**County/ Municipality** **Somerset/ Franklin Township**

**Block:** **36.01** **Lot:** **6.03**

**IB SL-3**

Form 3f. Pit Bailing Test Data:

1. Test IB SL-3 Soil Log IB SL-3 Date Tested 03/06/20

2. Record the following in feet:
   Depth to bottom of Pit, Dpit : 11.00
   Depth to water after 24 hr. stabilization period, Dwater : 6.66
   Depth to impermeable Stratum, (if unknown use 1.5 times depth of pit) Dstratum : 16.50
   Height of water level above impermeable stratum (Dstratum - Dwater), H : 9.84

3. Record the following data in the table below:
   Time measurement in minutes, tn :
   Depth to water level below reference point in inches dn :
   Water surface dimensions in feet, l & w :

4. Calculate the following values and enter in the table below:
   Water surface area in square feet, An :
   Water level rise in inches, hrise :
   Average water surface area in square feet, Aav :
   Average height of water level above impermeable stratum, h :
   Permeability in inches per hour, Ka :

| Time elapsed **tn** | Depth to water **dn** | Length **l** | Width **w** | Area **An** | Water Rise **hrise** | Average Area **Aav** | Height of Water **h** | Permeability **Ka** |
|---|---|---|---|---|---|---|---|---|
| 0 | 108.00 | 6.50 | 6.50 | 42.25 | | | | |
| 10 | *(Interval Time)* | | | | 4.00 | 43.06 | 7.67 | **12.0** |
| 10 | 104.00 | 6.50 | 6.75 | 43.88 | | | | |
| 10 | | | | | 3.00 | 44.69 | 7.96 | **10.6** |
| 20 | 101.00 | 6.50 | 7.00 | 45.50 | | | | |
| 10 | | | | | 3.00 | 46.31 | 8.21 | **12.5** |
| 30 | 98.00 | 6.50 | 7.25 | 47.13 | | | | |
| 10 | | | | | 2.00 | 47.94 | 8.42 | **9.8** |
| 40 | 96.00 | 6.50 | 7.50 | 48.75 | | | | |
| 10 | | | | | 3.00 | 48.75 | 8.63 | **17.2** |
| 50 | 93.00 | 6.50 | 7.50 | 48.75 | | | | |

Total Rise During Test = 15.00 inches

8D.14

**County/ Municipality** **Somerset/ Franklin Township**

**Block:** **36.01** **Lot:** **6.03**

**IB SL-3**

Form 3f. Pit Bailing Test Data - Continued from previous page LOG IB SL-3

5. Record the following data:

| | |
|---|---|
| Final Depth of Pit in feet, Dpit : | 11.00 |
| Depth to impermeable stratum in feet, Dstratum : | 16.50 |
| Height of standpipe above reference level in feet, hpipe : | 0 |
| Depth of water after 24 hour stabilization period in feet, Dwater : | 6.66 |
| Height of static water level above imperm. stratum in feet, H : | 9.84 |
| Average height of water level above imperm. stratum in feet, h : | 8.63 |

6. Re-calculation of K using data from section 5 above and from final time interval of section 4 :
**K = (hrise/t) x Aav/(2.27x(H2 - h2)) x 60 min/hr =**

17.2 inches/hour

where:

| | |
|---|---|
| 3.00 | **= hrise** |
| 48.75 | **= Aav** |
| 9.84 | **= H** |
| 8.63 | **= h** |
| 10 | **= t** |

7. I hereby certify that the information furnished on Form 3f of this application is true and accurate. I am aware that falsification of this data is a violation of the Water Pollution Control Act ( N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Peter R. Eshewsky – Site Evaluator — Date: 3/6/20

Jayesh S.Patel — NJ PE # 35306

8D.19

**County/ Municipality** **Somerset/ Franklin Township**

**Block:** **36.01** **Lot:** **6.03**

**SL-4**

Form 3f. Pit Bailing Test Data:

1. Test SL-4 Soil Log SL-4 Date Tested 03/06/20

2. Record the following in feet:

Depth to bottom of Pit, Dpit : 9.50

Depth to water after 24 hr. stabilization period, Dwater : 7.00

Depth to impermeable Stratum, (if unknown use 1.5 times depth of pit) Dstratum : 14.25

Height of water level above impermeable stratum (Dstratum - Dwater), H : 7.25

3. Record the following data in the table below:

Time measurement in minutes, tn :

Depth to water level below reference point in inches dn :

Water surface dimensions in feet, l & w :

4. Calculate the following values and enter in the table below:

Water surface area in square feet, An :

Water level rise in inches, hrise :

Average water surface area in square feet, Aav :

Average height of water level above impermeable stratum, h :

Permeability in inches per hour, Ka :

| Time elapsed **tn** | Depth to water **dn** | Length **l** | Width **w** | Area **An** | Water Rise **hrise** | Average Area **Aav** | Height of Water **h** | Permeability **Ka** |
|---|---|---|---|---|---|---|---|---|
| 0 | 97.00 | 6.90 | 6.50 | 44.85 | | | | |
| **10** | *(Interval Time)* | | | | 0.00 | 44.85 | 6.17 | **0.0** |
| 10 | 97.00 | 6.90 | 6.50 | 44.85 | | | | |
| **10** | | | | | 0.00 | 44.85 | 6.17 | **0.0** |
| 20 | 97.00 | 6.90 | 6.50 | 44.85 | | | | |
| **10** | | | | | 0.00 | 44.85 | 6.17 | **0.0** |
| 30 | 97.00 | 6.90 | 6.50 | 44.85 | | | | |
| **10** | | | | | 0.00 | 44.85 | 6.17 | **0.0** |
| 40 | 97.00 | 6.90 | 6.50 | 44.85 | | | | |
| **10** | | | | | 0.00 | 44.85 | 6.17 | **0.0** |
| 50 | 97 * | 6.90 | 6.50 | 44.85 | | | | |

Total Rise During Test = 12.00 inches

*Minimal water movement after 2.5 hours = abandoned.

8D.20

**County/ Municipality** **Somerset/ Franklin Township**

**Block:** **36.01** **Lot:** **6.03**

**SL-3**

Form 3f. Pit Bailing Test Data - Continued from previous page Log SL-4

5. Record the following data:

| | |
|---|---|
| Final Depth of Pit in feet, Dpit : | 11.00 |
| Depth to impermeable stratum in feet, Dstratum : | 16.50 |
| Height of standpipe above reference level in feet, hpipe : | 0 |
| Depth of water after 24 hour stabilization period in feet, Dwater : | 6.66 |
| Height of static water level above imperm. stratum in feet, H : | 9.84 |
| Average height of water level above imperm. stratum in feet, h : | 6.17 |

6. Re-calculation of K using data from section 5 above and from final time interval of section 4 :
**K = (hrise/t) x Aav/(2.27x(H2 - h2)) x 60 min/hr =**

0.0 inches/hour

where:

| | |
|---|---|
| 0 | **= hrise** |
| 44.85 | **= Aav** |
| 9.84 | **= H** |
| 6.17 | **= h** |
| 10 | **= t** |

7. I hereby certify that the information furnished on Form 3f of this application is true and accurate. I am aware that falsification of this data is a violation of the Water Pollution Control Act ( N.J.S.A. 58:10A-1 et seq.) and is subject to penalties as prescribed in N.J.A.C. 7:14-8.

Peter R. Eshewsky – Site Evaluator — Date 3/6/20

Jayesh S.Patel — NJ PE # 35306

8D.21

## Hydrograph for Pond 13P: Proposed Wet Basin

| Time (hours) | Inflow (cfs) | Storage (cubic-feet) | Elevation (feet) | Primary (cfs) |
|---|---|---|---|---|
| 0.00 | 0.00 | 0 | 96.50 | 0.00 |
| 3.00 | 0.32 | 1,709 | 96.54 | 0.03 |
| 6.00 | 0.47 | 5,244 | 96.62 | 0.14 |
| 9.00 | 1.12 | 10,690 | 96.75 | 0.39 |
| 12.00 | **28.22** | **48,575** | **97.52** | **2.69** |
| 15.00 | **2.45** | **74,150** | **97.97** | **6.11** |
| 18.00 | 1.33 | 49,777 | 97.54 | 2.79 |
| 21.00 | 1.05 | 37,049 | 97.31 | 1.99 |
| 24.00 | 0.87 | 28,526 | 97.15 | 1.48 |
| 27.00 | 0.00 | 17,307 | 96.90 | 0.77 |
| 30.00 | 0.00 | 11,166 | 96.76 | 0.41 |
| 33.00 | 0.00 | 7,717 | 96.68 | 0.24 |
| 36.00 | 0.00 | 5,621 | 96.63 | 0.15 |
| 39.00 | 0.00 | 4,263 | 96.60 | 0.10 |
| 42.00 | 0.00 | 3,338 | 96.58 | 0.07 |
| 45.00 | 0.00 | 2,682 | 96.56 | 0.05 |
| 48.00 | 0.00 | 2,200 | 96.55 | 0.04 |
| 51.00 | 0.00 | 1,837 | 96.54 | 0.03 |
| 54.00 | 0.00 | 1,556 | 96.54 | 0.02 |
| 57.00 | 0.00 | 1,334 | 96.53 | 0.02 |
| 60.00 | 0.00 | 1,157 | 96.53 | 0.01 |
| 63.00 | 0.00 | 1,012 | 96.52 | 0.01 |
| 66.00 | 0.00 | 893 | 96.52 | 0.01 |
| 69.00 | 0.00 | 794 | 96.52 | 0.01 |
| 72.00 | 0.00 | 710 | 96.52 | 0.01 |
| 75.00 | 0.00 | 639 | 96.52 | 0.01 |
| 78.00 | 0.00 | 578 | 96.51 | 0.01 |
| 81.00 | 0.00 | 526 | 96.51 | 0.00 |
| 84.00 | 0.00 | 480 | 96.51 | 0.00 |
| 87.00 | 0.00 | 440 | 96.51 | 0.00 |
| 90.00 | 0.00 | 404 | 96.51 | 0.00 |
| 93.00 | 0.00 | 373 | 96.51 | 0.00 |
| 96.00 | 0.00 | 345 | 96.51 | 0.00 |
| 99.00 | 0.00 | 321 | 96.51 | 0.00 |
| 102.00 | 0.00 | 299 | 96.51 | 0.00 |
| 105.00 | 0.00 | 279 | 96.51 | 0.00 |
| 108.00 | 0.00 | 261 | 96.51 | 0.00 |
| 111.00 | 0.00 | 244 | 96.51 | 0.00 |
| 114.00 | 0.00 | 229 | 96.51 | 0.00 |
| 117.00 | 0.00 | 216 | 96.51 | 0.00 |
| 120.00 | 0.00 | 203 | 96.50 | 0.00 |

} @ 12.77 HRS, PEAK ELEV 98.52 & DISCH. = 11.60 cfs

} @ 79.00 HRS, PEAK DISCH = 0.0 cfs

∴ TIME TO DRAIN WET POND

= 79.00 HRS − 12.77 HRS

= 66.23 HRS < 72.00 HRS ∴ OK

8D.22

# 9. GROUNDWATER RECHARGE CALCULATIONS

9A. Annual Groundwater Recharge Analysis (GSR-32 Spreadsheet)
9B. Time to Drain Calculations for Infiltration Basin-GW recharge volume
9C. Groundwater Mounding Analysis – Infiltration Basin

## GROUNDWATER RECHARGE CALCULATIONS

Per the NJ Stormwater Management Regulations (NJAC7:8), 100% of the site's average annual pre-developed groundwater recharge volume must be maintained after development.

Using GSR-32, Pre-developed and Post Developed conditions calculations were performed for the disturbed portion of the property (8.8 acres).

The following values of total annual recharge were determined.

Pre-Development – 441,609 cu-ft.

Post-Development – 232,685 cu-ft.

Since Post-Development recharge occurring is **less** than Pre-Development condition, groundwater recharge requirements are **not** met per NJAC 7:8-5.4 (a).2.i.(1). There will be a net Post -Development Annul Recharge Deficit of 208,924 c.f. This amount of recharge must be provided by using the structural BMP.

Therefore, it is proposed to provide sand-bottom infiltration basin in front of Wet Basin to provide the required groundwater recharge. Therefore, The infiltration basin has been designed with the following dimensions:

Depth = 0.45 ft. or 5.4 inches minimum (Between top of sand elevation = 97.25 and Spillway at Baffle area to Wet Basin- invert = 97.70.
Bottom Sand Area = 9,990 s.f.
Sand Bed Depth = 6 inches (Bottom of Sand Elevation = 96.75)
Depth to SHWT = 2.1 ft. (ESHWT = 94.65)
Top of basin Elevation is 100.0

Utilizing the New Jersey Groundwater Recharge Spreadsheet (NJGRS), an infiltration structure with a bottom area of 9,990 sq. ft. must have a storage depth of 4.7 inches to meet the annual BMP recharge requirements for the site. Since the proposed infiltration area of Basin has a depth of 5.4 inches, therefore recharge requirements have been satisfied.

New Jersey Groundwater Recharge Spreadsheet Version 2.0 November 2003

# Annual Groundwater Recharge Analysis (based on GSR-32)

| Select Township ↓ | Average Annual P (in) | Climatic Factor |
|---|---|---|
| SOMERSET CO., FRANKLIN TWP | 45.7 | 1.48 |

| Project Name: | Sai Datta Temple |
|---|---|
| Description: | 28970 sf temple building |
| Analysis Date: | 06/15/20 |

## Pre-Developed Conditions

| Land Segment | Area (acres) | TR-55 Land Cover | Soil | Annual Recharge (in) | Annual Recharge (cu.ft) |
|---|---|---|---|---|---|
| 1 | 0.36 | Brush | Royce | 13.5 | 17,582 |
| 2 | 0.44 | Woods-grass combination | Royce | 12.6 | 20,116 |
| 3 | 8 | Brush | penn | 13.9 | 403,912 |
| 4 | | | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | 0 | | | | |
| 8 | 0 | | | | |
| 9 | 0 | | | | |
| 10 | 0 | | | | |
| 11 | 0 | | | | |
| 12 | 0 | | | | |
| 13 | 0 | | | | |
| 14 | 0 | | | | |
| 15 | 0 | | | | |
| Total = | 8.8 | | | Total Annual Recharge (in) | Total Annual Recharge (cu-ft) |
| | | | | 13.8 | 441,609 |

## Post-Developed Conditions

| Land Segment | Area (acres) | TR-55 Land Cover | Soil | Annual Recharge (in) | Annual Recharge (cu.ft) |
|---|---|---|---|---|---|
| 1 | 0.34 | Impervious areas | Royce | 0.0 | - |
| 2 | 0.46 | Open space | Royce | 12.0 | 20,024 |
| 3 | 3.24 | Impervious areas | Penn | 0.0 | - |
| 4 | 4.76 | Open space | Penn | 12.3 | 212,661 |
| 5 | 0 | | | | |
| 6 | 0 | | | | |
| 7 | 0 | | | | |
| 8 | 0 | | | | |
| 9 | 0 | | | | |
| 10 | 0 | | | | |
| 11 | 0 | | | | |
| 12 | 0 | | | | |
| 13 | 0 | | | | |
| 14 | 0 | | | | |
| 15 | 0 | | | | |
| Total = | 8.8 | | | Total Annual Recharge (in) | Total Annual Recharge (cu.ft) |
| | | | | 7.3 | 232,685 |

## Annual Recharge Requirements Calculation ↓

| | | |
|---|---|---|
| % of Pre-Developed Annual Recharge to Preserve = | 100% | Total Impervious Area (sq.ft) |
| | | 155,945 |
| *Post-Development Annual Recharge Deficit=* | *208,924* | (cubic feet) |

## Recharge Efficiency Parameters Calculations (area averages)

| | | | | |
|---|---|---|---|---|
| RWC= | 3.95 | (in) | DRWC= 0.39 | (in) |
| ERWC = | 1.03 | (in) | EDRWC= 0.10 | (in) |

**Procedure to fill the Pre-Development and Post-Development Conditions Tables**

For each land segment, first enter the area, then select TR-55 Land Cover, then select Soil. Start from the top of the table and proceed downward. Don't leave blank rows (with A=0) in between your segment entries. Rows with A=0 will not be displayed or used in calculations. For impervious areas outside of standard lots select "Impervious Areas" as the Land Cover. Soil type for impervious areas are only required if an infiltration facility will be built within these areas.

9A.2

| Project Name | Description | Analysis Date | BMP or LID Type |
|---|---|---|---|
| Sai Datta Temple | 28970 sf temple building | 06/15/20 | 9990 sf sand bottom infilt |

**Recharge BMP Input Parameters**

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| BMP Area | ABMP | 9990.0 | sq.ft |
| BMP Effective Depth, this is the design variable | dBMP | 4.7 | in |
| Upper level of the BMP surface (negative if above ground) | dBMPu | 27.6 | in |
| Depth of lower surface of BMP, must be>=dBMPu | dEXC | 33.0 | in |
| Post-development Land Segment Location of BMP , Input Zero if Location is distributed or undetermined | SegBMP | 3 | unitless |

**Root Zone Water capacity Calculated Parameters**

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Empty Portion of RWC under Post-D Natural Recharge | ERWC | 0.98 | in |
| ERWC Modified to consider dEXC | EDRWC | 0.00 | in |
| Empty Portion of RWC under Infilt. BMP | RERWC | 0.00 | in |

**Recharge Design Parameters**

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Inches of Runoff to capture | Qdesign | 0.38 | in |
| Inches of Rainfall to capture | Pdesign | 0.49 | in |
| Recharge Provided Avg. over Imp. Area | | 20.1 | in |
| Runoff Captured Avg. over imp. Area | | 20.1 | in |

**BMP Calculated Size Parameters**

| | | | |
|---|---|---|---|
| ABMP/Aimp | Aratio | 0.08 | unitless |
| BMP Volume | VBMP | 3,927 | cu.ft |

**Parameters from Annual Recharge Worksheet**

| | | | |
|---|---|---|---|
| Post-D Deficit Recharge (or desired recharge volume) | Vdef | 208,924 | cu.ft |
| Post-D Impervious Area (or target Impervious Area) | Aimp | 125,000 | sq.ft |
| Root Zone Water Capacity | RWC | 3.77 | in |
| RWC Modified to consider dEXC | DRWC | 0.00 | in |
| Climatic Factor | C-factor | 1.48 | no units |
| Average Annual P | Pavg | 45.7 | in |
| Recharge Requirement over Imp. Area | dr | 16.1 | in |

**System Performance Calculated Parameters**

| | | | |
|---|---|---|---|
| Annual BMP Recharge Volume | | 208,924 | cu.ft |
| Avg BMP Recharge Efficiency | | 100.0% | Represents % Infiltration Recharged |
| %Rainfall became Runoff | | 77.9% | % |
| %Runoff Infiltrated | | 56.3% | % |
| %Runoff Recharged | | 45.2% | % |
| %Rainfall Recharged | | 35.2% | % |

**CALCULATION CHECK MESSAGES**

Volume Balance-> OK
dBMP Check---> OK
dEXC Check---> OK
BMP Location---> OK

**OTHER NOTES**

Pdesign is accurate only after BMP dimensions are updated to make rech volume= deficit volume. The portion of BMP infiltration prior to filling and the area occupied by BMP are ignored in these calculations. Results are sensetive to dBMP, make sure dBMP selected is small enough for BMP to empty in less than 3 days. For land Segment Location of BMP if you select "impervious areas" RWC will be minimal but not zero as determined by the soil type and a shallow root zone for this Land Cover allowing consideration of lateral flow and other losses.

**How to solve for different recharge volumes:** By default the spreadsheet assigns the values of total deficit recharge volume "Vdef" and total proposed impervious area "Aimp" from the "Annual Recharge" sheet to "Vdef" and "Aimp" on this page. This allows solution for a single BMP to handle the entire recharge requirement assuming the runoff from entire impervious area is available to the BMP.
To solve for a smaller BMP or a LID-IMP to recharge only part of the recharge requirement, set Vdef to your target value and Aimp to impervious area directly connected to your infiltration facility and then solve for ABMP or dBMP. To go back to the default configuration clik the "Default Vdef & Aimp" button.

9A.3

| | | | | | |
|---|---|---|---|---|---|
| **Job:** | Sai Datta Mandir, Inc. | **Notes By:** | JP | DATE: | 07/07/20 |
| **Project #:** | N5817 (583 S. Middlebush Rd, Franklin Twsp, NJ | **Check By:** | | DATE: | |

## Time to Drain Calculations-Groundwater Recharge Volume in Infiltration Basin

### *INFILTRATION BASIN*

| | | |
|---|---|---|
| Permeability-Pit Bailing Test | 10.9 | inches per hour (@IB SL-3) |
| Design Permeability, k | 5.5 | inches per hour |
| | 0.45 | ft per hour |
| Bottom area, A | 9,990 | sf |
| Max basin elevation WQ storm | 97.7 | ft |
| Basin bottom | 97.25 | ft |
| Seasonal high water elevation | 94.65 | ft |
| Average head, i, (1/2)(Max elev - Seasonal high water) | 1.53 | ft |
| Average flow, Q= kiA | 6,942 | cubic feet per hour |
| Volume | 4,496 | cubic feet |
| Dewatering time (Volume/Average flow) | 0.6 | hr |

# Hydraulic Impact to Groundwater Assessment under Proposed Infiltration Basin-Sai Datta Temple, Franklin, NJ

## Step 1: Calculate the duration of infiltration period

Duration of infiltration period, t (hours) = volume of runoff to be infiltrated (cf) x 12ft/in / Infiltration area (sf) x Recharge rate (in/hr)

Volume of runoff to be infiltrated =GW recharge volume in Infiltration Basin = 4,192 cf

Infiltration area = 185 ft x 54 ft = 9990 sf

Design permeability rate = ½ tested permeability rate = ½ x 10.9 in/hr (@ IB SL-3)
= 5.45 in/hr

Duration of infiltration period, t (hours) = 4,192 (cf) x 12ft/in / 9,990 sf x 5.45 in/hr

t (hours) = 0.92 hrs

## Step 2: Prepare the inputs for the spreadsheet

The design permeability rate, 5.45 in/hr, is used for the recharge rate in the spreadsheet. The specific yield is the default value, 0.15. The horizontal hydraulic conductivity is 1 times the vertical hydraulic conductivity (1x10.9 in/hr ) since the infiltration basin is located outside of the coastal plain. ½ length of basin is ½ x 185 ft =92.5 ft and ½ width of basin is ½ x 54 ft = 27 ft. The duration of infiltration period is obtained from Step 1. The initial thickness of saturated zone uses the default value, 10 feet.

| | |
|---|---|
| Recharge rate (R) | = 5.45 in/hr |
| Specific yield (Sy) | = 0.15 |
| Horizontal hydraulic conductivity (Kh) | = 10.9 in/hr |
| ½ length of basin (x direction) | = 92.5 ft |
| ½ length of basin (y direction) | = 27 ft |
| Duration of infiltration period (t) | = 0.92 hrs |
| Initial thickness of saturated zone (hi(0)) | = 10 ft |

The graphic shown below depicts the input section of the Hantush Spreadsheet with the parameter values shown above entered.

### Input Section of the Hantush Spreadsheet

Input Values

| | | |
|---|---|---|
| *5.45* | *R* | **Recharge rate (permeability rate) (in/hr)** |
| | | **Specific yield, Sy (dimensionless)** |
| *0.150* | Sy | **default value is 0.15; max value is 0.2 provided that a lab test data is submitted** |
| | | **Horizontal hydraulic conductivity (in/hr)** |
| 10.90 | Kh | **Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan** |
| 92.500 | x | **1/2 length of basin (x direction, in feet)** |
| 27.000 | y | **1/2 width of basin (y direction, in feet)** |
| 0.92 | t | **Duration of infiltration period (hours)** |
| 10.00 | hi(0) | **Initial thickness of saturated zone (feet)** |

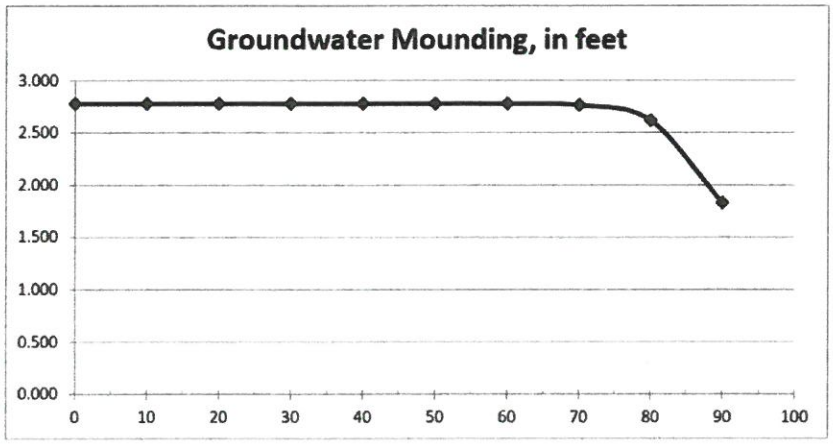
The results, depicted below, show the maximum height of groundwater mounding, 2.78 ft, that will occur at the end of the duration of infiltration period. Since the SHWT is 2.1 ft below the bottom of the sand layer, the temporarily elevated groundwater table, located at 2.78 ft above the SHWT elevation, intersects and exceeds the elevation of the bottom of the sand layer, interfering with the infiltration capability.

### Results Section of the Hantush Spreadsheet

| | | |
|---|---|---|
| 12.776 | h(max) | **Maximum thickness of saturated zone (beneath center of basin at end of infiltration period)** |
| 2.776 | 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 |
|---|---|
| 2.776 | 0 |
| 2.776 | 10 |
| 2.776 | 20 |
| 2.776 | 30 |
| 2.776 | 40 |
| 2.776 | 50 |
| 2.775 | 60 |
| 2.760 | 70 |
| 2.615 | 80 |
| 1.825 | 90 |

**Re-Calculate Now**




From above table, it is determined that the adjustments of the spreadsheet inputs are needed to reduce the height of groundwater mounding. The following step 3 provides adjustment to Input Section of the Hantush Spreadsheet.

**Step 3: Adjust spreadsheet inputs**

The height of groundwater mounding determined in Step 2 will reduce the vertical hydraulic gradient, which then slows the infiltration of runoff. Therefore, the vertical hydraulic conductivity will not be as high as expected, meaning it must be adjusted and rechecked to determine if the basin can still drain within 72 hours. For this example, the recharge rate is reduced to a smaller value of 0.5 in/hr. The horizontal hydraulic conductivity is not adjusted since it is not significantly affected by the reduced hydraulic gradient in the vertical direction. The duration of infiltration period must also be proportionally adjusted, as follows:

$$\text{Duration of infiltration period, t (hours)} = \frac{4{,}192 \text{ (cf)} \times 12 \text{ ft/in}}{9990 \text{ sf} \times 0.5 \text{ in/hr}}$$

$$\text{t (hours)} = 10.07 \text{ hrs}$$

The new adjusted parameter values, as follows, must be input into the spreadsheet:

Recharge rate (R) = 0.5 in/hr
Specific yield (Sy) = 0.15
Horizontal hydraulic conductivity (Kh) = 10.9 in/hr
½ length of basin (x direction) = 92.5 ft
½ length of basin (y direction) = 27 ft
Duration of infiltration period (t) = 10.07 hr
Initial thickness of saturated zone (hi(0)) = 10 ft

The graphic shown below depicts the adjusted input section of the Hantush Spreadsheet with the parameter values shown above entered.

**Input Section of the Hantush Spreadsheet**

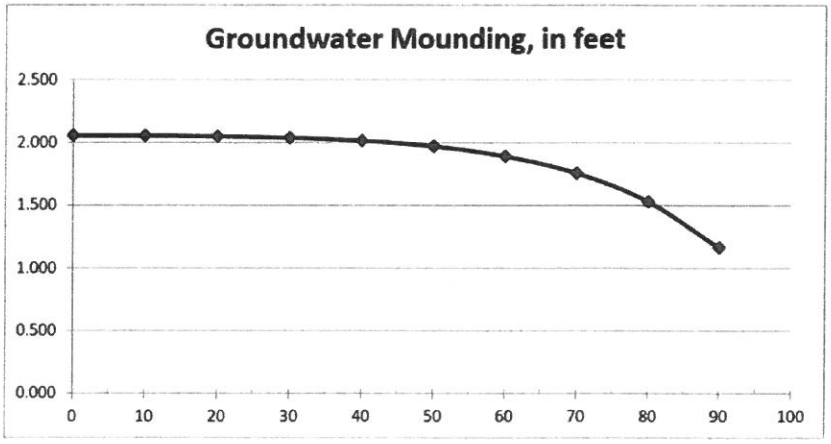
| Input Values | | |
|---|---|---|
| *0.50* | *R* | **Recharge rate (permeability rate) (in/hr)** |
| *0.150* | Sy | **Specific yield, Sy (dimensionless) default value is 0.15; max value is 0.2 provided that a lab test data is submitted** |
| 10.90 | Kh | **Horizontal hydraulic conductivity (in/hr) Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan** |
| 92.500 | x | **1/2 length of basin (x direction, in feet)** |
| 27.000 | y | **1/2 width of basin (y direction, in feet)** |
| 10.07 | t | **Duration of infiltration period (hours)** |
| 10.00 | hi(0) | **Initial thickness of saturated zone (feet)** |

The results, depicted below, show the maximum height of groundwater mounding, 2.06 ft, that will occur at the end of the duration of infiltration period. Since the SHWT is 2.1 ft below the bottom of the sand layer, the temporarily elevated groundwater table, located at 2.06 ft above the SHWT elevation, will not reach the bottom of the basin.

| | | |
|---|---|---|
| 12.056 | h(max) | Maximum thickness of saturated zone (beneath center of basin at end of infiltration period) |
| 2.056 | 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 |
|---|---|
| 2.056 | 0 |
| 2.054 | 10 |
| 2.049 | 20 |
| 2.037 | 30 |
| 2.014 | 40 |
| 1.970 | 50 |
| 1.891 | 60 |
| 1.755 | 70 |
| 1.529 | 80 |
| 1.164 | 90 |

Re-Calculate Now




**Conclusion:**

Therefore, the assessment shows no adverse hydraulic impact to the groundwater table from the proposed infiltration BMP. As calculated above, the infiltration basin now needs 10.07 hours to drain. Since the drain time is still within 72 hours, the design of the proposed infiltration basin still meets the design criteria set forth in the BMP manual.

Q:\5501-6000\5817\Stormwater\GW table Hydraulic Impact Assessments for Infiltration Basin-5817.odt

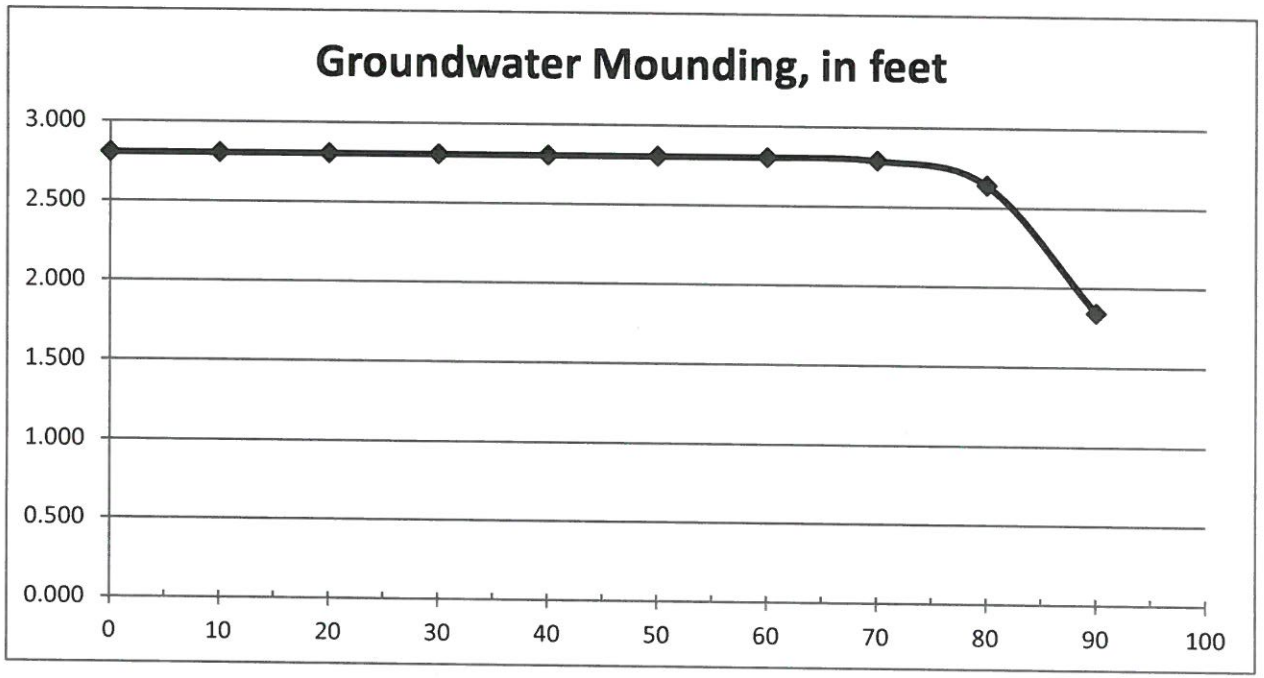
Input Values

| | | |
|---|---|---|
| 5.45 | *R* | Recharge rate (permeability rate) (in/hr) |
| | | Specific yield, Sy (dimensionless) |
| 0.150 | Sy | default value is 0.15; max value is 0.2 provided that a lab test data is submitted |
| | | Horizontal hydraulic conductivity (in/hr) |
| 10.90 | Kh | Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan |
| 92.500 | x | 1/2 length of basin (x direction, in feet) |
| 27.000 | y | 1/2 width of basin (y direction, in feet) |
| 0.93 | t | Duration of infiltration period (hours) |
| 10.00 | hi(0) | Initial thickness of saturated zone (feet) |

| | | |
|---|---|---|
| 12.806 | h(max) | Maximum thickness of saturated zone (beneath center of basin at end of infiltration period) |
| 2.806 | 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 |
|---|---|
| 2.806 | 0 |
| 2.806 | 10 |
| 2.806 | 20 |
| 2.806 | 30 |
| 2.806 | 40 |
| 2.806 | 50 |
| 2.805 | 60 |
| 2.789 | 70 |
| 2.640 | 80 |
| 1.842 | 90 |

Re-Calculate Now




9.25

5817 ORIGINAL INPUT - HANTUSH SPREADSHEET

REDUCED RECHARGE RATE

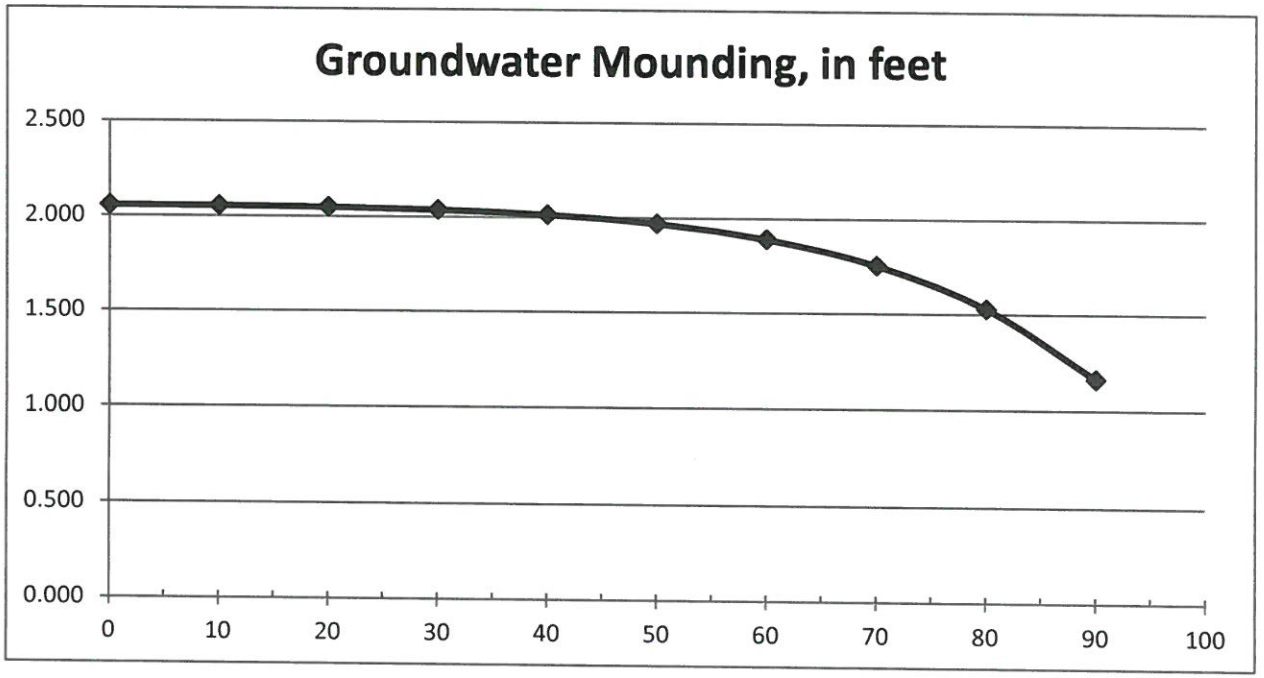
Input Values

| | | |
|---|---|---|
| 0.50 | $R$ | Recharge rate (permeability rate) (in/hr) |
| | | Specific yield, Sy (dimensionless) |
| 0.150 | Sy | default value is 0.15; max value is 0.2 provided that a lab test data is submitted |
| | | Horizontal hydraulic conductivity (in/hr) |
| 10.90 | Kh | Kh = 5xRecharge Rate (R) in the costal plan; Kh=R outside the coastal plan |
| 92.500 | x | 1/2 length of basin (x direction, in feet) |
| 27.000 | y | 1/2 width of basin (y direction, in feet) |
| 10.07 | t | Duration of infiltration period (hours) |
| 10.00 | hi(0) | Initial thickness of saturated zone (feet) |

| | | |
|---|---|---|
| 12.056 | h(max) | Maximum thickness of saturated zone (beneath center of basin at end of infiltration period) |
| 2.056 | 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 |
|---|---|
| 2.056 | 0 |
| 2.054 | 10 |
| 2.049 | 20 |
| 2.037 | 30 |
| 2.014 | 40 |
| 1.970 | 50 |
| 1.891 | 60 |
| 1.755 | 70 |
| 1.529 | 80 |
| 1.164 | 90 |

Re-Calculate Now



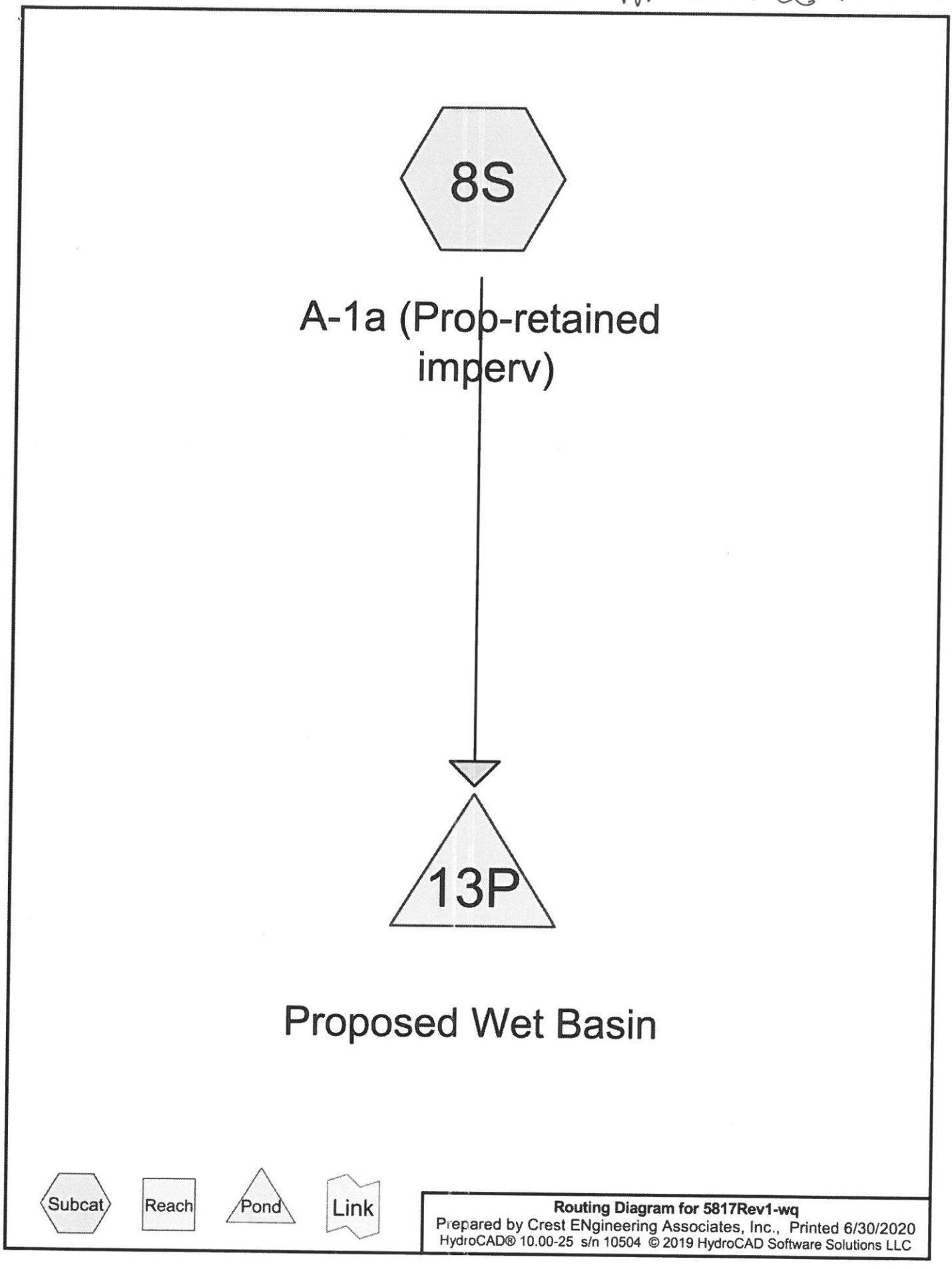

9.06

5817 MODIFIED INPUT- HANTUSH SPREADSHEET

# 10. WATER QUALITY CALCULATIONS

10A. Water Quality Stormwater Runoff to Wet Pond
10B. Wet Pond Permanent Pool Volume

WATER QUALITY



Time span=0.00-120.00 hrs, dt=0.03 hrs, 4001 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 8S: A-1a (Prop-retained** Runoff Area=3.580 ac 100.00% Impervious Runoff Depth=1.03"
Tc=6.0 min CN=98 Runoff=10.47 cfs 0.309 af

**Pond 13P: Proposed Wet Basin** Peak Elev=96.78' Storage=12,006 cf Inflow=10.47 cfs 0.309 af
Outflow=0.46 cfs 0.308 af

## Summary for Subcatchment 8S: A-1a (Prop-retained imperv)

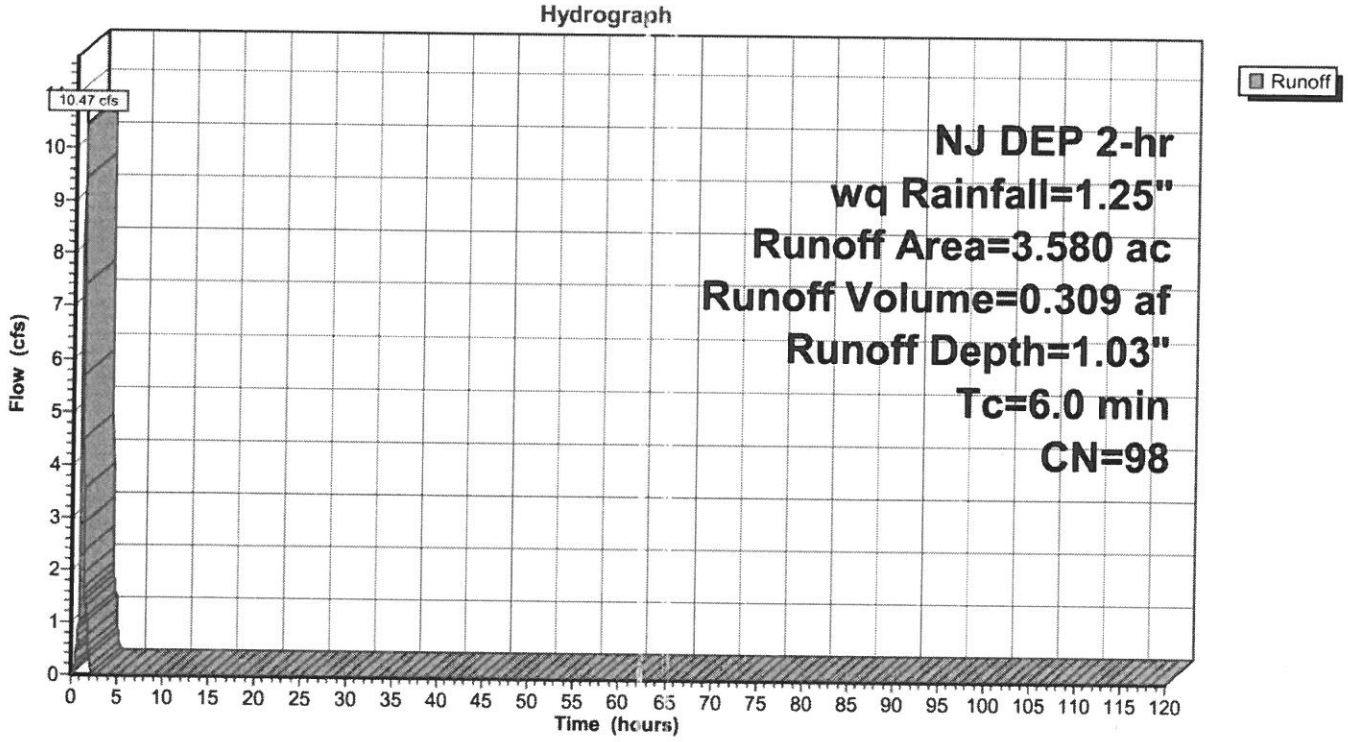
Runoff = 10.47 cfs @ 1.10 hrs, Volume= 0.309 af, Depth= 1.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
NJ DEP 2-hr wq Rainfall=1.25"

| Area (ac) | CN | Description |
|---|---|---|
| 0.665 | 98 | Unconnected roofs, HSG C |
| 0.290 | 98 | Unconnected pavement, HSG C |
| 0.465 | 98 | Unconnected pavement, HSG C |
| 2.160 | 98 | Paved parking, HSG C |
| 3.580 | 98 | Weighted Average |
| 3.580 | | 100.00% Impervious Area |
| 1.420 | | 39.66% Unconnected |

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

### Subcatchment 8S: A-1a (Prop-retained imperv)



## Hydrograph for Subcatchment 8S: A-1a (Prop-retained imperv)

| Time (hours) | Precip. (inches) | Excess (inches) | Runoff (cfs) |
|---|---|---|---|
| 0.00 | 0.00 | 0.00 | **0.00** |
| 1.50 | **1.15** | **0.94** | **1.40** |
| 3.00 | **1.25** | **1.03** | 0.00 |
| 4.50 | 1.25 | 1.03 | 0.00 |
| 6.00 | 1.25 | 1.03 | 0.00 |
| 7.50 | 1.25 | 1.03 | 0.00 |
| 9.00 | 1.25 | 1.03 | 0.00 |
| 10.50 | 1.25 | 1.03 | 0.00 |
| 12.00 | 1.25 | 1.03 | 0.00 |
| 13.50 | 1.25 | 1.03 | 0.00 |
| 15.00 | 1.25 | 1.03 | 0.00 |
| 16.50 | 1.25 | 1.03 | 0.00 |
| 18.00 | 1.25 | 1.03 | 0.00 |
| 19.50 | 1.25 | 1.03 | 0.00 |
| 21.00 | 1.25 | 1.03 | 0.00 |
| 22.50 | 1.25 | 1.03 | 0.00 |
| 24.00 | 1.25 | 1.03 | 0.00 |
| 25.50 | 1.25 | 1.03 | 0.00 |
| 27.00 | 1.25 | 1.03 | 0.00 |
| 28.50 | 1.25 | 1.03 | 0.00 |
| 30.00 | 1.25 | 1.03 | 0.00 |
| 31.50 | 1.25 | 1.03 | 0.00 |
| 33.00 | 1.25 | 1.03 | 0.00 |
| 34.50 | 1.25 | 1.03 | 0.00 |
| 36.00 | 1.25 | 1.03 | 0.00 |
| 37.50 | 1.25 | 1.03 | 0.00 |
| 39.00 | 1.25 | 1.03 | 0.00 |
| 40.50 | 1.25 | 1.03 | 0.00 |
| 42.00 | 1.25 | 1.03 | 0.00 |
| 43.50 | 1.25 | 1.03 | 0.00 |
| 45.00 | 1.25 | 1.03 | 0.00 |
| 46.50 | 1.25 | 1.03 | 0.00 |
| 48.00 | 1.25 | 1.03 | 0.00 |
| 49.50 | 1.25 | 1.03 | 0.00 |
| 51.00 | 1.25 | 1.03 | 0.00 |
| 52.50 | 1.25 | 1.03 | 0.00 |
| 54.00 | 1.25 | 1.03 | 0.00 |
| 55.50 | 1.25 | 1.03 | 0.00 |
| 57.00 | 1.25 | 1.03 | 0.00 |
| 58.50 | 1.25 | 1.03 | 0.00 |
| 60.00 | 1.25 | 1.03 | 0.00 |
| 61.50 | 1.25 | 1.03 | 0.00 |
| 63.00 | 1.25 | 1.03 | 0.00 |
| 64.50 | 1.25 | 1.03 | 0.00 |
| 66.00 | 1.25 | 1.03 | 0.00 |
| 67.50 | 1.25 | 1.03 | 0.00 |
| 69.00 | 1.25 | 1.03 | 0.00 |
| 70.50 | 1.25 | 1.03 | 0.00 |
| 72.00 | 1.25 | 1.03 | 0.00 |
| 73.50 | 1.25 | 1.03 | 0.00 |
| 75.00 | 1.25 | 1.03 | 0.00 |
| 76.50 | 1.25 | 1.03 | 0.00 |
| 78.00 | 1.25 | 1.03 | 0.00 |
| 79.50 | 1.25 | 1.03 | 0.00 |
| 81.00 | 1.25 | 1.03 | 0.00 |
| 82.50 | 1.25 | 1.03 | 0.00 |
| 84.00 | 1.25 | 1.03 | 0.00 |
| 85.50 | 1.25 | 1.03 | 0.00 |
| 87.00 | 1.25 | 1.03 | 0.00 |
| 88.50 | 1.25 | 1.03 | 0.00 |
| 90.00 | 1.25 | 1.03 | 0.00 |
| 91.50 | 1.25 | 1.03 | 0.00 |
| 93.00 | 1.25 | 1.03 | 0.00 |
| 94.50 | 1.25 | 1.03 | 0.00 |
| 96.00 | 1.25 | 1.03 | 0.00 |
| 97.50 | 1.25 | 1.03 | 0.00 |
| 99.00 | 1.25 | 1.03 | 0.00 |
| 100.50 | 1.25 | 1.03 | 0.00 |
| 102.00 | 1.25 | 1.03 | 0.00 |
| 103.50 | 1.25 | 1.03 | 0.00 |
| 105.00 | 1.25 | 1.03 | 0.00 |
| 106.50 | 1.25 | 1.03 | 0.00 |
| 108.00 | 1.25 | 1.03 | 0.00 |
| 109.50 | 1.25 | 1.03 | 0.00 |
| 111.00 | 1.25 | 1.03 | 0.00 |
| 112.50 | 1.25 | 1.03 | 0.00 |
| 114.00 | 1.25 | 1.03 | 0.00 |
| 115.50 | 1.25 | 1.03 | 0.00 |
| 117.00 | 1.25 | 1.03 | 0.00 |
| 118.50 | 1.25 | 1.03 | 0.00 |
| 120.00 | 1.25 | 1.03 | 0.00 |

## Summary for Pond 13P: Proposed Wet Basin

Inflow Area = 3.580 ac,100.00% Impervious, Inflow Depth = 1.03" for wq event
Inflow = 10.47 cfs @ 1.10 hrs, Volume= 0.309 af
Outflow = 0.46 cfs @ 1.89 hrs, Volume= 0.308 af, Atten= 96%, Lag= 47.4 min
Primary = 0.46 cfs @ 1.89 hrs, Volume= 0.308 af

Routing by Stor-Ind method, Time Span= 0.00-120.00 hrs, dt= 0.03 hrs
Peak Elev= 96.78' @ 1.89 hrs Surf.Area= 43,360 sf Storage= 12,006 cf

Plug-Flow detention time= 662.2 min calculated for 0.308 af (100% of inflow)
Center-of-Mass det. time= 663.7 min ( 734.0 - 70.3 )

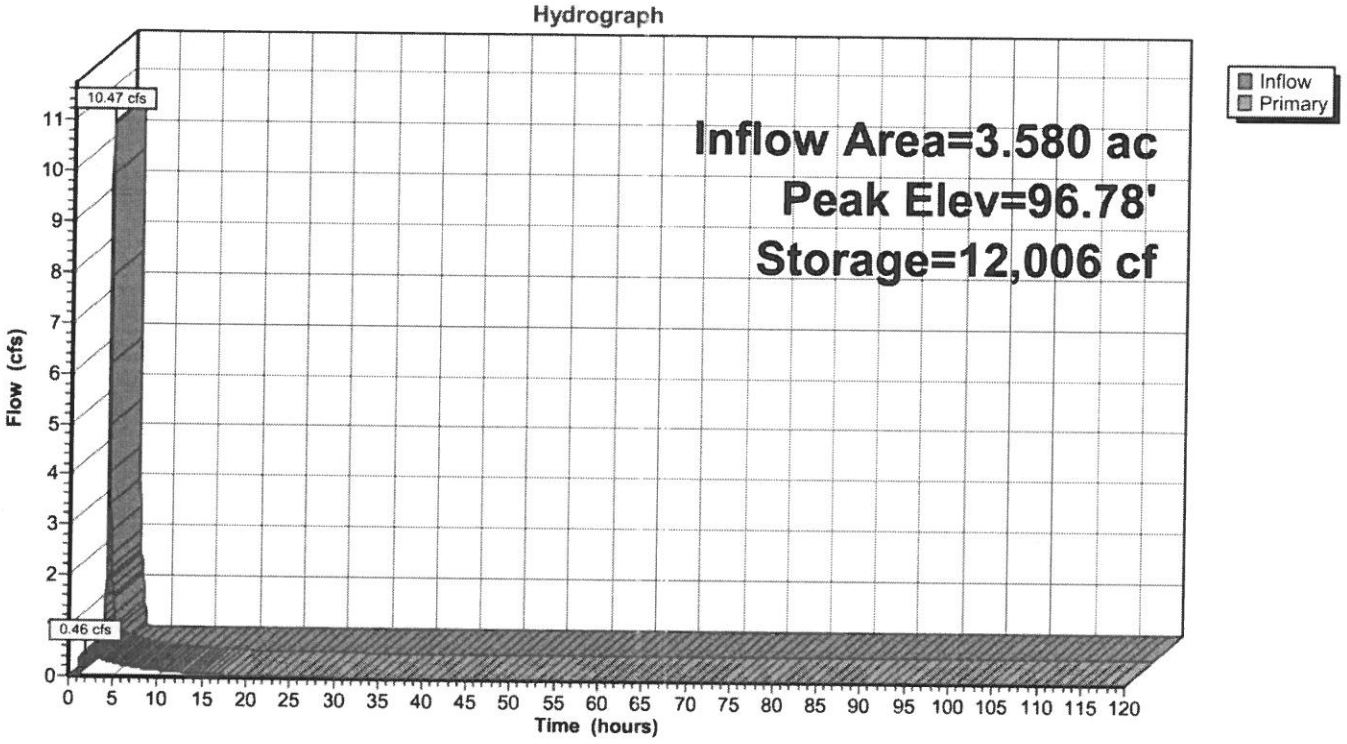
| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 96.50' | 139,722 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 96.50 | 42,130 | 0 | 0 |
| 97.00 | 44,320 | 21,613 | 21,613 |
| 97.25 | 54,100 | 12,303 | 33,915 |
| 98.00 | 58,070 | 42,064 | 75,979 |
| 98.10 | 61,680 | 5,987 | 81,966 |
| 98.25 | 62,500 | 9,314 | 91,280 |
| 99.00 | 66,680 | 48,443 | 139,722 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 96.50' | **1.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) |
| #2 | Primary | 97.50' | **2.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) |

**Primary OutFlow** Max=0.46 cfs @ 1.89 hrs HW=96.78' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.46 cfs @ 1.73 fps)
└—**2=Sharp-Crested Rectangular Weir** ( Controls 0.00 cfs)

## Pond 13P: Proposed Wet Basin



## Stage-Discharge for Pond 13P: Proposed Wet Basin

| Elevation (feet) | Primary (cfs) | Elevation (feet) | Primary (cfs) | Elevation (feet) | Primary (cfs) |
|---|---|---|---|---|---|
| 96.50 | 0.00 | 97.58 | 3.02 | 98.66 | 13.12 |
| 96.52 | 0.01 | 97.60 | 3.15 | 98.68 | 13.33 |
| 96.54 | 0.03 | 97.62 | 3.28 | 98.70 | 13.54 |
| 96.56 | 0.05 | 97.64 | 3.41 | 98.72 | 13.75 |
| 96.58 | 0.07 | 97.66 | 3.55 | 98.74 | 13.96 |
| 96.60 | 0.10 | 97.68 | 3.69 | 98.76 | 14.17 |
| 96.62 | 0.13 | 97.70 | 3.84 | 98.78 | 14.38 |
| 96.64 | 0.17 | 97.72 | 3.99 | 98.80 | 14.59 |
| 96.66 | 0.20 | 97.74 | 4.15 | 98.82 | 14.80 |
| 96.68 | 0.24 | 97.76 | 4.30 | 98.84 | 15.01 |
| 96.70 | 0.28 | 97.78 | 4.47 | 98.86 | 15.22 |
| 96.72 | 0.32 | 97.80 | 4.63 | 98.88 | 15.43 |
| 96.74 | 0.37 | 97.82 | 4.80 | 98.90 | 15.64 |
| 96.76 | 0.41 | 97.84 | 4.97 | 98.92 | 15.85 |
| 96.78 | 0.46 | 97.86 | 5.14 | 98.94 | 16.05 |
| 96.80 | 0.51 | 97.88 | 5.31 | 98.96 | 16.26 |
| 96.82 | 0.55 | 97.90 | 5.49 | 98.98 | 16.47 |
| 96.84 | 0.60 | 97.92 | 5.67 | 99.00 | **16.68** |
| 96.86 | 0.66 | 97.94 | 5.85 | | |
| 96.88 | 0.71 | 97.96 | 6.03 | | |
| 96.90 | 0.76 | 97.98 | 6.22 | | |
| 96.92 | 0.82 | 98.00 | 6.40 | | |
| 96.94 | 0.87 | 98.02 | 6.59 | | |
| 96.96 | 0.93 | 98.04 | 6.78 | | |
| 96.98 | 0.98 | 98.06 | 6.97 | | |
| 97.00 | 1.04 | 98.08 | 7.16 | | |
| 97.02 | 1.10 | 98.10 | 7.36 | | |
| 97.04 | 1.16 | 98.12 | 7.55 | | |
| 97.06 | 1.22 | 98.14 | 7.75 | | |
| 97.08 | 1.28 | 98.16 | 7.95 | | |
| 97.10 | 1.34 | 98.18 | 8.15 | | |
| 97.12 | 1.40 | 98.20 | 8.35 | | |
| 97.14 | 1.46 | 98.22 | 8.55 | | |
| 97.16 | 1.52 | 98.24 | 8.75 | | |
| 97.18 | 1.58 | 98.26 | 8.95 | | |
| 97.20 | 1.65 | 98.28 | 9.15 | | |
| 97.22 | 1.71 | 98.30 | 9.36 | | |
| 97.24 | 1.77 | 98.32 | 9.56 | | |
| 97.26 | 1.84 | 98.34 | 9.77 | | |
| 97.28 | 1.90 | 98.36 | 9.98 | | |
| 97.30 | 1.97 | 98.38 | 10.18 | | |
| 97.32 | 2.03 | 98.40 | 10.39 | | |
| 97.34 | 2.09 | 98.42 | 10.60 | | |
| 97.36 | 2.16 | 98.44 | 10.81 | | |
| 97.38 | 2.22 | 98.46 | 11.02 | | |
| 97.40 | 2.29 | 98.48 | 11.23 | | |
| 97.42 | 2.35 | 98.50 | 11.44 | | |
| 97.44 | 2.42 | 98.52 | 11.65 | | |
| 97.46 | 2.49 | 98.54 | 11.86 | | |
| 97.48 | 2.55 | 98.56 | 12.07 | | |
| 97.50 | 2.62 | 98.58 | 12.28 | | |
| 97.52 | 2.70 | 98.60 | 12.49 | | |
| 97.54 | 2.80 | 98.62 | 12.70 | | |
| 97.56 | 2.91 | 98.64 | 12.91 | | |

## Stage-Area-Storage for Pond 13P: Proposed Wet Basin

| Elevation (feet) | Surface (sq-ft) | Storage (cubic-feet) |
|---|---|---|
| 96.50 | 42,130 | 0 |
| 96.55 | 42,349 | 2,112 |
| 96.60 | 42,568 | 4,235 |
| 96.65 | 42,787 | 6,369 |
| 96.70 | 43,006 | 8,514 |
| 96.75 | 43,225 | 10,669 |
| 96.80 | 43,444 | 12,836 |
| 96.85 | 43,663 | 15,014 |
| 96.90 | 43,882 | 17,202 |
| 96.95 | 44,101 | 19,402 |
| 97.00 | 44,320 | 21,613 |
| 97.05 | 46,276 | 23,877 |
| 97.10 | 48,232 | 26,240 |
| 97.15 | 50,188 | 28,701 |
| 97.20 | 52,144 | 31,259 |
| 97.25 | 54,100 | 33,915 |
| 97.30 | 54,365 | 36,627 |
| 97.35 | 54,629 | 39,351 |
| 97.40 | 54,894 | 42,090 |
| 97.45 | 55,159 | 44,841 |
| 97.50 | 55,423 | 47,605 |
| 97.55 | 55,688 | 50,383 |
| 97.60 | 55,953 | 53,174 |
| 97.65 | 56,217 | 55,978 |
| 97.70 | 56,482 | 58,796 |
| 97.75 | 56,747 | 61,627 |
| 97.80 | 57,011 | 64,471 |
| 97.85 | 57,276 | 67,328 |
| 97.90 | 57,541 | 70,198 |
| 97.95 | 57,805 | 73,082 |
| 98.00 | 58,070 | 75,979 |
| 98.05 | 59,875 | 78,927 |
| 98.10 | 61,680 | 81,966 |
| 98.15 | 61,953 | 85,057 |
| 98.20 | 62,227 | 88,162 |
| 98.25 | 62,500 | 91,280 |
| 98.30 | 62,779 | 94,412 |
| 98.35 | 63,057 | 97,558 |
| 98.40 | 63,336 | 100,717 |
| 98.45 | 63,615 | 103,891 |
| 98.50 | 63,893 | 107,079 |
| 98.55 | 64,172 | 110,281 |
| 98.60 | 64,451 | 113,496 |
| 98.65 | 64,729 | 116,726 |
| 98.70 | 65,008 | 119,969 |
| 98.75 | 65,287 | 123,226 |
| 98.80 | 65,565 | 126,498 |
| 98.85 | 65,844 | 129,783 |
| 98.90 | 66,123 | 133,082 |
| 98.95 | 66,401 | 136,395 |
| 99.00 | **66,680** | **139,722** |

## Hydrograph for Pond 13P: Proposed Wet Basin

| Time (hours) | Inflow (cfs) | Storage (cubic-feet) | Elevation (feet) | Primary (cfs) |
|---|---|---|---|---|
| 0.00 | 0.00 | 0 | 96.50 | 0.00 |
| 0.30 | 0.00 | 0 | 96.50 | 0.00 |
| 0.60 | 0.55 | 203 | 96.50 | 0.00 |
| 0.90 | **2.24** | 1,323 | 96.53 | 0.02 |
| 1.20 | **5.69** | 8,891 | 96.71 | 0.30 |
| 1.50 | 1.40 | 11,161 | 96.76 | 0.41 |
| 1.80 | 0.96 | **11,938** | **96.78** | **0.46** |
| 2.10 | 0.13 | **11,912** | **96.78** | **0.45** |
| 2.40 | 0.00 | 11,453 | 96.77 | 0.43 |
| 2.70 | 0.00 | 11,002 | 96.76 | 0.41 |
| 3.00 | 0.00 | 10,576 | 96.75 | 0.38 |
| 3.30 | 0.00 | 10,173 | 96.74 | 0.36 |
| 3.60 | 0.00 | 9,792 | 96.73 | 0.34 |
| 3.90 | 0.00 | 9,430 | 96.72 | 0.33 |
| 4.20 | 0.00 | 9,088 | 96.71 | 0.31 |
| 4.50 | 0.00 | 8,763 | 96.71 | 0.29 |
| 4.80 | 0.00 | 8,455 | 96.70 | 0.28 |
| 5.10 | 0.00 | 8,162 | 96.69 | 0.26 |
| 5.40 | 0.00 | 7,883 | 96.69 | 0.25 |
| 5.70 | 0.00 | 7,618 | 96.68 | 0.24 |
| 6.00 | 0.00 | 7,366 | 96.67 | 0.23 |
| 6.30 | 0.00 | 7,126 | 96.67 | 0.22 |
| 6.60 | 0.00 | 6,897 | 96.66 | 0.21 |
| 6.90 | 0.00 | 6,678 | 96.66 | 0.20 |
| 7.20 | 0.00 | 6,469 | 96.65 | 0.19 |
| 7.50 | 0.00 | 6,270 | 96.65 | 0.18 |
| 7.80 | 0.00 | 6,080 | 96.64 | 0.17 |
| 8.10 | 0.00 | 5,897 | 96.64 | 0.17 |
| 8.40 | 0.00 | 5,723 | 96.63 | 0.16 |
| 8.70 | 0.00 | 5,556 | 96.63 | 0.15 |
| 9.00 | 0.00 | 5,396 | 96.63 | 0.14 |
| 9.30 | 0.00 | 5,243 | 96.62 | 0.14 |
| 9.60 | 0.00 | 5,096 | 96.62 | 0.13 |
| 9.90 | 0.00 | 4,955 | 96.62 | 0.13 |
| 10.20 | 0.00 | 4,819 | 96.61 | 0.12 |
| 10.50 | 0.00 | 4,689 | 96.61 | 0.12 |
| 10.80 | 0.00 | 4,564 | 96.61 | 0.11 |
| 11.10 | 0.00 | 4,444 | 96.60 | 0.11 |
| 11.40 | 0.00 | 4,328 | 96.60 | 0.10 |
| 11.70 | 0.00 | 4,217 | 96.60 | 0.10 |
| 12.00 | 0.00 | 4,110 | 96.60 | 0.10 |
| 12.30 | 0.00 | 4,007 | 96.59 | 0.09 |
| 12.60 | 0.00 | 3,908 | 96.59 | 0.09 |
| 12.90 | 0.00 | 3,812 | 96.59 | 0.09 |
| 13.20 | 0.00 | 3,719 | 96.59 | 0.08 |
| 13.50 | 0.00 | 3,630 | 96.59 | 0.08 |
| 13.80 | 0.00 | 3,543 | 96.58 | 0.08 |
| 14.10 | 0.00 | 3,460 | 96.58 | 0.08 |
| 14.40 | 0.00 | 3,380 | 96.58 | 0.07 |
| 14.70 | 0.00 | 3,302 | 96.58 | 0.07 |
| 15.00 | 0.00 | 3,228 | 96.58 | 0.07 |
| 15.30 | 0.00 | 3,156 | 96.57 | 0.07 |
| 15.60 | 0.00 | 3,086 | 96.57 | 0.06 |
| 15.90 | 0.00 | 3,018 | 96.57 | 0.06 |

1.80 → 12002 → 11,938 96.78 0.46 — 0.46 Peak storage & time

## Hydrograph for Pond 13P: Proposed Wet Basin (continued)

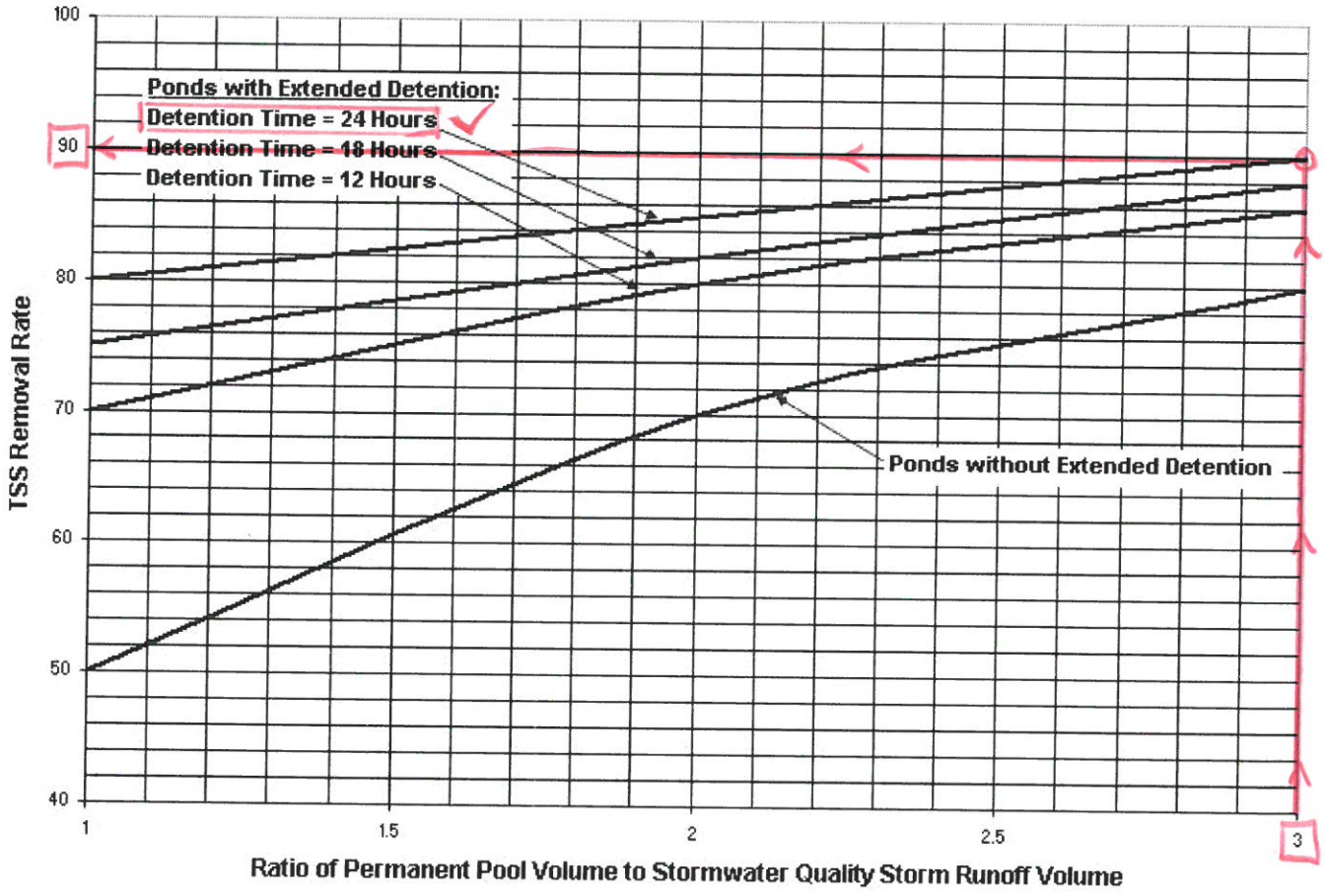
| Time (hours) | Inflow (cfs) | Storage (cubic-feet) | Elevation (feet) | Primary (cfs) |
|---|---|---|---|---|
| 16.20 | 0.00 | 2,952 | 96.57 | 0.06 |
| 16.50 | 0.00 | 2,888 | 96.57 | 0.06 |
| 16.80 | 0.00 | 2,827 | 96.57 | 0.06 |
| 17.10 | 0.00 | 2,767 | 96.57 | 0.05 |
| 17.40 | 0.00 | 2,708 | 96.56 | 0.05 |
| 17.70 | 0.00 | 2,652 | 96.56 | 0.05 |
| 18.00 | 0.00 | 2,597 | 96.56 | 0.05 |
| 18.30 | 0.00 | 2,544 | 96.56 | 0.05 |
| 18.60 | 0.00 | 2,493 | 96.56 | 0.05 |
| 18.90 | 0.00 | 2,443 | 96.56 | 0.05 |
| 19.20 | 0.00 | 2,394 | 96.56 | 0.04 |
| 19.50 | 0.00 | 2,347 | 96.56 | 0.04 |
| 19.80 | 0.00 | 2,302 | 96.55 | 0.04 |
| 20.10 | 0.00 | 2,258 | 96.55 | 0.04 |
| 20.40 | 0.00 | 2,215 | 96.55 | 0.04 |
| 20.70 | 0.00 | 2,173 | 96.55 | 0.04 |
| 21.00 | 0.00 | 2,133 | 96.55 | 0.04 |
| 21.30 | 0.00 | 2,094 | 96.55 | 0.04 |
| 21.60 | 0.00 | 2,055 | 96.55 | 0.03 |
| 21.90 | 0.00 | 2,018 | 96.55 | 0.03 |
| 22.20 | 0.00 | 1,982 | 96.55 | 0.03 |
| 22.50 | 0.00 | 1,946 | 96.55 | 0.03 |
| 22.80 | 0.00 | 1,911 | 96.55 | 0.03 |
| 23.10 | 0.00 | 1,877 | 96.54 | 0.03 |
| 23.40 | 0.00 | 1,844 | 96.54 | 0.03 |
| 23.70 | 0.00 | 1,812 | 96.54 | 0.03 |
| 24.00 | 0.00 | 1,780 | 96.54 | 0.03 |
| 24.30 | 0.00 | 1,750 | 96.54 | 0.03 |
| 24.60 | 0.00 | 1,720 | 96.54 | 0.03 |
| 24.90 | 0.00 | 1,690 | 96.54 | 0.03 |
| 25.20 | 0.00 | 1,661 | 96.54 | 0.03 |
| 25.50 | 0.00 | 1,633 | 96.54 | 0.03 |
| 25.80 | 0.00 | 1,606 | 96.54 | 0.03 |
| 26.10 | 0.00 | 1,579 | 96.54 | 0.02 |
| 26.40 | 0.00 | 1,553 | 96.54 | 0.02 |
| 26.70 | 0.00 | 1,528 | 96.54 | 0.02 |
| 27.00 | 0.00 | 1,503 | 96.54 | 0.02 |
| 27.30 | 0.00 | 1,479 | 96.54 | 0.02 |
| 27.60 | 0.00 | 1,455 | 96.53 | 0.02 |
| 27.90 | 0.00 | 1,432 | 96.53 | 0.02 |
| 28.20 | 0.00 | 1,409 | 96.53 | 0.02 |
| 28.50 | 0.00 | 1,387 | 96.53 | 0.02 |
| 28.80 | 0.00 | 1,366 | 96.53 | 0.02 |
| 29.10 | 0.00 | 1,345 | 96.53 | 0.02 |
| 29.40 | 0.00 | 1,324 | 96.53 | 0.02 |
| 29.70 | 0.00 | 1,304 | 96.53 | 0.02 |
| 30.00 | 0.00 | 1,284 | 96.53 | 0.02 |
| 30.30 | 0.00 | 1,265 | 96.53 | 0.02 |
| 30.60 | 0.00 | 1,246 | 96.53 | 0.02 |
| 30.90 | 0.00 | 1,228 | 96.53 | 0.02 |
| → 31.20 | 0.00 | 1,210 | 96.53 | 0.02 |
| 31.50 | 0.00 | 1,193 | 96.53 | 0.02 |
| 31.80 | 0.00 | 1,176 | 96.53 | 0.02 |
| 32.10 | 0.00 | 1,159 | 96.53 | 0.02 |

10A.10

10% Retained Volume @ 31.20 hrs

∴ 90% det. time = 31.20 − 1.90
= 29.3 hrs > 24 hrs

# FIGURE 9.11-2: TSS REMOVAL RATES FOR WET PONDS




Permanent Pool Volume of Wet Basin provided = 198,573 cf

Stormwater Quality Storm Runoff Volume from proposed imperv. area = 0.309 acft =13,460 cf

Ratio of Permanent Pool Volume to Stormwater Quality Storm Runoff Volume Provided

$$= \frac{198{,}573 \text{ cf}}{13{,}460 \text{ cf}} = 14.75 > 3.0$$

Enter Ratio of 3 along X-axis and draw vertical line in above figure and intersecting line of detention time = 24 hrs then moving horizontally to read TSS Removal Rate along Y axis =90%

Therefore, TSS removal rate provided is 90% > 80% minimum required. Therefore, Water Quality requirements are met.

Q:\5501-6000\5817\Stormwater\FIGURE 9.11-2.TSSRemoval-wetpond.doc

## WATER QUALITY CALCULATIONS

The current stormwater management standards adopted under NJAC 7:8 require that the stormwater runoff quality standards shall meet the requirements specified under NJAC 7:8-5.5. Stormwater management measures shall be designed for all major developments to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff generated from the water quality design storm by 80 percent of the anticipated load from the developed site, expressed as an annual average.

The water quality design storm is 1.25 inches of rainfall in two hours. Water quality calculations shall take into account the distribution of rain from the water quality design storm, as reflected in Table 1 below. The calculation of the volume of runoff may take into account the implementation of non-structural and structural stormwater management measures.

| Time (Minutes) | Cumulative Rainfall (Inches) | Time (Minutes) | Cumulative Rainfall (Inches) |
|---|---|---|---|
| 0 | 0.0000 | 65 | 0.8917 |
| 5 | 0.0083 | 70 | 0.9917 |
| 10 | 0.0166 | 75 | 1.0500 |
| 15 | 0.0250 | 80 | 1.0840 |
| 20 | 0.0500 | 85 | 1.1170 |
| 25 | 0.0750 | 90 | 1.1500 |
| 30 | 0.1000 | 95 | 1.1750 |
| 35 | 0.1330 | 100 | 1.2000 |
| 40 | 0.1660 | 105 | 1.2250 |
| 45 | 0.2000 | 110 | 1.2334 |
| 50 | 0.2583 | 115 | 1.2417 |
| 55 | 0.3583 | 120 | 1.2500 |
| 60 | 0.6250 | | |

For purposes of TSS reduction calculations, Table 2 below presents the removal rates for each BMPs designed in accordance with the New Jersey Stormwater Best Management Practices Manual. TSS reduction shall be calculated based on the removal rates for the BMPs in Table 2 below.

**Table 2: TSS Removal Rates for BMPs**

| Best Management Practice | TSS Percent Removal Rate |
|---|---|
| Bioretention Systems | 90 |
| Constructed Stormwater Wetland | 90 |
| Extended Detention Basin | 40-60 |
| Infiltration Structure | 80 |
| Manufactured Treatment Device | See N.J.A.C. 7:8-5.7(d) |
| Sand Filter | 80 |
| Vegetative Filter Strip | 60-80 |
| **Wet Pond** | **50-90 < -------- USED** |

For the proposed site improvements, the following WQ BMPs are provided to meet the TSS removal requirements for site @ minimum 80%

Fot the proposed building roof areas (0.66 ac)-no water quality measurements are required.

For the other impervious areas to wet pond

| Best Management Practice | Provided TSS Percent Removal Rate |
|---|---|
| Wet Pond | 90 |

WET POND - WATER QUALITY

Using the previously described rainfall intensity distribution for the water quality storm (i.e. 1-1/4" rainfall in 2 hrs.), the runoffs have been generated utilizing TR-20 methodology and HydroCad software for the impervious areas to wet basin. Subsequently, the hydrograph with impervious areas requiring water quality was routed through the wet basin basin. Since the permanent pool area into wetbasin has been designed such that the permanent pool volume and water quality runoff volume's 90% volume detention time will provide 90% TSS removal ratein wet basin.

## Summary for Pond 1P: Permanent Pool Volume -Wet Basin

[43] Hint: Has no inflow (Outflow=Zero)

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 90.00' | 198,573 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 90.00 | 20,827 | 0 | 0 |
| 91.00 | 23,245 | 22,036 | 22,036 |
| 92.00 | 25,791 | 24,518 | 46,554 |
| 93.00 | 28,470 | 27,131 | 73,685 |
| 94.00 | 31,293 | 29,882 | 103,566 |
| 94.10 | 34,229 | 3,276 | 106,842 |
| 95.00 | 37,295 | 32,186 | 139,028 |
| 96.00 | 40,485 | 38,890 | 177,918 |
| 96.50 | 42,136 | 20,655 | 198,573 |

# 11. WATER BUDGET CALCULATIONS

## WATER BUDGET CALCULATIONS - WET BASIN (SAI DATTA MANDIR INC.)

### USING SHORT CUT METHOD

Water Budget provides a simple method for calculating whether a stormwater pond has an appropriate water balance to maintain a wet pool over a 30-day period without rainfall.

When conducting this analysis, the following should be considered:

1. Calculate maximum drawdown during periods of high evaporation and during an extended period of no appreciable rainfall.
2. The change in storage within a pond ($\Delta V$) = Inflows - Outflows
3. Potential inflows: runoff, baseflow and rainfall
4. Potential outflows: infiltration, surface overflow and evaporation (and evapotranspiration)
5. Assume no inflow from baseflow, no losses for infiltration and because only the permanent pool volume is being evaluated, no losses for surface overflows.
6. Therefore, $\Delta V$ = runoff - evaporation

**Table 1: Site Data for Water Balance Analysis**

| | |
|---|---|
| Drainage Area | 10.21 Ac. |
| Post Developed CN | 82 |
| 2 yr Design Rainfall Event | 3.34 inches |
| 2 yr Design Storm Runoff | 1.8 inches |
| Surface area of wet pond | 42,130 sf =0.97 ac |

**Table 2 Evaporation Rates New Brunswick Station (Pan Evaporation Data-for weather station near Franklin Township, Somerset Co., NJ)**

| | April | May | June | **July** | Aug | Sept |
|---|---|---|---|---|---|---|
| Precipitation (ft) * | 0.333 | 0.358 | 0.441 | **0.392** | 0.383 | 0.342 |
| Evaporation (ft) ** | 0.165 | 0.147 | 0.208 | **0.227** | 0.186 | 0.158 |

* Average of yr 2000 to yr 2019 precipitation data for New Brunswick weather station

** Average of yr 2012 to yr 2019 (except 2018 data not available) evaporation data for New Brunswick weather station

**Calculate maximum drawdown during periods of high evaporation:**

• Period of greatest evaporation occurs during the month of July (see Table 2)

• Runoff Volume = P x E

where

P = Precipitation =0.392 ft for July

E = Runoff Efficiency (ratio of NRCS 2 year storm runoff to rainfall depths)

• For CN = 82, Volume of Runoff (2 year storm) = 1.83"

• For Somerset County, 2 year storm rainfall = 3..34"

• E = 1.83"/3.34" = 0.55

• Inflow = P × E

= .392 ft ×.55= 0.216 ft

over entire site area: (0.216 ft) (10.21 acres) = 2.205 ac-ft

• Outflow = wet pond surface area × evaporation losses

= 0.97 ac × 0.221 ft (see Table 2)

= 0.22 ac-ft

• Inflow (2.205 ac-ft) is greater than Outflow (0.22 ac-ft) therefore, drainage area is adequate to support wet pond during normal conditions.

**Check for drawdown over an extended period without rainfall:**

- Use a 45 day interval using worst case conditions
- Highest evaporation occurs during July – 0.227 ft per month (see Table 2)
- Calculate average evaporation per day = 0.227ft / 31 days = 0.0073 ft/day
- Over 45 day interval, evaporation loss = 45 × .0073 ft/day = 0.33 ft
- Assume surface of the permanent pool may drop up to 0.33 ft (4") over this interval.

The total permanent pool elevation will recede from El. 96.5 to El.96.2

The bottom of permanent pond is El. 90.0 Therefore, there will still be more than 6 ft of water depth available in permanent pond which meets the suggested mean depth of 3 to 6 ft to maintain a healthy environment within permanent pool.

**New Brunswick rainfall Data: Yr 2000 to Yr 2019**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | Avg 20 yrs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Jan | 3.28 | 3.65 | 2.37 | 3.28 | 2.26 | 4.5 | 5.07 | 3.23 | 2.31 | 2.98 | 2.37 | 3.72 | 3.56 | 3.08 | 2.86 | 5.02 | 4.92 | 4.6 | 2.16 | 5.1 | 3.5 |
| Feb | 1.97 | 3.09 | 0.64 | 5.02 | 2.62 | 2.33 | 2.5 | 1.28 | 4.79 | 0.69 | 5.37 | 2.98 | 0.82 | 2.75 | 5.19 | 2.57 | 4.32 | 1.51 | 6.67 | 3.46 | 3.0 |
| Mar | 4.12 | 6.86 | 4.35 | 4.6 | 3.42 | 5 | 0.91 | 4.59 | 3.43 | 1.99 | 11.13 | 5.68 | 2.02 | 2.72 | 4.51 | 4.65 | 1.6 | 3.53 | 5.53 | 4.38 | 4.3 |
| Apr | 3.16 | 1.88 | 2.8 | 2.64 | 4.82 | 3.32 | 3.45 | 12.37 | 3.34 | 4.06 | 2.54 | 7.17 | 3.15 | 2.34 | 3.19 | 2.23 | 1.3 | 6.29 | 5.03 | 3.96 | 4.0 |
| May | 4.16 | 3.07 | 4.92 | 3.78 | 4.1 | 2.94 | 3.03 | 2.21 | 4.57 | 5.44 | 2.68 | 3.17 | 4.65 | 4.36 | 6.9 | 1.44 | 4.56 | 7.32 | 5.85 | 7.15 | 4.3 |
| Jun | 3.28 | 6.59 | 4.38 | 9.8 | 3.11 | 5.02 | 7.95 | 5.83 | 5.71 | 6.47 | 2.67 | 2.61 | 5.22 | 10.04 | 3.93 | 6.13 | 2.35 | 5.36 | 4.96 | 5.45 | 5.3 |
| Jul | 4.04 | 3.01 | 2.07 | 4.54 | 8.2 | 6.4 | 4.66 | 5.56 | 3.8 | 5.83 | 3.83 | 3.09 | 2.76 | 4.92 | 7.15 | 2.7 | 7.15 | 4.08 | 4.3 | 6.3 | 4.7 |
| Aug | 6.25 | 3.98 | 5.51 | 4.25 | 3.53 | 1.16 | 1.95 | 6.7 | 3.92 | 7.21 | 1.39 | 17.43 | 4.13 | 4.53 | 1.88 | 1.21 | 0.84 | 7.63 | 4.18 | 4.58 | 4.6 |
| Sep | 4.3 | 3.51 | 4.93 | 6.82 | 7.2 | 2.03 | 6.26 | 0.96 | 8.54 | 2.74 | 4.48 | 6.67 | 2.99 | 2.22 | 1.23 | 3 | 1.7 | 1.78 | 8.82 | 1.52 | 4.1 |
| Oct | 0.65 | 0.53 | 8.03 | 4.42 | 1.88 | 12.33 | 7.83 | 4.95 | 3.28 | 5.19 | 3.85 | 5.21 | 4.5 | 0.6 | 4.13 | 4.3 | 3.06 | 5.2 | 3.2 | 5.18 | 4.4 |
| Nov | 3.35 | 1.19 | 4.59 | 5.98 | 4.39 | 4.11 | 5.94 | 1.92 | 2.84 | 1.81 | 2.06 | 3.63 | 5.19 | 3.05 | 4.59 | 1.59 | 2.8 | 2.1 | 8.72 | 2.13 | 3.6 |
| Dec | 4.6 | 2.19 | 4.26 | 5.74 | 3.69 | 3.35 | 2.22 | 5.67 | 7.94 | 7.48 | 3.67 | 4.76 | 1.68 | 4.87 | 5.34 | 3.38 | 4.17 | 1.94 | 5.81 | 5.93 | 4.4 |
| | 43.16 | 39.55 | 48.85 | 60.87 | 49.22 | 52.49 | 51.77 | 55.27 | 54.47 | 51.89 | 46.04 | 66.12 | 40.67 | 45.48 | 50.9 | 38.22 | 38.77 | 51.34 | 65.23 | 55.14 | 50.3 |

**Reference: Rainfall Data taken from : NOAA Climate Data Center- Station: "New Brunswick 3 SE, NJ USC00286055**

avg evaporation of available New Brunswick, NJ data

| | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | avg |
|---|---|---|---|---|---|---|---|---|---|
| Jan | | | | | | | | | |
| Feb | | | | | | | | | |
| Mar | | | | | 0 | | | | |
| Apr | 0.15 | 0.158 | | 0.168 | 0.183 | 0 | | | 0.165 |
| May | 0.142 | 0.153 | 0.132 | 0.196 | 0.137 | 0.069 | | 0.2 | 0.147 |
| Jun | 0.202 | 0.198 | 0.216 | 0.181 | 0.197 | 0.265 | | 0.2 | 0.208 |
| Jul | 0.239 | 0.197 | 0.31 | 0.209 | 0.216 | 0.205 | | 0.212 | 0.227 |
| Aug | 0.195 | 0.152 | 0.158 | 0.23 | 0.161 | 0.184 | | 0.225 | 0.186 |
| Sep | 0.17 | 0.135 | 0.149 | 0.146 | 0.165 | 0.135 | | 0.207 | 0.158 |
| Oct | 0.082 | 0.077 | 0.082 | 0.1 | 0.152 | | | 0.124 | 0.088 |
| Nov | 0.058 | 0.053 | | 0.038 | 0.039 | | | | 0.047 |
| Dec | | | | | 0 | | | | |

Reference: Evaporation Data taken from : NOAA Climate Data Center- Station: "New Brunswick, NJ".

# 12. SEDIMENT BASIN SIZING CALCULATIONS

## SEDIMENT BASIN COMPUTATION: -FOR INFILTRATION BASIN (SAI DATTA MANDIR, FRANKLIN, NJ)

Determine minimum basin volume to meet the 70% trap efficiency requirement. Set trap efficiency at 75% to meet actual trap efficiency requirement of 70% for a dry sediment pool with coarse sediment, as required by the standard in the section on Trap Efficiency.

I. Enter Curve 24-1 with 75%. Find C/I = 0.042 using curve for median grained sediments. From Figure 24-1, average annual surface runoff for Franklin Township is 21.5 inches. Total disturbed area draining to proposed infiltration basin is 7.65 Ac.

I = (21.5 in) (1 ft/12 in) (7.65 ac)
I = 13.70 Ac ft
C = (13.7 ac. ft.) (0.042)
C = 0.58 ac. ft. = 25,060 cf minimum volume in the sediment basin below emergency spillway elevation to obtain 70% trap efficiency with a dry pool.

**II.** Determine minimum basin volume to meet the requirements for sediment storage and temporary floodwater storage.

1. Determine volume for sediment storage using Method 2 in the standard under Sediment Storage Capacity.

   a. Determine, DA and A, Drainage Area and Average Annual Erosion

   Total Drainage Area to Basin = 7.65 ac.-5.45 acre construction area, woods -1 ac, developed area= 1.2 ac.
   Estimated Construction Time = 1 yr.
   Average annual erosion for construction area is 50 ton/acre/yr, woods @ 2ton/ac/yr, developed area 1.0 t/ac/yr

   1st year

   Const area-(DA) (A) = 5.45ac x 50 tons = 272.5 tons/yr
   Woods = 1.0 x 0.2 = 0.2 tons/yr
   Developed area = 1.2 x 1.0=1.2 t/yr
   (DA) (A) = 275 tons for the life of the basin.

   b. Determine DR, delivery ratio
   7.65/640 = 0.012 sq mi from Curve 24-2 for a silty soil, DR = 82%

c. Determine, density of the sediment. From Table 24-1 the density of aerated clay/silt ( $\gamma s$ ) is 65-85 lbs/ cu ft., Use $\gamma s$ = 75 lbs/cu ft.

d. Determine minimum volume for sediment storage for the planned life of the structure.

V = (DA) (A) (DR) (TE) (1/ $\gamma s$) (2,000 lbs/ton) (1/43,560 sq. ft./ac.)
V = (275) (0.82) (0.70) (1/75) (2,000) (1/43,560)
V = 0.097 Ac. ft. (4,225 cf)

2. Determine minimum volume for temporary floodwater storage.

a. The standard requires that we have at least 1 foot between the crest of the principal spillway and the crest of the emergency spillway and that the runoff from the 2 year frequency 24 hour duration storm not cause flow in the emergency spillway. See the sections in the standard on Sediment Basin Volume and Principal Spillway.

b. The 2 year 24 hour rainfall is 3.29 inches and the hydrologic soil group for Penn/Royce Loam is C from reference #1.

c. From reference #9, Urban Hydrology for Small Watersheds, the runoff curve number is 83. The runoff is 1.54 watershed inches from a 2 yr 24 hr storm.

d. The size of principal spillway pipe selected will have an effect on the volume of temporary floodwater storage required. For this site we selected a 12" CMP riser with a 12" CMP outlet. From the site survey and the preliminary layout of the principal spillway we found that the capacity of the principal spillway is approximately 9.3 cfs. (weir flow with 1 ft of head)

e. Using the above principal spillway and the routing the minimum volume for temporary floodwater storage using the 12 inch CMP principal spillway is 0.48 ac.ft. (20,921 cf)

3. The minimum basin volume to meet the requirement for sediment storage capacity and temporary floodwater storage is 0.097 ac.ft + 0.48 ac.ft = 0.58 ac. ft. (25,146 cf)

III. The standard under Sediment Basin Volume requires that we provide volume for the larger of the two values calculated above under I and II.

The volume for 70% trap efficiency is 0.58ac. ft. The volume for sediment and temporary floodwater storage is also 0.58 ac. ft. Therefore, we must provide below the crest of the emergency spillway at least 0.58 ac. ft. of volume.

Therefore, the required storage volume below the crest of the emergency spillway is at least 0.58 ac.ft. (Total storage volume provided = 8986 cu.ft below el. 96.20+ 16,270 cu.ft. between el. 97.9-96.20 = 25,256 cu.ft = 0.58 ac.ft. = required minimum storage volume of 25,146 cf). Therefore, the emergency spillway elevation for the temporary sediment basin will be minimum elevation of 97.90.

**Calculations for invert elevation for the dewatering holes in the temporary riser @ 50% trap efficiency**

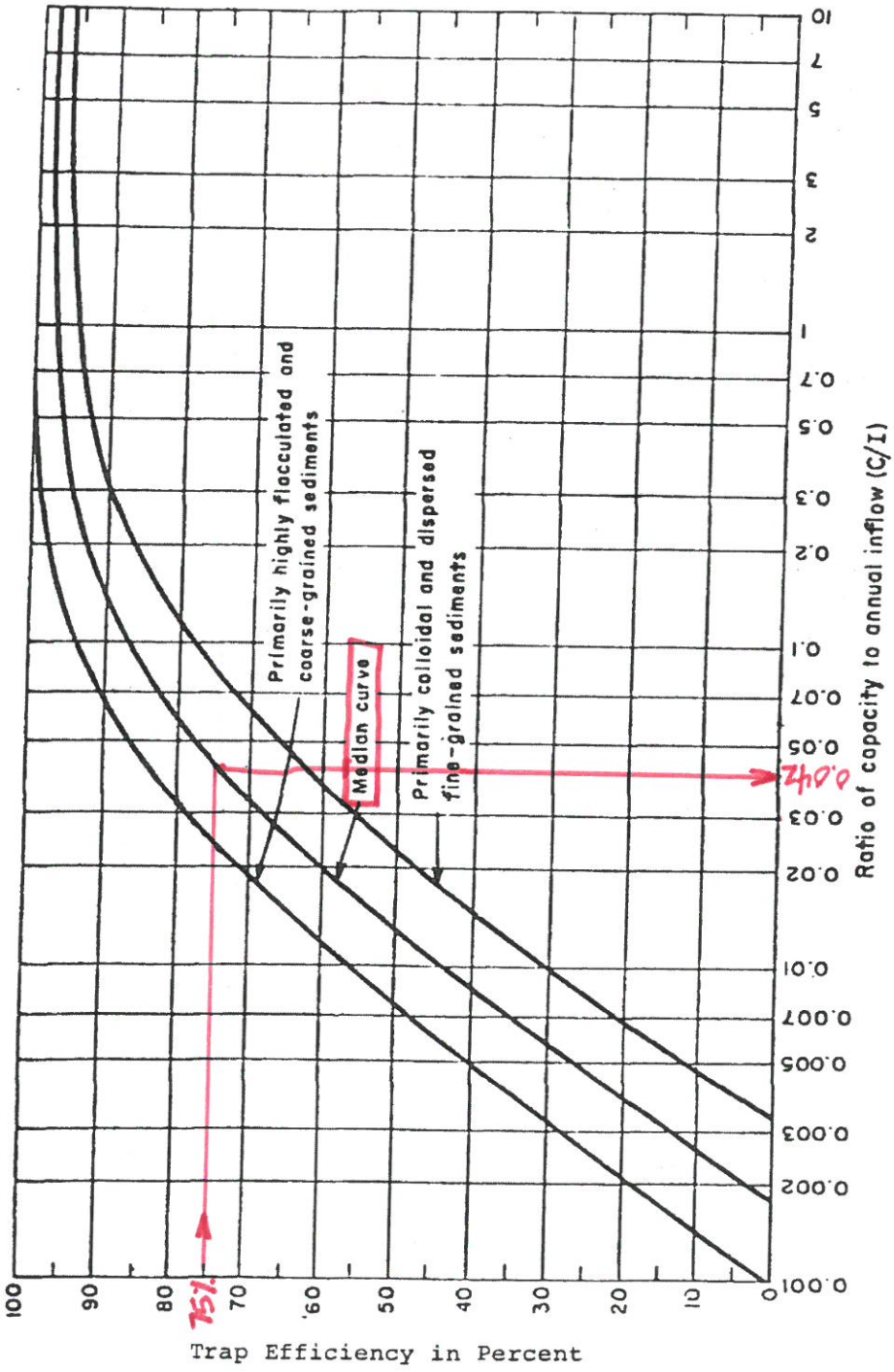
Determine minimum basin volume to meet the 50% trap efficiency requirement to set invert elevation for the dewatering holes.

Enter Curve 24-1 with 50%. Find C/I = 0.015 using curve for medium grained sediments. From Figure 24-1, average annual surface runoff for Franklin Twsp is 21.5 inches. Total disturbed area draining to proposed infiltration basin is 7.65 Ac.

I = (21.5 in) (1 ft/12 in) (7.65ac)
I = 13.7Ac ft
C = (13.7 ac. ft.) (0.015)
C = 0.206 ac. ft. = 8,973 cf minimum volume in the sediment basin below dewatering hole invert elevation to obtain 50% trap efficiency with a dry pool.

With pond routing data for infiltration basin, elevation 96.20 will provide 9000 cf of storage volume. Therefore, the dewatering holes invert elevation shall be 96.20.

CURVE 24-1




TRAP EFFICIENCY OF RESERVOIRS

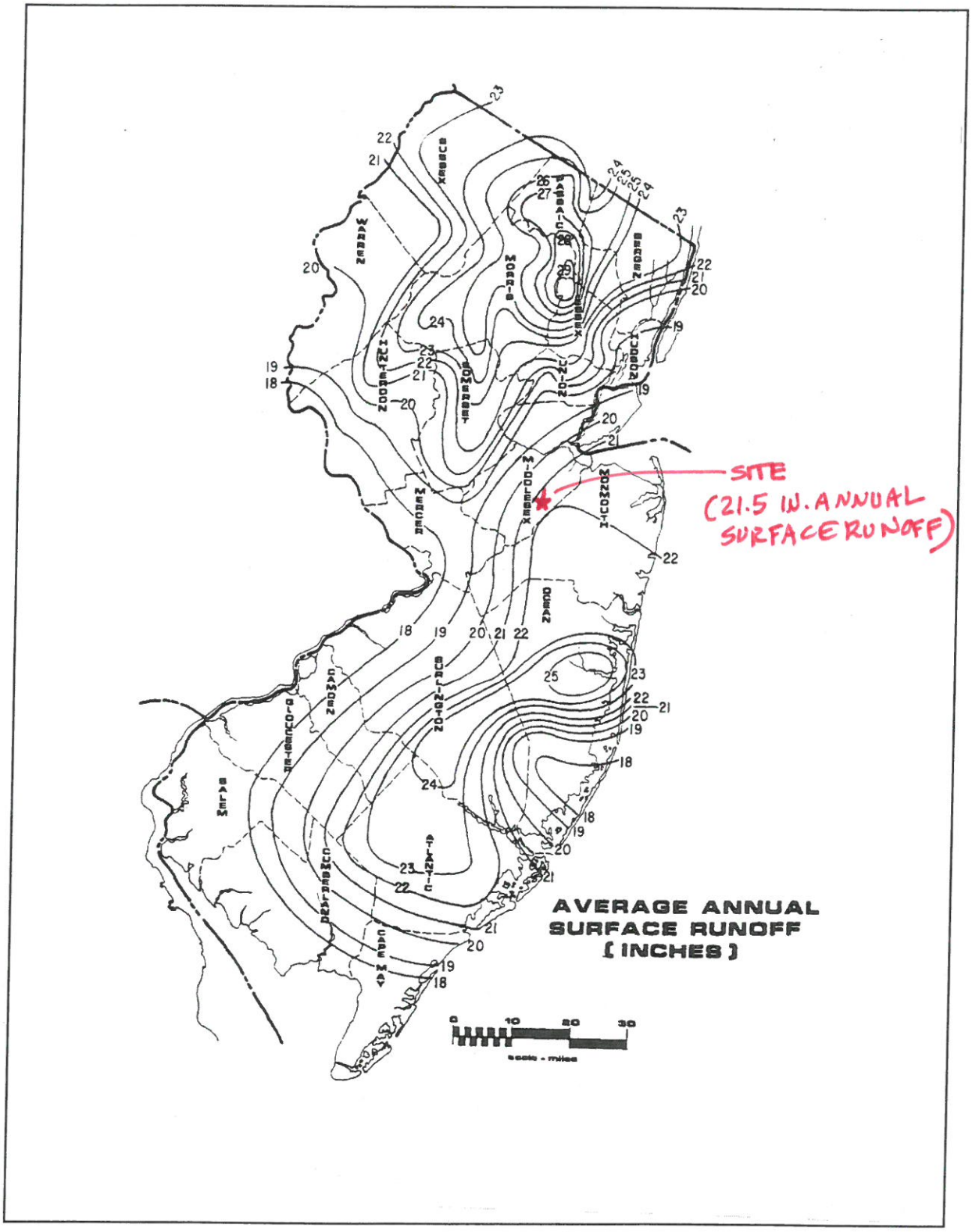
Reference: Brune, Gunnar M., "Trap Efficiency of Reservoirs", Trans. AGU, Vol. 34, No.3, pp 407-418, June 1953.



12.4

5817

FIGURE 24-1



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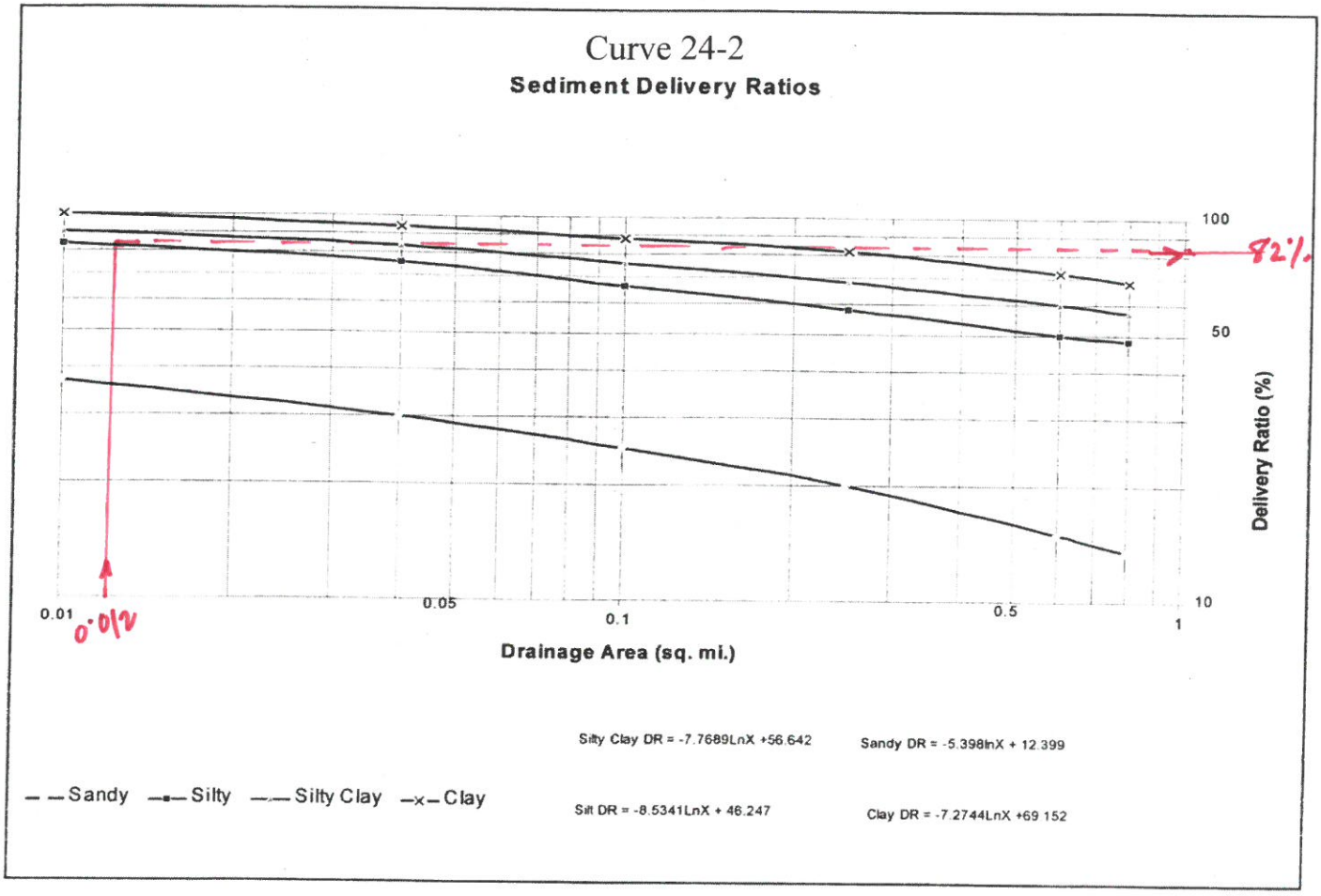
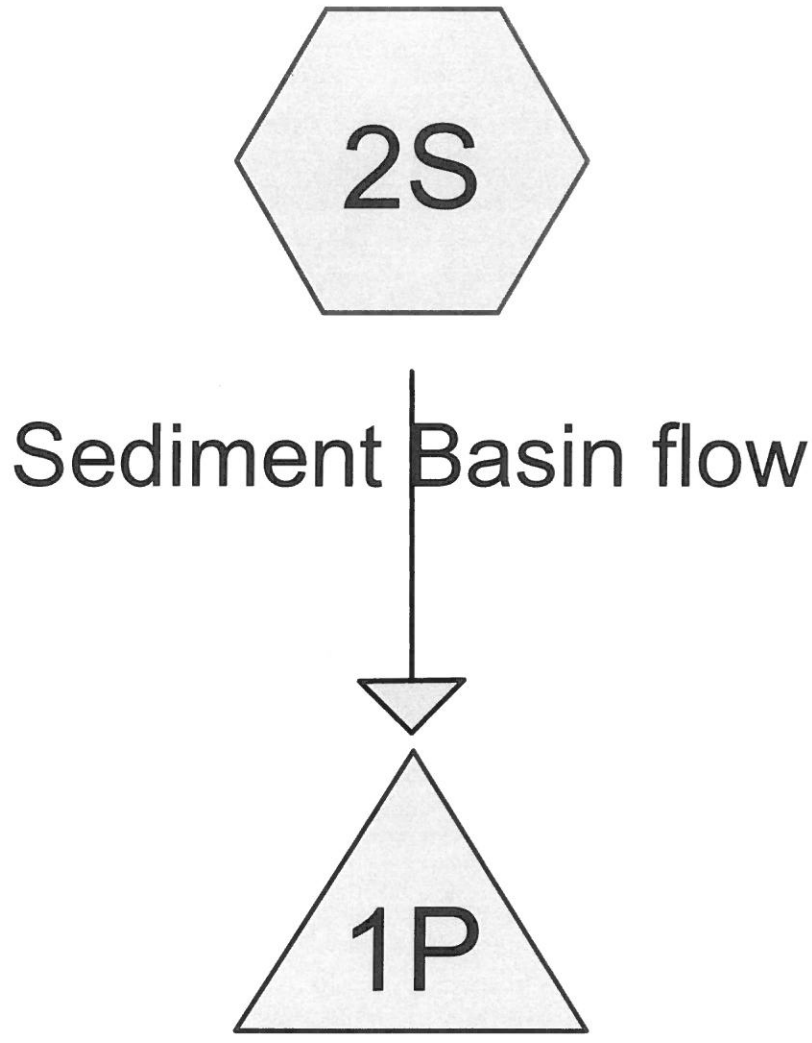

Curve 24-2
Sediment Delivery Ratios
100
50
10
Delivery Ratio (%)
82%
0.01
0.012
0.05
0.1
0.5
1
Drainage Area (sq. mi.)
Silty Clay DR = -7.7689LnX +56.642
Sandy DR = -5.398lnX + 12.399
Sandy
Silty
Silty Clay
Clay
Silt DR = -8.5341LnX + 46.247
Clay DR = -7.2744LnX +69.152



12.6 5817




sediment basin

Subcat Reach Pond Link

**Routing Diagram for sediment basin1**
Prepared by Crest ENgineering Associates, Inc., Printed 6/30/2020
HydroCAD® 10.00-25 s/n 10504 © 2019 HydroCAD Software Solutions LLC

## Summary for Subcatchment 2S: Sediment Basin flow

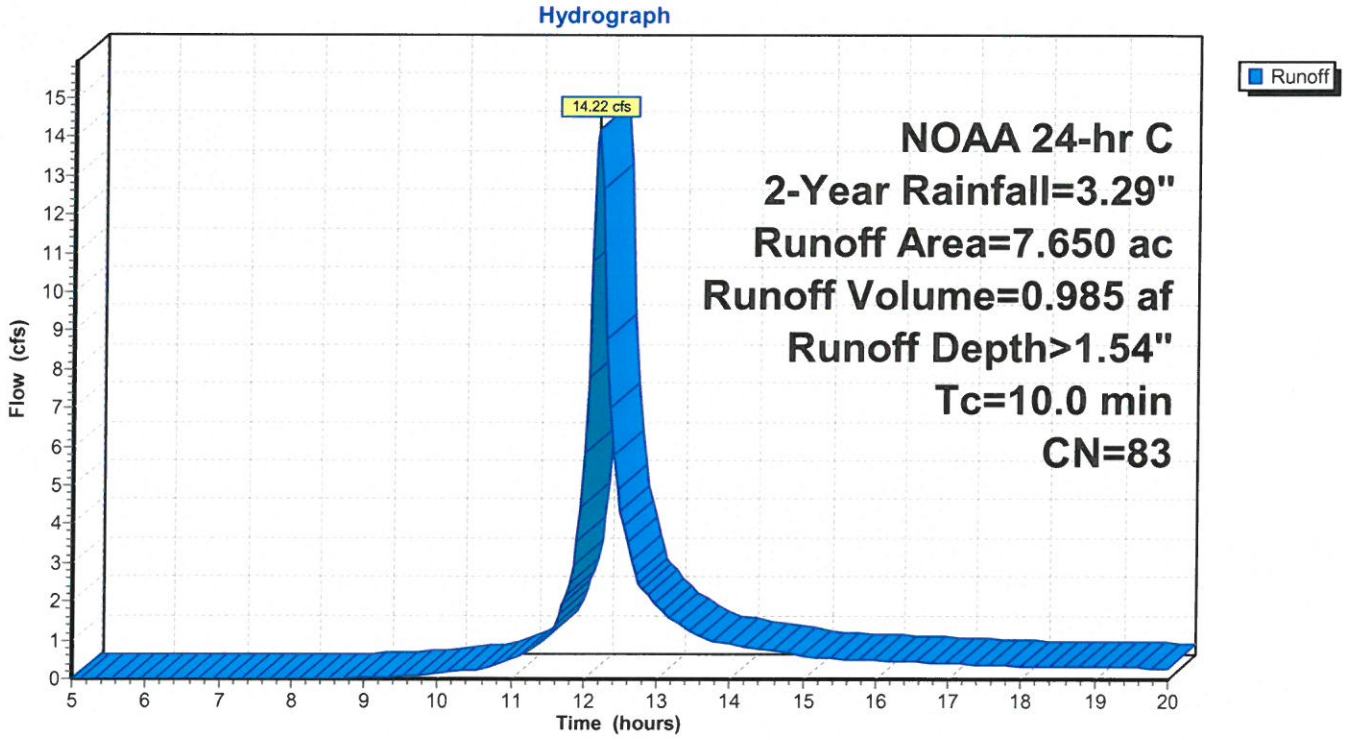
Runoff = 14.22 cfs @ 12.18 hrs, Volume= 0.985 af, Depth> 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
NOAA 24-hr C 2-Year Rainfall=3.29"

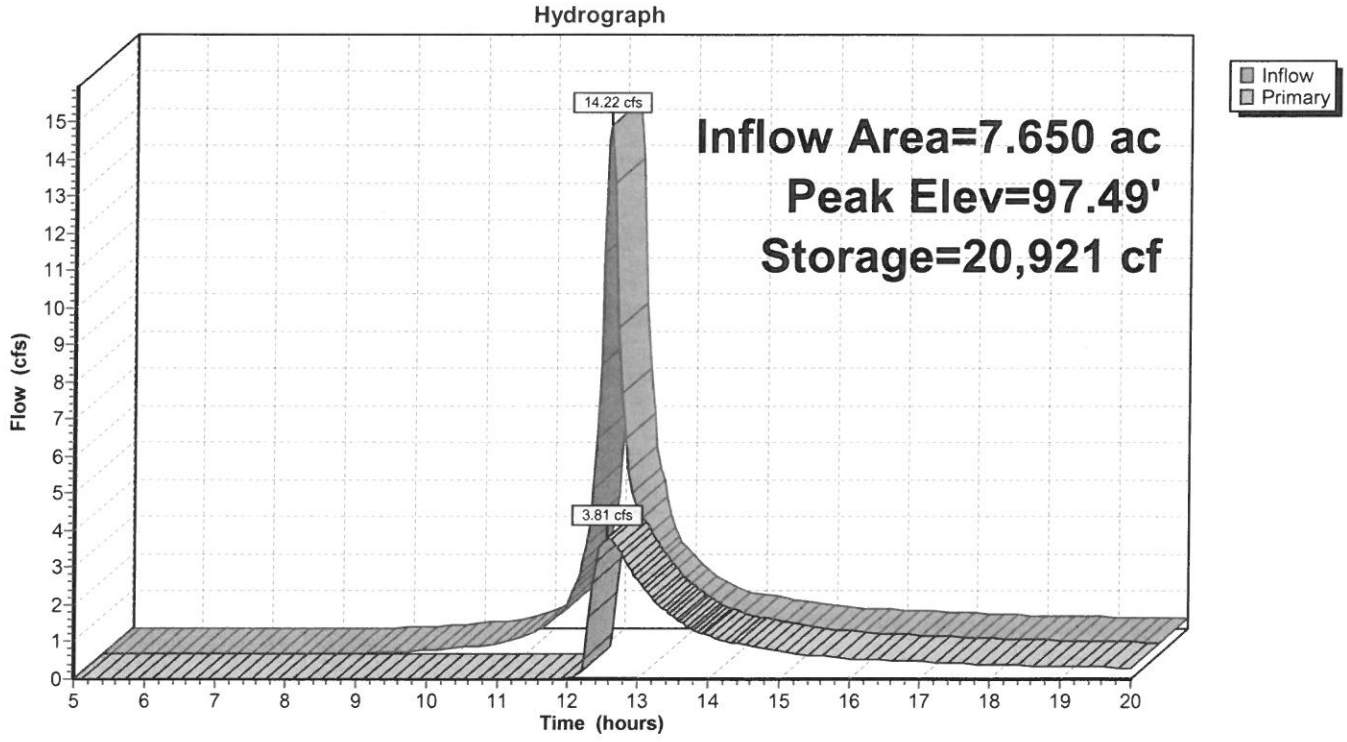
| | Area (ac) | CN | Description |
|---|---|---|---|
| * | 7.650 | 83 | |
| | 7.650 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 10.0 | | | | | **Direct Entry, ab** |

## Subcatchment 2S: Sediment Basin flow



## Pond 1P: sediment basin




12.10

## Summary for Pond 1P: sediment basin

Inflow Area = 7.650 ac, 0.00% Impervious, Inflow Depth > 1.54" for 2-Year event
Inflow = 14.22 cfs @ 12.18 hrs, Volume= 0.985 af
Outflow = 3.81 cfs @ 12.57 hrs, Volume= 0.606 af, Atten= 73%, Lag= 23.7 min
Primary = 3.81 cfs @ 12.57 hrs, Volume= 0.606 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 97.49' @ 12.57 hrs Surf.Area= 10,342 sf Storage= 20,921 cf

Plug-Flow detention time= 143.2 min calculated for 0.604 af (61% of inflow)
Center-of-Mass det. time= 71.7 min ( 867.7 - 796.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 95.00' | 39,112 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 95.00 | 6,720 | 0 | 0 |
| 96.00 | 8,000 | 7,360 | 7,360 |
| 97.00 | 9,360 | 8,680 | 16,040 |
| 97.25 | 9,990 | 2,419 | 18,459 |
| 97.75 | 10,716 | 5,177 | 23,635 |
| 98.00 | 11,020 | 2,717 | 26,352 |
| 99.00 | 14,500 | 12,760 | 39,112 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 96.20' | **3.0" Vert. Orifice/Grate** C= 0.600 |
| #2 | Primary | 97.00' | **Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** |
| | | | Head (feet) 0.00 1.00 |
| | | | Width (feet) 3.14 3.14 |

**Primary OutFlow** Max=3.80 cfs @ 12.57 hrs HW=97.49' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.26 cfs @ 5.20 fps)
└—**2=Custom Weir/Orifice** (Weir Controls 3.54 cfs @ 2.30 fps)

12.11

## Stage-Area-Storage for Pond 1P: sediment basin

| Elevation (feet) | Surface (sq-ft) | Storage (cubic-feet) |
|---|---|---|
| 95.00 | 6,720 | 0 |
| 95.05 | 6,784 | 338 |
| 95.10 | 6,848 | 678 |
| 95.15 | 6,912 | 1,022 |
| 95.20 | 6,976 | 1,370 |
| 95.25 | 7,040 | 1,720 |
| 95.30 | 7,104 | 2,074 |
| 95.35 | 7,168 | 2,430 |
| 95.40 | 7,232 | 2,790 |
| 95.45 | 7,296 | 3,154 |
| 95.50 | 7,360 | 3,520 |
| 95.55 | 7,424 | 3,890 |
| 95.60 | 7,488 | 4,262 |
| 95.65 | 7,552 | 4,638 |
| 95.70 | 7,616 | 5,018 |
| 95.75 | 7,680 | 5,400 |
| 95.80 | 7,744 | 5,786 |
| 95.85 | 7,808 | 6,174 |
| 95.90 | 7,872 | 6,566 |
| 95.95 | 7,936 | 6,962 |
| 96.00 | 8,000 | 7,360 |
| 96.05 | 8,068 | 7,762 |
| 96.10 | 8,136 | 8,167 |
| 96.15 | 8,204 | 8,575 |
| 96.20 | 8,272 | 8,987 |
| 96.25 | 8,340 | 9,403 |
| 96.30 | 8,408 | 9,821 |
| 96.35 | 8,476 | 10,243 |
| 96.40 | 8,544 | 10,669 |
| 96.45 | 8,612 | 11,098 |
| 96.50 | 8,680 | 11,530 |
| 96.55 | 8,748 | 11,966 |
| 96.60 | 8,816 | 12,405 |
| 96.65 | 8,884 | 12,847 |
| 96.70 | 8,952 | 13,293 |
| 96.75 | 9,020 | 13,743 |
| 96.80 | 9,088 | 14,195 |
| 96.85 | 9,156 | 14,651 |
| 96.90 | 9,224 | 15,111 |
| 96.95 | 9,292 | 15,574 |
| 97.00 | 9,360 | 16,040 |
| 97.05 | 9,486 | 16,511 |
| 97.10 | 9,612 | 16,989 |
| 97.15 | 9,738 | 17,472 |
| 97.20 | 9,864 | 17,962 |
| 97.25 | 9,990 | 18,459 |
| 97.30 | 10,063 | 18,960 |
| 97.35 | 10,135 | 19,465 |
| 97.40 | 10,208 | 19,974 |
| 97.45 | 10,280 | 20,486 |
| 97.50 | 10,353 | 21,002 |
| 97.55 | 10,426 | 21,521 |
| 97.60 | 10,498 | 22,044 |
| 97.65 | 10,571 | 22,571 |
| 97.70 | 10,643 | 23,101 |
| 97.75 | 10,716 | 23,635 |
| 97.80 | 10,777 | 24,173 |
| 97.85 | 10,838 | 24,713 |
| 97.90 | 10,898 | 25,256 |
| 97.95 | 10,959 | 25,803 |
| 98.00 | 11,020 | 26,352 |
| 98.05 | 11,194 | 26,908 |
| 98.10 | 11,368 | 27,472 |
| 98.15 | 11,542 | 28,044 |
| 98.20 | 11,716 | 28,626 |
| 98.25 | 11,890 | 29,216 |
| 98.30 | 12,064 | 29,815 |
| 98.35 | 12,238 | 30,422 |
| 98.40 | 12,412 | 31,039 |
| 98.45 | 12,586 | 31,664 |
| 98.50 | 12,760 | 32,297 |
| 98.55 | 12,934 | 32,940 |
| 98.60 | 13,108 | 33,591 |
| 98.65 | 13,282 | 34,250 |
| 98.70 | 13,456 | 34,919 |
| 98.75 | 13,630 | 35,596 |
| 98.80 | 13,804 | 36,282 |
| 98.85 | 13,978 | 36,976 |
| 98.90 | 14,152 | 37,680 |
| 98.95 | 14,326 | 38,392 |
| 99.00 | **14,500** | **39,112** |

12.12

## Stage-Discharge for Pond 1P: sediment basin

| Elevation (feet) | Primary (cfs) | Elevation (feet) | Primary (cfs) | Elevation (feet) | Primary (cfs) | Elevation (feet) | Primary (cfs) |
|---|---|---|---|---|---|---|---|
| 95.00 | 0.00 | 96.08 | 0.00 | 97.16 | 0.87 | 98.24 | 13.32 |
| 95.02 | 0.00 | 96.10 | 0.00 | 97.18 | 1.00 | 98.26 | 13.51 |
| 95.04 | 0.00 | 96.12 | 0.00 | 97.20 | 1.14 | 98.28 | 13.70 |
| 95.06 | 0.00 | 96.14 | 0.00 | 97.22 | 1.28 | 98.30 | 13.88 |
| 95.08 | 0.00 | 96.16 | 0.00 | 97.24 | 1.44 | 98.32 | 14.07 |
| 95.10 | 0.00 | 96.18 | 0.00 | 97.26 | 1.59 | 98.34 | 14.25 |
| 95.12 | 0.00 | 96.20 | 0.00 | 97.28 | 1.75 | 98.36 | 14.43 |
| 95.14 | 0.00 | 96.22 | 0.00 | 97.30 | 1.92 | 98.38 | 14.60 |
| 95.16 | 0.00 | 96.24 | 0.00 | 97.32 | 2.10 | 98.40 | 14.77 |
| 95.18 | 0.00 | 96.26 | 0.01 | 97.34 | 2.28 | 98.42 | 14.94 |
| 95.20 | 0.00 | 96.28 | 0.01 | 97.36 | 2.46 | 98.44 | 15.11 |
| 95.22 | 0.00 | 96.30 | 0.02 | 97.38 | 2.65 | 98.46 | 15.28 |
| 95.24 | 0.00 | 96.32 | 0.03 | 97.40 | 2.85 | 98.48 | 15.44 |
| 95.26 | 0.00 | 96.34 | 0.04 | 97.42 | 3.05 | 98.50 | 15.60 |
| 95.28 | 0.00 | 96.36 | 0.05 | 97.44 | 3.25 | 98.52 | 15.77 |
| 95.30 | 0.00 | 96.38 | 0.05 | 97.46 | 3.46 | 98.54 | 15.92 |
| 95.32 | 0.00 | 96.40 | 0.06 | 97.48 | 3.67 | 98.56 | 16.08 |
| 95.34 | 0.00 | 96.42 | 0.07 | 97.50 | 3.89 | 98.58 | 16.24 |
| 95.36 | 0.00 | 96.44 | 0.08 | 97.52 | 4.11 | 98.60 | 16.39 |
| 95.38 | 0.00 | 96.46 | 0.09 | 97.54 | 4.34 | 98.62 | 16.54 |
| 95.40 | 0.00 | 96.48 | 0.09 | 97.56 | 4.57 | 98.64 | 16.69 |
| 95.42 | 0.00 | 96.50 | 0.10 | 97.58 | 4.81 | 98.66 | 16.84 |
| 95.44 | 0.00 | 96.52 | 0.10 | 97.60 | 5.05 | 98.68 | 16.99 |
| 95.46 | 0.00 | 96.54 | 0.11 | 97.62 | 5.29 | 98.70 | 17.14 |
| 95.48 | 0.00 | 96.56 | 0.11 | 97.64 | 5.54 | 98.72 | 17.28 |
| 95.50 | 0.00 | 96.58 | 0.12 | 97.66 | 5.79 | 98.74 | 17.42 |
| 95.52 | 0.00 | 96.60 | 0.12 | 97.68 | 6.04 | 98.76 | 17.57 |
| 95.54 | 0.00 | 96.62 | 0.13 | 97.70 | 6.30 | 98.78 | 17.71 |
| 95.56 | 0.00 | 96.64 | 0.13 | 97.72 | 6.56 | 98.80 | 17.85 |
| 95.58 | 0.00 | 96.66 | 0.14 | 97.74 | 6.83 | 98.82 | 17.99 |
| 95.60 | 0.00 | 96.68 | 0.14 | 97.76 | 7.10 | 98.84 | 18.12 |
| 95.62 | 0.00 | 96.70 | 0.14 | 97.78 | 7.37 | 98.86 | 18.26 |
| 95.64 | 0.00 | 96.72 | 0.15 | 97.80 | 7.65 | 98.88 | 18.40 |
| 95.66 | 0.00 | 96.74 | 0.15 | 97.82 | 7.92 | 98.90 | 18.53 |
| 95.68 | 0.00 | 96.76 | 0.16 | 97.84 | 8.21 | 98.92 | 18.66 |
| 95.70 | 0.00 | 96.78 | 0.16 | 97.86 | 8.49 | 98.94 | 18.80 |
| 95.72 | 0.00 | 96.80 | 0.16 | 97.88 | 8.78 | 98.96 | 18.93 |
| 95.74 | 0.00 | 96.82 | 0.17 | 97.90 | 9.08 | 98.98 | 19.06 |
| 95.76 | 0.00 | 96.84 | 0.17 | 97.92 | 9.37 | 99.00 | **19.19** |
| 95.78 | 0.00 | 96.86 | 0.17 | 97.94 | 9.67 | | |
| 95.80 | 0.00 | 96.88 | 0.18 | 97.96 | 9.97 | | |
| 95.82 | 0.00 | 96.90 | 0.18 | 97.98 | 10.28 | | |
| 95.84 | 0.00 | 96.92 | 0.18 | 98.00 | 10.59 | | |
| 95.86 | 0.00 | 96.94 | 0.19 | 98.02 | 10.87 | | |
| 95.88 | 0.00 | 96.96 | 0.19 | 98.04 | 11.13 | | |
| 95.90 | 0.00 | 96.98 | 0.19 | 98.06 | 11.38 | | |
| 95.92 | 0.00 | 97.00 | 0.19 | 98.08 | 11.62 | | |
| 95.94 | 0.00 | 97.02 | 0.23 | 98.10 | 11.85 | | |
| 95.96 | 0.00 | 97.04 | 0.28 | 98.12 | 12.08 | | |
| 95.98 | 0.00 | 97.06 | 0.35 | 98.14 | 12.30 | | |
| 96.00 | 0.00 | 97.08 | 0.44 | 98.16 | 12.51 | | |
| 96.02 | 0.00 | 97.10 | 0.53 | 98.18 | 12.72 | | |
| 96.04 | 0.00 | 97.12 | 0.64 | 98.20 | 12.92 | | |
| 96.06 | 0.00 | 97.14 | 0.75 | 98.22 | 13.12 | | |

# 13. GRASS SWALE DESIGN CALCULATIONS

CREST ENGINEERING ASSOCIATES — FIELD NOTES

DATE: May 12, 2020 | FILE NO.: 5817 | JOB NAME: SHIRDI IN AMERICA, FRANKLIN, NJ

CREW: | TEMP.: | SHEET 1 OF

REFERENCE: GRASS WATERWAY DESIGN - WW1 | WEATHER

| STATION | BS + | HI | FS – TP | FS INT | ELEV. | REMARKS |
|---|---|---|---|---|---|---|

SWALE DESIGN TO FES-2A (GRASS SWALE - WW1)

AREA 2.76 Ac "C" SOILS

(IMP.) 0.41 Ac (C=0.99) | 2.35 Ac (1.35 Ac BRUSH/WOODS (C=0.51) | 1.0 (C=0.45))

$$\text{AVG } C = \frac{0.41 \times 0.99 + 1.35 \times 0.51 + 1.0 \times 0.45}{2.76}$$

$$= 0.56$$

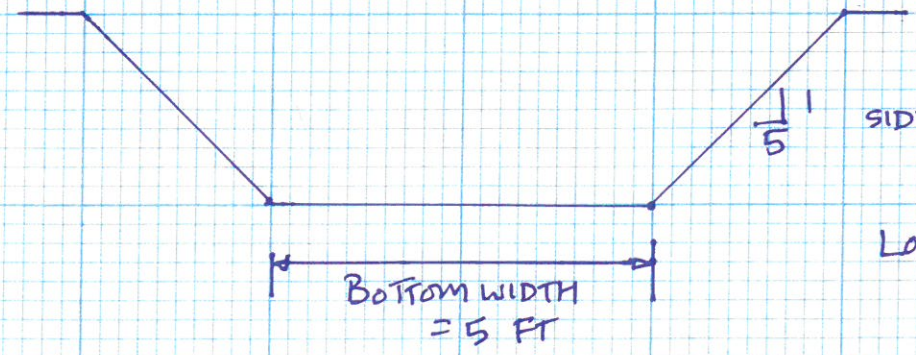
$T_c$ = 14 MIN $I_{100}$ = 5.45 IN/HR ← 100 YR STORM

$$Q = CIA = 0.56 \times 5.45 \times 2.76$$

$$= 8.42 \text{ CFS}$$

USE 8.5 CFS FOR PEAK FLOW

TRAPEZOIDAL GRASS SWALE:




LONGITUDINAL SLOPE
1.5%

Reduced by: | Ck. by: | Plotted by: | Drawing No.:

United States Department of Agriculture
Natural Resources Conservation Service

# GRASSED WATERWAY DESIGN

*Version 3.9 (Rev. 9/14)*

Landuser: Sai Datta Mandir
County: Somerset, NJ
Location: 583 S Middlebush Rd

Designed by: JP-Crest Engg
Checked by:
Sec.: Twp.:

Date: 5/6/2020
Date:
Range:

Waterway Type: Trapezoidal

Solve for: Depth

Retardance Values:
Capacity = D
Stability = E

Job Class I

| Min. Std. W/W ID | Reach Station | | Reach Station | Design Q (cfs) | Slope (%) | Bottom Width (ft) | Side Slope Ratio (Z:1) | Depth (ft) | Capacity $TW_2$ (ft) | Capacity $D_2$ (ft) | Capacity $V_2$ (fps) | Stability $V_1$ (fps) | | Seed Width (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WW1 | 0+00 | to | 4+10 | 8.5 | 1.5 | 5 | 5 | 0.6 | 11.4 | 0.6 | 1.6 | 2.4 | | |
| | | to | | | | | | | | | | | | |
| | | to | | | | | | | | | | | | |
| | | to | | | | | | | | | | | | |
| | | to | | | | | | | | | | | | |
| | | to | | | | | | | | | | | | |
| | | to | | | | | | | | | | | | |
| | | to | | | | | | | | | | | | |

Total Waterway Length= 410 feet

Total Waterway Acres = 0.1
Total Seeded Acres = 0.1

**Warnings:**



13.2

CREST ENGINEERING ASSOCIATES — FIELD NOTES

DATE: May 12, 2020 | FILE NO.: 5817 | JOB NAME: SHIRDI IN AMERICA, FRANKLIN, NJ

CREW: | TEMP.: | SHEET 1 OF

REFERENCE: GRASS WATERWAY DESIGN - WW2 | WEATHER

| STATION | BS + | HI | FS – TP | FS INT | ELEV. | REMARKS |
|---|---|---|---|---|---|---|

SWALE DESIGN - WW2

GRASS WATERWAY TO FES-9 (SWALE BEHIND BLDG & EMERGENCY ACCESS DR.)

AREA 1.27 AC ALL "C" SOILS

IMPERVIOUS 0.26 AC C=0.99

GRASS 0.81 AC C=0.51

BRUSH/WOODS 0.2 AC C=0.45

$T_c$ = 18 MIN

$I_{100}$ = 5.2 IN/HR

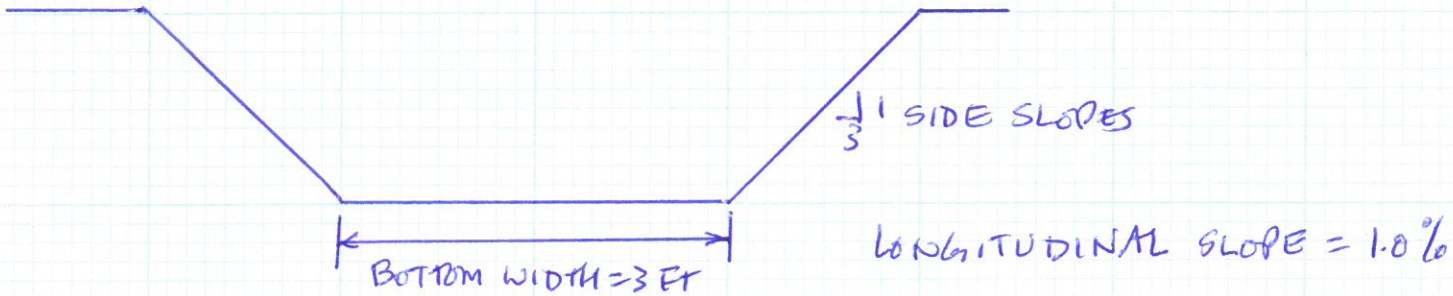
$$C_{avg} = \frac{0.26\times.99 + 0.81\times0.51 + 0.2\times0.45}{1.27}$$

$$= 0.6$$

$Q = CIA$

$= 0.6 \times 5.2 \times 1.27$

$= 4.0$ CFS (100 YR FLOW)




LONGITUDINAL SLOPE = 1.0%

Reduced by: Ck. by: Plotted by: Drawing No.:

United States Department of Agriculture
Natural Resources Conservation Service

# GRASSED WATERWAY DESIGN

*Version 3.9 (Rev. 9/14)*

Landuser: Sai Datta Mandir
County: Somerset, NJ
Location: 583 S Middlebush Rd

Designed by: JP-Crest Engg
Checked by:
Sec.: Twp.: Range:

Date: 5/6/2020
Date:

Waterway Type: Trapezoidal
Solve for: Depth

Retardance Values:
Capacity = D
Stability = E

Job Class I

| Min. Std. W/W ID | Reach Station | | Reach Station | Design Q (cfs) | Slope (%) | Bottom Width (ft) | Side Slope Ratio (Z:1) | Depth (ft) | Capacity $TW_2$ (ft) | Capacity $D_2$ (ft) | Capacity $V_2$ (fps) | Stability $V_1$ (fps) | | Seed Width (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WW1 | 0+00 | to | 4+10 | 5 | 1 | 3 | 3 | 0.7 | 7.4 | 0.7 | 1.3 | 2.0 | | |
| | | to | | | | | | | | | | | | |
| | | to | | | | | | | | | | | | |
| | | to | | | | | | | | | | | | |
| | | to | | | | | | | | | | | | |
| | | to | | | | | | | | | | | | |
| | | to | | | | | | | | | | | | |
| | | to | | | | | | | | | | | | |

Total Waterway Length= 410 feet

Total Waterway Acres = 0.1
Total Seeded Acres = 0.1

**Warnings:**
Velocity is less than 1.5 fps in Line 1

Precipitation Frequency Data Server

**NOAA Atlas 14, Volume 2, Version 3**
**Location name: Somerset, New Jersey, USA***
**Latitude: 40.5209°, Longitude: -74.571°**
**Elevation: 85.83 ft****
* source: ESRI Maps
** source: USGS

## POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

## PF tabular

**PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]**

| Duration | Average recurrence interval (years) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 10 | 25 | 50 | 100 | 200 | 500 | 1000 |
| 5-min | 3.98 (3.60-4.40) | 4.74 (4.30-5.24) | 5.63 (5.08-6.22) | 6.26 (5.65-6.92) | 7.04 (6.32-7.78) | 7.60 (6.78-8.36) | 8.14 (7.24-8.98) | 8.63 (7.63-9.53) | 9.24 (8.10-10.2) | 9.70 (8.44-10.8) |
| 10-min | 3.18 (2.88-3.52) | 3.80 (3.43-4.19) | 4.50 (4.06-4.97) | 5.01 (4.52-5.54) | 5.62 (5.03-6.19) | 6.05 (5.40-6.67) | 6.47 (5.75-7.13) | 6.84 (6.05-7.55) | 7.31 (6.41-8.09) | 7.63 (6.65-8.47) |
| 15-min | 2.65 (2.40-2.94) | 3.18 (2.88-3.52) | 3.80 (3.43-4.20) | 4.22 (3.81-4.67) | 4.74 (4.26-5.23) | 5.10 (4.56-5.62) | 5.45 (4.84-6.01) | 5.76 (5.09-6.35) | 6.13 (5.38-6.79) | 6.39 (5.56-7.09) |
| 30-min | 1.82 (1.64-2.01) | 2.20 (1.99-2.43) | 2.70 (2.44-2.98) | 3.06 (2.76-3.38) | 3.51 (3.15-3.88) | 3.84 (3.43-4.24) | 4.17 (3.71-4.60) | 4.48 (3.96-4.95) | 4.88 (4.28-5.40) | 5.17 (4.50-5.74) |
| 60-min | 1.13 (1.02-1.25) | 1.38 (1.25-1.52) | 1.73 (1.56-1.91) | 1.99 (1.80-2.20) | 2.34 (2.10-2.58) | 2.60 (2.33-2.87) | 2.87 (2.56-3.17) | 3.14 (2.78-3.47) | 3.50 (3.07-3.88) | 3.78 (3.29-4.19) |
| 2-hr | 0.692 (0.622-0.770) | 0.843 (0.759-0.936) | 1.07 (0.962-1.19) | 1.25 (1.12-1.38) | 1.49 (1.33-1.65) | 1.69 (1.50-1.87) | 1.89 (1.67-2.09) | 2.11 (1.84-2.33) | 2.40 (2.08-2.67) | 2.64 (2.26-2.94) |
| 3-hr | 0.512 (0.462-0.572) | 0.624 (0.563-0.697) | 0.793 (0.714-0.884) | 0.924 (0.830-1.03) | 1.11 (0.988-1.23) | 1.26 (1.11-1.39) | 1.41 (1.24-1.57) | 1.57 (1.37-1.75) | 1.79 (1.55-2.00) | 1.97 (1.69-2.20) |
| 6-hr | 0.328 (0.295-0.367) | 0.398 (0.359-0.445) | 0.505 (0.454-0.562) | 0.593 (0.530-0.658) | 0.718 (0.636-0.795) | 0.822 (0.724-0.909) | 0.934 (0.815-1.03) | 1.06 (0.911-1.17) | 1.23 (1.05-1.36) | 1.37 (1.15-1.52) |
| 12-hr | 0.198 (0.178-0.222) | 0.240 (0.215-0.269) | 0.306 (0.273-0.342) | 0.361 (0.322-0.404) | 0.444 (0.392-0.494) | 0.516 (0.452-0.573) | 0.594 (0.515-0.658) | 0.680 (0.582-0.755) | 0.809 (0.679-0.899) | 0.918 (0.759-1.02) |
| 24-hr | 0.113 (0.105-0.123) | 0.137 (0.127-0.149) | 0.175 (0.162-0.190) | 0.207 (0.191-0.225) | 0.256 (0.234-0.277) | 0.298 (0.271-0.323) | 0.345 (0.310-0.374) | 0.396 (0.353-0.431) | 0.474 (0.415-0.516) | 0.540 (0.466-0.589) |
| 2-day | 0.065 (0.060-0.072) | 0.079 (0.072-0.087) | 0.101 (0.092-0.111) | 0.119 (0.108-0.131) | 0.145 (0.132-0.160) | 0.168 (0.151-0.184) | 0.192 (0.172-0.211) | 0.219 (0.193-0.241) | 0.258 (0.224-0.285) | 0.291 (0.250-0.323) |
| 3-day | 0.046 (0.042-0.051) | 0.056 (0.051-0.062) | 0.071 (0.065-0.078) | 0.084 (0.076-0.092) | 0.102 (0.092-0.111) | 0.117 (0.105-0.128) | 0.133 (0.119-0.146) | 0.151 (0.134-0.166) | 0.177 (0.154-0.195) | 0.198 (0.171-0.220) |
| 4-day | 0.037 (0.034-0.040) | 0.044 (0.041-0.049) | 0.056 (0.051-0.062) | 0.066 (0.060-0.072) | 0.080 (0.072-0.087) | 0.091 (0.082-0.100) | 0.104 (0.093-0.113) | 0.117 (0.104-0.128) | 0.136 (0.119-0.150) | 0.152 (0.132-0.168) |
| 7-day | 0.025 (0.023-0.027) | 0.029 (0.027-0.032) | 0.037 (0.034-0.040) | 0.043 (0.039-0.046) | 0.051 (0.047-0.055) | 0.058 (0.053-0.063) | 0.065 (0.059-0.071) | 0.073 (0.066-0.080) | 0.084 (0.075-0.093) | 0.094 (0.082-0.103) |
| 10-day | 0.020 (0.018-0.021) | 0.023 (0.022-0.025) | 0.029 (0.027-0.031) | 0.033 (0.030-0.035) | 0.039 (0.036-0.042) | 0.044 (0.040-0.047) | 0.049 (0.044-0.053) | 0.054 (0.049-0.059) | 0.062 (0.055-0.067) | 0.068 (0.060-0.074) |
| 20-day | 0.013 (0.012-0.014) | 0.016 (0.015-0.017) | 0.019 (0.018-0.020) | 0.021 (0.020-0.022) | 0.024 (0.023-0.026) | 0.027 (0.025-0.029) | 0.029 (0.027-0.031) | 0.032 (0.029-0.034) | 0.035 (0.032-0.038) | 0.038 (0.034-0.041) |
| 30-day | 0.011 (0.010-0.012) | 0.013 (0.012-0.014) | 0.015 (0.014-0.016) | 0.017 (0.016-0.018) | 0.019 (0.018-0.020) | 0.021 (0.019-0.022) | 0.022 (0.021-0.024) | 0.024 (0.022-0.025) | 0.026 (0.024-0.027) | 0.027 (0.025-0.029) |
| 45-day | 0.009 (0.009-0.010) | 0.011 (0.010-0.012) | 0.013 (0.012-0.013) | 0.014 (0.013-0.015) | 0.016 (0.015-0.016) | 0.017 (0.016-0.018) | 0.018 (0.017-0.019) | 0.019 (0.018-0.020) | 0.020 (0.019-0.022) | 0.021 (0.020-0.023) |
| 60-day | 0.008 (0.008-0.009) | 0.010 (0.009-0.010) | 0.011 (0.011-0.012) | 0.012 (0.012-0.013) | 0.014 (0.013-0.014) | 0.014 (0.014-0.015) | 0.015 (0.015-0.016) | 0.016 (0.015-0.017) | 0.017 (0.016-0.018) | 0.018 (0.017-0.019) |

[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.

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## PF graphical

13.5

# 14. NONSTRUCTURAL STORMWATER MANAGEMENT STRATEGIES

14A. NJDEP LOW IMPACT DEVELOPMENT CHECKLIST

# LOW IMPACT DEVELOPMENT CHECKLIST

A checklist for identifying nonstructural stormwater management strategies incorporated into proposed land development

Municipality: Franklin Township

County: Somerset Date: Nov. 11, 2019

Review board or agency: Franklin Township Zoning Board,

Proposed land development name: Prelim. And Final Major Site Plan-(Sai Datta Mandir, Inc.)

Lot(s): 6.03 Block(s): 36.01

Project or application number: __

Applicant's name: Sai Datta Mandir, Inc. (A NY non profit organization)

Applicant's address: 902 Oak Tree Road, Suite 100, South Plainfield, NJ 07080

Telephone: 732-809-1200 Fax:

Email address: raghusankaramanchi@gmail.com

Designer's name: Jayesh S. Patel, P.E., P.P., Crest Engg. Associates, Inc.

Designer's address: 100 Rike Dr, Millstone Township, NJ 08535

Telephone:609-448-5550 Fax:609-448-2157

Email address: jpatel@crestengineering.net

**Part 1: Description of Nonstructural Approach to Site Design**

In narrative form, provide an overall description of the nonstructural stormwater management approach and strategies incorporated into the proposed site's design. Attach additional pages as necessary. Details of each nonstructural strategy are provided in Part 3 below.

The project site, Lot 6.03, in Block 36.01 is comprised of approximately 24.83 ac. The site is believed to have been used for leaf compost processing in thr past.

The proposed site plan includes the construction of 28,616 sf house of worship. The proposed site development includes access drive ftom South Middlebush Road, parking lot with 203 spaces and a stormwater basin (combination of infiltration basin and wet basin) discharging to an onsite manmade impoundment (detention area with berm and existing outlet structure). Total area of proposed site disturbance will be 8.8 acres with proposed impervious area of 3.58 acres.

Main access drive is provided with grass swale on one side to intercept undisturbed area runoffs from onsite and offsite areas. In addition rear of the proposed building is provided with paved access drive for emergency vehicles. The grass swale is provided running on one side of the paved emergency access drive to capture and control stormwater runoff & providing discontinuation of impervious areas. Additionally along the center of the parking area near building access point where drop off/pickup areas for visitors is provided pervious pavers area is proposed to provide additional low impact development strategy.

Presently site is vacant and most of the previously used area for leaf composting is covered with approximately 6"to8" of stones underlain by filter fabric. Site does not have any defined natural areas.

**Part 2: Review of Local Stormwater Management Regulations**

Title and date of stormwater management regulations used in development design:
Chapter 330, "stormwater Management" adopted by Twsp of Franklin on 5/23/2006 and amended 5/28/203.

Do regulations include nonstructural requirements?
Yes: x No: _____

If yes, briefly describe: Similar to NJ Stormwater Regulation (NJAC 7:8)

List LID-BMPs prohibited by local regulations: none

Pre-design meeting held? Yes: x Dates: (1) Dec 7, 2017 and (2) Mar 22, 2018
No: _____

Meeting held with: (1) Twsp Staff and (2) County Engg Staff

Pre-design site walk held? Yes: _____ Date: _____ No: x

Site walk held with: _____

Other agencies with stormwater review jurisdiction:

Name: NJDEP

Required approval: Wetlands GP 11/Delaware and Raritan Canal Commission.

Name: Middlesex County

Required approval: County Road Widening (if required), Access, Utilities etc & Site Plan approval

Name: Somerset Union Soil Conservation District

Required approval: SESC certification

Name: Middlesex County

Required approval: County Road Widening, Access, Utilities etc

## Part 3: Nonstructural Strategies and LID-BMPs in Design

### 3.1 Vegetation and Landscaping

Effective management of both existing and proposed site vegetation can reduce a development's adverse impacts on groundwater recharges and runoff quality and quantity. This section of the checklist helps identify the vegetation and landscaping strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to help maintain existing recharge rates and/or minimize or prevent increases in runoff quantity and pollutant loading.

A. Has an inventory of existing site vegetation been performed?
Yes: No trees > 4 inches are located within the limits of proposed site disturbance. Most of the existing trees/shrubs along site perimeter will remain undisturbed.
No: _____

If yes, was this inventory a factor in the site's layout and design? Yes: x No: __

B. Does the site design utilize any of the following nonstructural LID-BMPs?

Preservation of natural areas? Yes:_____No:_____N/A (See Below)
If yes, specify % of site:_____

Most of the site has been used for leaf compost processing in the past has been covered with approx 6"-8" stone with filter fabric underneath.. Most of the newly proposed site disturbance area falls within previously disturbed area.

Native ground cover? Yes: _____ No: x
If yes, specify % of site: _____

Vegetated buffers? Yes: x No: x
If yes, specify % of site: 93% of 6.07 ac

C. Do the land development regulations require these nonstructural LID-BMPs?

Preservation of natural areas? Yes: x No: _____
If yes, specify % of site: no specific percentage

Native ground cover? Yes: x No: _____
If yes, specify % of site: no specific percentage

Vegetated buffers? Yes: x No: _____
If yes, specify % of site: no specific percentage

D. If vegetated filter strips or buffers are utilized, specify their functions: Along rear of the building, grass/landscaped buffer area utilized.Also grass swales provided as vegetated filter strips

Reduce runoff volume increases through lower runoff coefficient:
Yes: x No: _____

Reduce runoff pollutant loads through runoff treatment:
Yes: __x___ No: _____

Maintain groundwater recharge by preserving natural areas:
Yes: _____ No: __x___

**3.2 Minimize Land Disturbance**

Minimizing land disturbance is a nonstructural LID-BMP that can be applied during both the development's construction and post-construction phases. This section of the checklist helps identify those land disturbance strategies and nonstructural LID-BMPs that have been incorporated into the proposed development's design to minimize land disturbance and the resultant change in the site's hydrologic character.

A. Have inventories of existing site soils and slopes been performed?
Yes: __x__ No: _____

If yes, were these inventories factors in the site's layout and design? Yes: __x__ No: _____

B. Does the development's design utilize any of the following nonstructural LID-BMPs?
Restrict permanent site disturbance by land owners?
Yes: __x__ No: _____

If yes, how: Provide delineated & conserved wetlands /buffer area

Restrict temporary site disturbance during construction?
Yes: __x__ No: _____

If yes, how: Silt fence/tree protection fence to be provided at limits of disturbance.

Consider soils and slopes in selecting disturbance limits?
Yes: __x__ No: ____

If yes, how: Preserving steep slopes along site perimeter

C. Specify percentage of site to be cleared: <5% (1.0 ac) Regraded: 35% (8.08 ac)

D. Specify percentage of cleared areas done so for buildings: zero %
For driveways and parking: 5.0% For roadways: N/A

E. What design criteria and/or site changes would be required to reduce the percentages in C and D above? None. The site disturbance proposed is minimal needed for economically viable site development

F. Specify site's hydrologic soil group (HSG) percentages: (areas to Millstone River only)

HSG A: - HSG B: - HSG C: 100% HSG D: -

G. Specify percentage of each HSG that will be permanently disturbed: (areas to Millstone River only)
HSG A: - HSG B: - HSG C: 35% HSG D: -

H. Locating site disturbance within areas with less permeable soils (HSG C and D) and minimizing disturbance within areas with greater permeable soils (HSG A and B) can

help maintain groundwater recharge rates and reduce runoff volume increases. In light of the HSG percentages in F and G above, what other practical measures if any can be taken to achieve this?

No . "C" soils present onsite .

I. Does the site include Karst topography? Yes: _____ No: __x___
If yes, discuss measures taken to limit Karst impacts: _____

### 3.3 Impervious Area Management

New impervious surfaces at a development site can have the greatest adverse effect on groundwater recharge and stormwater quality and quantity. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into a proposed development's design to comprehensively manage the extent and impacts of new impervious surfaces.

A. Specify impervious cover at site: Existing: 0.0% Proposed: 15% (approx 3.6 ac)

B. Specify maximum site impervious coverage allowed by regulations: 40% (plus additional 10% if pervious pavement)

C. Compare proposed street cartway widths with those required by regulations: N/A

| Type of Street | Proposed Cartway Width (feet) | Required Cartway Width (feet) |
|---|---|---|
| Residential access – low intensity | | |
| Residential access – medium intensity | | |
| Residential access – high intensity with parking | | |
| Residential access – high intensity without parking | | |
| Neighborhood | | |
| Minor collector – low intensity without parking | | |
| Minor collector – with one parking lane | | |
| Minor collector – with two parking lanes | | |
| Minor collector – without parking | | |
| Major collector | | |

D. Compare proposed parking space dimensions with those required by regulations:
Proposed: 9'x18' Regulations: 9'x18'

E. Compare proposed number of parking spaces with those required by regulations:
Proposed: 203 Regulations: 196

F. Specify percentage of total site impervious cover created by buildings: 2.64%
By driveways and parking: 11.36% * By roadways: N/A

* -includes 1.2% of pervious area

G. What design criteria and/or site changes would be required to reduce the percentages in F above?
None. Already proposed lower than allowed by zoning regulations..

H. Specify percentage of total impervious area that will be unconnected:
Total site: 11.36% Buildings: 0.0 Driveways and parking: 11.36% *
Roads: N/A

* passing thru infiltration basin first. Also swales are provided where possible

I. Specify percentage of total impervious area that will be porous:
Total site: 1.2% Buildings: 0.0% Driveways and parking: 1.2%
Roads: 0.0%

J. Specify percentage of total building roof area that will be vegetated: 0.0%

K. Specify percentage of total parking area located beneath buildings: 0.0%

L. Specify percentage of total parking located within multi-level parking deck: 0.0%

### 3.4 Time of Concentration Modifications

Decreasing a site's time of concentration (Tc) can lead directly to increased site runoff rates which, in turn, can create new and/or aggravate existing erosion and flooding problems downstream. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to effectively minimize such Tc decreases.

When reviewing Tc modification strategies, it is important to remember that a drainage area's Tc should reflect the general conditions throughout the area. As a result, Tc modifications must generally be applied throughout a drainage area, not just along a specific Tc route.

A. Specify percentage of site's total stormwater conveyance system length that will be:
Storm sewer: 56% Vegetated swale: 35% Natural channel: 2.5%
Stormwater management facility: 6.5% Other: 0.0%
Note: the total length of the stormwater conveyance system should be measured from the site's downstream property line to the downstream limit of sheet flow at the system's headwaters.

B. What design criteria and/or site changes would be required to reduce the storm sewer percentages and increase the vegetated swale and natural channel percentages in A above?
None. Vegetated swales and natural channel (wetlands low area) percentages are maximized as much as possible.

C. In conveyance system subareas that have overland or sheet flow over impervious surfaces or turf grass, what practical and effective site changes can be made to:

Decrease overland flow slope: None.

Increase overland flow roughness: None.

**3.5 Preventative Source Controls**

The most effective way to address water quality concerns is by pollution prevention. This section of the checklist helps identify those nonstructural strategies and LID-BMPs that have been incorporated into the proposed development's design to reduce the exposure of pollutants to prevent their release into the stormwater runoff.

A. Trash Receptacles

Specify the number of trash receptacles provided: 1

Specify the spacing between the trash receptacles: N/A

Compare trash receptacles proposed with those required by regulations:

Proposed: 1 Regulations: 1

B. Pet Waste Stations

Specify the number of pet waste stations provided: None

Specify the spacing between the pet waste stations: N/A

Compare pet waste stations proposed with those required by regulations:

Proposed: 0 Regulations: 0

C. Inlets, Trash Racks, and Other Devices that Prevent Discharge of Large Trash and Debris

Specify percentage of total inlets that comply with the NJPDES storm drain inlet criteria: 100%

D. Maintenance

Specify the frequency of the following maintenance activities:

Street sweeping: Proposed: N/A (No street proposed) Regulations: N/A

Litter collection: Proposed: Private Hauler-weekly Regulations: frequency not specified

Identify other stormwater management measures on the site that prevent discharge of large trash and debris:

Curbed site, inlets comply to stormwater regs where all large trash & debris will get blocked, impervious areas drain to infiltration basins where all small trash & debris and sediments will get collected, which will be removed periodically through maintenance program

E. Prevention and Containment of Spills

Identify locations where pollutants are located on the site, and the features that prevent these pollutants from being exposed to stormwater runoff:

Pollutant: trace oil /grease & sediment Location: driveway/parking area

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: trace oil/grease Location: infiltration basin-sand bottom

Feature utilized to prevent pollutant exposure, harmful accumulation, or contain spills:

Pollutant: sediment Location: infiltration basin-sand bottom

**Part 4: Compliance with Nonstructural Requirements of NJDEP Stormwater Management Rules**

1. Based upon the checklist responses above, indicate which nonstructural strategies have been incorporated into the proposed development's design in accordance with N.J.A.C. 7:8-5.3(b):

| No. | Nonstructural Strategy | Yes | No |
|---|---|---|---|
| 1 | Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss | x | |
| 2 | Minimize impervious surfaces and breakup or disconnect the flow of runoff over impervious surfaces. | x | |
| 3 | Maximize the protection of natural drainage features and vegetation. | x | |
| 4 | Maximize the decrease in the pre-construction time of concentration. | x | |
| 5 | Minimize land disturbance including clearing and grading. | x | |
| 6 | Minimize soil compaction. | x | |
| 7 | Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides. | x | |
| 8 | Provide vegetated open channel conveyance systems discharge into and through stable vegetated areas. | x | |
| 9 | Provide preventive source controls. | x | |

2. For those strategies that have not been incorporated into the proposed development's design, provide engineering, environmental, and/or safety reasons. Attached additional pages as necessary.

## 15. MAJOR DEVELOPMENT -STORM WATER SUMMARY (ATTACHMENT D OF TIER A-MS4 NJPDES PERMIT)

Permit No. NJ0141852
Tier A MS4 NJPDES Permit

# Attachment D – Major Development Stormwater Summary

## General Information

1. Project Name: Shirdi In America
2. Municipality: Franklin Twsp. County: Somerset Block(s): 36.01 Lot(s): 6.03
3. Site Location (State Plane Coordinates – NAD83): E: 477650 N: 592970
4. Date of Final Approval for Construction by Municipality: Not Known Yet
   Date of Certificate of Occupancy: Not Known Yet
5. Project Type (check all that apply):
   Residential ☐ Commercial ☐ Industrial ☐ Other (please specify) Religious
6. Soil Conservation District Project Number: 2019-3975 (Somerset-Union SCD)
7. Did project require an NJDEP Land Use Permit? Yes ◉ No ○ Land Use Permit #: 1808-05-0028.1 (Pending)
8. Did project require the use of any mitigation measures? Yes ○ No ◉
   If yes, which standard was mitigated? _____

## Site Design Specifications

1. Area of Disturbance (acres): 8.8 Area of Proposed Impervious (acres): 3.58
2. List all Hydrologic Soil Groups: Group C (Penn Silt Loam and Royce Silt Loam)
3. Please Identify the Amount of Each Best Management Practices (BMPs) Utilized in Design Below:
   Bioretention Systems ___ Constructed Wetlands ___ Dry Wells ___ Extended Detention Basins ___
   Infiltration Basins 1 Combination Infiltration/Detention Basins ___ Manufactured Treatment Devices ___
   Pervious Paving Systems ___ Sand Filters ___ Vegetative Filter Strips ___ Wet Ponds 1
   Grass Swales ___ Subsurface Gravel Wetlands ___ Other _____

## Storm Event Information

Storm Event - Rainfall (inches and duration): 2 yr.: 3.34in/24hr 10 yr.: 5.01in\24hr
100 yr.: 8.21in\24hr WQDS: 1.25 in/2 hrs

Runoff Computation Method:
NRCS: Dimensionless Unit Hydrograph ☑ NRCS: Delmarva Unit Hydrograph ☐ Rational ☐ Modified Rational ☐
Other: _____

## Basin Specifications (answer all that apply)

*If more than one basin, attach multiple sheets*

1. Type of Basin: **Infiltration Basin** Surface/Subsurface (select one): Surface ◉ Subsurface ○
2. Owner (select one):
   ○ Public ◉ Private: If so, Name: **Sai Datta Mandir, Inc** Phone number: **516-359-5136**
3. Basin Construction Completion Date: not known yet
4. Drain Down Time (hr.): 0.6 hrs
5. Design Soil Permeability (in./hr.): 5.45
6. Seasonal High Water Table Depth from Bottom of Basin (ft.): **2.10** Date Obtained: **March 5, 2020**
7. Groundwater Recharge Methodology (select one): 2 Year Difference ○ NJGRS ◉ Other ○ NA ○
8. Groundwater Mounding Analysis (select one): Yes ◉ No ○ If, Yes Methodology Used: **Hantush spreadsheet**
9. Maintenance Plan Submitted: Yes ◉ No ○ Is the Basin Deed Restricted: Yes ○ No ◉

Comments:

Name of Person Filling Out This Form: Jayesh S. Patel, P.E., P.P. Signature: JSPatel

Title: Project Engineer Date: July 20, 2020

15.1

| Basin Specifications (answer all that apply)<br>*If more than one basin, attach multiple sheets* | |
|---|---|
| 1. Type of Basin: Wet Basin | Surface/Subsurface (select one): Surface ◉ Subsurface ○ |
| 2. Owner (select one): ○ Public ◉ Private: If so, Name: Sai Datta Mandir, Inc | Phone number: 516-359-5136 |
| 3. Basin Construction Completion Date: To Be Determined | |
| 4. Drain Down Time (hr.): 66.23 Hrs | |
| 5. Design Soil Permeability (in./hr.): No Infiltration considered | |
| 6. Seasonal High Water Table Depth from Bottom of Basin (ft.): 4.2 ft * | Date Obtained: March 5, 2020 |
| 7. Groundwater Recharge Methodology (select one): 2 Year Difference ○ NJGRS ○ Other ○ NA ◉ | |
| 8. Groundwater Mounding Analysis (select one): Yes ○ No ◉ | If, Yes Methodology Used: |
| 9. Maintenance Plan Submitted: Yes ◉ No ○ | Is the Basin Deed Restricted: Yes ○ No ◉ |

*** - above the pond bottom**

| Basin Specifications (answer all that apply)<br>*If more than one basin, attach multiple sheets* | |
|---|---|
| 1. Type of Basin: | Surface/Subsurface (select one): Surface ○ Subsurface ○ |
| 2. Owner (select one): ○ Public ○ Private: If so, Name: | Phone number: |
| 3. Basin Construction Completion Date: | |
| 4. Drain Down Time (hr.): | |
| 5. Design Soil Permeability (in./hr.): | |
| 6. Seasonal High Water Table Depth from Bottom of Basin (ft.): | Date Obtained: |
| 7. Groundwater Recharge Methodology (select one): 2 Year Difference ○ NJGRS ○ Other ○ NA ○ | |
| 8. Groundwater Mounding Analysis (select one): Yes ○ No ○ | If, Yes Methodology Used: |
| 9. Maintenance Plan Submitted: Yes ○ No ○ | Is the Basin Deed Restricted: Yes ○ No ○ |

| Basin Specifications (answer all that apply)<br>*If more than one basin, attach multiple sheets* | |
|---|---|
| 1. Type of Basin: | Surface/Subsurface (select one): Surface ○ Subsurface ○ |
| 2. Owner (select one): ○ Public ○ Private: If so, Name: | Phone number: |
| 3. Basin Construction Completion Date: | |
| 4. Drain Down Time (hr.): | |
| 5. Design Soil Permeability (in./hr.): | |
| 6. Seasonal High Water Table Depth from Bottom of Basin (ft.): | Date Obtained: |
| 7. Groundwater Recharge Methodology (select one): 2 Year Difference ○ NJGRS ○ Other ○ NA ○ | |
| 8. Groundwater Mounding Analysis (select one): Yes ○ No ○ | If, Yes Methodology Used: |
| 9. Maintenance Plan Submitted: Yes ○ No ○ | Is the Basin Deed Restricted: Yes ○ No ○ |

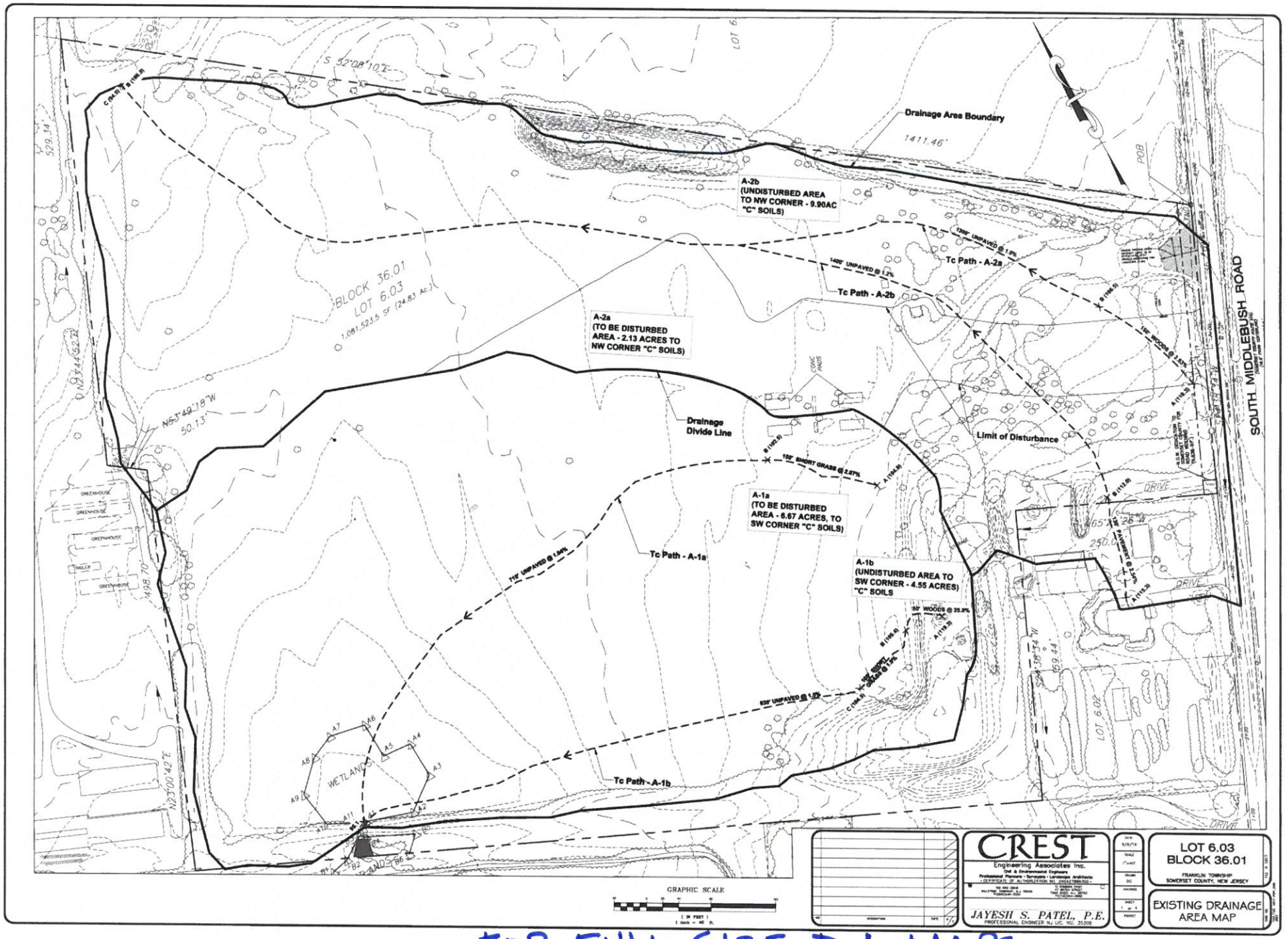
Name of Person Filling Out This Form: Jayesh S. Patel, P.E., P.P.

Signature: JSPatel

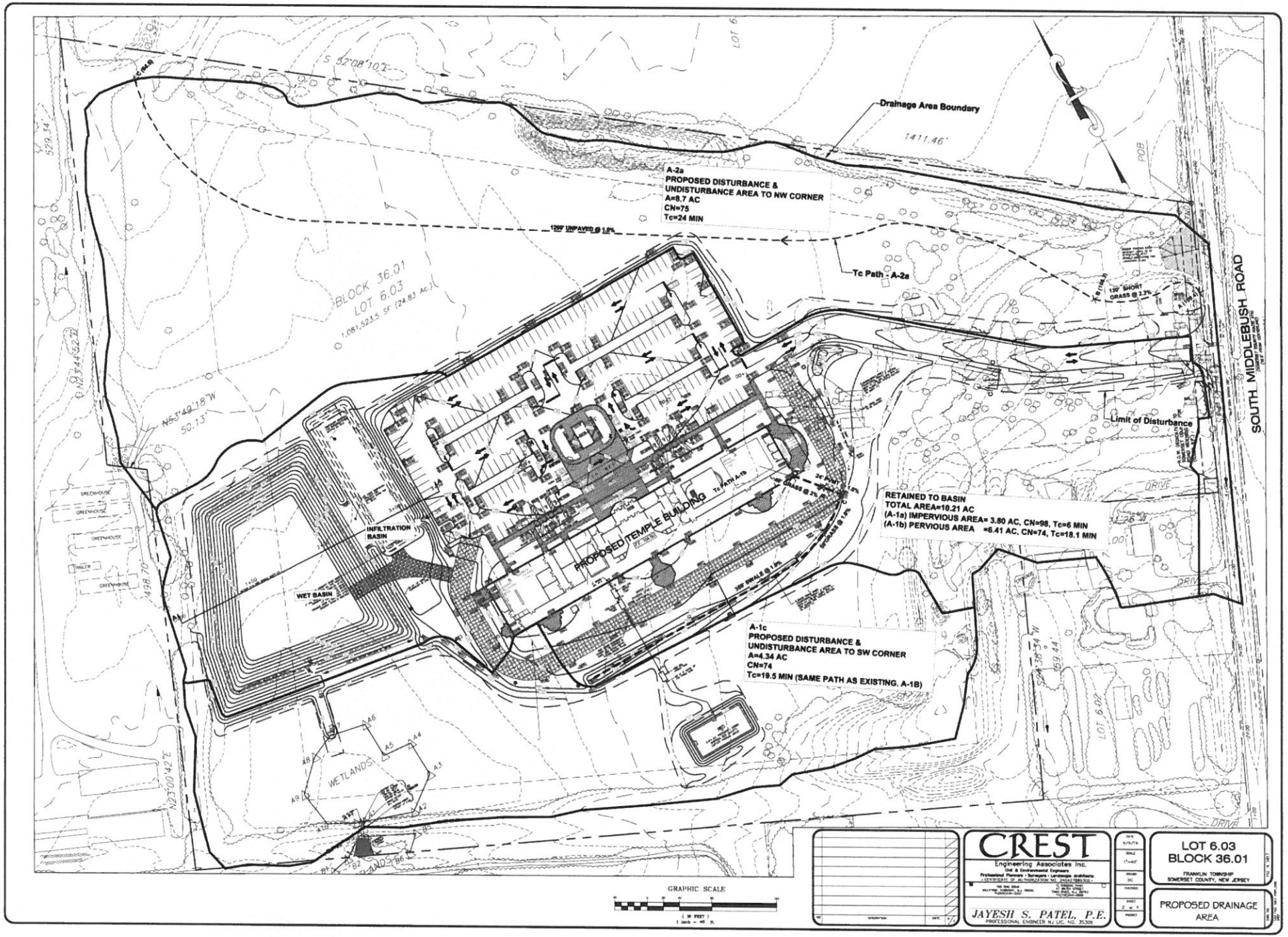
Title: Project Engineer

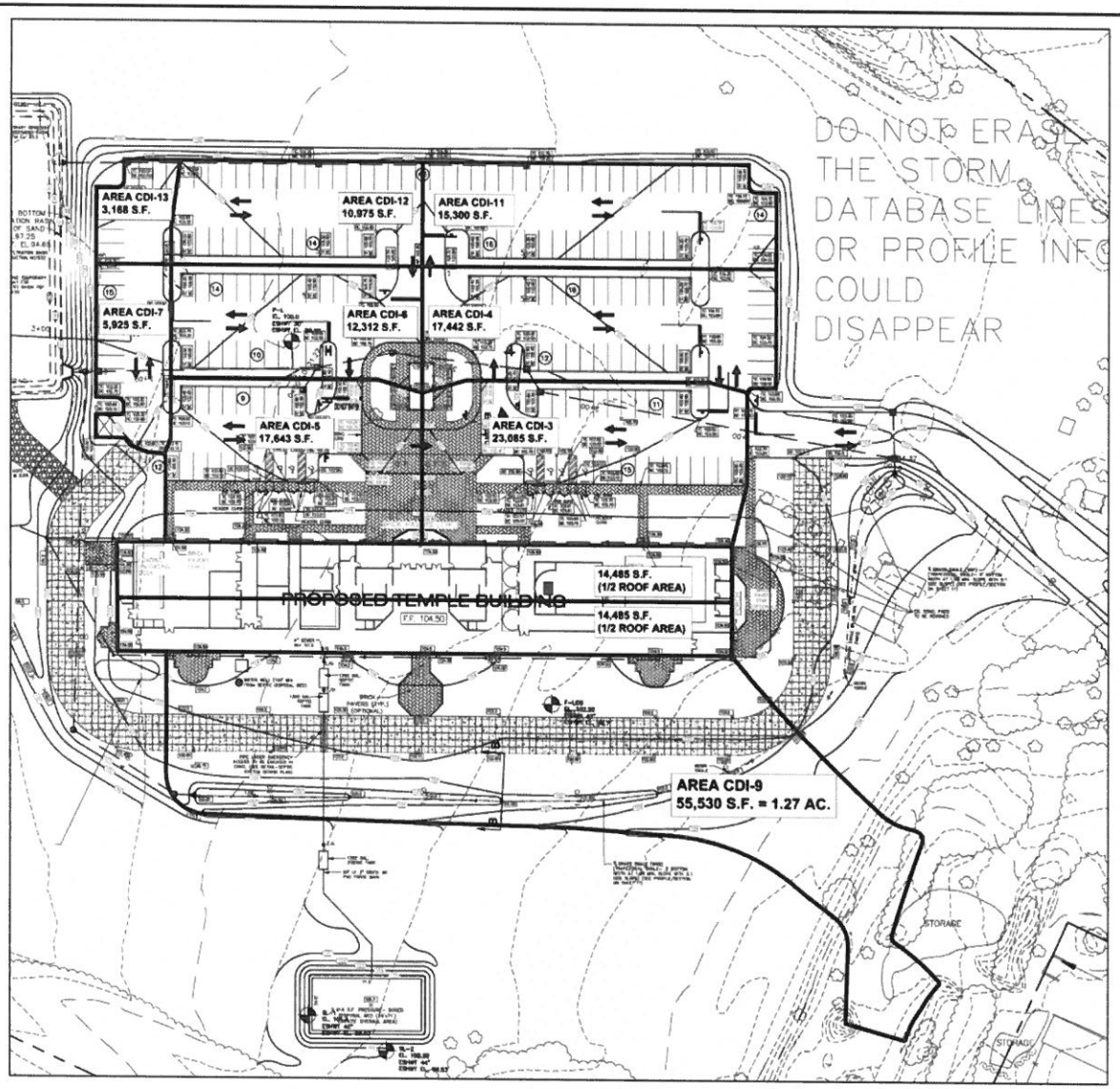
Date: July 20, 2020

# 16. DRAINAGE AREA MAPS




FOR FULL SIZE D.A. MAPS
SEE SWM Report - Back Binder pockets


Drainage Area Boundary
A-2a
PROPOSED DISTURBANCE &
UNDISTURBANCE AREA TO NW CORNER
A=8.7 AC
CN=75
Tc=24 MIN
Tc Path - A-2a
BLOCK 36.01
LOT 6.03
1,061,523.5 SF (24.81 AC.)
PROPOSED TEMPLE BUILDING
INFILTRATION BASIN
WET BASIN
WETLANDS
Limit of Disturbance
RETAINED TO BASIN
TOTAL AREA=10.21 AC
(A-1a) IMPERVIOUS AREA= 3.80 AC, CN=98, Tc=6 MIN
(A-1b) PERVIOUS AREA =6.41 AC, CN=74, Tc=18.1 MIN
A-1c
PROPOSED DISTURBANCE &
UNDISTURBANCE AREA TO SW CORNER
A=4.34 AC
CN=74
Tc=19.5 MIN (SAME PATH AS EXISTING. A-1B)
SOUTH MIDDLEBUSH ROAD
GRAPHIC SCALE
CREST
Engineering Associates Inc.
JAYESH S. PATEL, P.E.
LOT 6.03
BLOCK 36.01
FRANKLIN TOWNSHIP
SOMERSET COUNTY, NEW JERSEY
PROPOSED DRAINAGE AREA




LEGEND

GRAPHIC SCALE

( IN FEET )

CREST
Engineering Associates Inc.
Civil & Environmental Engineers
Professional Planners · Surveyors · Landscape Architects
· CERTIFICATE OF AUTHORIZATION NO. 24GA27996200 ·

JAYESH S. PATEL, P.E.
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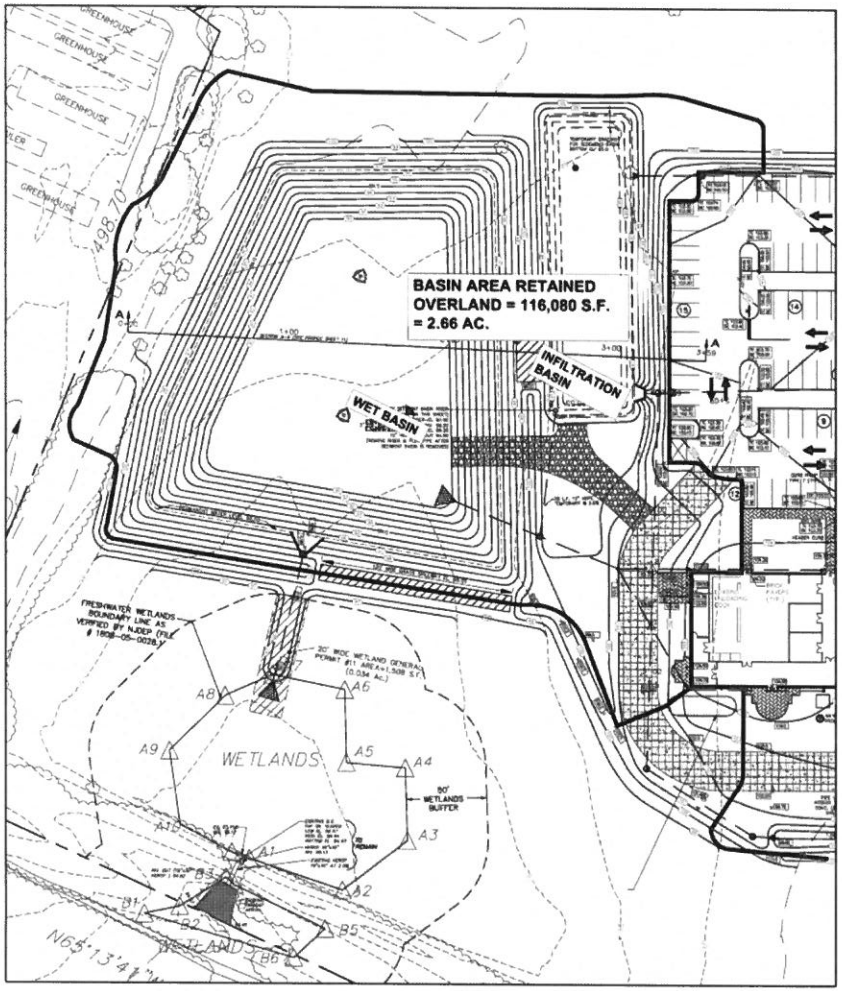
LOT 6.03
BLOCK 36.01
FRANKLIN TOWNSHIP
SOMERSET COUNTY, NEW JERSEY

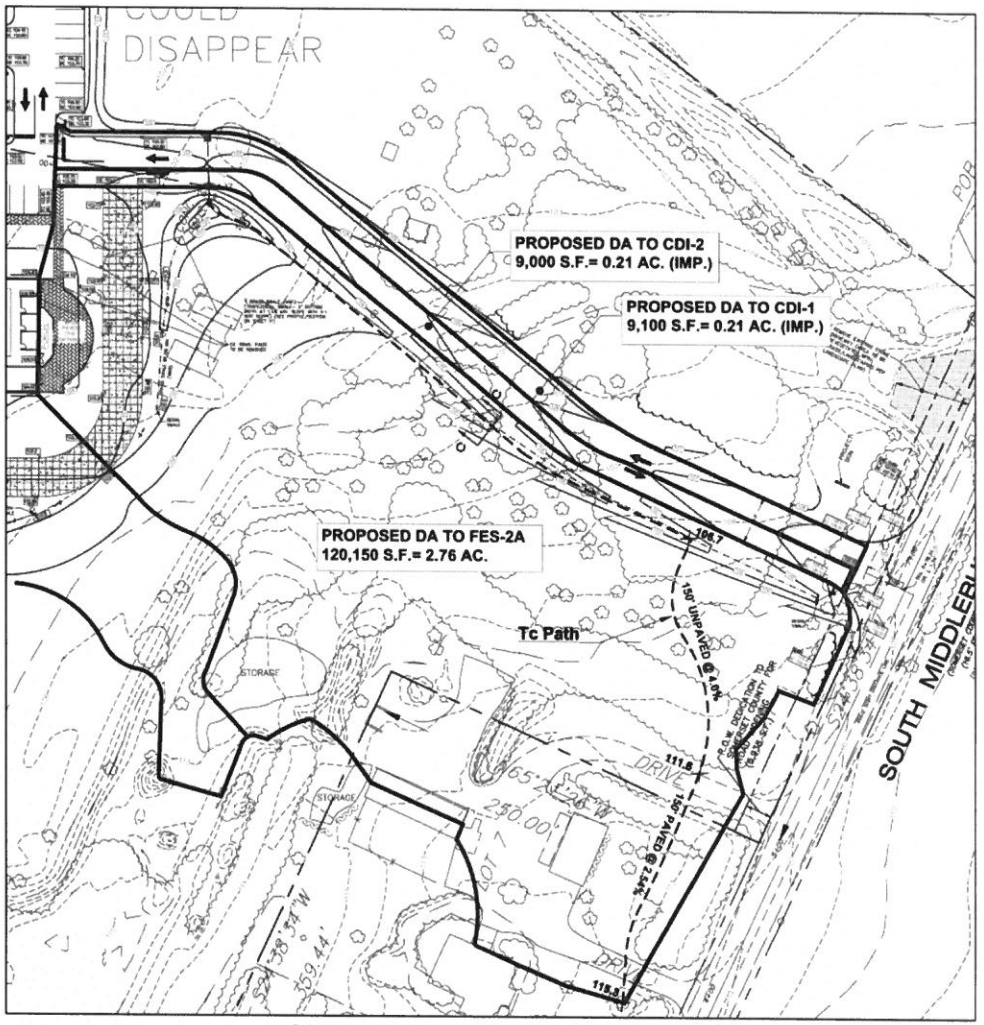
PROPOSED CATCHMENT
MAP (1 of 2)




GRADING OF BASIN

GRAPHIC SCALE

( IN FEET )
1 inch = 30 ft.




GRADING OF ENTRANCE (ACCESS DRIVE)

GRAPHIC SCALE

( IN FEET )
1 inch = 30 ft.

LEGEND

CREST
Engineering Associates Inc.
Civil & Environmental Engineers
Professional Planners • Surveyors • Landscape Architects
• CERTIFICATE OF AUTHORIZATION NO. 24GA27996300 •

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PROPOSED CATCHMENT
MAP (2 of 2)