Appendix F Hydrology

PRELIMINARY ON-SITE HYDROLOGY / HYDRAULIC STUDY

for

Crystal Springs Uplands School
New Middle School
6 Davis Drive
Belmont, CA 94002

Prepared:
November 21st, 2014

by

ams associates, inc.
Project No. 11-2114

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I. NARRATIVE

Introduction

This report was prepared for Hydrology and Hydraulic Calculations based on the City of Belmont's 5-year and 10-year storm design. The typical annual rainfall precipitation is 25". The proposed Storm Drain System is to discharge to the existing 24" Storm Drain Line located to the southeast of the property, running North to South.

Existing Conditions

The site consists of two parcels totaling approximately 6.46 acres located at 6 Davis Drive. Davis Drive is located to the East, commercial buildings are located to the Southeast and North, and adjacent to the West and South of the property is open space. The site currently consists of commercial buildings and an asphaltic parking lot.

Proposed Conditions

The proposed project consists of the construction of new school structures, including a classroom building, gymnasium and swimming pool. Appurtenant parking, utilities, landscaping, bioretention, a recreational sports field, and other improvements necessary for site development are also provided.

The Hydrology Calculations were performed illustrating discharge of stormwater to the existing 24" storm drain pipe on the site. The project's stormwater will drain into several Bio-Retention areas located throughout the site. The new Bio-Retention areas are designed for treatment of the run-off prior to discharging to the public 24" Storm Drain Line. As part of the new development we will decrease impervious area, therefore, the proposed discharge for the site will be decreased as indicated in the attached Calculations and the Plans.

Modeling

The rational method was used to model the run-off based on 5-year and 10-year storm events. The drainage was defined based on the proposed grade.

The existing and proposed storm drain system was designed using a computer modeling system, Hydraflow Storm Sewer 2013. The existing and proposed model for this site was a 5-year and 10-year storm event.

The model uses rainfall intensities and the HGL as input by the user and calculates storm run-off using the Rational Method, calculates pipe capacity and depth of flow using Manning's Formula and calculates flow profile utilizing Standard Step Method.

The following is a list of the assumptions on which the design is based upon:

- Mannings n = 0.013
- Runoff coefficient:

1. $C = \frac{\Sigma C_i A_i}{\Sigma A_i}$

   C = Runoff Coefficient for the Rational formula

   A = Area
   C = 0.9 (Concrete/ Asphalt/ Roof) C = 0.3 (Landscaping)

A. <u>Pre-Coefficient Hydrology</u>

Pre-Impervious = 159,263 sq.ft. = 3.66 acs.
Pre-Pervious = 122,171 sq.ft. = 2.80 acs.
= 281,434 sq.ft. = 6.46 acs.

$$\text{Pre-C} = \frac{(0.9)(159{,}263) + (0.3)(122{,}171)}{281{,}434 \text{ sq.ft.}} = 0.64$$

B. <u>Post-Coefficient Hydrology</u>

Post –Impervious = 116,883 sq.ft. = 2.68 acs.
Post – Pervious = 164,551 sq.ft. = 3.78 acs.
= 281,434 sq.ft. = 6.46 acs.

$$\text{Post-C} = \frac{(0.9)(116{,}883) + (0.3)(164{,}551)}{281{,}434 \text{ sq.ft.}} = 0.55$$

- System designed to a 5 year and 10 year storm intensity based upon Rainfall Analysis for Drainage Design.

Analysis

The area contributed by this Site is over 6 ± acres. The total time of concentration calculated is approximately 10 minutes. The starting Hydraulic Grade Line Elevation for the 5-year and 10-year event are to match the crown of the pipe which is about 295.81 feet at the southeast corner of the site where the existing 24" storm drain line located. The "C" factor is reduced due to the proposed pervious area is increased. This can help the proposed runoff not to exceed the existing runoff.

Existing Site Runoff
5-year Storm Event = 6.89 cfs
10-year Storm Event = 9.28 cfs

Post Site Runoff
5-year Storm Event = 3.54 cfs
10-year Storm Event = 4.66 cfs

Conclusion

Based on the calculations provided, the proposed system is designed to discharge only 3.54 cfs for 5-year Storm and 4.66 cfs for 10-year Storm to the main system versus the existing runoff is 6.89 cfs for 5-year Storm and 9.28 for 10-year Storm. Therefore, the proposed runoff for the proposed storm drain system will reduce the runoff which will be in compliance with the City's request for this project's design. The proposed Hydraulic Grade Line Elevation will be below the proposed ground and the catch basin grade elevation.

II. RAINFALL INTENSITIES

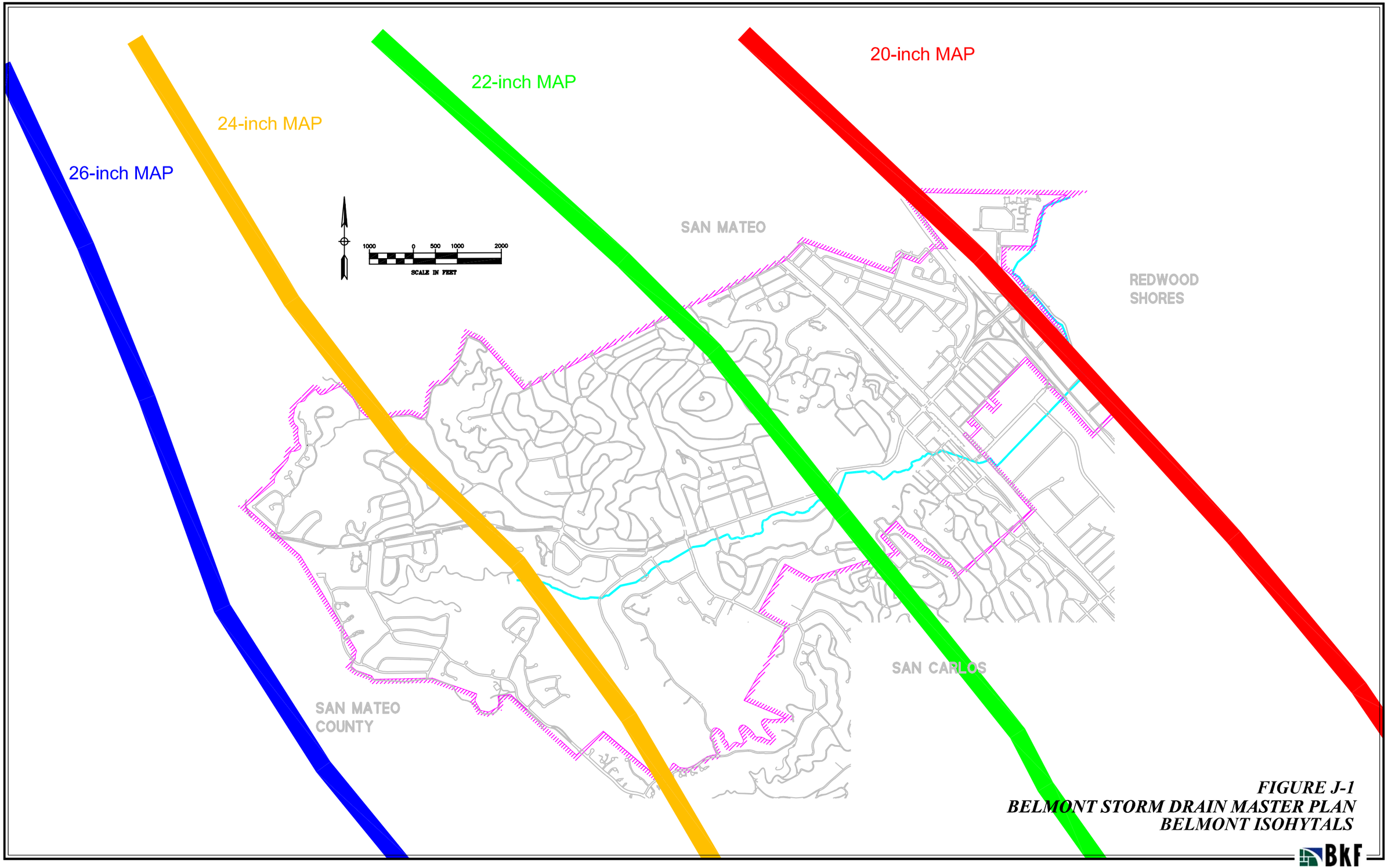


FIGURE J-1
BELMONT STORM DRAIN MASTER PLAN
BELMONT ISOHYTALS

BKF

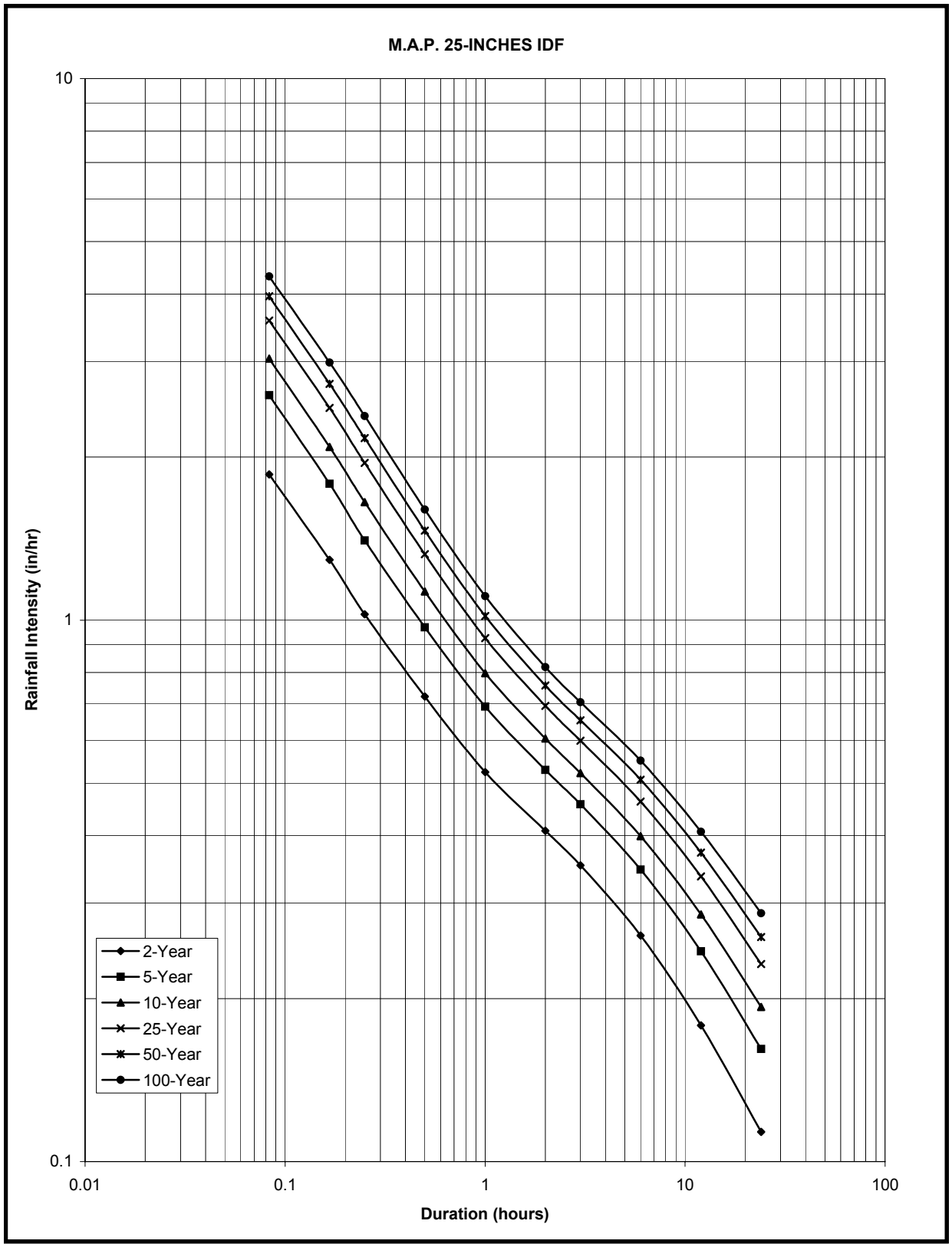
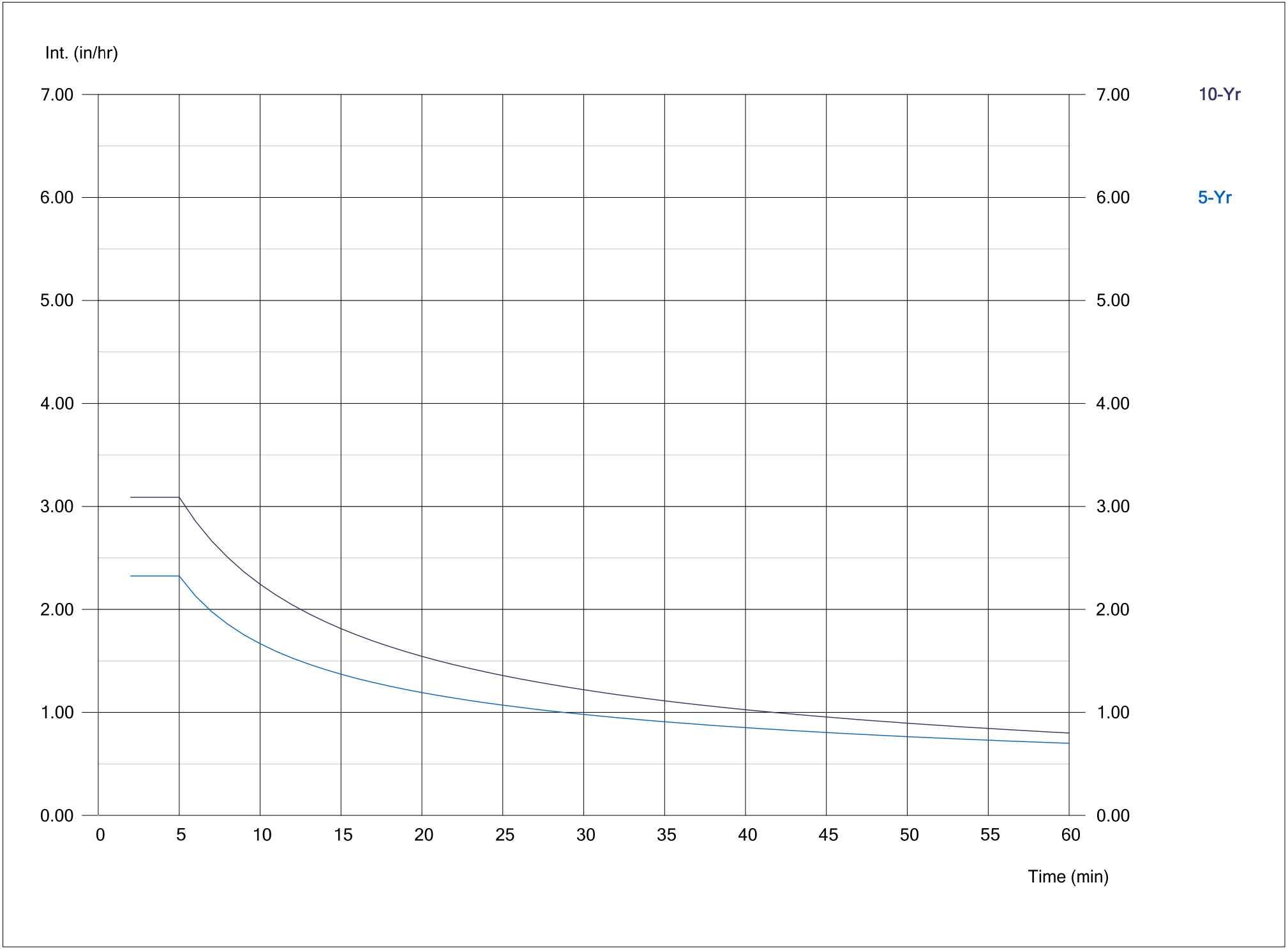


Figure B-3
IDF Curve, M.A.P. = 25 inches

Storm Sewer IDF Curves

IDF file: Belmont.IDF



III. CALCULATIONS

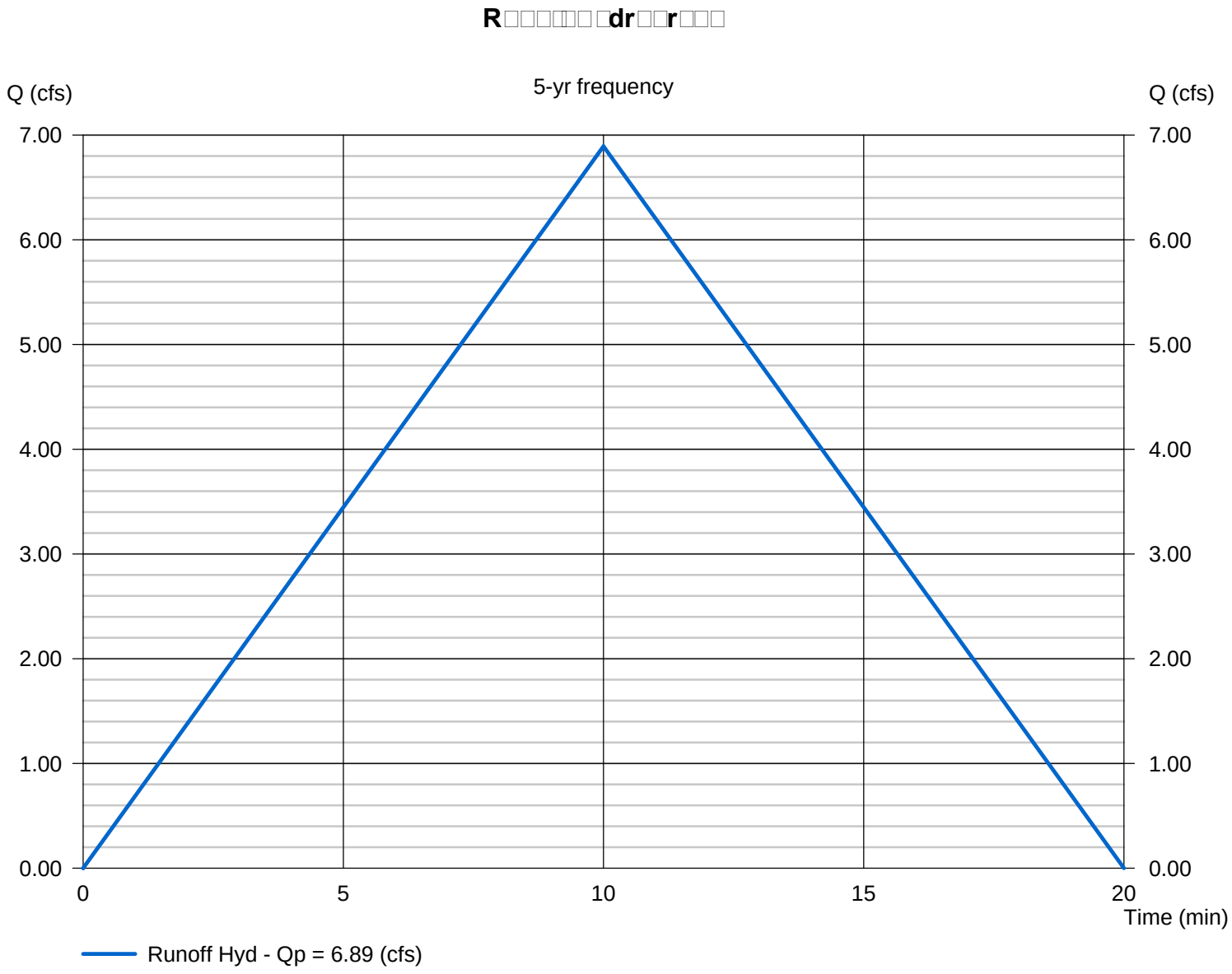
□□dr□□□□□R□□□r□

Hydraflow Express Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. Friday, Nov 21 2014

Pr□□D□□□□□□□□ □□□□ □□□r□ □□□□ □□□□

Hydrograph type	=	Rational	Peak discharge (cfs)	=	6.893
Storm frequency (yrs)	=	5	Time interval (min)	=	1
Drainage area (ac)	=	6.460	Runoff coeff. (C)	=	0.64
Rainfall Inten (in/hr)	=	1.667	Tc by User (min)	=	10
IDF Curve	=	Belmont.IDF	Rec limb factor	=	1.00

Hydrograph Volume = 4,136 (cuft); 0.095 (acft)



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Hydraflow Express Extension for AutoCAD® Civil 3D® 2013 by Autodesk, Inc. Friday, Nov 21 2014

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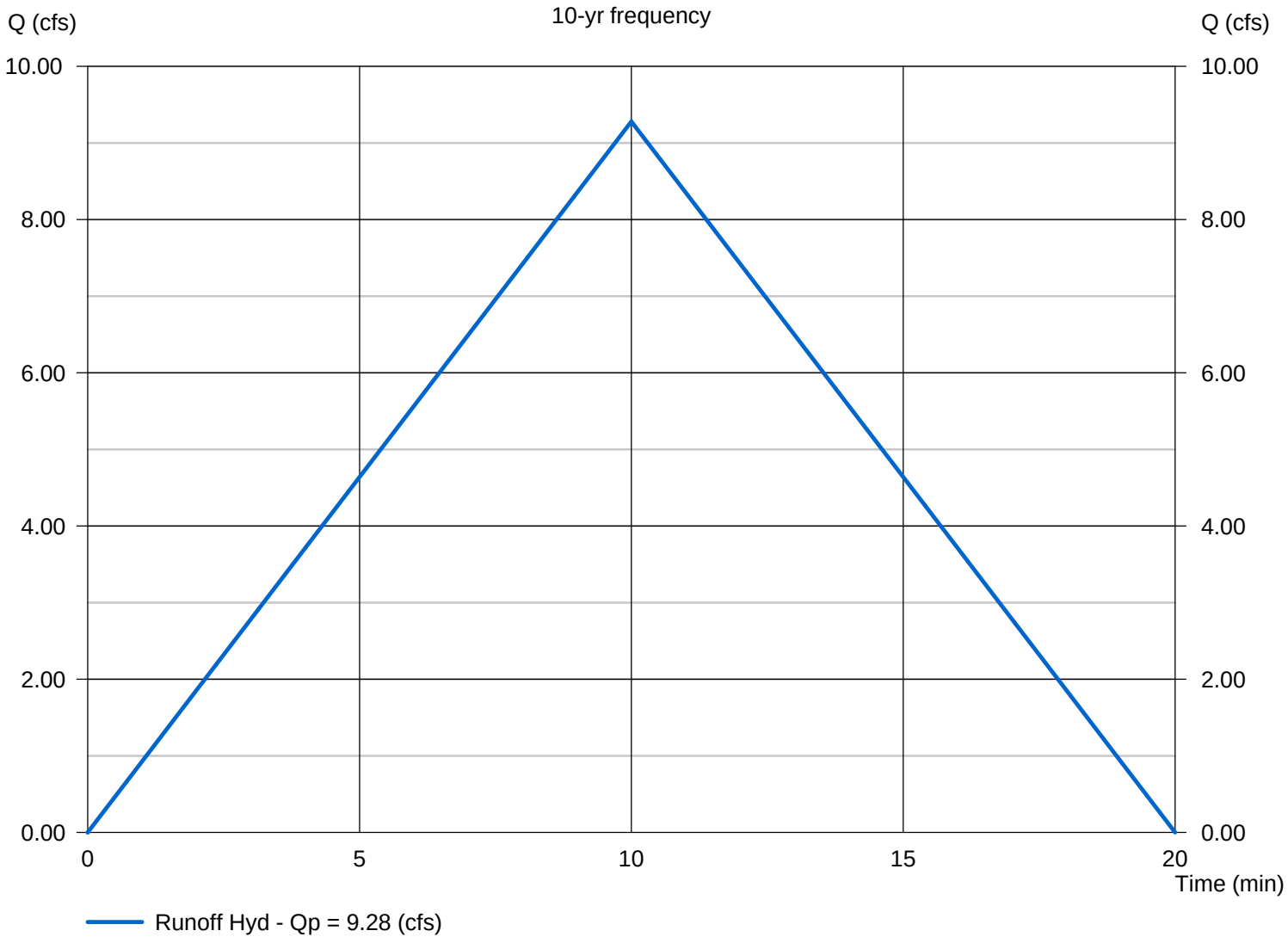
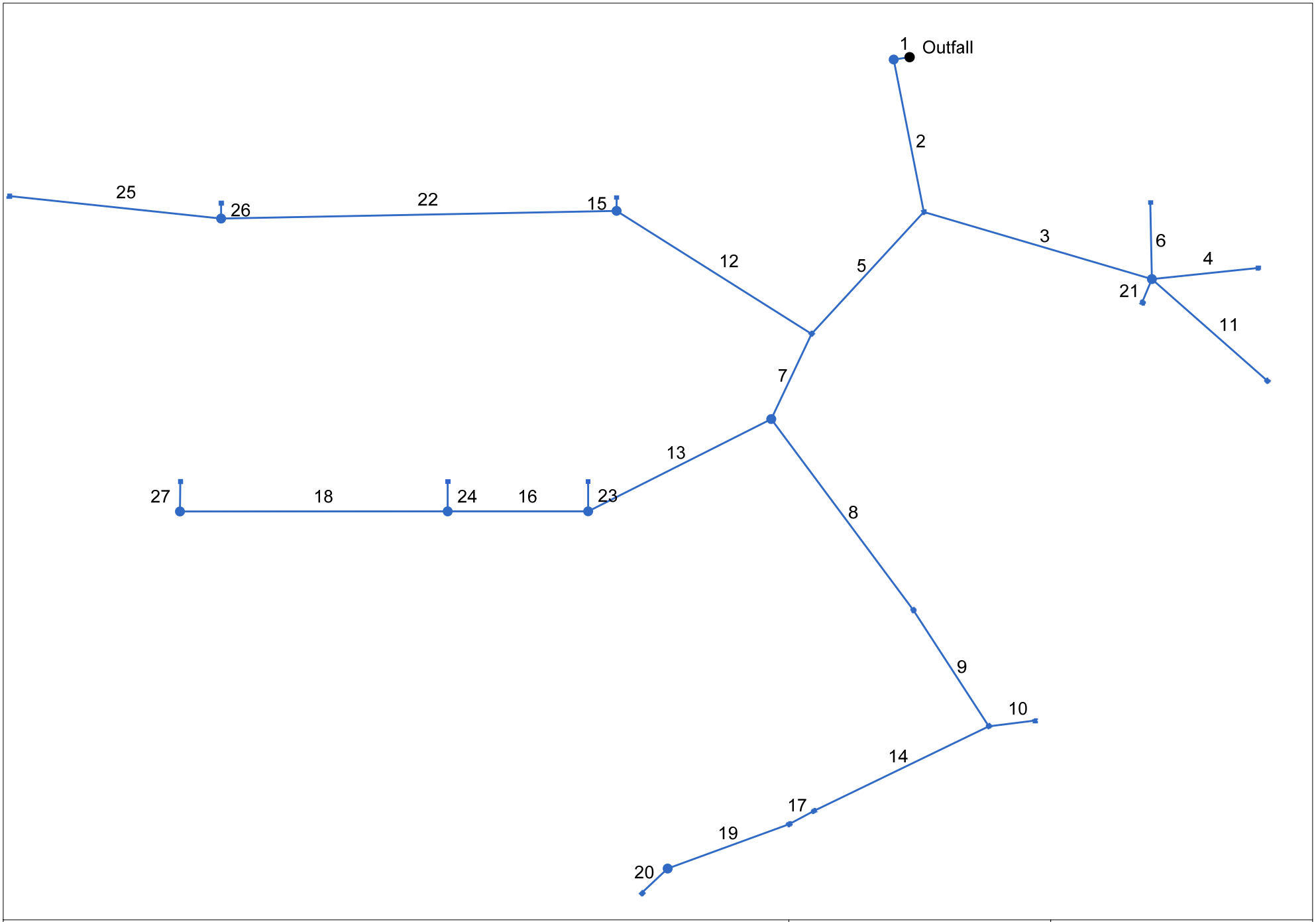
Hydrograph type	=	Rational	Peak discharge (cfs)	=	9.280
Storm frequency (yrs)	=	10	Time interval (min)	=	1
Drainage area (ac)	=	6.460	Runoff coeff. (C)	=	0.64
Rainfall Inten (in/hr)	=	2.245	Tc by User (min)	=	10
IDF Curve	=	Belmont.IDF	Rec limb factor	=	1.00

Hydrograph Volume = 5,568 (cuft); 0.128 (acft)

R□□□□□□□dr□□r□□□



Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2013 Plan



Project File: 5yrslinea.stm	Number of lines: 27	Date: 11/21/2014

Storm Sewers v10.00

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	8.007	171.493	MH	0.00	0.00	0.52	10.0	293.81	1.12	293.90	24	Cir	0.013	1.00	300.00	OUTFALL-MH#1
2	1	77.460	-92.645	DrGrt	0.00	0.18	0.52	10.0	294.27	0.30	294.50	18	Cir	0.013	1.88	298.90	MH#1-CB#14
3	2	118.136	-62.375	MH	0.00	0.00	0.52	10.0	295.86	0.98	297.02	12	Cir	0.013	1.00	301.90	CB#14-MH#8
4	3	53.129	-22.481	DrGrt	0.00	0.10	0.52	10.0	297.02	0.51	297.29	12	Cir	0.013	1.00	300.95	MH#8-CB#8
5	2	82.536	53.678	DrGrt	0.00	1.84	0.52	10.0	294.50	1.50	295.74	12	Cir	0.013	1.48	300.00	CB#14-CB#3
6	3	38.220	-107.648	DrGrt	0.00	0.22	0.52	10.0	297.02	0.65	297.27	12	Cir	0.013	1.00	300.75	MH#8-CB#7
7	5	46.914	-17.272	MH	0.00	0.00	0.52	10.0	295.74	0.51	295.98	12	Cir	0.013	0.90	302.15	CB#3-JB#1
8	7	118.522	-61.792	DrGrt	0.00	0.30	0.52	10.0	295.98	0.50	296.57	12	Cir	0.013	0.50	301.50	JB#1-CB#5
9	8	69.052	3.612	DrGrt	0.00	0.05	0.52	10.0	296.57	0.67	297.03	12	Cir	0.013	1.50	301.58	CB#5-CB#17
10	9	22.938	-64.162	DrGrt	0.00	0.11	0.52	10.0	297.03	0.52	297.15	12	Cir	0.013	1.00	301.50	CB#17-CB#6
11	3	76.444	24.990	DrGrt	0.00	0.15	0.52	10.0	297.02	0.93	297.73	12	Cir	0.013	1.00	301.90	MH#8-CB#12
12	5	114.635	79.843	MH	0.00	0.00	0.52	10.0	295.74	0.50	296.31	12	Cir	0.013	0.87	300.83	CB#3-MH#2
13	7	101.914	37.916	MH	0.00	0.00	0.52	10.0	295.98	1.07	297.07	12	Cir	0.013	1.00	302.40	JB#1-MH#10
14	9	96.514	97.041	DrGrt	0.00	0.27	0.52	10.0	297.03	0.50	297.51	12	Cir	0.013	0.50	301.58	CB#17-CB#11
15	12	6.748	57.873	DrGrt	0.00	0.39	0.52	10.0	296.31	0.59	296.35	12	Cir	0.013	1.00	298.00	MH#2-CB#2
16	13	69.748	26.805	MH	0.00	0.00	0.52	10.0	297.07	1.00	297.77	12	Cir	0.013	1.00	302.60	MH#10-JUCT
17	14	14.107	-2.507	DrGrt	0.00	0.05	0.52	10.0	297.51	0.50	297.58	12	Cir	0.013	0.50	302.50	CB#11-CB#13
18	16	133.000	0.000	MH	0.00	0.00	0.52	10.0	297.77	1.00	299.10	12	Cir	0.013	1.00	302.49	JUCT-MH#11
19	17	64.222	8.284	MH	0.00	0.00	0.52	10.0	297.58	0.50	297.90	12	Cir	0.013	0.45	300.20	CB#13-JB#2
20	19	17.656	-23.310	DrGrt	0.00	0.43	0.52	10.0	297.90	0.51	297.99	12	Cir	0.013	1.00	300.20	JB#2-CB#9
21	3	12.724	96.327	DrGrt	0.00	0.29	0.52	10.0	297.02	0.94	297.14	12	Cir	0.013	1.00	301.22	MH#8-CB#11
22	12	196.458	-33.488	MH	0.00	0.00	0.52	10.0	296.31	0.50	297.29	12	Cir	0.013	1.00	301.40	MH#2-MH#3
23	13	14.957	116.802	DrGrt	0.00	0.11	0.52	10.0	297.07	1.00	297.22	12	Cir	0.013	1.00	302.00	CB#3A-CB#4

Project File: 5yrslinea.stm | Number of lines: 27 | Date: 11/21/2014

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
24	16	14.949	89.998	DrGrt	0.00	0.11	0.52	10.0	297.77	1.00	297.92	12	Cir	0.013	1.00	302.55	JUNCTION-CB#12
25	22	105.839	7.190	DrGrt	0.00	0.19	0.52	10.0	297.29	0.50	297.82	12	Cir	0.013	1.00	301.50	MH#3-CB#4
26	22	7.801	90.930	DrGrt	0.00	0.27	0.52	10.0	297.29	0.51	297.33	12	Cir	0.013	1.00	300.20	MH#3-CB#1
27	18	15.000	90.668	DrGrt	0.00	0.14	0.52	10.0	299.10	1.00	299.25	12	Cir	0.013	1.00	302.00	MH#11-CB#19

Project File: 5yrslinea.stm | Number of lines: 27 | Date: 11/21/2014

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	8.007	0.00	5.20	0.52	0.00	2.70	10.0	16.5	1.3	3.54	23.98	1.14	24	1.12	293.81	293.90	295.81	295.81	299.00	300.00	OUTFALL-MH#1
2	1	77.460	0.18	5.20	0.52	0.09	2.70	10.0	15.9	1.3	3.61	5.72	2.07	18	0.30	294.27	294.50	295.83	295.91	300.00	298.90	MH#1-CB#14
3	2	118.136	0.00	0.76	0.52	0.00	0.40	10.0	11.7	1.5	0.61	3.53	2.15	12	0.98	295.86	297.02	296.14	297.30	298.90	301.90	CB#14-MH#8
4	3	53.129	0.10	0.10	0.52	0.05	0.05	10.0	10.0	1.7	0.09	2.54	0.51	12	0.51	297.02	297.29	297.48	297.49	301.90	300.95	MH#8-CB#8
5	2	82.536	1.84	4.26	0.52	0.96	2.22	10.0	15.5	1.3	2.99	4.37	4.08	12	1.50	294.50	295.74	296.04	296.55	298.90	300.00	CB#14-CB#3
6	3	38.220	0.22	0.22	0.52	0.11	0.11	10.0	10.0	1.7	0.19	2.88	1.18	12	0.65	297.02	297.27	297.30	297.44	301.90	300.75	MH#8-CB#7
7	5	46.914	0.00	1.57	0.52	0.00	0.82	10.0	14.4	1.4	1.14	2.55	1.45	12	0.51	295.74	295.98	296.99	297.04	300.00	302.15	CB#3-JB#1
8	7	118.522	0.30	1.21	0.52	0.16	0.63	10.0	12.2	1.5	0.95	2.51	1.58	12	0.50	295.98	296.57	297.07	297.17	302.15	301.50	JB#1-CB#5
9	8	69.052	0.05	0.91	0.52	0.03	0.47	10.0	11.6	1.6	0.73	2.91	2.10	12	0.67	296.57	297.03	297.20	297.37	301.50	301.58	CB#5-CB#17
10	9	22.938	0.11	0.11	0.52	0.06	0.06	10.0	10.0	1.7	0.10	2.58	0.25	12	0.52	297.03	297.15	297.59	297.60	301.58	301.50	CB#17-CB#6
11	3	76.444	0.15	0.15	0.52	0.08	0.08	10.0	10.0	1.7	0.13	3.43	1.14	12	0.93	297.02	297.73	297.30	297.86	301.90	301.90	MH#8-CB#12
12	5	114.635	0.00	0.85	0.52	0.00	0.44	10.0	13.5	1.4	0.64	2.51	0.93	12	0.50	295.74	296.31	296.99	297.03	300.00	300.83	CB#3-MH#2
13	7	101.914	0.00	0.36	0.52	0.00	0.19	10.0	13.0	1.5	0.27	3.68	1.22	12	1.07	295.98	297.07	297.07	297.29	302.15	302.40	JB#1-MH#10
14	9	96.514	0.27	0.75	0.52	0.14	0.39	10.0	10.8	1.6	0.63	2.51	2.02	12	0.50	297.03	297.51	297.59	297.85	301.58	301.58	CB#17-CB#11
15	12	6.748	0.39	0.39	0.52	0.20	0.20	10.0	10.0	1.7	0.34	2.74	1.44	12	0.59	296.31	296.35	297.04	296.59	300.83	298.00	MH#2-CB#2
16	13	69.748	0.00	0.25	0.52	0.00	0.13	10.0	12.2	1.5	0.20	3.57	1.37	12	1.00	297.07	297.77	297.36	297.93	302.40	302.60	MH#10-JUCT
17	14	14.107	0.05	0.48	0.52	0.03	0.25	10.0	10.7	1.6	0.40	2.51	1.60	12	0.50	297.51	297.58	297.90	297.91	301.58	302.50	CB#11-CB#13
18	16	133.000	0.00	0.14	0.52	0.00	0.07	10.0	10.2	1.6	0.12	3.56	1.14	12	1.00	297.77	299.10	297.93	299.23	302.60	302.49	JUCT-MH#11
19	17	64.222	0.00	0.43	0.52	0.00	0.22	10.0	10.1	1.7	0.37	2.51	1.90	12	0.50	297.58	297.90	297.93	298.16	302.50	300.20	CB#13-JB#2
20	19	17.656	0.43	0.43	0.52	0.22	0.22	10.0	10.0	1.7	0.37	2.54	2.37	12	0.51	297.90	297.99	298.16	298.25	300.20	300.20	JB#2-CB#9
21	3	12.724	0.29	0.29	0.52	0.15	0.15	10.0	10.0	1.7	0.25	3.46	1.47	12	0.94	297.02	297.14	297.30	297.32	301.90	301.22	MH#8-CB#11
22	12	196.458	0.00	0.46	0.52	0.00	0.24	10.0	11.2	1.6	0.38	2.52	1.46	12	0.50	296.31	297.29	297.04	297.55	300.83	301.40	MH#2-MH#3

Project File: 5yrslinea.stm | Number of lines: 27 | Run Date: 11/21/2014

NOTES:Intensity = 5.14 / (Inlet time + 0.10) ^ 0.49; Return period =Yrs. 5 ; c = cir e = ellip b = box

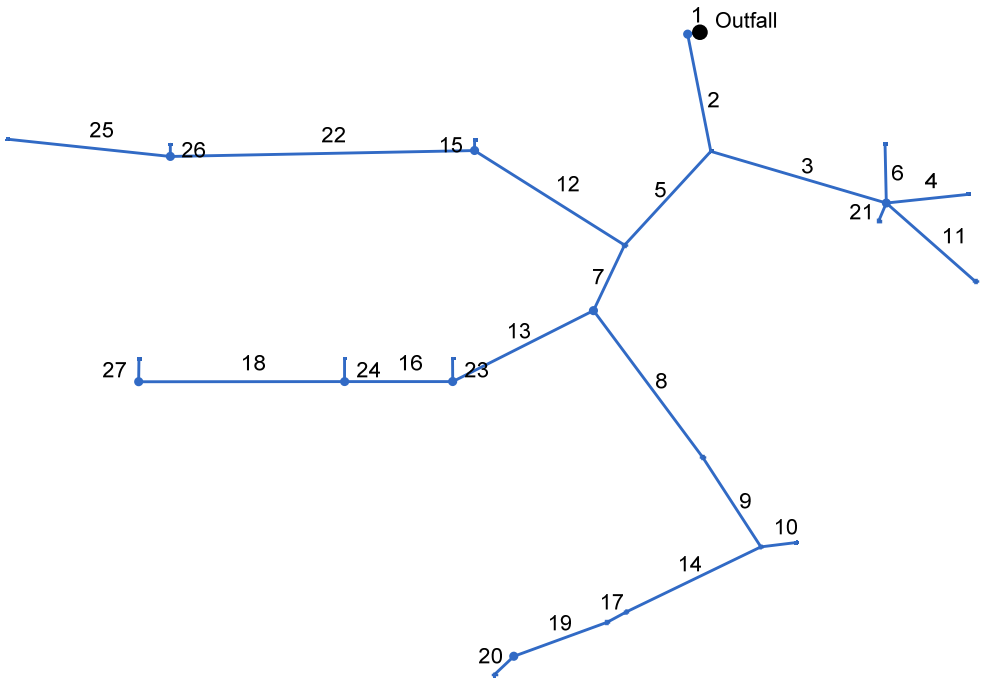
Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	13	14.957	0.11	0.11	0.52	0.06	0.06	10.0	10.0	1.7	0.10	3.57	1.05	12	1.00	297.07	297.22	297.36	297.33	302.40	302.00	CB#3A-CB#4
24	16	14.949	0.11	0.11	0.52	0.06	0.06	10.0	10.0	1.7	0.10	3.57	1.05	12	1.00	297.77	297.92	297.93	298.03	302.60	302.55	JUNCTION-CB#1
25	22	105.839	0.19	0.19	0.52	0.10	0.10	10.0	10.0	1.7	0.16	2.52	1.42	12	0.50	297.29	297.82	297.55	297.99	301.40	301.50	MH#3-CB#4
26	22	7.801	0.27	0.27	0.52	0.14	0.14	10.0	10.0	1.7	0.23	2.55	1.19	12	0.51	297.29	297.33	297.55	297.53	301.40	300.20	MH#3-CB#1
27	18	15.000	0.14	0.14	0.52	0.07	0.07	10.0	10.0	1.7	0.12	3.56	1.05	12	1.00	299.10	299.25	299.23	299.38	302.49	302.00	MH#11-CB#19

Project File: 5yrslinea.stm | Number of lines: 27 | Run Date: 11/21/2014

NOTES:Intensity = 5.14 / (Inlet time + 0.10) ^ 0.49; Return period =Yrs. 5 ; c = cir e = ellip b = box

Hydraflow Storm Sewers Extension for AutoCAD® Civil 3D® 2013 Plan



Project File: 10yrslinea.stm	Number of lines: 27	Date: 11/21/2014

Storm Sewers v10.00

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
1	End	8.007	171.493	MH	0.00	0.00	0.52	10.0	293.81	1.12	293.90	24	Cir	0.013	1.00	300.00	OUTFALL-MH#1
2	1	77.460	-92.645	DrGrt	0.00	0.18	0.52	10.0	294.27	0.30	294.50	18	Cir	0.013	1.88	298.90	MH#1-CB#14
3	2	118.136	-62.375	MH	0.00	0.00	0.52	10.0	295.86	0.98	297.02	12	Cir	0.013	1.00	301.90	CB#14-MH#8
4	3	53.129	-22.481	DrGrt	0.00	0.10	0.52	10.0	297.02	0.51	297.29	12	Cir	0.013	1.00	300.95	MH#8-CB#8
5	2	82.536	53.678	DrGrt	0.00	1.84	0.52	10.0	294.50	1.50	295.74	12	Cir	0.013	1.48	300.00	CB#14-CB#3
6	3	38.220	-107.648	DrGrt	0.00	0.22	0.52	10.0	297.02	0.65	297.27	12	Cir	0.013	1.00	300.75	MH#8-CB#7
7	5	46.914	-17.272	MH	0.00	0.00	0.52	10.0	295.74	0.51	295.98	12	Cir	0.013	0.90	302.15	CB#3-JB#1
8	7	118.522	-61.792	DrGrt	0.00	0.30	0.52	10.0	295.98	0.50	296.57	12	Cir	0.013	0.50	301.50	JB#1-CB#5
9	8	69.052	3.612	DrGrt	0.00	0.05	0.52	10.0	296.57	0.67	297.03	12	Cir	0.013	1.50	301.58	CB#5-CB#17
10	9	22.938	-64.162	DrGrt	0.00	0.11	0.52	10.0	297.03	0.52	297.15	12	Cir	0.013	1.00	301.50	CB#17-CB#6
11	3	76.444	24.990	DrGrt	0.00	0.15	0.52	10.0	297.02	0.93	297.73	12	Cir	0.013	1.00	301.90	MH#8-CB#12
12	5	114.635	79.843	MH	0.00	0.00	0.52	10.0	295.74	0.50	296.31	12	Cir	0.013	0.87	300.83	CB#3-MH#2
13	7	101.914	37.916	MH	0.00	0.00	0.52	10.0	295.98	1.07	297.07	12	Cir	0.013	1.00	302.40	JB#1-MH#10
14	9	96.514	97.041	DrGrt	0.00	0.27	0.52	10.0	297.03	0.50	297.51	12	Cir	0.013	0.50	301.58	CB#17-CB#11
15	12	6.748	57.873	DrGrt	0.00	0.39	0.52	10.0	296.31	0.59	296.35	12	Cir	0.013	1.00	298.00	MH#2-CB#2
16	13	69.748	26.805	MH	0.00	0.00	0.52	10.0	297.07	1.00	297.77	12	Cir	0.013	1.00	302.60	MH#10-JUCT
17	14	14.107	-2.507	DrGrt	0.00	0.05	0.52	10.0	297.51	0.50	297.58	12	Cir	0.013	0.50	302.50	CB#11-CB#13
18	16	133.000	0.000	MH	0.00	0.00	0.52	10.0	297.77	1.00	299.10	12	Cir	0.013	1.00	302.49	JUCT-MH#11
19	17	64.222	8.284	MH	0.00	0.00	0.52	10.0	297.58	0.50	297.90	12	Cir	0.013	0.45	300.20	CB#13-JB#2
20	19	17.656	-23.310	DrGrt	0.00	0.43	0.52	10.0	297.90	0.51	297.99	12	Cir	0.013	1.00	300.20	JB#2-CB#9
21	3	12.724	96.327	DrGrt	0.00	0.29	0.52	10.0	297.02	0.94	297.14	12	Cir	0.013	1.00	301.22	MH#8-CB#11
22	12	196.458	-33.488	MH	0.00	0.00	0.52	10.0	296.31	0.50	297.29	12	Cir	0.013	1.00	301.40	MH#2-MH#3
23	13	14.957	116.802	DrGrt	0.00	0.11	0.52	10.0	297.07	1.00	297.22	12	Cir	0.013	1.00	302.00	CB#3A-CB#4

Project File: 10yrslinea.stm | Number of lines: 27 | Date: 11/21/2014

Storm Sewer Inventory Report

Line No.	Alignment				Flow Data				Physical Data								Line ID
	Dnstr Line No.	Line Length (ft)	Defl angle (deg)	Junc Type	Known Q (cfs)	Drng Area (ac)	Runoff Coeff (C)	Inlet Time (min)	Invert El Dn (ft)	Line Slope (%)	Invert El Up (ft)	Line Size (in)	Line Shape	N Value (n)	J-Loss Coeff (K)	Inlet/ Rim El (ft)	
24	16	14.949	89.998	DrGrt	0.00	0.11	0.52	10.0	297.77	1.00	297.92	12	Cir	0.013	1.00	302.55	JUNCTION-CB#12
25	22	105.839	7.190	DrGrt	0.00	0.19	0.52	10.0	297.29	0.50	297.82	12	Cir	0.013	1.00	301.50	MH#3-CB#4
26	22	7.801	90.930	DrGrt	0.00	0.27	0.52	10.0	297.29	0.51	297.33	12	Cir	0.013	1.00	300.20	MH#3-CB#1
27	18	15.000	90.668	DrGrt	0.00	0.14	0.52	10.0	299.10	1.00	299.25	12	Cir	0.013	1.00	302.00	MH#11-CB#19

Project File: 10yrslinea.stm | Number of lines: 27 | Date: 11/21/2014

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	8.007	0.00	5.20	0.52	0.00	2.70	10.0	16.5	1.7	4.66	23.98	1.49	24	1.12	293.81	293.90	295.81	295.81	299.00	300.00	OUTFALL-MH#1
2	1	77.460	0.18	5.20	0.52	0.09	2.70	10.0	15.9	1.8	4.75	5.72	2.69	18	0.30	294.27	294.50	295.85	296.00	300.00	298.90	MH#1-CB#14
3	2	118.136	0.00	0.76	0.52	0.00	0.40	10.0	11.8	2.1	0.81	3.53	2.30	12	0.98	295.86	297.02	296.21	297.35	298.90	301.90	CB#14-MH#8
4	3	53.129	0.10	0.10	0.52	0.05	0.05	10.0	10.0	2.2	0.12	2.54	0.48	12	0.51	297.02	297.29	297.55	297.56	301.90	300.95	MH#8-CB#8
5	2	82.536	1.84	4.26	0.52	0.96	2.22	10.0	15.6	1.8	3.94	4.37	5.01	12	1.50	294.50	295.74	296.21	297.22	298.90	300.00	CB#14-CB#3
6	3	38.220	0.22	0.22	0.52	0.11	0.11	10.0	10.0	2.2	0.26	2.88	1.28	12	0.65	297.02	297.27	297.35	297.47	301.90	300.75	MH#8-CB#7
7	5	46.914	0.00	1.57	0.52	0.00	0.82	10.0	14.2	1.9	1.52	2.55	1.94	12	0.51	295.74	295.98	297.80	297.88	300.00	302.15	CB#3-JB#1
8	7	118.522	0.30	1.21	0.52	0.16	0.63	10.0	12.0	2.0	1.29	2.51	1.64	12	0.50	295.98	296.57	297.94	298.09	302.15	301.50	JB#1-CB#5
9	8	69.052	0.05	0.91	0.52	0.03	0.47	10.0	11.5	2.1	0.99	2.91	1.26	12	0.67	296.57	297.03	298.11	298.16	301.50	301.58	CB#5-CB#17
10	9	22.938	0.11	0.11	0.52	0.06	0.06	10.0	10.0	2.2	0.13	2.58	0.16	12	0.52	297.03	297.15	298.20	298.20	301.58	301.50	CB#17-CB#6
11	3	76.444	0.15	0.15	0.52	0.08	0.08	10.0	10.0	2.2	0.18	3.43	1.24	12	0.93	297.02	297.73	297.35	297.88	301.90	301.90	MH#8-CB#12
12	5	114.635	0.00	0.85	0.52	0.00	0.44	10.0	13.5	1.9	0.85	2.51	1.08	12	0.50	295.74	296.31	297.80	297.86	300.00	300.83	CB#3-MH#2
13	7	101.914	0.00	0.36	0.52	0.00	0.19	10.0	12.8	2.0	0.37	3.68	0.49	12	1.07	295.98	297.07	297.94	297.95	302.15	302.40	JB#1-MH#10
14	9	96.514	0.27	0.75	0.52	0.14	0.39	10.0	10.8	2.2	0.84	2.51	1.21	12	0.50	297.03	297.51	298.20	298.25	301.58	301.58	CB#17-CB#11
15	12	6.748	0.39	0.39	0.52	0.20	0.20	10.0	10.0	2.2	0.46	2.74	0.58	12	0.59	296.31	296.35	297.88	297.88	300.83	298.00	MH#2-CB#2
16	13	69.748	0.00	0.25	0.52	0.00	0.13	10.0	12.0	2.0	0.27	3.57	1.51	12	1.00	297.07	297.77	297.95	297.95	302.40	302.60	MH#10-JUCT
17	14	14.107	0.05	0.48	0.52	0.03	0.25	10.0	10.6	2.2	0.54	2.51	0.90	12	0.50	297.51	297.58	298.26	298.27	301.58	302.50	CB#11-CB#13
18	16	133.000	0.00	0.14	0.52	0.00	0.07	10.0	10.2	2.2	0.16	3.56	1.24	12	1.00	297.77	299.10	297.95	299.25	302.60	302.49	JUCT-MH#11
19	17	64.222	0.00	0.43	0.52	0.00	0.22	10.0	10.1	2.2	0.50	2.51	1.27	12	0.50	297.58	297.90	298.27	298.30	302.50	300.20	CB#13-JB#2
20	19	17.656	0.43	0.43	0.52	0.22	0.22	10.0	10.0	2.2	0.50	2.54	1.84	12	0.51	297.90	297.99	298.32	298.33	300.20	300.20	JB#2-CB#9
21	3	12.724	0.29	0.29	0.52	0.15	0.15	10.0	10.0	2.2	0.34	3.46	1.59	12	0.94	297.02	297.14	297.35	297.35	301.90	301.22	MH#8-CB#11
22	12	196.458	0.00	0.46	0.52	0.00	0.24	10.0	11.2	2.1	0.51	2.52	0.80	12	0.50	296.31	297.29	297.88	297.93	300.83	301.40	MH#2-MH#3

Project File: 10yrslinea.stm | Number of lines: 27 | Run Date: 11/21/2014

NOTES:Intensity = 11.87 / (Inlet time + 2.90) ^ 0.65; Return period =Yrs. 10 ; c = cir e = ellip b = box

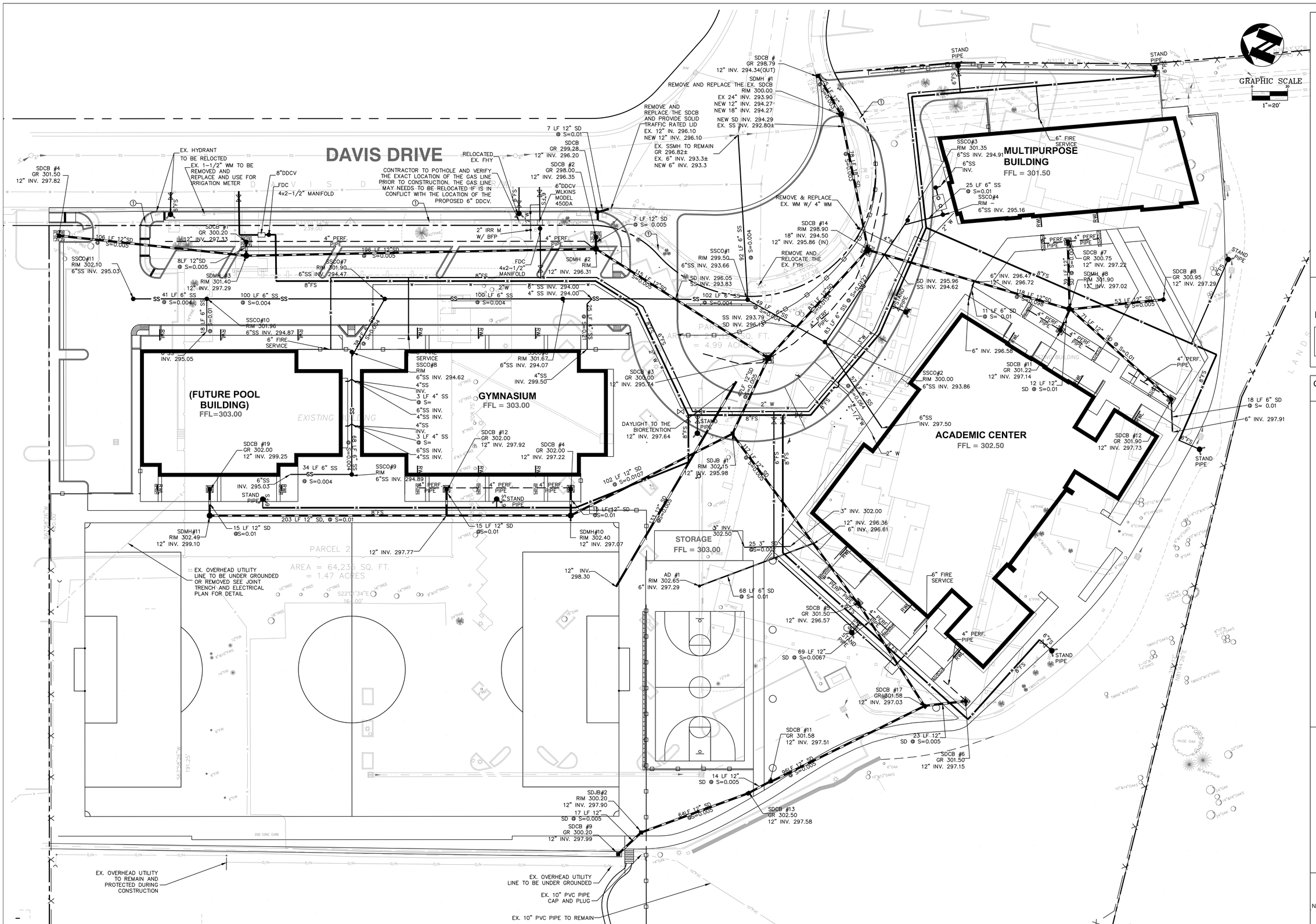
Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	13	14.957	0.11	0.11	0.52	0.06	0.06	10.0	10.0	2.2	0.13	3.57	1.15	12	1.00	297.07	297.22	297.95	297.35	302.40	302.00	CB#3A-CB#4
24	16	14.949	0.11	0.11	0.52	0.06	0.06	10.0	10.0	2.2	0.13	3.57	1.14	12	1.00	297.77	297.92	297.95	298.05	302.60	302.55	JUNCTION-CB#1
25	22	105.839	0.19	0.19	0.52	0.10	0.10	10.0	10.0	2.2	0.22	2.52	1.00	12	0.50	297.29	297.82	297.94	298.05	301.40	301.50	MH#3-CB#4
26	22	7.801	0.27	0.27	0.52	0.14	0.14	10.0	10.0	2.2	0.32	2.55	1.30	12	0.51	297.29	297.33	297.94	297.57	301.40	300.20	MH#3-CB#1
27	18	15.000	0.14	0.14	0.52	0.07	0.07	10.0	10.0	2.2	0.16	3.56	1.15	12	1.00	299.10	299.25	299.25	299.40	302.49	302.00	MH#11-CB#19

Project File: 10yrslinea.stm | Number of lines: 27 | Run Date: 11/21/2014

NOTES:Intensity = 11.87 / (Inlet time + 2.90) ^ 0.65; Return period =Yrs. 10 ; c = cir e = ellip b = box

IV. EXHIBITS



FIRE DEPARTMENT NOTES

1. ALL NEW FIRE HYDRANTS SHALL HAVE 2 ½" AND 6" CONNECTION PER THE CITY OF BELMONT'S FIRE CODE STANDARD & SPECIFICATION.
2. AUTOMATIC FIRE SPRINKLER SYSTEM SHALL MEET WITH THE REQUIREMENTS OF THE FIRE DEPARTMENT AND CALIFORNIA BUILD CODE.
3. ADDRESS NUMBERS SHALL BE ILLUMINATED AND VISIBLE ON ALL NEW BUILDINGS. REAR ADDRESSING IS ALSO REQUIRED. THE SIZE OF LETTERING SHALL BE A MINIMUM OF 12 INCHES AND LOCATION, ILLUMINATION SHALL BE INCLUDED IN THE CONSTRUCTION PLANS AND MEET THE BELMONT FIRE DEPARTMENT STANDARDS.

NOTES

1. CAUTION EX. GAS LINE TO REMAIN CONTRACTOR TO POTHOLE AND VERIFY EXACT LOCATION AND DEPTH PRIOR TO CONSTRUCTION

boora

boora architects inc.
720 SW Washington Ste 800, Portland, OR 97205
T. 503.226.1575 F. 503.241.7429

Crystal Springs Uplands School - New Middle School
Davis Drive
Belmont, CA 94002

ISSUED FOR INFORMATIONAL PURPOSES ONLY

NOT FOR CONSTRUCTION

CITY OF BELMONT SUBMITTAL

ams associates, inc.

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801 YGNACIO VALLEY ROAD
SUITE 220
WALNUT CREEK CA, 94596
T.925.243.2777 F.925.243.2778

NUMBER	REVISION	DATE
		1-8-14

UTILITY PLAN

Scale: 1" = 20'

Drawn By: ML Author

Issued: 11-21-14

ams JOB#: 11-2114

C-3

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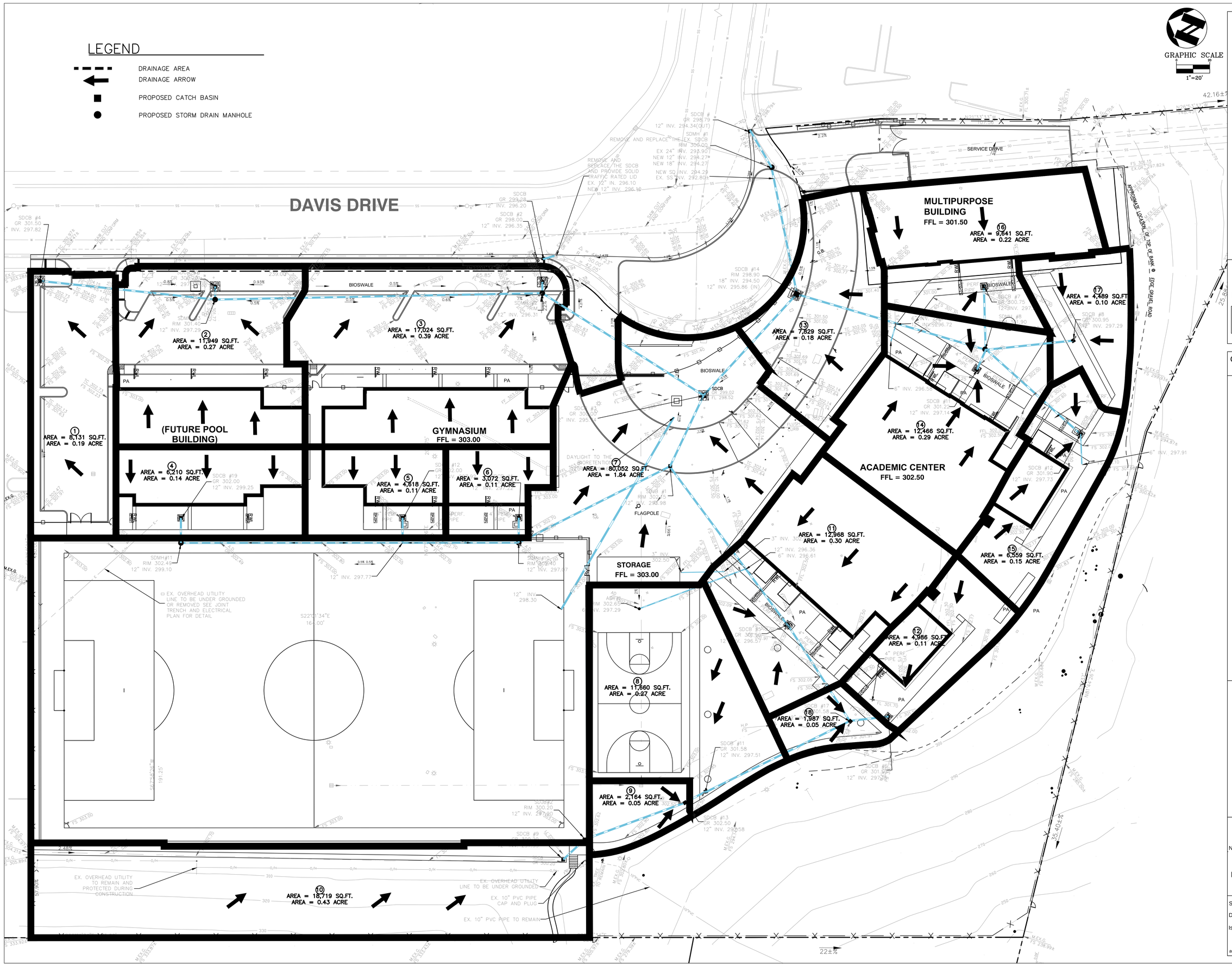

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CD

ams associates, inc.

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801 YGNACIO VALLEY ROAD, SUITE #220
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NUMBER ____ REVISION ____ DATE

HYDROLOGY MAP

Scale: 1" = 20'
Drawn By: MA Author
Issued: 11-21-14
ams JOB#: 11-2114

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