110 East Main St, Georgetown, KY 40324

502.863.1756

# Dan Cummins Parking Lot Addition Drainage Analysis

This report was prepared by Thoroughbred Engineering for Dan Cummins, US 27/US 68 BYPASS RD, Paris, Kentucky. The intent of the following drainage report is to analyze a drainage area totaling 4.80 acres. The stormwater detention is provided for by a detention basin located to the east of the property designed by GRW Engineers, INC. The "Paris Development Drainage Report" created by GRW on November 20, 2006 shall be referenced throughout this report. For specific information regarding the detention basin, reference the drainage analysis report mentioned above. The following report is based on field conditions and the drainage report and Pondpak data created by GRW Engineers.

## Software and Methodology

Carlson Civil Suite 2017 was utilized to design the storm sewer system and model the watershed to determine the pre and post conditions. Predicted peak runoff( $Q_0$ ) was calculated using the Rational Method,

Q<sub>p</sub>= CiA

where,

C = runoff coefficient, variable with land use

i = intensity of rainfall of chosen frequency for a duration equal to time of concentration to

A= area of watershed (acres)

NOAA's National Weather Service Precipitation Frequency Data Surver was used for local precipitation data.

#### Site Statistics

The following table lists the site statistics and hydrologic parameters:

Hydrograph Runoff Input and Results								
Hydrograph Type	Rational		Impervious Percentage	89 %				
Drainage Area	4.80 acres		Pre-Development-C	0.25				
Impervious Area	4.30 acres		Post-Development-C	0.86				
Pervious Area	0.5 acres		GRW Design-C*	0.86				

<sup>\*</sup>See GRW Report for Design runoff coefficient

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The planned development of the site is as follows:

Lot area = 4. 80 acres

Impervious area = 4.30 acres; C = 0.95Vegetative area = 0.50 acres; C = 0.25Total Weighted runoff coefficient C = 0.86

### **Existing Detention Summary**

The existing detention pond was designed by GRW Engineering to capture the runoff from for a developed property with runoff coefficient (C) of 0.86. The actual runoff coefficient of the developed property is 0.86 Since the actual runoff coefficient is not greater than the planned developed condition with a runoff coefficient of 0.86, no additional detention is required.

If you have any questions, please feel free to contact us.

Sincerely,

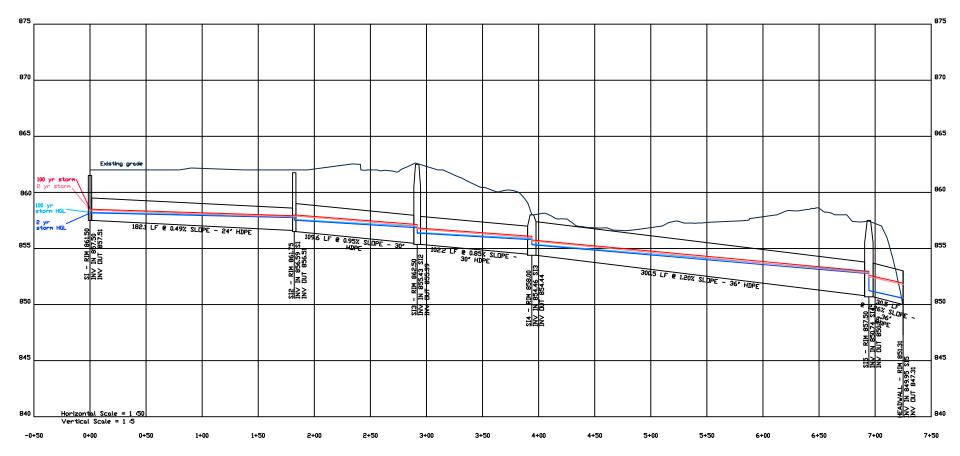
**Thoroughbred Engineering** 

Daniel Rehner, P.E.

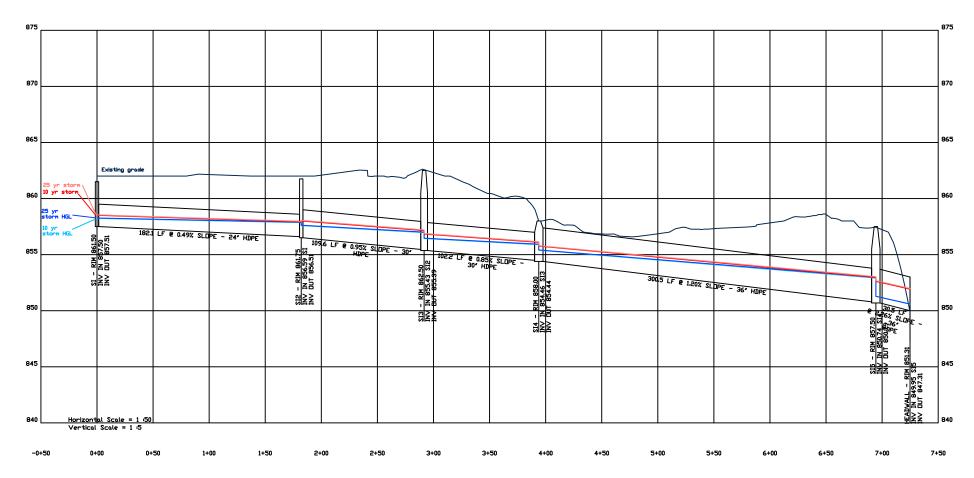
**Project Engineer** 

Darrin Croucher, P.E. Principal Engineer

ami E. Crouler



2-yr/100yr Storm events



10-yr/25yr Storm events

Sewer Network Report - Drainage

#### Thu Aug 09 14:38:17 2018

Sewer Network File: Ground Surface File: Design Method: Hydro Method: Rainfall ID: Return Period:

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Peak Discharge Calculation
Rational Method
NWS
2 YEAR

System A Sewer Line From Upstream to Downstream

Structure Name	Area	Area	Area	Runoff	Tc	Compound	Tc Intensity	Discharge
	(Acres)	(SF)	(SqMiles)	Coefficient	(min)	(min)	(in/hr) (	cfs)
SI	2.44	106204.00	0.00	0.92	10.00	10.00	4.07	9.13
SI2	1.86	81200.00	0.00	0.91	10.00	11.03	3.92	6.90
SI3	0.00	0.00	0.00	0.00	10.00	11. <del>4</del> 7	3.86	0.00
SI4	0.00	0.00	0.00	0.00	10.00	11.88	3.80	0.00
SI5	0.00	0.00	0.00	0.00	10.00	13.43	3.58	0.00
HEADWALL	0.00	0.00	0.00	0.00	0.00	13.49	3.57	0.00

Return Period: 10 YEAR System A Sewer Line From Upstream to Downstream 10 YEAR

Structure Name	Area	Area	Area	Runoff	Tc	Compound	Tc Intensity	Discharge
	(Acres)	(SF)	(SqMiles)	Coefficient	(min)	(min)	(in/hr) (cf:	s)
SI	2.44	106204.00	Ò.ÓO ´	0.92	10.00	10.00	5.26	11.80
SI2	1.86	81200.00	0.00	0.91	10.00	10.97	5.09	8.92
SI3	0.00	0.00	0.00	0.00	10.00	11.39	5.01	0.00
SI4	0.00	0.00	0.00	0.00	10.00	11.78	4.94	0.00
SI5	0.00	0.00	0.00	0.00	10.00	13.28	4.68	0.00
HEADWALL	0.00	0.00	0.00	0.00	0.00	13.33	4.67	0.00

Return Period: 25 YEAR System A Sewer Line From Upstream to Downstream 25 YEAR

Structure Name	Area	Area	Area	Runoff	Tc	Compound	Tc Intensity	Discharge
	(Acres)	(SF)	(SqMiles)	Coefficient	(min)	(min)	(in/hr) (c	fs)
SI	2.44	106204.00	0.00	0.92	10.00	10.00	5.90	13.23
SI2	1.86	81200.00	0.00	0.91	10.00	10.94	5.72	10.01
SI3	0.00	0.00	0.00	0.00	10.00	11.36	5.63	0.00
SI4	0.00	0.00	0.00	0.00	10.00	11.74	5.56	0.00
SI5	0.00	0.00	0.00	0.00	10.00	13.21	5.27	0.00
HEADWALL	0.00	0.00	0.00	0.00	0.00	13.26	5.26	0.00

Return Period: 100 YEA System A Sewer Line From Upstream to Downstream 100 YEAR

Structure Name	Area	Area	Area	Runoff	Tc	Compound	Tc Intensity I	Discharge
	(Acres)	(SF)	(SqMiles)	Coefficient	(min)	(min)	(in/hr) (cfs	) -
SI	2.44	106204.00	0.00	0.92	10.00	10.00	6.85	15.36
SI2	1.86	81200.00	0.00	0.91	10.00	10.91	6.64	11.62
SI3	0.00	0.00	0.00	0.00	10.00	11.32	6.55	0.00
SI4	0.00	0.00	0.00	0.00	10.00	11.69	6.47	0.00
SI5	0.00	0.00	0.00	0.00	10.00	13.12	6.14	0.00
HEADWALL	0.00	0.00	0.00	0.00	0.00	13.17	6.13	0.00

Sewer Network Report - Simple Thu Aug 09 14:40:42 2018

2 YEAR

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Peak Discharge Calculation
Rational Method Sewer Network File:

Ground Surface File:
Design Method:
Hydro Method:
Rainfall ID:

System A

Sewer Line From SI To HEADWALL (Upstream to Downstream)

Name	Station Distance	Invert-In Slope(%)	Invert-Out Size(in)	Rim Elev Min Cover(ft)	Area(SF) Flow Direction	Depth(in)
SI	0+00.00 182.11	0.49	857.50 24.00	861.50 2.50	106204.00 S 81°42'12" E	9.63
SI2	1+82.11 109.59	856.60 0.95	856.50 30.00	861.75 3.00	81200.00 S 84°08'55" E	16.37
SI3	2+91.70 102.22	855.46 0.85	855.36 30.00	862.50 1.01	0.00 N 17'43'14" E	19.53
SI4	3+93.92 300.51	854.49 1.20	854.39 36.00	858.00 0.15	0.00 S 69°06'42" E	18.07
SI5	6+94.42 30.50	850.79 2.26	850.69 36.00	857.50 -3.12	0.00 S 04°19'18" W	27.55
HEADWALL	7+24.93	850.00 2.26	847.31	850.00	0.00	7.43

Sewer Network Report - Simple

Thu Aug 09 14:41:33 2018

Sewer Network File: Ground Surface File: Design Method: Hydro Method: Rainfall ID: Return Period:

10 YEAR

System A

Sewer Line From SI To HEADWALL (Upstream to Downstream)

Name	Station Distance	Invert-In Slope(%)	Invert-Out Size(in)	Rim Elev Min Cover(ft)	Area(SF) Flow Direction	Depth(in)
SI	0+00.00 182.11	0.49	857.50 24.00	861.50 2.50	106204.00 S 81°42'12" E	8.78
SI2	1+82.11 109.59	856.60 0.95	856.50 30.00	861.75 3.00	81200.00 S 84°08'55" E	14.96
SI3	2+91.70 102.22	855.46 0.85	855.36 30.00	862.50 1.01	0.00 N 17°43'14" E	17.96
SI4	3+93.92 300.51	854.49 1.20	854.39 36.00	858.00 0.15	0.00 S 69°06'42" E	16.66
SI5	6+94.42 30.50	850.79 2.26	850.69 36.00	857.50 -3.12	0.00 S 04°19'18" W	25.39
HEADWALL	7+24.93	850.00 2.26	847.31	850.00	0.00	6.95

Sewer Network Report - Simple

Thu Aug 09 14:41:50 2018

Sewer Network File: Ground Surface File:
Design Method:
Hydro Method:
Rainfall ID:
Return Period: C:\Users\djreh\Dropbox (RTC360)\thoroughbred engineering\projects\Dan Cummins — Paris\Civil\Storm Design\Storm djr.sew
C:\Users\djreh\Dropbox (RTC360)\thoroughbred engineering\projects\Dan Cummins — Paris\Civil\Tin Files\FG Merged.tin
Peak Discharge Calculation
Rational Method
NWS
25 YEAR

System A Sewer Line From SI To HEADWALL (Upstream to Downstream)

Name	Station Distance	Invert-In	Invert-Out	Rim Elev	Area(SF) Flow	Depth(in)
SI	0+00.00	Slope(%)	Size(in) 857.50	Min Cover(ft) 861.50	106204.00	9.14
SI2	182.11 1+82.11	0.49 856.60	24.00 856.50	2.50 861.75	S 81°42′12″ E 81200.00	15.55
SI3	109.59 2+91.70	0.95 855.46	30.00 855.36	3.00 862,50	S 84°08'55" E 0.00	18.62
	102.22	0.85	30.00	1.01	N 17"43'14" E	
SI4	3+93.92 300.51	854.49 1.20	854.39 36.00	858.00 0.15	0.00 S 69°06'42" E	17.26
SI5	6+94.42	850.79	850.69	857.50	0.00	26.30
HEADWALL	30.50 7+24.93	2.26 850.00 2.26	36.00 847.31	-3.12 850.00	S 04°19'18" W 0.00	7.16

Sewer Network Report - Simple

Thu Aug 09 14:42:24 2018

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Ground Surface File: C:\Users\djreh\Dropbox (RTC360)\thoroughbred engineering\projects\Dan Cummins — Paris\Civil\Tin

Files\FG Merged.tin
Design Method:
Hydro Method:
Rainfall ID: Peak Discharge Calculation Rational Method NWS 100 YEAR Return Period:

System A

Sewer Line From SI To HEADWALL (Upstream to Downstream)

Name	Station Distance	Invert-In Slope(%)	Invert-Out Size(in)	Rim Elev Min Cover(ft)	Area(SF) Flow	Depth(in)
SI	0+00.00 182.11	0.49	857.50 24.00	861.50 2.50	106204.00 S 81°42'12" E	9.63
SI2	1+82.11 109.59	856.60 0.95	856.50 30.00	861.75 3.00	81200.00 S 84°08'55" E	16.37
SI3	2+91.70 102.22	855.46 0.85	855.36 30.00	862.50 1.01	0.00 N 17'43'14" E	19.53
SI4	3+93.92 300.51	854.49 1.20	854.39 36.00	858.00 0.15	0.00 S 69°06'42" E	18.07
SI5	6+94.42 30.50	850.79 2.26	850.69 36.00	857.50 -3.12	0.00 S 04°19'18" W	27.55
HEADWALL	7+24.93	850.00 2.26	847.31	850.00	0.00	7.43

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esign Method		Peal	k Discharge	Calculation				
lydro Method:			onal Method					
ainfall ID:		NWS						
eturn Period:	•	100	YEAR					
ewer Line Fr	om Upstream	to Downstre	eam					
ipe from SI	to SI2, system	n A						
laterial:		HDP	E					
ection Type:		Circ	ular					
ection Area:		3.14	•	sq.ft				
iameter:		24.0	00 in	•				
lanning's n:		0.01	2					
ength:			2.11 ft					
ope:		0.49						
ull Flow:		17.2						
aximum Flow	v:		18.58	cfs				
otal Flow:		5.18	cfs					
eak Time:		10.9	1 min					
ravel Time:		0.91	min					
nitial Travel 1	līme:		0.63	min				
nitial Flow Ve		4.80	) fps					
ull Flow Velo	city:	5.50						
	Invert	Rim Elev	Cover	HGL	EGL	Flow	Velocity	
		(ft)	(ft)	(ft)	(ft)	Depth(in)(ft/s	9)	
ownstream	856.60 857.50	861.75 861.50	3.15	857.96	858.04	16.37	2.27	
pstream	857.50		2.00	858.30	858.60	9.63	4.40	
	to SI3, syste							
aterial: ection Type:		HDP Circ						
ection Area:		4.91		sq.ft				
iameter:		30.0		34.10				
anning's n:		0.01						
ength:		109.						
ope:		0.95 43.4						
ull Flow:		43.4		-4-				
aximum Flow otal Flow:	v:	12.1	46.69 1 cfs	cfs				
eak Time:		11.3 0.41						
ravel Time:	l'im as	0.41	min 0.24	min				
iitial Travel 1 iitial Flow Ve		7.62		min				
ull Flow Velo		7.02	8.84	fps				
	Invert	Rim Elev	Cover	HGL	EGL	Flow	Velocity	
		(ft)	(ft)	(ft)	(ft)	Depth(in) (ft/s		
ownstream	855.46	862.50	4.54	857.09	857.29	19.53	´ 3.58	
pstream	856.50	861.75	2.75	857.67	858.12	14.02	5.38	
ipe from SI	3 to SI4, syst	em A				Pine for	m SI5 +-	HEADWALL, system A
laterial:	<u> </u>	HD	PF			Material		HDDF

Material:		HDPE			
Section Type	:	Circul	or		
Section Area		4.91		sq.ft	
Diameter:		30.0	0 in	- 4	
Manning's n:		0.012			
		102.			
Length:					
Slope:		0.85			
Full Flow:		41,10			
Maximum Flo	ow:	44.2			
Total Flow:		11.75	cfs		
Peak Time:		11.6	9 min		
Travel Time:		0.37	min		
Initial Travel	Time:	0.23	min		
Initial Flow V		7.28	fps		
Full Flow Vel		8.37	fps		
1 411 1 10 # 461	outy.	0.07	iba		
	Invert	Rim Elev	Cover	HGL	
EGL	Flow	Velocity			
	Elev(ft)	(ft)	(ft)	(ft)	(ft)
Depth(in) (1	ft/s)	` '	• •	• •	• •
Downstream	854.49	858.00	1.01	856.00	
856.22	18.07	3.80		230.00	
Upstream	855.36	862.50	4.64	856.51	
856.95	13.80	5.33	7.07	000.01	
000.90	13.00	0.00			

Material:		HDPE			
Section Type:		Circul	ar		
Section Area:		7.07		sq.ft	
Diameter:			36.00 in		
Manning's n:		0.01			
Length:		30.5			
Slope:		2.20			
Full Flow:		108.9			
Maximum Flo	N:		.22 cfs		
Total Flow:		10.15			
Peak Time:		13.1	13.17 min		
Travel Time:		0.05	min		
Initial Travel	Time:	0.05	min		
Initial Flow Ve	elocity:	9.98	fps		
Full Flow Velo		15.42	fps		
	,c.,,.		.,,,		
	Invert	Rim Elev	Cover	HGL	
EGL	Flow	Velocity			
	Elev(ft)	(ft)	(ft)	(ft)	
Depth(in) (f	t/s)	()	()	()	
Downstream	850.00	850.00	-3.00	850.62	
852.06	7.43	9.64	-3.00	000.02	
			7.04	054.74	
Upstream	850.69	857.50	3.81	851.31	
852.75	7.43	9.64			

(ft)

Pipe	from	SI4	to	SI5,	system	A

sq.ft	

EGL	Invert Flow	Rim Elev Velocity	Cover	HGL	
LOL	Elev(ft)	(ft)	(ft)	(ft)	(ft)
Depth(in) (fi	t/s)				
Downstream	850.79	857.50	3.71	853.09	
853.15	27.55	1.97			
Upstream	854.39	858.00	0.61	855.46	
OFF OC	40.00	E 0.7			

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Sewer Network Report - Pipe
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Invert

Elev(ft) 850.00 850.69

Downstream Upstream

(ft) 850.00 857.50

(ft) -3.00

(ft) 850.60 851.29

(ft) 851.98 852.67

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Peak Discharge Calculation
Rational Method Sewer Network File: Ground Surface File: Design Method: Hydro Method: Rainfall ID: NWS 25 YEAR Return Period: Sewer Line From Upstream to Downstream Pipe from SI to SI2, system A Material: HDPE Circular 3.14 24.00 Section Type: Section Area: sq.ft in Diameter: 0.012 182.11 0.49 17.28 18.58 ft % cfs Length: Slope: Full Flow: Maximum Flow: Total Flow: Peak Time: cfs cfs min 4.68 10.94 0.94 0.65 Travel Time: Initial Travel Time: Initial Flow Velocity: min 4.67 5.50 fps fps Rim Elev Flow Depth(in) 15.55 9.14 Cover HGL EGL Velocity Invert Elev(ft) 856.60 857.50 (ft) 3.15 2.00 (ft) 857.90 858.26 (ft) 857.97 858.54 (ft) 861.75 861.50 (ft/s) 2.17 4.26 Downstream Upstream Pipe from SI2 to SI3, system A HDPE Section Type: Section Area: Circular 4.91 30.00 sq.ft Diameter in Mannina's n: 0.012 109.59 0.95 43.40 46.69 11.17 11.36 ft % cfs cfs cfs Length: Slope: Full Flow: Maximum Flow: Maximum Flow:
Total Flow:
Peak Time:
Travel Time:
Initial Travel Time:
Initial Flow Velocity:
Full Flow Velocity: min 0.42 0.25 7.45 8.84 min fps fps Invert Elev(ft) 855.46 856.50 Rim Elev Cover HGL EGL Velocity (ft) 4.54 2.75 (ft) 857.20 358.05 (ft) 857.01 257.62 Depth(in) (ft/s) 18.62 (ft) 862.50 Downstream Upstream 861.75 Pipe from SI3 to SI4, system A HDPE Circular 4.91 30.00 Material: Section Type: Section Area: sq.ft Diameter: in Diameter:
Manning's n:
Length:
Slope:
Full Flow:
Maximum Flow:
Total Flow:
Peak Time:
Travel Time:
Initial Travel Time:
Initial Flow Velocity:
Full Flow Velocity: 0.012 102.22 0.85 41.10 ft % cfs 44.22 cfs 10.85 11.74 0.38 cfs min min 0.24 7.13 8.37 fps fps min Flow Depth(in) 17.26 13.24 EGL Rim Elev Cover HGL Velocity Invert Elev(ft) 854.49 855.36 (ft) 858.00 862.50 (ft) 1.01 4.64 (ft) 855.93 856.46 (ft) (ft/s) 856.14 856.88 Downstream Upstream Pipe from SI4 to SI5, system A Material: Section Type: Section Area: HDPE Circular 7.07 sq.ft Diamete 36.00 in 0.012 300.51 Manning's n: Manning's n: Length: Slope: Full Flow: Maximum Flow: Total Flow: Peak Time: Travel Time: Initial Travel Time: Initial Flow Velocity: Full Flow Velocity: ft % cfs cfs cfs 1.20 79.30 85.30 10.56 13.21 min 1.47 min 0.64 7.89 11.22 min fps fps Invert Elev(ft) 850.79 854.39 Rim Elev Cover HGL EGL Flow Depth(in) (ft/s) 26.30 12.35 Velocity (ft) 853.04 855.80 (ft) 852.98 255.42 (ft) 3.71 Downstream 858.00 Pipe from SI5 to HEADWALL, system A HDPE Circular 7.07 36.00 Material: Section Type: Section Area: Diameter: sq.ft in Manning's n: Length: Slope: Full Flow: 0.012 30.50 2.26 108.97 ft % cfs 08.97 117.22 9.42 13.26 0.05 0.05 Maximum Flow: Total Flow: cfs cfs cfs min min Total Flow:
Peak Time:
Travel Time:
Initial Travel Time:
Initial Flow Velocity:
Full Flow Velocity: min 9.75 15.42 fps fps Flow Rim Elev Cover HGL EGL

Velocity

Depth(in) (ft/s) 7.16 7.16

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Peck Discharge Calculation Sewer Network File: Ground Surface File: Design Method: Hydro Method: Rational Method Rainfall ID: 10 YEAR Sewer Line From Upstream to Downstream Pipe from SI to SI2, system A Material: HDPE Circular 3.14 24.00 Section Type: Section Area: sq.ft 0.012 182.11 Manning's n: ft % cfs cfs cfs Length: 182.11 0.49 17.28 18.58 4.33 10.97 Slope: Full Flow: Maximum Flow: Total Flow: Peak Time: Travel Time 0.97 Initial Travel Time: Initial Flow Velocity: Full Flow Velocity: 0.66 4.58 5.50 min fps fps Flow Depth(in) (ft/s) 14.96 Rim Elev Cover HGL EGL Velocity (ft) 857.85 58.23 Elev(ft) 856.60 (ft) 861.75 (ft) 3.15 (ft) 857.92 Downstream 8.78 Upstream 857.50 861.50 2.00 858.50 Pipe from SI2 to SI3, system A Material: **HDPE** Section Type: Section Area: Diameter: Circular 4.91 30.00 sq.ft 30.00 30.00 0.012 109.59 0.95 43.40 46.69 10.50 11.39 0.43 0.25 7.32 8.84 in Manning's n: Length: Slope: Full Flow: ft % cfs Full Flow: Maximum Flow: Total Flow: Peak Time: Travel Time: cfs cfs min min Initial Travel Time: Initial Flow Velocity: min fps Full Flow Velocity: Rim Elev Cover HGL EGL Flow Velocity (ft) 856.96 -7 58 Depth(in) (ft/s) 17.96 13.01 Elev(ft) 855.46 856.50 (ft) 862.50 861.75 (ft) 4.54 2.75 (ft) Downstream Upstream 857.14 Pipe from SI3 to SI4, system A Material: HDPE Circular 4.91 30.00 0.012 102.22 Section Type: Section Area: sq.ft in Manning's n: ft % cfs cfs cfs Length: 0.85 41.10 44.22 10.21 11.78 Full Flow: Maximum Flow: Total Flow: Peak Time: min Travel Time:
Initial Travel Time:
Initial Flow Velocity:
Full Flow Velocity: 0.39 0.24 7.00 8.37 min fps fps Flow Depth(in) (ft/s) 16.66 12.82 Rim Elev Cover HGL EGL Velocity Elev(ft) 854.49 (ft) 855.88 (ft) 858.00 862.50 (ft) (ft) 1.01 856.08 3.65 Downstream 855.36 856.43 856.83 Pipe from SI4 to SI5, system A HDPE Material: Section Type: Section Area: Diameter: Circular 7.07 36.00 7.0, 36.00 0.012 300.51 1.20 79.30 85.30 9.93 13.28 1.50 0.65 7.75 sq.ft in Manning's n: Length: ft % cfs Slope: Full Flow: Full Flow:
Maximum Flow:
Total Flow:
Peak Time:
Travel Time:
Initial Travel Time:
Initial Flow Velocity: cfs cfs min min n. fps fps Velocity: Rim Elev Cover HGL EGL Flow Velocity Depth(in) (ft/s) 25.39 11.97 Elev(ft) 850.79 854.39 (ft) 857.50 858.00 (ft) 852.91 855.39 (ft) Downstream Upstream 852.96 855.75 Pipe from SI5 to HEADWALL, system A Material: HDPE Section Type: Section Area: Circular 7.07 36.00 sq.ft Diameter: in 0.012 30.50 2.26 Manning's n: ft % Length: 2.26 108.97 117.22 8.88 13.33 0.05 Full Flow: cfs Maximum Flow: Total Flow: Peak Time: cfs cfs min Travel Time: Initial Travel Time: Initial Flow Velocity: Full Flow Velocity: min 0.05 9.59 15.42 min fps fps

Flow Depth(in) 6.95

6.95

Velocity

(ft/s)

**EGL** 

852.61

(ft)

Rim Elev

(ft) 850.00 857.50

Elev(ft) 850.00 850.69

Downstream Upstream

Cover

(ft) -3.00 3.81

HGL

(ft) 850.58 851.27

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C:\Users\djreh\Dropbox (RTC360)\thoroughbred engineering\projects\Dan Cummins — Paris\Civil\Tin Files\FG Merged.tin
Peak Discharge Calculation
Rational Method Sewer Network File: Sewer Network File:
Ground Surface File:
Design Method:
Hydro Method:
Rainfall ID:
Return Period: NWS 2 YEAR Sewer Line From Upstream to Downstream Pipe from SI to SI2, system A Material: HDPE Section Type: Section Area: Diameter: Circular 3.14 24.00 sq.ft 0.012 Manning's n: ft % cfs cfs cfs min min Length: Slope: Full Flow: 182.11 182.11 0.49 17.28 18.58 3.64 11.03 Maximum Flow: Total Flow: Total Flow:
Peak Time:
Travel Time:
Initial Travel Time:
Initial Flow Velocity:
Full Flow Velocity: 1.03 0.70 4.35 5.50 min fps fps Rim Elev HGL EGL Velocity Depth(in) (ft/s) 13.76 (ft) 857.75 858.17 Elev(ft) 856.60 (ft) 861.75 (ft) 3.15 (ft) 857.81 Downstream 1.95 Upstream 857.50 861.50 8.02 Pipe from SI2 to SI3, system A HDPE Circular 4.91 30.00 Material: Section Type: Section Area: Diameter: sq.ft in Manning's Length: Slope: Full Flow: 0.012 109.59 0.95 43.40 ft % cfs Maximum Flow: Total Flow: Peak Time: 46.69 9.20 11.47 0.44 cfs Travel Time: Initial Travel Time: Initial Flow Velocity: Full Flow Velocity: min 0.26 7.05 8.84 min fps fps Velocity Rim Elev Cover HGL **EGL** Flow Invert Elev(ft) 855.46 856.50 (ft) 862.50 861.75 (ft) 4.54 2.75 Depth(in) 16.62 12.15 (ft) 856.85 857.51 (ft) (ft/s) 857.01 857.89 Downstream Upstream pipe from SI3 to SI4, system A Material: HDPE Circular 4.91 30.00 Section Type: Section Area: sq.ft Diameter: in Manning's n: Length: Slope: Full Flow: 0.012 102.22 0.85 ft % cfs 41.10 Full Flow:
Maximum Flow:
Total Flow:
Peak Time:
Travel Time:
Initial Travel Time:
Initial Flow Velocity:
Full Flow Velocity: crs cfs cfs min 44.22 8.96 11.88 0.40 min 0.25 min fps fps 8.37 HGL EGL Rim Elev Cover Flow Invert Elev(ft) 854.49 855.36 (ft) 858.00 862.50 (ft) 1.01 4.64 (ft) 855.78 856.36 Depth(in) 15.46 11.97 (ft) (ft/s) 855.97 856.73 Downstream Upstream Pipe from SI4 to SI5, system A HDPE Material: Section Type: Section Area: Circular 7.07 sq.ft 36.00 in Manning's n: 0.012 ft % cfs cfs cfs 300.51 Length: 1.20 79.30 85.30 8.73 13.43 Slope:
Full Flow:
Maximum Flow:
Total Flow:
Peak Time:
Travel Time:
Initial Travel Time:
Initial Flow Velocity:
Full Flow Velocity: min 0.67 7.47 11.22 min fps fps Cover Flow Depth(in) 23.52 11.19 Invert Elev(ft) 850.79 854.39 Rim Elev HGL EGL Velocity (ft) 852.75 855.32 (ft) 857.50 858.00 (ft/s) (ft) 3.71 (ft) 852.80 1.78 4.66 Downstream Upstream 855.66 Pipe from SI5 to HEADWALL, system A HDPE Material: Section Type: Section Area: Diameter: Circular 7.07 36.00 sq.ft in 0.012 30.50 2.26 108.97 117.22 Manning's n: Length: Slope: Full Flow: ft % cfs Full Flow:
Maximum Flow:
Total Flow:
Peak Time:
Travel Time:
Initial Travel Time:
Initial Flow Velocity:
Full Flow Velocity: cfs 7.86 13.49 0.06 0.06 cfs min min min n. fps fps 15.42 HGL Rim Elev Cover EGL

(ft) 850.00 857.50

Elev(ft)

Downstream Upstream (ft) -3.00 3.81 (ft) 850.55 851.24 (ft)

851.79 852.48 Depth(in) (ft/s) 6.55 6.55