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State of NJ Certificate of Authorization No. 276726

STORMWATER MANAGEMENT CALCULATIONS

MULTI-STORY MIXED-USE BUILDING

BLOCK 20403, LOTS 1 & 2

682 NJ STATE HIGHWAY ROUTE 440

CITY OF JERSEY CITY

HUDSON COUNTY, NEW JERSEY

PROJECT NO. 20-2206

Robert L. Costa N.J. Lic. No. 34702 & 4639
Professional Engineer and Planner

June 6, 2021
Revised September 30, 2021

NOAA Atlas 14, Volume 2, Version 3
Location name: Jersey City, New Jersey, USA*
Latitude: 40.7202°, Longitude: -74.0925°
Elevation: 9.38 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	4.00 (3.66-4.38)	4.76 (4.37-5.23)	5.65 (5.15-6.20)	6.31 (5.75-6.94)	7.13 (6.46-7.82)	7.70 (6.95-8.46)	8.30 (7.45-9.13)	8.83 (7.87-9.73)	9.50 (8.36-10.5)	10.0 (8.76-11.2)
10-min	3.18 (2.91-3.49)	3.79 (3.47-4.17)	4.51 (4.11-4.95)	5.02 (4.57-5.51)	5.65 (5.12-6.20)	6.09 (5.50-6.69)	6.53 (5.86-7.18)	6.92 (6.17-7.63)	7.43 (6.53-8.23)	7.78 (6.79-8.65)
15-min	2.64 (2.42-2.89)	3.17 (2.90-3.48)	3.78 (3.45-4.15)	4.21 (3.84-4.62)	4.74 (4.30-5.21)	5.12 (4.62-5.63)	5.48 (4.92-6.02)	5.82 (5.18-6.40)	6.22 (5.48-6.89)	6.50 (5.67-7.22)
30-min	1.80 (1.65-1.97)	2.18 (1.99-2.39)	2.67 (2.44-2.93)	3.03 (2.76-3.32)	3.48 (3.16-3.83)	3.82 (3.44-4.19)	4.16 (3.73-4.57)	4.47 (3.98-4.93)	4.89 (4.30-5.41)	5.20 (4.53-5.77)
60-min	1.12 (1.02-1.23)	1.36 (1.25-1.49)	1.71 (1.56-1.87)	1.96 (1.79-2.16)	2.31 (2.10-2.54)	2.58 (2.32-2.83)	2.85 (2.56-3.13)	3.12 (2.78-3.44)	3.49 (3.07-3.86)	3.77 (3.29-4.19)
2-hr	0.688 (0.628-0.760)	0.838 (0.762-0.925)	1.06 (0.964-1.17)	1.23 (1.12-1.36)	1.47 (1.33-1.62)	1.67 (1.49-1.84)	1.87 (1.66-2.06)	2.08 (1.83-2.29)	2.37 (2.06-2.62)	2.60 (2.24-2.89)
3-hr	0.510 (0.466-0.562)	0.620 (0.566-0.685)	0.785 (0.715-0.867)	0.914 (0.830-1.01)	1.09 (0.987-1.21)	1.24 (1.11-1.37)	1.39 (1.24-1.53)	1.55 (1.37-1.71)	1.77 (1.54-1.96)	1.95 (1.68-2.16)
6-hr	0.330 (0.301-0.363)	0.400 (0.366-0.440)	0.504 (0.459-0.553)	0.588 (0.534-0.644)	0.706 (0.637-0.774)	0.805 (0.721-0.882)	0.909 (0.807-0.995)	1.02 (0.897-1.12)	1.18 (1.02-1.30)	1.31 (1.12-1.44)
12-hr	0.200 (0.183-0.220)	0.243 (0.222-0.267)	0.308 (0.281-0.337)	0.361 (0.328-0.395)	0.439 (0.396-0.478)	0.505 (0.452-0.550)	0.576 (0.509-0.627)	0.653 (0.571-0.712)	0.766 (0.657-0.836)	0.860 (0.727-0.942)
24-hr	0.113 (0.104-0.123)	0.137 (0.127-0.149)	0.175 (0.161-0.190)	0.207 (0.191-0.225)	0.255 (0.234-0.276)	0.297 (0.270-0.321)	0.343 (0.308-0.370)	0.394 (0.350-0.426)	0.469 (0.411-0.509)	0.535 (0.462-0.582)
2-day	0.066 (0.061-0.072)	0.080 (0.073-0.087)	0.102 (0.093-0.111)	0.120 (0.110-0.131)	0.147 (0.134-0.160)	0.171 (0.154-0.186)	0.196 (0.176-0.214)	0.224 (0.199-0.245)	0.265 (0.232-0.291)	0.300 (0.258-0.331)
3-day	0.046 (0.043-0.050)	0.056 (0.052-0.061)	0.071 (0.066-0.078)	0.084 (0.077-0.091)	0.103 (0.094-0.112)	0.119 (0.108-0.129)	0.136 (0.122-0.148)	0.155 (0.138-0.169)	0.182 (0.160-0.200)	0.205 (0.178-0.226)
4-day	0.037 (0.034-0.040)	0.044 (0.041-0.048)	0.056 (0.052-0.061)	0.066 (0.061-0.072)	0.081 (0.074-0.087)	0.093 (0.084-0.100)	0.106 (0.096-0.115)	0.120 (0.108-0.131)	0.141 (0.124-0.154)	0.158 (0.138-0.174)
7-day	0.025 (0.023-0.026)	0.029 (0.027-0.032)	0.037 (0.034-0.040)	0.043 (0.040-0.046)	0.051 (0.047-0.055)	0.059 (0.054-0.063)	0.066 (0.060-0.072)	0.075 (0.067-0.081)	0.087 (0.077-0.094)	0.096 (0.084-0.105)
10-day	0.019 (0.018-0.021)	0.023 (0.022-0.025)	0.029 (0.027-0.031)	0.033 (0.031-0.035)	0.039 (0.036-0.042)	0.044 (0.041-0.048)	0.050 (0.045-0.053)	0.055 (0.050-0.060)	0.064 (0.057-0.069)	0.070 (0.062-0.076)
20-day	0.013 (0.012-0.014)	0.016 (0.015-0.017)	0.019 (0.017-0.020)	0.021 (0.020-0.022)	0.024 (0.023-0.026)	0.027 (0.025-0.028)	0.029 (0.027-0.031)	0.032 (0.029-0.034)	0.035 (0.032-0.038)	0.038 (0.035-0.041)
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 (0.024-0.028)	0.028 (0.025-0.029)
45-day	0.009 (0.009-0.010)	0.011 (0.010-0.011)	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)	0.021 (0.019-0.022)	0.022 (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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TABLE 7.1

TYPICAL RUNOFF COEFFICIENTS (C VALUES) FOR 100 YEAR FREQUENCY STORM

TABLE 7.1

TYPICAL RUNOFF COEFFICIENTS (C VALUES) FOR 100 YEAR FREQUENCY STORM

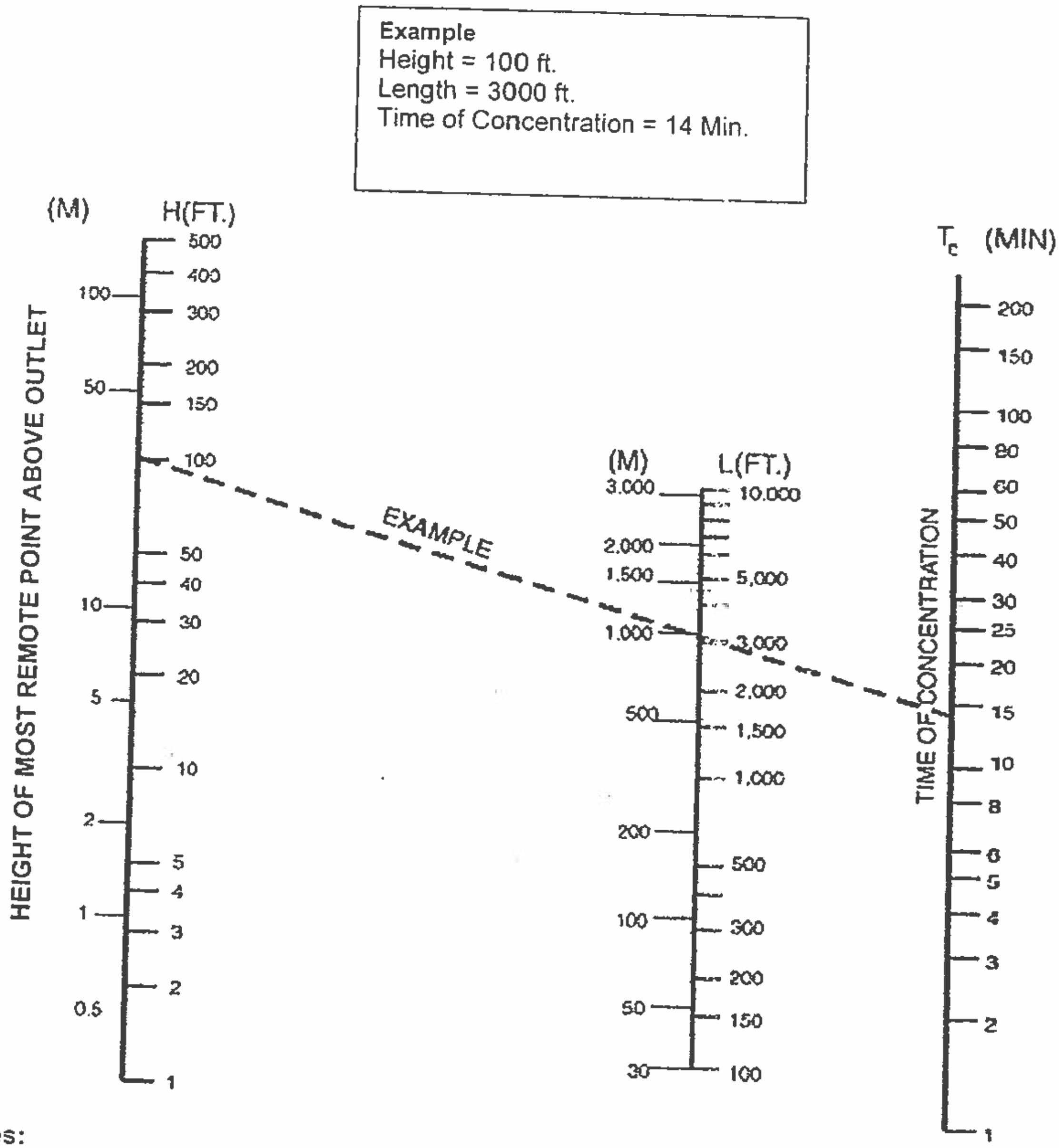
Land Use Description		Hydrologic Soil Group A	B	C	D
Cultivated land:					
without conservation treatment		0.49	0.67	0.81	0.88
with conservation treatment		0.27	0.43	0.61	0.67
Pasture or range land:					
poor condition		0.38	0.63	0.78	0.84
good condition		NA	0.25	0.51	0.65
Meadow: good condition		NA	NA	0.44	0.61
Wood or forest land:					
thin stand, poor cover, no mulch		NA	NA	0.59	0.79
good cover		NA	NA	0.45	0.59
Open spaces, lawns, parks, golf courses, cemeteries:					
good condition, grass cover on 75% or more of area		NA	0.25	0.51	0.65
fair condition, grass cover on 50–75% of area		NA	0.45	0.63	0.74
Commercial and business areas (85% impervious)		0.84	0.90	0.93	0.96
Industrial districts (72% impervious)		0.67	0.81	0.88	0.92
Residential:					
Average lot size	Average impervious				
⅛ acre	65%	0.59	0.76	0.86	0.90
¼ acre	38%	0.25	0.55	0.70	0.80
⅓ acre	30%	NA	0.49	0.67	0.78
½ acre	25%	NA	0.45	0.65	0.76
1 acre	20%	NA	0.41	0.63	0.74
Paved parking lots, roofs, driveways, etc.		0.99	0.99	0.99	0.99
Streets and roads:					
paved with curbs and storm sewers		0.99	0.99	0.99	0.99
gravel		0.57	0.76	0.84	0.88
dirt		0.49	0.69	0.80	0.84

Note: NA denotes information is not available; design engineers should rely on another authoritative source.

Source: New Jersey Department of Environmental Protection, Technical Manual for Land Use Regulation Program, Bureaus of Inland and Coastal Regulations, Stream Encroachment Permits (Trenton, New Jersey: Department of Environmental Protection, Revised September 1995) p. 12.

Figure 7.1

TIME OF CONCENTRATION



Notes:

Use Nomograph T_c for natural basins with well-defined channels, for overland or bare earth, and for mowed grass roadside channels.

For overland flow, grassed surfaces, multiply T_c by 2.

For overland flow, concrete or asphalt surfaces, multiply T_c by 0.4.

For concrete channels, multiply T_c by 0.2 overland flow.

Based on a study by P.Z. Kirpich, Civil Engineering, Vol.10, No.6, June 1940, p. 362.

EXECUTIVE SUMMARY

This project titled “Multi-Story Mixed-Use Building” consists of the new thirteen-story multi-family building consisting of residential dwellings and a parking garage. The project is located in block 20403, lots 1&2 through 19, 682 NJ State Highway Route 404 in the City of Jersey City, Hudson County, New Jersey. Pre-existing conditions and postconditions are shown on the next page.

The Modified Rational Method was used to calculate pre- and post-development peak discharges. Using the required reductions, storage volumes were computed. The 2-year storm produces the greatest storage volume as per the modified rational method. The required storage volume is **1,223** ***ft***^{3}. To comply with the required storage, this project required 120 LF of 36” ADS pipe with chambers at both ends. The detention system has a capacity of 1,956 cu. ft. with a ***circular 6” and 4” orifice*** to provide the necessary reductions in the runoff.

This project complies with the new NJDEP Stormwater Management Regulations. Water quantity standards have been addressed by using a 100-year storm. Water quality standards have been since all parking areas are located internal to the proposed building. At last, the building will have a green roof to address DEP requirements.

All calculations are made part of this report.

Multi-Story Mixed-Use Building

682 NJ State Highway Route 440

Block 20403, Lots 1& 2

City of Jersey City

Hudson County, New Jersey

C1	EXISTING (CFS) C2	REDUCTION (CFS) C3	UN-DETAINED (CFS) C4	ROUTING (CFS) C5	ALLOWABLE (CFS) (C3-C4) C6	STORAGE (CU.FT.) C7
2 YEAR	2.56	50% = 1.28	0.10	1.08	1.18	1,223
10 YEAR	3.39	75% = 2.54	0.13	1.59	2.41	836
100 YEAR	4.42	80% = 3.54	0.16	1.97	3.38	842

STORAGE DATA

ELEVATION (FT)	OUTFLOW (CFS)	STORAGE (CU.FT.)
0.00	0.00	0
0.5	0.5	219
1.00	0.8	575
1.50	1.1	978
2.00	1.5	1,361
2.50	1.8	1,722
3.00	2.0	1,956

SUMMARY OF PEAK OUTFLOW AND PEAK ELEVATION

	PEAK INFLOW (CFS)	PEAK OUTFLOW (CFS)	PEAK ELEVATION (FT)	TOTAL STORAGE IN POND (CU.FT.)
2 YEAR	1.28	1.08	1.47	955
10 YEAR	2.44	1.59	2.15	1,472
100 YEAR	3.41	1.97	2.93	1,923

PRE-EXISTING:

TOTAL: 0.683 Acres
IMPERVIOUS: 0.683 Acres

POST-DEVELOPMENT:

PROPOSED AREA: (UN-DETAINED)
IMPERVIOUS: 0.00154 Acres
GREEN: 0.0247 Acres

(DETAINED):
IMPERVIOUS: 0.66 Acres

Project Name:- Multi -Story Mixed Use Building
Block 20403, Lot 1 & 2
City of Jersey City
Hudson County, New Jersey

	EXISTING CONDITION (CFS)	REDUCTION (CFS)	REDUCTION FLOW (CFS)	UNDETAIN FLOW (CFS)	ALLOWABLE FLOW (CFS)	REQUIRED STORAGE (CU.FT.)
2 YEARS	2.56	50%	1.28	0.10	1.18	1,223
10 YEARS	3.39	75%	2.54	0.13	2.41	836
100 YEARS	4.42	80%	3.54	0.16	3.38	842

Pipe Storage					
ELEVATION	D/D^2	LENGTH (FT.)	D^2 (SQ.FT.)	ROW	TOTAL (CU.FT.)
0.50	0.0811	120	9	2	175.18
1.00	0.2260	120	9	2	488.16
1.50	0.3927	120	9	2	848.23
2.00	0.5499	120	9	2	1187.78
2.50	0.6969	120	9	2	1505.30
3.00	0.7854	120	9	2	1696.46

CHAMBER STORAGE				TOTAL
ELEVATION	LENGTH	WIDTH	NO. OF CHAMBER	CHAMBER STORAGE (CU.FT.)
0.50	10.833333	4	2	43.33
1.00	10.833333	4	2	86.67
1.50	10.833333	4	2	130.00
2.00	10.833333	4	2	173.33
2.50	10.833333	4	2	216.67
3.00	10.833333	4	2	260.00

TOTAL STORAGE			
ELEVATION	PIPE STORAGE	CHAMBER STORAGE	TOTAL STORAGE (Cu.FT.)
0.50	175.18	43.33	219
1.00	488.16	86.67	575
1.50	848.23	130.00	978
2.00	1187.78	173.33	1361
2.50	1505.30	216.67	1722
3.00	1696.46	260.00	1956

Quick TR-55 Ver.5.46 S/N:
Executed: 13:10:20 06-15-2021

PRE DEVELOPMENT ANALYSIS FOR THE 2 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
IMPERVIOUS	0.990	0.68						
			10.00	0.990	0.990	3.790	0.68	2.56

Quick TR-55 Ver.5.46 S/N:
Executed: 13:11:33 06-15-2021

PRE DEVELOPMENT ANALYSIS FOR THE 10 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 10 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
IMPERVIOUS	0.990	0.68						
			10.00	0.990	0.990	5.020	0.68	3.39

Quick TR-55 Ver.5.46 S/N:
Executed: 13:12:41 06-15-2021

PRE DEVELOPMENT ANALYSIS FOR THE 100 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
IMPERVIOUS	0.990	0.68						
			10.00	0.990	0.990	6.530	0.68	4.42

Quick TR-55 Ver.5.46 S/N:
Executed: 13:39:25 06-15-2021

POST DEVELOPMENT ANALYSIS FOR THE 2 YEAR STORM (UNDETAIN AREA)
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

$$Q = adj * C * I * A$$

Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
IMPERVIOUS	0.990	0.00						
GREEN	0.960	0.02						
			10.00	0.962	0.962	3.790	0.03	0.10

Quick TR-55 Ver.5.46 S/N:
Executed: 13:43:11 06-15-2021

POST DEVELOPMENT ANALYSIS FOR THE 10 YEAR STORM (UNDETAIN AREA)
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 10 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
IMPERVIOUS	0.990	0.00						
GREE	0.960	0.02						
			10.00	0.962	0.962	5.020	0.03	0.13

Quick TR-55 Ver.5.46 S/N:
Executed: 13:44:43 06-15-2021

POST DEVELOPMENT ANALYSIS FOR THE 100 YEAR STORM (UNDETAIN AREA)
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
IMPERVIOUS	0.990	0.00						
GREEN	0.960	0.02						
			10.00	0.962	0.962	6.530	0.03	0.16

Quick TR-55 Ver.5.46   S/N:
Executed: 09:58:17   09-30-2021

MODIFIED RATIONAL METHOD

---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

POST DEVELOPMENT ANALYSIS FOR THE 2   YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

```
**********************************************************************
*  RETURN FREQUENCY:   2 yr      |  Allowable Outflow:     1.18 cfs    *
*  'C' Adjustment: 1.000         |  Required Storage:     1,223 cu.ft. *
*--------------------------------------------------------------------*
*  Peak Inflow:    1.28 cfs         Inflow .HYD stored: 2022A2  .HYD   *
**********************************************************************
```

```
   |              Td =  38 minutes                  |  Return Freq:     2 yr
   /------- Approx. Duration for Max. Storage ------/  C adj.factor: 1.00
   |                                                |
   |                                                |
   |               Tc=   10.00  minutes             |
   |               I =   3.790  in/hr               |  Area (ac):      0.66
   |              . Q =   2.48  cfs                 |  Weighted C:     0.99
   |             .|.                                |  Adjusted C:     0.99
 F |            .   .                               |
 L |           .  |  .            Required Storage  |
 O |          .    .         .--      1,223 cu.ft.  |  Td=      38 minutes
 W |         .    |  .         |                    |  I =   1.961 in/hr
   |        .     x x x x x x x|x x x x x x x x x x x  Q =    1.28 cfs
 c |       .                   |
 f |      .    x                                       x
 s |     .                                               o   Q=    1.18 cfs
   |    .   x                             o           |x  (Allow.Outflow)
   |   .  x                       .     o             |
   |  .  x               o       .        NOT TO SCALE |     x
   | . x         o                 .      ============ |
   | o                              .                  |        x
   `---------------------------------------------------|------------
                                                    38.79 minutes
```

Quick TR-55 Ver.5.46 S/N:
Executed: 09:58:17 09-30-2021

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

POST DEVELOPMENT ANALYSIS FOR THE 2 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

RETURN FREQUENCY: 2 yr `C' Adjustment = 1.000 Allowable Q = 1.18 cfs

Hydrograph file duration= 38.00 minutes
Hydrograph file: 2022A2 .HYD Tc = 10.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	VOLUMES Storage (cu.ft.)
0.990	0.990	10	3.790	0.66	2.48	1,486	778
0.990	0.990	15	3.170	0.66	2.07	1,864	979
0.990	0.990	20	2.840	0.66	1.86	2,227	1,165
0.990	0.990	30	2.180	0.66	1.42	2,564	1,148
Storage Maximum							
0.990	0.990	38	1.961	0.66	1.28	2,922	1,223
0.990	0.990	40	1.907	0.66	1.25	2,990	1,220
0.990	0.990	50	1.633	0.66	1.07	Qpeak < Qallow	

Quick TR-55 Ver.5.46 S/N:
Executed: 09:58:17 09-30-2021

```
************************************************************************
************************************************************************
*                                                                      *
*                                                                      *
*                       MODIFIED RATIONAL METHOD                       *
*          ---- Grand Summary For All Storm Frequencies ----           *
*                                                                      *
*                                                                      *
************************************************************************
************************************************************************
```

First peak outflow point assumed to occur at inflow recession leg.

POST DEVELOPMENT ANALYSIS FOR THE 2 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

Area = 0.66 acres Tc = 10.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (cu.ft.)	VOLUMES Storage (cu.ft.)
2	0.990	38	1.961	1.28	1.18	2,922	1,223

Quick TR-55 Ver.5.46 S/N:
Executed: 09:58:17 09-30-2021

POST DEVELOPMENT ANALYSIS FOR THE 2 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 2 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
IMPERVIOUS	0.990	0.66						
			10.00	0.990	0.990	3.790	0.66	2.48

Quick TR-55 Ver.5.46 S/N:
Executed: 09:58:17 09-30-2021

POST DEVELOPMENT ANALYSIS FOR THE 2 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

**** Modified Rational Hydrograph *****

Weighted C = 0.990 Area= 0.660 acres Tc = 10.00 minutes

Adjusted C = 0.990 Td= 38.00 min. I= 1.96 in/hr Qp= 1.28 cfs

RETURN FREQUENCY: 2 year storm Adj.factor = 1.00
Output file: 2022A2 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 2 Year Storm

Time Hours	Time increment = 0.017 Hours Time on left represents time for first Q in each row.						
0.000	0.00	0.13	0.26	0.38	0.51	0.64	0.77
0.117	0.90	1.03	1.15	1.28	1.28	1.28	1.28
0.233	1.28	1.28	1.28	1.28	1.28	1.28	1.28
0.350	1.28	1.28	1.28	1.28	1.28	1.28	1.28
0.467	1.28	1.28	1.28	1.28	1.28	1.28	1.28
0.583	1.28	1.28	1.28	1.28	1.15	1.03	0.90
0.700	0.77	0.64	0.51	0.38	0.26	0.13	0.00

Quick TR-55 Ver.5.46   S/N:
Executed: 10:08:27   09-30-2021

MODIFIED RATIONAL METHOD

---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

POST DEVELOPMENT ANALYSIS FOR THE 10 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

```
 ***********************************************************************
 *  RETURN FREQUENCY:  10 yr     |  Allowable Outflow:     2.41 cfs    *
 *  'C' Adjustment: 1.000        |  Required Storage:       836 cu.ft. *
 *---------------------------------------------------------------------*
 *  Peak Inflow:   2.44 cfs         Inflow .HYD stored: 2022A10 .HYD   *
 ***********************************************************************

     |               Td =  21 minutes                  |  Return Freq:    10 yr
    /------- Approx. Duration for Max. Storage ------/   C adj.factor: 1.00
     |                                                 |
     |                                                 |
     |                Tc=   10.00  minutes             |
     |                I =   5.020  in/hr               |  Area (ac):      0.66
     |              . Q =    3.28  cfs                 |  Weighted C:     0.99
     |             .|.                                 |  Adjusted C:     0.99
 F   |            .   .                                |
 L   |           .  |  .             Required Storage  |
 O   |          .       .         .--      836 cu.ft.  |  Td=       21 minutes
 W   |         .    |    .        |                    |  I =   3.738 in/hr
     |        .     x x x x x x x|x x x x x x x x x x x  Q =    2.44 cfs
 c   |       .                    |
 f   |      .   x                                         x
 s   |     .                                                o   Q=    2.41 cfs
     |    .  x                                 o           |x  (Allow.Outflow)
     |   .  x                  .       o                   |
     |  .  x           o        .        NOT TO SCALE      |     x
     | . x       o               .       ============      |
     | o                          .                        |        x
     `-----------------------------------------------------|------------
                                                      21.13 minutes
```

Quick TR-55 Ver.5.46 S/N:
Executed: 10:08:27 09-30-2021

POST DEVELOPMENT ANALYSIS FOR THE 10 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

**** Modified Rational Hydrograph *****

Weighted C = 0.990 Area= 0.660 acres Tc = 10.00 minutes

Adjusted C = 0.990 Td= 21.00 min. I= 3.74 in/hr Qp= 2.44 cfs

RETURN FREQUENCY: 10 year storm Adj.factor = 1.00
Output file: 2022A10 .HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 10 Year Storm

Time Hours	Time increment = 0.017 Hours Time on left represents time for first Q in each row.						
0.000	0.00	0.24	0.49	0.73	0.98	1.22	1.47
0.117	1.71	1.95	2.20	2.44	2.44	2.44	2.44
0.233	2.44	2.44	2.44	2.44	2.44	2.44	2.44
0.350	2.44	2.20	1.95	1.71	1.47	1.22	0.98
0.467	0.73	0.49	0.24	0.00			

Quick TR-55 Ver.5.46 S/N:
Executed: 10:08:27 09-30-2021

POST DEVELOPMENT ANALYSIS FOR THE 10 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 10 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
IMPERVIOUS	0.990	0.66						
			10.00	0.990	0.990	5.020	0.66	3.28

Quick TR-55 Ver.5.46 S/N:
Executed: 10:08:27 09-30-2021

****
****

MODIFIED RATIONAL METHOD

---- Grand Summary For All Storm Frequencies ----

****
****

First peak outflow point assumed to occur at inflow recession leg.

POST DEVELOPMENT ANALYSIS FOR THE 10 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

Area = 0.66 acres Tc = 10.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (cu.ft.)	VOLUMES Storage (cu.ft.)
10	0.990	21	3.738	2.44	2.41	3,077	836

Quick TR-55 Ver.5.46   S/N:
Executed: 10:08:27   09-30-2021

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

POST DEVELOPMENT ANALYSIS FOR THE 10 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

RETURN FREQUENCY: 10 yr   `C' Adjustment = 1.000   Allowable Q = 2.41 cfs

Hydrograph file duration= 21.00 minutes
Hydrograph file: 2022A10 .HYD   Tc = 10.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
0.990	0.990	10	5.020	0.66	3.28	1,968	522
0.990	0.990	15	4.210	0.66	2.75	2,476	668
0.990	0.990	20	3.817	0.66	2.49	2,993	824
***** Storage Maximum							
0.990	0.990	21	3.738	0.66	2.44	3,077	836
0.990	0.990	30	3.030	0.66	1.98	Qpeak < Qallow	

Quick TR-55 Ver.5.46   S/N:
Executed: 10:08:47   09-30-2021

MODIFIED RATIONAL METHOD

---- Graphical Summary for Maximum Required Storage ----

First peak outflow point assumed to occur at inflow recession leg.

POST DEVELOPMENT ANALYSIS FOR THE 100 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

```
**********************************************************************
*  RETURN FREQUENCY: 100 yr  |  Allowable Outflow:    3.38 cfs    *
*  'C' Adjustment: 1.000     |  Required Storage:      842 cu.ft. *
*--------------------------------------------------------------------*
*  Peak Inflow:    3.41 cfs     Inflow .HYD stored: 2022A100.HYD   *
**********************************************************************
```

```
   |               Td =  18 minutes                         |  Return Freq:   100 yr
   /------- Approx. Duration for Max. Storage ------/  C adj.factor: 1.00
   |                                                        |
   |                                                        |
   |                Tc=   10.00  minutes                    |
   |                I =   6.530  in/hr                      |  Area (ac):      0.66
   |              . Q =    4.27  cfs                        |  Weighted C:     0.99
   |             .|.                                        |  Adjusted C:     0.99
F  |            .   .                                       |
L  |           .  |  .              Required Storage        |
O  |          .       .        .--         842 cu.ft.       |  Td=       18 minutes
W  |         .    |    .       |                            |  I =   5.216 in/hr
   |        .     x x x x x x x|x x x x x x x x x x x       Q =    3.41 cfs
C  |       .                   |
f  |      .    x                                               x
s  |     .                                                       o   Q=    3.38 cfs
   |    .   x                                o                   |x  (Allow.Outflow)
   |   .  x                   .     o                            |
   |  .  x           o    .         NOT TO SCALE                 |   x
   | . x       o           .        ============                 |
   | o                      .                                    |      x
   `-------------------------------------------------------------|-----------
                                                     18.08 minutes
```

Quick TR-55 Ver.5.46 S/N:
Executed: 10:08:47 09-30-2021

POST DEVELOPMENT ANALYSIS FOR THE 100 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

**** Modified Rational Hydrograph *****

Weighted C = 0.990 Area= 0.660 acres Tc = 10.00 minutes

Adjusted C = 0.990 Td= 18.00 min. I= 5.22 in/hr Qp= 3.41 cfs

RETURN FREQUENCY: 100 year storm Adj.factor = 1.00
Output file: 2022A100.HYD

HYDROGRAPH FOR MAXIMUM STORAGE
For the 100 Year Storm

Time increment = 0.017 Hours
Time on left represents time for first Q in each row.

Time Hours							
0.000	0.00	0.34	0.68	1.02	1.36	1.70	2.04
0.117	2.39	2.73	3.07	3.41	3.41	3.41	3.41
0.233	3.41	3.41	3.41	3.41	3.41	3.07	2.73
0.350	2.39	2.04	1.70	1.36	1.02	0.68	0.34
0.467	0.00						

Quick TR-55 Ver.5.46 S/N:
Executed: 10:08:47 09-30-2021

POST DEVELOPMENT ANALYSIS FOR THE 100 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

* * * * * * SUMMARY OF RATIONAL METHOD PEAK DISCHARGES * * * * * *

Q = adj * C * I * A
Where: Q=cfs, C=Weighted Runoff Coefficient, I=in/hour, A=acres
adj = 'C' adjustment factor for each return frequency

RETURN FREQUENCY = 100 years
`C' adjustment, k = 1
Adj. 'C' = Wtd.'C' x 1

Subarea Descr.	Runoff 'C'	Area acres	Tc (min)	Wtd. 'C'	Adj. 'C'	I in/hr	Total acres	Peak Q (cfs)
IMPERVIOUS	0.990	0.66						
			10.00	0.990	0.990	6.530	0.66	4.27

Quick TR-55 Ver.5.46 S/N:
Executed: 10:08:47 09-30-2021

```
***************************************************************************
***************************************************************************
*                                                                         *
*                                                                         *
*                        MODIFIED RATIONAL METHOD                         *
*           ---- Grand Summary For All Storm Frequencies ----             *
*                                                                         *
*                                                                         *
***************************************************************************
***************************************************************************
```

First peak outflow point assumed to occur at inflow recession leg.

POST DEVELOPMENT ANALYSIS FOR THE 100 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

Area = 0.66 acres   Tc = 10.00 minutes

Frequency (years)	Adjusted 'C'	Duration minutes	Intens. in/hr	Qpeak cfs	Allowable cfs	VOLUMES Inflow (cu.ft.)	Storage (cu.ft.)
100	0.990	18	5.216	3.41	3.38	3,681	842

Quick TR-55 Ver.5.46 S/N:
Executed: 10:08:47 09-30-2021

MODIFIED RATIONAL METHOD
---- Summary for Single Storm Frequency ----

First peak outflow point assumed to occur at inflow recession leg.

POST DEVELOPMENT ANALYSIS FOR THE 100 YEAR STORM
MULTI STORY MIXED USE BLDG., BL 20403, LOT 1 & 2
682 NJ STATE HIGHWAY RT 440, JERSEY CITY, NJ

RETURN FREQUENCY: 100 yr `C' Adjustment = 1.000 Allowable Q = 3.38 cfs

Hydrograph file duration= 18.00 minutes
Hydrograph file: 2022A100.HYD Tc = 10.00 minutes

Weighted `C'	Adjusted 'C'	Duration minutes	Intens. in/hr	Areas acres	Qpeak cfs	VOLUMES Inflow (cu.ft.)	VOLUMES Storage (cu.ft.)
0.990	0.990	10	6.530	0.66	4.27	2,560	532
0.990	0.990	15	5.480	0.66	3.58	3,223	688
****** Storage Maximum							
0.990	0.990	18	5.216	0.66	3.41	3,681	842
0.990	0.990	20	5.040	0.66	3.29	Qpeak < Qallow	

Outlet Structure File: 2021   .STR

POND-2 Version: 5.21   S/N:
Date Executed: Time Executed:

****

OUTLET STRUCTURE FOR 682 NJ STATE HIGHWAY ROUTE 440
BLOCK 20403, LOT 1 & 2
CITY OF JERSEY CITY, HUDSON COUNTY, NJ

****

***** COMPOSITE OUTFLOW SUMMARY ****

Elevation (ft)	Q (cfs)	Contributing Structures
0.00	0.0	
0.50	0.5	1
1.00	0.8	1
1.50	1.1	1
2.00	1.5	2 +1
2.50	1.8	2 +1
3.00	2.0	2 +1

```
Outlet Structure File: 2021    .STR

POND-2 Version: 5.21            S/N:
Date Executed:                  Time Executed:


  ***************************************************
  OUTLET STRUCTURE FOR 682 NJ STATE HIGHWAY ROUTE 440
               BLOCK 20403, LOT 1 & 2
        CITY OF JERSEY CITY, HUDSON COUNTY, NJ

  ***************************************************


 Outlet Structure File:    C:\PONDPACK\2021    .STR
 Planimeter Input File:     *** NONE ***
 Rating Table Output File: C:\PONDPACK\2021    .PND

Min. Elev.(ft) = 0   Max. Elev.(ft) = 3   Incr.(ft) = .5

   Additional elevations (ft) to be included in table:
   * * * * * * * * * * * * * * * * * * * * * * * * * *



     **********************************************
                  SYSTEM CONNECTIVITY
     **********************************************

          Structure     No.   Q Table   Q Table
          ----------    ---   ------    -------
          ORIFICE        2           ->   2
          ORIFICE        1           ->   1

Outflow rating table summary was stored in file:
C:\PONDPACK\2021    .PND
```

Outlet Structure File: 2021   .STR

POND-2 Version: 5.21   S/N:
Date Executed: Time Executed:

****
OUTLET STRUCTURE FOR 682 NJ STATE HIGHWAY ROUTE 440
BLOCK 20403, LOT 1 & 2
CITY OF JERSEY CITY, HUDSON COUNTY, NJ

****

>>>>>> Structure No. 2 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	1.7266
E2 elev.(ft)?	3.001
Orifice coeff.?	0.6
Invert elev.(ft)?	1.56
Datum elev.(ft) ?	1.7266
Orifice area (sq ft)?	0.087266

Outlet Structure File: 2021   .STR

POND-2 Version: 5.21   S/N:
Date Executed: Time Executed:

****
OUTLET STRUCTURE FOR 682 NJ STATE HIGHWAY ROUTE 440
BLOCK 20403, LOT 1 & 2
CITY OF JERSEY CITY, HUDSON COUNTY, NJ

****

>>>>>> Structure No. 1 <<<<<<
(Input Data)

ORIFICE
Orifice - Based on Area and Datum Elevation

E1 elev.(ft)?	0.25
E2 elev.(ft)?	3.001
Orifice coeff.?	0.6
Invert elev.(ft)?	0
Datum elev.(ft) ?	0.25
Orifice area (sq ft)?	0.19635

Outlet Structure File: 2021 .STR

POND-2 Version: 5.21 S/N:
Date Executed: Time Executed:

****
OUTLET STRUCTURE FOR 682 NJ STATE HIGHWAY ROUTE 440
BLOCK 20403, LOT 1 & 2
CITY OF JERSEY CITY, HUDSON COUNTY, NJ

****

Outflow Rating Table for Structure #2
ORIFICE Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
0.00	0.0	E < E1=1.7266
0.50	0.0	E < E1=1.7266
1.00	0.0	E < E1=1.7266
1.50	0.0	E < E1=1.7266
2.00	0.2	H =.273
2.50	0.4	H =.773
3.00	0.5	H =1.273

C = .6 A = .087266 sq.ft.
H (ft) = Table elev. - Datum elev. (1.7266 ft)
Q (cfs) = C * A * sqr(2g * H)

Outlet Structure File: 2021   .STR

POND-2 Version: 5.21   S/N:
Date Executed: Time Executed:

****

OUTLET STRUCTURE FOR 682 NJ STATE HIGHWAY ROUTE 440
BLOCK 20403, LOT 1 & 2
CITY OF JERSEY CITY, HUDSON COUNTY, NJ

****

Outflow Rating Table for Structure #1
ORIFICE   Orifice - Based on Area and Datum Elevation

Elevation (ft)	Q (cfs)	Computation Messages
0.00	0.0	E < E1=0.25
0.50	0.5	H =.25
1.00	0.8	H =.750
1.50	1.1	H =1.25
2.00	1.3	H =1.75
2.50	1.4	H =2.25
3.00	1.6	H =2.75

C = .6   A = .19635 sq.ft.
H (ft) = Table elev. - Datum elev. (.25 ft)
Q (cfs) = C * A * sqr(2g * H)

```
************************************************************
*                                                          *
* OUTLET STRUCTURE FOR 682 NJ STATE HIGHWAY ROUTE 440      *
*               BLOCK 20403, LOT 1 & 2                     *
*        CITY OF JERSEY CITY, HUDSON COUNTY, NJ            *
*                                                          *
*                                                          *
************************************************************
```

Inflow Hydrograph: C:\PONDPACK\2022A2 .HYD
Rating Table file: C:\PONDPACK\2021 .PND

----INITIAL CONDITIONS----
Elevation = 0.00 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA / INTERMEDIATE ROUTING COMPUTATIONS

ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + 0 (cfs)
0.00	0.0	0	0.0	0.0
0.50	0.5	219	7.3	7.8
1.00	0.8	575	19.2	20.0
1.50	1.1	978	32.6	33.7
2.00	1.5	1,361	45.4	46.9
2.50	1.8	1,722	57.4	59.2
3.00	2.0	1,956	65.2	67.2

Time increment (t) = 0.017 hrs.

EXECUTED: 09-30-2021 10:19:00

Pond File: C:\PONDPACK\2021 .PND
Inflow Hydrograph: C:\PONDPACK\2022A2 .HYD
Outflow Hydrograph: C:\PONDPACK\OUT .HYD

INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.000	0.00	-----	0.0	0.0	0.00	0.00
0.017	0.13	0.1	0.1	0.1	0.01	0.01
0.033	0.26	0.4	0.4	0.5	0.03	0.03
0.050	0.38	0.6	0.9	1.1	0.07	0.07
0.067	0.51	0.9	1.6	1.8	0.12	0.12
0.083	0.64	1.2	2.4	2.7	0.18	0.18
0.100	0.77	1.4	3.3	3.8	0.24	0.24
0.117	0.90	1.7	4.3	5.0	0.32	0.32
0.133	1.03	1.9	5.5	6.3	0.40	0.40
0.150	1.15	2.2	6.7	7.7	0.49	0.49
0.167	1.28	2.4	8.0	9.1	0.53	0.55
0.183	1.28	2.6	9.5	10.6	0.57	0.61
0.200	1.28	2.6	10.8	12.0	0.60	0.67
0.217	1.28	2.6	12.1	13.4	0.64	0.73
0.233	1.28	2.6	13.3	14.7	0.67	0.78
0.250	1.28	2.6	14.5	15.9	0.70	0.83
0.267	1.28	2.6	15.6	17.0	0.73	0.88
0.283	1.28	2.6	16.6	18.1	0.76	0.93
0.300	1.28	2.6	17.6	19.2	0.78	0.97
0.317	1.28	2.6	18.6	20.2	0.81	1.01
0.333	1.28	2.6	19.5	21.1	0.83	1.04
0.350	1.28	2.6	20.4	22.1	0.85	1.08
0.367	1.28	2.6	21.2	22.9	0.86	1.11
0.383	1.28	2.6	22.0	23.7	0.88	1.14
0.400	1.28	2.6	22.7	24.5	0.90	1.17
0.417	1.28	2.6	23.5	25.3	0.92	1.19
0.433	1.28	2.6	24.2	26.0	0.93	1.22
0.450	1.28	2.6	24.8	26.7	0.95	1.25
0.467	1.28	2.6	25.5	27.4	0.96	1.27
0.483	1.28	2.6	26.1	28.0	0.98	1.29
0.500	1.28	2.6	26.7	28.6	0.99	1.32
0.517	1.28	2.6	27.2	29.2	1.00	1.34
0.533	1.28	2.6	27.7	29.8	1.01	1.36
0.550	1.28	2.6	28.2	30.3	1.03	1.38
0.567	1.28	2.6	28.7	30.8	1.04	1.40
0.583	1.28	2.6	29.2	31.3	1.05	1.41
0.600	1.28	2.6	29.6	31.8	1.06	1.43
0.617	1.28	2.6	30.1	32.2	1.07	1.45
0.633	1.28	2.6	30.5	32.6	1.08	1.46
0.650	1.15	2.4	30.7	32.9	1.08	1.47
0.667	1.03	2.2	30.8	32.9	1.08	1.47
0.683	0.90	1.9	30.5	32.7	1.08	1.46
0.700	0.77	1.7	30.1	32.2	1.07	1.45
0.717	0.64	1.4	29.4	31.5	1.05	1.42
0.733	0.51	1.2	28.5	30.5	1.03	1.38

Pond File: C:\PONDPACK\2021 .PND
Inflow Hydrograph: C:\PONDPACK\2022A2 .HYD
Outflow Hydrograph: C:\PONDPACK\OUT .HYD

INFLOW HYDROGRAPH — ROUTING COMPUTATIONS

TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.750	0.38	0.9	27.3	29.3	1.01	1.34
0.767	0.26	0.6	26.0	28.0	0.98	1.29
0.783	0.13	0.4	24.5	26.4	0.94	1.24
0.800	0.00	0.1	22.9	24.7	0.90	1.17

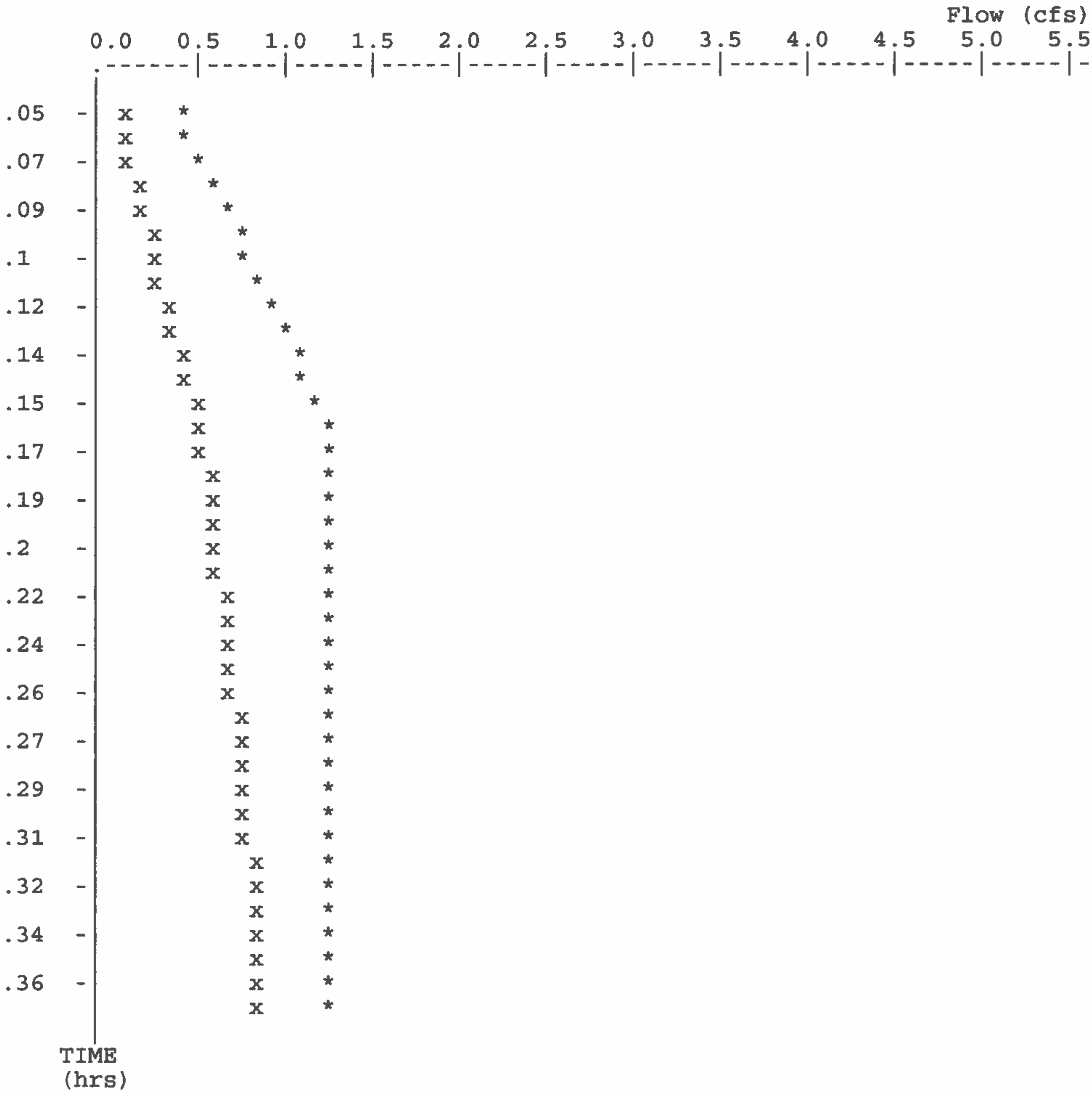
****************** SUMMARY OF ROUTING COMPUTATIONS ******************

```
Pond File:          C:\PONDPACK\2021     .PND
Inflow Hydrograph:  C:\PONDPACK\2022A2   .HYD
Outflow Hydrograph: C:\PONDPACK\OUT      .HYD

Starting Pond W.S. Elevation =     0.00 ft

         ***** Summary of Peak Outflow and Peak Elevation *****

                      Peak Inflow    =     1.28 cfs
                      Peak Outflow   =     1.08 cfs
                      Peak Elevation =     1.47 ft

           ***** Summary of Approximate Peak Storage *****

               Initial Storage          =          0 cu-ft
               Peak Storage From Storm  =        955 cu-ft
                                           ---------------
               Total Storage in Pond    =        955 cu-ft
```

Pond File: C:\PONDPACK\2021 .PND
Inflow Hydrograph: C:\PONDPACK\2022A2 .HYD
Outflow Hydrograph: C:\PONDPACK\OUT .HYD

EXECUTED: 09-30-2021
10:19:00

Peak Inflow = 1.28 cfs
Peak Outflow = 1.08 cfs
Peak Elevation = 1.47 ft



x File: C:\PONDPACK\OUT .HYD Qmax = 1.1 cfs
* File: C:\PONDPACK\2022A2 .HYD Qmax = 1.3 cfs

OUTLET STRUCTURE FOR 682 NJ STATE HIGHWAY ROUTE 440
BLOCK 20403, LOT 1 & 2
CITY OF JERSEY CITY, HUDSON COUNTY, NJ

Inflow Hydrograph: C:\PONDPACK\2022A10 .HYD
Rating Table file: C:\PONDPACK\2021 .PND

----INITIAL CONDITIONS----
Elevation = 0.00 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + 0 (cfs)
0.00	0.0	0	0.0	0.0
0.50	0.5	219	7.3	7.8
1.00	0.8	575	19.2	20.0
1.50	1.1	978	32.6	33.7
2.00	1.5	1,361	45.4	46.9
2.50	1.8	1,722	57.4	59.2
3.00	2.0	1,956	65.2	67.2

Time increment (t) = 0.017 hrs.

POND-2 Version: 5.21 S/N:
EXECUTED: 09-30-2021 10:25:37

Pond File: C:\PONDPACK\2021 .PND
Inflow Hydrograph: C:\PONDPACK\2022A10 .HYD
Outflow Hydrograph: C:\PONDPACK\OUT .HYD

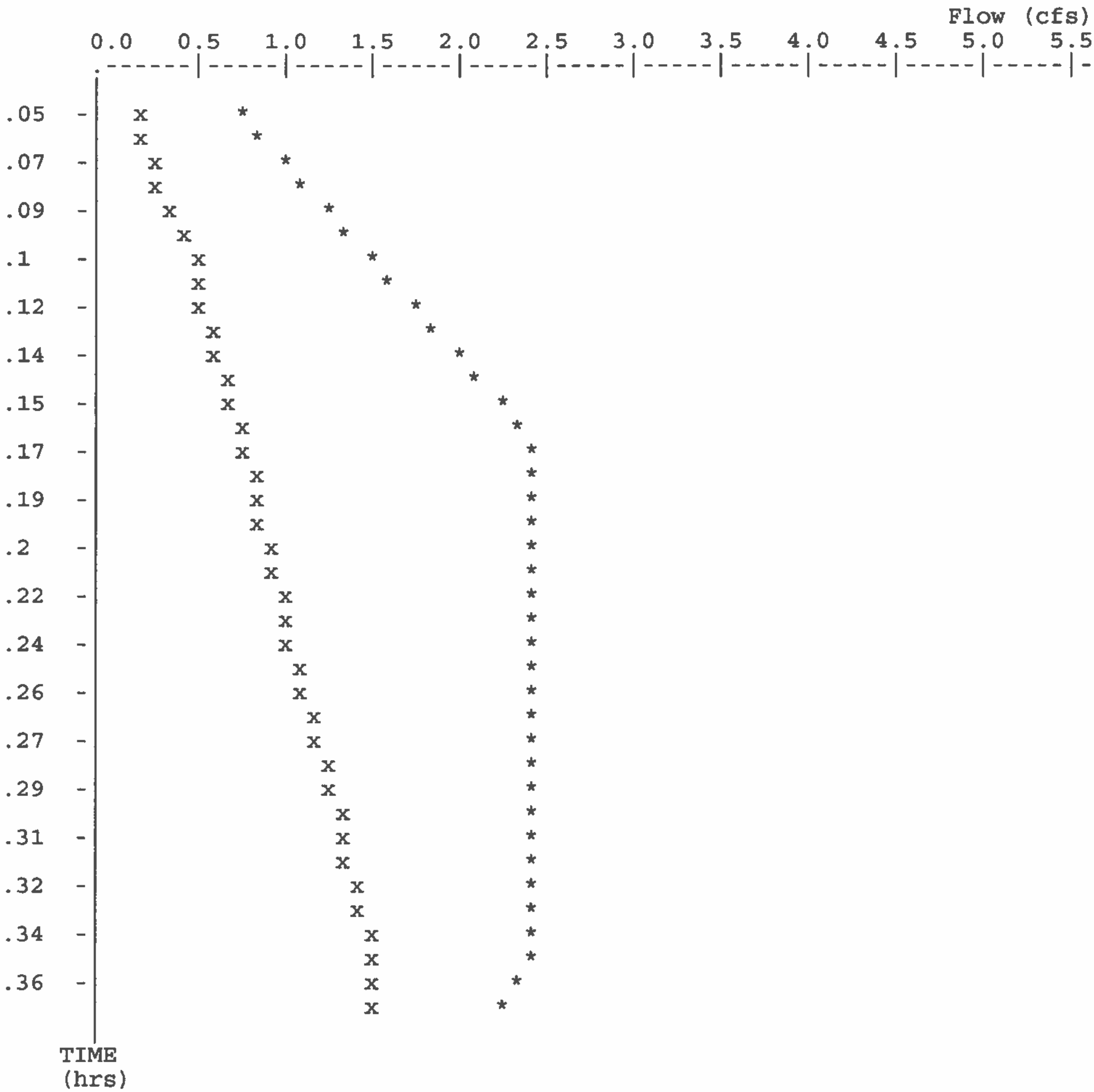
INFLOW HYDROGRAPH | ROUTING COMPUTATIONS

TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.000	0.00	-----	0.0	0.0	0.00	0.00
0.017	0.24	0.2	0.2	0.2	0.02	0.02
0.033	0.49	0.7	0.8	0.9	0.06	0.06
0.050	0.73	1.2	1.8	2.0	0.13	0.13
0.067	0.98	1.7	3.0	3.5	0.22	0.22
0.083	1.22	2.2	4.6	5.2	0.34	0.34
0.100	1.47	2.7	6.3	7.3	0.47	0.47
0.117	1.71	3.2	8.4	9.5	0.54	0.57
0.133	1.95	3.7	10.9	12.1	0.61	0.68
0.150	2.20	4.2	13.7	15.0	0.68	0.80
0.167	2.44	4.6	16.8	18.3	0.76	0.93
0.183	2.44	4.9	20.0	21.7	0.84	1.06
0.200	2.44	4.9	23.1	24.9	0.91	1.18
0.217	2.44	4.9	26.0	27.9	0.97	1.29
0.233	2.44	4.9	28.8	30.9	1.04	1.40
0.250	2.44	4.9	31.5	33.7	1.10	1.50
0.267	2.44	4.9	34.0	36.4	1.18	1.60
0.283	2.44	4.9	36.4	38.9	1.26	1.70
0.300	2.44	4.9	38.6	41.2	1.33	1.79
0.317	2.44	4.9	40.7	43.5	1.40	1.87
0.333	2.44	4.9	42.6	45.5	1.46	1.95
0.350	2.44	4.9	44.5	47.5	1.52	2.03
0.367	2.20	4.6	46.0	49.1	1.56	2.09
0.383	1.95	4.2	47.0	50.2	1.58	2.13
0.400	1.71	3.7	47.5	50.7	1.59	2.15
0.417	1.47	3.2	47.5	50.6	1.59	2.15
0.433	1.22	2.7	47.0	50.2	1.58	2.13
0.450	0.98	2.2	46.1	49.2	1.56	2.09
0.467	0.73	1.7	44.7	47.8	1.52	2.04
0.483	0.49	1.2	43.0	46.0	1.47	1.97
0.500	0.24	0.7	40.9	43.7	1.41	1.88
0.517	0.00	0.2	38.5	41.2	1.33	1.78

****************** SUMMARY OF ROUTING COMPUTATIONS ******************

```
Pond File:          C:\PONDPACK\2021     .PND
Inflow Hydrograph:  C:\PONDPACK\2022A10  .HYD
Outflow Hydrograph: C:\PONDPACK\OUT      .HYD

Starting Pond W.S. Elevation =    0.00 ft

         ***** Summary of Peak Outflow and Peak Elevation *****

                      Peak Inflow    =     2.44 cfs
                      Peak Outflow   =     1.59 cfs
                      Peak Elevation =     2.15 ft

           ***** Summary of Approximate Peak Storage *****

               Initial Storage          =          0 cu-ft
               Peak Storage From Storm  =      1,472 cu-ft
                                          ---------------
               Total Storage in Pond    =      1,472 cu-ft
```

```
Pond File:           C:\PONDPACK\2021     .PND
Inflow Hydrograph:   C:\PONDPACK\2022A10  .HYD
Outflow Hydrograph:  C:\PONDPACK\OUT      .HYD
                                              EXECUTED: 09-30-2021
Peak Inflow    =      2.44 cfs                          10:25:37
Peak Outflow   =      1.59 cfs
Peak Elevation =      2.15 ft
```




```
x  File:  C:\PONDPACK\OUT      .HYD   Qmax =     1.6 cfs
*  File:  C:\PONDPACK\2022A10  .HYD   Qmax =     2.4 cfs
```

EXECUTED: 09-30-2021 10:22:57

```
************************************************************
*                                                          *
* OUTLET STRUCTURE FOR 682 NJ STATE HIGHWAY ROUTE 440      *
*                BLOCK 20403, LOT 1 & 2                    *
*        CITY OF JERSEY CITY, HUDSON COUNTY, NJ            *
*                                                          *
*                                                          *
************************************************************
```

Inflow Hydrograph: C:\PONDPACK\2022A100.HYD
Rating Table file: C:\PONDPACK\2021 .PND

----INITIAL CONDITIONS----
Elevation = 0.00 ft
Outflow = 0.00 cfs
Storage = 0 cu-ft

GIVEN POND DATA			INTERMEDIATE ROUTING COMPUTATIONS	
ELEVATION (ft)	OUTFLOW (cfs)	STORAGE (cu-ft)	2S/t (cfs)	2S/t + 0 (cfs)
0.00	0.0	0	0.0	0.0
0.50	0.5	219	7.3	7.8
1.00	0.8	575	19.2	20.0
1.50	1.1	978	32.6	33.7
2.00	1.5	1,361	45.4	46.9
2.50	1.8	1,722	57.4	59.2
3.00	2.0	1,956	65.2	67.2

Time increment (t) = 0.017 hrs.

Pond File: C:\PONDPACK\2021 .PND
Inflow Hydrograph: C:\PONDPACK\2022A100.HYD
Outflow Hydrograph: C:\PONDPACK\OUT .HYD

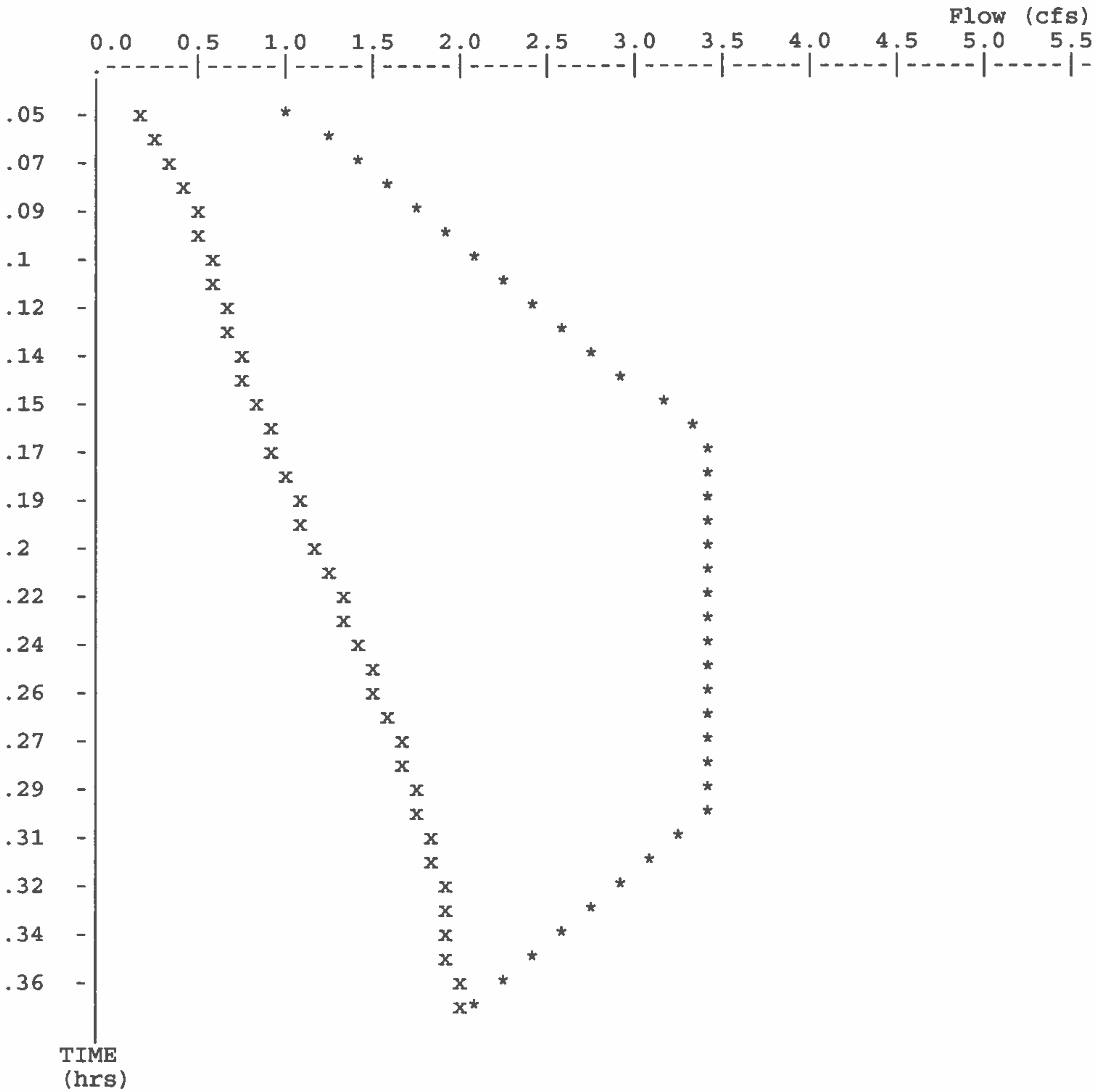
INFLOW HYDROGRAPH		ROUTING COMPUTATIONS				
TIME (hrs)	INFLOW (cfs)	I1+I2 (cfs)	2S/t - O (cfs)	2S/t + O (cfs)	OUTFLOW (cfs)	ELEVATION (ft)
0.000	0.00	-----	0.0	0.0	0.00	0.00
0.017	0.34	0.3	0.3	0.3	0.02	0.02
0.033	0.68	1.0	1.1	1.3	0.08	0.08
0.050	1.02	1.7	2.5	2.8	0.18	0.18
0.067	1.36	2.4	4.2	4.9	0.31	0.31
0.083	1.70	3.1	6.4	7.3	0.47	0.47
0.100	2.04	3.7	9.0	10.1	0.56	0.59
0.117	2.39	4.4	12.1	13.4	0.64	0.73
0.133	2.73	5.1	15.8	17.3	0.73	0.89
0.150	3.07	5.8	19.9	21.6	0.84	1.06
0.167	3.41	6.5	24.5	26.4	0.94	1.23
0.183	3.41	6.8	29.2	31.3	1.05	1.41
0.200	3.41	6.8	33.7	36.1	1.17	1.59
0.217	3.41	6.8	37.9	40.5	1.31	1.76
0.233	3.41	6.8	41.9	44.7	1.44	1.92
0.250	3.41	6.8	45.6	48.7	1.54	2.07
0.267	3.41	6.8	49.2	52.4	1.64	2.23
0.283	3.41	6.8	52.5	56.0	1.72	2.37
0.300	3.41	6.8	55.7	59.3	1.80	2.51
0.317	3.07	6.5	58.5	62.2	1.88	2.69
0.333	2.73	5.8	60.4	64.3	1.93	2.82
0.350	2.39	5.1	61.6	65.5	1.96	2.90
0.367	2.04	4.4	62.1	66.0	1.97	2.93
0.383	1.70	3.7	61.9	65.8	1.97	2.92
0.400	1.36	3.1	61.1	65.0	1.94	2.86
0.417	1.02	2.4	59.6	63.5	1.91	2.77
0.433	0.68	1.7	57.6	61.3	1.85	2.64
0.450	0.34	1.0	55.1	58.7	1.79	2.48
0.467	0.00	0.3	52.0	55.4	1.71	2.35

```
****************** SUMMARY OF ROUTING COMPUTATIONS ******************

Pond File:           C:\PONDPACK\2021    .PND
Inflow Hydrograph:   C:\PONDPACK\2022A100.HYD
Outflow Hydrograph:  C:\PONDPACK\OUT     .HYD

Starting Pond W.S. Elevation =     0.00 ft

     ***** Summary of Peak Outflow and Peak Elevation *****

            Peak Inflow    =     3.41 cfs
            Peak Outflow   =     1.97 cfs
            Peak Elevation =     2.93 ft

      ***** Summary of Approximate Peak Storage *****

        Initial Storage         =         0 cu-ft
        Peak Storage From Storm =     1,923 cu-ft
                                  ---------------
        Total Storage in Pond   =     1,923 cu-ft
```

Pond File: C:\PONDPACK\2021 .PND
Inflow Hydrograph: C:\PONDPACK\2022A100.HYD
Outflow Hydrograph: C:\PONDPACK\OUT .HYD

EXECUTED: 09-30-2021
10:22:57

Peak Inflow = 3.41 cfs
Peak Outflow = 1.97 cfs
Peak Elevation = 2.93 ft



x File: C:\PONDPACK\OUT .HYD Qmax = 2.0 cfs
* File: C:\PONDPACK\2022A100.HYD Qmax = 3.4 cfs

Conclusion

The proposed ADS pipe storage is sufficient to convey a 2- year storm by using the modified rational method. Therefore, we comply with N.J.A.C. 7:8- Stormwater Management Standards. Additionally, the following table shows the reduction for 2, 10, and 100 years' storm analyses.

C1	EXISTING (CFS) C2	REDUCTION (CFS) C3	UN-DETAINED (CFS) C4	ROUTING (CFS) C5	ALLOWABLE (CFS) (C3-C4) C6	STORAGE (CU.FT.) C7
2 YEAR	2.56	50% = 1.28	0.10	1.08	1.18	1,223
10 YEAR	3.39	75% = 2.54	0.13	1.59	2.41	836
100 YEAR	4.42	80% = 3.54	0.16	1.97	3.38	842

GENERAL INSPECTION, MAINTENANCE & CLEANING PROCEDURES FOR INLETS, MANHOLES, PIPES & DETENTION SYSTEM

1. INSPECT INLETS, MANHOLES, PIPES & DETENTION SYSTEM FOR SEDIMENT ANNUALLY.
2. REMOVE GRATE OR COVER.
3. SKIM OFF OILS AND FLOATABLES.
4. USING A STADIA ROD, MEASURE THE DEPTH OF SEDIMENT.
5. IF SEDIMENT IS AT A DEPTH GREATER THAN 6" PROCEED TO STEP 6.
   IF NOT PROCEED TO STEP 7.
6. VACUUM OR MANUALLY REMOVE SEDIMENT.
7. REPLACE GRATE.
8. RECORD DEPTH AND DATE AND SCHEDULE NEXT INSPECTION.

DATE	STADIA ROD READINGS		SEDIMENT DEPTH (1) - (2)	OBSERVATIONS/ACTIONS	INSPECTOR
	FIXED POINT TO CHAMBER BOTTOM (1)	FIXED POINT TO TOP OF SEDIMENT (2)			

GENERAL INSPECTION, MAINTENANCE & CLEANING PROCEDURES FOR INLETS, MANHOLES, PIPES & DETENTION SYSTEM

1. INSPECT INLETS, MANHOLES, PIPES & DETENTION SYSTEM FOR SEDIMENT ANNUALLY.
2. REMOVE GRATE OR COVER.
3. SKIM OFF OILS AND FLOATABLES.
4. USING A STADIA ROD, MEASURE THE DEPTH OF SEDIMENT.
5. IF SEDIMENT IS AT A DEPTH GREATER THAN 6" PROCEED TO STEP 6. IF NOT PROCEED TO STEP 7.
6. VACUUM OR MANUALLY REMOVE SEDIMENT.
7. REPLACE GRATE.
8. RECORD DEPTH AND DATE AND SCHEDULE NEXT INSPECTION.

DATE	STADIA ROD READINGS		SEDIMENT DEPTH (1) - (2)	OBSERVATIONS/ACTIONS	INSPECTOR
	FIXED POINT TO CHAMBER BOTTOM (1)	FIXED POINT TO TOP OF SEDIMENT (2)			

Sample Maintenance Log

Date	Stadia rod readings		Sediment Depth (1) - (2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/01	6.3 ft	none		New installation. Fixed point is CI frame at grade	djm
9/24/01		6.2	0.1 ft	Some grit felt	sm
6/20/03		5.8	0.5 ft	Mucky feel, debris visible in manhole and in isolator row, maintenance due	rv
7/07/03	6.3 ft		0	System jetted and vacuumed	djm

Additional Notes

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.

2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

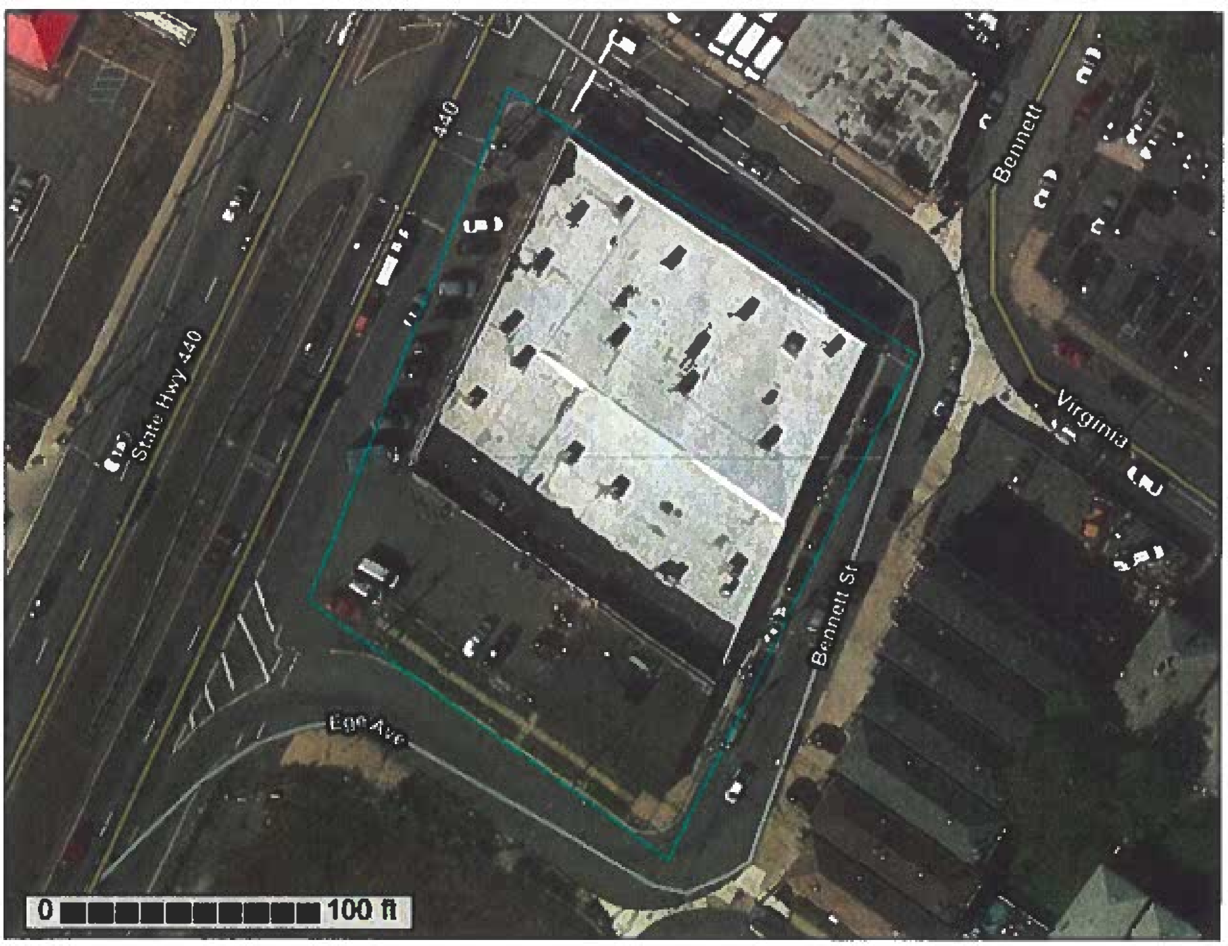
THE OWNER OF THE PROPERTY, MYNENI PROPERTIES, LLC. IT'S SUCCESSORS AND/OR ASSIGNS, WILL BE RESPONSIBLE FOR THE MAINTENANCE OF THE INLETS, MANHOLES, PIPES & DETENTION SYSTEM ON THE PROPERTY LOCATED AT
682 NJ STATE HIGHWAY 440
CITY OF JERSEY CITY, NJ
TEL: 201--424-4409

USDA United States Department of Agriculture

NRCS Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for
Hudson County, New Jersey



June 15, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Soil Map

Map Scale: 1:552 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 5, 10, 20, 30

Feet: 0, 25, 50, 100, 150

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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

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

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

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

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

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

Soil Survey Area: Hudson County, New Jersey
Survey Area Data: Version 10, Jun 1, 2020

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

Date(s) aerial images were photographed: Aug 25, 2014—Sep 27, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
URTILB	Urban land, till substratum, 0 to 8 percent slopes	0.9	98.5%
URWETB	Urban land, wet substratum, 0 to 8 percent slopes	0.0	1.5%
Totals for Area of Interest		**0.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Hudson County, New Jersey

URTILB—Urban land, till substratum, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2qjwr
Elevation: 0 to 520 feet
Mean annual precipitation: 30 to 56 inches
Mean annual air temperature: 47 to 63 degrees F
Frost-free period: 179 to 217 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land, till substratum: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land, Till Substratum

Setting

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Asphalt over human-transported material

Typical profile

M - 0 to 15 inches: material
2^C - 15 to 79 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Calcium carbonate, maximum content: 10 percent
Available water capacity: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Greenbelt

Percent of map unit: 10 percent
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Crest, side slope, base slope, talf
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

URWETB—Urban land, wet substratum, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 13q0j
Elevation: 0 to 520 feet
Mean annual precipitation: 30 to 64 inches
Mean annual air temperature: 46 to 79 degrees F
Frost-free period: 131 to 213 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land, wet substratum: 90 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land, Wet Substratum

Setting

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Asphalt over human-transported material

Typical profile

M1 - 0 to 6 inches: material
M2 - 6 to 20 inches: material
2^Cu - 20 to 79 inches: very artifactual coarse sandy loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: About 20 inches
Calcium carbonate, maximum content: 19 percent
Available water capacity: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Parsippany, frequently flooded

Percent of map unit: 5 percent
Landform: Lake terraces
Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: Yes

Whippany

Percent of map unit: 5 percent
Landform: Lake terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

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