

Stormwater Management Facilities Report

FINAL DEVELOPMENT PLANS CLUB CARWASH LEE'S SUMMIT, MISSOURI



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Architecture
Civil Engineering
Land Surveying
Site Development
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Cochran Project No. M24-8767A

Drainage Calculations
Club Carwash
Lee's Summit, Missouri

Storm Water Calculations	Section
Design Summary	1
Hydrology	2
Drainage Area Maps and Details	3
Storm Sewer Hydraulics	4

Section 1

Design Summary

**DRAINAGE CALCULATIONS
CLUB CARWASH
LEE'S SUMMIT, MISSOURI
PROJECT NO. M24-8767A**

The following drainage calculations have been performed for Club Carwash at 1021 Jefferson Crossing, Lee's Summit, Missouri. Said calculations were performed in accordance with the city of Lee's Summit standards. All hydraulic calculations were performed with the aid of AutoCAD Civil 3D Software. Existing and proposed hydrology for the 10-year storm are attached.

The existing conditions for the site is open space. The proposed land use for the site will be for a car wash. The project consists of on-site tributary areas. The work will be done on the 1.08-acre site in Lee's Summit. The site is tributary to Cedar Creek. All stormwater runoff shall be routed to the regional detention basin which will provide all detention and water quality requirements. Supporting calculations for the conveyance system are included in this report.

CALCULATIONS SUMMARY:

Existing flows were calculated using drainage area flows with current cover conditions. The existing condition flow using the 10-year storm event is 1.96 cfs. The proposed condition flow using the 10-year storm event is 5.45 cfs. The difference between the existing and proposed conditions is then a decrease of 3.49 cfs.

Section 2

Rational Method Hydrology

Existing Rational Method (10 Year)							
Drainage Area	Pervious (ac.)	Impervious (ac.)	Total (ac.)	C	Tc	Intensity (in/hr)	Q
1	1.085	0	1.085	0.30	10.29	6.02	1.96

Rational Method		E_DA 1		10 year design	
Tc	=	10.29	minutes		
Ti	=	9.68	minutes	0	minutes
	D =	100	ft	0	ft
	C =	0.3		0	
	S =	3.29	%	0	%
Tt	=	0.61	minutes		
I	=	6.02	in/hr		

Surface	Area				C
Open	47242	s.f.	1.085	acres	0.3
Impervious	0	s.f.	0	acres	0.9

Total	1.085	acres
K	1.0	
Composite C	0.3	

Q = KCIA = 1 * 0.3 * 6.02 * 1.085 =	1.96	cfs
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Proposed Rational Method (10 Year)							
Drainage Area	Pervious (ac.)	Impervious (ac.)	Total (ac.)	C	Tc	Intensity (in/hr)	Q
1	0.08	0.22	0.30	0.74	13.75	5.38	1.19
2	0.03	0	0.03	0.30	6.38	6.95	0.06
3	0.06	0	0.06	0.30	10.29	6.02	0.11
4	0.04	0.38	0.42	0.84	5	7.35	2.59
5	0.001	0.009	0.01	0.84	5	7.35	0.06
6	0	0.12	0.12	0.90	5	7.35	0.79
7	0	0.005	0.005	0.90	5	7.35	0.03
8	0.05	0.04	0.09	0.57	5	7.35	0.38
9	0.02	0.03	0.05	0.66	5	7.35	0.24

Rational Method		P_DA_1		10 year design	
Tc	=	13.75	minutes		
Ti	=	12.06	minutes	1.08	minutes
	D =	81	ft	19	ft
	C =	0.3		0.9	
	S =	1.24	%	3.1	%
Tt	=	0.61	minutes		
I	=	5.38	in/hr		

Surface	Area				C
Open	3459	s.f.	0.08	acres	0.3
Impervious	9579	s.f.	0.22	acres	0.9

Total	0.3	acres
K	1.0	
Composite C	0.74	

Q = KCIA = 1 * 0.74 * 5.38 * 0.3 =			1.19	cfs
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Rational Method		P_DA_2		10 year design	
Tc	=	6.38	minutes		
Ti	=	6.38	minutes	0	minutes
	D =	27	ft	0	ft
	C =	0.3		0	
	S =	1.61	%	0	%
Tt	=	0	minutes		
I	=	6.95	in/hr		

Surface	Area				C
Open	1129	s.f.	0.03	acres	0.3
Impervious	0	s.f.	0	acres	0.9

Total	0.03	acres
K	1.0	
Composite C	0.3	

Q = KCIA = 1 * 0.3 * 6.95 * 0.03 =	0.06	cfs
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Rational Method		P_DA_3		10 year design	
Tc	=	10.29	minutes		
Ti	=	10.29	minutes	0	minutes
	D =	73	ft	0	ft
	C =	0.3		0.9	
	S =	1.71	%	1.01	%
Tt	=	0	minutes		
I	=	6.02	in/hr		

Surface	Area				C
Open	2459	s.f.	0.06	acres	0.3
Impervious	0	s.f.	0	acres	0.9

Total	0.06	acres
K	1.0	
Composite C	0.3	

Q = KCIA = 1 * 0.3 * 6.02 * 0.06 =	0.11	cfs
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Rational Method		P_DA_4		10 year design	
Tc	=	5	minutes		
Ti	=	3.03	minutes	0	minutes
	D =	100	ft	0	ft
	C =	0.9		0	
	S =	1.67	%	0	%
Tt	=	0.56	minutes		
I	=	7.35	in/hr		

Surface	Area				C
Open	1612	s.f.	0.04	acres	0.3
Impervious	16768	s.f.	0.38	acres	0.9

Total	0.42	acres
K	1.0	
Composite C	0.84	

Q = KCIA = 1 * 0.84 * 7.35 * 0.42 =	2.59	cfs
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Rational Method		P_DA_5		10 year design	
Tc	=	5	minutes		
Ti	=	1.22	minutes	0	minutes
	D =	22	ft	0	ft
	C =	0.9		0	
	S =	2.68	%	0	%
Tt	=	0	minutes		
I	=	7.35	in/hr		

Surface	Area				C
Open	49	s.f.	0.001	acres	0.3
Impervious	377	s.f.	0.009	acres	0.9

Total	0.01	acres
K	1.0	
Composite C	0.84	

Q = KCIA = 1 * 0.84 * 7.35 * 0.01 =	0.06	cfs
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Rational Method		P_DA_6		10 year design	
Tc	=	5	minutes		
Ti	=	2.16	minutes	0	minutes
	D =	36	ft	0	ft
	C =	0.9		0	
	S =	1	%	0	%
Tt	=	0.62	minutes		
I	=	7.35	in/hr		

Surface	Area				C
Open	0	s.f.	0	acres	0.3
Impervious	5163	s.f.	0.12	acres	0.9

Total	0.12	acres
K	1.0	
Composite C	0.9	

Q = KCIA = 1 * 0.9 * 7.35 * 0.12 =			0.79	cfs
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Rational Method		P_DA_7		10 year design	
Tc	=	5	minutes		
Ti	=	1.19	minutes	0	minutes
	D =	11	ft	0	ft
	C =	0.9		0	
	S =	1	%	0	%
Tt	=	0.58	minutes		
I	=	7.35	in/hr		

Surface	Area				C
Open	33	s.f.	0	acres	0.3
Impervious	204	s.f.	0.005	acres	0.9

Total	0.005	acres
K	1.0	
Composite C	0.9	

Q = KCIA = 1 * 0.9 * 7.35 * 0.005 =	0.03	cfs
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Rational Method		P_DA_8		10 year design	
Tc	=	5	minutes		
Ti	=	1.45	minutes	0	minutes
	D =	64	ft	0	ft
	C =	0.9		0	
	S =	7.85	%	0	%
Tt	=	0	minutes		
I	=	7.35	in/hr		

Surface	Area				C
Open	2098	s.f.	0.05	acres	0.3
Impervious	1834	s.f.	0.04	acres	0.9

Total	0.09	acres
K	1.0	
Composite C	0.57	

Q = KCIA = 1 * 0.57 * 7.35 * 0.09 =	0.38	cfs
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Rational Method		P_DA_9		10 year design	
Tc	=	5	minutes		
Ti	=	2.3	minutes	0	minutes
	D =	56	ft	0	ft
	C =	0.9		0	
	S =	1.61	%	0	%
Tt	=	0	minutes		
I	=	7.35	in/hr		

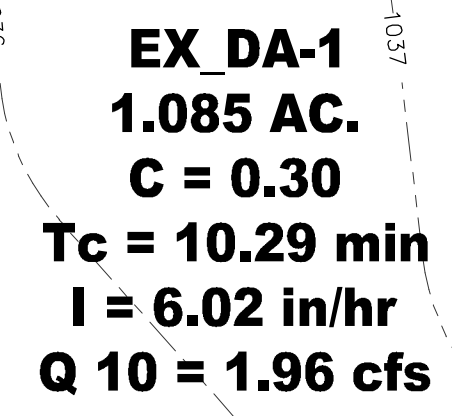
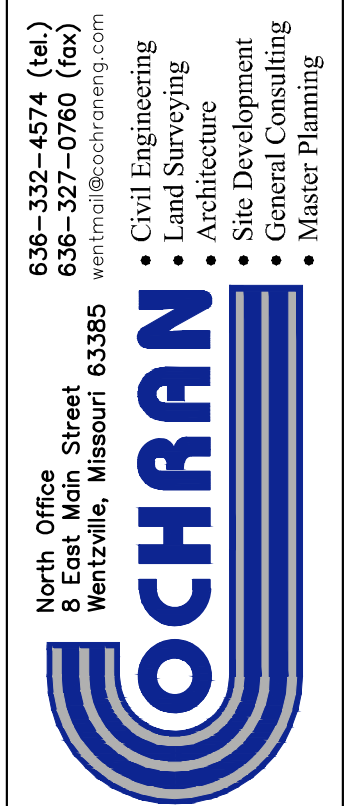
Surface	Area				C
Open	963	s.f.	0.02	acres	0.3
Impervious	1505	s.f.	0.03	acres	0.9

Total	0.05	acres
K	1.0	
Composite C	0.66	

Q = KCIA = 1 * 0.66 * 7.35 * 0.05 =	0.24	cfs
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Section 3

Drainage Area Maps and Details



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DEVELOPER:
CLUB CARWASH OPERATING, LLC
1591 E. PRATHERSVILLE RD.
COLUMBIA, MO 65202

PROPOSED RATIONAL METHOD CALCULATIONS								ONSITE RATIONAL METHOD FLOW DIFFERENTIAL	RUNOFF COEFFICIENT		
	PERVIOUS	IMPERVIOUS	TOTAL AREA	COMPOSITE C	Tc	INTENSITY	10 YR. FLOW	EXISTING			0.30
1	1.085	0.00	1.085	0.30	10.29	6.02	1.96	DIFFERENCE	+3.49	PROPOSED	0.74

<i>EXISTING DRAINAGE AREA MAP</i>					
		SHEET NO.		DRAWN BY:	APPROVED BY:
		DATE			
		SCALE			
		PROJECT NO.			
		DRAWING NO.			
		DATE			
		KAF		ESK	
		MAY 2025			
		1:20			
		M24-8767A			
		DWG. NO.			
		<i>C10</i>			

***FINAL DEVELOPMENT PLANS
CLUB CARWASH
LEE'S SUMMIT, MISSOURI***



ONSITE RATIONAL METHOD FLOW DIFFERENTIAL	
EXISTING 10 YR.	1.96
PROPOSED 10 YR.	5.45
DIFFERENCE	+3.49

RUNOFF COEFFICIENT	
EXISTING	0.30
PROPOSED	0.74

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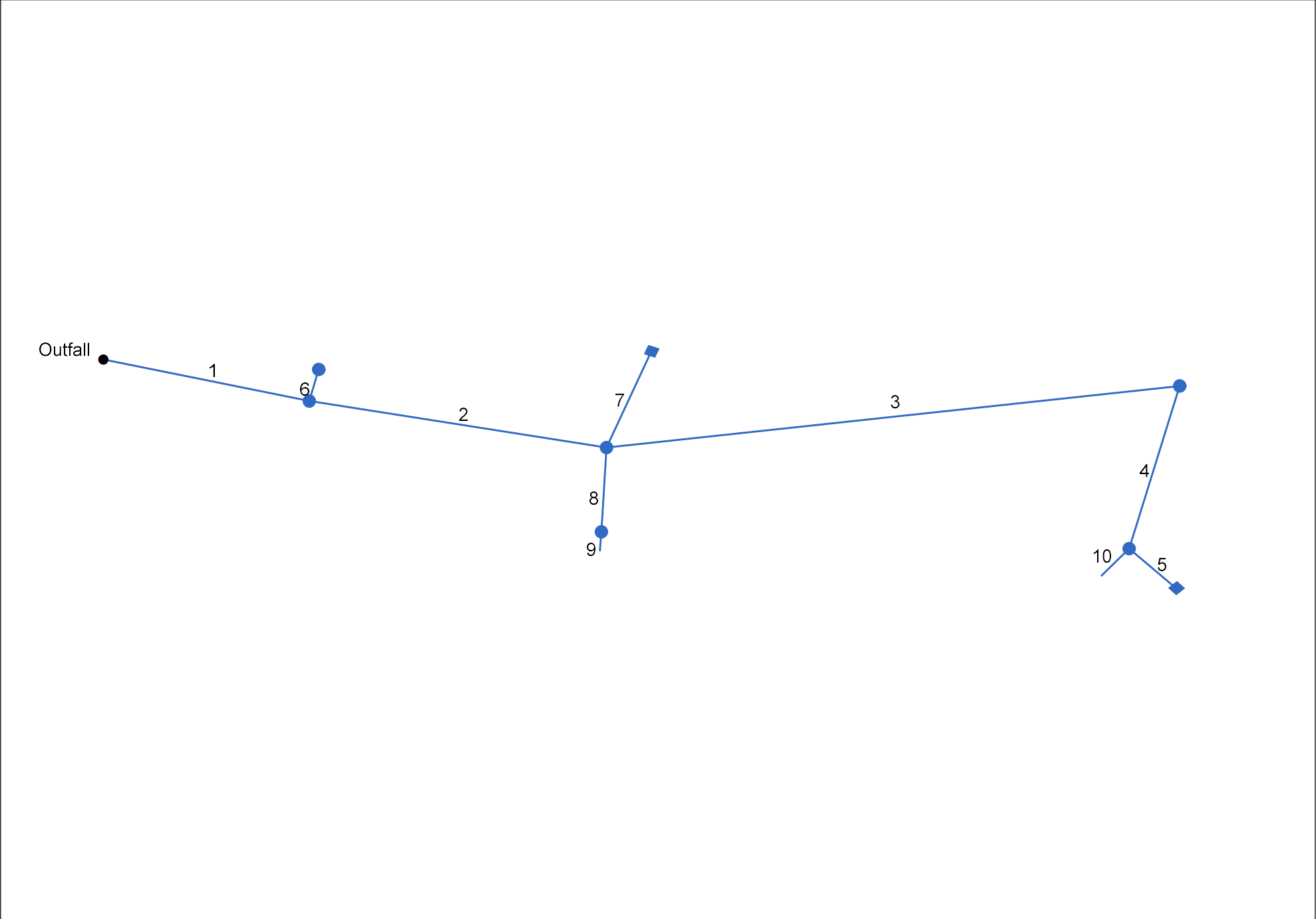
PROPOSED DRAINAGE AREA MAP

C11

Section 4

Storm Sewer Hydraulics

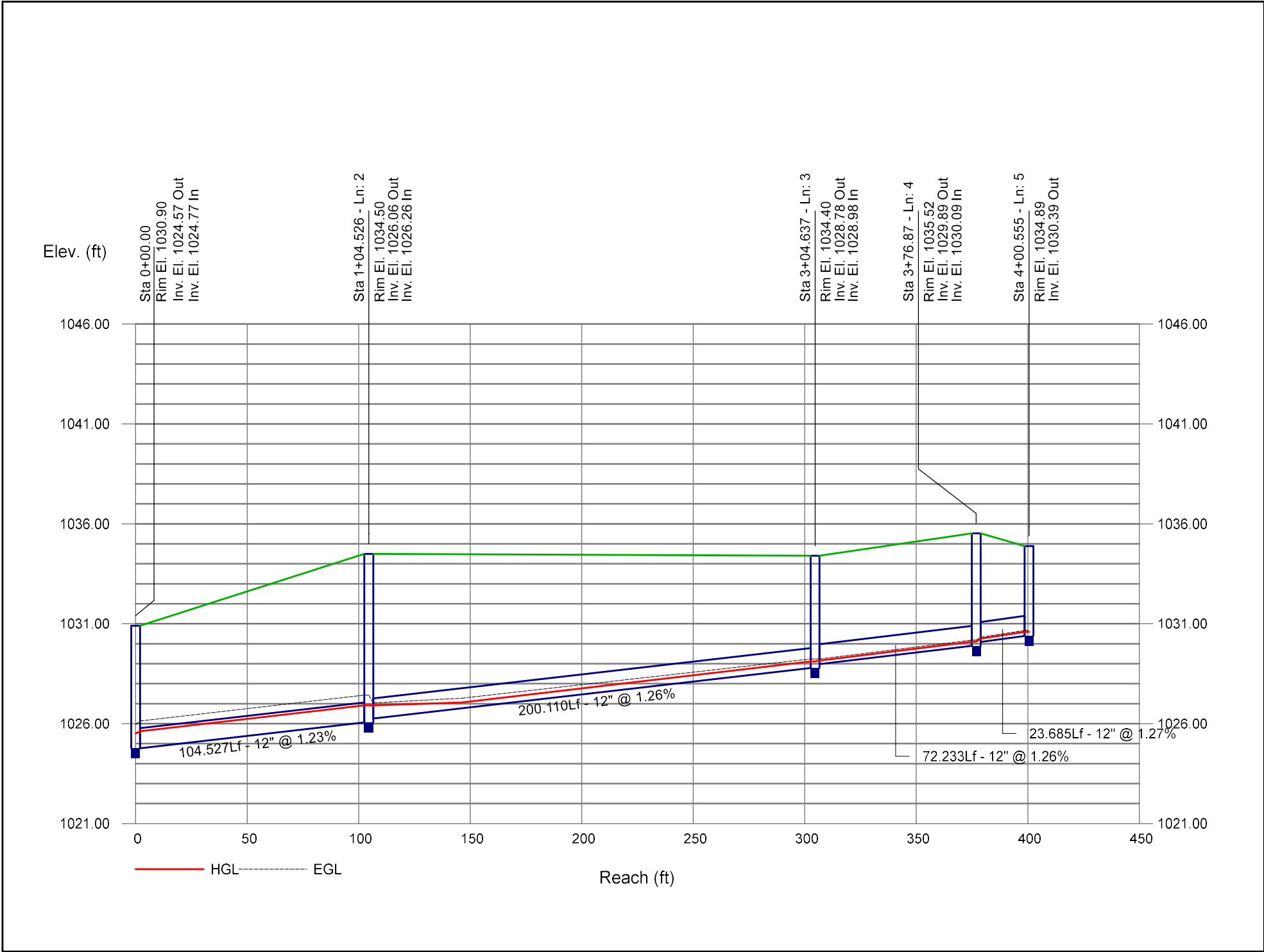
Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



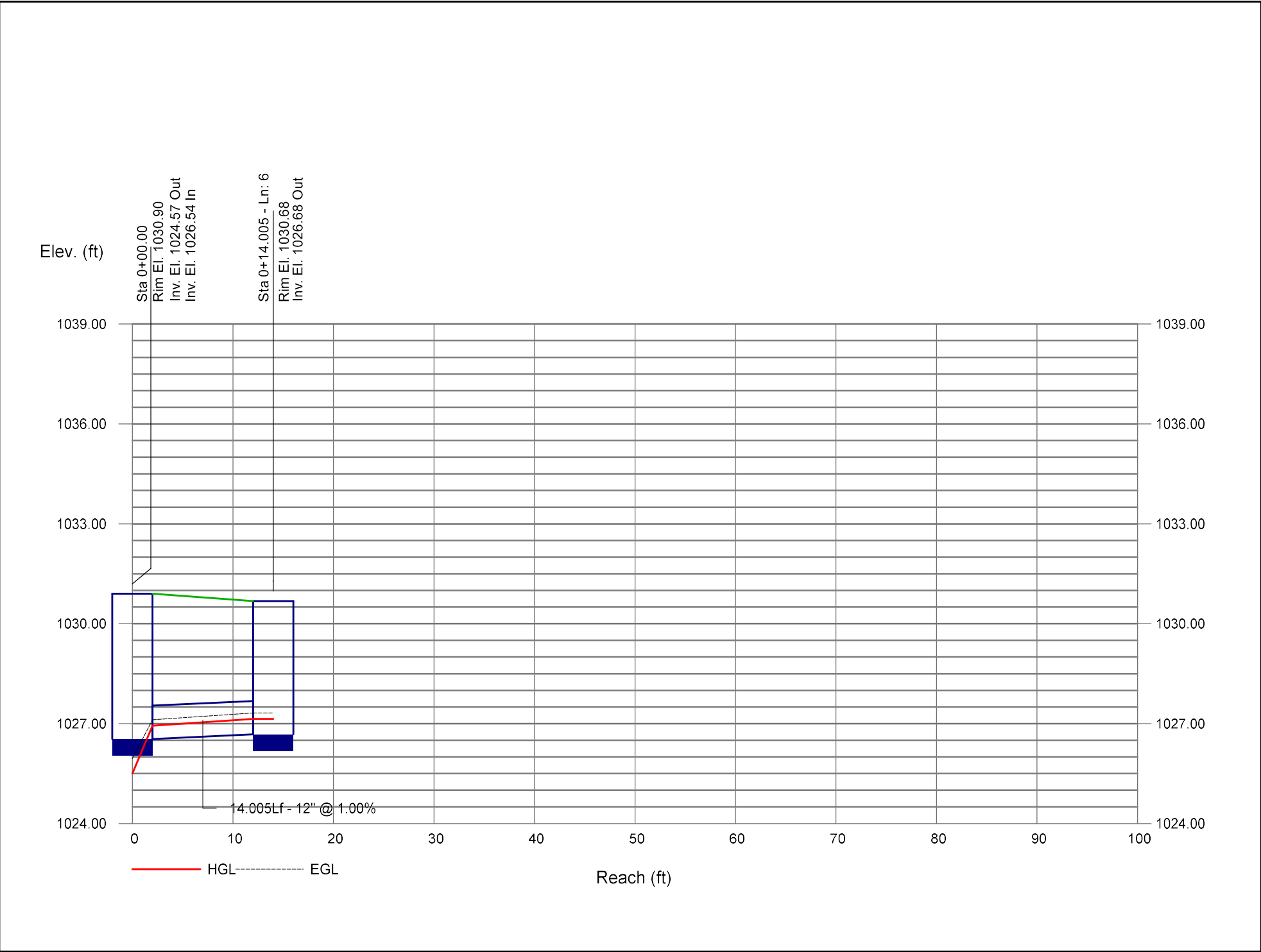
Project File: M24-8767 Storm 10yr_2025-05-22.stm	Number of lines: 10	Date: 5/28/2025
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Line No.	Line ID	DnStm Ln No	Invert Dn	Invert Up	Line Length	Line Slope	Line Size	Capac Full	Known Q	Flow Rate	HGL Dn	HGL Up	Vel Ave	Rim-Hw	
			(ft)	(ft)	(ft)	(%)	(in)	(cfs)	(cfs)	(cfs)	(ft)	(ft)	(ft/s)	(ft)	
1	EXISTING PIPE	Outfall	1023.83	1024.57	73.524	1.01	15	7.02	0.00	5.28	1025.08	1025.50 j	4.85	5.40	
2	EX MH - MH 1	1	1024.77	1026.06	104.527	1.23	12	3.96	0.00	4.09	1025.62	1026.92	5.72	7.59	
3	MH 1 - GCI 2	2	1026.26	1028.78	200.110	1.26	12	4.00	0.38	0.65	1026.92	1029.12 j	2.00	5.28	
4	GCI 2 - MH 3	3	1028.98	1029.89	72.233	1.26	12	4.00	0.00	0.27	1029.16	1030.10	2.55	5.42	
5	MH 3 - GCI 4	4	1030.09	1030.39	23.685	1.27	12	4.01	0.24	0.24	1030.26	1030.59	2.47	4.30	
6	EX MH - CI 5	1	1026.54	1026.68	14.005	1.00	12	3.56	1.19	1.19	1026.94	1027.14	3.73	3.54	
7	MH 1 - GI 6	2	1026.26	1027.89	44.156	3.69	12	6.84	2.59	2.59	1026.92	1028.58	4.62	3.97	
8	MH 1 - MH 7	2	1029.26	1029.90	36.349	1.76	12	4.73	0.79	0.85	1029.55	1030.29	3.80	5.25	
9	MH 7 - TD 8	8	1032.77	1033.57	7.957	10.05	8	4.15	0.06	0.06	1032.83	1033.68	2.92		
10	MH 3 - TD 9	4	1032.60	1034.09	14.945	9.97	8	4.13	0.03	0.03	1032.64	1034.17	2.38		
Project File: M24-8767 Storm 10yr_2025-05-22.stm											Number of lines: 10			Date: 5/28/2025	
NOTES: ** Critical depth															

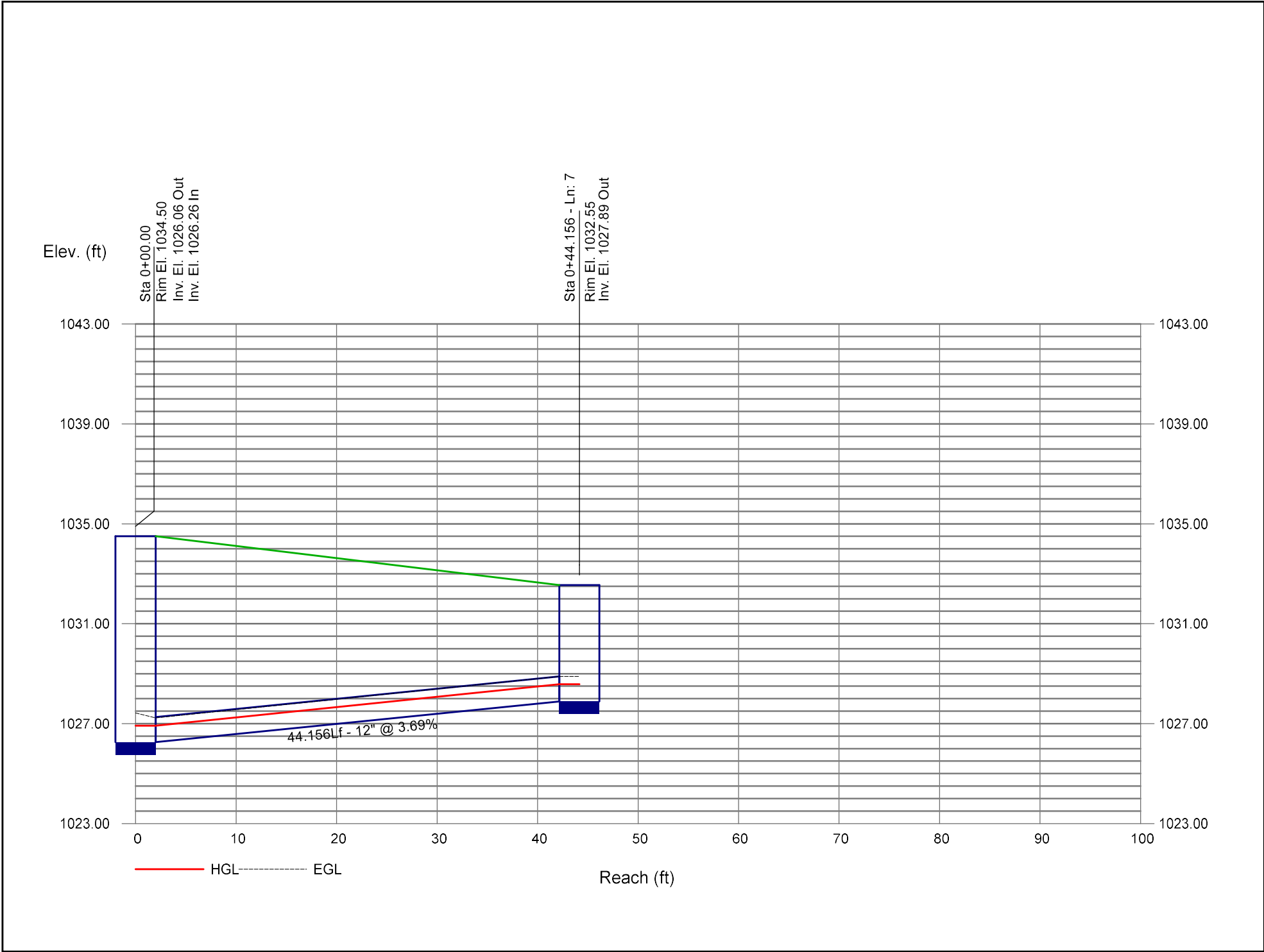
Storm Sewer Profile



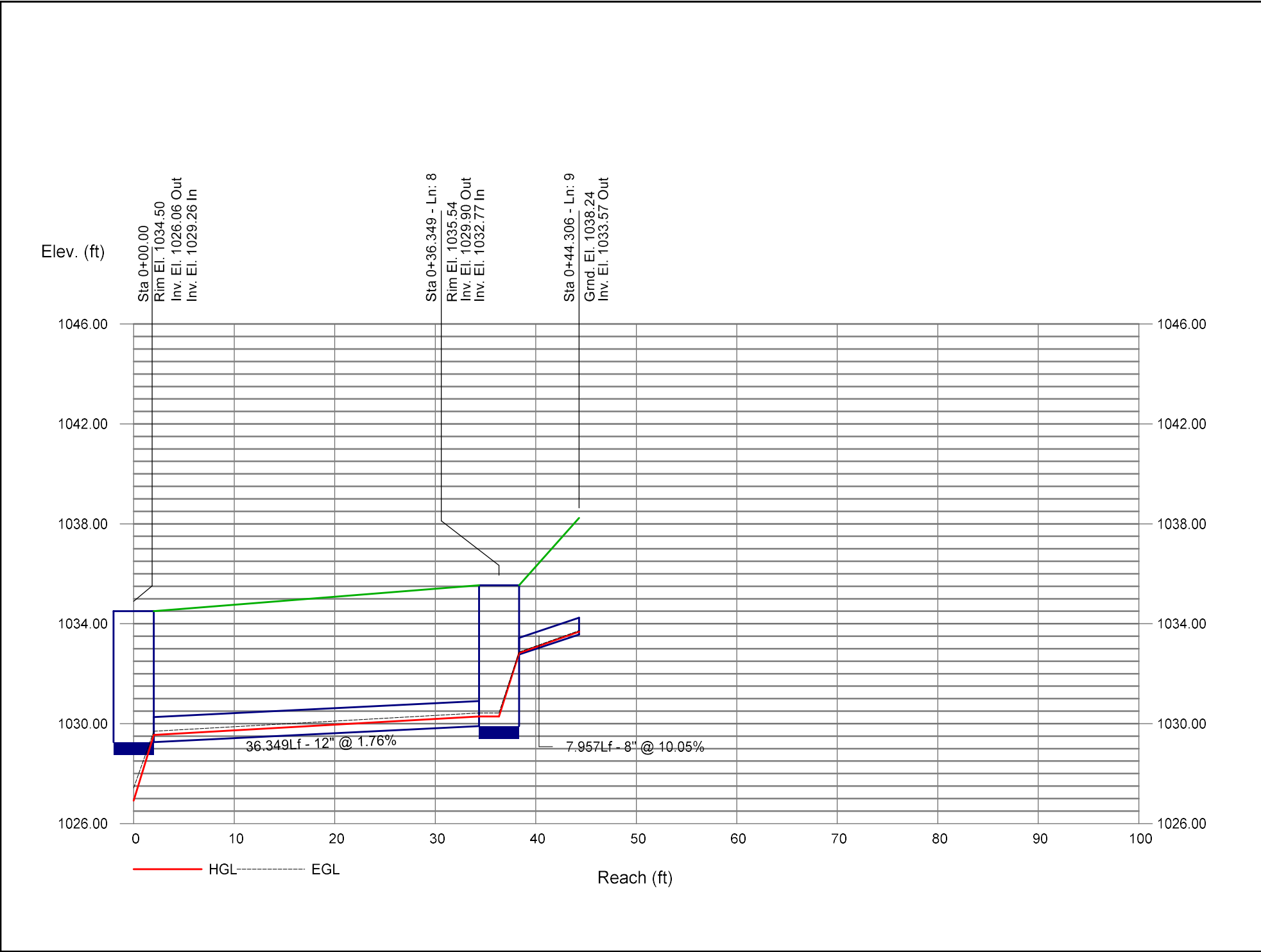
Storm Sewer Profile



Storm Sewer Profile



Storm Sewer Profile



Storm Sewer Profile

