

# STORMWATER MANAGEMENT REPORT

**180 FORT LEE ROAD  
LOT 4 BLOCK 1205  
BOROUGH OF LEONIA  
BERGEN COUNTY, NJ**

**REVISED October 21, 2022(resubmitted)  
REVISED February 5, 2016  
REVISED October 16, 2015  
September 10, 2015**

**MARK MARTINS ENGINEERING, LLC  
PROFESSIONAL ENGINEERING & LAND SURVEYING  
55 WALNUT STREET  
SUITE 201  
NORWOOD, N.J.  
201-391-3222**



---

**Mark S. Martins**  
PROFESSIONAL ENGINEER & LAND SURVEYOR  
NJ LICENSE NO. 35,858

# TABLE OF CONTENTS

	<u>Page</u>
<u>SUMMARY AND CONCLUSIONS</u>	i
<u>SECTION 1</u> Existing and Proposed Runoff	
Existing Runoff	1.1
Proposed Runoff (undetained)	1.2
Proposed Uncontrolled Runoff	1.3
Target Allowable Flow	1.4
<u>SECTION 2</u> Modified Rational Method Hydrographs for Controlled Area	
2 yr Hydrograph	2.1
10 yr Hydrograph	2.2
25 yr Hydrograph	2.3
100 yr Hydrgraph	2.4
<u>SECTION 3</u> Retention System Calculations	
Proposed 24" HDPE Perforated Pipe Storage Volumes	3.1
<u>APPENDIX</u>	
Rainfall curves	A1
Runoff coefficient table	A2

## SUMMARY AND CONCLUSIONS

### **Existing & Proposed Site Conditions:**

The site, located in the Borough of Leonia, Bergen County, N.J., is located north of the intersection of Fort Lee Road and Leonia Ave and is known as 180 Fort Lee Road. The site is designated as Lot 4 in Block 1205 on the Tax Map 12 of the Borough of Leonia. The total tract area and the area of this study encompass 13,447 square feet (0.309 ac.). The site is currently a vacant lot with an existing driveway. The proposed development consists of the construction of a 2 1/2 story dwelling with 4 units. All of the existing structures on the site will be removed to accommodate the proposed development.

### **Methodology:**

The modified rational method has been used to analyze drainage of the study area. Soil on site was found to be Boonton-Urban Land Complex from the National Resources Conservation Service Web Soil Survey. This soil has a Hydrologic Soil Group rating of C. The Time of Concentration for the existing conditions is 10 mins. The storm water runoff has been calculated for the 2, 10, 25 & 100 year storm events in a pre-existing and post developed condition in accordance with the Residential Site Improvement Standards. A retention system, consisting of one 24" HDPE pipe, has been designed so that the post-project construction peak runoff will be reduced for the 2, 10, 25 & 100 year storms as per the RSIS requirements.

### **Summary Table:**

#### **Conclusions:**

Design Storm	Existing Runoff	Proposed Runoff (without retention)	Target Allowable Runoff	Required RSIS Storage	Provided Storage Volume
	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
2 Year	0.62	1.10	0.21	565	856
10 Year	0.82	1.44	0.49	581	856
25 Year	1.12	1.70	0.84	508	856
100 Year	1.36	2.06	0.87	691	856

The proposed retention system will provide a total capacity of 856 cf and will reduce the rates of runoff in compliance with the RSIS standards.

## **SECTION 1**

## EXISTING CONDITIONS

### AREAS

			RUNOFF COEFFICIENT c (H.S.G.=C)	
			100 YR	ADJ. 2,10YR
BUILDING	0	sf	0.99	0.99
DRIVEWAYS	1,218		0.99	0.99
Walks	116			
PERVIOUS	12,114		0.51	0.41
TOTAL	13,447	sf		
	= 0.309	ac		

### DRAINAGE AREA CHARACTERISTICS

DRAINAGE AREA, A	0.309	ac
TIME OF CONCENTRATION, T <sub>c</sub>	10	min
RAINFALL INTENSITY, i <sub>100</sub>	8.0	in/hr
RAINFALL INTENSITY, i <sub>25</sub>	6.6	in/hr
RAINFALL INTENSITY, i <sub>10</sub>	5.8	in/hr
RAINFALL INTENSITY, i <sub>2</sub>	4.4	in/hr
25 yr, c (weighted)	0.55	
2-10yr, c (weighted)	0.46	

### EXISTING RUNOFF

$$Q = ciA \text{ (cfs)}$$

		Peak Flow		Red. Factor		ALLOWABLE
<b>2 year storm</b>	<b>Q =</b>	<b>0.62</b>	x	0.50	=	0.31
<b>10 year storm</b>	<b>Q =</b>	<b>0.82</b>	x	0.75	=	0.61
<b>25 year storm</b>	<b>Q =</b>	<b>1.12</b>	x	0.88	=	0.98
<b>100 year storm</b>	<b>Q =</b>	<b>1.36</b>	x	0.80	=	1.08

# PROPOSED CONDITIONS

---

## AREAS

			<u>RUNOFF COEFFICIENT c</u>		(H.S.G.=C)
			<u>100 YR</u>	<u>ADJ. 2,10YR</u>	
BUILDING	5,001	sf	0.99	0.99	
DRIVEWAYS	4,122		0.99	0.99	
PATIOS, WALKS, AC etc.	296		0.99	0.99	
WALLS	297				
PERVIOUS	3,731		0.51	0.41	
TOTAL	13,447	sf			
	= 0.309	Ac			

## DRAINAGE AREA CHARACTERISTICS

DRAINAGE AREA	0.309	Ac
TIME OF CONCENTRATION, T <sub>c</sub>	10	min
RAINFALL INTENSITY, i <sub>100</sub>	8.0	in/hr
RAINFALL INTENSITY, i <sub>25</sub>	6.6	in/hr
RAINFALL INTENSITY, i <sub>10</sub>	5.8	in/hr
RAINFALL INTENSITY, i <sub>2</sub>	4.4	in/hr
25-100 yr, c (weighted)	0.83	
2-10yr, c (weighted)	0.81	

## PROPOSED PEAK RUNOFF

$$Q = ciA \text{ (cfs)}$$

<b>2 year storm</b>	<b>Q =</b>	<b>1.10</b>	cfs
<b>10 year storm</b>	<b>Q =</b>	<b>1.44</b>	
<b>25 year storm</b>	<b>Q =</b>	<b>1.70</b>	
<b>100 year storm</b>	<b>Q =</b>	<b>2.06</b>	

## PROPOSED UNCONTROLLED RUNOFF

---

**DRAINAGE AREA** = 3219 sf = 0.074 Ac

		<u>100 YR</u>	<u>2,10YR</u>
C IMPERVIOUS	=	0.99	0.99
C PERVIOUS	=	0.35	0.28
C GRAVEL	=	0.84	0.84

**PROPOSED AREAS**

IMPERVIOUS	74	sf
PERVIOUS	3,145	sf
GRAVEL	0	sf

**PROPOSED RUNOFF**

	<u>WEIGHTED C</u>	<u>INTENSITY, i</u>	<u>RUNOFF, Q</u> Q = CIA
2 Year Storm	0.30	4.4	<b>0.10</b> cfs
10 Year Storm	0.30	5.8	<b>0.13</b> cfs
25 Year Storm	0.30	6.6	<b>0.14</b> cfs
100 Year Storm	0.36	8	<b>0.22</b> cfs

## TARGET ALLOWABLE FLOW

---

DESIGN STORM	ENTIRE SITE ALLOWABLE RUNOFF	PROPOSED UNCONTROLLED RUNOFF	TARGET ALLOWABLE
2	0.31	0.10	0.21
10	0.61	0.13	0.49
25	0.98	0.14	0.84
100	1.08	0.22	0.87

Where:

TARGET ALLOWABLE = ENTIRE SITE ALLOWABLE RUNOFF - PROPOSED OFFSITE RUNOFF



## **SECTION 2**

# Hydrograph Report

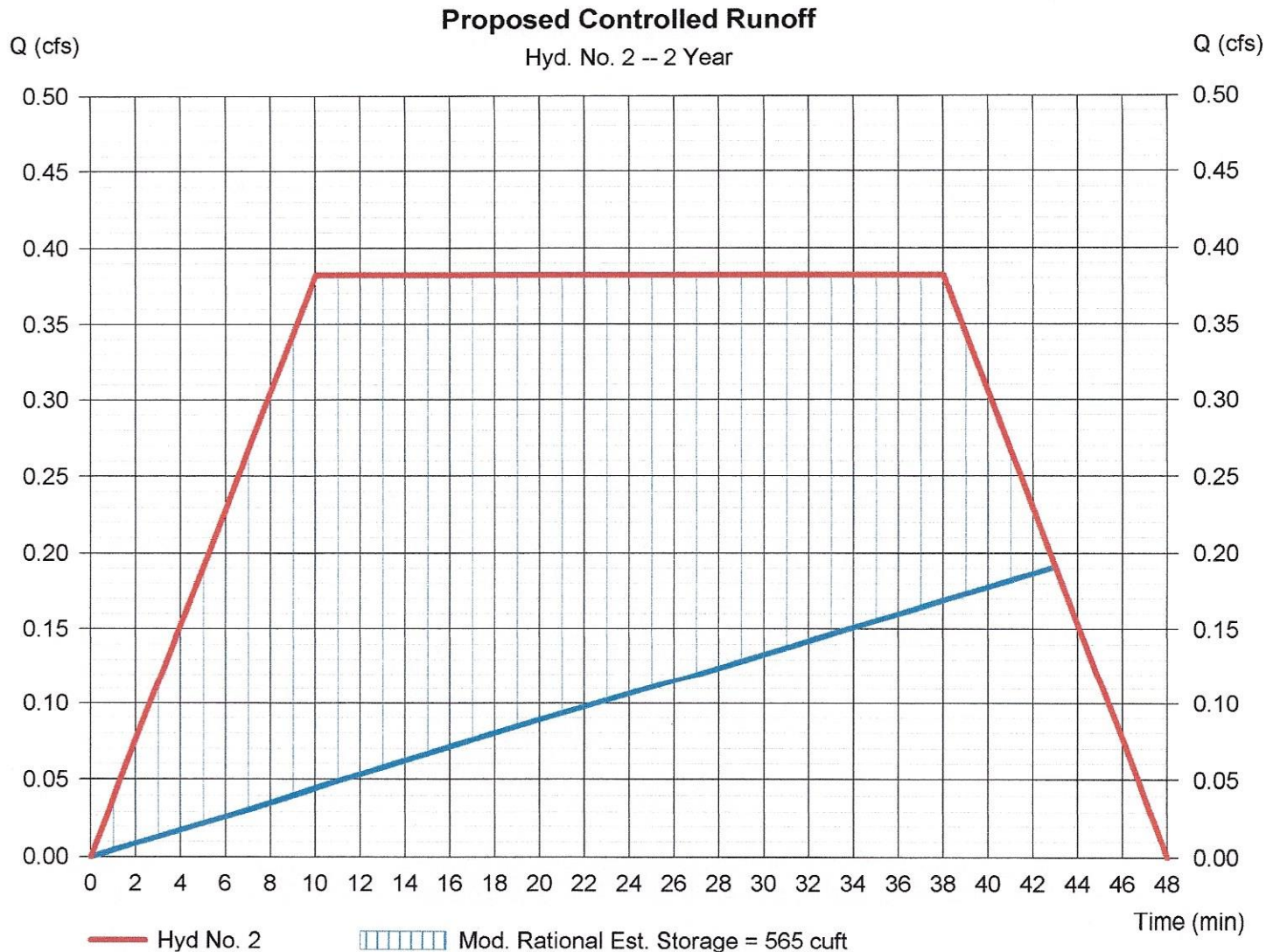
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Friday, 02 / 5 / 2016

## Hyd. No. 2

### Proposed Controlled Runoff

Hydrograph type	= Mod. Rational	Peak discharge	= 0.382 cfs
Storm frequency	= 2 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 873 cuft
Drainage area	= 0.235 ac	Runoff coeff.	= 0.81
Intensity	= 2.006 in/hr	Tc by User	= 10.00 min
IDF Curve	= Bergen County1.IDF	Storm duration	= 3.8 x Tc
Target Q	=0.210 cfs	Est. Req'd Storage	=565 cuft

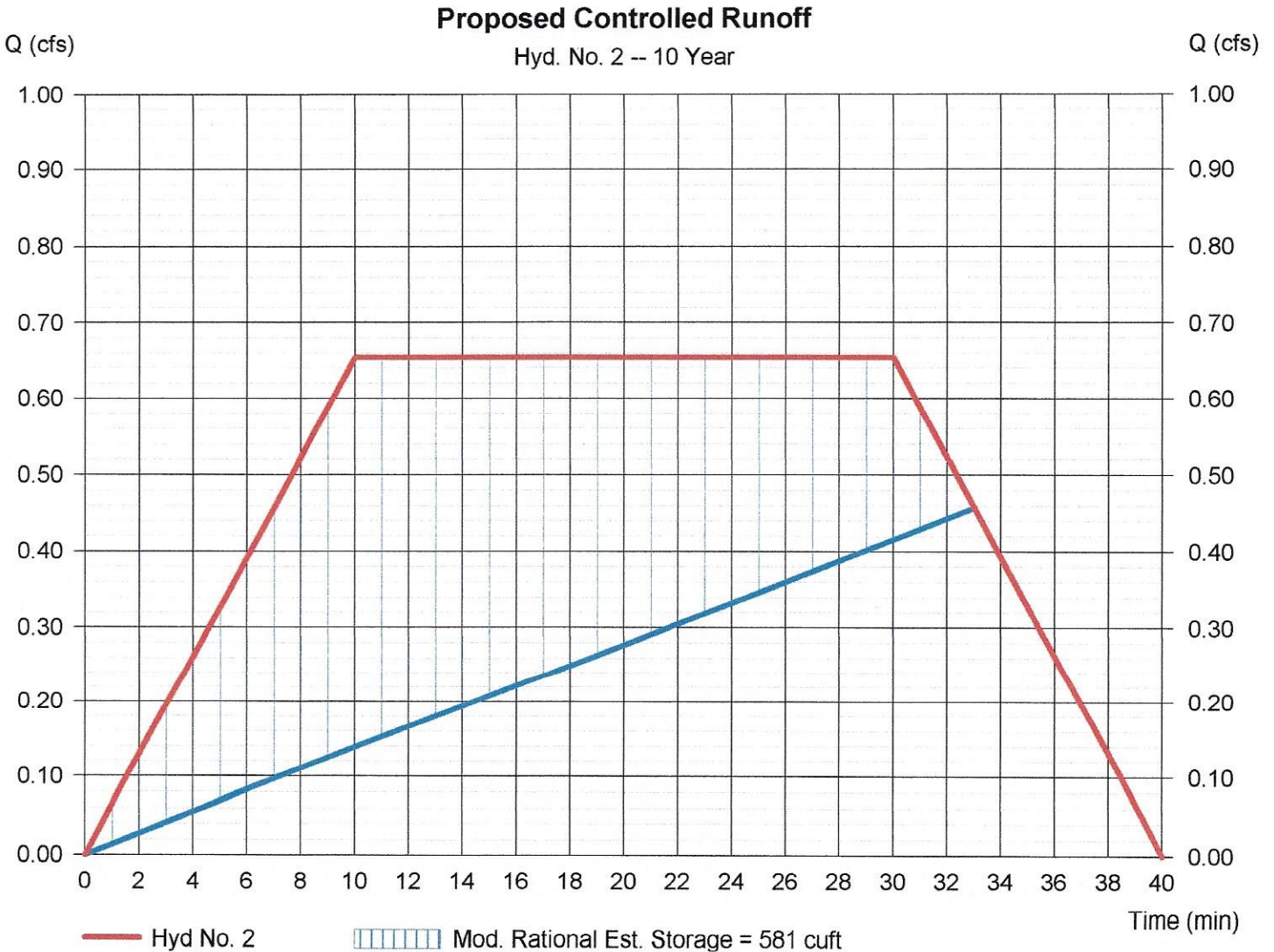


# Hydrograph Report

## Hyd. No. 2

### Proposed Controlled Runoff

Hydrograph type	= Mod. Rational	Peak discharge	= 0.654 cfs
Storm frequency	= 10 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,180 cuft
Drainage area	= 0.235 ac	Runoff coeff.	= 0.81
Intensity	= 3.433 in/hr	Tc by User	= 10.00 min
IDF Curve	= Bergen County1.IDF	Storm duration	= 3.0 x Tc
Target Q	=0.490 cfs	Est. Req'd Storage	=581 cuft



# Hydrograph Report

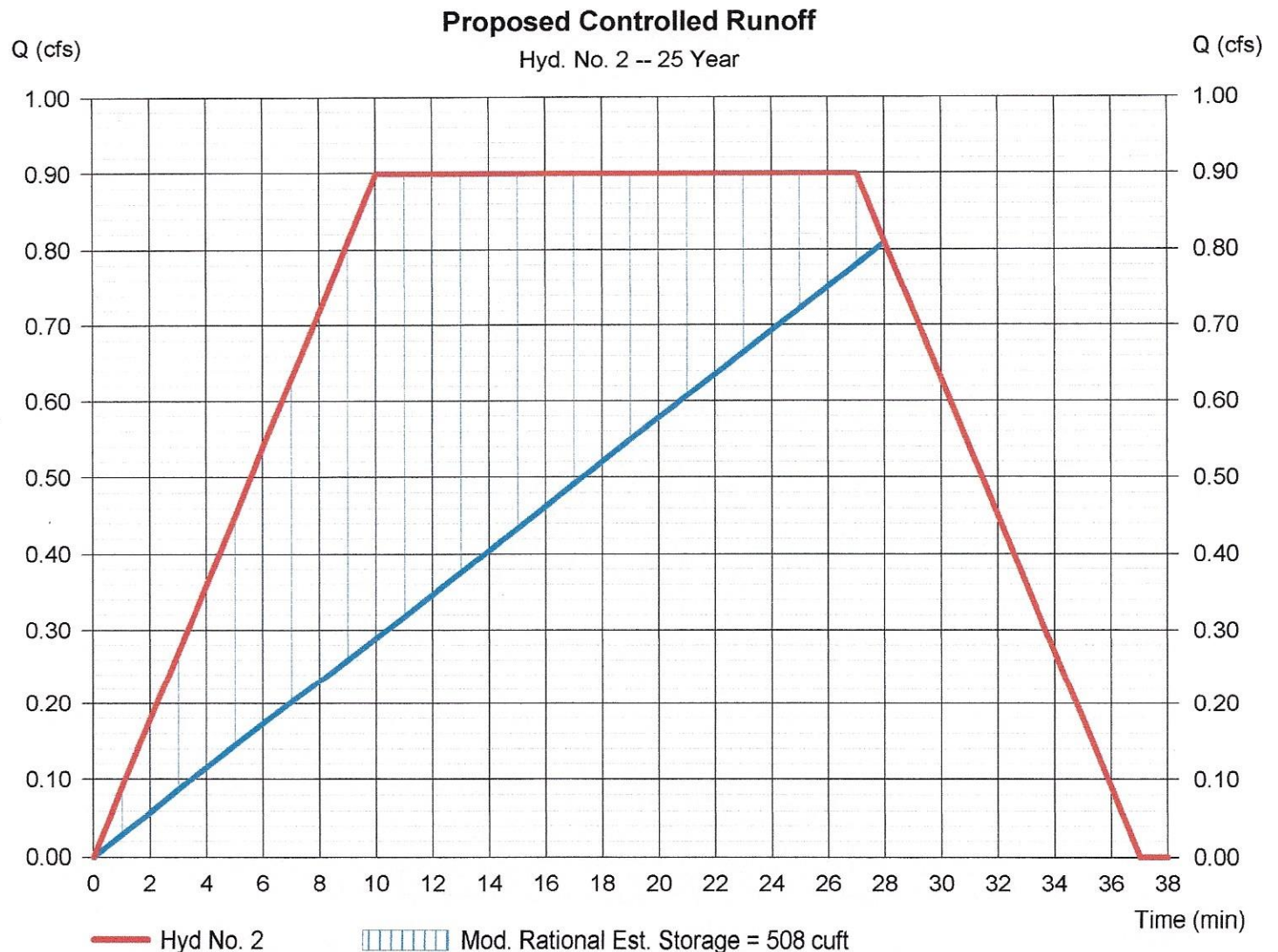
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Friday, 02 / 5 / 2016

## Hyd. No. 2

### Proposed Controlled Runoff

Hydrograph type	= Mod. Rational	Peak discharge	= 0.899 cfs
Storm frequency	= 25 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,461 cuft
Drainage area	= 0.235 ac	Runoff coeff.	= 0.83
Intensity	= 4.608 in/hr	Tc by User	= 10.00 min
IDF Curve	= Bergen County1.IDF	Storm duration	= 2.7 x Tc
Target Q	=0.840 cfs	Est. Req'd Storage	=508 cuft



# Hydrograph Report

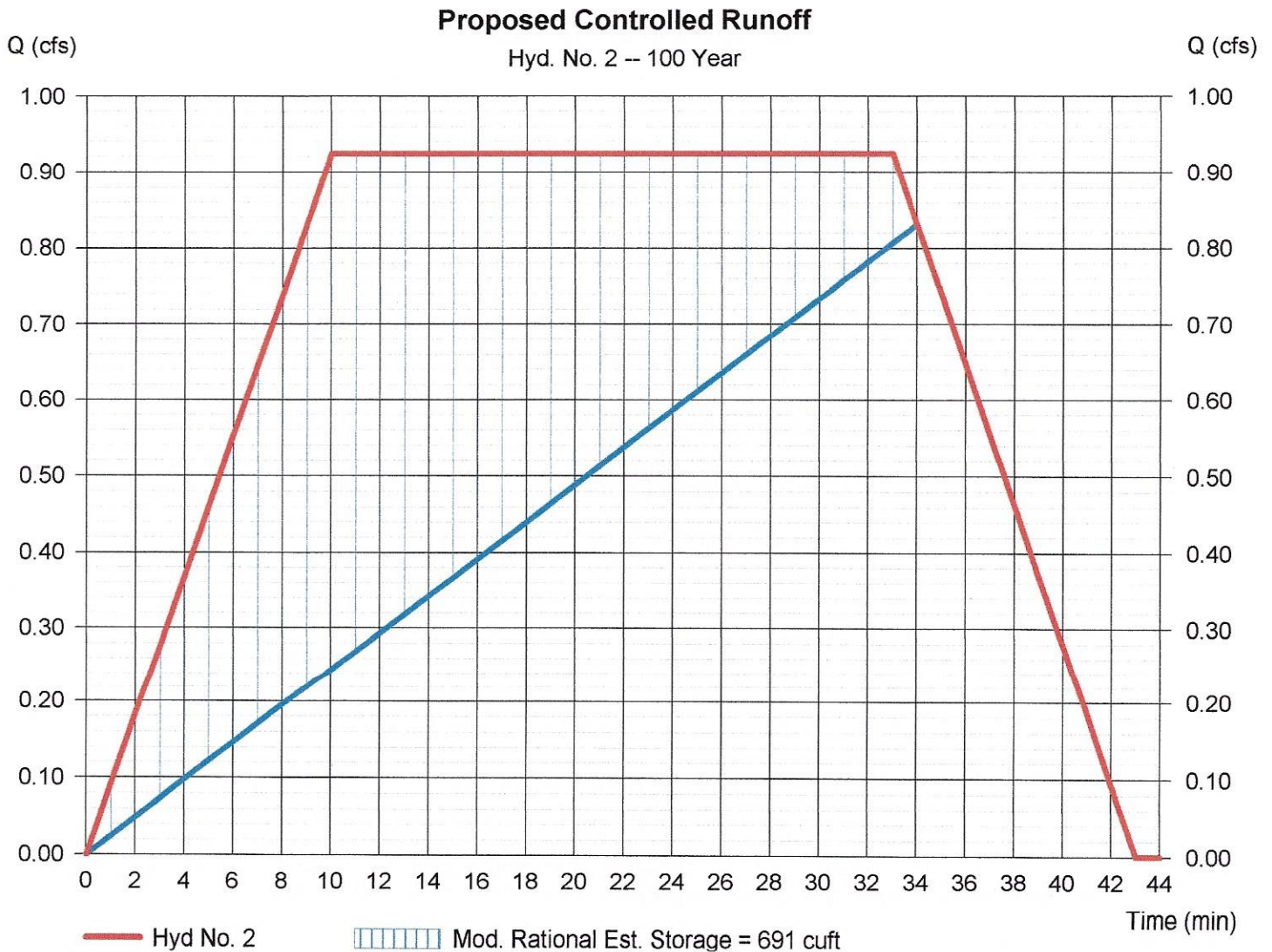
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3

Friday, 02 / 5 / 2016

## Hyd. No. 2

### Proposed Controlled Runoff

Hydrograph type	= Mod. Rational	Peak discharge	= 0.923 cfs
Storm frequency	= 100 yrs	Time to peak	= 10 min
Time interval	= 1 min	Hyd. volume	= 1,834 cuft
Drainage area	= 0.235 ac	Runoff coeff.	= 0.83
Intensity	= 4.733 in/hr	Tc by User	= 10.00 min
IDF Curve	= Bergen County1.IDF	Storm duration	= 3.3 x Tc
Target Q	=0.870 cfs	Est. Req'd Storage	=691 cuft



## **SECTION 3**



THE MOST ADVANCED NAME IN DRAINAGE SYSTEMS  
Version 7.8

Enter or Select values in the Yellow fields ONLY

Unit of Measure	UNITS	
	<input checked="" type="radio"/> Imperial (ft., in)	<input type="radio"/> Metric (mm, m)
Joint Type	Plain End ST <input type="text"/>	
Design Storage Volume	635	CF
Average Cover Height <sup>4</sup>	2.00	FT

## STORMWATER RETENTION / DETENTION PIPE SYSTEM SIZING WORKSHEET

Project Name: 180 Fort Lee Road  
 Location (City, State): Leonia, NJ  
 Prepared For: Salvatore Nobile  
 Date Prepared: 10/16/2015  
 Engineer: Mark S. Martins  
 Contractor:  
 Regional Engineer:  
 Area Sales Representative:  
 Surface Application:

HEADER		LATERALS			BACKFILL	
Header Diameter	24	Lateral Diameter (in)	Lateral Length (ft)	Number of Laterals	# of Sticks / Lateral	Approx. Length of End Stick
Number of Headers	1	24	124	1	7	6.8-ft
Perforate Headers?	No	24			0	0-ft
Include Header(s) in Storage Volume?	No	24			0	0-ft
		Perforate Laterals? <input type="text"/> Yes <input type="text"/>			Stone Porosity? <input type="text"/> 40 %	
					*Enter "0" to not include the backfill in the storage volume	
					Additional Stone Layer Allowing Storage (ASV)? <input type="text"/> 12 in.	

Group	STORAGE VOLUME		APPROXIMATE SYSTEM SIZE		EXCAVATION						
	Product Volume (CF)	Stone (CF)	ASV (CF)	Total System (CF)	Width (FT)	Length (FT)	Pipe Diameter (IN)	Disturbed Surface Area (SYD)	Excavation <sup>2</sup> (CYD)	Estimated Backfill <sup>3</sup> (CYD)	ASV (CYD)
Group 1	390	244	222	856	2	127	24	62	95	81	21
Group 2	0	0	0	0	0	0	24	0	0	0	0
Group 3	0	0	0	0	0	0	24	0	0	0	0
<b>TOTALS</b>	<b>390</b>	<b>244</b>	<b>222</b>	<b>856.05</b>				<b>62</b>	<b>95</b>	<b>81</b>	<b>21</b>

134.8% of the required storage

### NOTES

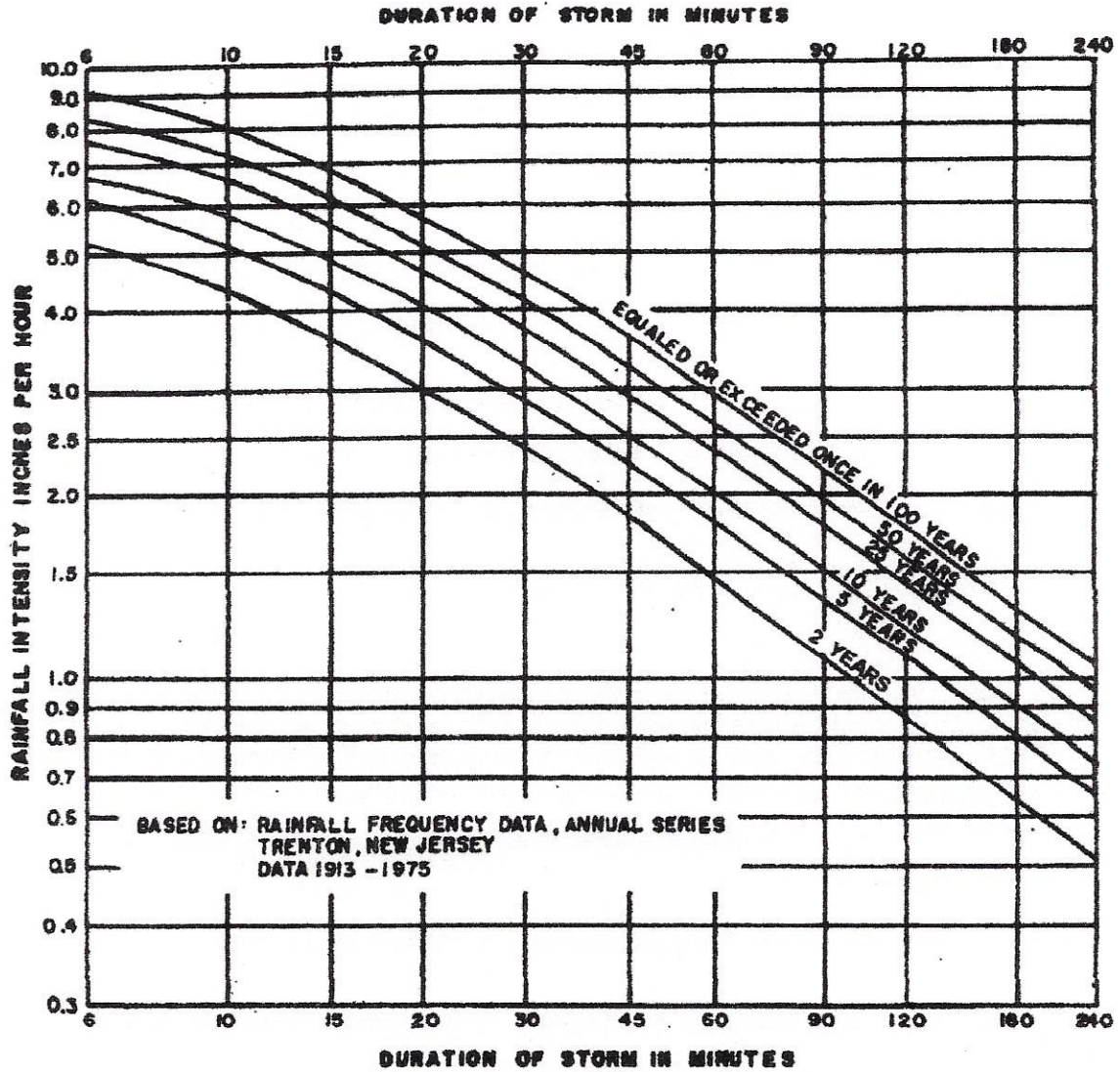
- 1 - Full Stick: Assumed a standard lay length of 19'-8".
- 2 - Excavation: Based on manufacturer's recommended trench width and bedding depth. Estimated volumes assume a flat system based on the user-entered Average Cover Height.
- 3 - Backfill: Does not account for pipe corrugations - calculated for conservative quantities. Not for use with take-offs or ordering purposes.
- 4 - Cover Height: For traffic installations, 1-ft of minimum cover is required for diameters 12'-36", 2-ft for 42'-60". Maximum cover shall not exceed 8-ft without consulting Applications Engineering.
- 5 - Bill of Materials: Does not differentiate between ST and WT fittings or between A and H profile connections. Determined on a project-specific basis.
- 6 - Quantities: Assumes all Groups are same diameter. Run separate calculations to determine quantities and costs for different Group diameters.

This Excel spreadsheet is provided for rough estimating purposes only. This tool is intended to assist the design engineer in sizing stormwater management systems using ADS pipe and manifold components. As with any calculation aid, this tool should be used for estimating only; the engineer must verify the assumptions and methods to ensure they satisfy the project and local design criteria.

## **APPENDIX**



Figure 5-4: Rainfall Intensity-Duration-Frequency Curves



Note: Adapted from Figure 2.1-2 in the NJDEP Technical Manual for Stream Encroachment Permits.

<b>TABLE 7.1 TYPICAL RUNOFF COEFFICIENTS (C VALUES) FOR 100-YEAR FREQUENCY STORM</b>				
<b>LAND-USE DESCRIPTION</b>	<b>HYDROLOGIC SOIL GROUP</b>			
	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
Cultivated land: without conservation treatment with conservation treatment	0.49 0.27	0.67 0.43	0.81 0.61	0.88 0.67
Pasture or range land: poor condition good condition	0.38 NA	0.63 0.25	0.78 0.51	0.84 0.65
Meadow: good condition	NA	NA	0.44	0.61
Wood or forest land: thin stand, poor cover, no mulch good cover	NA NA	NA NA	0.59 0.45	0.79 0.59
Open spaces, lawns, parks, golf courses, cemeteries: good condition, grass cover on 75% or more of area fair condition, grass cover on 50-75% of area	NA NA	0.25 0.45	0.51 0.63	0.65 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: <u>Average lot size</u> <u>Average impervious</u>				
1/8 acre                  65%	0.59	0.76	0.86	0.90
1/4 acre                  38%	0.25	0.55	0.70	0.80
1/3 acre                  30%	NA	0.49	0.67	0.78
1/2 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 gravel dirt	0.99 0.57 0.49	0.99 0.76 0.69	0.99 0.84 0.80	0.99 0.88 0.84
NOTE:	NA denotes information is not available; design engineers should rely on another authoritative source.			
SOURCE:	Technical Manual for Land Use Regulation Program, Department of Environmental Protection, Bureaus of Inland and Coastal Regulations, Stream Encroachment Permits (Trenton, New Jersey, revised September 1995), p. 12.			