MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT AMENDMENT FOR COTTAGES AT DRY CREEK

February 2024

Prepared for:

BCC Management, LLC
Attn: Brian Schumann
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Colorado Springs, CO 80921

Prepared By:

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JOB NUMBER:20-270

MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT AMENDMENT FOR COTTAGES AT DRY CREEK

Engineer's Statement:

This report and plan for the drainage design of COTTAGES AT DRY CREEK was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual and is in conformity with the master plan of the drainage basin. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

COLORADO LICENSED
DAVID L. MIJARES
40510
PROFESSIONAL ENGINEER

David L. Mijares, Colorado PE #40510 — Date: 2/12/24
For and on behalf of Catamount Engineering

Developer's Statement:

BCC MANAGEMENT LLC hereby certifies that the drainage facilities for COTTAGES AT DRY CREEK shall be constructed according to the design presented in this report. I understand that the City of Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to the City of Colorado Springs pursuant to section 7.7.906 of the City Code; and cannot, on behalf of COTTAGES AT DRY CREEK guarantee that final drainage design review will absolve BCC MANAGEMENT, LLC and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

Schumann Communications PSP
Name of Developer

Authorized Signature — Date: 2/13/24

BRIAN SCHUMANN
Printed Name

TRUSTEE
Title

Address

City of Colorado Springs Only:

Filed in accordance with Section 7.7.906 of the Code of the City of Colorado Springs, 2001, as amended.

For City Engineer — Date: 2/27/2024

CONDITIONS:

MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT AMENDMENT FOR COTTAGES AT DRY CREEK

PURPOSE

The purpose of this drainage report amendment is to update the previously approved drainage report with minor site revisions in the current development plan amendment. The development plan amendment relocated residential duplexes within basins A2, B2, and C2. Area of disturbance and impervious ratios within basins A2 and B2 were not modified with unit relocation. The remaining basins and infrastructure were not affected by unit relocation. The 'in-review' HGL amendment was also included in this drainage report amendment at the request of SWENT. Additionally relocation of units allowed for reconfiguration of proposed pond C removing proposed retaining walls. Scope of the amendment is to verify calculations provided in the approved drainage report and revise details to conform with submitted development plan. Total disturbed area for the development is 471,743 square feet.

Calculations affected by the amendment are highlighted in blue in the appendix.

The site is contained within the Dry Creek Drainage Basin and outfalls to Dry Creek. The parcel was previously studied in the preliminary drainage report Corporate Centre Filing No. 3 dated February 2021, prepared by Catamount Engineering and the 'MASTER DEVELOPMENT PLAN AND FINAL DRAINAGE REPORT FOR THE COTTAGES AT DRY CREEK", approved 5/10/23 and prepared by Catamount Engineering.

DEVELOPED DRAINAGE BASINS

See Proposed Conditions Drainage Map

Only basins affected by the development plan amendment are discussed in the amendment.

The site 'Proposed Drainage' plan, is provided in the appendix.

BASIN A-

A2 (3.20 Acres, Q_5=2.8 cfs, Q_{100}=7.3 cfs)

Basin A2 (3.20 Acres, Q_5=2.8 cfs, and Q_{100}=7.3 cfs) consists of the northern and eastern basin of the development; bordering along Mark Dabbling Blvd. Basin A2 primarily consists of the north half of the site's residential development, including the landscape and rear lot swale drainage. Runoff within Basin A2 will primarily sheet flow southwest toward the rear lot proposed drainage swale and be conveyed by a private CDOT Type D inlet and conveyed in an 18" private HDPE to confluence with runoff from Basin A1 pipe design point P1.

BASIN B-

B2 (1.92 Acres, Q_5=2.5 cfs, Q_{100}=6.0 cfs)

Basin B2 (1.92 Acres, Q_5=2.5 cfs, and Q_{100}=6.0 cfs) consists of the northeastern portion of the southerly half of the development; bordering along Mark Dabbling Blvd. Basin B2 primarily consists of residential development, including the landscape and rear lot swale drainage. Runoff within Basin B2 will primarily sheet flow southwest toward the rear lot proposed drainage swale and be conveyed by a private CDOT Type D inlet and conveyed in an 18" private HDPE to confluence with runoff from Basin B1 pipe design point P3.

BASIN C-

C2 (1.42 Acres, Q_5=1.8 cfs, Q_{100}=4.7 cfs)

Basin C2 (1.42 Acres, Q_5=1.8 cfs, and Q_{100}=4.7 cfs) consists of the Southeastern portion of the southerly half of the development; bordering along Mark Dabbling Blvd. Basin C2 primarily consists of the residential development, including the landscape and rear lot swale drainage. Runoff within Basin B2 will primarily sheet flow east to private EDB C.

STORM SEWER

Only basins affected by the development plan amendment are discussed in the amendment.

Runoff from Basin B2 of Q_5=2.5 cfs, Q_{100}=6.0 cfs will be conveyed in a grass lined swale and collected in a private Type D inlet. Captured flow will be conveyed in a private 18" HDPE to pipe design point P3. Combined flows from P3 of Q_5=4.2 cfs, Q_{100}=9.2 cfs will be conveyed in a private 18" HDPE storm sewer to pipe design point P4. Combined flows from P4 of Q_5=4.5 cfs, Q_{100}=9.8 cfs will be conveyed in a private 18" HDPE storm sewer to private extended detention basin B.

Hydraulic grade line calculations were developed utilizing UDSEWER 2009 Version 1.4.0.25. Rational method peak flows for the initial and major storm events as developed in the final drainage report were used for hydraulic analysis.

Tailwater assumptions (for both minor and major storm events) at the discharge into each of the proposed permanent control measure structure – Extended Detention Basins (A, B, & C) utilized the respective water surface elevation (WSE) of each event and associated EDB.

Peak flows from the major event do not exceed 1.0' below finished ground surface elevation. On Site flows are directed through the private full-spectrum extended detention basin prior to release to the proposed Storm Sewer System.

The analysis in the report appendix provides more detailed calculations for the system in accordance with the requirements of the City of Colorado Springs Drainage Criteria Manual Vol. I. The storm sewer plan and profile drawings have been submitted concurrently with this analysis.

See calculations in the report appendix.

EXTENDED DETENTION BASINS

Only basins affected by the development plan amendment are discussed in the amendment.

This project proposes to develop 12.78 acres within the Dry Creek major drainage basin which necessitates water quality treatment and full-spectrum detention per the criteria of the City of Colorado Springs Drainage Criteria Manual Volume 2.

EDB C

The proposed private and full spectrum Extended Detention Basin located in the southerly section of the portion of the development has 2.60 tributary acres of development with an average imperviousness of 62.50%. Full spectrum pond development routed hydrograph results indicated 0.050 acre-ft of water quality capture volume after runoff reduction ponding to an elevation of 6553.12, an EURV volume of 0.19-acre ft ponding to a depth of 6554.94, and a total volume of 0.291 acre-ft ponding to an elevation of 6555.52 providing full spectrum detention including the 100-YR event.

Runoff generated within the site will be conveyed to the pond through storm sewer systems or as direct sheetflow. The storm sewer systems will outfall directly to 12" concrete forebays providing 66 cubic feet of volume and with baffle providing adequate protection at discharge point. The concrete forebays require a total volume of 49 cubic feet of volume (2% of the design WQCV). The forebay will be constructed of a concrete slab with sides conforming to the pond slopes and 1' wall with a 3.2" rectangular notch which outfalls to the proposed trickle channel at the downstream end.

The pond will be constructed with 4:1 minimum side slopes to be vegetated per the final landscape plan. A 2' wide by 6" deep concrete trickle channel with a 0.5% longitudinal slope will convey low flows across the pond bottom to the micropool/outlet structure. The trickle channel will outfall to a 5' long by 4' wide by 2.5' deep concrete micropool. The micropool will provide a surface area of 16 square feet and an initial surcharge volume of 5.3 cubic feet utilizing an 4" initial surcharge depth.

The outlet structure will consist of a concrete box with orifice plate and screen providing water quality outlet and weir with trash rack for larger storm outfall. The pond will outfall Q_5=0.1 cfs, Q_{100}=1.9 cfs through a private 12" HDPE pipe system to existing public storm sewer in the southerly portion of the site. Runoff will continue in an existing 48" RCP to outfall within Monument Creek adjacent to the easterly limits of Mark Dabbling Blvd.

The emergency spillway will consist of a 20' weir along the easterly end of the pond at an elevation of 6254.55. The 20' weir will convey developed undetained flows a depth of 0.32' and consist of 12" depth of type L soil riprap.

Outfall from EDB C to the existing 48" RCP increases flows by Q_5=0.1 cfs, Q_{100}=2.0 cfs. At the existing MH the pipe slope changes from 1.03% upstream to 25.70% downstream to outfall directly to Monument Creek. The existing outfall consists of a 25' long by 24' wide 5' depth of d50=30" riprap.

See Calculations in the Appendix

4-STEP PROCESS

RUNOFF REDUCTION

The total development disturbance is not changing with the Development Plan Amendment. Runoff reduction calculations were revised to reflect the Development Plan Amendment changes. The development addresses Low Impact Development strategies primarily through the utilization of landscape swales within sides and rear of proposed residential buildings and directing runoff from buildings and walkways through swales with minimal longitudinal grade prior to outfall to storm conveyance systems. Runoff reduction through routing of unconnected impervious areas through receiving swales and buffer areas was calculated utilizing MHFD UD-BMP Version 3.07. Overall reduction of WQCV for the development is 55%. See appendix for calculations.———

DRAINAGE METHODOLOGY

This drainage report was prepared in accordance to the criteria established in the City of Colorado Springs Drainage Criteria Manual Volumes 1 as revised January 2021 and 2 as revised December 2020.

The rational method for drainage basin study areas of less than 100 acres was utilized in the analysis. For the Rational Method, flows were calculated for the 2, 5, 10, 25, 50, and 100-year recurrence intervals. The average runoff coefficients, 'C' values, are taken from Table 6-6 and the Intensity-Duration-Frequency curves are taken from Figure 6-5 of the City Drainage Criteria Manual. Time of concentration for overland flow and storm drain or gutter flow are calculated per Section 3.2 of the City Drainage Criteria Manual. Calculations for the Rational Method are shown in the Appendix of this report.

Mile High Flood District methodology was utilized for determination of the conceptual extended detention basin design. Details and analysis of final storm drain conveyance and collection system will be developed in the final drainage report submitted with the re-plat of the Corporate Centre Filing No. 3 subdivision. The MHFD-Detention v_4.03 spreadsheet was utilized in development of extended detention basin sizing. Calculations are included in the appendix of this report.

A grading and erosion control plan has been approved by Colorado Springs Stormwater Engineering for the proposed phases of development. MHFD UD-Sewer calculations were utilized in the hydraulic grade line analysis.

SUMMARY

This Drainage Report Amendment is in conformance with the City of Colorado Springs Drainage Criteria Manual, Volumes 1&2, May 2014 editions(Volume 1 as revised January 2021 and Volume 2 as revised December 2020). Mark Dabling Cottages will require that flows be treated for water quality and be detained to historic levels prior to release from the site. Site runoff and storm drain and appurtenances will not adversely affect the downstream and surrounding developments. This report is in general conformance with all previously approved reports which included this site. Private storm facilities will be owned or maintained by the Homeowner's Association.

REFERENCES:

City of Colorado Springs Engineering Division Drainage Criteria Manual Volume 1 as revised January 2021 and Volume 2 as revised December 2020

"Study of the Dry Creek Drainage Basin", prepared by KKBNA, dated February 1985

Urban Storm Drainage Criteria Manual, Volumes I-III, Mile High Flood District (MHFD)

FEMA Flood Insurance Rate Map Number 08041C0512 G, effective December 7, 2018

Natural Resources Conservation Service Web Soil Survey

"MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT FOR COTTAGES AT DRY CREEK", prepared by Catamount Engineering, approved April 2023.

APPENDIX

CALCULATIONS

							CONVEYANCE TC						TT				
BASIN	**AREA TOTAL (Acres)**	**C_5**	**C_{100}**	**Length (ft)**	**Height (ft)**	**TI (min)**	**Length (ft)**	**Height (ft)**	**C_V**	**Slope (%)**	**Velocity (fps)**	**TC (min)**	**TOTAL (min)**	**I_5 (in/hr)**	**I_{100} (in/hr)**	**Q_5 (c.f.s.)**	**Q_{100} (c.f.s.)**
A1	1.80	**0.78**	**0.87**	45	1	3.0	1108	23	20	2.1%	2.9	6.4	9.4	4.2	7.1	**5.9**	**11.1**
ROOF	0.04	0.73	0.81														
PAVEMENT	1.49	0.90	0.96														
LANDSCAPE	0.27	0.12	0.39														
A2	3.20	**0.35**	**0.55**	153	1.5	16.8	830	18	7	2.2%	1.0	13.4	30.2	2.5	4.1	**2.8**	**7.3**
ROOF	0.92	0.73	0.81														
PAVEMENT	0.23	0.90	0.96														
LANDSCAPE	2.05	0.12	0.39														
A3	0.07	**0.79**	**0.88**	15	1	1.2	100	2	20	2.0%	2.8	0.6	5.0	5.2	8.7	**0.3**	**0.5**
ROOF	0.00	0.73	0.81										*MIN*				
PAVEMENT	0.06	0.90	0.96														
LANDSCAPE	0.01	0.12	0.39														
A4	0.18	**0.17**	**0.42**	25	6	2.9	0	0	7	0.0%	0.0	0.0	5.0	5.2	8.7	**0.2**	**0.7**
ROOF	0.00	0.73	0.81										*MIN*				
GRAVEL	0.02	0.59	0.70														
LANDSCAPE	0.16	0.12	0.39														
B1	0.69	**0.80**	**0.89**	81	1.5	4.0	486	7	20	1.4%	2.4	3.4	7.4	4.6	7.7	**2.5**	**4.7**
ROOF	0.04	0.73	0.81														
PAVEMENT	0.57	0.90	0.96														
LANDSCAPE	0.08	0.12	0.39														
B2	1.92	**0.41**	**0.59**	100	2.2	9.6	423	4.5	7	1.1%	0.7	9.8	19.3	3.1	5.3	**2.5**	**6.0**
ROOF	0.73	0.73	0.81														
PAVEMENT	0.15	0.90	0.96														
LANDSCAPE	1.04	0.12	0.39														
B3	0.13	**0.73**	**0.81**	22	0.4	2.6	120	2.4	7	2.0%	1.0	2.0	5.0	5.2	8.7	**0.5**	**0.9**
ROOF	0.13	0.73	0.81										*MIN*				
PAVEMENT	0.00	0.90	0.96														
LANDSCAPE	0.00	0.12	0.39														

Calculated by: DLM

Date: 24.01.03

							CONVEYANCE TC						TT				
BASIN	**AREA TOTAL (Acres)**	**C_5**	**C_{100}**	**Length (ft)**	**Height (ft)**	**TI (min)**	**Length (ft)**	**Height (ft)**	**C_V**	**Slope (%)**	**Velocity (fps)**	**TC (min)**	**TOTAL (min)**	**I_5 (in/hr)**	**I_{100} (in/hr)**	**Q_5 (c.f.s.)**	**Q_{100} (c.f.s.)**
B4	0.20	**0.12**	**0.39**	40	6	4.6	10	0.2	7	2.0%	1.0	0.2	5.0	5.2	8.7	**0.1**	**0.7**
ROOF	0.00	0.73	0.81										*MIN*				
PAVEMENT	0.00	0.90	0.96														
LANDSCAPE	0.20	0.12	0.39														
C1	0.60	**0.80**	**0.89**	79	1.5	3.9	297	5	20	1.7%	2.6	1.9	5.8	4.9	8.3	**2.4**	**4.4**
ROOF	0.03	0.73	0.81														
PAVEMENT	0.50	0.90	0.96														
LANDSCAPE	0.07	0.12	0.39														
C2	1.42	**0.36**	**0.56**	100	2	10.6	242	4	7	1.7%	0.9	4.5	15.1	3.5	5.9	**1.8**	**4.7**
ROOF	0.42	0.73	0.81														
PAVEMENT	0.11	0.90	0.96														
LANDSCAPE	0.89	0.12	0.39														
C3	0.58	**0.78**	**0.87**	56	1.2	3.4	219	3	20	1.4%	2.3	1.6	8.6	4.4	7.3	**2.0**	**3.7**
ROOF	0.10	0.73	0.81			POND-C	180	2.5	7	1.4%	0.8	3.6					
PAVEMENT	0.41	0.90	0.96														
LANDSCAPE	0.07	0.12	0.39														
D1	1.91	**0.12**	**0.39**	73	6.5	7.3	1036	20	7	1.9%	1.0	17.8	25.1	2.7	4.6	**0.6**	**3.4**
ROOF	0.00	0.73	0.81														
PAVEMENT	0.00	0.90	0.96														
LANDSCAPE	1.91	0.12	0.39														
D2	1.17	**0.12**	**0.39**	70	14	5.5	488	4	7	0.8%	0.6	12.8	18.3	3.2	5.4	**0.5**	**2.5**
ROOF	0.00	0.73	0.81														
PAVEMENT	0.00	0.90	0.96														
LANDSCAPE	1.17	0.12	0.39														
D3	1.19	**0.12**	**0.39**	64	14	5.1	428	4.5	7	1.1%	0.7	9.9	15.1	3.5	5.9	**0.5**	**2.7**
ROOF	0.00	0.73	0.81														
PAVEMENT	0.00	0.90	0.96														
LANDSCAPE	1.19	0.12	0.39														
D4	0.06	**0.38**	**0.58**	12	2	1.8	22	3	20	13.6%	7.4	0.0	5.0	5.2	8.7	**0.1**	**0.3**
ROOF	0.00	0.73	0.81										*MIN*				
PAVEMENT	0.02	0.90	0.96														
LANDSCAPE	0.04	0.12	0.39														

Calculated by: DLM

Date: 24.01.03

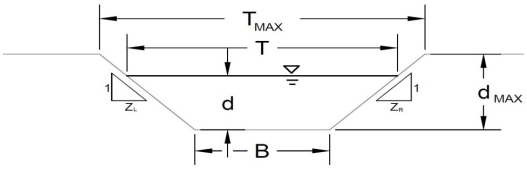
DESIGN POINT	AREA TOTAL (Acres)	C_5	C_{100}	TT TOTAL (min)	I_5 (in/hr)	I_{100} (in/hr)	Q_5 (c.f.s.)	Q_{100} (c.f.s.)
1	**2.00**	**0.48**	**0.65**	**15.1**	3.5	5.9	**3.4**	**7.6**
BASIN C2	1.42	0.36	0.56	15.1				
BASIN C3	0.58	0.78	0.87	8.6				
P1	**5.00**	**0.51**	**0.67**	**30.2**	2.5	4.1	**6.2**	**13.8**
BASIN A1	1.80	0.78	0.87	9.4				
BASIN A2	3.20	0.35	0.55	30.2				
P2	**5.07**	**0.51**	**0.67**	**30.2**	2.5	4.1	**6.4**	**14.1**
BASIN A3	0.07	0.79	0.88	5.0				
PIPE DESIGN POINT P1	5.00	0.51	0.67	30.2				
P3	**2.61**	**0.52**	**0.67**	**19.3**	3.1	5.3	**4.2**	**9.2**
BASIN B1	0.69	0.80	0.89	7.4				
BASIN B2	1.92	0.41	0.59	19.3				
P4	**2.74**	**0.53**	**0.68**	**19.3**	3.1	5.3	**4.5**	**9.8**
BASIN B3	0.13	0.73	0.81	5.0				
PIPE DESIGN POINT P3	2.61	0.52	0.67	19.3				
POND A	**5.25**	**0.50**	**0.66**	**30.2**	2.5	4.1	**6.5**	**14.4**
BASIN A4	0.18	0.17	0.42	5.00				
PIPE DESIGN POINT P2	5.07	0.51	0.67	30.2				
POND B	**2.94**	**0.50**	**0.66**	**19.3**	3.1	5.3	**4.6**	**10.2**
BASIN B4	0.20	0.12	0.39	5.0				
PIPE DESIGN POINT P4	2.74	0.53	0.68	19.3				
POND C	**2.60**	**0.56**	**0.70**	**15.1**	3.5	5.9	**5.1**	**10.8**
BASIN C1	0.60	0.80	0.89	5.8				
DESIGN POINT 1	2.00	0.48	0.65	15.1				

Calculated by: DLM

Date: 24.01.03

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Cottages at Dry Creek
Basin A2



Grass Type	Limiting Manning's n
A	0.06
B	0.04
C	0.033
D	0.03
E	0.024

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.022	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	3.00	ft
Left Side Slope	Z1 =	33.00	ft/ft
Right Side Slope	Z2 =	33.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Sandy	5.0 fps	0.50
Non-Sandy	7.0 fps	0.80

Choose One:
- ○ Sandy
- ◉ Non-Sandy

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**26.00**	**26.00**	**feet**
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.00**	**1.00**	**feet**

Maximum Channel Capacity Based On Allowable Top Width

		Minor Storm	Major Storm	
Max. Allowable Top Width	T_{MAX} =	**26.00**	**26.00**	**ft**
Water Depth	d =	0.35	0.35	ft
Flow Area	A =	5.05	5.05	sq ft
Wetted Perimeter	P =	26.01	26.01	ft
Hydraulic Radius	R =	0.19	0.19	ft
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	3.21	3.21	fps
Velocity-Depth Product	VR =	0.62	0.62	ft^2/s
Hydraulic Depth	D =	0.19	0.19	ft
Froude Number	Fr =	1.28	1.28	
Max. Flow Based On Allowable Top Width	Q_T =	**16.23**	**16.23**	**cfs**

Maximum Channel Capacity Based On Allowable Water Depth

		Minor Storm	Major Storm	
Max. Allowable Water Depth	d_{MAX} =	**1.00**	**1.00**	**feet**
Top Width	T =	69.00	69.00	feet
Flow Area	A =	36.00	36.00	square feet
Wetted Perimeter	P =	69.03	69.03	feet
Hydraulic Radius	R =	0.52	0.52	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	6.21	6.21	fps
Velocity-Depth Product	VR =	3.24	3.24	ft^2/s
Hydraulic Depth	D =	0.52	0.52	feet
Froude Number	Fr =	1.51	1.51	
Max. Flow Based On Allowable Water Depth	Q_d =	**223.40**	**223.40**	**cfs**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**16.23**	**16.23**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.35**	**0.35**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**2.80**	**7.30**	**cfs**
Water Depth	d =	**0.16**	**0.25**	**feet**
Top Width	T =	13.75	19.40	feet
Flow Area	A =	1.36	2.78	square feet
Wetted Perimeter	P =	13.76	19.40	feet
Hydraulic Radius	R =	0.10	0.14	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	2.05	2.62	fps
Velocity-Depth Product	VR =	0.20	0.38	ft^2/s
Hydraulic Depth	D =	0.10	0.14	feet
Warning 04 Froude Number	Fr =	1.15	1.22	

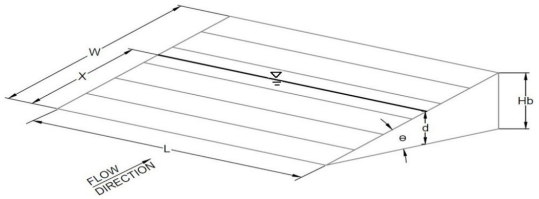
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'
Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Cottages at Dry Creek
Basin A2

Inlet Design Information (Input)

Type of Inlet — Inlet Type = CDOT Type D (In Series & Depressed)



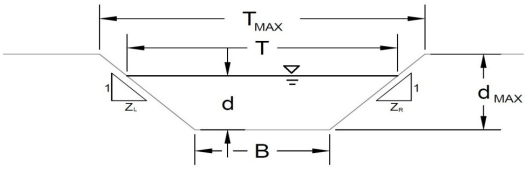
Angle of Inclined Grade (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grade	W =	3.00	feet
Length of Grade	L =	6.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grade	H_B =	0.00	feet
Clogging Factor	C_f =	0.38	
Grate Discharge Coefficient	C_d =	0.72	
Orifice Coefficient	C_o =	0.48	
Weir Coefficient	C_w =	1.53	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	1.16	1.25	
Grate Capacity as a Weir				
Submerged Side Weir Length	X =	6.00	6.00	feet
Inclined Side Weir Flow	Q_{ws} =	20.16	22.43	cfs
Base Weir Flow	Q_{wb} =	14.40	16.02	cfs
Interception without Clogging	Q_{wi} =	54.73	60.87	cfs
Interception with Clogging	Q_{wa} =	34.20	38.04	cfs
Grate Capacity as an Orifice				
Interception without Clogging	Q_{oi} =	52.01	53.89	cfs
Interception with Clogging	Q_{oa} =	32.51	33.68	cfs
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**32.51**	**33.68**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (> Q PEAK)	**Bypassed Flow, Q_b =**	**0.00**	**0.00**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

Warning 04: Froude No. exceeds USDCM Volume I recommendation.

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Cottages at Dry Creek
Basin B2



Grass Type	Limiting Manning's n
A	0.06
B	0.04
C	0.033
D	0.03
E	0.024

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.022	
Channel Invert Slope	S_O =	0.0080	ft/ft
Bottom Width	B =	3.00	ft
Left Side Slope	Z1 =	33.00	ft/ft
Right Side Slope	Z2 =	33.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Sandy	5.0 fps	0.50
Non-Sandy	7.0 fps	0.80

Choose One:
- ○ Sandy
- ◉ Non-Sandy

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**26.00**	**26.00**	**feet**
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.00**	**1.00**	**feet**

Maximum Channel Capacity Based On Allowable Top Width

		Minor Storm	Major Storm	
Max. Allowable Top Width	T_{MAX} =	**26.00**	**26.00**	**ft**
Water Depth	d =	0.35	0.35	ft
Flow Area	A =	5.05	5.05	sq ft
Wetted Perimeter	P =	26.01	26.01	ft
Hydraulic Radius	R =	0.19	0.19	ft
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	2.03	2.03	fps
Velocity-Depth Product	VR =	0.39	0.39	ft^2/s
Hydraulic Depth	D =	0.19	0.19	ft
Froude Number	Fr =	0.81	0.81	
Max. Flow Based On Allowable Top Width	Q_T =	**10.27**	**10.27**	**cfs**

Maximum Channel Capacity Based On Allowable Water Depth

		Minor Storm	Major Storm	
Max. Allowable Water Depth	d_{MAX} =	**1.00**	**1.00**	**feet**
Top Width	T =	69.00	69.00	feet
Flow Area	A =	36.00	36.00	square feet
Wetted Perimeter	P =	69.03	69.03	feet
Hydraulic Radius	R =	0.52	0.52	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	3.92	3.92	fps
Velocity-Depth Product	VR =	2.05	2.05	ft^2/s
Hydraulic Depth	D =	0.52	0.52	feet
Froude Number	Fr =	0.96	0.96	
Max. Flow Based On Allowable Water Depth	Q_d =	**141.29**	**141.29**	**cfs**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**10.27**	**10.27**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.35**	**0.35**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**2.50**	**6.00**	**cfs**
Water Depth	**d =**	**0.19**	**0.28**	**feet**
Top Width	T =	15.54	21.34	feet
Flow Area	A =	1.76	3.38	square feet
Wetted Perimeter	P =	15.55	21.35	feet
Hydraulic Radius	R =	0.11	0.16	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	1.42	1.77	fps
Velocity-Depth Product	VR =	0.16	0.28	ft^2/s
Hydraulic Depth	D =	0.11	0.16	feet
Froude Number	Fr =	0.74	0.79	

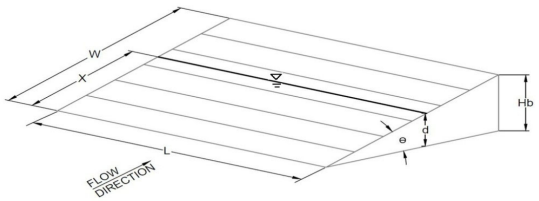
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'
Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Cottages at Dry Creek
Basin B2

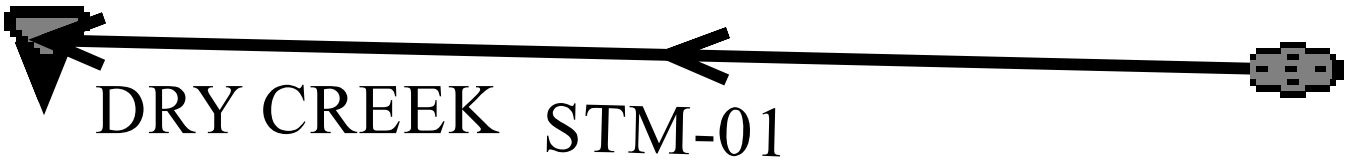
Inlet Design Information (Input)

Type of Inlet — Inlet Type = CDOT Type D (In Series & Depressed)

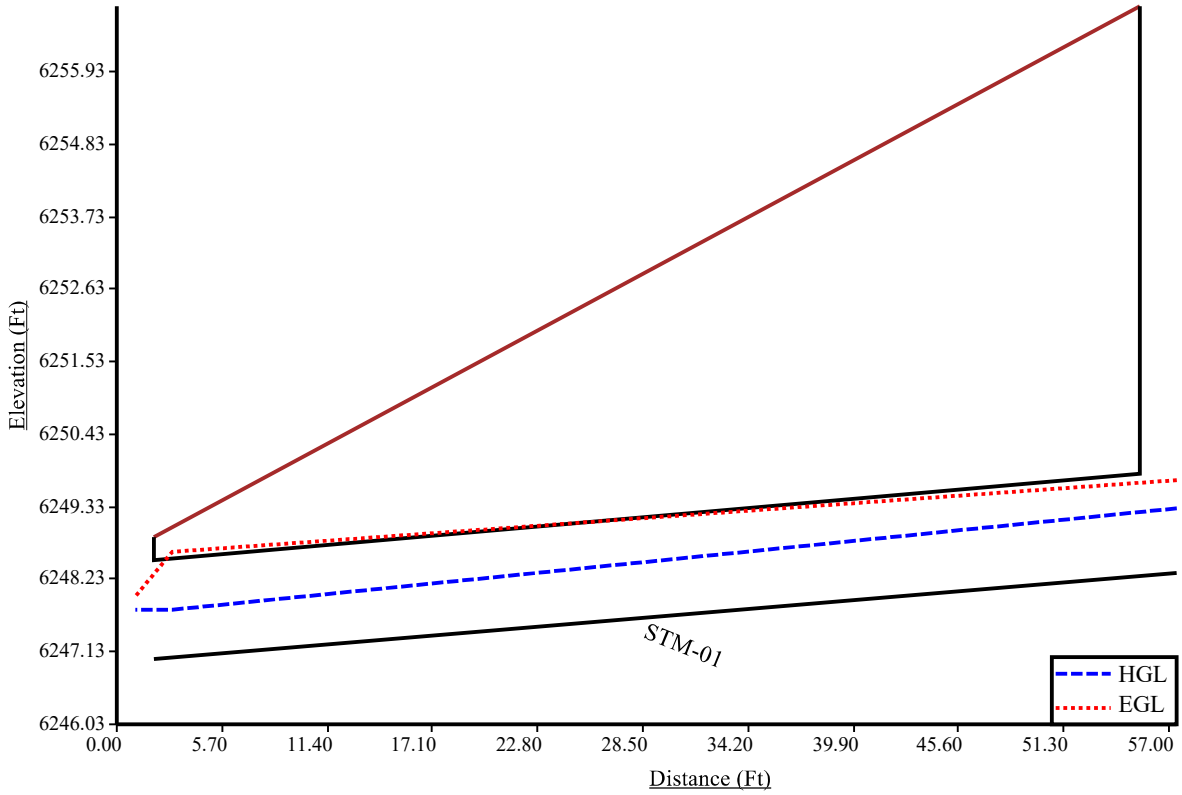


Angle of Inclined Grade (must be <= 30 degrees)	θ =	0.00		degrees
Width of Grade	W =	3.00		feet
Length of Grade	L =	6.00		feet
Open Area Ratio	A_{RATIO} =	0.70		
Height of Inclined Grade	H_B =	0.00		feet
Clogging Factor	C_f =	0.38		
Grate Discharge Coefficient	C_d =	0.72		
Orifice Coefficient	C_o =	0.48		
Weir Coefficient	C_w =	1.53		

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	1.19	1.28	
Grate Capacity as a Weir				
Submerged Side Weir Length	X =	6.00	6.00	feet
Inclined Side Weir Flow	Q_{ws} =	20.87	23.23	cfs
Base Weir Flow	Q_{wb} =	14.91	16.59	cfs
Interception without Clogging	Q_{wi} =	56.65	63.04	cfs
Interception with Clogging	Q_{wa} =	35.41	39.40	cfs
Grate Capacity as an Orifice				
Interception without Clogging	Q_{oi} =	52.62	54.52	cfs
Interception with Clogging	Q_{oa} =	32.88	34.08	cfs
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**32.88**	**34.08**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (> Q PEAK)	**Bypassed Flow, Q_b =**	**0.00**	**0.00**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**


DRY CREEK
STM-01

STM-01 5YR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6251.53
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6249.33
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6247.13
6246.03
Elevation (Ft)
0.00
5.70
11.40
17.10
22.80
28.50
34.20
39.90
45.60
51.30
57.00
Distance (Ft)
STM-01
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/14/2023 11:20:23 AM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 1 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6247.77

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
DRY CREEK	6248.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-01	6256.92	6.40	6.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
DRY CREEK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-01	0.00	0.00	0.00	0.00	6.40	0.00	0.00	0.00	6.40	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-01	57.41	6247.02	2.3	6248.33	0.015	0.00	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity	Critical Flow	Normal Flow	

Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-01	13.79	7.80	11.74	5.24	8.62	7.66	1.81	Supercritical	6.40	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-01	6.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6247.77

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-01	6247.02	6248.33	0.00	0.00	6247.77	6249.31	6248.65	1.09	6249.74

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)

- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

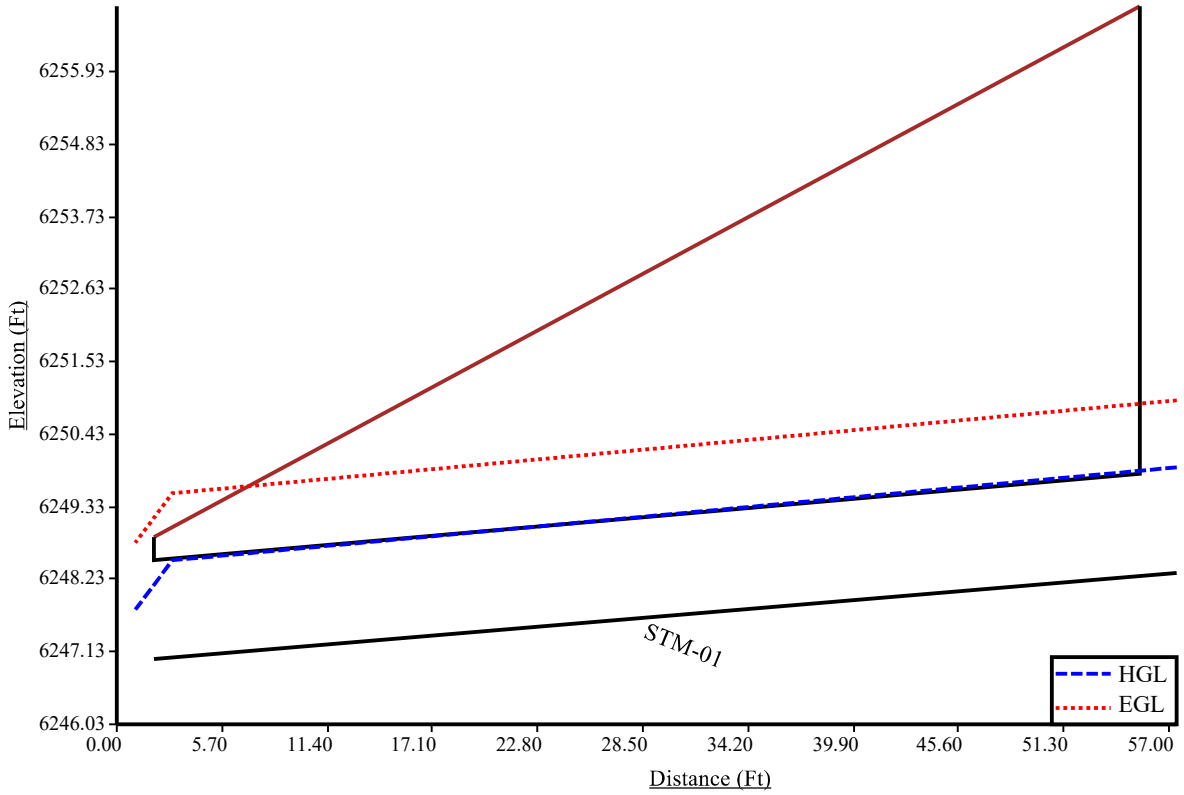
The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-01	57.41	2.50	4.00	4.92	0.00	2.39	0.14	16.68	9.13	6.88	96.27	Sewer Too Shallow

Total earth volume for sewer trenches = 96 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

STM-01 100YR


6255.93
6254.83
6253.73
6252.63
6251.53
6250.43
6249.33
6248.23
6247.13
6246.03
Elevation (Ft)
0.00
5.70
11.40
17.10
22.80
28.50
34.20
39.90
45.60
51.30
57.00
Distance (Ft)
STM-01
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/14/2023 10:57:14 AM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 1 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6247.77

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
FS-EDB A	6248.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-01	6256.92	14.30	14.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
FS-EDB A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-01	0.00	0.00	0.00	0.00	14.30	0.00	0.00	0.00	14.30	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-01	57.41	6247.02	2.3	6248.33	0.015	0.00	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity	Critical Flow	Normal Flow	

Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-01	13.79	7.80	18.00	8.09	18.00	8.09	0.00	Pressurized	14.30	57.41	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-01	14.30	CIRCULAR	18.00 in	18.00 in	21.00 in	21.00 in	18.00 in	18.00 in	1.77	Existing height is smaller than the suggested height. Existing width is smaller than the suggested width. Exceeds max. Depth/Rise

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6247.77

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)

STM-01	6247.02	6248.33	0.00	0.00	6248.52	6249.93	6249.54	1.41	6250.95

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

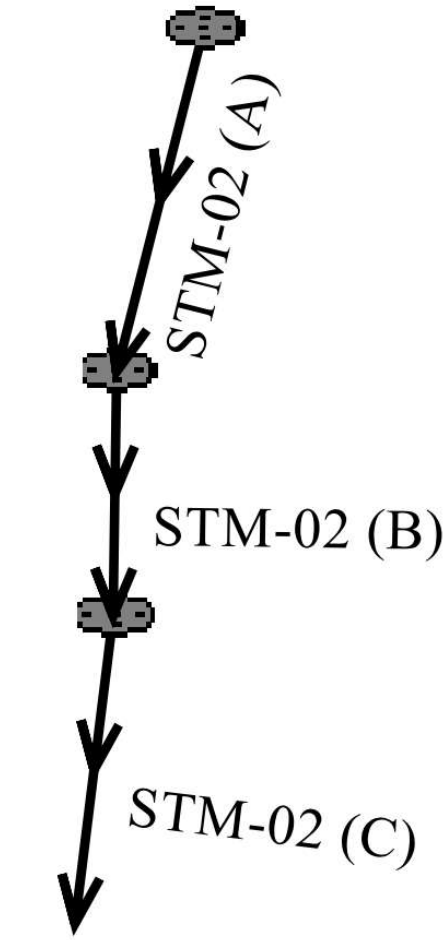
Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

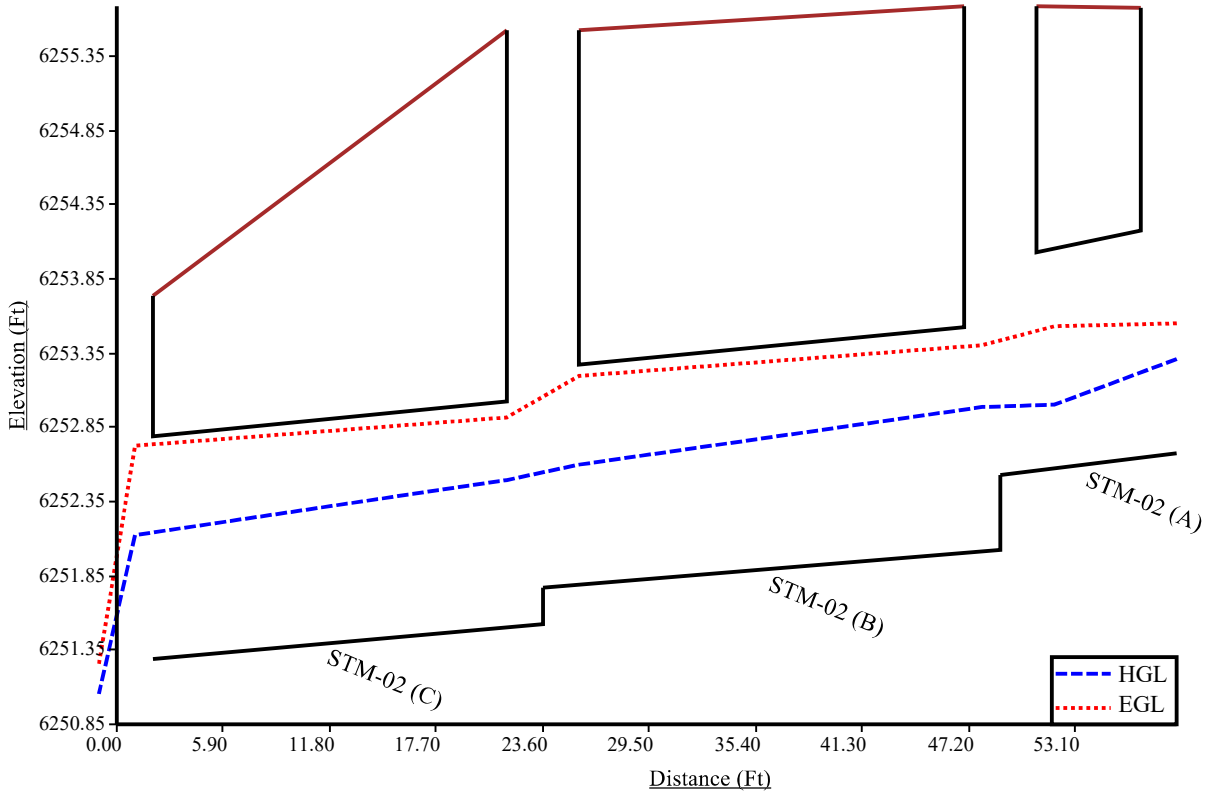
					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-01	57.41	2.50	4.00	4.92	0.00	2.39	0.14	16.68	9.13	6.88	96.27	Sewer Too Shallow

Total earth volume for sewer trenches = 96 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.


STM-02 (A)
STM-02 (B)
STM-02 (C)

STM-02 5YR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6254.35
6253.85
6253.35
6252.85
6252.35
6251.85
6251.35
6250.85
Elevation (Ft)
0.00
5.90
11.80
17.70
23.60
29.50
35.40
41.30
47.20
53.10
Distance (Ft)
STM-02 (A)
STM-02 (B)
STM-02 (C)
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/14/2023 3:11:27 PM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 2 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6251.06

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
FOREBAY	6253.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-02 (C)	6255.53	6.30	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-02 (B)	6255.69	6.20	3.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-02 (A)	6255.68	2.80	2.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
FOREBAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-02 (C)	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	6.30	
STM-02 (B)	0.00	0.00	0.00	0.00	3.50	0.00	0.00	0.00	6.20	
STM-02 (A)	0.00	0.00	0.00	0.00	2.80	0.00	0.00	0.00	2.80	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-02 (C)	23.60	6251.29	1.0	6251.53	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in
STM-02 (B)	25.34	6251.78	1.0	6252.03	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in

STM-02 (A)	9.78	6252.53	1.5	6252.68	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
STM-02 (C)	10.53	5.96	11.64	5.21	10.03	6.23	1.33	Supercritical	6.30	0.00	
STM-02 (B)	10.53	5.96	11.55	5.18	9.93	6.20	1.34	Supercritical	6.20	0.00	
STM-02 (A)	12.90	7.30	7.62	3.93	5.70	5.83	1.75	Supercritical	2.80	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
STM-02 (C)	6.30	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-02 (B)	6.20	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-02 (A)	2.80	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6251.06

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-02 (C)	6251.29	6251.53	0.00	0.00	6252.13	6252.50	6252.73	0.19	6252.92
STM-02 (B)	6251.78	6252.03	0.01	0.00	6252.60	6252.99	6253.20	0.21	6253.41
STM-02 (A)	6252.53	6252.68	0.00	0.00	6253.01	6253.32	6253.54	0.02	6253.56

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

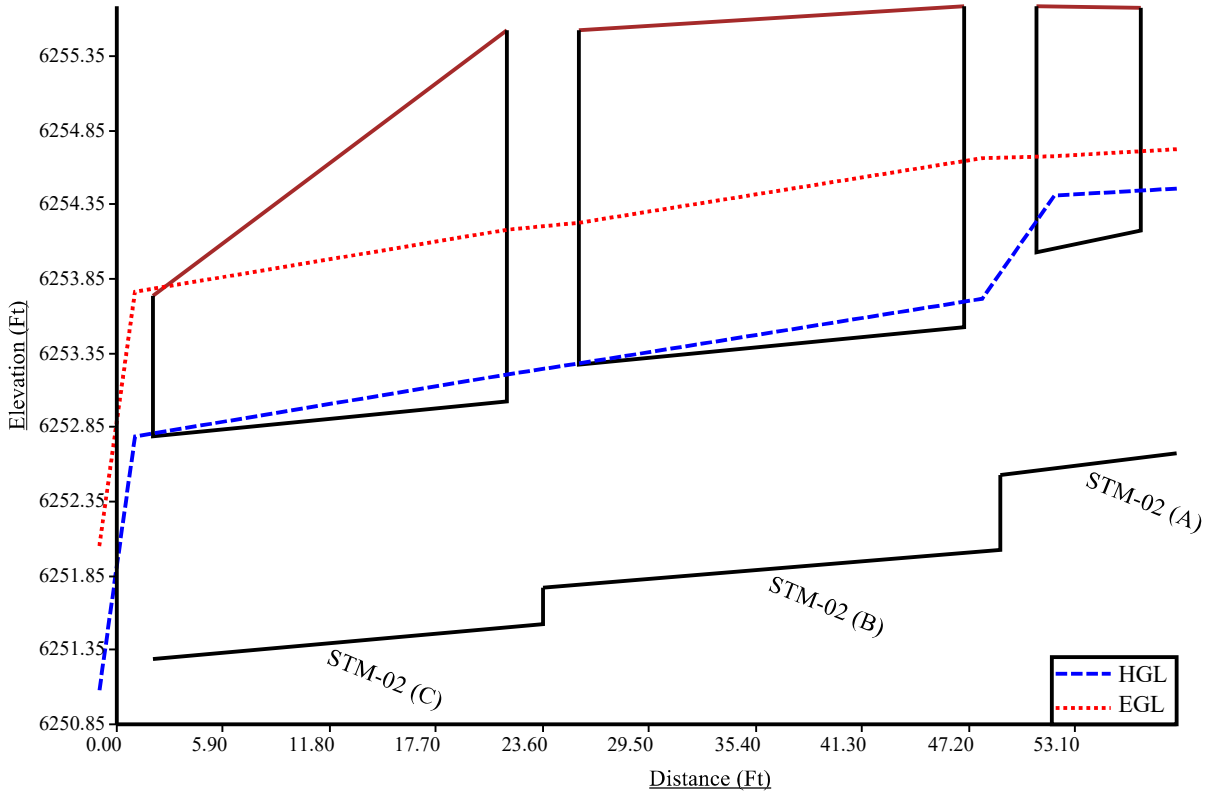
					Downstream			Upstream				
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Volume (cu. yd)	Comment
STM-02 (C)	23.60	2.50	4.00	4.92	0.00	2.99	0.74	7.50	4.54	2.29	15.32	Sewer Too Shallow
STM-02 (B)	25.34	2.50	4.00	4.92	7.01	4.30	2.05	6.82	4.20	1.95	20.54	
STM-02 (A)	9.78	2.50	4.00	4.92	5.81	3.70	1.45	5.50	3.54	1.29	6.50	

Total earth volume for sewer trenches = 42 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.

- Six inches for pipes less than 60 inches.
- Eight inches for all larger sizes.

STM-02 100YR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11.80
17.70
23.60
29.50
35.40
41.30
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Distance (Ft)
STM-02 (A)
STM-02 (B)
STM-02 (C)
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/14/2023 3:14:37 PM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 2 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6251.06

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
FOREBAY	6253.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-02 (C)	6255.53	14.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-02 (B)	6255.69	13.80	6.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-02 (A)	6255.68	7.30	2.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
FOREBAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-02 (C)	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	14.00	
STM-02 (B)	0.00	0.00	0.00	0.00	6.50	0.00	0.00	0.00	13.80	
STM-02 (A)	0.00	0.00	0.00	0.00	2.80	0.00	0.00	0.00	7.30	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-02 (C)	23.60	6251.29	1.0	6251.53	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in
STM-02 (B)	25.34	6251.78	1.0	6252.03	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in

STM-02 (A)	9.78	6252.53	1.5	6252.68	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	**Flow (cfs)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Depth (in)**	**Velocity (fps)**	**Froude Number**	**Flow Condition**	**Flow (cfs)**	**Surcharged Length (ft)**	**Comment**
STM-02 (C)	10.53	5.96	18.00	7.92	18.00	7.92	0.00	Pressurized	14.00	23.60	
STM-02 (B)	10.53	5.96	18.00	7.81	18.00	7.81	0.00	Pressurized	13.80	25.34	
STM-02 (A)	12.90	7.30	12.56	5.55	9.69	7.52	1.65	Pressurized	7.30	9.78	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
STM-02 (C)	14.00	CIRCULAR	18.00 in	18.00 in	21.00 in	21.00 in	18.00 in	18.00 in	1.77	Existing height is smaller than the suggested height. Existing width is smaller than the suggested width. Exceeds max. Depth/Rise
STM-02 (B)	13.80	CIRCULAR	18.00 in	18.00 in	21.00 in	21.00 in	18.00 in	18.00 in	1.77	Existing height is smaller than the suggested height. Existing width is smaller than the suggested width. Exceeds max. Depth/Rise
STM-02 (A)	7.30	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6251.06

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-02 (C)	6251.29	6251.53	0.00	0.00	6252.79	6253.21	6253.77	0.42	6254.19
STM-02 (B)	6251.78	6252.03	0.05	0.00	6253.29	6253.72	6254.23	0.44	6254.67
STM-02 (A)	6252.53	6252.68	0.01	0.00	6254.42	6254.46	6254.68	0.05	6254.73

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

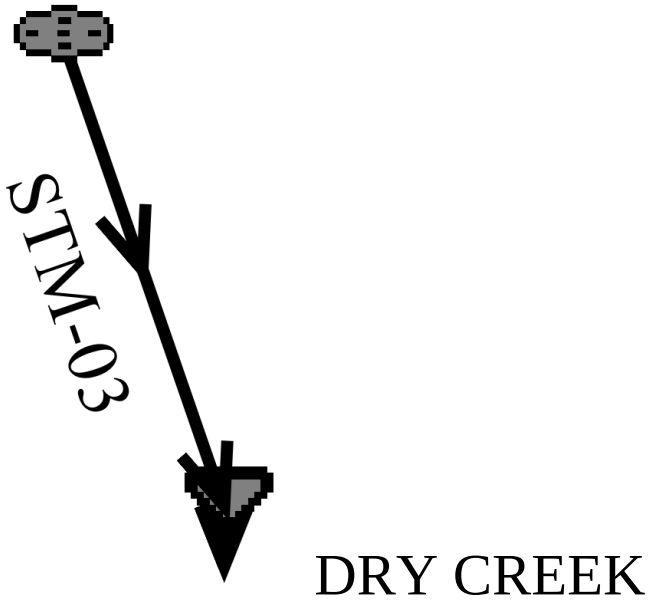
Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

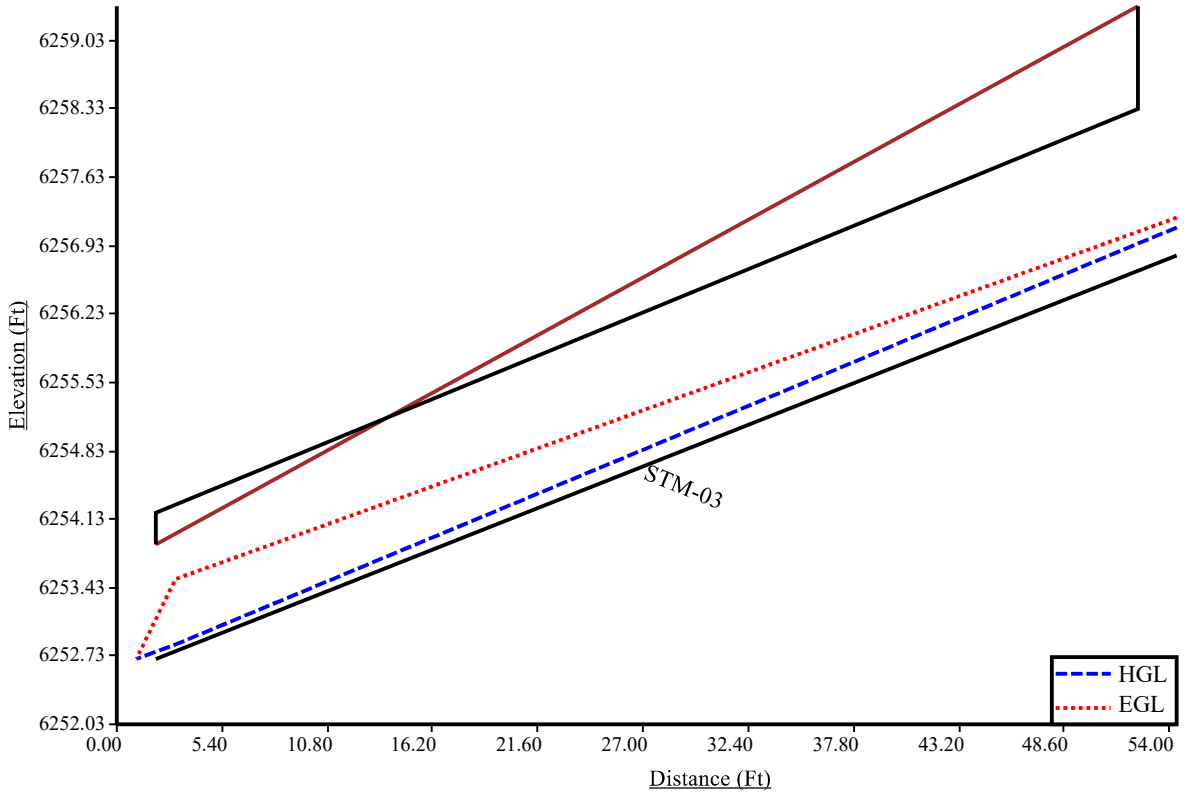
					Downstream			Upstream				
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Volume (cu. yd)	Comment
STM-02 (C)	23.60	2.50	4.00	4.92	0.00	2.99	0.74	7.50	4.54	2.29	15.32	Sewer Too Shallow
STM-02 (B)	25.34	2.50	4.00	4.92	7.01	4.30	2.05	6.82	4.20	1.95	20.54	
STM-02 (A)	9.78	2.50	4.00	4.92	5.81	3.70	1.45	5.50	3.54	1.29	6.50	

Total earth volume for sewer trenches = 42 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
    - Four inches for pipes less than 33 inches.
    - Six inches for pipes less than 60 inches.
    - Eight inches for all larger sizes.


STM-03
DRY CREEK

STM-03 5YR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32.40
37.80
43.20
48.60
54.00
Distance (Ft)
STM-03
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/14/2023 1:11:23 PM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 3 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6252.70

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
DRY CREEK SCULPTED DROP	6253.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-03	6259.38	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
DRY CREEK SCULPTED DROP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-03	54.38	6252.70	7.6	6256.83	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity	Critical Flow	Normal Flow	

Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-03	29.04	16.43	3.45	2.54	1.79	6.57	3.63	Supercritical	0.60	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-03	0.60	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6252.70

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-03	6252.70	6256.83	0.00	0.00	6252.85	6257.12	6253.52	3.70	6257.22

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)

- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

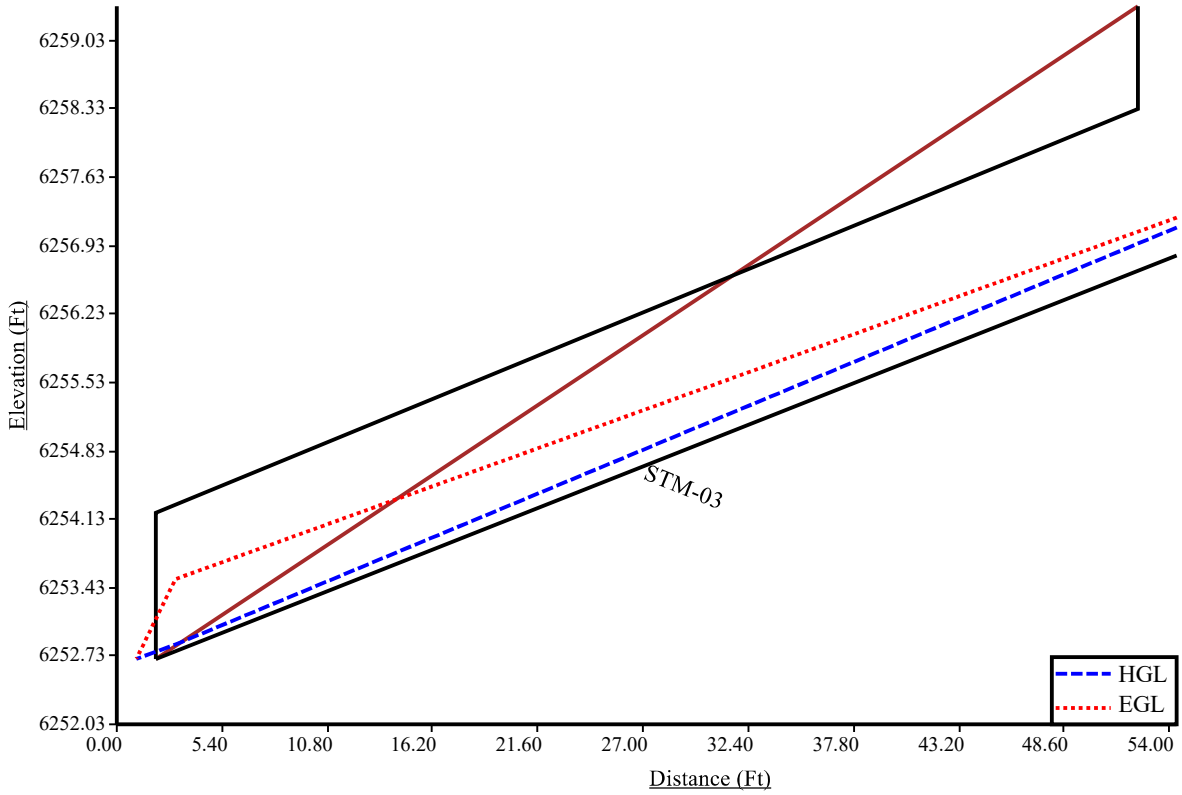
The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-03	54.38	2.50	4.00	4.92	0.00	1.71	0.00	4.92	3.09	0.84	19.63	Sewer Too Shallow

Total earth volume for sewer trenches = 20 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

STM-03 100YR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6258.33
6257.63
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6253.43
6252.73
6252.03
Elevation (Ft)
0.00
5.40
10.80
16.20
21.60
27.00
32.40
37.80
43.20
48.60
54.00
Distance (Ft)
STM-03
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/14/2023 1:09:13 PM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 3 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6252.70

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
DRY CREEK SCULPTED DROP	6253.87	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-03	6259.38	3.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
DRY CREEK SCULPTED DROP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.40	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-03	54.38	6252.70	7.6	6256.83	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity	Critical Flow	Normal Flow	

Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-03	29.04	16.43	8.44	4.18	4.16	11.00	3.92	Supercritical	3.40	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-03	3.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6252.70

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-03	6252.70	6256.83	0.00	0.00	6253.04	6257.53	6254.92	2.88	6257.80

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)

- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

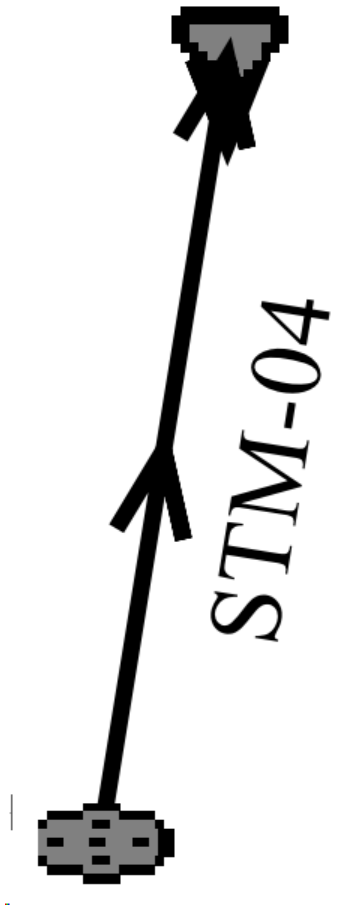
The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-03	54.38	2.50	4.00	4.92	0.00	1.71	0.00	4.92	3.09	0.84	19.63	Sewer Too Shallow

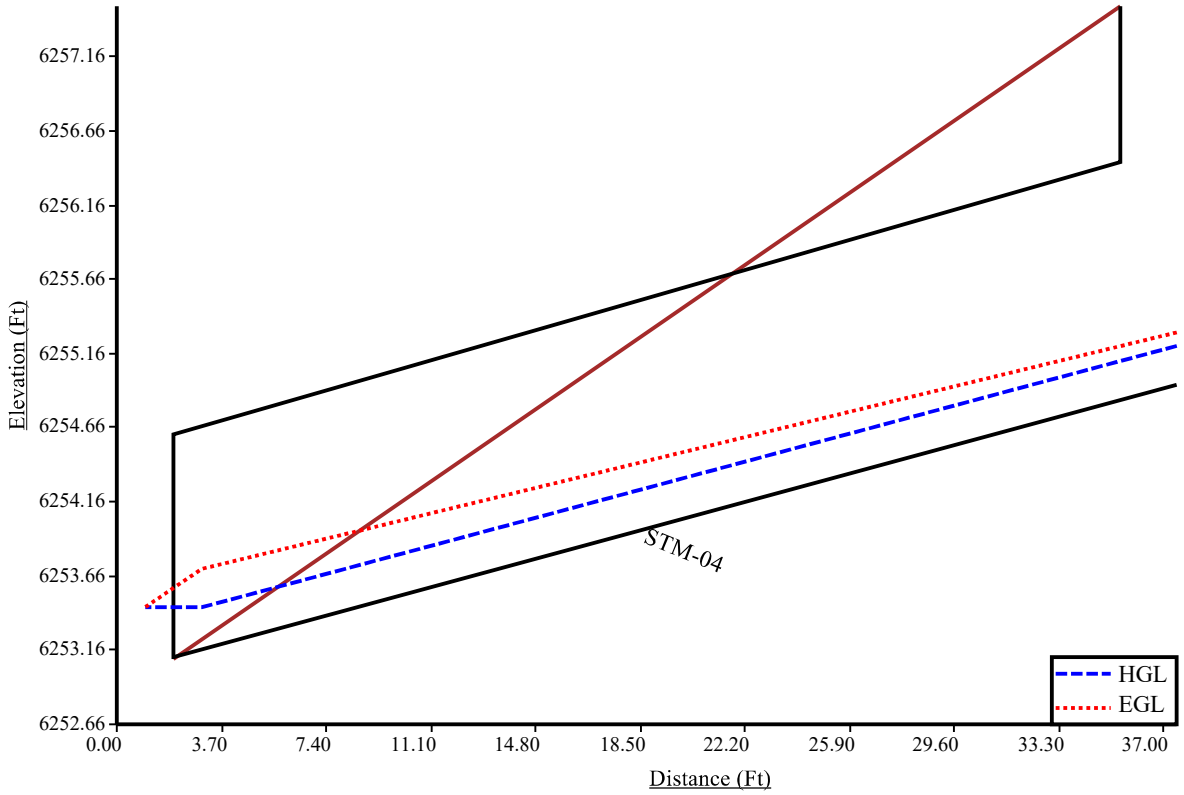
Total earth volume for sewer trenches = 20 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

DRY CREEK



STM-04 5YR


6257.16
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6256.16
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6252.66
Elevation (Ft)
0.00
3.70
7.40
11.10
14.80
18.50
22.20
25.90
29.60
33.30
37.00
Distance (Ft)
STM-04
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/14/2023 1:24:49 PM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 4 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6253.45

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
DRY DREEK SCULPTED DROP	6253.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-04	6257.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
DRY DREEK SCULPTED DROP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Surface Water Present (Upstream)
STM-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.50	Surface Water Present (Downstream)

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-04	37.45	6253.11	4.9	6254.95	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-04	23.31	13.19	3.14	2.42	1.82	5.34	2.92	Supercritical	0.50	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-04	0.50	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6253.45

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-04	6253.11	6254.95	0.00	0.00	6253.45	6255.21	6253.71	1.59	6255.30

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.

- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

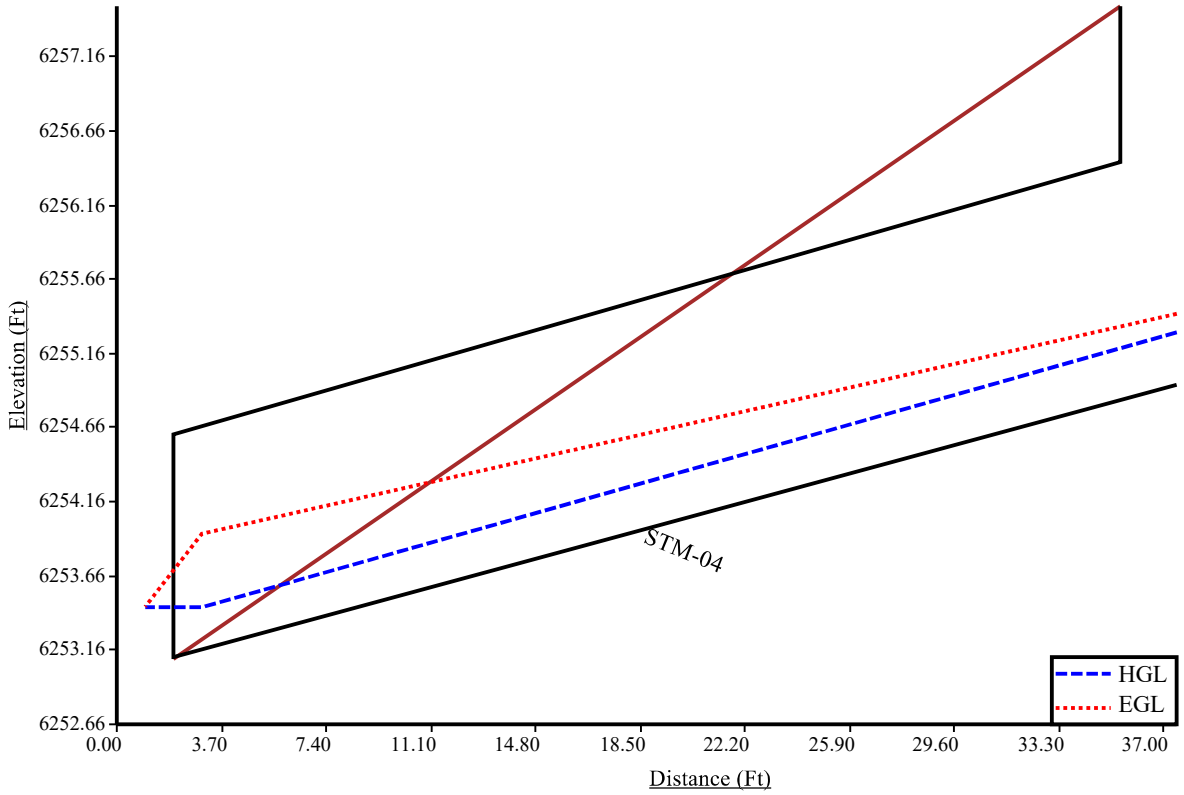
The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-04	37.45	2.50	4.00	4.92	0.00	0.53	0.00	4.92	3.09	0.84	9.47	Sewer Too Shallow

Total earth volume for sewer trenches = 9 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

STM-04 100YR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6253.16
6252.66
Elevation (Ft)
0.00
3.70
7.40
11.10
14.80
18.50
22.20
25.90
29.60
33.30
37.00
Distance (Ft)
STM-04
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/14/2023 1:22:59 PM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 4 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6253.45

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
DRY DREEK SCULPTED DROP	6253.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-04	6257.50	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
DRY DREEK SCULPTED DROP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	Surface Water Present (Upstream)
STM-04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.90	Surface Water Present (Downstream)

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-04	37.45	6253.11	4.9	6254.95	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-04	23.31	13.19	4.24	2.83	2.42	6.37	3.02	Supercritical	0.90	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-04	0.90	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6253.45

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-04	6253.11	6254.95	0.00	0.00	6253.45	6255.30	6253.95	1.48	6255.43

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.

- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

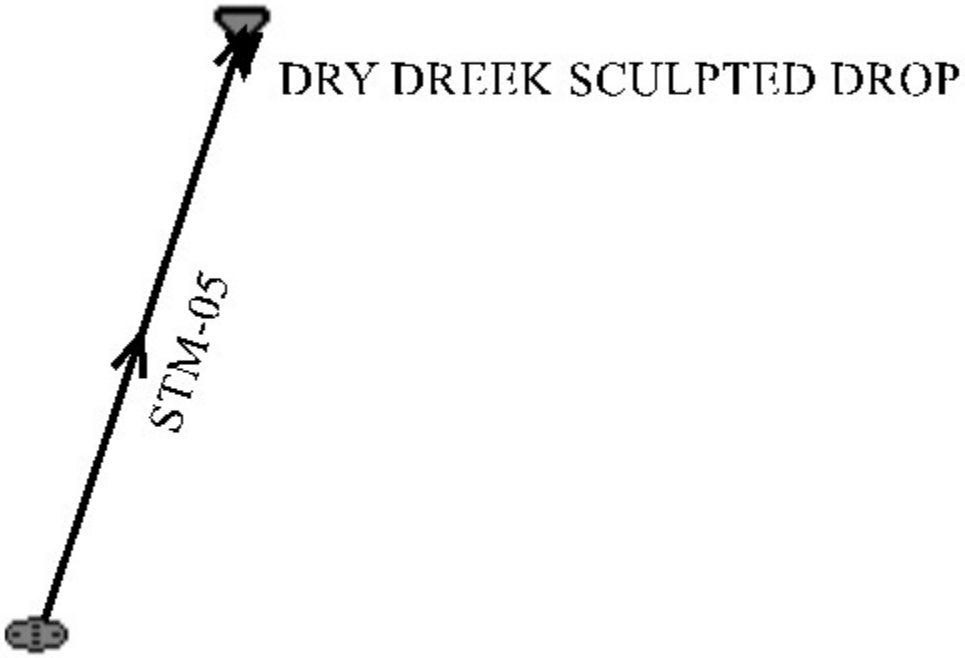
Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

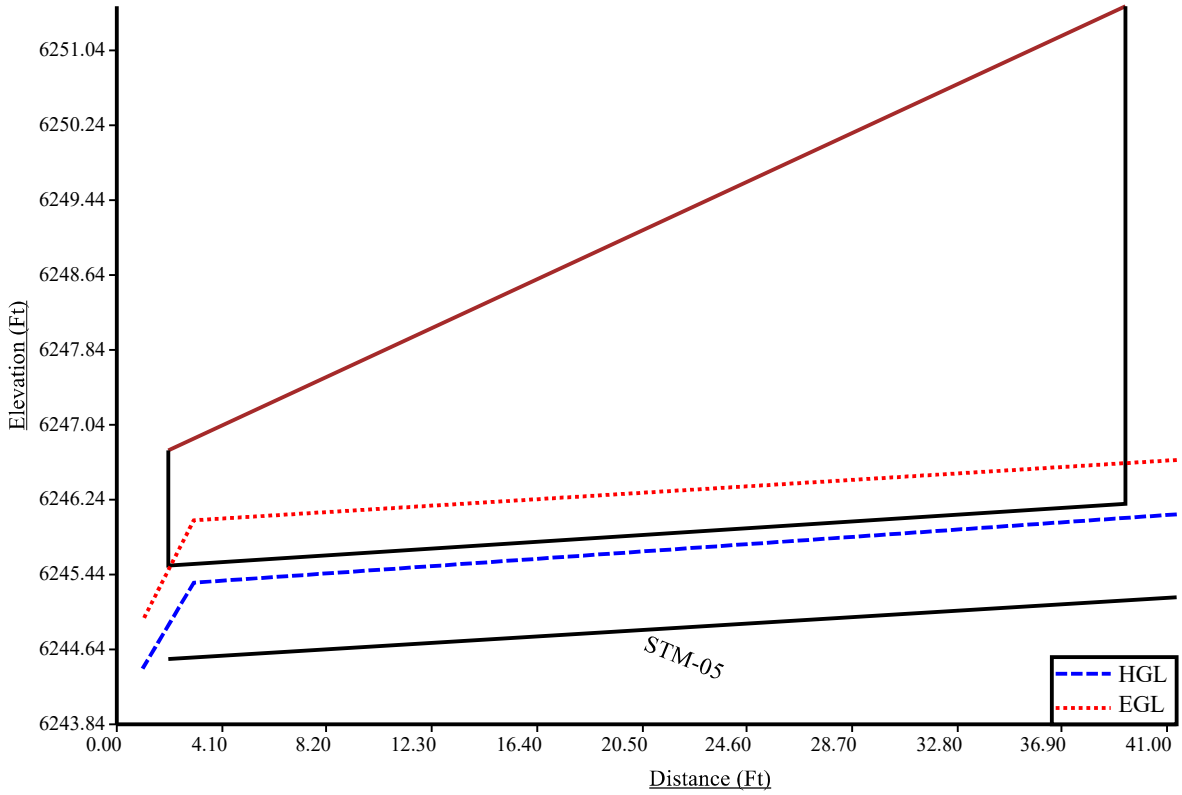
					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-04	37.45	2.50	4.00	4.92	0.00	0.53	0.00	4.92	3.09	0.84	9.47	Sewer Too Shallow

Total earth volume for sewer trenches = 9 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.


DRY DREEK SCULPTED DROP
STM-05

STM-05 5YR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6248.64
6247.84
6247.04
6246.24
6245.44
6244.64
6243.84
Elevation (Ft)
0.00
4.10
8.20
12.30
16.40
20.50
24.60
28.70
32.80
36.90
41.00
Distance (Ft)
STM-05
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/19/2023 11:50:00 AM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 5 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6244.44

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
DRY DREEK SCULPTED DROP	6246.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-05	6251.51	4.50	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
DRY DREEK SCULPTED DROP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-05	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	4.50	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-05	41.37	6244.54	1.6	6245.20	0.013	0.00	0.00	CIRCULAR	12.00 in	12.00 in

Sewer Flow Summary:

	Full Flow Capacity	Critical Flow	Normal Flow	

Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-05	4.51	5.75	10.64	6.11	9.80	6.55	1.22	Supercritical	4.50	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-05	4.50	CIRCULAR	12.00 in	12.00 in	18.00 in	18.00 in	12.00 in	12.00 in	0.79	Height is too small. Width is too small. Existing height is smaller than the suggested height. Existing width is smaller than the suggested width.

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6244.44

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)

STM-05	6244.54	6245.20	0.00	0.00	6245.36	6246.09	6246.02	0.64	6246.67

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

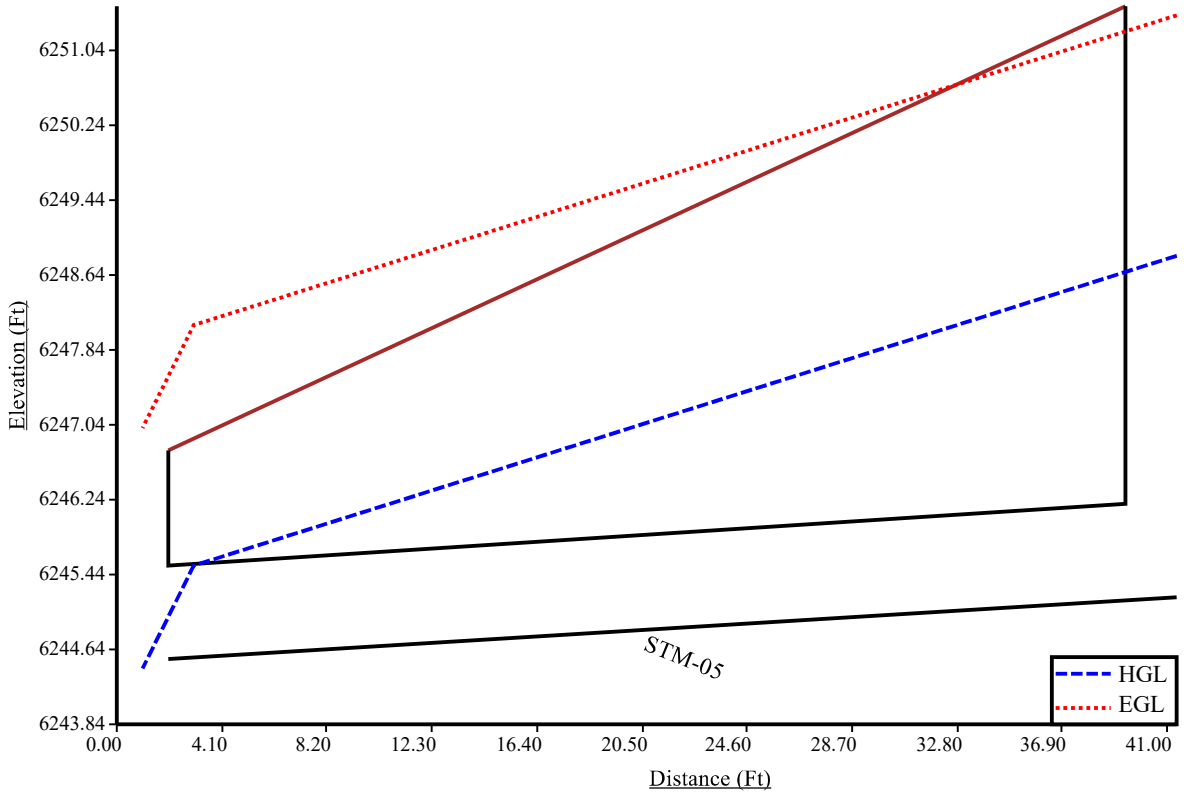
The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-05	41.37	2.00	4.00	4.33	4.46	2.73	1.06	12.62	6.81	5.14	44.83	Sewer Too Shallow

Total earth volume for sewer trenches = 45 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

STM-05 100YR


6251.04
6250.24
6249.44
6248.64
6247.84
6247.04
6246.24
6245.44
6244.64
6243.84
Elevation (Ft)
0.00
4.10
8.20
12.30
16.40
20.50
24.60
28.70
32.80
36.90
41.00
Distance (Ft)
STM-05
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/19/2023 11:46:20 AM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 5 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6244.44

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
DRY DREEK SCULPTED DROP	6246.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-05	6251.51	10.10	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
DRY DREEK SCULPTED DROP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-05	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	10.10	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-05	41.37	6244.54	1.6	6245.20	0.013	0.00	0.00	CIRCULAR	12.00 in	12.00 in

Sewer Flow Summary:

	Full Flow Capacity	Critical Flow	Normal Flow	

Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-05	4.51	5.75	12.00	12.86	12.00	12.86	0.00	Pressurized	10.10	41.37	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-05	10.10	CIRCULAR	12.00 in	12.00 in	18.00 in	18.00 in	12.00 in	12.00 in	0.79	Height is too small. Width is too small. Existing height is smaller than the suggested height. Existing width is smaller than the suggested width. Exceeds max. Depth/Rise

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6244.44

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss	Lateral Loss	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss	Upstream (ft)

			(ft)	(ft)				(ft)	
STM-05	6244.54	6245.20	0.00	0.00	6245.54	6248.85	6248.11	3.31	6251.41

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

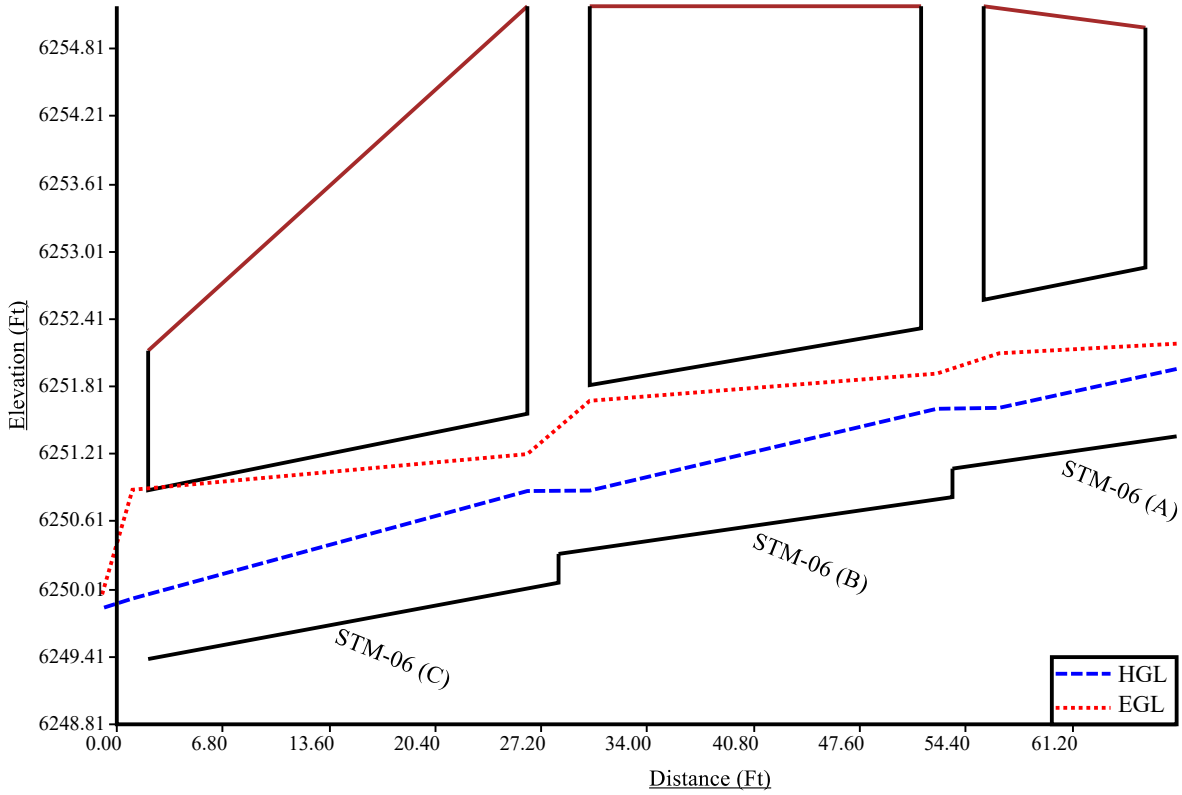
					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-05	41.37	2.00	4.00	4.33	4.46	2.73	1.06	12.62	6.81	5.14	44.83	Sewer Too Shallow

Total earth volume for sewer trenches = 45 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

EDB-B
STM-06 (C)
STM-06 (B)
STM-06 (A)

STM-06 5YR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6253.61
6253.01
6252.41
6251.81
6251.21
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6250.01
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6248.81
Elevation (Ft)
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13.60
20.40
27.20
34.00
40.80
47.60
54.40
61.20
Distance (Ft)
STM-06 (A)
STM-06 (B)
STM-06 (C)
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4
Run Date: 2/16/2024 11:12:27 AM

UDSewer Results Summary

Project Title: 20-270 Mark Dabbling Storm 6 HGL
Project Description: Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6249.84

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
EDB-B	6252.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

STM-06 (C)	6255.19	4.50	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-06 (B)	6255.19	4.20	1.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-06 (A)	6255.00	2.50	2.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-06 (C)	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	4.50	
STM-06 (B)	0.00	0.00	0.00	0.00	1.70	0.00	0.00	0.00	4.20	
STM-06 (A)	0.00	0.00	0.00	0.00	2.50	0.00	0.00	0.00	2.50	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-06 (C)	28.30	6249.39	2.4	6250.07	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in
STM-06 (B)	25.23	6250.33	2.0	6250.83	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in
STM-06 (A)	14.37	6251.08	2.0	6251.37	0.013	0.25	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-06 (C)	16.32	9.23	9.77	4.59	6.46	7.89	2.21	Supercritical	4.50	0.00	
STM-06 (B)	14.90	8.43	9.42	4.49	6.54	7.24	2.01	Supercritical	4.20	0.00	
STM-06 (A)	14.90	8.43	7.18	3.80	4.99	6.26	2.02	Supercritical	2.50	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-06 (C)	4.50	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-06 (B)	4.20	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-06 (A)	2.50	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6249.84

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-06 (C)	6249.39	6250.07	0.00	0.00	6249.93	6250.88	6250.90	0.32	6251.21
STM-06 (B)	6250.33	6250.83	0.00	0.00	6250.89	6251.62	6251.69	0.24	6251.93
STM-06 (A)	6251.08	6251.37	0.01	0.00	6251.62	6251.97	6252.11	0.09	6252.19

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

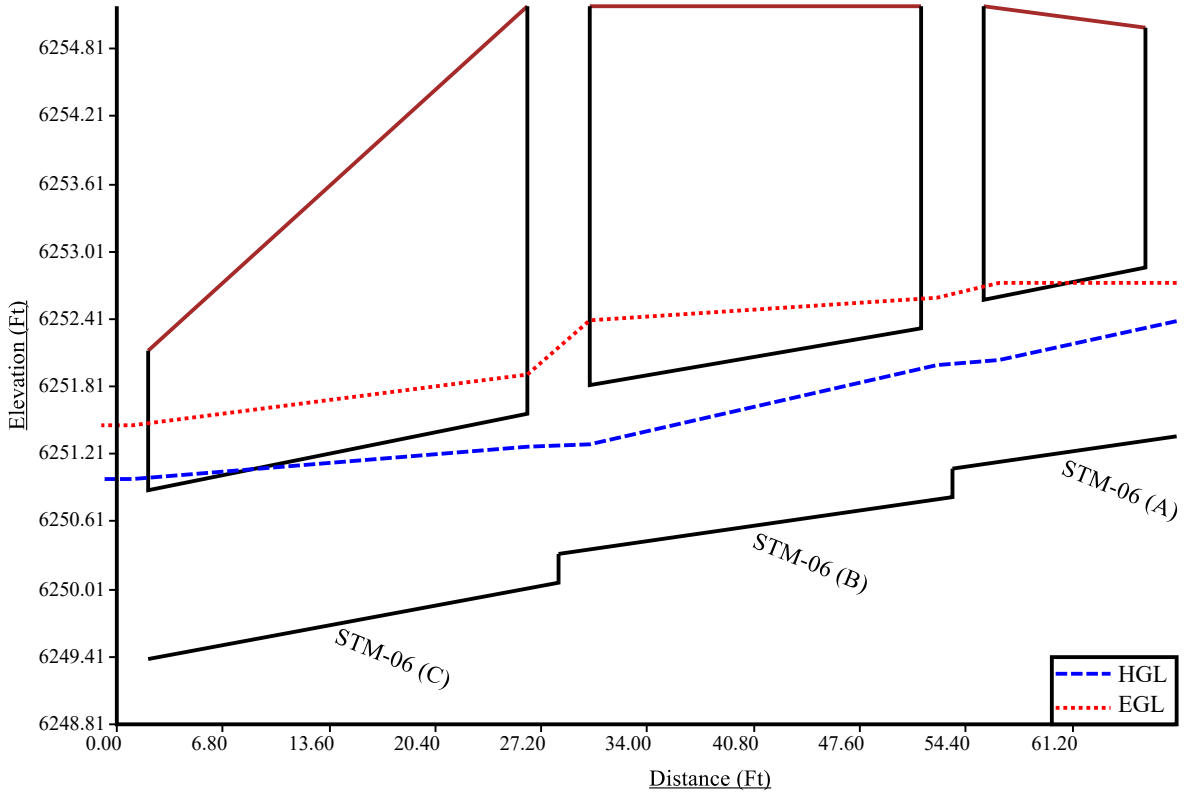
					Downstream			Upstream				
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Volume (cu. yd)	Comment

STM-06 (C)	28.30	2.50	4.00	4.92	4.98	3.28	1.03	9.74	5.66	3.41	26.09	Sewer Too Shallow
STM-06 (B)	25.23	2.50	4.00	4.92	9.23	5.41	3.16	8.22	4.90	2.65	27.13	
STM-06 (A)	14.37	2.50	4.00	4.92	7.71	4.65	2.40	6.76	4.17	1.92	12.29	Sewer Too Shallow

Total earth volume for sewer trenches = 66 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

STM-06 100YR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Elevation (Ft)
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20.40
27.20
34.00
40.80
47.60
54.40
61.20
Distance (Ft)
STM-06 (A)
STM-06 (B)
STM-06 (C)
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 2/16/2024 11:16:06 AM	**UDSewer Results Summary** **Project Title:** 20-270 Mark Dabbling Storm 6 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6250.99

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	**Ground Elevation (ft)**	**Total Known Flow (cfs)**	**Local Contribution (cfs)**	**Drainage Area (Ac.)**	**Runoff Coefficient**	**5yr Coefficient**	**Overland Length (ft)**	**Overland Slope (%)**	**Gutter Length (ft)**	**Gutter Velocity (fps)**
EDB-B	6252.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

STM-06 (C)	6255.19	9.80	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-06 (B)	6255.19	9.20	3.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-06 (A)	6255.00	6.00	6.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-06 (C)	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	9.80	
STM-06 (B)	0.00	0.00	0.00	0.00	3.20	0.00	0.00	0.00	9.20	
STM-06 (A)	0.00	0.00	0.00	0.00	6.00	0.00	0.00	0.00	6.00	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-06 (C)	28.30	6249.39	2.4	6250.07	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in
STM-06 (B)	25.23	6250.33	2.0	6250.83	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in
STM-06 (A)	14.37	6251.08	2.0	6251.37	0.013	0.25	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-06 (C)	16.32	9.23	14.49	6.43	10.06	9.65	2.06	Supercritical Jump	9.80	6.47	
STM-06 (B)	14.90	8.43	14.07	6.21	10.23	8.87	1.87	Supercritical	9.20	0.00	
STM-06 (A)	14.90	8.43	11.35	5.11	7.95	7.97	1.98	Supercritical	6.00	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
STM-06 (C)	9.80	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-06 (B)	9.20	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-06 (A)	6.00	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6250.99

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	**Downstream (ft)**	**Upstream (ft)**	**Bend Loss (ft)**	**Lateral Loss (ft)**	**Downstream (ft)**	**Upstream (ft)**	**Downstream (ft)**	**Friction Loss (ft)**	**Upstream (ft)**
STM-06 (C)	6249.39	6250.07	0.00	0.00	6250.99	6251.28	6251.47	0.45	6251.92
STM-06 (B)	6250.33	6250.83	0.02	0.00	6251.30	6252.00	6252.40	0.20	6252.60
STM-06 (A)	6251.08	6251.37	0.04	0.00	6252.05	6252.39	6252.73	0.00	6252.73

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

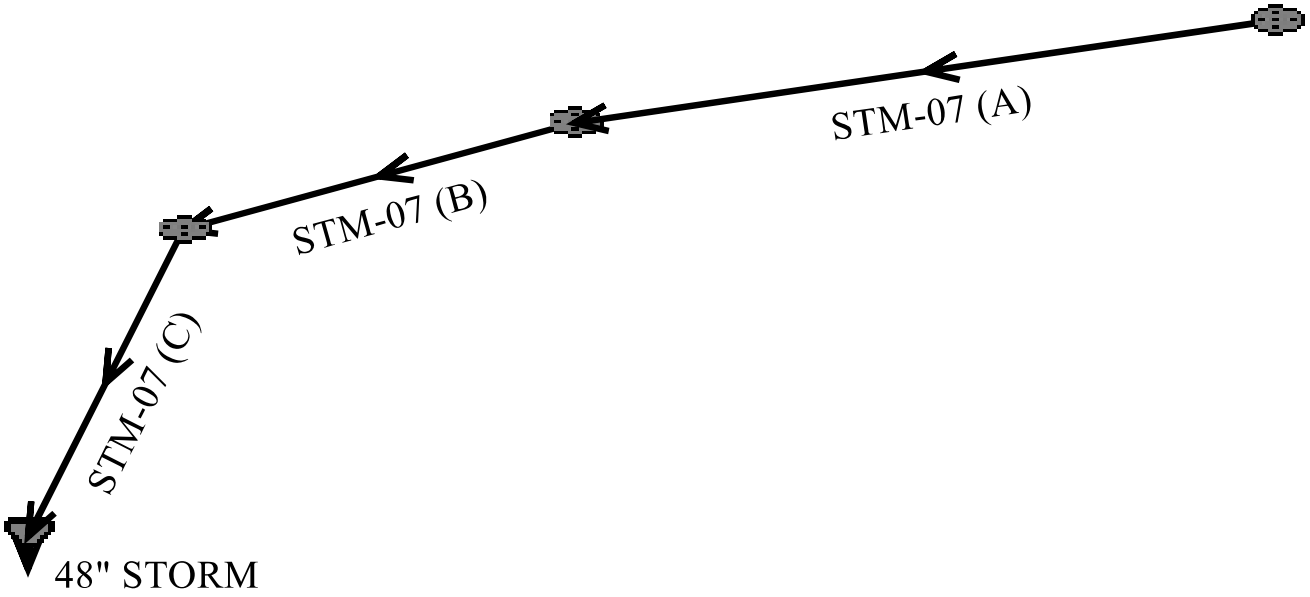
The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**

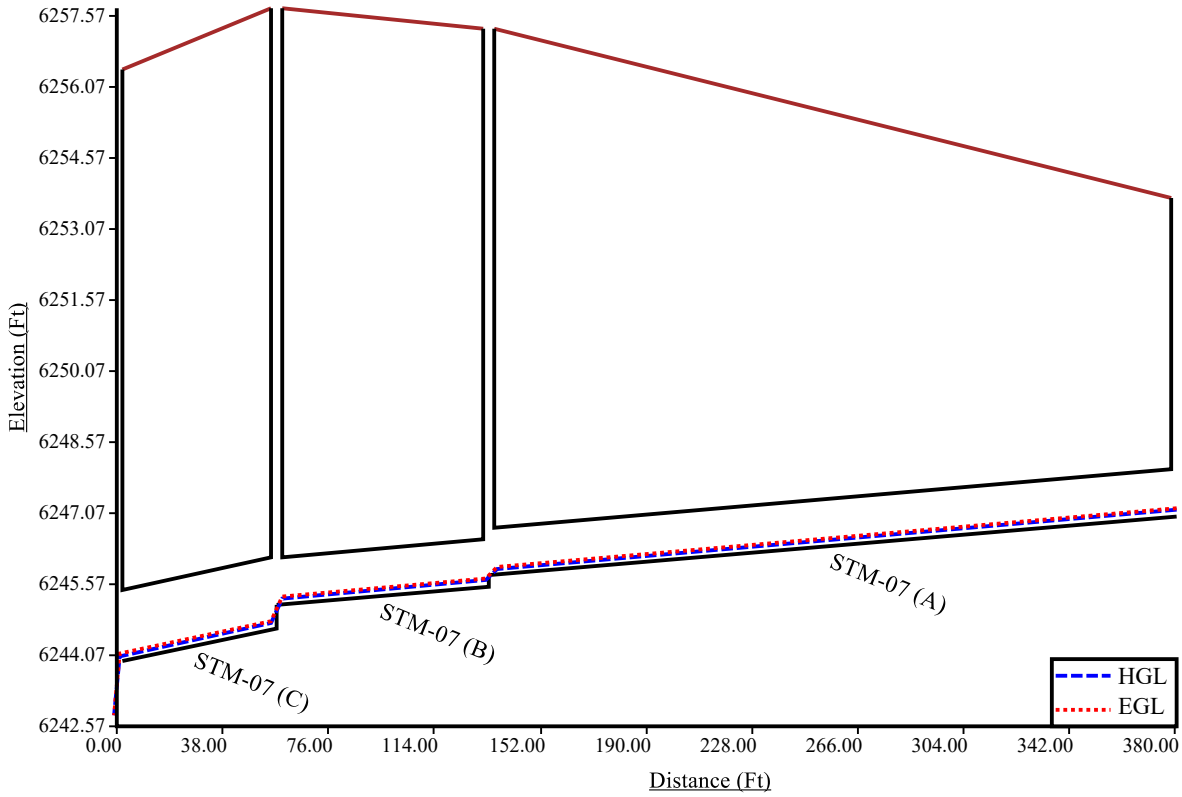
STM-06 (C)	28.30	2.50	4.00	4.92	4.98	3.28	1.03	9.74	5.66	3.41	26.09	Sewer Too Shallow
STM-06 (B)	25.23	2.50	4.00	4.92	9.23	5.41	3.16	8.22	4.90	2.65	27.13	
STM-06 (A)	14.37	2.50	4.00	4.92	7.71	4.65	2.40	6.76	4.17	1.92	12.29	Sewer Too Shallow

Total earth volume for sewer trenches = 66 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
    - Four inches for pipes less than 33 inches.
    - Six inches for pipes less than 60 inches.
    - Eight inches for all larger sizes.


STM-07 (A)
STM-07 (B)
STM-07 (C)
48" STORM

STM-07 5YR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Distance (Ft)
STM-07 (C)
STM-07 (B)
STM-07 (A)
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4
Run Date: 2/16/2024 1:07:28 PM

UDSewer Results Summary

Project Title: 20-270 Mark Dabbling Storm 7 HGL
Project Description: Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6242.81

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
48" STORM	6256.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

STM-07 (C)	6257.72	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-07 (B)	6257.29	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-07 (A)	6253.72	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
48" STORM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-07 (C)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	
STM-07 (B)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	
STM-07 (A)	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.10	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-07 (C)	57.35	6243.95	1.2	6244.64	0.013	0.48	0.00	CIRCULAR	18.00 in	18.00 in
STM-07 (B)	76.11	6245.14	0.5	6245.52	0.013	0.05	0.00	CIRCULAR	12.00 in	12.00 in
STM-07 (A)	246.92	6245.77	0.5	6247.00	0.013	0.08	0.00	CIRCULAR	12.00 in	12.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-07 (C)	11.54	6.53	1.39	1.59	1.19	2.01	1.37	Supercritical	0.10	0.00	
STM-07 (B)	2.53	3.22	1.55	1.69	1.63	1.56	0.90	Subcritical	0.10	0.00	Velocity is Too Low
STM-07 (A)	2.53	3.22	1.55	1.69	1.63	1.56	0.90	Subcritical	0.10	0.00	Velocity is Too Low

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
STM-07 (C)	0.10	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-07 (B)	0.10	CIRCULAR	12.00 in	12.00 in	18.00 in	18.00 in	12.00 in	12.00 in	0.79	Height is too small. Width is too small. Existing height is smaller than the suggested height. Existing width is smaller than the suggested width.
STM-07 (A)	0.10	CIRCULAR	12.00 in	12.00 in	18.00 in	18.00 in	12.00 in	12.00 in	0.79	Height is too small. Width is too small. Existing height is smaller than the suggested height. Existing width is smaller than the suggested width.

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6242.81

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	**Downstream (ft)**	**Upstream (ft)**	**Bend Loss (ft)**	**Lateral Loss (ft)**	**Downstream (ft)**	**Upstream (ft)**	**Downstream (ft)**	**Friction Loss (ft)**	**Upstream (ft)**
STM-07 (C)	6243.95	6244.64	0.00	0.00	6244.05	6244.76	6244.11	0.68	6244.80
STM-07 (B)	6245.14	6245.52	0.00	0.00	6245.27	6245.66	6245.31	0.38	6245.70
STM-07 (A)	6245.77	6247.00	0.00	0.00	6245.89	6247.15	6245.94	1.24	6247.18

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).

- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

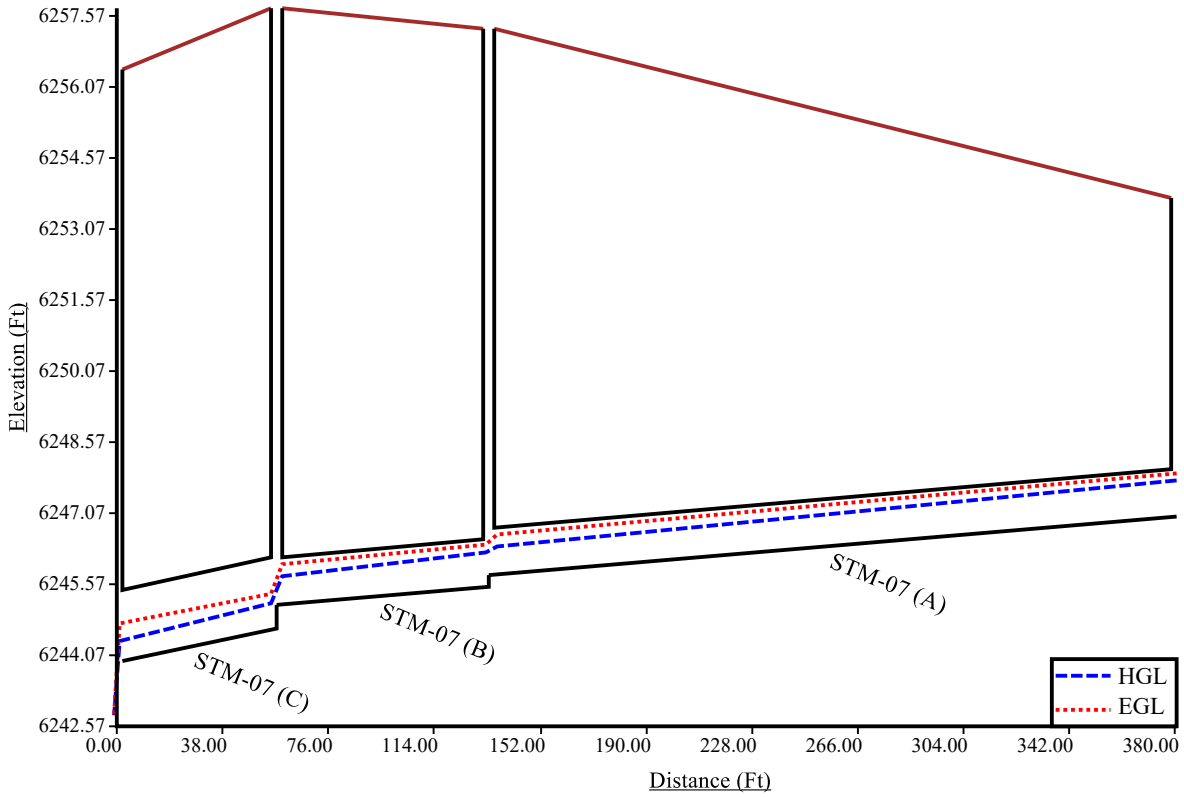
The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-07 (C)	57.35	2.50	4.00	4.92	24.46	13.02	10.77	25.66	13.62	11.37	354.73	
STM-07 (B)	76.11	2.00	4.00	4.33	25.16	13.08	11.41	23.54	12.27	10.60	437.67	
STM-07 (A)	246.92	2.00	4.00	4.33	23.05	12.02	10.36	13.44	7.22	5.55	876.55	

Total earth volume for sewer trenches = 1669 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

STM-07 100YR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STM-07 (B)
STM-07 (A)
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4
Run Date: 2/16/2024 1:09:06 PM

UDSewer Results Summary

Project Title: 20-270 Mark Dabbling Storm 7 HGL
Project Description: Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6242.81

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
48" STORM	6256.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

STM-07 (C)	6257.72	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-07 (B)	6257.29	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-07 (A)	6253.72	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
48" STORM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-07 (C)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	
STM-07 (B)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	
STM-07 (A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-07 (C)	57.35	6243.95	1.2	6244.64	0.013	0.48	0.00	CIRCULAR	18.00 in	18.00 in
STM-07 (B)	76.11	6245.14	0.5	6245.52	0.013	0.05	0.00	CIRCULAR	12.00 in	12.00 in
STM-07 (A)	246.92	6245.77	0.5	6247.00	0.013	0.08	0.00	CIRCULAR	12.00 in	12.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-07 (C)	11.54	6.53	6.40	3.55	5.07	4.89	1.57	Supercritical	2.00	0.00	
STM-07 (B)	2.53	3.22	7.24	4.04	8.06	3.57	0.81	Subcritical	2.00	0.00	
STM-07 (A)	2.53	3.22	7.24	4.04	8.06	3.57	0.81	Subcritical	2.00	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
STM-07 (C)	2.00	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-07 (B)	2.00	CIRCULAR	12.00 in	12.00 in	18.00 in	18.00 in	12.00 in	12.00 in	0.79	Height is too small. Width is too small. Existing height is smaller than the suggested height. Existing width is smaller than the suggested width.
STM-07 (A)	2.00	CIRCULAR	12.00 in	12.00 in	18.00 in	18.00 in	12.00 in	12.00 in	0.79	Height is too small. Width is too small. Existing height is smaller than the suggested height. Existing width is smaller than the suggested width.

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6242.81

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	**Downstream (ft)**	**Upstream (ft)**	**Bend Loss (ft)**	**Lateral Loss (ft)**	**Downstream (ft)**	**Upstream (ft)**	**Downstream (ft)**	**Friction Loss (ft)**	**Upstream (ft)**
STM-07 (C)	6243.95	6244.64	0.00	0.00	6244.37	6245.17	6244.75	0.62	6245.37
STM-07 (B)	6245.14	6245.52	0.01	0.00	6245.74	6246.24	6246.00	0.42	6246.41
STM-07 (A)	6245.77	6247.00	0.01	0.00	6246.37	6247.76	6246.62	1.29	6247.91

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).

- Friction loss is always Upstream EGL - Downstream EGL.

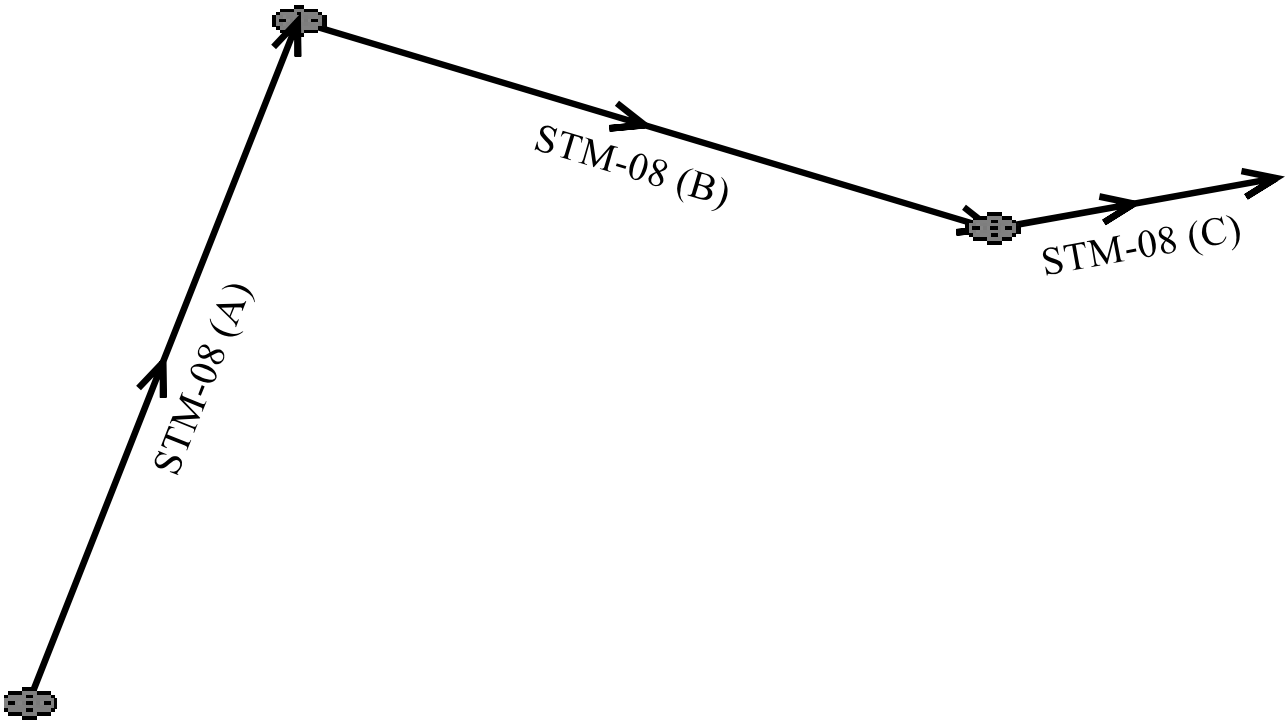
Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-07 (C)	57.35	2.50	4.00	4.92	24.46	13.02	10.77	25.66	13.62	11.37	354.73	
STM-07 (B)	76.11	2.00	4.00	4.33	25.16	13.08	11.41	23.54	12.27	10.60	437.67	
STM-07 (A)	246.92	2.00	4.00	4.33	23.05	12.02	10.36	13.44	7.22	5.55	876.55	

Total earth volume for sewer trenches = 1669 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.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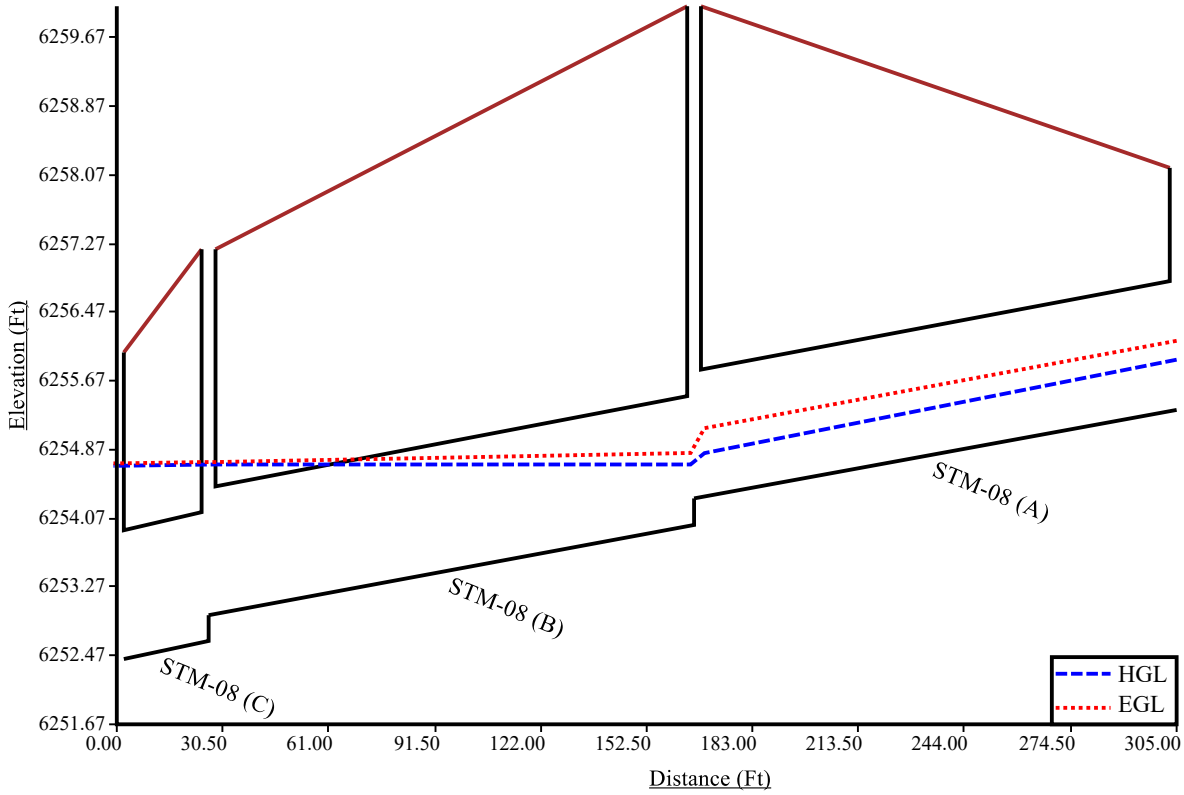
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305.00
Distance (Ft)
STM-08 (A)
STM-08 (B)
STM-08 (C)
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4
Run Date: 2/16/2024 1:37:20 PM

UDSewer Results Summary

Project Title: 20-270 Mark Dabbling Storm 8 HGL
Project Description: Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6254.68

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
EDB-C	6256.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

STM-08 (C)	6257.20	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (B)	6260.03	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (A)	6258.15	2.40	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-08 (C)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	
STM-08 (B)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.40	
STM-08 (A)	0.00	0.00	0.00	0.00	2.40	0.00	0.00	0.00	2.40	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-08 (C)	26.41	6252.43	0.8	6252.64	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in
STM-08 (B)	139.75	6252.94	0.8	6253.99	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in
STM-08 (A)	138.94	6254.30	0.7	6255.33	0.013	0.38	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-08 (C)	9.42	5.33	7.03	3.75	6.20	4.45	1.28	Pressurized	2.40	26.41	
STM-08 (B)	9.13	5.17	7.03	3.75	6.30	4.36	1.24	Supercritical Jump	2.40	36.51	
STM-08 (A)	9.07	5.13	7.03	3.75	6.32	4.33	1.23	Supercritical	2.40	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-08 (C)	2.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-08 (B)	2.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-08 (A)	2.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6254.68

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-08 (C)	6252.43	6252.64	0.00	0.00	6254.68	6254.69	6254.71	0.01	6254.72
STM-08 (B)	6252.94	6253.99	0.00	0.00	6254.70	6254.70	6254.72	0.11	6254.83
STM-08 (A)	6254.30	6255.33	0.01	0.00	6254.83	6255.92	6255.12	1.02	6256.13

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

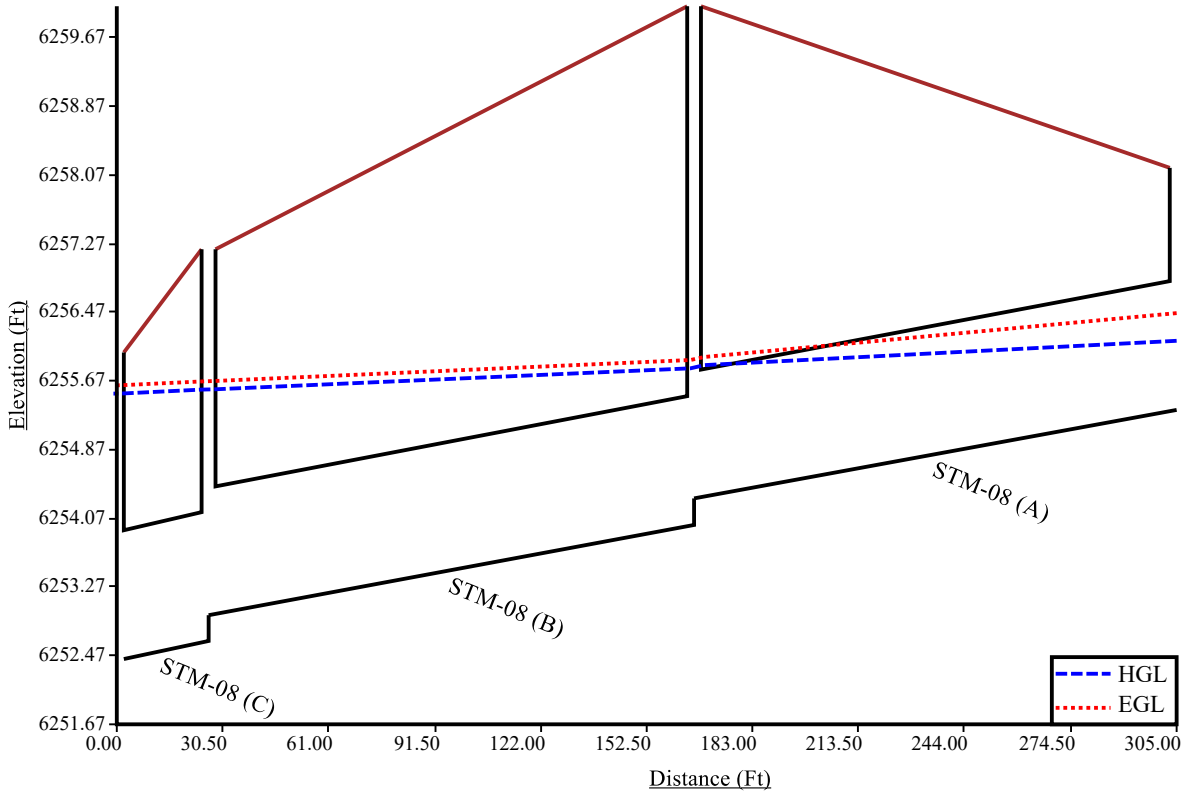
					Downstream			Upstream				
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Volume (cu. yd)	Comment
STM-08 (C)	26.41	2.50	4.00	4.92	6.64	4.11	1.86	8.62	5.10	2.85	24.20	

STM-08 (B)	139.75	2.50	4.00	4.92	8.02	4.80	2.55	11.58	6.58	4.33	179.81	
STM-08 (A)	138.94	2.50	4.00	4.92	10.96	6.27	4.02	5.14	3.36	1.11	145.40	

Total earth volume for sewer trenches = 349 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
    - Four inches for pipes less than 33 inches.
    - Six inches for pipes less than 60 inches.
    - Eight inches for all larger sizes.

STM-08 100 YR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Elevation (Ft)
0.00
30.50
61.00
91.50
122.00
152.50
183.00
213.50
244.00
274.50
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Distance (Ft)
STM-08 (A)
STM-08 (B)
STM-08 (C)
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4
Run Date: 2/16/2024 1:32:30 PM

UDSewer Results Summary

Project Title: 20-270 Mark Dabbling Storm 8 HGL
Project Description: Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6255.52

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
EDB-C	6256.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

STM-08 (C)	6257.20	4.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (B)	6260.03	4.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-08 (A)	6258.15	4.40	4.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-08 (C)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.40	
STM-08 (B)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.40	
STM-08 (A)	0.00	0.00	0.00	0.00	4.40	0.00	0.00	0.00	4.40	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-08 (C)	26.41	6252.43	0.8	6252.64	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in
STM-08 (B)	139.75	6252.94	0.8	6253.99	0.013	0.05	0.00	CIRCULAR	18.00 in	18.00 in
STM-08 (A)	138.94	6254.30	0.7	6255.33	0.013	0.38	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-08 (C)	9.42	5.33	9.65	4.56	8.65	5.24	1.23	Pressurized	4.40	26.41	
STM-08 (B)	9.13	5.17	9.65	4.56	8.81	5.12	1.19	Pressurized	4.40	139.75	
STM-08 (A)	9.07	5.13	9.65	4.56	8.84	5.09	1.18	Supercritical Jump	4.40	9.11	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	**Peak Flow (cfs)**	**Cross Section**	**Rise**	**Span**	**Rise**	**Span**	**Rise**	**Span**	**Area (ft^2)**	**Comment**
STM-08 (C)	4.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-08 (B)	4.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	
STM-08 (A)	4.40	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6255.52

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	**Downstream (ft)**	**Upstream (ft)**	**Bend Loss (ft)**	**Lateral Loss (ft)**	**Downstream (ft)**	**Upstream (ft)**	**Downstream (ft)**	**Friction Loss (ft)**	**Upstream (ft)**
STM-08 (C)	6252.43	6252.64	0.00	0.00	6255.52	6255.57	6255.62	0.05	6255.66
STM-08 (B)	6252.94	6253.99	0.00	0.00	6255.57	6255.81	6255.67	0.24	6255.91
STM-08 (A)	6254.30	6255.33	0.04	0.00	6255.85	6256.13	6255.95	0.51	6256.46

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-08 (C)	26.41	2.50	4.00	4.92	6.64	4.11	1.86	8.62	5.10	2.85	24.20	

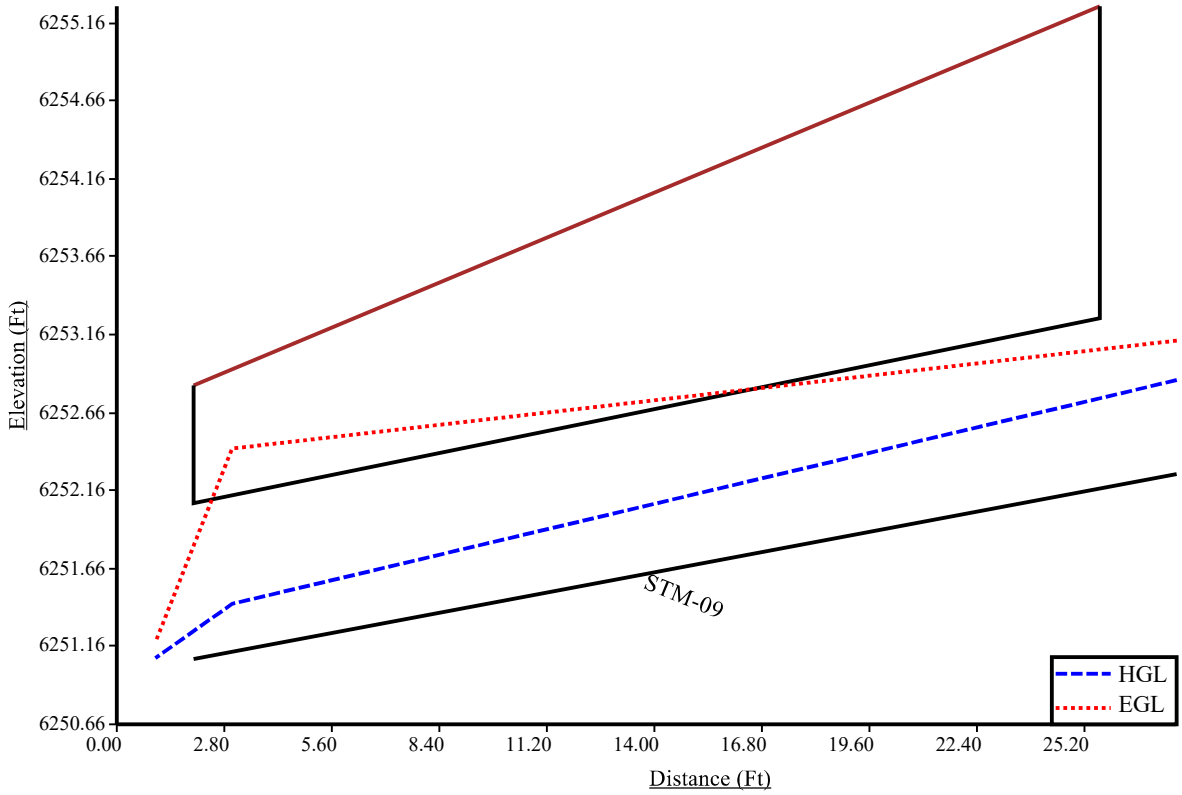
STM-08 (B)	139.75	2.50	4.00	4.92	8.02	4.80	2.55	11.58	6.58	4.33	179.81	
STM-08 (A)	138.94	2.50	4.00	4.92	10.96	6.27	4.02	5.14	3.36	1.11	145.40	

Total earth volume for sewer trenches = 349 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
    - Four inches for pipes less than 33 inches.
    - Six inches for pipes less than 60 inches.
    - Eight inches for all larger sizes.


STM-09
EDB-C

STM-09 5YR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Elevation (Ft)
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2.80
5.60
8.40
11.20
14.00
16.80
19.60
22.40
25.20
Distance (Ft)
STM-09
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/18/2023 3:49:05 PM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 9 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6251.09

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
EDB-C	6252.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-09	6255.27	2.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-09	0.00	0.00	0.00	0.00	2.00	0.00	0.00	0.00	2.00	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-09	27.60	6251.08	4.3	6252.27	0.013	0.20	0.00	CIRCULAR	12.00 in	12.00 in

Sewer Flow Summary:

	Full Flow Capacity	Critical Flow	Normal Flow	

Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-09	7.41	9.43	7.24	4.04	4.26	8.01	2.76	Supercritical	2.00	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-09	2.00	CIRCULAR	12.00 in	12.00 in	18.00 in	18.00 in	12.00 in	12.00 in	0.79	Height is too small. Width is too small. Existing height is smaller than the suggested height. Existing width is smaller than the suggested width.

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6251.09

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)

STM-09	6251.08	6252.27	0.00	0.00	6251.44	6252.87	6252.43	0.69	6253.13

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

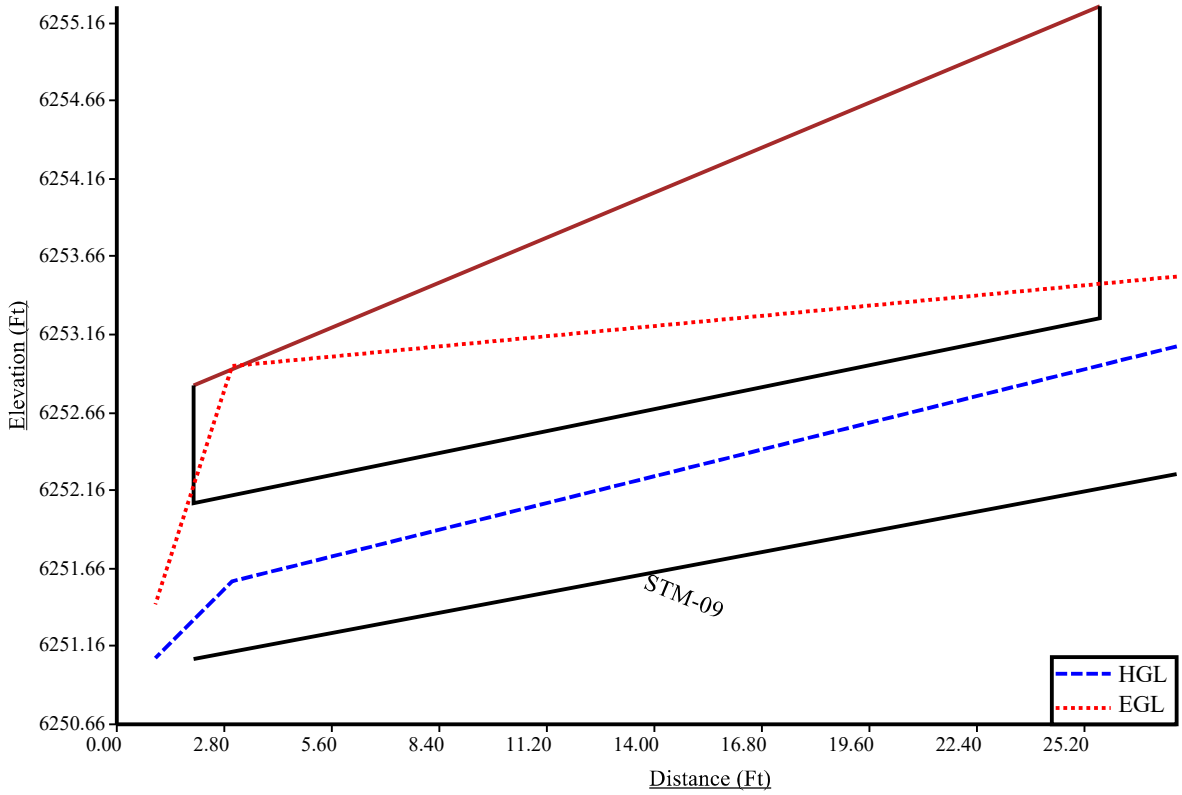
The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-09	27.60	2.00	4.00	4.33	0.00	2.26	0.59	6.00	3.50	1.83	11.80	Sewer Too Shallow

Total earth volume for sewer trenches = 12 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

STM-09 100YR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0.00
2.80
5.60
8.40
11.20
14.00
16.80
19.60
22.40
25.20
Distance (Ft)
STM-09
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/18/2023 3:47:36 PM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 9 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6251.09

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
EDB-C	6252.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-09	6255.27	3.70	3.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-09	0.00	0.00	0.00	0.00	3.70	0.00	0.00	0.00	3.70	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-09	27.60	6251.08	4.3	6252.27	0.013	0.20	0.00	CIRCULAR	12.00 in	12.00 in

Sewer Flow Summary:

	Full Flow Capacity	Critical Flow	Normal Flow	

Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-09	7.41	9.43	9.83	5.37	6.00	9.43	2.65	Supercritical	3.70	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-09	3.70	CIRCULAR	12.00 in	12.00 in	18.00 in	18.00 in	12.00 in	12.00 in	0.79	Height is too small. Width is too small. Existing height is smaller than the suggested height. Existing width is smaller than the suggested width.

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6251.09

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)

STM-09	6251.08	6252.27	0.00	0.00	6251.58	6253.09	6252.96	0.57	6253.54

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

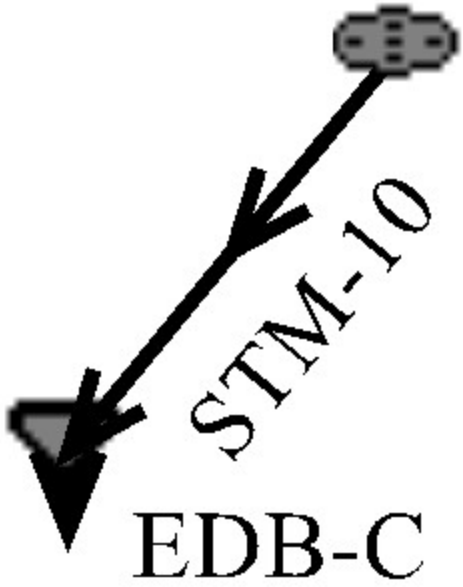
Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

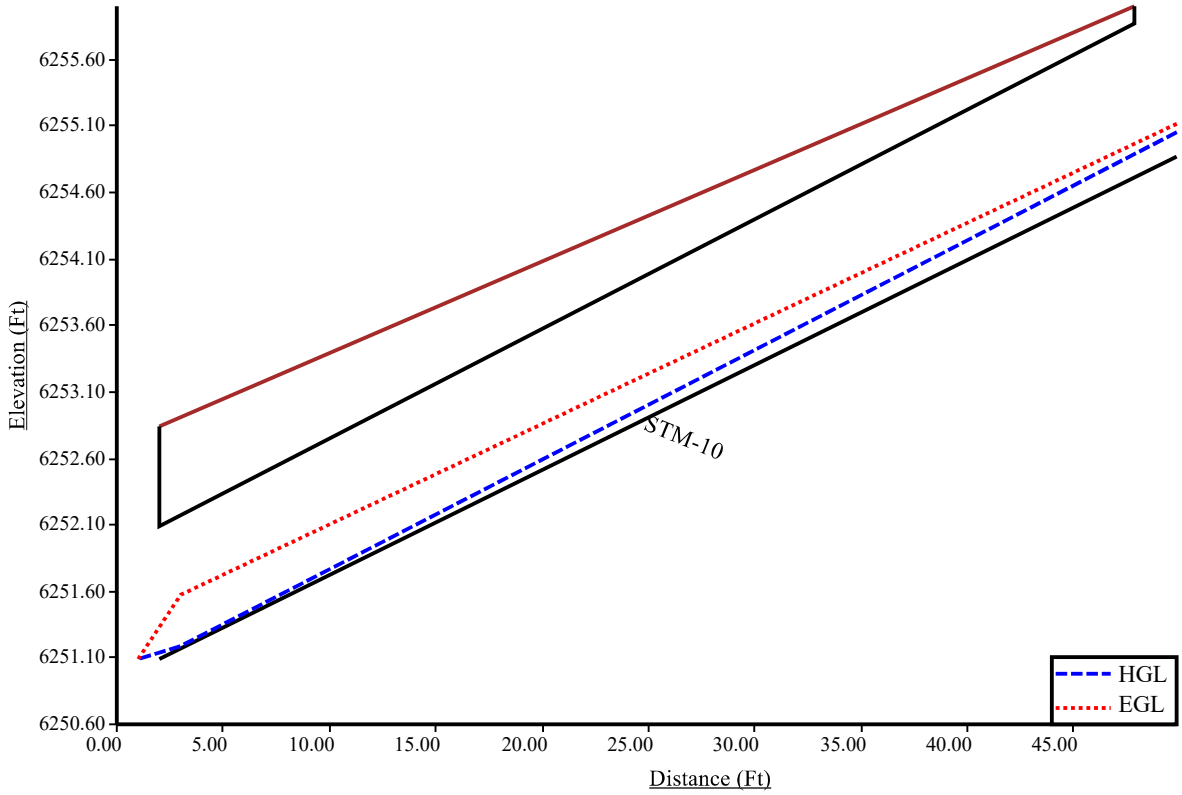
					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-09	27.60	2.00	4.00	4.33	0.00	2.26	0.59	6.00	3.50	1.83	11.80	Sewer Too Shallow

Total earth volume for sewer trenches = 12 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.


STM-10
EDB-C

STM-10 5YR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Elevation (Ft)
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Distance (Ft)
STM-10
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/19/2023 8:20:30 AM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 10 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6251.09

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
EDB-C	6252.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-10	6256.00	0.20	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-10	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.20	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-10	49.83	6251.09	7.6	6254.87	0.013	0.00	0.00	CIRCULAR	12.00 in	12.00 in

Sewer Flow Summary:

	Full Flow Capacity	Critical Flow	Normal Flow	

Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-10	9.84	12.53	2.20	2.03	1.18	4.99	3.39	Supercritical	0.20	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-10	0.20	CIRCULAR	12.00 in	12.00 in	18.00 in	18.00 in	12.00 in	12.00 in	0.79	Height is too small. Width is too small. Existing height is smaller than the suggested height. Existing width is smaller than the suggested width.

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6251.09

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)

STM-10	6251.09	6254.87	0.00	0.00	6251.19	6255.05	6251.57	3.54	6255.12

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

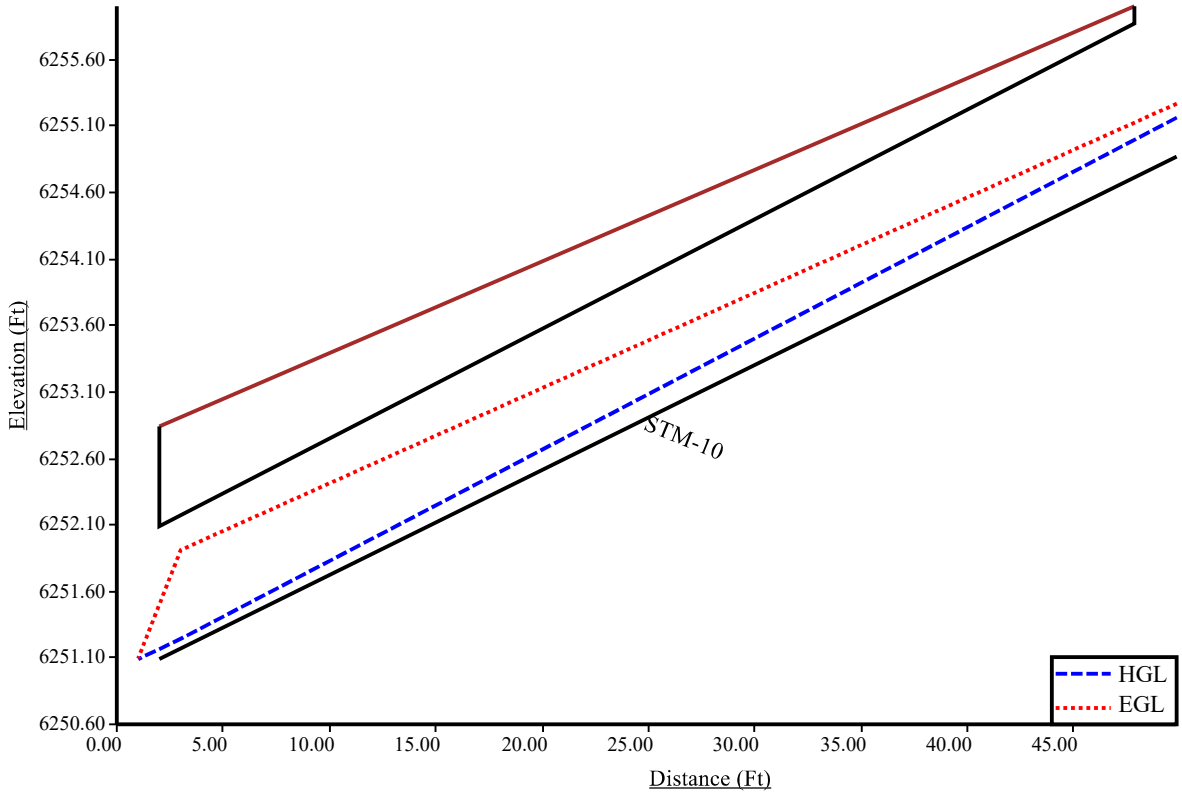
The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-10	49.83	2.00	4.00	4.33	0.00	2.25	0.58	4.33	1.63	0.00	13.18	Sewer Too Shallow

Total earth volume for sewer trenches = 13 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

STM-10 100YR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Elevation (Ft)
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5.00
10.00
15.00
20.00
25.00
30.00
35.00
40.00
45.00
Distance (Ft)
STM-10
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/19/2023 8:18:35 AM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 10 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6251.09

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
EDB-C	6252.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-10	6256.00	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-10	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.50	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-10	49.83	6251.09	7.6	6254.87	0.013	0.00	0.00	CIRCULAR	12.00 in	12.00 in

Sewer Flow Summary:

	Full Flow Capacity	Critical Flow	Normal Flow	

Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-10	9.84	12.53	3.52	2.61	1.84	6.56	3.55	Supercritical	0.50	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-10	0.50	CIRCULAR	12.00 in	12.00 in	18.00 in	18.00 in	12.00 in	12.00 in	0.79	Height is too small. Width is too small. Existing height is smaller than the suggested height. Existing width is smaller than the suggested width.

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6251.09

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)

STM-10	6251.09	6254.87	0.00	0.00	6251.24	6255.16	6251.91	3.36	6255.27

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

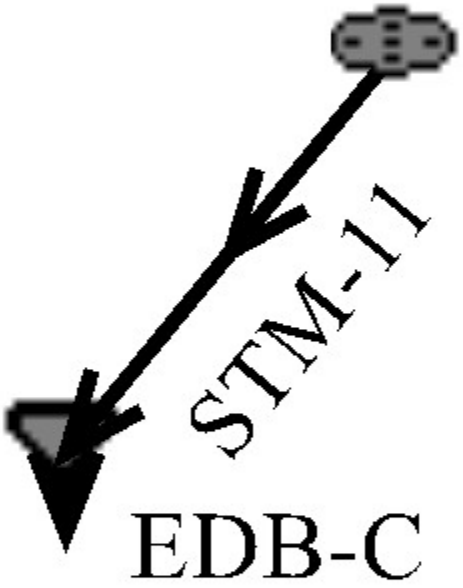
Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

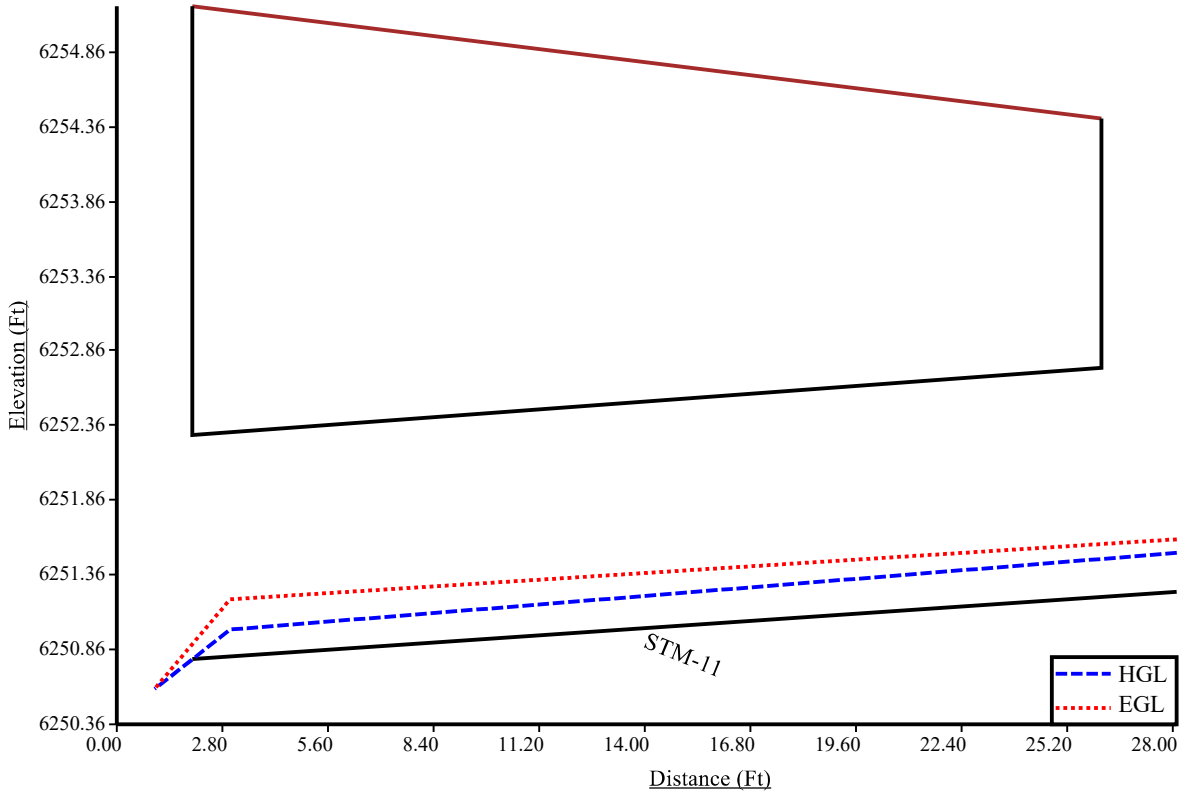
					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-10	49.83	2.00	4.00	4.33	0.00	2.25	0.58	4.33	1.63	0.00	13.18	Sewer Too Shallow

Total earth volume for sewer trenches = 13 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.


STM-11
EDB-C

STM-11 5YR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Elevation (Ft)
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2.80
5.60
8.40
11.20
14.00
16.80
19.60
22.40
25.20
28.00
Distance (Ft)
STM-11
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/18/2023 4:14:21 PM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 11 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 5
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6250.60

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
EDB-C	6255.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-11	6254.42	0.50	0.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-11	0.00	0.00	0.00	0.00	0.50	0.00	0.00	0.00	0.50	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-11	28.10	6250.80	1.6	6251.25	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity	Critical Flow	Normal Flow	

Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-11	13.33	7.54	3.14	2.42	2.38	3.61	1.72	Supercritical	0.50	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-11	0.50	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6250.60

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-11	6250.80	6251.25	0.00	0.00	6251.00	6251.51	6251.20	0.40	6251.60

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)

- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

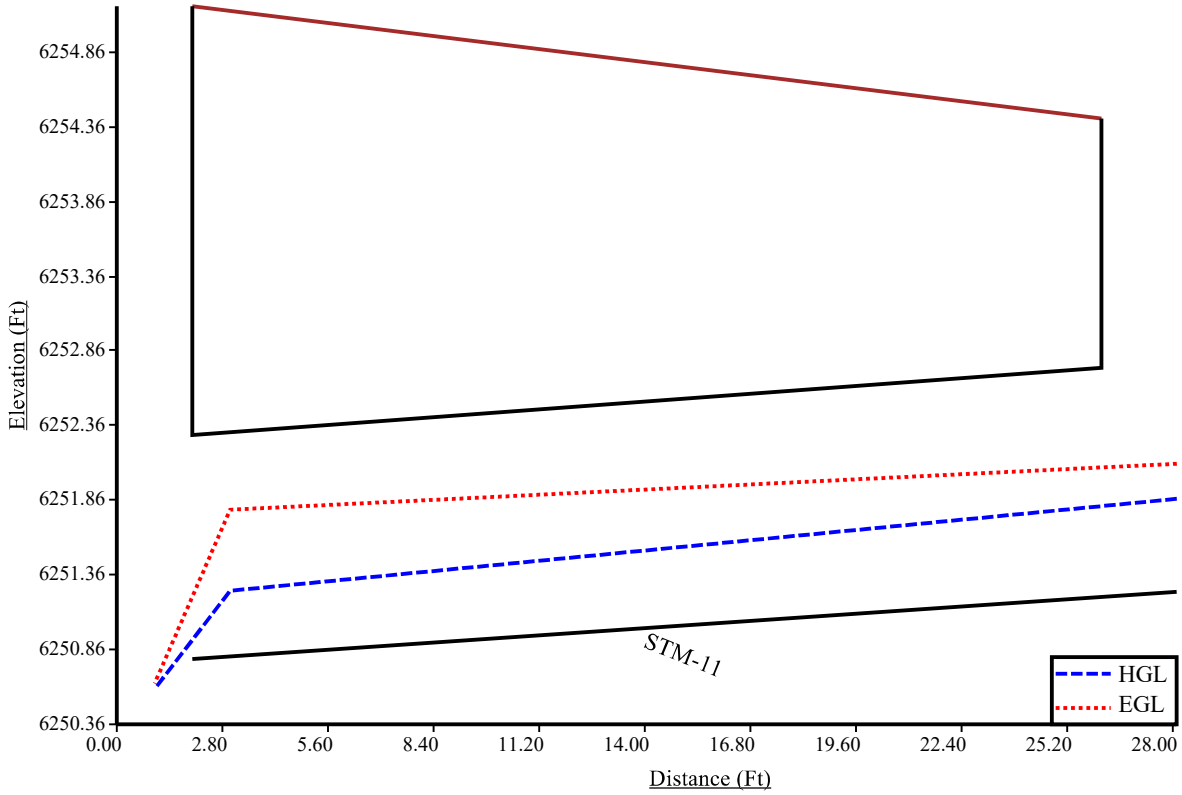
The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-11	28.10	2.50	4.00	4.92	8.24	4.91	2.66	5.84	3.71	1.46	23.61	Sewer Too Shallow

Total earth volume for sewer trenches = 24 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

STM-11 100YR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6254.36
6253.86
6253.36
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6250.36
Elevation (Ft)
0.00
2.80
5.60
8.40
11.20
14.00
16.80
19.60
22.40
25.20
28.00
Distance (Ft)
STM-11
HGL
EGL

Program: UDSEWER Math Model Interface 2.1.1.4 **Run Date:** 7/18/2023 4:08:54 PM	# UDSewer Results Summary **Project Title:** 20-270 Mark Dabbling Storm 11 HGL **Project Description:** Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6250.60

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
EDB-C	6255.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STM-11	6254.42	2.70	2.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
EDB-C	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
STM-11	0.00	0.00	0.00	0.00	2.70	0.00	0.00	0.00	2.70	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
STM-11	28.10	6250.80	1.6	6251.25	0.013	0.00	0.00	CIRCULAR	18.00 in	18.00 in

Sewer Flow Summary:

	Full Flow Capacity	Critical Flow	Normal Flow	

Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
STM-11	13.33	7.54	7.48	3.89	5.49	5.91	1.81	Supercritical	2.70	0.00	

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
STM-11	2.70	CIRCULAR	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	18.00 in	1.77	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6250.60

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
STM-11	6250.80	6251.25	0.00	0.00	6251.26	6251.87	6251.80	0.31	6252.11

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)

- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

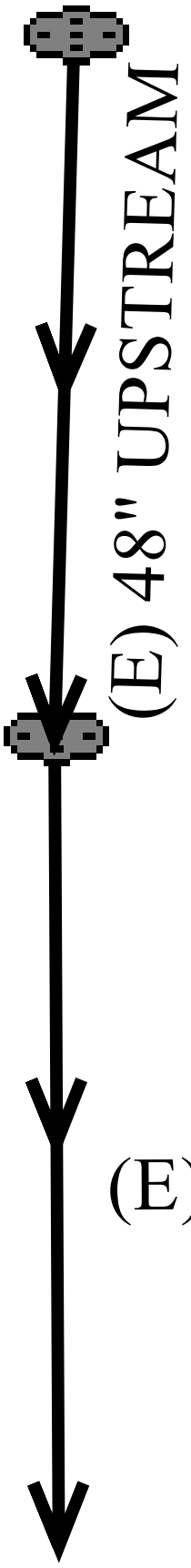
Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	**Length (ft)**	**Wall (in)**	**Bedding (in)**	**Bottom Width (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Top Width (ft)**	**Trench Depth (ft)**	**Cover (ft)**	**Volume (cu. yd)**	**Comment**
STM-11	28.10	2.50	4.00	4.92	8.24	4.91	2.66	5.84	3.71	1.46	23.61	Sewer Too Shallow

Total earth volume for sewer trenches = 24 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.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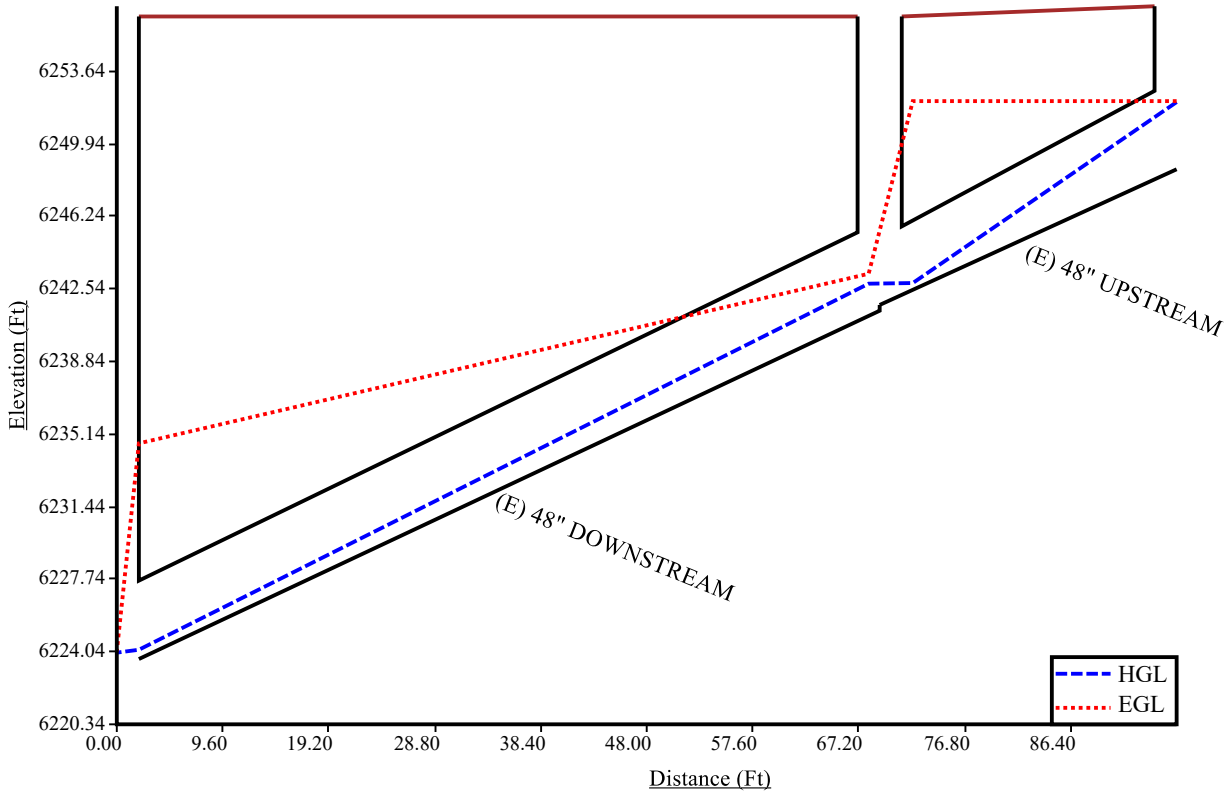
(E) 48" DOWNSTREAM

(E) 48" STORM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19.20
28.80
38.40
48.00
57.60
67.20
76.80
86.40
Distance (Ft)
(E) 48" UPSTREAM
(E) 48" DOWNSTREAM
HGL
EGL

Program:
UDSEWER Math Model Interface 2.1.1.4
Run Date:
2/16/2024 12:58:58 PM

UDSewer Results Summary

Project Title: 20-270 Mark Dabbling EX 48" HGL
Project Description: Default system

System Input Summary

Rainfall Parameters

Rainfall Return Period: 100
Rainfall Calculation Method: Formula

One Hour Depth (in):
Rainfall Constant "A": 28.5
Rainfall Constant "B": 10
Rainfall Constant "C": 0.786

Rational Method Constraints

Minimum Urban Runoff Coeff.: 0.20
Maximum Rural Overland Len. (ft): 500
Maximum Urban Overland Len. (ft): 300
Used UDFCD Tc. Maximum: Yes

Sizer Constraints

Minimum Sewer Size (in): 18.00
Maximum Depth to Rise Ratio: 0.90
Maximum Flow Velocity (fps): 18.0
Minimum Flow Velocity (fps): 2.0

Backwater Calculations:

Tailwater Elevation (ft): 6224.00

Manhole Input Summary:

		Given Flow		Sub Basin Information						
Element Name	Ground Elevation (ft)	Total Known Flow (cfs)	Local Contribution (cfs)	Drainage Area (Ac.)	Runoff Coefficient	5yr Coefficient	Overland Length (ft)	Overland Slope (%)	Gutter Length (ft)	Gutter Velocity (fps)
48" OUTFALL	6256.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(E) 48" DOWNSTREAM	6256.43	22.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(E) 48" UPSTREAM	6256.95	20.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Manhole Output Summary:

	Local Contribution					Total Design Flow				
Element Name	Overland Time (min)	Gutter Time (min)	Basin Tc (min)	Intensity (in/hr)	Local Contrib (cfs)	Coeff. Area	Intensity (in/hr)	Manhole Tc (min)	Peak Flow (cfs)	Comment
48" OUTFALL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
(E) 48" DOWNSTREAM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.00	
(E) 48" UPSTREAM	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.00	

Sewer Input Summary:

		Elevation			Loss Coefficients			Given Dimensions		
Element Name	Sewer Length (ft)	Downstream Invert (ft)	Slope (%)	Upstream Invert (ft)	Mannings n	Bend Loss	Lateral Loss	Cross Section	Rise (ft or in)	Span (ft or in)
(E) 48" DOWNSTREAM	69.10	6223.67	25.7	6241.43	0.013	0.00	0.00	CIRCULAR	48.00 in	48.00 in
(E) 48" UPSTREAM	26.90	6241.73	25.7	6248.64	0.013	0.05	0.46	CIRCULAR	48.00 in	48.00 in

Sewer Flow Summary:

	Full Flow Capacity		Critical Flow		Normal Flow						
Element Name	Flow (cfs)	Velocity (fps)	Depth (in)	Velocity (fps)	Depth (in)	Velocity (fps)	Froude Number	Flow Condition	Flow (cfs)	Surcharged Length (ft)	Comment
(E) 48" DOWNSTREAM	730.16	58.10	16.59	5.71	5.72	26.03	8.03	Supercritical	22.00	0.00	Velocity is Too High
(E) 48" UPSTREAM	730.16	58.10	15.79	5.55	5.46	25.29	7.99	Supercritical	20.00	0.00	Velocity is Too High

- A Froude number of 0 indicates that pressured flow occurs (adverse slope or undersized pipe).
- If the sewer is not pressurized, full flow represents the maximum gravity flow in the sewer.
- If the sewer is pressurized, full flow represents the pressurized flow conditions.

Sewer Sizing Summary:

			Existing		Calculated		Used			
Element Name	Peak Flow (cfs)	Cross Section	Rise	Span	Rise	Span	Rise	Span	Area (ft^2)	Comment
(E) 48" DOWNSTREAM	22.00	CIRCULAR	48.00 in	48.00 in	18.00 in	18.00 in	48.00 in	48.00 in	12.57	
(E) 48" UPSTREAM	20.00	CIRCULAR	48.00 in	48.00 in	18.00 in	18.00 in	48.00 in	48.00 in	12.57	

- Calculated diameter was determined by sewer hydraulic capacity rounded up to the nearest commercially available size.
- Sewer sizes should not decrease downstream.
- All hydraulics where calculated using the 'Used' parameters.

Grade Line Summary:

Tailwater Elevation (ft): 6224.00

	Invert Elev.		Downstream Manhole Losses		HGL		EGL		
Element Name	Downstream (ft)	Upstream (ft)	Bend Loss (ft)	Lateral Loss (ft)	Downstream (ft)	Upstream (ft)	Downstream (ft)	Friction Loss (ft)	Upstream (ft)
(E) 48" DOWNSTREAM	6223.67	6241.43	0.00	0.00	6224.15	6242.81	6234.67	8.65	6243.32
(E) 48" UPSTREAM	6241.73	6248.64	0.00	0.03	6242.84	6252.07	6252.12	0.00	6252.12

- Bend and Lateral losses only apply when there is an outgoing sewer. The system outfall, sewer #0, is not considered a sewer.
- Bend loss = Bend K * V_fi ^ 2/(2*g)
- Lateral loss = V_fo ^ 2/(2*g)- Junction Loss K * V_fi ^ 2/(2*g).
- Friction loss is always Upstream EGL - Downstream EGL.

Excavation Estimate:

The trench side slope is 1.0 ft/ft
The minimum trench width is 2.00 ft

					Downstream			Upstream				
Element Name	Length (ft)	Wall (in)	Bedding (in)	Bottom Width (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Top Width (ft)	Trench Depth (ft)	Cover (ft)	Volume (cu. yd)	Comment
(E) 48" DOWNSTREAM	69.10	5.00	6.00	7.83	62.52	33.68	28.34	27.00	15.92	10.58	1571.25	
(E) 48" UPSTREAM	26.90	5.00	6.00	7.83	26.41	15.62	10.29	13.62	9.23	3.89	144.09	

Total earth volume for sewer trenches = 1715 cubic yards.

- The trench was estimated to have a bottom width equal to the outer pipe diameter plus 36 inches.
- If the calculated width of the trench bottom is less than the minimum acceptable width, the minimum acceptable width was used.
- The sewer wall thickness is equal to: (equivalent diameter in inches/12)+1 inches
- The sewer bedding thickness is equal to:
  - Four inches for pipes less than 33 inches.
  - Six inches for pipes less than 60 inches.
  - Eight inches for all larger sizes.

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: David Mijares
Company: Catamount Engineering
Date: February 13, 2024
Project: cottages at dry creek
Location: EDB C

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 62.2 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.622

C) Contributing Watershed Area — Area = 2.590 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = in

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- (•) Water Quality Capture Volume (WQCV)
- ( ) Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)
V_{DESIGN} = ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN} / 0.43))$)
$V_{DESIGN\ OTHER}$ = ac-ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)
$V_{DESIGN\ USER}$ = 0.021 ac-ft

I) NRCS Hydrologic Soil Groups of Tributary Watershed
i) Percentage of Watershed consisting of Type A Soils — HSG_A = %
ii) Percentage of Watershed consisting of Type B Soils — HSG_B = %
iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = %

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
$EURV_{DESIGN}$ = ac-f t

K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)
$EURV_{DESIGN\ USER}$ = ac-f t

2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)
L : W = 4.3 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)
Z = 4.00 ft / ft

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 1% of the WQCV)
V_{FMIN} = 0.000 ac-ft

B) Actual Forebay Volume
V_F = 0.002 ac-ft

C) Forebay Depth (D_F = 12 inch maximum)
D_F = 12.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
Q_{100} = 11.00 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)
Q_F = 0.22 cfs

E) Forebay Discharge Design

Choose One
- ( ) Berm With Pipe
- (•) Wall with Rect. Notch
- ( ) Wall with V-Notch Weir

Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches)
Calculated D_P = in

G) Rectangular Notch Width
Calculated W_N = 3.2 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: David Mijares
Company: Catamount Engineering
Date: February 13, 2024
Project: cottages at dry creek
Location: EDB C

6. Trickle Channel

A) Type of Trickle Channel — Choose One: (●) Concrete ( ) Soft Bottom

F) Slope of Trickle Channel — S = 0.0050 ft / ft

7. Micropool and Outlet Structure

A) Depth of Micropool (2.5-feet minimum) — D_M = 2.5 ft

B) Surface Area of Micropool (10 ft^2 minimum) — A_M = 16 sq ft

C) Outlet Type — Choose One: (●) Orifice Plate ( ) Other (Describe):

See UD-DETENTION FOR OUTFALL

D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention) — $D_{orifice}$ = inches

E) Total Outlet Area — A_{ot} = square inches

8. Initial Surcharge Volume

A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches) — D_{IS} = 4 in

B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV) — V_{IS} = cu ft

C) Initial Surcharge Provided Above Micropool — V_s = 5.3 cu ft

9. Trash Rack

A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$ — A_t = square inches

B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)

Other (Y/N): N

C) Ratio of Total Open Area to Total Area (only for type 'Other') — User Ratio =

D) Total Water Quality Screen Area (based on screen type) — A_{total} = sq. in.

E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E) — H= feet

F) Height of Water Quality Screen (H_{TR}) — H_{TR}= inches

G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended) — $W_{opening}$ = inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: David Mijares
Company: Catamount Engineering
Date: February 13, 2024
Project: cottages at dry creek
Location: EDB C

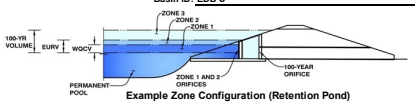
10. Overflow Embankment	
A) Describe embankment protection for 100-year and greater overtopping:	
B) Slope of Overflow Embankment (Horizontal distance per unit vertical, 4:1 or flatter preferred)	Ze = 4.00 ft / ft
11. Vegetation	Choose One: ○ Irrigated ○ Not Irrigated
12. Access	
A) Describe Sediment Removal Procedures	

Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

Project: COTTAGES AT DRY CREEK

Basin ID: EDB C



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	2.60	acres
Watershed Length =	329	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	62.50%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	UDFCD Default	
Water Quality Capture Volume (WQCV) =	0.053	acre-feet
Excess Urban Runoff Volume (EURV) =	0.199	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.132	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.174	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.218	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	0.287	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	0.338	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	0.397	acre-feet
500-yr Runoff Volume (P1 = 3.29 in.) =	0.556	acre-feet
Approximate 2-yr Detention Volume =	0.126	acre-feet
Approximate 5-yr Detention Volume =	0.166	acre-feet
Approximate 10-yr Detention Volume =	0.209	acre-feet
Approximate 25-yr Detention Volume =	0.236	acre-feet
Approximate 50-yr Detention Volume =	0.254	acre-feet
Approximate 100-yr Detention Volume =	0.291	acre-feet

Optional User Input 1-hr Precipitation

1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

Stage-Storage Calculation

Zone 1 Volume (User Defined) =	0.021	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.178	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.091	acre-feet
Total Detention Basin Volume =	0.291	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

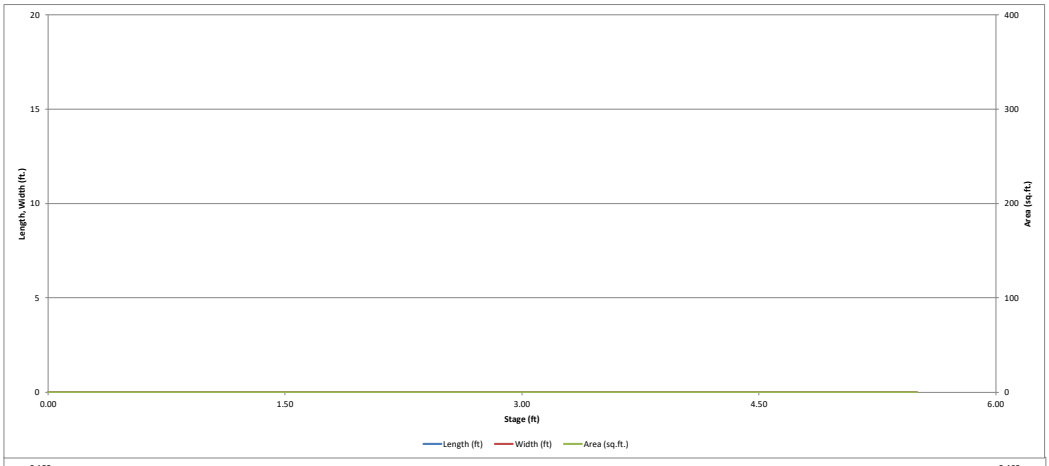
WQCV not provided!

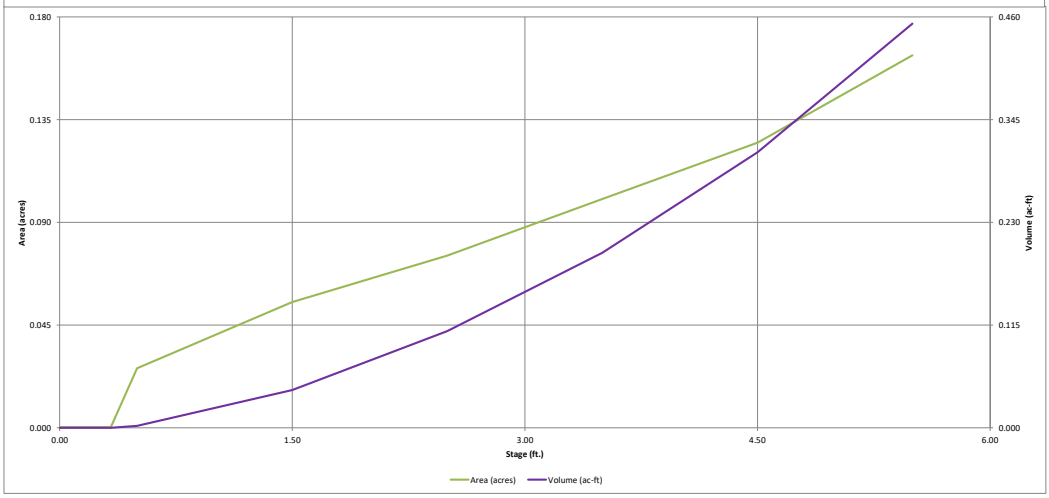
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Micropool	--	0.00	--	--	--	16	0.000		
ISV	--	0.33	--	--	--	16	0.000	5	0.000
6252	--	0.50	--	--	--	1,134	0.026	92	0.002
6253	--	1.50	--	--	--	2,400	0.055	1,846	0.042
6254	--	2.50	--	--	--	3,283	0.075	4,711	0.108
6255	--	3.50	--	--	--	4,367	0.100	8,536	0.196
6256	--	4.50	--	--	--	5,438	0.125	13,439	0.309
6257	--	5.50	--	--	--	7,108	0.163	19,712	0.453

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

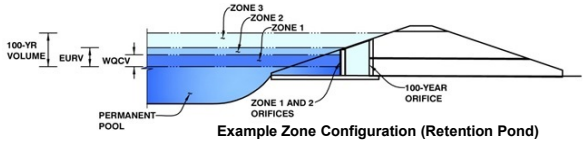




Detention Basin Outlet Structure Design

Project: COTTAGES AT DRY CREEK

Basin ID: EDB C



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (User)	1.05	0.021	Orifice Plate
Zone 2 (EURV)	3.54	0.178	Orifice Plate
Zone 3 (100-year)	4.36	0.091	Weir&Pipe (Restrict)
		0.291	Total

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.54	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.50	2.90					
Orifice Area (sq. inches)	0.44	0.79	0.79					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.54	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	3.54	N/A	feet
Over Flow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	58.77	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	11.20	N/A	ft^2
Overflow Grate Open Area w/ Debris =	5.60	N/A	ft^2

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.33	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	12.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	3.50		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.19	N/A	ft^2
Outlet Orifice Centroid =	0.17	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.20	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	30.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

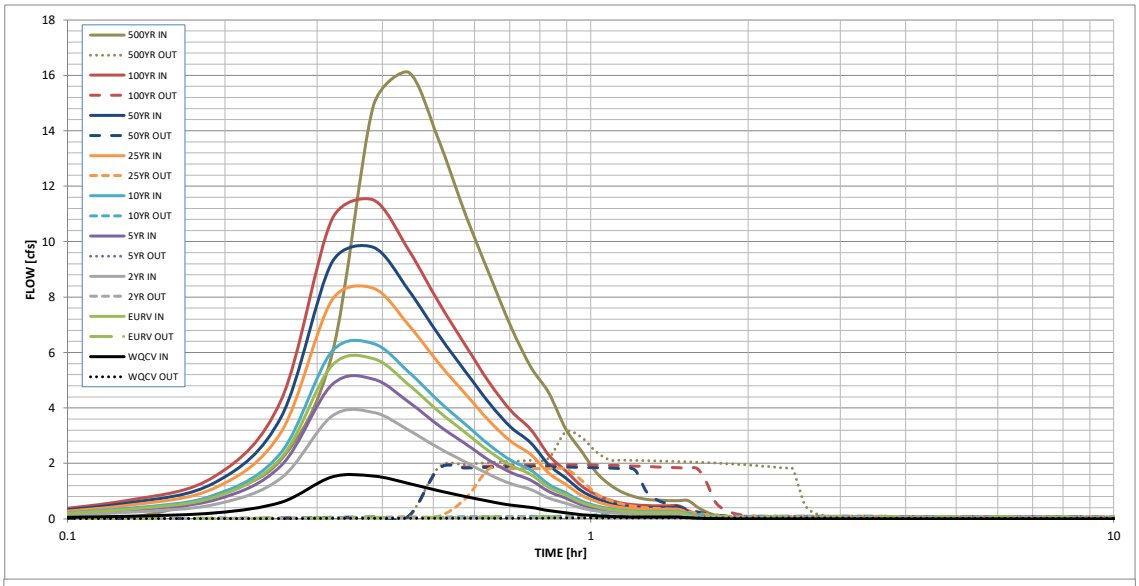
Calculated Parameters for Spillway

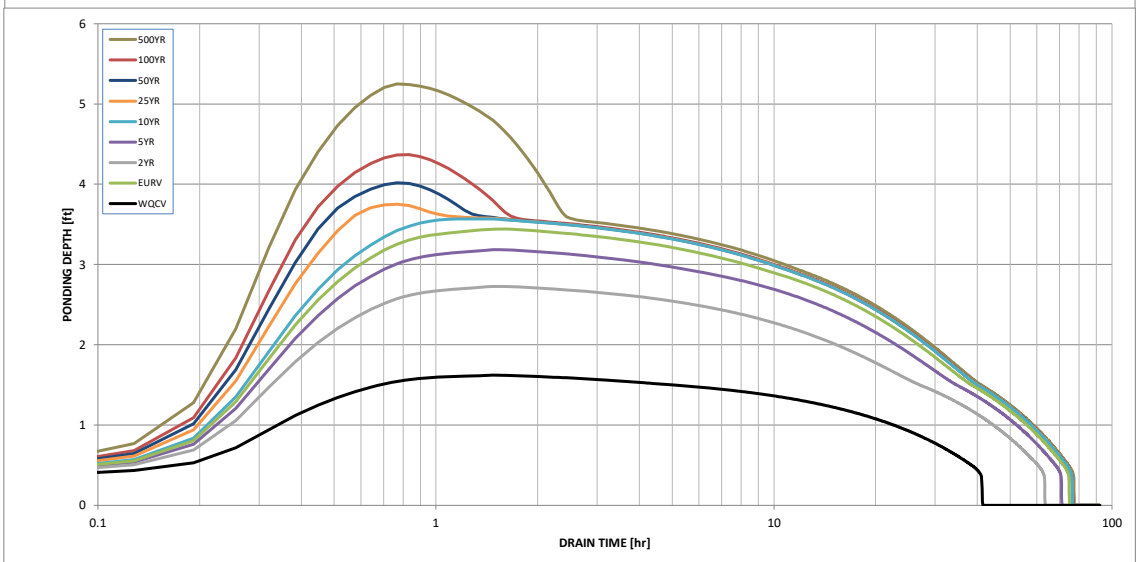
Spillway Design Flow Depth=	0.24	feet
Stage at Top of Freeboard =	6.44	feet
Basin Area at Top of Freeboard =	0.16	acres

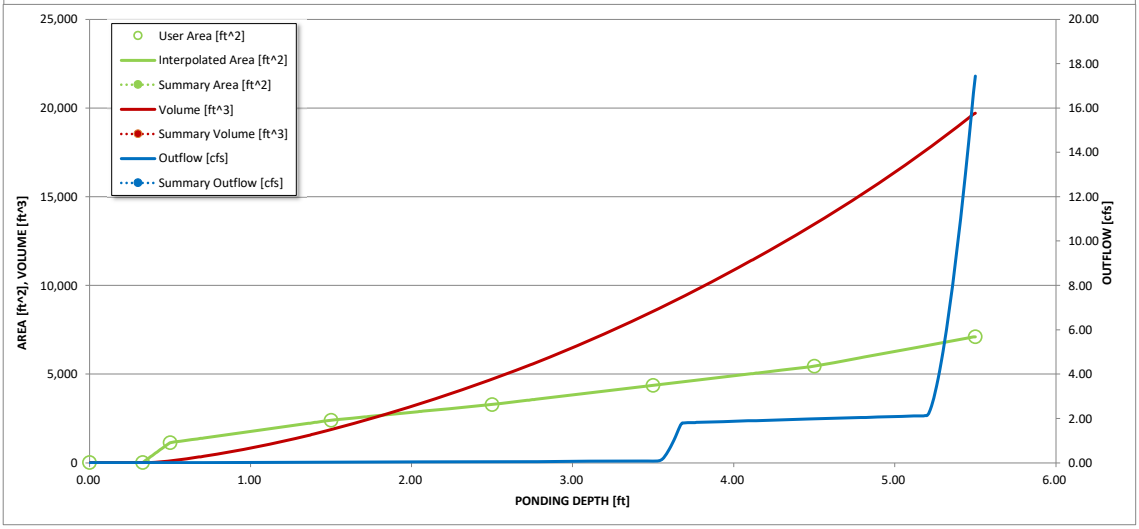
Routed Hydrograph Results

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.29
Calculated Runoff Volume (acre-ft) =	0.053	0.199	0.132	0.174	0.218	0.287	0.338	0.397	0.556
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.052	0.199	0.132	0.173	0.217	0.286	0.338	0.397	0.555
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.01	0.02	0.23	0.48	0.78	1.41
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.0	0.1	0.6	1.2	2.0	3.7
Peak Inflow Q (cfs) =	1.5	5.8	3.8	5.0	6.3	8.3	9.8	11.5	16.1
Peak Outflow Q (cfs) =	0.0	0.1	0.1	0.1	0.3	1.8	1.9	2.0	3.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.4	5.0	3.0	1.5	1.0	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.2	0.2	0.2	0.2
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	68	59	65	69	67	66	64	61
Time to Drain 99% of Inflow Volume (hours) =	**41**	72	62	69	74	73	72	72	71
Maximum Ponding Depth (ft) =	1.62	3.44	2.73	3.18	3.57	3.75	4.02	4.37	5.25
Area at Maximum Ponding Depth (acres) =	0.06	0.10	0.08	0.09	0.10	0.11	0.11	0.12	0.15
Maximum Volume Stored (acre-ft) =	0.050	0.190	0.125	0.165	0.202	0.222	0.250	0.291	0.411

Detention Basin Outlet Structure Design







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename:

Storm Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
3.84 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:03:50	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03
Hydrograph	0:07:41	0.09	0.33	0.22	0.29	0.36	0.47	0.55	0.65	0.88
Constant	0:11:31	0.22	0.79	0.53	0.69	0.87	1.13	1.33	1.55	2.14
1.303	0:15:22	0.60	2.20	1.47	1.92	2.40	3.14	3.68	4.30	5.91
	0:19:12	1.51	5.52	3.70	4.83	6.03	7.88	9.24	10.80	14.87
	0:23:02	1.54	5.78	3.84	5.04	6.33	8.32	9.80	11.50	16.11
	0:26:53	1.28	4.85	3.21	4.22	5.31	7.00	8.26	9.72	13.66
	0:30:43	1.01	3.88	2.55	3.37	4.25	5.61	6.63	7.81	11.00
	0:34:34	0.81	3.11	2.05	2.71	3.41	4.51	5.32	6.27	8.82
	0:38:24	0.63	2.43	1.60	2.11	2.66	3.53	4.17	4.91	6.93
	0:42:14	0.49	1.92	1.26	1.67	2.11	2.79	3.30	3.89	5.49
	0:46:05	0.42	1.61	1.06	1.40	1.76	2.33	2.75	3.23	4.54
	0:49:55	0.29	1.13	0.74	0.98	1.24	1.65	1.95	2.29	3.24
	0:53:46	0.22	0.86	0.56	0.74	0.94	1.24	1.47	1.73	2.44
	0:57:36	0.15	0.59	0.38	0.51	0.64	0.85	1.01	1.19	1.69
	1:01:26	0.11	0.43	0.28	0.37	0.47	0.63	0.74	0.87	1.23
	1:05:17	0.09	0.33	0.22	0.29	0.37	0.49	0.57	0.68	0.95
	1:09:07	0.07	0.28	0.18	0.24	0.30	0.40	0.48	0.56	0.79
	1:12:58	0.07	0.25	0.17	0.22	0.27	0.36	0.43	0.50	0.70
	1:16:48	0.06	0.24	0.16	0.21	0.26	0.35	0.41	0.48	0.67
	1:20:38	0.06	0.24	0.16	0.21	0.26	0.34	0.40	0.47	0.66
	1:24:29	0.06	0.24	0.16	0.21	0.26	0.34	0.40	0.47	0.66
	1:28:19	0.06	0.24	0.16	0.21	0.26	0.34	0.40	0.47	0.66
	1:32:10	0.04	0.14	0.09	0.12	0.16	0.21	0.25	0.29	0.42
	1:36:00	0.02	0.08	0.05	0.07	0.09	0.12	0.15	0.17	0.24
	1:39:50	0.01	0.05	0.03	0.04	0.05	0.07	0.08	0.10	0.14
	1:43:41	0.01	0.03	0.02	0.02	0.03	0.04	0.04	0.05	0.08
	1:47:31	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.04
	1:51:22	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	1:55:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1:59:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:02:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:06:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:10:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:14:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:18:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:22:05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:25:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:29:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:33:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:37:26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:41:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:48:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:52:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:56:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:04:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:08:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:12:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:19:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:23:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:27:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:31:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:38:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:42:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:46:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:54:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:58:05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:01:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:09:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:13:26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:17:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:21:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:24:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:28:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:32:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:36:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Detention Basin Outlet Structure Design

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Friday, Feb 16 2024

Trickle Channel EDB C

Triangular

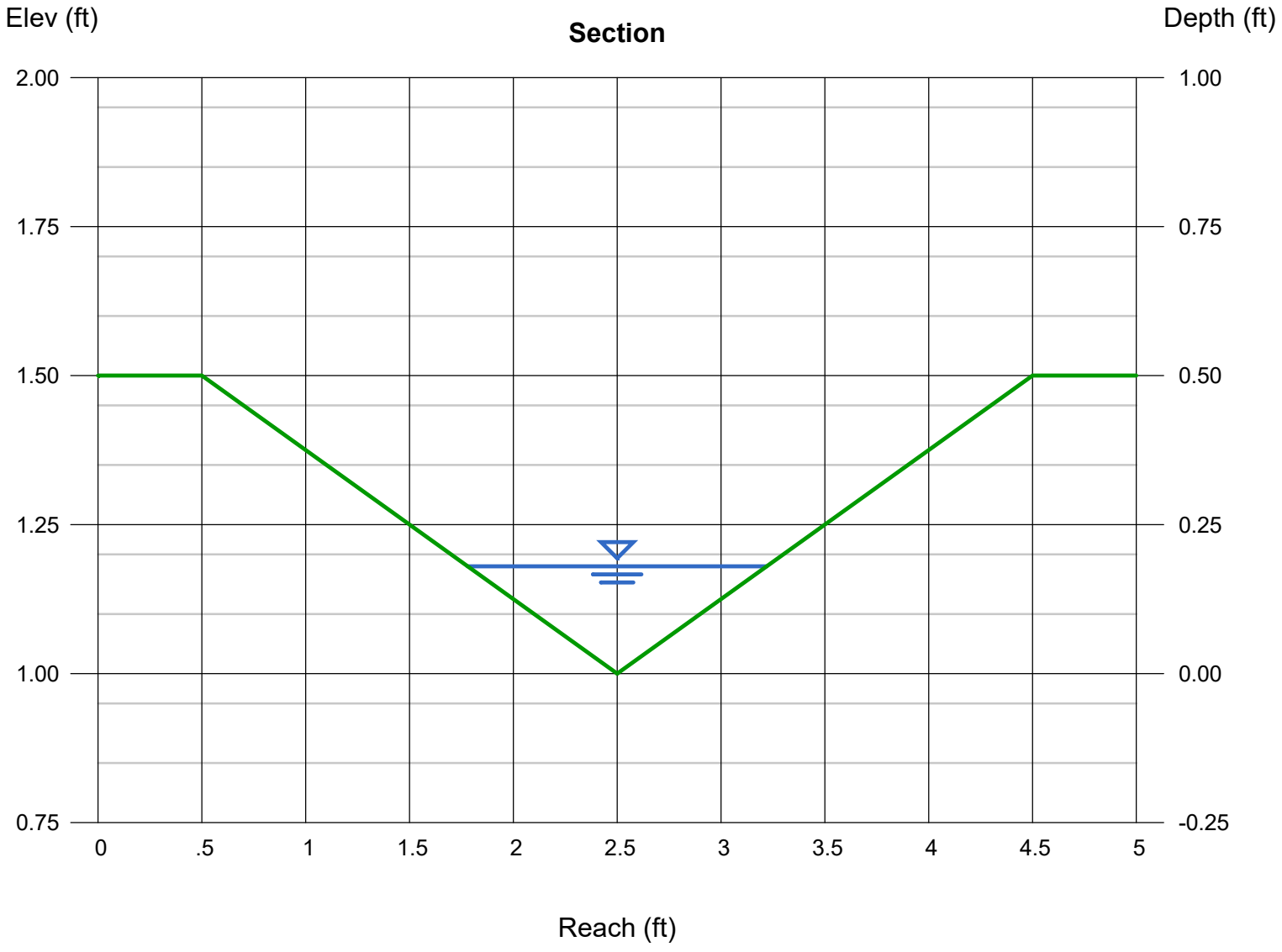
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.012

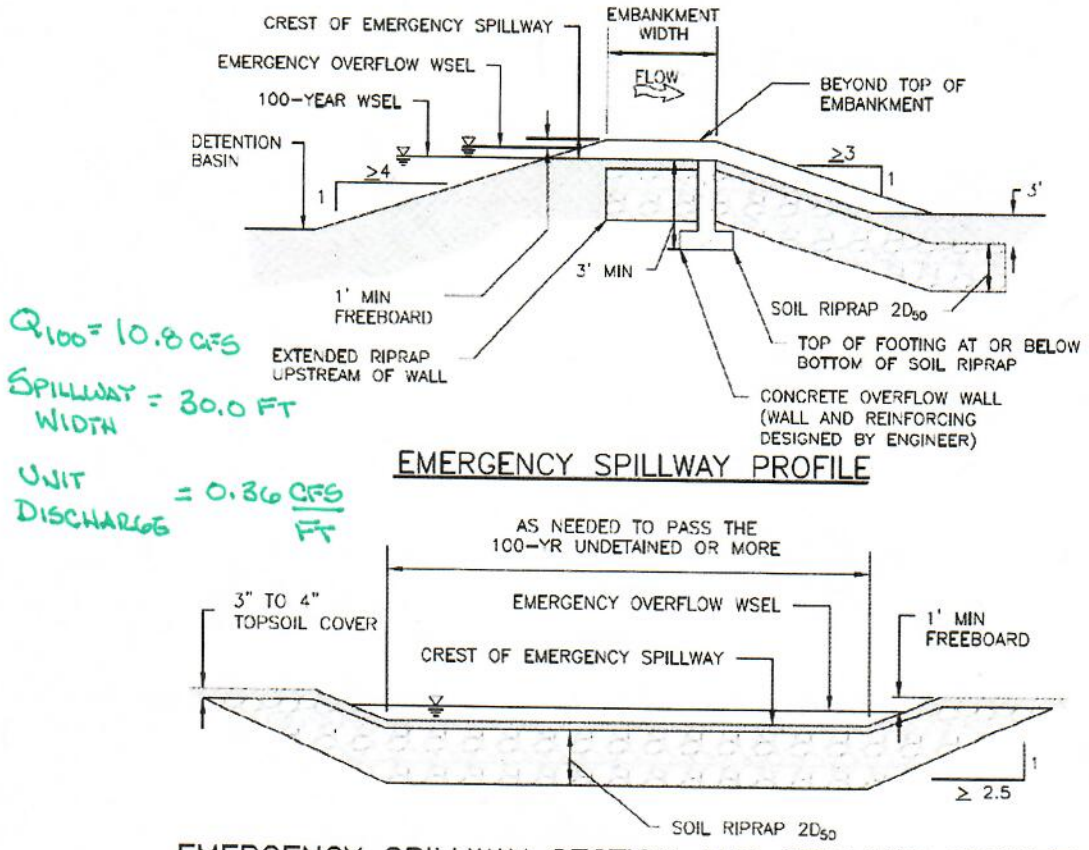
Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.22

Highlighted

Depth (ft)	= 0.18
Q (cfs)	= 0.220
Area (sqft)	= 0.13
Velocity (ft/s)	= 1.70
Wetted Perim (ft)	= 1.48
Crit Depth, Yc (ft)	= 0.18
Top Width (ft)	= 1.44
EGL (ft)	= 0.22





$Q_{100} = 10.8$ CFS

SPILLWAY WIDTH = 30.0 FT

UNIT DISCHARGE = 0.36 CFS/FT

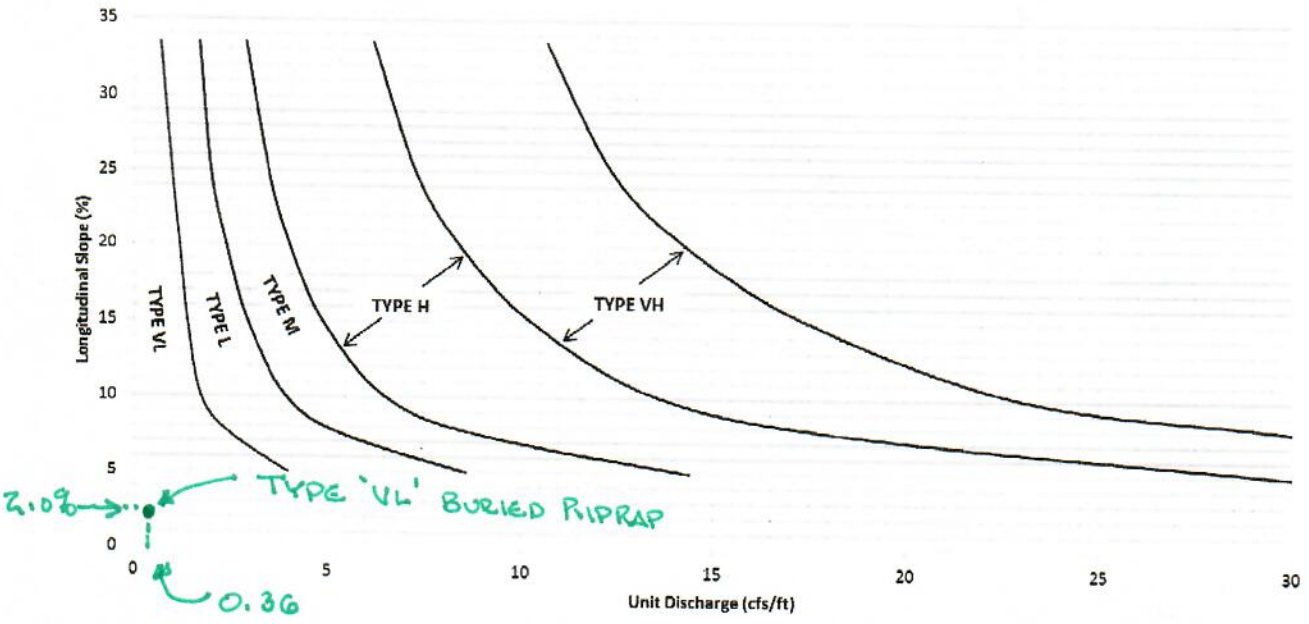


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018) — Sheet 1 of 1

Designer:	David Mijares
Company:	Catamount Engineering
Date:	February 26, 2024
Project:	COTTAGES AT DRY CREEK
Location:	TOTAL

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth = 0.60 inches

Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	DCIA	SPA	UIA:RPA	DCIA	SPA	UIA:RPA	DCIA	SPA	UIA:RPA	DCIA	SPA	UIA:RPA
Area ID	A1 IMP	A1 PERV	A1-DC-RPA	A2-IMP	A2 PERV	A2-DC-RPA	B-IMP	B-PERV	B-DC-RPA	C-IMP	C-PERV	C-DC-RPA
Downstream Design Point ID	A	A	A	A	A	A	B	B	B	C	C	C
Downstream BMP Type	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB
DCIA (ft^2)	32,083	--	--	35,629	--	--	28,361	--	--	22,205	--	--
UIA (ft^2)	--	--	37,008	--	--	26,214	--	--	33,161	--	--	48,360
RPA (ft^2)	--	--	11,456	--	--	12,078	--	--	9,564	--	--	10,437
SPA (ft^2)	--	41,657	--	--	34,732	--	--	56,980	--	--	31,818	--
HSG A (%)	--	100%	100%	--	100%	100%	--	100%	100%	--	100%	100%
HSG B (%)	--	0%	0%	--	0%	0%	--	0%	0%	--	0%	0%
HSG C/D (%)	--	0%	0%	--	0%	0%	--	0%	0%	--	0%	0%
Average Slope of RPA (ft/ft)	--	--	0.020	--	--	0.020	--	--	0.015	--	--	0.010
UIA:RPA Interface Width (ft)	--	--	15.00	--	--	15.00	--	--	10.00	--	--	15.00

CALCULATED RUNOFF RESULTS

Area ID	A1 IMP	A1 PERV	A1-DC-RPA	A2-IMP	A2 PERV	A2-DC-RPA	B-IMP	B-PERV	B-DC-RPA	C-IMP	C-PERV	C-DC-RPA
UIA:RPA Area (ft^2)	--	--	48,464	--	--	38,292	--	--	42,725	--	--	58,797
L / W Ratio	--	--	16.00	--	--	16.00	--	--	16.00	--	--	16.00
UIA / Area	--	--	0.7636	--	--	0.6846	--	--	0.7761	--	--	0.8225
Runoff (in)	0.50	0.00	0.00	0.50	0.00	0.00	0.50	0.00	0.00	0.50	0.00	0.00
Runoff (ft^3)	1337	0	0	1485	0	0	1182	0	0	925	0	0
Runoff Reduction (ft^3)	0	2083	1542	0	1737	1092	0	2849	1382	0	1591	2015

CALCULATED WQCV RESULTS

Area ID	A1 IMP	A1 PERV	A1-DC-RPA	A2-IMP	A2 PERV	A2-DC-RPA	B-IMP	B-PERV	B-DC-RPA	C-IMP	C-PERV	C-DC-RPA
WQCV (ft^3)	1337	0	1542	1485	0	1092	1182	0	1382	925	0	2015
WQCV Reduction (ft^3)	0	0	1542	0	0	1092	0	0	1382	0	0	2015
WQCV Reduction (%)	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%
Untreated WQCV (ft^3)	1337	0	0	1485	0	0	1182	0	0	925	0	0

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	A	B	C									
DCIA (ft^2)	67,712	28,361	22,205									
UIA (ft^2)	63,222	33,161	48,360									
RPA (ft^2)	23,534	9,564	10,437									
SPA (ft^2)	76,389	56,980	31,818									
Total Area (ft^2)	230,857	128,066	112,820									
Total Impervious Area (ft^2)	130,934	61,522	70,565									
WQCV (ft^3)	5,456	2,563	2,940									
WQCV Reduction (ft^3)	2,634	1,382	2,015									
WQCV Reduction (%)	48%	54%	69%									
Untreated WQCV (ft^3)	2,821	1,182	925									

USED TO SIZE WQCV FOR POND 'C'.

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	471,743
Total Impervious Area (ft^2)	263,021
WQCV (ft^3)	10,959
WQCV Reduction (ft^3)	6,031
WQCV Reduction (%)	55%
Untreated WQCV (ft^3)	4,928

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Designer: David Mijares
Company: Catamount Engineering
Date: February 13, 2024
Project: COTTAGES AT DRY CREEK
Location: TOTAL

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth = 0.60 inches
Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	DCIA	SPA	UIA:RPA	DCIA	SPA	UIA:RPA	DCIA	SPA	UIA:RPA	DCIA	SPA	UIA:RPA
Area ID	A1 IMP	A1 PERV	A1-DC-RPA	A2-IMP	A2 PERV	A2-DC-RPA	B-IMP	B-PERV	B-DC-RPA	C-IMP	C-PERV	C-DC-RPA
Downstream Design Point ID	A	A	A	A	A	A	B	B	B	C	C	C
Downstream BMP Type	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB
DCIA (ft^2)	32,083	--	--	35,629	--	--	28,361	--	--	22,205	--	--
UIA (ft^2)	--	--	37,008	--	--	26,214	--	--	33,161	--	--	48,360
RPA (ft^2)	--	--	11,456	--	--	12,078	--	--	9,564	--	--	10,437
SPA (ft^2)	--	41,657	--	--	34,732	--	--	56,980	--	--	31,818	--
HSG A (%)	--	100%	100%	--	100%	100%	--	100%	100%	--	100%	100%
HSG B (%)	--	0%	0%	--	0%	0%	--	0%	0%	--	0%	0%
HSG C/D (%)	--	0%	0%	--	0%	0%	--	0%	0%	--	0%	0%
Average Slope of RPA (ft/ft)	--	--	0.020	--	--	0.020	--	--	0.015	--	--	0.010
UIA:RPA Interface Width (ft)	--	--	15.00	--	--	15.00	--	--	10.00	--	--	15.00

CALCULATED RUNOFF RESULTS

Area ID	A1 IMP	A1 PERV	A1-DC-RPA	A2-IMP	A2 PERV	A2-DC-RPA	B-IMP	B-PERV	B-DC-RPA	C-IMP	C-PERV	C-DC-RPA
UIA:RPA Area (ft^2)	--	--	48,464	--	--	38,292	--	--	42,725	--	--	58,797
L / W Ratio	--	--	16.00	--	--	16.00	--	--	16.00	--	--	16.00
UIA / Area	--	--	0.7636	--	--	0.6846	--	--	0.7761	--	--	0.8225
Runoff (in)	0.50	0.00	0.00	0.50	0.00	0.00	0.50	0.00	0.00	0.50	0.00	0.00
Runoff (ft^3)	1337	0	0	1485	0	0	1182	0	0	925	0	0
Runoff Reduction (ft^3)	0	2083	1542	0	1737	1092	0	2849	1382	0	1591	2015

CALCULATED WQCV RESULTS

Area ID	A1 IMP	A1 PERV	A1-DC-RPA	A2-IMP	A2 PERV	A2-DC-RPA	B-IMP	B-PERV	B-DC-RPA	C-IMP	C-PERV	C-DC-RPA
WQCV (ft^3)	1337	0	1542	1485	0	1092	1182	0	1382	925	0	2015
WQCV Reduction (ft^3)	0	0	1542	0	0	1092	0	0	1382	0	0	2015
WQCV Reduction (%)	0%	0%	100%	0%	0%	100%	0%	0%	100%	0%	0%	100%
Untreated WQCV (ft^3)	1337	0	0	1485	0	0	1182	0	0	925	0	0

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	A	B	C									
DCIA (ft^2)	67,712	28,361	22,205									
UIA (ft^2)	63,222	33,161	48,360									
RPA (ft^2)	23,534	9,564	10,437									
SPA (ft^2)	76,389	56,980	31,818									
Total Area (ft^2)	230,857	128,066	112,820									
Total Impervious Area (ft^2)	130,934	61,522	70,565									
WQCV (ft^3)	5,456	2,563	2,940									
WQCV Reduction (ft^3)	2,634	1,382	2,015									
WQCV Reduction (%)	48%	54%	69%									
Untreated WQCV (ft^3)	2,821	1,182	925									

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	471,743
Total Impervious Area (ft^2)	263,021
WQCV (ft^3)	10,959
WQCV Reduction (ft^3)	6,031
WQCV Reduction (%)	55%
Untreated WQCV (ft^3)	4,928

DRAINAGE MAP

SCALE: 1" = 50'

AREA CALCULATIONS						
AREA ID	TOTAL AREA (SQ FT)	DCIA AREA (SQ FT)	SPA AREA (SQ FT)	UIA AREA (SQ FT)	RPA AREA (SQ FT)	WQCV REDUCTION
A	230857	67712	76389	63222	23534	48%
B	128066	28361	56980	33161	9564	54%
C	112820	22205	31818	48360	10437	69%
TOTAL	471743					55%

RUNOFF REDUCTION LEGEND

AREA ID
SURFACE SHEET FLOW DIRECTION
PROPERTY BOUNDARY
RIGHT-OF-WAY
LOT LINE
(E) STORM SEWER, INLET, MH
(P) STORM SEWER, INLET, MH
DRAINAGE BASIN BOUNDARY
(P) DRAINAGE SWALE
(E) STREAMSIDE OVERLAY OUTER
(E) STREAMSIDE OVERLAY INNER
(E) FLOODPLAIN ZONE – AE
(E) FLOODPLAIN ZONE – X

REV.	DESCRIPTION	DATE
1	DEVELOPMENT PLAN AMENDMENT	1/3/24

Know what's below. Call 72 hours before you dig. For more details visit: www.call811.com

PREPARED FOR:
BCC MANAGEMENT, LLC
150 WUTHERING HEIGHTS DRIVE
COLORADO SPRINGS, CO 80921

CATAMOUNT ENGINEERING
321 W. HENRIETTA AVE, PO BOX 221, WOODLAND PARK, CO 80866, (719)426-2124

MARK DRABLING COTTAGES
NORTH PORTION

RUNOFF REDUCTION

DESIGNED BY: DLM | DRAWN BY: DLM
SCALE: 1" = 100' | DATE: 12/20/22
JOB NUMBER: 20–270 | SHEET 1 OF 1

0 50 100

SCALE: 1" = 50'

AREA CALCULATIONS

AREA ID	TOTAL AREA (SQ FT)	DCIA AREA (SQ FT)	SPA AREA (SQ FT)	UIA AREA (SQ FT)	RPA AREA (SQ FT)	WQCV REDUCTION
A	230857	67712	76389	63222	23534	48%
B	128066	28361	56980	33161	9564	54%
C	112820	22205	31818	48360	10437	69%
TOTAL	471743					55%

RUNOFF REDUCTION LEGEND

AREA ID
SURFACE SHEET FLOW DIRECTION
PROPERTY BOUNDARY
RIGHT-OF-WAY
LOT LINE
(E) STORM SEWER, INLET, MH
(P) STORM SEWER, INLET, MH
DRAINAGE BASIN BOUNDARY
(P) DRAINAGE SWALE
(E) STREAMSIDE OVERLAY OUTER
(E) STREAMSIDE OVERLAY INNER
(E) FLOODPLAIN ZONE – AE
(E) FLOODPLAIN ZONE – X

REV.	DESCRIPTION	DATE
1	DEVELOPMENT PLAN AMENDMENT	1/3/24

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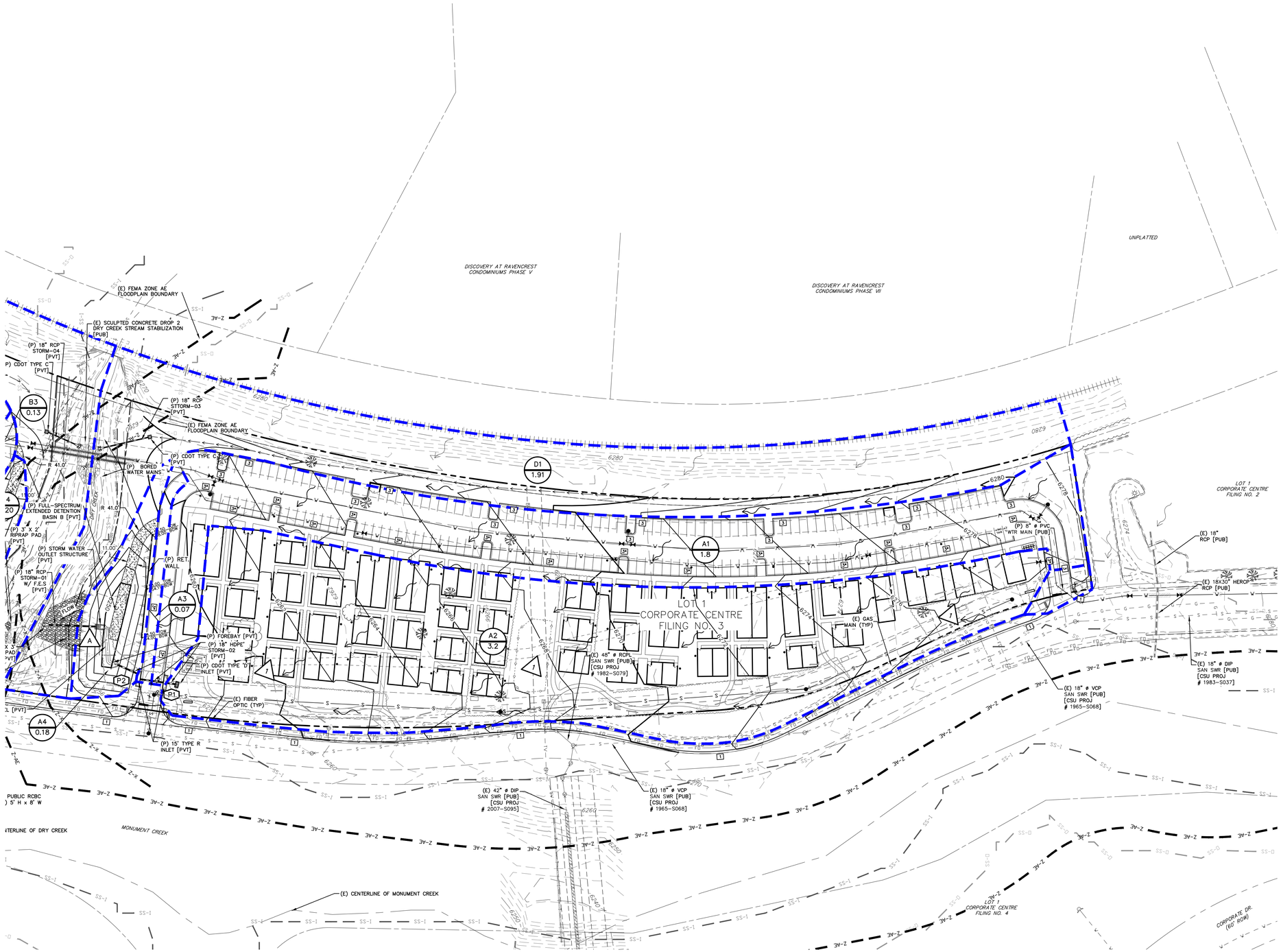
PREPARED FOR:
BCC MANAGEMENT, LLC
150 WUTHERING HEIGHTS DRIVE
COLORADO SPRINGS, CO 80921

CATAMOUNT ENGINEERING
321 W. HENRIETTA AVE, PO BOX 221, WOODLAND PARK, CO 80866, (719)426-2124

MARK DRABLING COTTAGES
SOUTH PORTION

RUNOFF REDUCTION

DESIGNED BY: DLM
DRAWN BY: DLM
SCALE: 1" = 100'
DATE: 12/20/22
JOB NUMBER: 20-270
SHEET: 1 OF 1



0 50 100

SCALE: 1" = 50'

REVISED PER 11/05/24 DP AMENDMENT

PROPOSED DRAINAGE BASINS

BASIN	AREA (ACRES)	Q5 (CFS)	Q100 (CFS)
A1	1.80	5.9	11.1
A2	3.20	2.8	7.3
A3	0.07	0.3	0.5
A4	0.18	0.2	0.7
B1	0.69	2.5	4.7
B2	1.92	2.5	6.0
B3	0.13	0.5	0.9
B4	0.20	0.1	0.7
C1	0.60	2.4	4.4
C2	1.42	1.8	4.7
C3	0.58	2.0	3.7
D1	1.91	0.6	3.4
D2	1.17	0.5	2.5
D3	1.19	0.5	2.7
D4	0.06	0.1	0.3

PROPOSED DESIGN POINTS

BASIN	Q5 (CFS)	Q100 (CFS)
1	3.4	7.6
P1	6.2	13.8
P2	6.4	14.1
P3	4.2	9.2
P4	4.5	9.8
POND A	6.5	14.4
POND B	4.6	10.2
POND C	5.1	10.8

DRAINAGE LEGEND

BASIN IDENTIFIER	F
BASIN AREA [AC]	0.36
DESIGN POINT IDENTIFIERS	3
PIPE DESIGN POINT	P2
EXISTING	(E)
PROPOSED	(P)
CURB AND GUTTER	C&G
TYPE 1	1
TYPE 3 SPILL	3
TYPE 3 CARRY	3
EASEMENT	ESMT
PUBLIC	PUB
PRIVATE	PVT
FUTURE	(F)
SLOPE/DIRECTION	1.00%
SURFACE SHEET FLOW DIRECTION	
PROPERTY BOUNDARY	
RIGHT-OF-WAY	
LOT LINE	
(E) CONTOUR, INDEX	5960
(E) CONTOUR	
(P) CONTOUR, INDEX	5960
(P) CONTOUR	
(E) UG ELECTRIC	
(E) FIBER OPTIC	
(E) GAS MAIN	
(E) UG TELEPHONE	
(E) SANITARY MAIN, MH	
(E) STORM SEWER, INLET, MH	
(E) WATER MAIN, VALVE, FH	
(P) STORM SEWER, INLET, MH	
DRAINAGE BASIN BOUNDARY	
(P) DRAINAGE SWALE	
(E) STREAMSIDE OVERLAY OUTER	
(E) STREAMSIDE OVERLAY INNER	
(E) FLOODPLAIN ZONE – AE	
(E) FLOODPLAIN ZONE – X	

REV.	DESCRIPTION	DATE
1	DEVELOPMENT PLAN AMENDMENT	1/3/24

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MARK DRABLING COTTAGES NORTH PORTION

PROPOSED DRAINAGE PLAN

DESIGNED BY:	DRAWN BY:
DLM	DLM
SCALE: 1" = 50'	DATE: 2/11/21
JOB NUMBER	SHEET
20-270	1 OF 1

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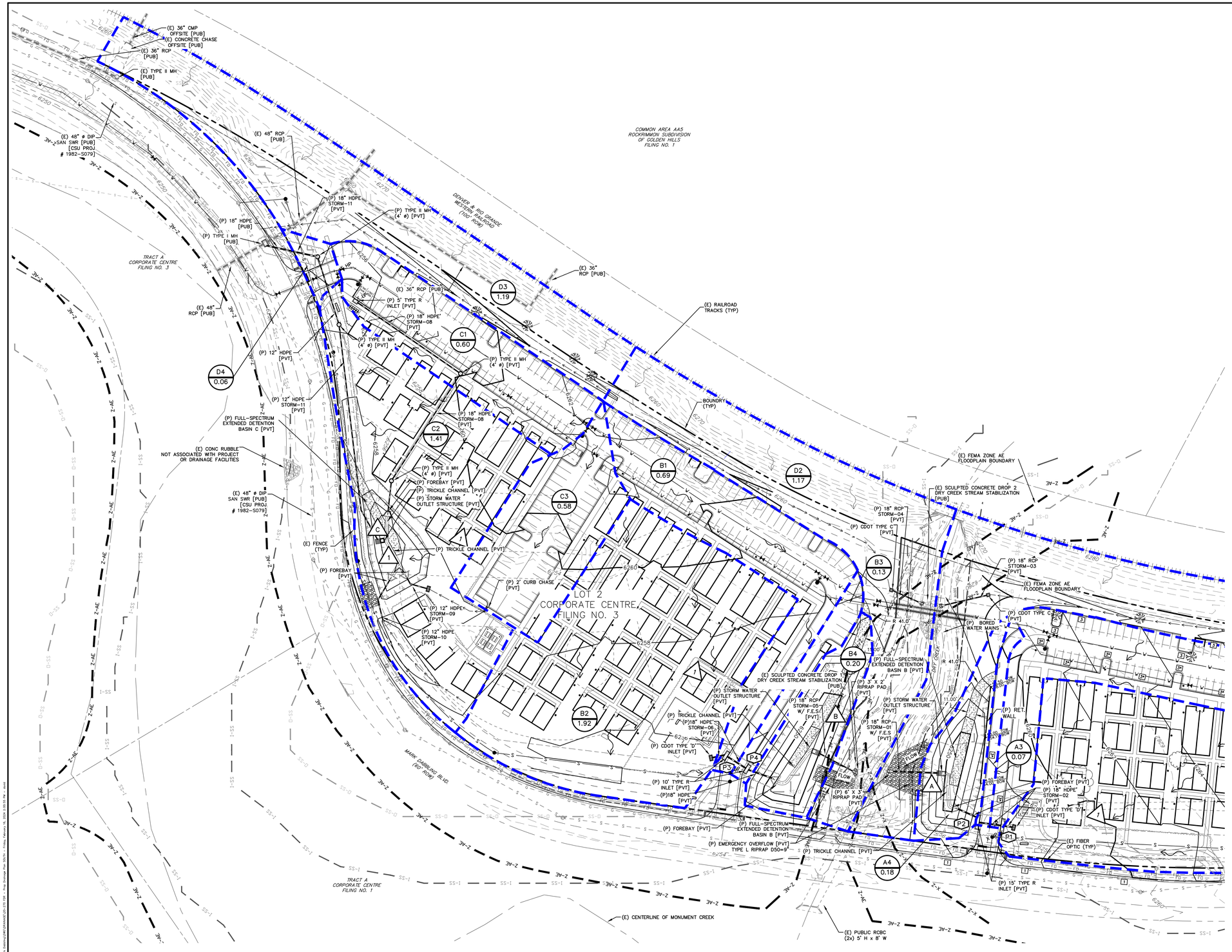

0 50 100

SCALE: 1" = 50'

REVISED PER 11/05/24 DP AMENDMENT

PROPOSED DRAINAGE BASINS

BASIN	AREA (ACRES)	Q5 (CFS)	Q100 (CFS)
A1	1.80	5.9	11.1
A2	3.20	2.8	7.3
A3	0.07	0.3	0.5
A4	0.18	0.2	0.7
B1	0.69	2.5	4.7
B2	1.92	2.5	6.0
B3	0.13	0.5	0.9
B4	0.20	0.1	0.7
C1	0.60	2.4	4.4
C2	1.42	1.8	4.7
C3	0.58	2.0	3.7
D1	1.91	0.6	3.4
D2	1.17	0.5	2.5
D3	1.19	0.5	2.7
D4	0.06	0.1	0.3

PROPOSED DESIGN POINTS

BASIN	Q5 (CFS)	Q100 (CFS)
1	3.4	7.6
P1	6.2	13.8
P2	6.4	14.1
P3	4.2	9.2
P4	4.5	9.8
POND A	6.5	14.4
POND B	4.6	10.2
POND C	5.1	10.8

DRAINAGE LEGEND

BASIN IDENTIFIER	F
BASIN AREA [AC]	0.36
DESIGN POINT IDENTIFIERS	3
PIPE DESIGN POINT	P2
EXISTING	(E)
PROPOSED	(P)
CURB AND GUTTER	C&G
TYPE 1	
TYPE 3 SPILL	
TYPE 3 CARRY	
EASEMENT	ESMT
PUBLIC	PUB
PRIVATE	PVT
FUTURE	(F)
SLOPE/DIRECTION	1.00%
SURFACE SHEET FLOW DIRECTION	
PROPERTY BOUNDARY	
RIGHT-OF-WAY	
LOT LINE	
(E) CONTOUR, INDEX	5960
(E) CONTOUR	
(P) CONTOUR, INDEX	5960
(P) CONTOUR	
(E) UG ELECTRIC	
(E) FIBER OPTIC	
(E) GAS MAIN	
(E) UG TELEPHONE	
(E) SANITARY MAIN, MH	
(E) STORM SEWER, INLET, MH	
(E) WATER MAIN, VALVE, FH	
(P) STORM SEWER, INLET, MH	
DRAINAGE BASIN BOUNDARY	
(P) DRAINAGE SWALE	
(E) STREAMSIDE OVERLAY OUTER	
(E) STREAMSIDE OVERLAY INNER	
(E) FLOODPLAIN ZONE – AE	
(E) FLOODPLAIN ZONE – X	

REV.	DESCRIPTION	DATE
1	DEVELOPMENT PLAN AMENDMENT	1/3/24

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PREPARED FOR:

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321 W. HENRIETTA AVE WOODLAND PARK, CO 80866
PO BOX 221 (719)426-2124

MARK DRABLING COTTAGES SOUTH PORTION

PROPOSED DRAINAGE PLAN

DESIGNED BY:	DLM	DRAWN BY:	DLM
SCALE:	1" = 100'	DATE:	2/11/21
JOB NUMBER		SHEET	
20-270		1 OF 1	

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