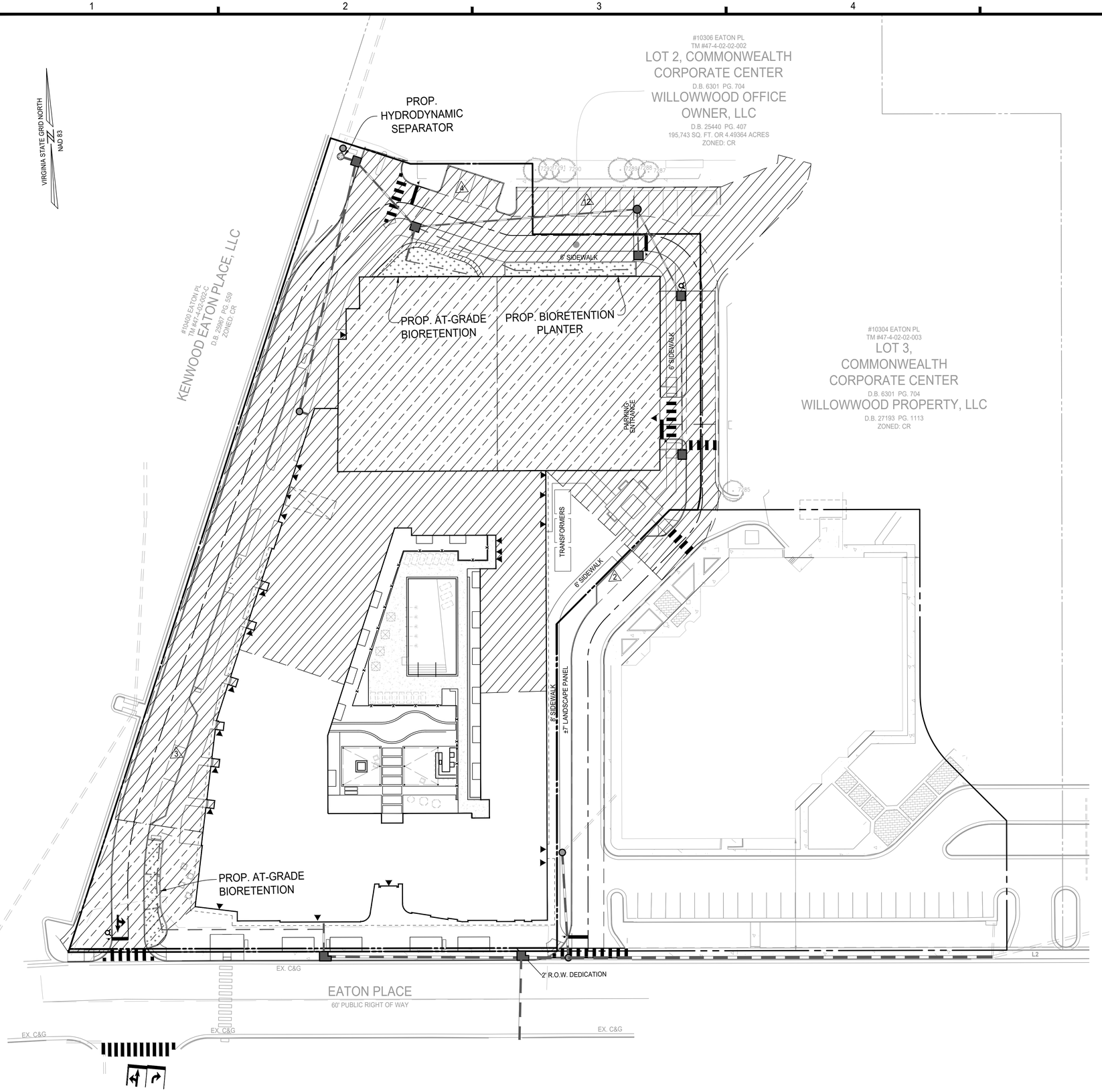

STORMWATER MANAGEMENT & BEST MANAGEMENT PRACTICE (SWM/BMP) NARRATIVE

ADEQUATE OUTFALL
THE EXISTING SITE DISCHARGES RUNOFF TO ACCOTINK CREEK THAT IS ADJACENT TO THE SITE.

SWM
WATER QUANTITY FOR THIS PROJECT WILL BE PROVIDED IN ACCORDANCE WITH STATE CODE 9VAC25-870-66-WATER QUANTITY AND THE CITY OF FAIRFAX STORMWATER ORDINANCE.

THE WATER QUANTITY REQUIREMENTS WILL BE MET BY A REDUCTION IN IMPERVIOUS AND RUNOFF REDUCING BMP METHODS. THE STORMWATER WILL THEN BE DIRECTED TO THE EXISTING CMP DETENTION STRUCTURE AT THE EAST OF THE SITE, AND ULTIMATELY TO THE TRIPLE BOX CULVERT AND INTO ACCOTINK CREEK WHERE IT DOES NOT CAUSE EROSION TO THE SYSTEM FOR THE TWO-YEAR STORM (CHANNEL PROTECTION) AND CONFINES THE STORMWATER RUNOFF DURING A 10-YEAR STORM (FLOOD PROTECTION). FOR THE 100-YEAR STORM, THE RUNOFF WILL STILL UTILIZE THE EXISTING CMP SYSTEM TO PROVIDE THE REQUIRED DETENTION FOR THE SITE.

BMP
THIS PROJECT WILL USE THE VIRGINIA RUNOFF REDUCTION METHOD (VRRM) REDEVELOPMENT TO MEET THE STATE, PART IIB CRITERIA (9VAC25-870-65) AND CITY WATER QUALITY DESIGN CRITERIA. THE PROJECT SITE AREA FOR WATER QUALITY CALCULATIONS WILL INCLUDE ALL AREA WITHIN THE LIMITS OF CLEARING AND GRADING. TO MEET WATER QUALITY DESIGN CRITERIA AND PHOSPHORUS REMOVAL, BIORETENTION AND PROPRIETARY BMP FACILITIES WILL BE USED. THESE PROPRIETARY FACILITIES MAY INCLUDE HYDRODYNAMIC SEPARATORS AND/OR STORMFILTERS. ADDITIONAL PROPRIETARY AND NON-PROPRIETARY BMP FACILITIES MAY BE USED AS THE DESIGN OF THE SITE DEVELOPS FURTHER. PRELIMINARY LOCATIONS ARE SHOWN ON THE DEVELOPMENT PLAN.

NOTE:
LOCATIONS AND SIZING OF SWM/BMP FACILITIES SHOWN ARE BASED ON A PRELIMINARY STUDY TO ENSURE COMPLIANCE WITH STATE AND CITY REQUIREMENTS; THE LOCATION AND TYPE OF FACILITY IS SUBJECT TO CHANGE WITH FINAL DESIGN.

AREA DRAINING TO BIORETENTION

AREA DRAINING TO HYDRODYNAMIC SEPARATOR

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COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
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04/28/2023

N29 APARTMENTS
GENERAL DEVELOPMENT PLAN

CITY OF FAIRFAX, VA

MARK	DATE	DESCRIPTION
1	11-30-2022	ADDRESSED PER CITY COMMENTS
2	04-28-2023	ADDRESSED PER CITY COMMENTS

PROJECT No.: 21082.002.00
DRAWING No.: 111772
DATE: 2022-07-15
SCALE: 1"=30'
DESIGN: JH
DRAWN: YH
CHECKED: JH

SHEET TITLE:

BMP NOTES NARRATIVE

SHEET No.

PI_500

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 3.0

○ 2011 BMP Standards and Specifications ◉ 2013 Draft BMP Standards and Specifications

Project Name: Willowwood - Phase 1
Date: 4/19/2023
Linear Development Project? No

CLEAR ALL

data input cells | constant values | calculation cells | final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Enter Total Disturbed Area *(acres)* → 3.70

Maximum reduction required:	*20%*
The site's net increase in impervious cover (acres) is:	*0*
Post-Development TP Load Reduction for Site (lb/yr):	*0.79*

Check:
BMP Design Specifications List: 2013 Draft Stds & Specs
Linear project? No
Land cover areas entered correctly? ✓
Total disturbed area entered? ✓

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed				0.31	0.31
Impervious Cover (acres)				2.66	2.66
					2.97

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed				0.56	0.56
Impervious Cover (acres)				2.41	2.41
Area Check	**OK.**	**OK.**	**OK.**	**OK.**	2.97

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

LAND COVER SUMMARY -- PRE-REDEVELOPMENT

Land Cover Summary-Pre Pre-ReDevelopment	Listed	Adjusted[1]
Forest/Open Space Cover (acres)	0.00	0.00
Weighted Rv(forest)	0.00	0.00
% Forest	0%	0%
Managed Turf Cover (acres)	0.31	0.31
Weighted Rv(turf)	0.25	0.25
% Managed Turf	10%	10%
Impervious Cover (acres)	2.66	2.66
Rv(impervious)	0.95	0.95
% Impervious	90%	90%
Total Site Area (acres)	**2.97**	**2.97**
Site Rv	**0.88**	**0.88**

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary-Post (Final) Post ReDev. & New Impervious	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	0.56
Weighted Rv (turf)	0.25
% Managed Turf	19%
Impervious Cover (acres)	2.41
Rv(impervious)	0.95
% Impervious	81%
Final Site Area (acres)	**2.97**
Final Post Dev Site Rv	**0.82**

Land Cover Summary-Post Post-ReDevelopment	
Forest/Open Space Cover (acres)	0.00
Weighted Rv(forest)	0.00
% Forest	0%
Managed Turf Cover (acres)	0.56
Weighted Rv (turf)	0.25
% Managed Turf	19%
ReDev. Impervious Cover (acres)	2.41
Rv(impervious)	0.95
% Impervious	81%
Total ReDev. Site Area (acres)	**2.97**
ReDev Site Rv	**0.82**

Land Cover Summary-Post Post-Development New Impervious	
New Impervious Cover (acres)	0.00
Rv(impervious)	--

Treatment Volume and Nutrient Load

Pre-ReDevelopment Treatment Volume (acre-ft)	0.2170	0.2170
Pre-ReDevelopment Treatment Volume (cubic feet)	9,454	9,454
Pre-ReDevelopment TP Load (lb/yr)	**5.94**	**5.94**
Pre-ReDevelopment TP Load per acre (lb/acre/yr)	2.00	2.00
Baseline TP Load (lb/yr) (**0.41 lbs/acre/yr** applied to pre-redevelopment area excluding pervious land proposed for new impervious cover)		*1.22*

Treatment Volume and Nutrient Load

Final Post-Development Treatment Volume (acre-ft)	0.2025	
Final Post-Development Treatment Volume (cubic feet)	8,819	
Final Post-Development TP Load (lb/yr)	**5.54**	
Final Post-Development TP Load per acre (lb/acre/yr)	1.87	

Post-ReDevelopment Treatment Volume (acre-ft)	0.2025	
Post-ReDevelopment Treatment Volume (cubic feet)	8,819	
Post-ReDevelopment Load (TP) (lb/yr)*	**5.54**	
Post-ReDevelopment TP Load per acre (lb/acre/yr)	1.87	
Max. Reduction Required (Below Pre-ReDevelopment Load)	**20%**	
TP Load Reduction Required for Redeveloped Area (lb/yr)	**0.79**	

Post-Development Treatment Volume (acre-ft)	--	
Post-Development Treatment Volume (cubic feet)	--	
Post-Development TP Load (lb/yr)	**--**	
TP Load Reduction Required for New Impervious Area (lb/yr)	**0**	

[1] *Adjusted Land Cover Summary:*
Pre ReDevelopment land cover minus pervious land cover (forest/open space or managed turf) acreage proposed for new impervious cover.

Adjusted total acreage is consistent with Post-ReDevelopment acreage (minus acreage of new impervious cover).

Column I shows load reduction requirement for new impervious cover (based on new development load limit, 0.41 lbs/acre/year).

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	**0.79**

Nitrogen Loads (Informational Purposes Only)

Pre-ReDevelopment TN Load (lb/yr)	42.49
Final Post-Development TN Load (Post-ReDevelopment & New Impervious) (lb/yr)	39.64

Drainage Area A

CLEAR BMP AREAS

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)				0.17	0.17	0.25
Impervious Cover (acres)				1.56	1.56	0.95
				Total	1.73	

Total Phosphorus Available for Removal in D.A. A (lb/yr) 3.48
Post Development Treatment Volume in D.A. A (ft³) 5,534

2. Rooftop Disconnection (RR)													
2.i. To Stormwater Planter, Urban Bioretention (Spec #9, Appendix A)	40		0.21	0	290	435	724	25	0.00	0.45	0.25	0.20	14.a. MTD - Hydrodynamic
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	0.01	0.28	0	390	585	975	25	0.00	0.61	0.34	0.28	14.a. MTD - Hydrodynamic
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0	0.16	1.02	1,123	0	4,785	4,785	20	0.53	2.30	0.57	2.26	

Drainage Area B

CLEAR BMP AREAS

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)				0.01	0.01	0.25
Impervious Cover (acres)				0.11	0.11	0.95
				Total	0.12	

Total Phosphorus Available for Removal in D.A. B (lb/yr) 0.24
Post Development Treatment Volume in D.A. B (ft³) 388

6. Bioretention (RR)												
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	0.01	0.11	0	155	233	388	25	0.00	0.24	0.13	0.11

Site Results (Water Quality Compliance)

Area Checks	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	AREA CHECK
FOREST/OPEN SPACE (ac)	0.00	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	1.51	0.11	0.00	0.00	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	1.51	0.11	0.00	0.00	0.00	OK.
MANAGED TURF AREA (ac)	0.17	0.01	0.00	0.00	0.00	OK.
MANAGED TURF AREA TREATED (ac)	0.17	0.01	0.00	0.00	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft³) 8,819

Runoff Reduction Volume and TP By Drainage Area

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	TOTAL
RUNOFF REDUCTION VOLUME ACHIEVED (ft³)	680	155	0	0	0	835
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	3.37	0.24	0.00	0.00	0.00	3.61
TP LOAD REDUCTION ACHIEVED (lb/yr)	1.14	0.13	0.00	0.00	0.00	1.28
TP LOAD REMAINING (lb/yr)	2.23	0.11	0.00	0.00	0.00	2.34
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	4.88	1.12	0.00	0.00	0.00	6.00

Total Phosphorus

FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	5.54
TP LOAD REDUCTION REQUIRED (lb/yr)	0.79
TP LOAD REDUCTION ACHIEVED (lb/yr)	1.28
TP LOAD REMAINING (lb/yr):	4.26
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	0.00 **

** TARGET TP REDUCTION EXCEEDED BY 0.49 LB/YEAR **

Total Nitrogen (For Information Purposes)

POST-DEVELOPMENT LOAD (lb/yr)	39.64
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	6.00
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	33.64

BIORETENTION SIZING CHART

At-Grade Bioretention (West)	
Impervious DA (AC)	0.280
Managed DA (AC)	0.020
Total DA (AC)	0.3
Treatment Volume (CF)	984
Minimum Area (SF)	645
Actual Area (SF)	732
Upstream BMP	None
Downstream BMP	None
Phosphorus Removal %	25%
Phosphorus Removed	0.59

Bioretention Planter (East)	
Impervious DA (AC)	0.26
Managed DA (AC)	0
Total DA (AC)	0.26
Treatment Volume (CF)	897
Minimum Area (SF)	588
Actual Area (SF)	673
Upstream BMP	None
Downstream BMP	None
Phosphorus Removal %	25%
Phosphorus Removed	0.31

At-Grade Bio Storage Depth	
0.5' Ponding (1.0 Vr)	
2.5' Soil (0.25 Vr)	
1' Stone (0.4 Vr)	
Storage Depth	1.525

Bio Planter Storage Depth	
0.5' Ponding (1.0 Vr)	
2.5' Soil (0.25 Vr)	
1' Stone (0.4 Vr)	
Storage Depth	1.525

At-Grade Bioretention (Entrance)	
Impervious DA (AC)	0.110
Managed DA (AC)	0.010
Total DA (AC)	0.12
Treatment Volume (CF)	414
Minimum Area (SF)	271
Actual Area (SF)	668
Upstream BMP	None
Downstream BMP	None
Phosphorus Removal %	25%
Phosphorus Removed	0.13

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COMMONWEALTH OF VIRGINIA
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04/28/2023
PROFESSIONAL ENGINEER

N29 APARTMENTS
GENERAL DEVELOPMENT PLAN

CITY OF FAIRFAX, VA

MARK	DATE	DESCRIPTION
1	11-30-2022	ADDRESSED PER CITY COMMENTS
2	04-28-2023	ADDRESSED PER CITY COMMENTS

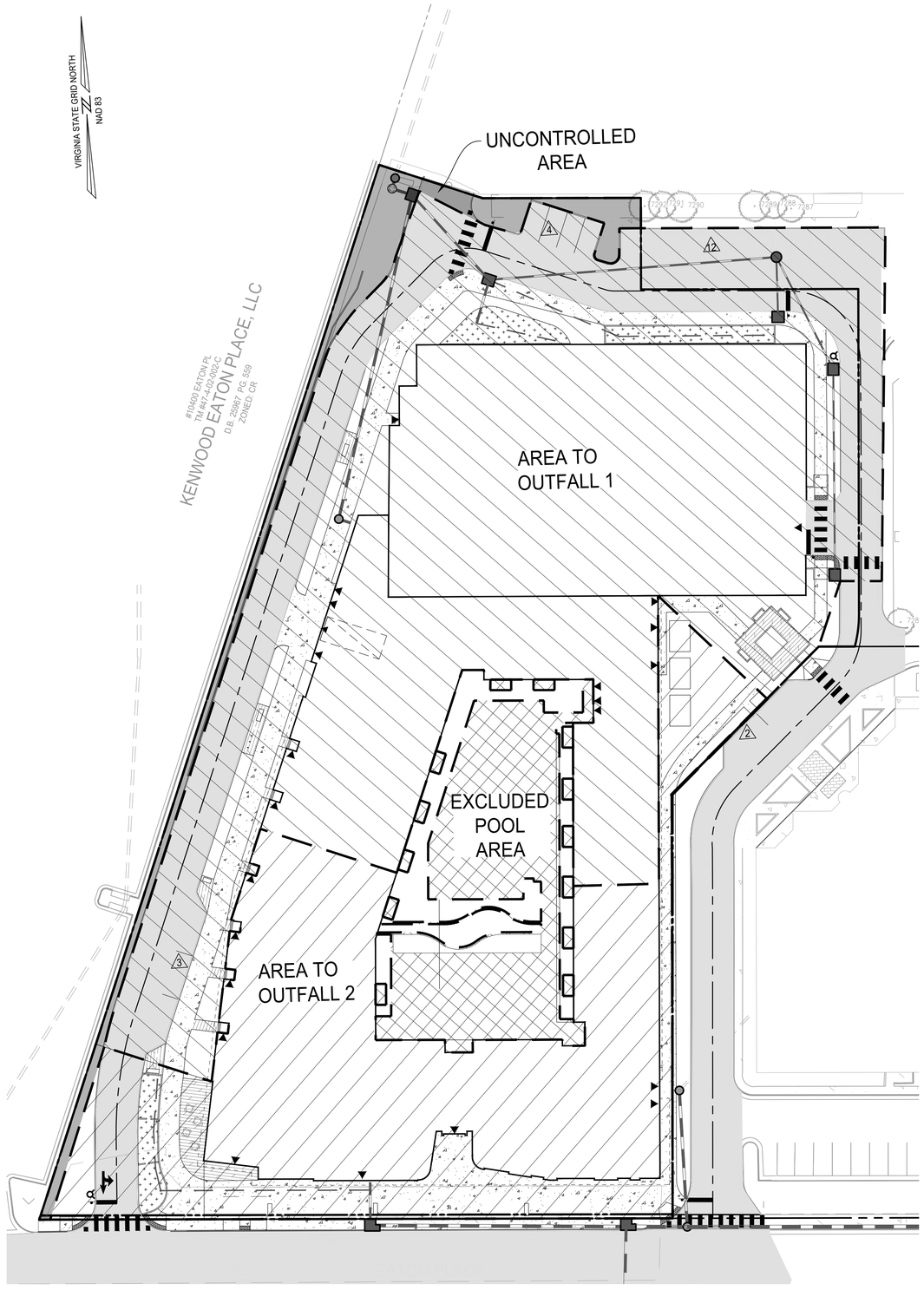
PROJECT No.: 21082.002.00
DRAWING No.: 111772
DATE: 2022-07-15
SCALE: N/A
DESIGN: JH
DRAWN: YH
CHECKED: JH

SHEET TITLE:

BMP CALCULATIONS

SHEET No.

PI_501



LEGEND

OUTFALL AREA 1

OUTFALL AREA 2

POOL AREA EXCLUDED

POST-DEVELOPED

OUTFALL (1-YR)		DA	IMP (D)	TURF (D)
Bioretention & HDS	DA-A/ Outfall 1	1.80	1.62	0.18
	CN ave.	**98**	VRRM - See this sheet	
Untreated	Outfall 2	0.95	0.66	0.29
	CN ave.	**93**	98	80
Untreated	Uncontrolled	0.10	0.00	0.09
	CN	**72**	98	80
	Total Area	2.85		
	CN ave.	**95**		

OUTFALL (2&10-YR)		DA	IMP (D)	TURF (D)
Bioretention & HDS	DA-A/ Outfall 1	1.80	1.62	0.18
	CN ave.	**98**	VRRM - See this sheet	
Untreated	Outfall 2	0.95	0.66	0.29
	CN ave.	**93**	98	80
Untreated	Uncontrolled	0.10	0.00	0.09
	CN	**72**	98	80
	Total Area	2.85		
	CN ave.	**95**		

*POOL AREA AND AREA DRAINING WITH THE POOL TO THE SANITARY SYSTEM OF 0.22 AC HAVE BEEN REMOVED FROM THE POST-DEV AREA

Phase I

	On-Site			
	Q1	RV1	Q10	RV10
Pre	8.06	24,224	15.60	48,957
Post	7.19	20,800	14.53	44,298

Channel Protection (1-Year Storm)

Qdev < IF (Qpre*Rvpre)/Rvdev

< 0.80 (8.061 * 24224)/ 20800

7.19 < 7.51

Detention required: -0.32 CFS

Flood Protection (10-Year Storm)

Q10 post < (Qpre*Rvpre)/Rvdev

14.53 < 17.24072

Detention required: -2.71 CFS

*SEE HYDROGRAPHS ON SHEET PI_503 AND PI_504.

	On-Site		
	Q2	RV2	
Pre	9.92	30,236	
Post	8.99	26,576	

Channel Protection (2-Year Storm)

Qdev < IF (Qpre*Rvpre)/Rvdev

< 0.80 (9.918 * 30236)/ 26576

8.99 < 9.03

Detention required: -0.04 CFS

Drainage Area Curve Numbers and Runoff Depths*

Curve numbers (CN, CNadj) and runoff depths ($RV_{Developed}$) are computed with and without reduction practices.

Drainage Area A		**A Soils**	**B Soils**	**C Soils**	**D Soils**
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.17
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	0.00	0.00	1.51
	CN	98	98	98	98
					$CN_{(D.A.\ A)}$
					96

	1-year storm	**2-year storm**	**10-year storm**
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	2.26	2.75	4.73
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	2.15	2.64	4.62
Adjusted CN*	**95**	**95**	**95**

Total Area (acres):	1.68
Runoff Reduction Volume (ft^3):	680

Drainage Area B		**A Soils**	**B Soils**	**C Soils**	**D Soils**
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.01
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.11
	CN	98	98	98	98
					$CN_{(D.A.\ B)}$
					97

	1-year storm	**2-year storm**	**10-year storm**
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	2.36	2.86	4.85
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	2.00	2.50	4.49
Adjusted CN*	**93**	**93**	**94**

Total Area (acres):	0.12
Runoff Reduction Volume (ft^3):	155

30 15 0 30 60

GRAPHIC SCALE
1" = 30'

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PROJECT No.: 21082.002.00
DRAWING No.: 111772
DATE: 2022-07-15
SCALE: 1" = 30'
DESIGN: JH
DRAWN: YH
CHECKED: JH

SHEET TITLE:

STORMWATER MANAGEMENT PLAN

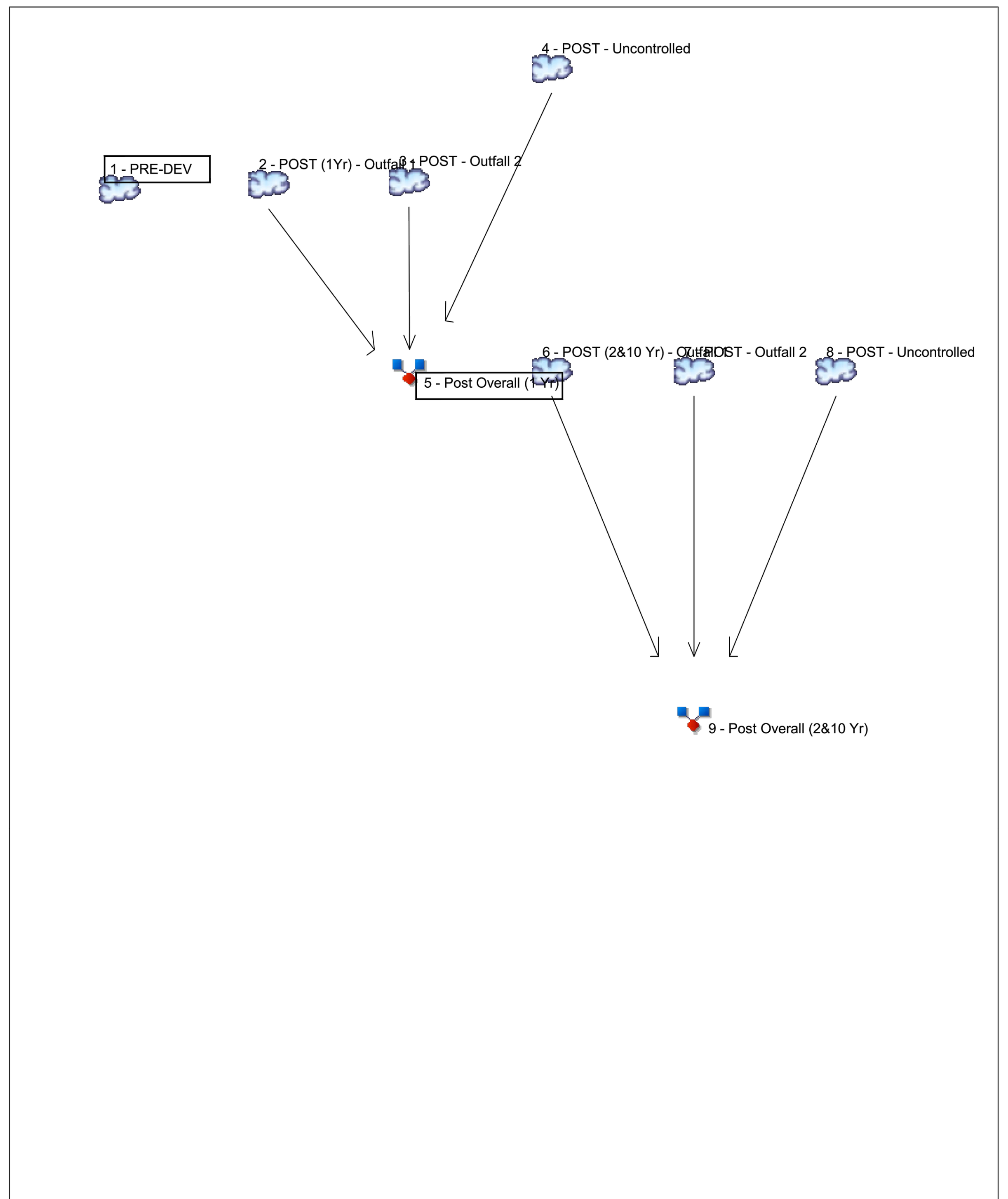
SHEET No.

PI_502

Watershed Model Schematic

1

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022



Project: SWM - Phase 1.gpw | Monday, 11 / 28 / 2022

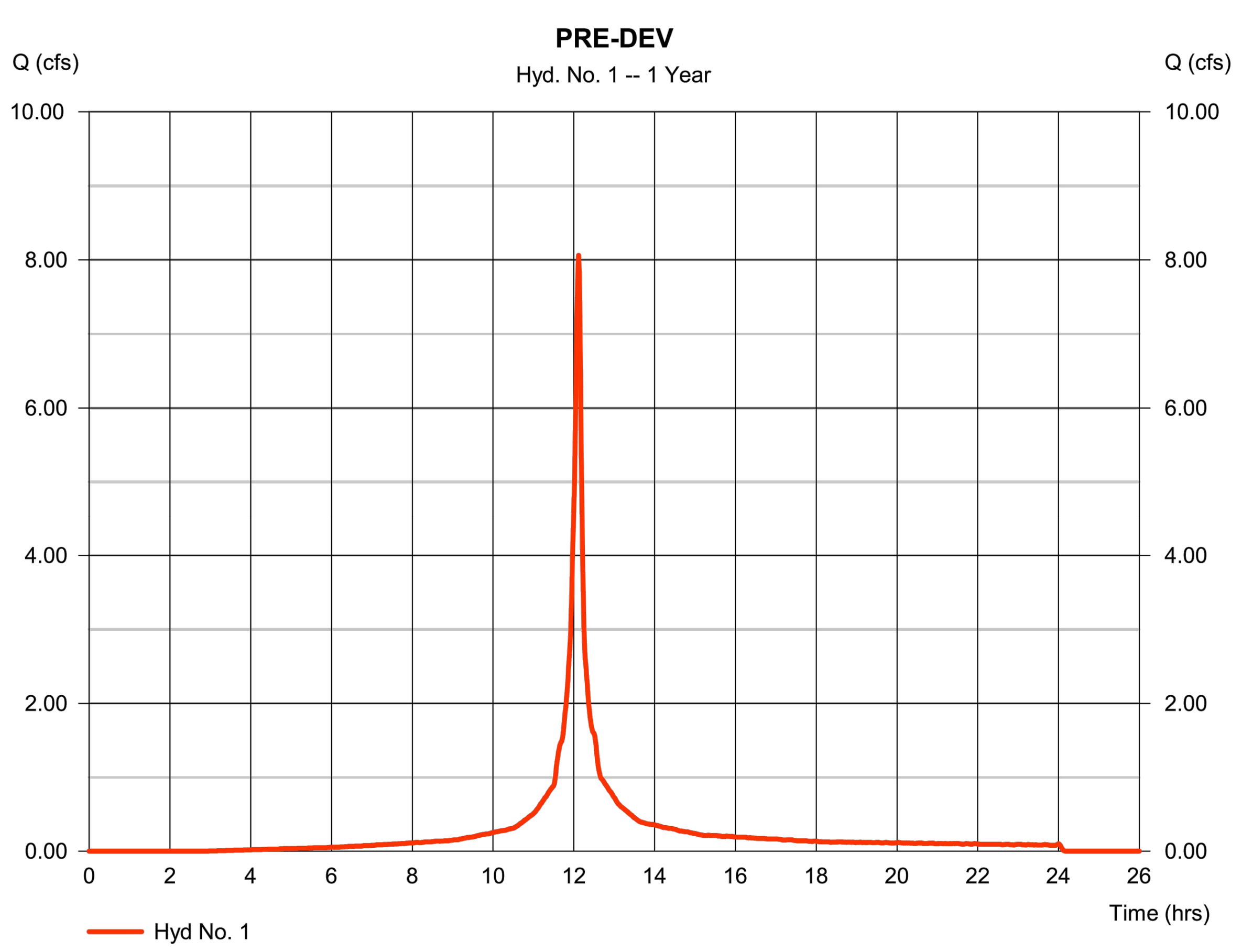
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 | Thursday, 11 / 24 / 2022

Hyd. No. 1

PRE-DEV

Hydrograph type	= SCS Runoff	Peak discharge	= 8.061 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 24,224 cuft
Drainage area	= 2.970 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 2.62 in	Distribution	= Custom
Storm duration	= P:\FX\Projects\18043\00200\10 SITE PLAN\DESIGN\ENGR\pond\24Hr_Dist-1		



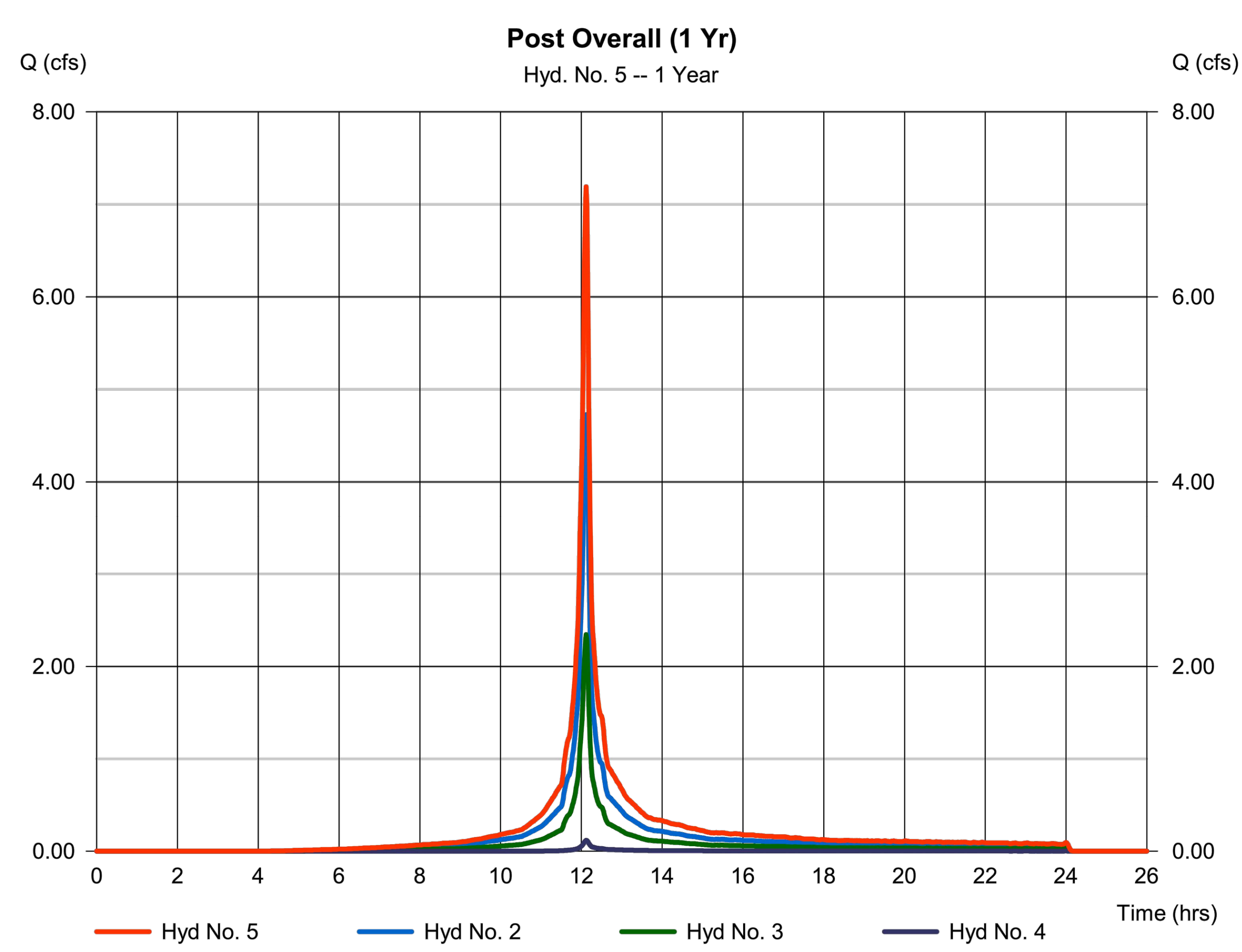
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 | Monday, 11 / 28 / 2022

Hyd. No. 5

Post Overall (1 Yr)

Hydrograph type	= Combine	Peak discharge	= 7.190 cfs
Storm frequency	= 1 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 20,800 cuft
Inflow hyds.	= 2, 3, 4	Contrib. drain. area	= 2.890 ac



Hydrograph Summary Report

2

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	8.061	1	727	24,224	------	------	------	PRE-DEV
2	SCS Runoff	4.728	1	727	13,741	------	------	------	POST (1Yr) - Outfall 1
3	SCS Runoff	2.345	1	727	6,731	------	------	------	POST - Outfall 2
4	SCS Runoff	0.118	1	727	328	------	------	------	POST - Uncontrolled
5	Combine	7.190	1	727	20,800	2, 3, 4	------	------	Post Overall (1 Yr)
~~6~~	~~SCS Runoff~~	~~4.881~~	~~1~~	~~727~~	~~14,401~~	~~------~~	~~------~~	~~------~~	~~POST (2&10 Yr) - Outfall 1~~
~~7~~	~~SCS Runoff~~	~~2.188~~	~~1~~	~~727~~	~~6,215~~	~~------~~	~~------~~	~~------~~	~~POST - Outfall 2~~
~~8~~	~~SCS Runoff~~	~~0.118~~	~~1~~	~~727~~	~~328~~	~~------~~	~~------~~	~~------~~	~~POST - Uncontrolled~~
~~9~~	~~Combine~~	~~7.186~~	~~1~~	~~727~~	~~20,944~~	~~6, 7, 8~~	~~------~~	~~------~~	~~Post Overall (2&10 Yr)~~

SWM - Phase 1.gpw | Return Period: 1 Year | Monday, 11 / 28 / 2022

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GENERAL DEVELOPMENT PLAN

CITY OF FAIRFAX, VA

MARK	DATE	DESCRIPTION
1	11-30-2022	ADDRESSED PER CITY COMMENTS
2	04-28-2023	ADDRESSED PER CITY COMMENTS

PROJECT No.: 21082.002.00
DRAWING No.: 111772
DATE: 2022-07-15
SCALE: NOT TO SCALE
DESIGN: JH
DRAWN: YH
CHECKED: JH

SHEET TITLE:

OUTFALL 1
HYDROGRAPHS

SHEET No.

PI_503

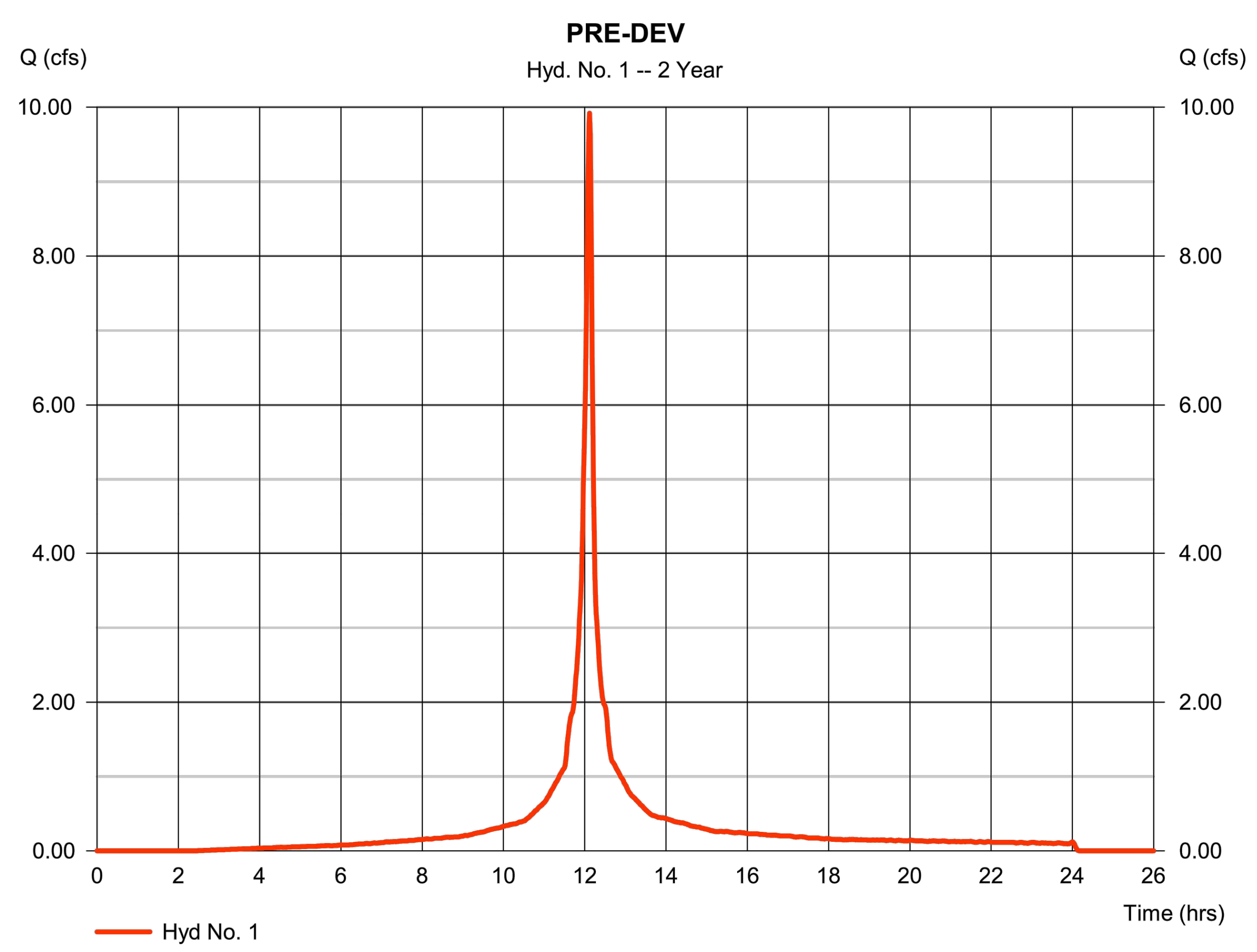
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Monday, 11 / 28 / 2022

Hyd. No. 1

PRE-DEV

Hydrograph type	= SCS Runoff	Peak discharge	= 9.918 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 30,236 cuft
Drainage area	= 2.970 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.17 in	Distribution	= Custom
Storm duration	= P:\FX\Projects\18043\00200\1[illegible] PLAN\DESIGN\ENGR\pond\24Hr_Dist-1	Shape factor	= 484



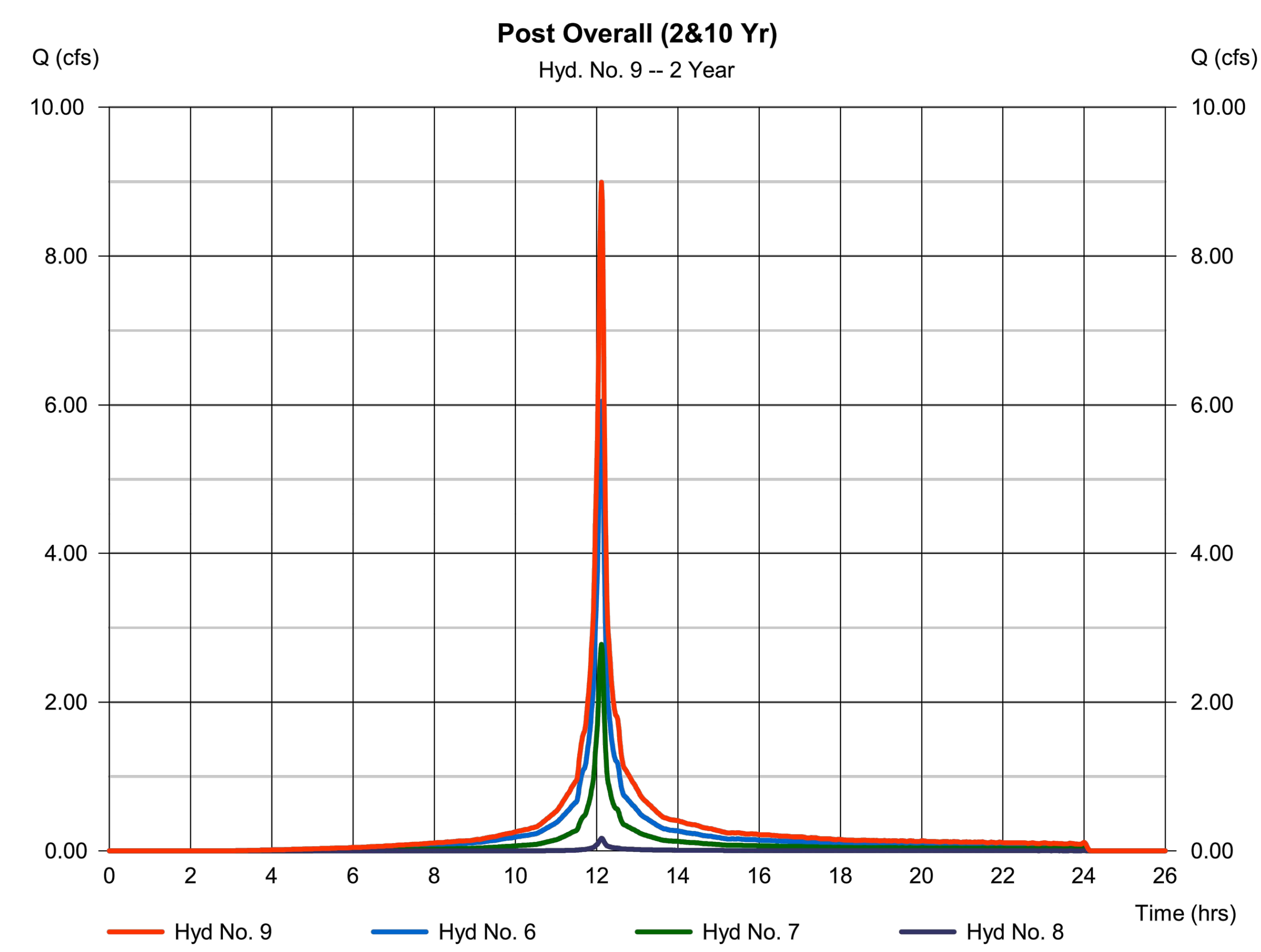
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Monday, 11 / 28 / 2022

Hyd. No. 9

Post Overall (2&10 Yr)

Hydrograph type	= Combine	Peak discharge	= 8.993 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 26,576 cuft
Inflow hyds.	= 6, 7, 8	Contrib. drain. area	= 2.860 ac



4

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	9.918	1	727	30,236	------	------	------	PRE-DEV
~~2~~	~~SCS Runoff~~	~~5.903~~	~~1~~	~~727~~	~~17,415~~	~~------~~	~~------~~	~~------~~	~~POST (1Yr) - Outfall 1~~
~~3~~	~~SCS Runoff~~	~~2.951~~	~~1~~	~~727~~	~~8,595~~	~~------~~	~~------~~	~~------~~	~~POST - Outfall 2~~
~~4~~	~~SCS Runoff~~	~~0.168~~	~~1~~	~~727~~	~~465~~	~~------~~	~~------~~	~~------~~	~~POST - Uncontrolled~~
~~5~~	~~Combine~~	~~9.023~~	~~1~~	~~727~~	~~26,475~~	~~2, 3, 4~~	~~------~~	~~------~~	~~Post Overall (1 Yr)~~
6	SCS Runoff	6.048	1	727	18,114	------	------	------	POST (2&10 Yr) - Outfall 1
7	SCS Runoff	2.777	1	727	7,997	------	------	------	POST - Outfall 2
8	SCS Runoff	0.168	1	727	465	------	------	------	POST - Uncontrolled
9	Combine	8.993	1	727	26,576	6, 7, 8	------	------	Post Overall (2&10 Yr)

SWM - Phase 1.gpw | Return Period: 2 Year | Monday, 11 / 28 / 2022

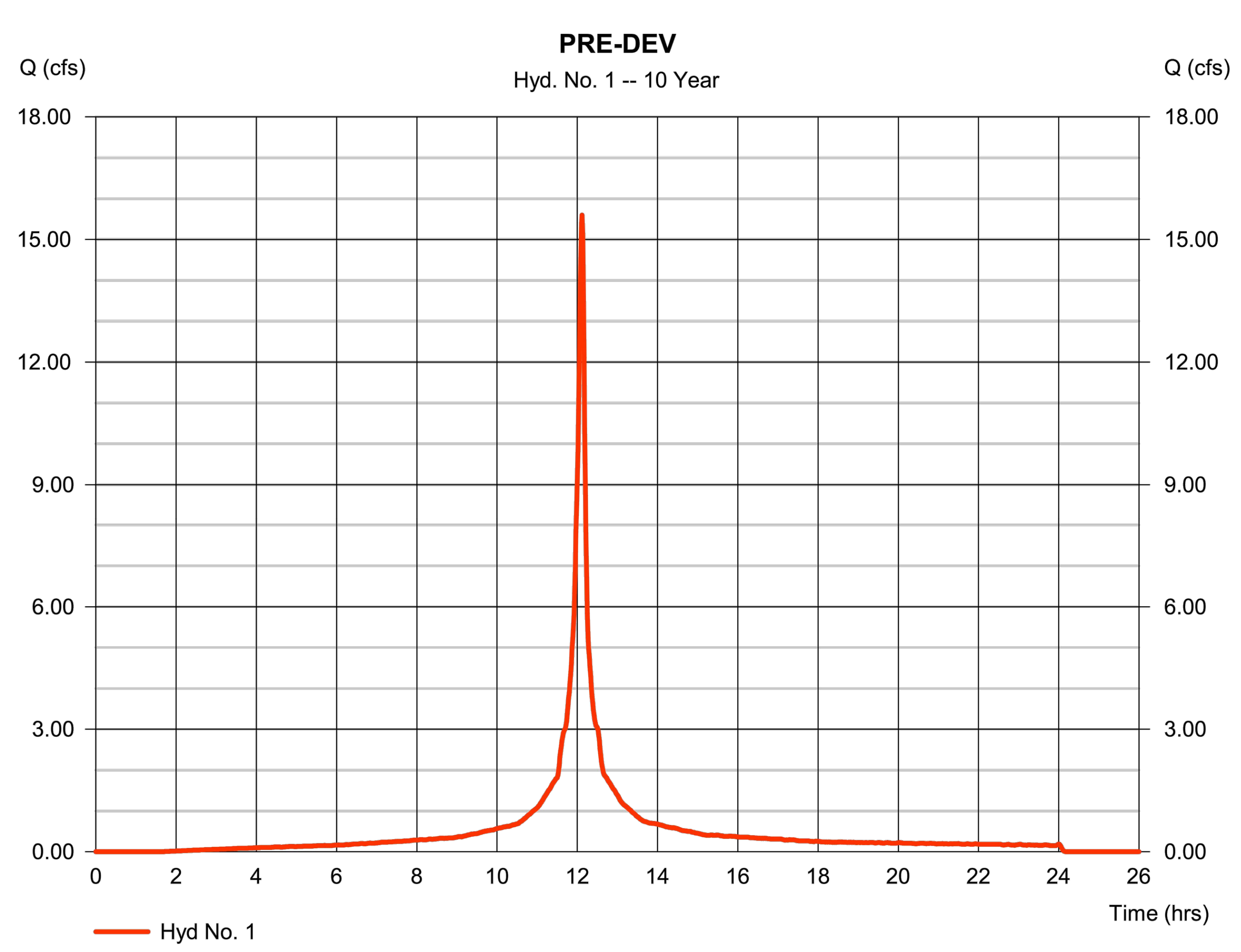
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Thursday, 11 / 24 / 2022

Hyd. No. 1

PRE-DEV

Hydrograph type	= SCS Runoff	Peak discharge	= 15.60 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 48,957 cuft
Drainage area	= 2.970 ac	Curve number	= 96
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= User	Time of conc. (Tc)	= 5.00 min
Total precip.	= 4.87 in	Distribution	= Custom
Storm duration	= P:\FX\Projects\18043\00200\1[illegible] PLAN\DESIGN\ENGR\pond\24Hr_Dist-1	Shape factor	= 484



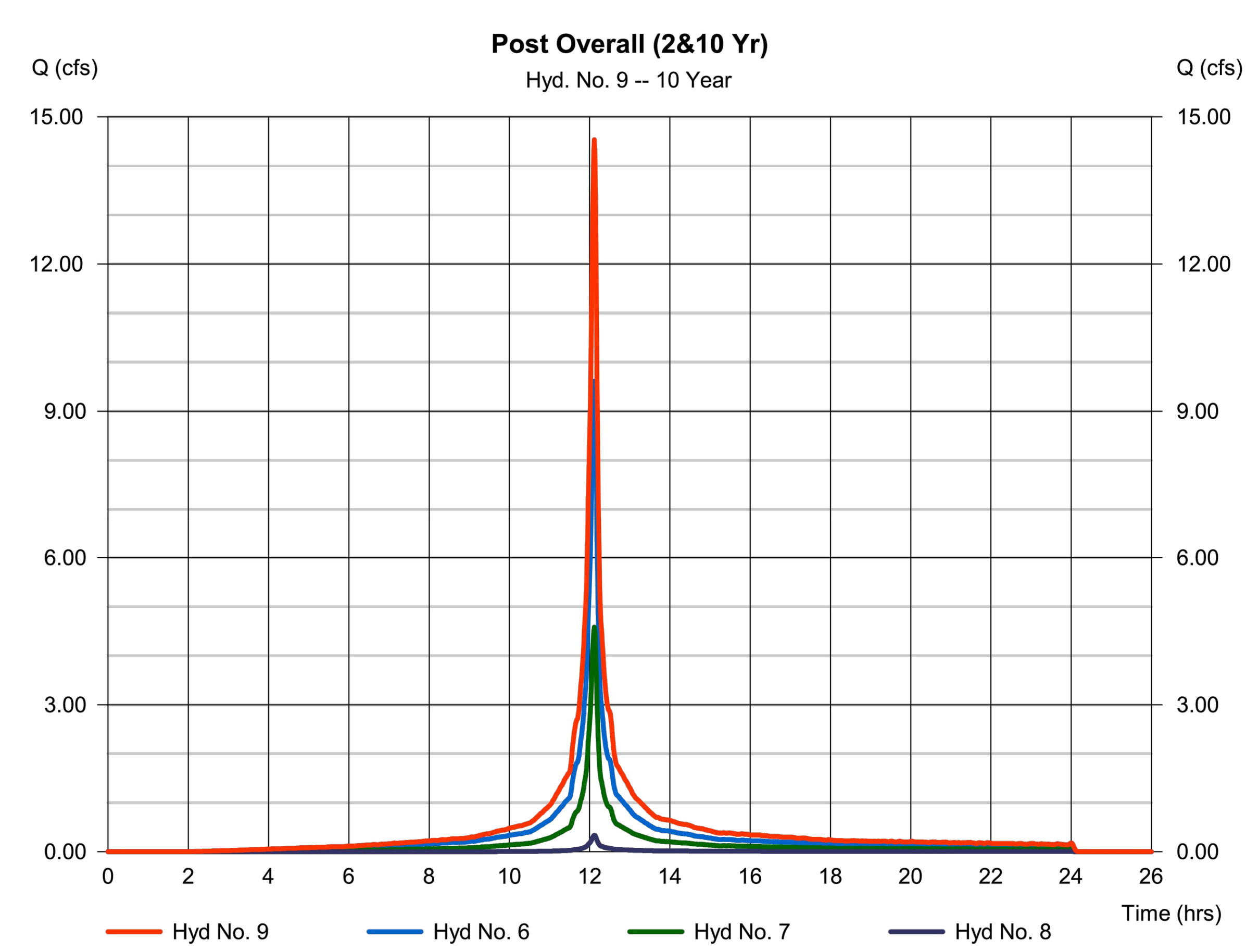
Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022 — Monday, 11 / 28 / 2022

Hyd. No. 9

Post Overall (2&10 Yr)

Hydrograph type	= Combine	Peak discharge	= 14.53 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.12 hrs
Time interval	= 1 min	Hyd. volume	= 44,298 cuft
Inflow hyds.	= 6, 7, 8	Contrib. drain. area	= 2.860 ac



6

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022

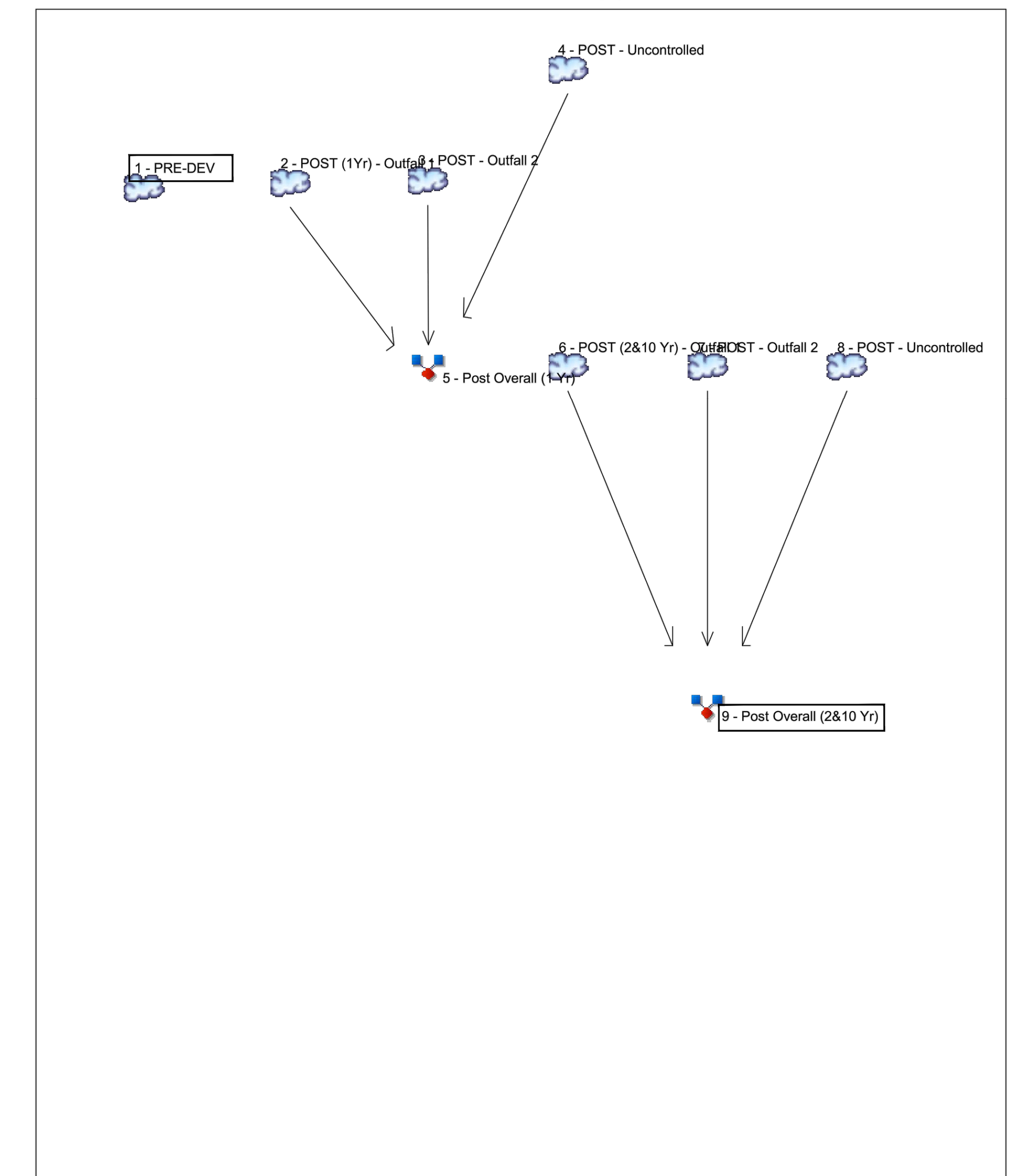
Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
1	SCS Runoff	15.60	1	727	48,957	------	------	------	PRE-DEV
~~2~~	~~SCS Runoff~~	~~9.493~~	~~1~~	~~727~~	~~28,946~~	~~------~~	~~------~~	~~------~~	~~POST (1Yr) - Outfall 1~~
~~3~~	~~SCS Runoff~~	~~4.806~~	~~1~~	~~727~~	~~14,475~~	~~------~~	~~------~~	~~------~~	~~POST - Outfall 2~~
~~4~~	~~SCS Runoff~~	~~0.338~~	~~1~~	~~727~~	~~937~~	~~------~~	~~------~~	~~------~~	~~POST - Uncontrolled~~
~~5~~	~~Combine~~	~~14.64~~	~~1~~	~~727~~	~~44,358~~	~~2, 3, 4~~	~~------~~	~~------~~	~~Post Overall (1 Yr)~~
6	SCS Runoff	9.613	1	727	29,715	------	------	------	POST (2&10 Yr) - Outfall 1
7	SCS Runoff	4.582	1	727	13,646	------	------	------	POST - Outfall 2
8	SCS Runoff	0.338	1	727	937	------	------	------	POST - Uncontrolled
9	Combine	14.53	1	727	44,298	6, 7, 8	------	------	Post Overall (2&10 Yr)

SWM - Phase 1.gpw | Return Period: 10 Year | Monday, 11 / 28 / 2022

1

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2022



Project: SWM - Phase 1.gpw | Monday, 11 / 28 / 2022

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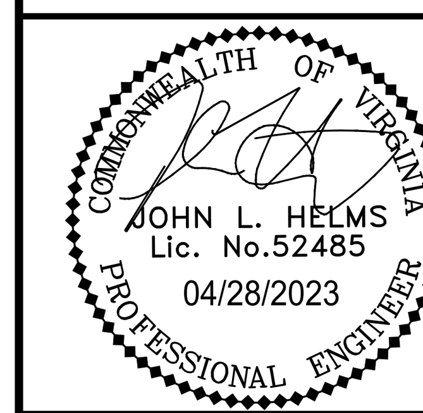

N29 APARTMENTS
GENERAL DEVELOPMENT PLAN

CITY OF FAIRFAX, VA

MARK	DATE	DESCRIPTION
1	11-30-2022	ADDRESSED PER CITY COMMENTS
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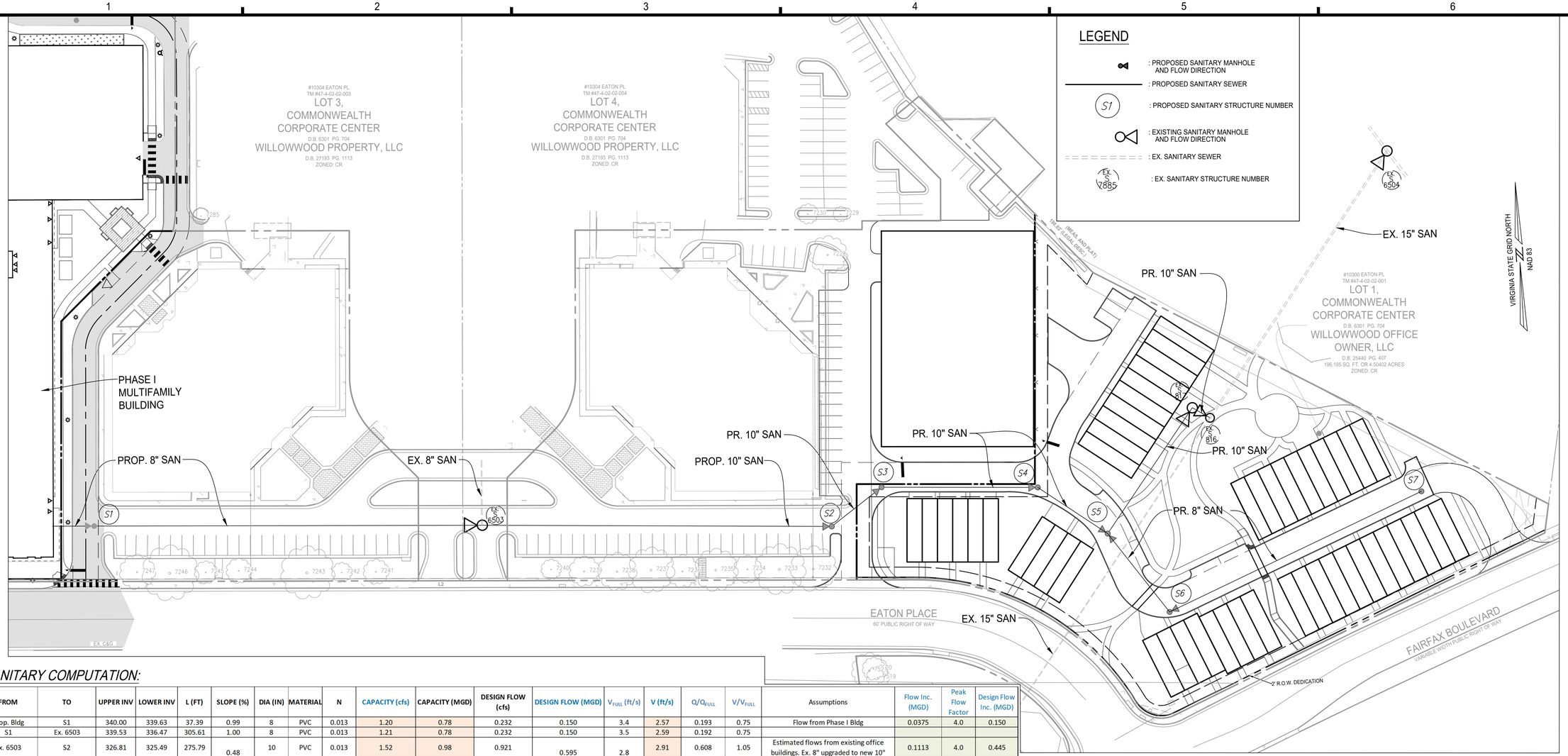
DESIGN: JH
DRAWN: YH
CHECKED: JH

SHEET TITLE:

OUTFALL 2 HYDROGRAPHS

SHEET No.

PI_504



SANITARY COMPUTATION:

FROM	TO	UPPER INV	LOWER INV	L (FT)	SLOPE (%)	DIA (IN)	MATERIAL	N	CAPACITY (cfs)	CAPACITY (MGD)	DESIGN FLOW (cfs)	DESIGN FLOW (MGD)	V_{FULL} (ft/s)	V (ft/s)	Q/Q_{FULL}	V/V_{FULL}	Assumptions	Flow Inc. (MGD)	Peak Flow Factor	Design Flow Inc. (MGD)
Prop. Bldg	S1	340.00	339.63	37.39	0.99	8	PVC	0.013	1.20	0.78	0.232	0.150	3.4	2.57	0.193	0.75	Flow from Phase I Bldg	0.0375	4.0	0.150
S1	Ex. 6503	339.53	336.47	305.61	1.00	8	PVC	0.013	1.21	0.78	0.232	0.150	3.5	2.59	0.192	0.75				
Ex. 6503	S2	326.81	325.49	275.79	0.48	10	PVC	0.013	1.52	0.98	0.921	0.595	2.8	2.91	0.608	1.05	Estimated flows from existing office buildings. Ex. 8" upgraded to new 10"	0.1113	4.0	0.445
S2	S3	325.48	325.24	49.97	0.48	10	PVC	0.013	1.52	0.98	0.921	0.595	2.8	2.91	0.607	1.05				
S3	S4	325.23	324.64	123.12	0.48	10	PVC	0.013	1.52	0.98	0.932	0.602	2.8	2.91	0.615	1.05	Flows from Phase II Res. Units	0.0018	4.0	0.007
S4	S5	324.63	324.32	65.74	0.47	10	PVC	0.013	1.50	0.97	0.939	0.607	2.8	2.89	0.624	1.05	Flows from Phase II Res. Units	0.0012	4.0	0.005
S7	S6	330.00	327.80	220.08	1.00	8	PVC	0.013	1.21	0.78	0.052	0.034	3.5	1.71	0.043	0.50	Flows from Phase II Res. Units	0.0084	4.0	0.034
S6	S5	327.70	326.91	78.69	1.00	8	PVC	0.013	1.21	0.78	0.056	0.036	3.5	1.72	0.046	0.50	Flows from Phase II Res. Units	0.0006	4.000	0.002
S5	Ex. 817	324.22	323.64	119.56	0.49	10	PVC	0.013	1.53	0.99	1.088	0.703	2.8	3.03	0.713	1.08	Flows from Phase II Res. Units	0.0150	4.0	0.060
Ex. 817	Ex. 816	323.60	323.38	16.04	1.37	10	PVC	0.013	2.57	1.66	1.088	0.703	4.7	4.44	0.424	0.94	Ex. 8" upgraded to new 10"			
Ex. 816	Ex. 6504	316.55	314.97	252.63	0.63	15	RCP	0.013	5.11	3.30	3.376	2.182	4.2	4.41	0.661	1.06	Estimated offsite sanitary flows	0.3698	4.0	1.479

Notes:
1. See contributing sewage flow estimates below.
2. Peaking factor of 4.0 used.
3. Existing office building areas obtained from City of Fairfax Real Estate Assessment Database.
4. See Sanitary Sewer Off-Site Map sheet for offsite flow estimates.

Contributing Sewage Flow Estimate (Existing)

Discharge Facility (Ex. Office Buildings)	SF	Estimated Flow (gpd/1000 SF)	Total Incremetal Flow (gpd)	Sanitary From	Sanitary To
10300 Eaton Pl	138,860	200	27,772	Ex. 6503	Ex. 3168
10302 Eaton Pl	142,648	200	28,530	Ex. 6503	Ex. 3168
10304 Eaton Pl	135,942	200	27,188	Ex. 6503	Ex. 3168
10306 Eaton Pl	138,860	200	27,772	Ex. 6503	Ex. 3168
Total SF	556,310	Estimated Cumulative Existing Flow	111,262	Ex. 6503	Ex. 3168

PHASE I

Contributing Sewage Flow Estimate (Proposed)

Discharge Facility	No. of Units	No. of People	Design Flow (gpd/person)	Total Incremetal Flow (gpd)	Total Cummulative Flow (gpd)	Sanitary From	Sanitary To
Multifamily	268	375	100	37,500	37,500	S1	Ex. 6503

PHASE II

Contributing Sewage Flow Estimate (Proposed)

Discharge Facility	# of Units	No. of People	Design Flow (gpd/person)	Total Incremetal Flow (gpd)	Total Cummulative Flow (gpd)	Sanitary From	Sanitary To
Phase II Res.	6	18	100	1,800	1,800	S3	S4
Phase II Res.	4	12	100	1,200	3,000	S4	S5
Phase II Res.	28	84	100	8,400	8,400	S7	S6
Phase II Res.	2	6	100	600	9,000	S6	S5
Phase II Res.	10	30	100	3,000	15,000	S5	S817

SANITARY SEWER ANALYSIS

THE PURPOSE OF THIS ANALYSIS IS TO DEMONSTRATE THE CAPACITY AND HYDRAULIC ADEQUACY OF THE DOWN STREAM SANITARY SEWER MAIN.

EXISTING CONDITIONS:
CURRENTLY, THE EXISTING SITE CONSISTS OF AN EXISTING ASPHALT PARKING LOT WITH NO EXISTING SANITARY SEWER MAIN ON SITE.

THE UPSTREAM FOR THIS SEWER-SHED IS SHOWN ON SHEET PI_601, WEST OF THE SITE, AND ON THIS SHEET FROM EXISTING OFFICE BUILDINGS, DESIGNATED AS ESTIMATED FLOW.

PHASE I

PROPOSED CONDITIONS:
NEW LATERALS AND SANITARY MAIN WILL BE CONSTRUCTED ON-SITE AND CONNECT TO THE EXISTING MANHOLE S6503.

CAPACITY AND HYDRAULIC ANALYSIS:
THE SANITARY SEWER WAS ANALYZED FROM THE ON-SITE 8-INCH SEWER TO EXISTING MANHOLE S816.

THE VOLUME OF FLOW USED IN THIS ANALYSIS HAS BEEN COMPUTED IN ACCORDANCE WITH STATE CODE 9VAC25-790-460 AND 9VAC25-790-310. SEE COMPUTATIONS ON THIS SHEET.

PHASE II

PROPOSED CONDITIONS:
EXISTING 10" SANITARY SEWER WILL BE REMOVED AND RELOCATED FOR THE CONSTRUCTION OF PROPOSED TONWHOMES. PROPOSED 10" SANITARY SEWER NETWORK WILL CONNECT TO THE EXISTING 10" SANITARY WHICH CONNECTS TO EXISTING MANHOLE S817.

CAPACITY AND HYDRAULIC ANALYSIS:
THE SANITARY SEWER WAS ANALYZED FROM THE EX. 8-INCH SEWER TO FROM THE PHASE I DEVELOPMENT TO EXISTING MANHOLE S816.

THE VOLUME OF FLOW USED IN THIS ANALYSIS HAS BEEN COMPUTED IN ACCORDANCE WITH STATE CODE 9VAC25-790-460 AND 9VAC25-790-310. SEE COMPUTATIONS ON THIS SHEET.

CONCLUSION:
IT IS OUR CONCLUSION THAT THE EXISTING DOWNSTREAM 8-INCH SEWERS NOTED IN THE SANITARY COMPUTATION CHART NEED TO BE UPGRADED TO 10-INCH PIPES TO MEET CAPACITY AND HYDRAULIC ADEQUACY OF THE ADDED REDEVELOPMENT FLOWS.

40 20 0 40 80
GRAPHIC SCALE
1"=40'

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COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
Lic. No.52485
04/28/2023
PROFESSIONAL ENGINEER

N29 APARTMENTS
GENERAL DEVELOPMENT PLAN

CITY OF FAIRFAX, VA

MARK	DATE	DESCRIPTION
1	11-30-2022	ADDRESSED PER CITY COMMENTS
2	04-28-2023	ADDRESSED PER CITY COMMENTS

PROJECT No.: 21082.002.00
DRAWING No.: ----
DATE: 2022-07-15
SCALE: 1" = 30'
DESIGN: JH
DRAWN: YH
CHECKED: JH

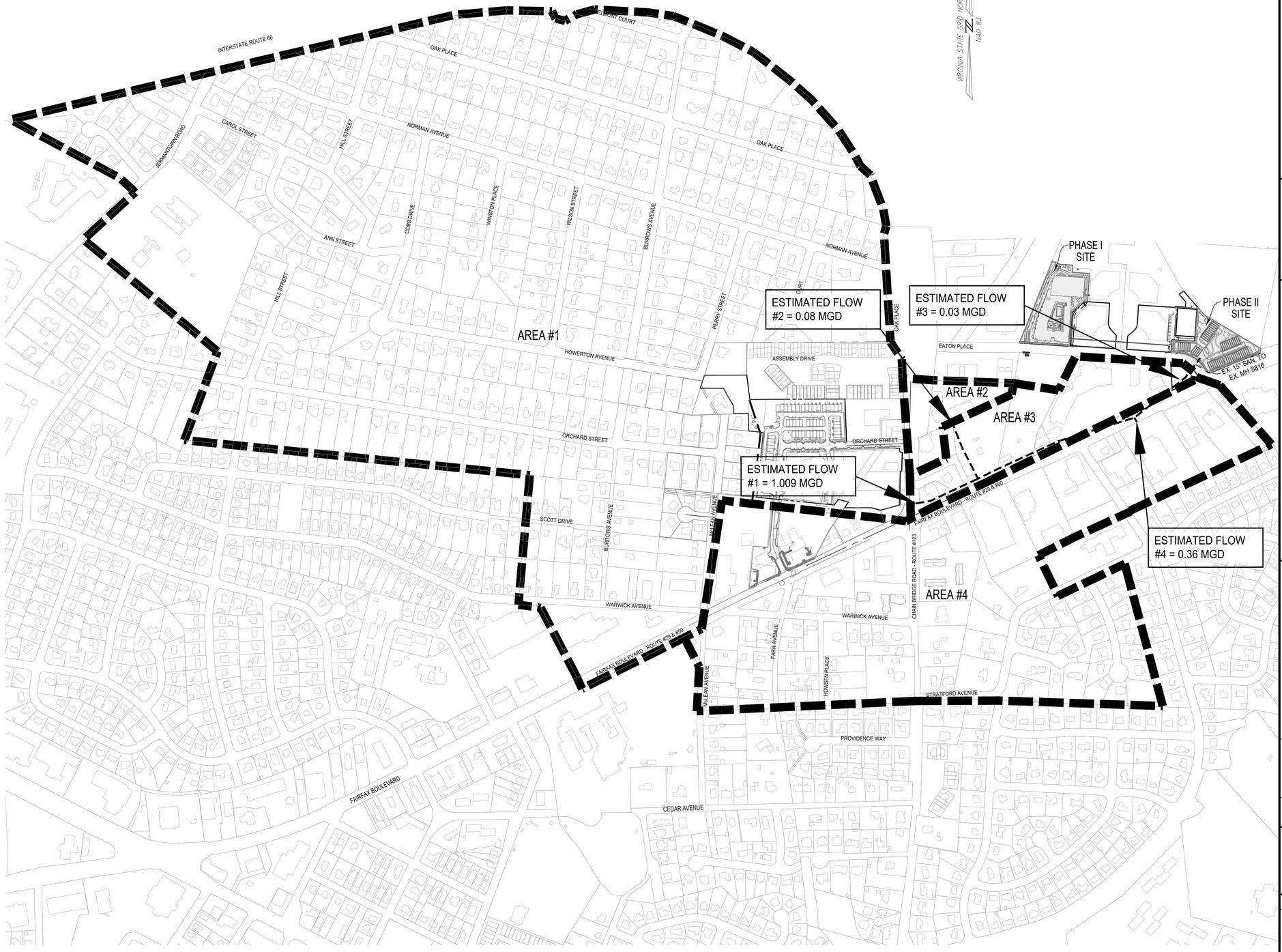
SHEET TITLE:

SANITARY SEWER ANALYSIS

SHEET No.

PI_600

OFFSITE SANITARY FLOW ESTIMATES:
AREA #1 FLOW ESTIMATES: FROM NORTHFAX WEST PUBLIC IMPROVEMENT PLAN (SP-20-00300) TOTAL PEAK FLOW = 1.009 MGD
AREA #2 EXISTING DEVELOPMENT ESTIMATES: HOTEL= 152 ROOMS FLOW ESTIMATES: 152 UNITS x 130 GPD/UNIT = 19,760 GPD TOTAL FLOW = 19,760 GPD TOTAL PEAK FLOW = 79,040 GPD = 0.08 MGD
AREA #3 EXISTING DEVELOPMENT ESTIMATES: OFFICE/RETAIL = 41,161 SF FLOW ESTIMATES: 41,161 SF OFFICE/RETAIL x 200 GPD/1000 SF = 8,232 GPD TOTAL FLOW = 8,232 GPD TOTAL PEAK FLOW = 32,929 GPD = 0.03 MGD
AREA #4 EXISTING DEVELOPMENT ESTIMATES: RESIDENTIAL= 63 DWELLING UNITS OFFICE/RETAIL = 344,446 SF FLOW ESTIMATES: 63 UNITS x 350 GPD/UNIT = 22,050 GPD 344,446 SF OFFICE/RETAIL x 200 GPD/1000 SF = 68,889 GPD TOTAL FLOW = 90,939 GPD TOTAL PEAK FLOW = 363,757 GPD = 0.36 MGD



NOTES:
1. SEE SHEET PI_600 FOR SANITARY SEWER ANALYSIS.
2. SEE THIS SHEET FOR EXISTING FLOW ESTIMATES.
3. A PEAK FACTOR OF 4.0 WAS USED FOR ALL OFFSITE SANITARY FLOWS.

300 150 0 300 600
HORIZONTAL GRAPHIC SCALE
1" = 300'

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CITY OF FAIRFAX, VA

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SCALE: 1"=300'
DESIGN: LBD,ZY
DRAWN: ZY
CHECKED: LBD

SHEET TITLE:

SANITARY SEWER OFF-SITE MAP

SHEET No.
PI_601

MULTIFAMILY BUILDING:

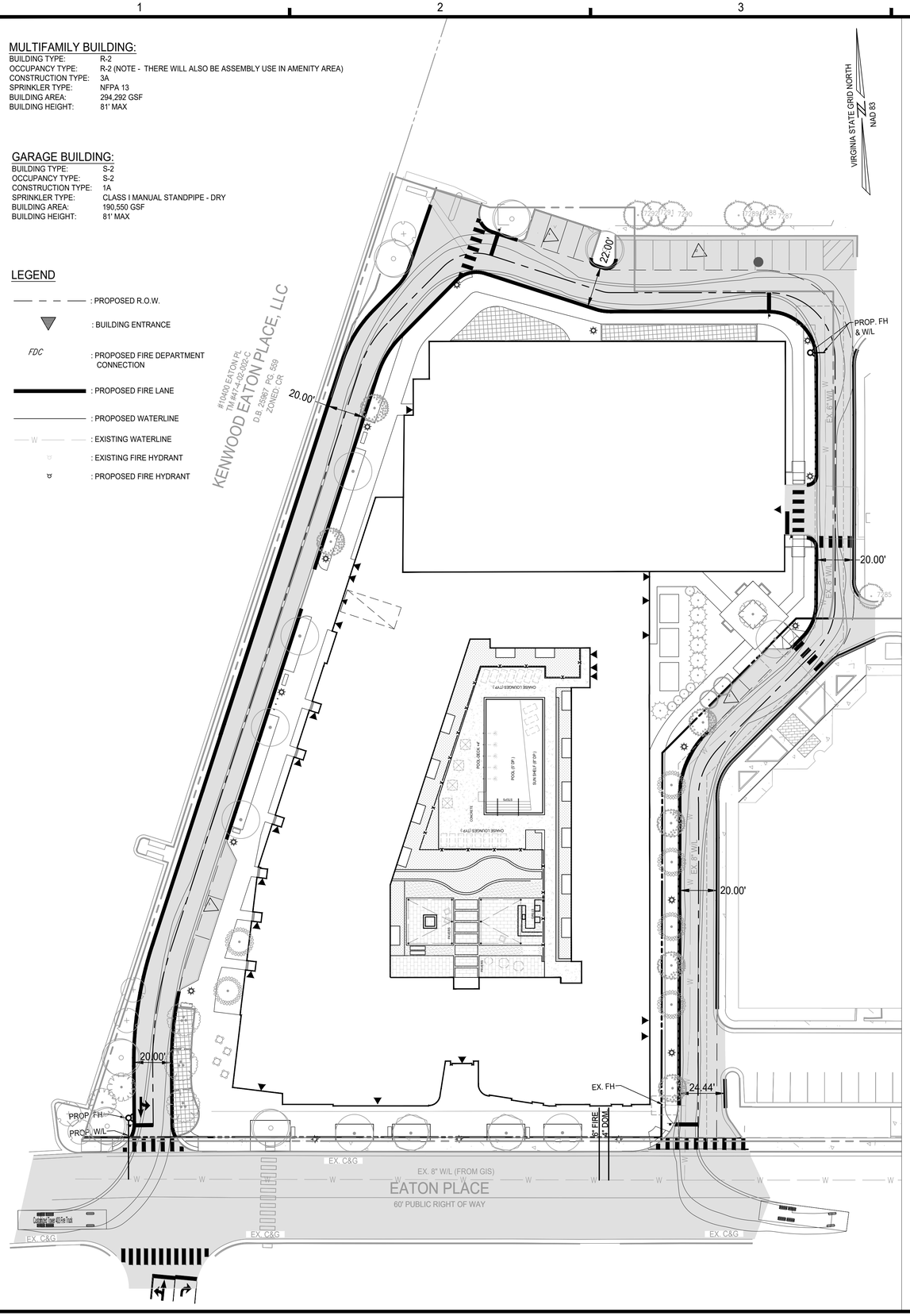
BUILDING TYPE:	R-2
OCCUPANCY TYPE:	R-2 (NOTE - THERE WILL ALSO BE ASSEMBLY USE IN AMENITY AREA)
CONSTRUCTION TYPE:	3A
SPRINKLER TYPE:	NFPA 13
BUILDING AREA:	294,292 GSF
BUILDING HEIGHT:	81' MAX

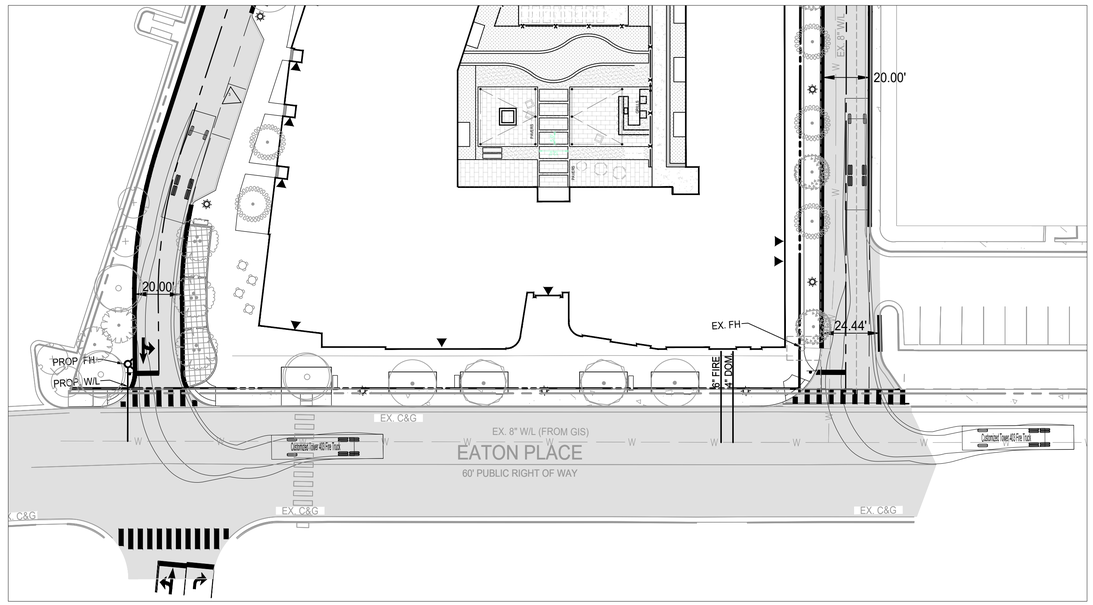
GARAGE BUILDING:

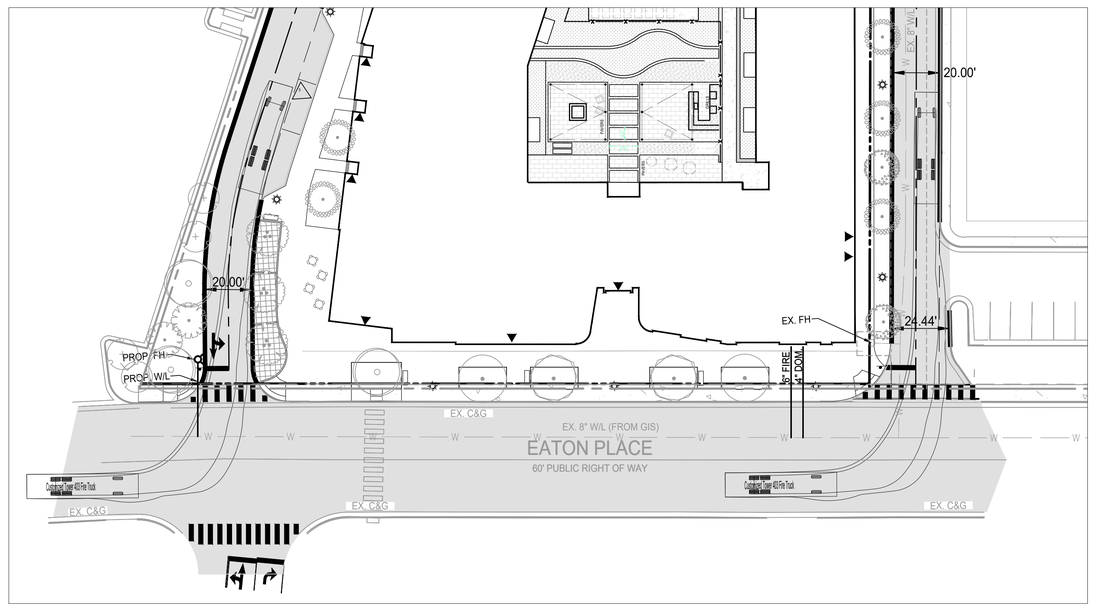
BUILDING TYPE:	S-2
OCCUPANCY TYPE:	S-2
CONSTRUCTION TYPE:	1A
SPRINKLER TYPE:	CLASS I MANUAL STANDPIPE - DRY
BUILDING AREA:	190,550 GSF
BUILDING HEIGHT:	81' MAX

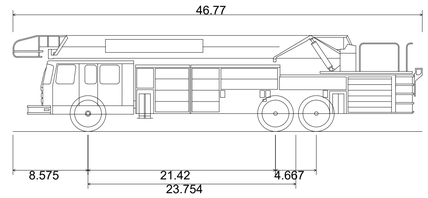
LEGEND

- : PROPOSED R.O.W.
- : BUILDING ENTRANCE
- FDC : PROPOSED FIRE DEPARTMENT CONNECTION
- : PROPOSED FIRE LANE
- : PROPOSED WATERLINE
- W : EXISTING WATERLINE
- : EXISTING FIRE HYDRANT
- : PROPOSED FIRE HYDRANT









Customized Tower 403 Fire Truck	
Overall Length	46.770ft
Overall Width	10.160ft
Overall Body Height	10.976ft
Min Body Ground Clearance	1.512ft
Track Width	7.667ft
Lock-to-lock time	4.00s
Wall to Wall Turning Radius	45.000ft

NOTE:
NO LOADING, DELIVERY, OR REFUSE TRUCKS WILL BE LARGER THAN THE FIRE TRUCK.

30 15 0 30 60
GRAPHIC SCALE
1" = 30'

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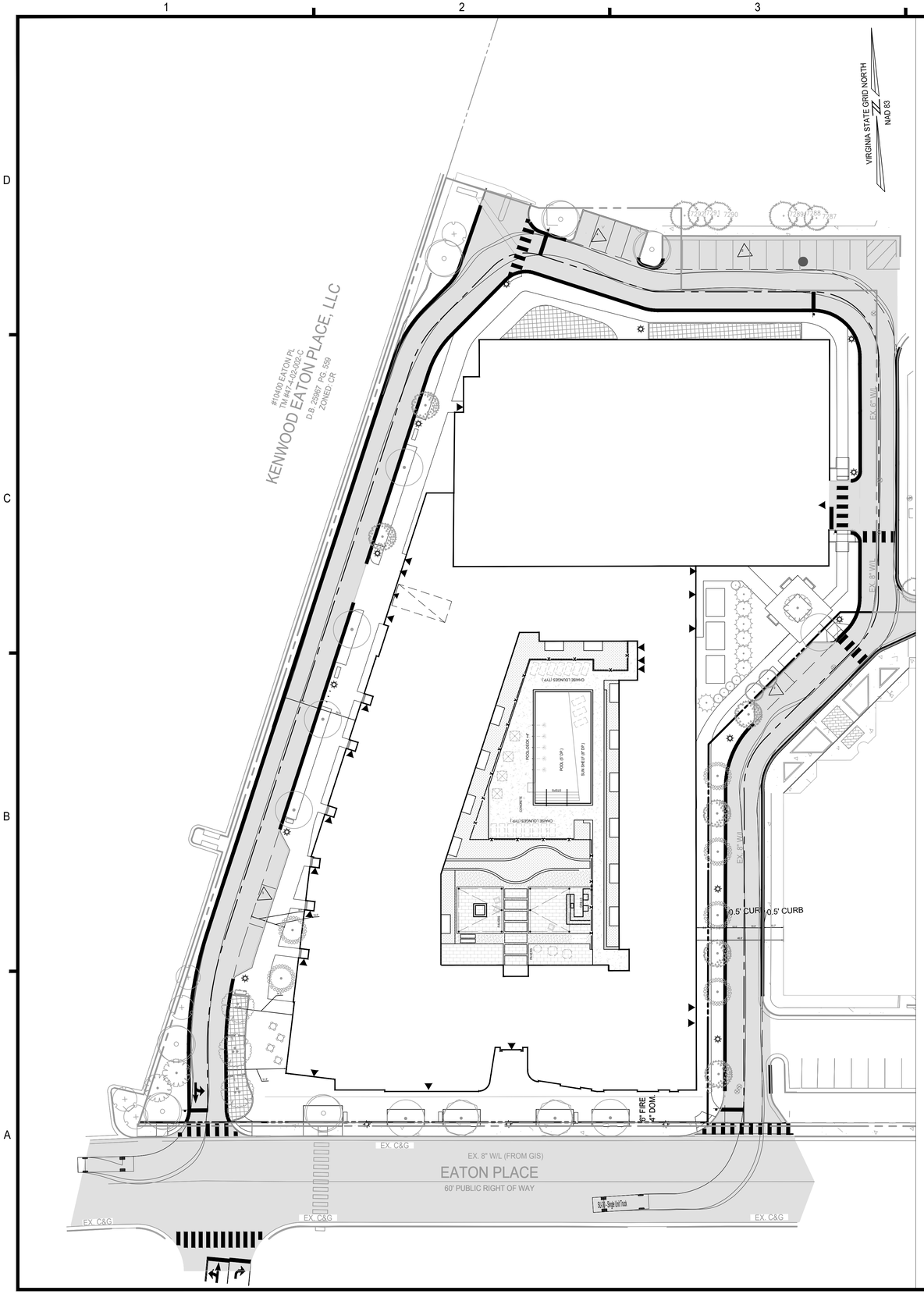
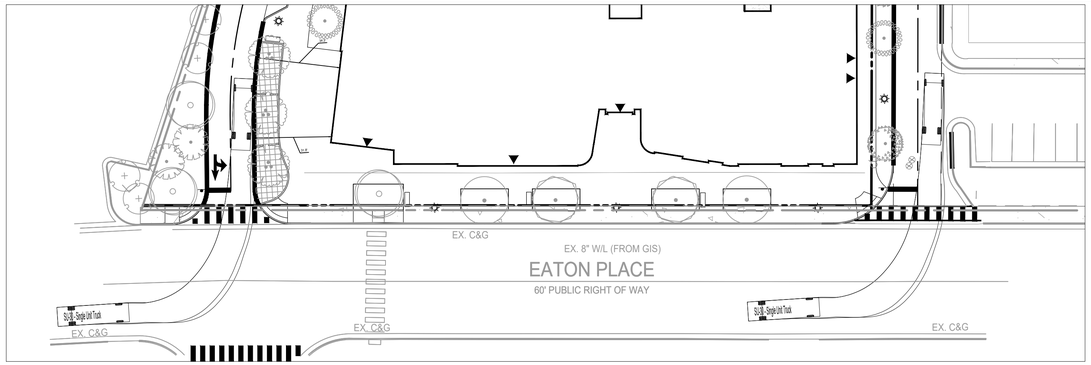
DESIGN: JH
DRAWN: YH
CHECKED: JH

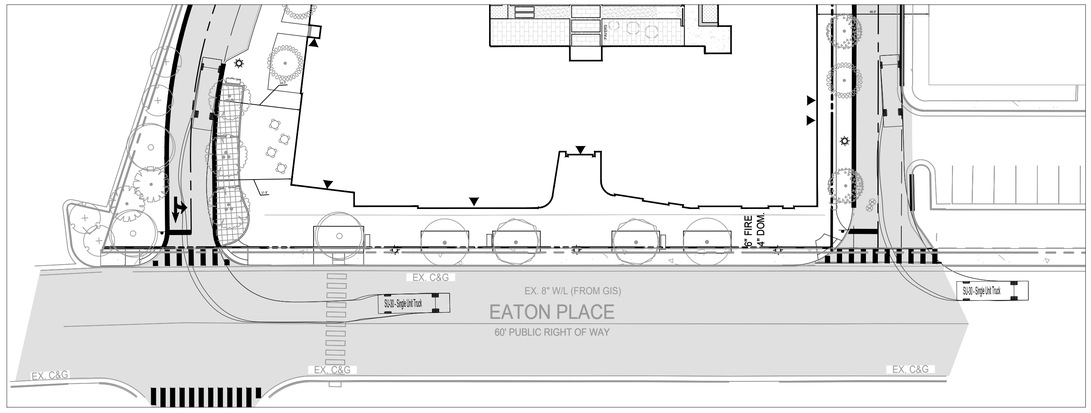
SHEET TITLE:

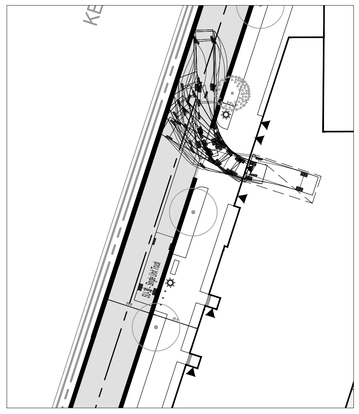
FIRE SERVICE PLAN

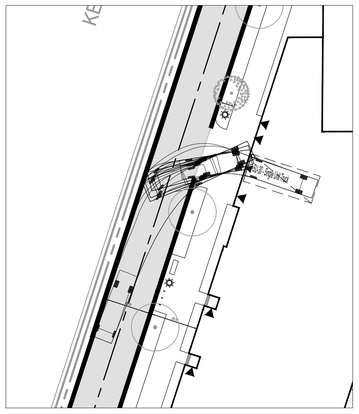
SHEET No.
PI_800

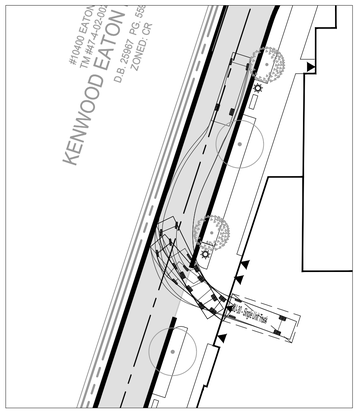


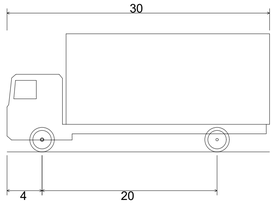












NOTE:
NO LOADING, DELIVERY, OR REFUSE TRUCKS WILL BE LARGER THAN THE FIRE TRUCK.

SU-30 - Single Unit Truck

Overall Length	30.000ft
Overall Width	8.000ft
Overall Body Height	13.500ft
Min Body Ground Clearance	1.367ft
Track Width	8.000ft
Lock-to-lock time	5.00s
Max Steering Angle (Virtual)	31.80°

30 15 0 30 60
GRAPHIC SCALE
1" = 30'

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COMMONWEALTH OF VIRGINIA
JOHN L. HELMS
Lic. No.52485
04/28/2023
PROFESSIONAL ENGINEER

N29 APARTMENTS
GENERAL DEVELOPMENT PLAN

CITY OF FAIRFAX, VA

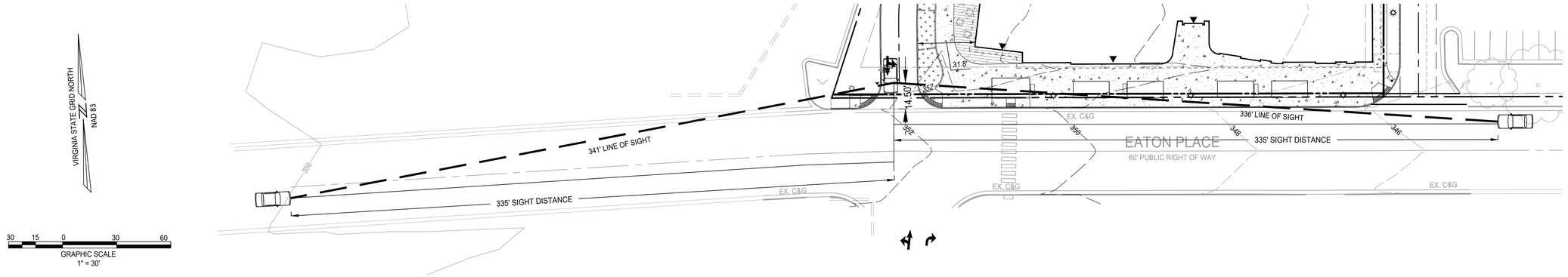
MARK	DATE	DESCRIPTION
1	11-30-2022	ADDRESSED PER CITY COMMENTS
2	04-28-2023	ADDRESSED PER CITY COMMENTS

PROJECT No.: 21082.002.00
DRAWING No.: 111772
DATE: 2022-07-15
SCALE: 1" = 30'
DESIGN: JH
DRAWN: YH
CHECKED: JH

SHEET TITLE:

TURNING MOVEMENTS - DELIVERY TRUCK

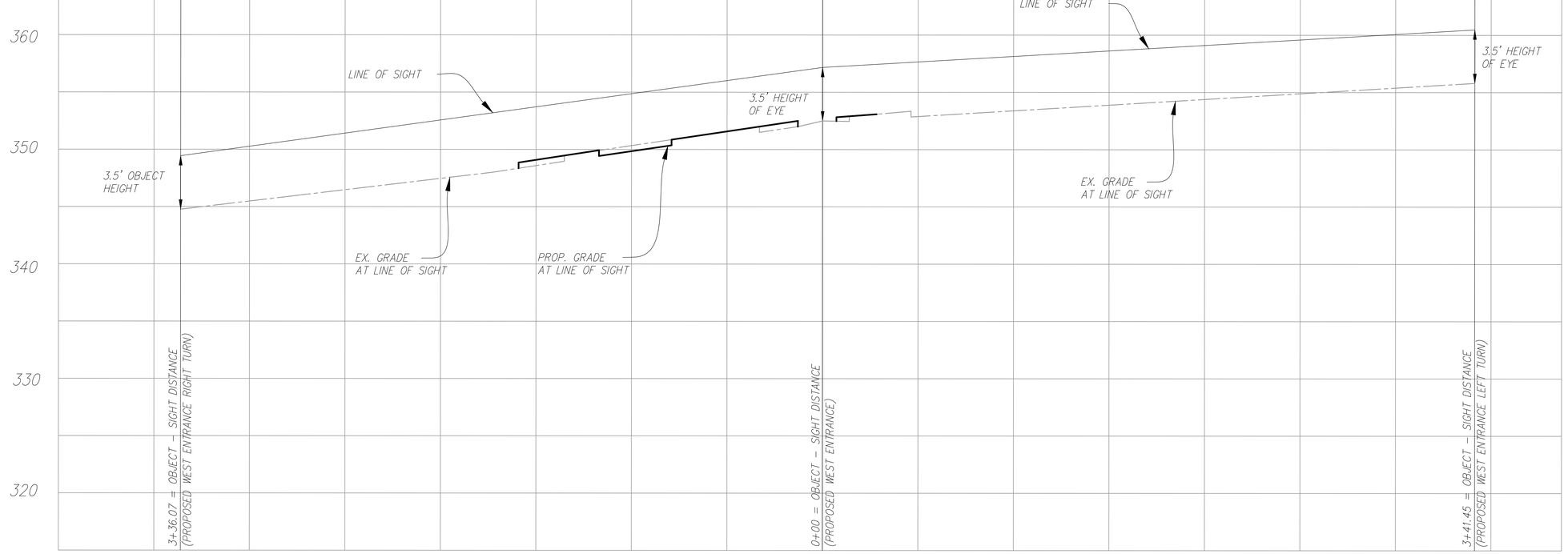
SHEET No.
PI_801



EATON PLACE SIGHT DISTANCE
WEST ENTRANCE

(VARIABLE WIDTH)

POSTED SPEED: 25 MPH, DESIGN SPEED: 30 MPH



5 2.5 0 5 10
VERTICAL GRAPHIC SCALE
1" = 5'

30 15 0 30 60
HORIZONTAL GRAPHIC SCALE
1" = 30'

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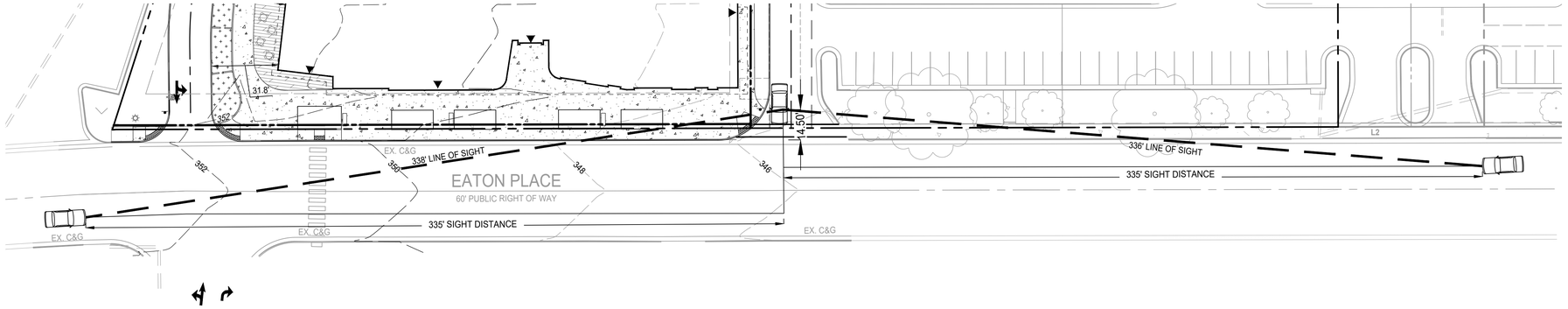
DRAWING No.: 111772
DATE: 2022-07-15
SCALE: 1" = 30'
DESIGN: JH
DRAWN: YH
CHECKED: JH

SHEET TITLE:

SIGHT DISTANCE

SHEET No.

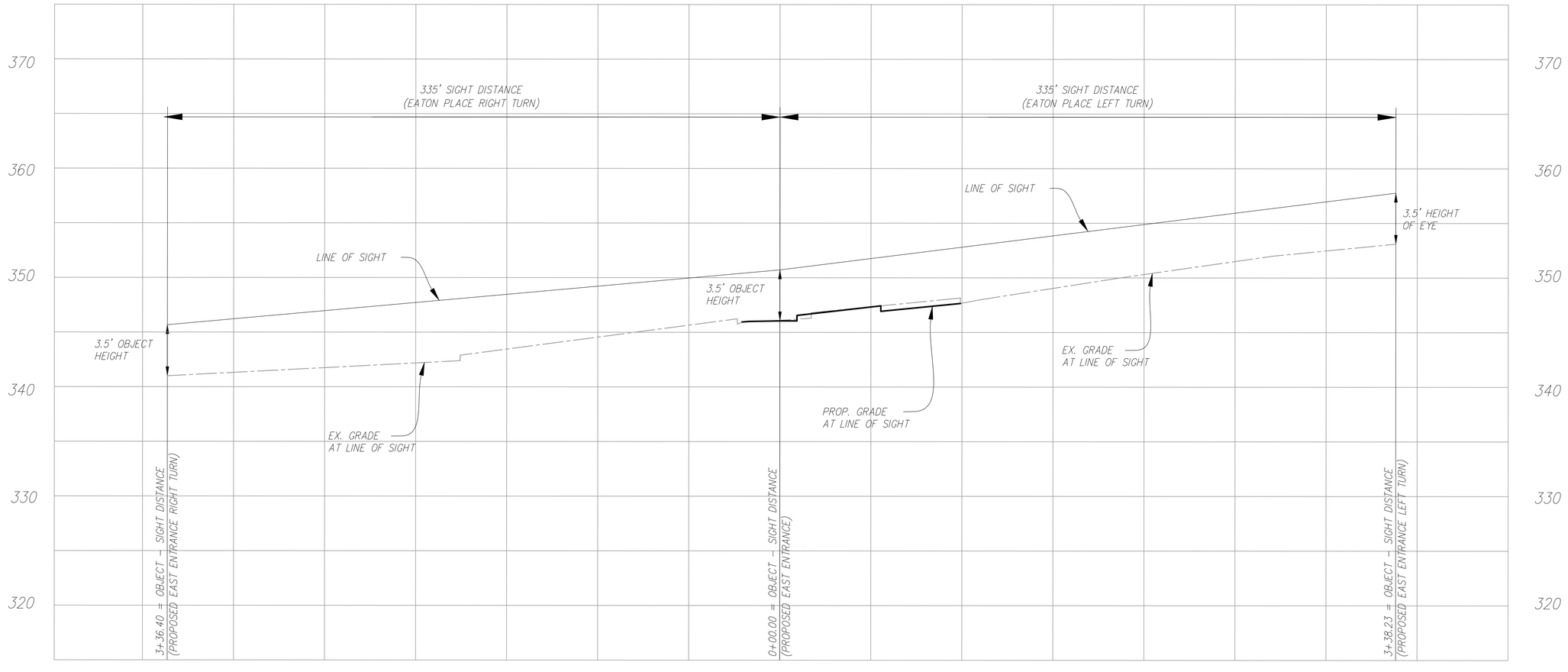
PI_830



EATON PLACE SIGHT DISTANCE
EAST ENTRANCE

(VARIABLE WIDTH)

POSTED SPEED: 25 MPH, DESIGN SPEED: 30 MPH



5 2.5 0 5 10
VERTICAL GRAPHIC SCALE
1" = 5'

30 15 0 30 60
HORIZONTAL GRAPHIC SCALE
1" = 30'

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DRAWING No.: 111772
DATE: 2022-07-15
SCALE: 1" = 30'
DESIGN: JH
DRAWN: YH
CHECKED: JH

SHEET TITLE:

SIGHT DISTANCE

SHEET No.

PI_831