70	0.00	0.00	0.00	
37.00	0.00	0	24.70	0.00	0.00	0.00	
38.00	0.00	0	24.70	0.00	0.00	0.00	
39.00	0.00	0	24.70	0.00	0.00	0.00	
40.00	0.00	0	24.70	0.00	0.00	0.00	
41.00	0.00	0	24.70	0.00	0.00	0.00	
42.00	0.00	0	24.70	0.00	0.00	0.00	
43.00	0.00	0	24.70	0.00	0.00	0.00	
44.00	0.00	0	24.70	0.00	0.00	0.00	
45.00	0.00	0	24.70	0.00	0.00	0.00	
46.00	0.00	0	24.70	0.00	0.00	0.00	
47.00	0.00	0	24.70	0.00	0.00	0.00	
48.00	0.00	0	24.70	0.00	0.00	0.00	