



BENDER & MODLIN FIRE SPRINKLER
170-G COLLEGE DR
ORANGE PARK, FLORIDA 32073
(904) 298-2637

Job Name : TSC STORE #550 GARDEN CTR
Building : 5359 WEST US HWY 90
Location : LAKE CITY, FLORIDA 32055
System :
Contract :
Data File : TSCLAKECITY.WX2

Hydraulic Design Information Sheet

Name - TRACTOR SUPPLY COMPANY Date - 11/3/22
Location - LAKE CITY, FLORIDA 32055
Building - 5359 WEST US HWY 90 System No. -
Contractor - BENDER & MODLIN FIRE SPRINKLER Contract No. -
Calculated By - DAVID L BLAKE Drawing No. -
Construction: () Combustible (X) Non-Combustible Ceiling Height - VARIES
Occupancy - GARDEN CENTER - OH2

S (X) NFPA 13 () Lt. Haz. Ord.Haz.Gp. () 1 (X) 2 () 3 () Ex.Haz.
Y () NFPA 231 () NFPA 231C () Figure Curve
S Other
T Specific Ruling Made By Date

M Area of Sprinkler Operation - ENTIRE System Type Sprinkler/Nozzle
Density - .2 () Wet Make SSU
D Area Per Sprinkler - 96 (X) Dry Model QR
E Elevation at Highest Outlet - 20.750 () Deluge Size ¾"
S Hose Allowance - Inside - 100 () Preaction K-Factor 8.0
I Rack Sprinkler Allowance - () Other Temp.Rat.200°
G Hose Allowance - Outside - 150

N Note

Calculation Flow Required - 932.377 Press Required - 48.145 AT CITY
Summary C-Factor Used: 100 Overhead 150 Underground

W Water Flow Test: Pump Data: Tank or Reservoir:
A Date of Test - 8/24/22 Cap. -
T Time of Test - 10:20 AM Rated Cap.- Elev.-
E Static Press - 81 @ Press -
R Residual Press - 52 Elev. -
Flow - 943 Well
S Elevation - 0 Proof Flow

U Location - WEST OF 5359 WEST US HWY 90
P
L Source of Information - CITY OF LAKE CITY
Y

C Commodity Class Location
O Storage Ht. Area Aisle W.
M Storage Method: Solid Piled % Palletized % Rack
M
S () Single Row () Conven. Pallet () Auto. Storage () Encap.
R () Double Row () Slave Pallet () Solid Shelf () Non
T A () Mult. Row () Open Shelf
O C
R K Flue Spacing Clearance:Storage to Ceiling
A Longitudinal Transverse
G
E Horizontal Barriers Provided:

Water Supply Curve C

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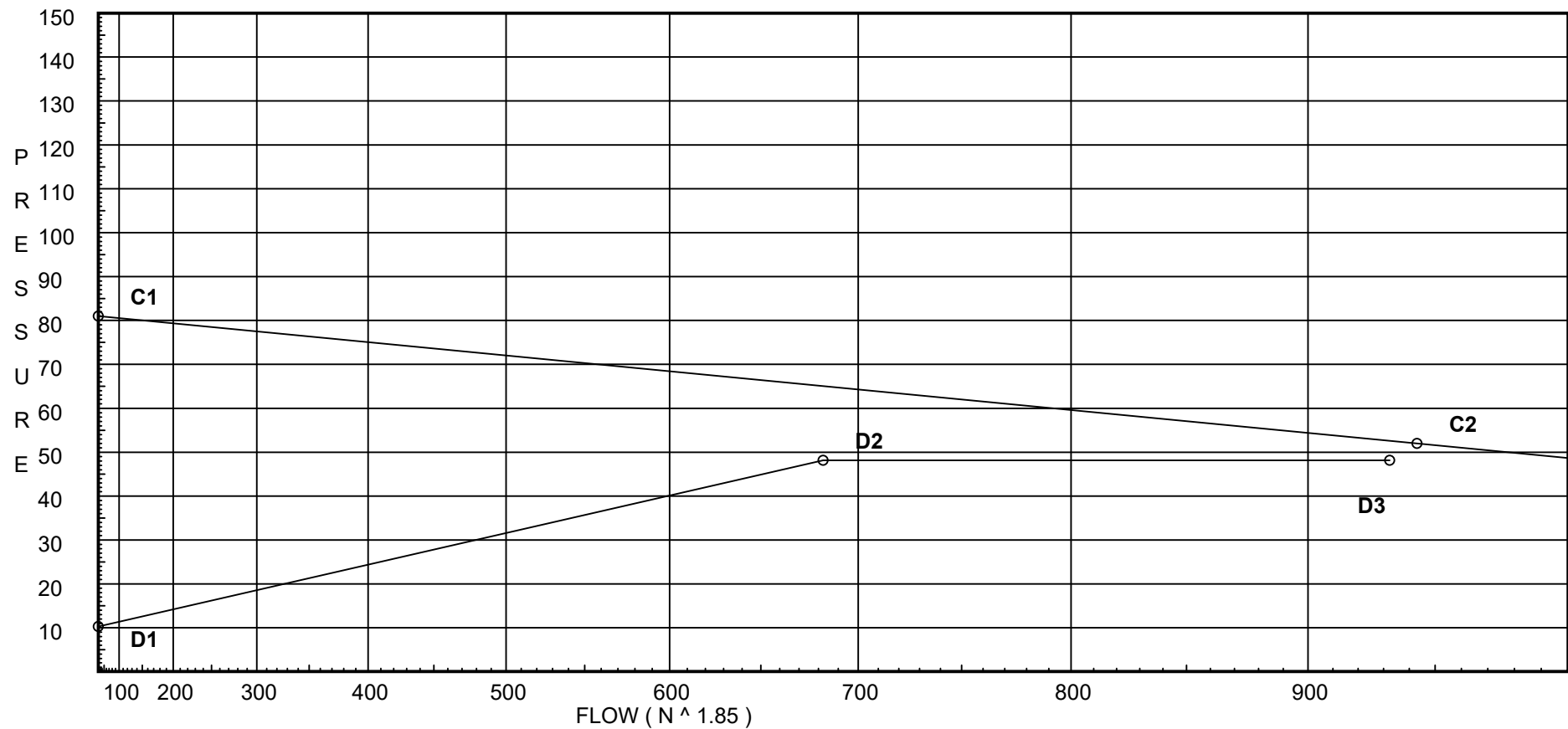
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City Water Supply:

C1 - Static Pressure : 81
C2 - Residual Pressure: 52
C2 - Residual Flow : 943

Demand:

D1 - Elevation : 10.286
D2 - System Flow : 682.377
D2 - System Pressure : 48.144
Hose (Demand) : 250
D3 - System Demand : 932.377
Safety Margin : 4.457



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Figure 1: A diagram illustrating the hierarchical structure of the 2019-2020 season, showing the progression of cases from the initial wave (1-11) to the second wave (12-21) and the third wave (22-31). The diagram is organized into three main sections, each representing a wave of infection. The first section (1-11) shows the initial wave, the second section (12-21) shows the second wave, and the third section (22-31) shows the third wave. The diagram uses arrows to indicate the flow of cases between different groups, and numbers to represent the count of cases. The groups are labeled with numbers (1-31) and letters (R1, R2, R3, R4, M1, M2, M3, M4, M5, TDR, DPV, CON, BOR, STUB, U1, BF1, BF2, U2, CITY). The diagram shows that the number of cases in each wave is increasing, with the third wave (22-31) having the highest number of cases.

```

graph TD
    1 -- 23.6 --> 2
    2 -- 47.4 --> 3
    3 -- 71.5 --> 4
    4 -- 96.3 --> R1
    R1 -- 170.6 --> 7
    7 -- 24.6 --> 6
    6 -- 49.2 --> 5
    5 -- 74.3 --> R1
    R1 -- 170.6 --> M1
    M1 -- 170.6 --> 8
    8 -- 21.2 --> 9
    9 -- 42.4 --> 10
    10 -- 64 --> 11
    11 -- 86.3 --> R2
    R2 -- 152.8 --> 14
    14 -- 22 --> 13
    13 -- 44.1 --> 12
    12 -- 66.6 --> R2
    R2 -- 152.8 --> M2
    M2 -- 152.8 --> 15
    15 -- 24 --> 16
    16 -- 48 --> 17
    17 -- 72.4 --> 18
    18 -- 97.6 --> R3
    R3 -- 172.9 --> 21
    21 -- 24.9 --> 20
    20 -- 49.9 --> 19
    19 -- 75.3 --> R3
    R3 -- 172.9 --> M3
    M3 -- 172.9 --> 22
    22 -- 25.8 --> 23
    23 -- 51.7 --> 24
    24 -- 78 --> 25
    25 -- 105.1 --> R4
    R4 -- 186.1 --> 28
    28 -- 26.8 --> 27
    27 -- 53.7 --> 26
    26 -- 81 --> R4
    R4 -- 186.1 --> M4
    M4 -- 186.1 --> M1
    M1 -- 170.6 --> M2
    M2 -- 323.4 --> M3
    M3 -- 499.3 --> M4
    M4 -- 682.4 --> M5
    M5 -- 682.4 --> TDR
    TDR -- 682.4 --> DPV
    DPV -- 682.4 --> CON
    CON -- 682.4 --> BOR
    BOR -- 782.4 --> STUB
    STUB -- 782.4 --> U1
    U1 -- 782.4 --> BF1
    BF1 -- 782.4 --> BF2
    BF2 -- 782.4 --> U2
    U2 -- 782.4 --> CITY
  
```

Fittings Used Summary

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Fitting Legend

Abbrev.	Name	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12	14	16	18	20	24
B	NFPA 13 Butterfly Valve	0	0	0	0	0	6	7	10	0	12	9	10	12	19	21	0	0	0	0	0
Dvc	Dry Vic 768 NXT					3	9	8	17		21		22	50							
E	NFPA 13 90' Standard Elbow	1	2	2	3	4	5	6	7	8	10	12	14	18	22	27	35	40	45	50	61
F	NFPA 13 45' Elbow	1	1	1	1	2	2	3	3	3	4	5	7	9	11	13	17	19	21	24	28
Fsp	Flow Switch Potter VSR	Fitting generates a Fixed Loss Based on Flow																			
G	NFPA 13 Gate Valve	0	0	0	0	0	1	1	1	1	2	2	3	4	5	6	7	8	10	11	13
L	NFPA 13 Long Turn Elbow	0.5	1	2	2	2	3	4	5	5	6	8	9	13	16	18	24	27	30	34	40
T	NFPA 13 90' Flow thru Tee	3	4	5	6	8	10	12	15	17	20	25	30	35	50	60	71	81	91	101	121
U	45' Ell Grvd Short Radius	0	0	0	0	0	1.8	2.2	2.6	0	3.4	4.2	5	5	2.8	3.2	0	0	0	0	0
V	90' Ell Grvd Short Radius	0	0	0	0	0	3.5	4.3	5	0	6.8	8.5	10	13	4.5	5.1	0	0	0	0	0
Zwc	Watts 709	Fitting generates a Fixed Loss Based on Flow																			

Units Summary

Diameter Units	Inches
Length Units	Feet
Flow Units	US Gallons per Minute
Pressure Units	Pounds per Square Inch

Note: Fitting Legend provides equivalent pipe lengths for fittings types of various diameters. Equivalent lengths shown are standard for actual diameters of Sched 40 pipe and CFactors of 120 except as noted with *. The fittings marked with a * show equivalent lengths values supplied by manufacturers based on specific pipe diameters and CFactors and they require no adjustment. All values for fittings not marked with a * will be adjusted in the calculation for CFactors of other than 120 and diameters other than Sched 40 per NFPA.

Pressure / Flow Summary - STANDARD

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Node No.	Elevation	K-Fact	Pt Actual	Pn	Flow Actual	Density	Area	Press Req.
1	16.58	8	8.73	na	23.64	0.2	96	7.0
2	16.58	8	8.8	na	23.74	0.2	96	7.0
3	16.58	8	9.07	na	24.09	0.2	96	7.0
4	16.58	8	9.65	na	24.85	0.2	96	7.0
7	16.58	8	9.43	na	24.56	0.2	96	7.0
6	16.58	8	9.51	na	24.67	0.2	96	7.0
5	16.58	8	9.79	na	25.04	0.2	96	7.0
R1	16.58		10.79	na				
8	20.75	8	7.0	na	21.17	0.2	96	7.0
9	20.75	8	7.06	na	21.26	0.2	96	7.0
10	20.75	8	7.28	na	21.58	0.2	96	7.0
11	20.75	8	7.75	na	22.27	0.2	96	7.0
14	20.75	8	7.57	na	22.01	0.2	96	7.0
13	20.75	8	7.63	na	22.1	0.2	96	7.0
12	20.75	8	7.87	na	22.44	0.2	96	7.0
R2	20.75		8.68	na				
15	16.58	8	8.97	na	23.96	0.2	96	7.0
16	16.58	8	9.05	na	24.06	0.2	96	7.0
17	16.58	8	9.32	na	24.42	0.2	96	7.0
18	16.58	8	9.91	na	25.19	0.2	96	7.0
21	16.58	8	9.69	na	24.9	0.2	96	7.0
20	16.58	8	9.77	na	25.0	0.2	96	7.0
19	16.58	8	10.06	na	25.38	0.2	96	7.0
R3	16.58		11.08	na				
22	15.75	8	10.39	na	25.79	0.2	96	7.0
23	15.75	8	10.48	na	25.9	0.2	96	7.0
24	15.75	8	10.8	na	26.28	0.2	96	7.0
25	15.75	8	11.47	na	27.09	0.2	96	7.0
28	15.75	8	11.21	na	26.79	0.2	96	7.0
27	15.75	8	11.31	na	26.9	0.2	96	7.0
26	15.75	8	11.65	na	27.3	0.2	96	7.0
R4	15.75		12.81	na				
M1	14.25		14.99	na				
M2	14.25		15.08	na				
M3	14.25		15.37	na				
M4	13.75		17.15	na				
M5	13.75		18.66	na				
TDR	13.75		25.49	na				
DPV	6.0		29.37	na				
CON	7.0		30.09	na				
BOR	1.0		33.77	na	100.0			
STUB	-3.0		35.91	na				
U1	-3.0		40.46	na				
BF1	3.0		38.27	na				
BF2	3.0		43.78	na				
U2	-3.0		46.67	na				
CITY	-3.0		48.14	na	150.0			

The maximum velocity is 16.34 and it occurs in the pipe between nodes R4 and M4

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
1 to 2	16.580 16.580	8.00	23.64	2	0.0 0.0 0.0	10.000 0.0 10.000	100	8.729 0.0 0.074			
									Vel =	2.08	
2 to 3	16.580 16.580	8.00	23.73	2	0.0 0.0 0.0	10.000 0.0 10.000	100	8.803 0.0 0.268			
									Vel =	4.16	
3 to 4	16.580 16.580	8.00	24.10	2	0.0 0.0 0.0	10.000 0.0 10.000	100	9.071 0.0 0.575			
									Vel =	6.27	
4 to R1	16.580 16.580	8.00	24.84	2	T 8.783 0.0	2.670 8.783 11.453	100	9.646 0.0 1.143			
									Vel =	8.46	
R1			0.0 96.31					10.789		K Factor =	29.32
7 to 6	16.580 16.580	8.00	24.56	2	0.0 0.0 0.0	10.000 0.0 10.000	100	9.427 0.0 0.080			
									Vel =	2.16	
6 to 5	16.580 16.580	8.00	24.67	2	0.0 0.0 0.0	10.000 0.0 10.000	100	9.507 0.0 0.288			
									Vel =	4.32	
5 to R1	16.580 16.580	8.00	25.04	2	T 8.783 0.0	7.330 8.783 16.113	100	9.795 0.0 0.994			
									Vel =	6.52	
R1 to M1	16.580 14.250		96.31	2	T 8.783 0.0	2.330 8.783 11.113	100	10.789 1.009 3.193			
									Vel =	14.98	
M1			0.0 170.58					14.991		K Factor =	44.06
8 to 9	20.750 20.750	8.00	21.17	2	0.0 0.0 0.0	10.000 0.0 10.000	100	7.000 0.0 0.060			
									Vel =	1.86	
9 to 10	20.750 20.750	8.00	21.25	2	0.0 0.0 0.0	10.000 0.0 10.000	100	7.060 0.0 0.219			
									Vel =	3.72	
10 to 11	20.750 20.750	8.00	21.59	2	0.0 0.0 0.0	10.000 0.0 10.000	100	7.279 0.0 0.469			
									Vel =	5.62	
11 to R2	20.750 20.750	8.00	22.27	2	T 8.783 0.0	2.670 8.783 11.453	100	7.748 0.0 0.932			
									Vel =	7.58	
R2			0.0 86.28					8.680		K Factor =	29.29
14 to 13	20.750 20.750	8.00	22.01	2	0.0 0.0 0.0	10.000 0.0 10.000	100	7.569 0.0 0.065			
									Vel =	1.93	
13 to 12	20.750 20.750	8.00	22.10	2	0.0 0.0 0.0	10.000 0.0 10.000	100	7.634 0.0 0.235			
									Vel =	3.87	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Equiv Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
12 to R2	20.750 20.750	8.00	22.44 66.55	2 2.157	T 0.0	8.783 8.783	100 0.0503	7.869 0.0			
R2 to M2	20.750 14.250		86.28 152.83	2 2.157	T 0.0	8.783 8.783	100 0.2345	8.680 2.815	Vel = 5.84		
M2			0.0 152.83					15.079		K Factor = 39.36	
15 to 16	16.580 16.580	8.00	23.96 23.96	2 2.157	0.0 0.0	10.000 0.0	100 0.0076	8.970 0.0	Vel = 2.10		
16 to 17	16.580 16.580	8.00	24.06 48.02	2 2.157	0.0 0.0	10.000 0.0	100 0.0276	9.046 0.0	Vel = 4.22		
17 to 18	16.580 16.580	8.00	24.43 72.45	2 2.157	0.0 0.0	10.000 0.0	100 0.0589	9.322 0.0	Vel = 6.36		
18 to R3	16.580 16.580	8.00	25.18 97.63	2 2.157	T 0.0	8.783 8.783	100 0.1023	9.911 0.0	Vel = 8.57		
R3			0.0 97.63					11.083		K Factor = 29.33	
21 to 20	16.580 16.580	8.00	24.90 24.9	2 2.157	0.0 0.0	10.000 0.0	100 0.0082	9.686 0.0	Vel = 2.19		
20 to 19	16.580 16.580	8.00	25.00 49.9	2 2.157	0.0 0.0	10.000 0.0	100 0.0296	9.768 0.0	Vel = 4.38		
19 to R3	16.580 16.580	8.00	25.38 75.28	2 2.157	T 0.0	8.783 8.783	100 0.0632	10.064 0.0	Vel = 6.61		
R3 to M3	16.580 14.250		97.63 172.91	2 2.157	T 0.0	8.783 8.783	100 0.2946	11.083 1.009	Vel = 15.18		
M3			0.0 172.91					15.366		K Factor = 44.11	
22 to 23	15.750 15.750	8.00	25.79 25.79	2 2.157	0.0 0.0	10.000 0.0	100 0.0088	10.392 0.0	Vel = 2.26		
23 to 24	15.750 15.750	8.00	25.90 51.69	2 2.157	0.0 0.0	10.000 0.0	100 0.0315	10.480 0.0	Vel = 4.54		
24 to 25	15.750 15.750	8.00	26.28 77.97	2 2.157	0.0 0.0	10.000 0.0	100 0.0675	10.795 0.0	Vel = 6.85		
25 to R4	15.750 15.750	8.00	27.10 105.07	2 2.157	T 0.0	8.783 8.783	100 0.1173	11.470 0.0	Vel = 9.23		

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
R4			0.0 105.07						12.813		K Factor = 29.35	
28 to 27	15.750 15.750	8.00	26.79	2		0.0 0.0	10.000 0.0	100	11.214 0.0			
27 to 26	15.750 15.750	8.00	26.90	2		0.0 0.0	10.000 0.0	100	11.307 0.0		Vel = 2.35	
26 to R4	15.750 15.750	8.00	53.69	2.157		0.0 0.0	10.000 0.0	0.0339	0.339		Vel = 4.71	
26 to R4	15.750 15.750	8.00	27.30	2	T	8.783 0.0	7.330 8.783	100	11.646 0.0			
R4 to M4	15.750 13.750		80.99	2.157		0.0 0.0	16.113 8.783	0.0724	1.167		Vel = 7.11	
R4 to M4	15.750 13.750		105.07	2	T	8.783 0.0	1.500 8.783	100	12.813 0.866			
M4			0.0 186.06						17.148		K Factor = 44.93	
M1 to M2	14.250 14.250		170.58	4		0.0 0.0	8.420 0.0	100	14.991 0.0			
M2 to M3	14.250 14.250		170.58	4.26		0.0 0.0	8.420 0.0	0.0105	0.088		Vel = 3.84	
M2 to M3	14.250 14.250		152.83	4		0.0 0.0	8.420 0.0	100	15.079 0.0			
M3 to M4	14.250 13.750		323.41	4.26		0.0 0.0	8.420 0.0	0.0341	0.287		Vel = 7.28	
M3 to M4	14.250 13.750		172.91	4	2V	12.78 0.0	8.000 12.780	100	15.366 0.217			
M4 to M5	13.750 13.750		496.32	4.26		0.0 0.0	20.780 11.100	0.0753	1.565		Vel = 11.17	
M4 to M5	13.750 13.750		186.06	4	V	6.39 0.0	4.710 6.390	100	17.148 0.0			
M5 to TDR	13.750 13.750		682.38	4.26		0.0 0.0	11.100 50.296	0.1359	1.508		Vel = 15.36	
M5 to TDR	13.750 13.750		0.0	4	U V	3.195 6.39	40.710 9.586	100	18.656 0.0			
TDR to DPV	13.750 6		682.38	4.26		0.0 0.0	50.296 27.491	0.1358	6.829		Vel = 15.36	
TDR to DPV	13.750 6		0.0	6	Dvc	19.742 0.0	7.750 19.741	100	25.485 3.357			
DPV to CON	6 7		682.38	6.357		0.0 0.0	27.491 75.440	0.0193	0.531		Vel = 6.90	
DPV to CON	6 7		0.0	6	B 2V	12.573 25.147	8.000 75.440	120	29.373 -0.433			
CON to BOR	7 1		682.38	6.357	T	37.72 0.0	83.440 6.000	0.0138	1.151		Vel = 6.90	
CON to BOR	7 1		0.0	6	Fsp	0.0 0.0	6.000 0.0	120	30.091 3.599			
BOR to STUB	1 -3	H100	682.38	6.357		0.0 0.0	6.000 11.756	0.0138	0.083		* * Fixed Loss = 1 Vel = 6.90	
BOR to STUB	1 -3	H100	100.00	6	L	11.756 0.0	12.000 11.756	120	33.773 1.732			
STUB to U1	-3 -3		782.38	6.407		0.0 0.0	23.756 260.396	0.0171	0.406		Vel = 7.79	
STUB to U1	-3 -3		0.0	6	2F L	17.893 11.503	231.000 29.396	150	35.911 0.0			
U1 to BF1	-3 3		782.38	5.86		0.0 0.0	260.396 20.084	0.0175	4.552		Vel = 9.31	
U1 to BF1	-3 3		0.0	6	E	20.084 0.0	6.000 20.084	140	40.463 -2.599			
BF1	3		782.38	6.16		0.0	26.084	0.0156	0.406		Vel = 8.42	

Final Calculations : Hazen-Williams

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Node1 to Node2	Elev1 Elev2	K Fact	Qa Qt	Nom Act	Fitting or Eqiv	Len	Pipe Ftngs Total	CFact Pf/Ft	Pt Pe Pf	*****	Notes	*****
BF1 to BF2	3 3		0.0 782.38	6 6.065	Zwc E	0.0 14.0	1.000 14.000	120	38.270 5.173		* * Fixed Loss = 5.173	
						0.0	15.000	0.0223	0.335		Vel = 8.69	
BF2 to U2	3 -3		0.0 782.38	6 6.16	L	12.911 0.0	6.000 12.911	140	43.778 2.599			
						0.0	18.911	0.0155	0.294		Vel = 8.42	
U2 to CITY	-3 -3		0.0 782.38	6 6.09	F G T	10.791 4.625 46.249	40.000 61.665 101.665	150	46.671 0.0 1.473			
								0.0145			Vel = 8.62	
CITY			150.00 932.38						48.144		Qa = 150.00 K Factor = 134.38	