



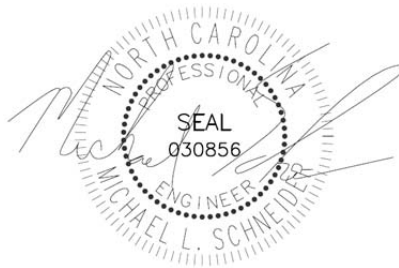
Piedmont Land Design, LLP

8522-204 Six Forks Road ♦ Raleigh, NC 27615 ♦ (919) 845-7600 ♦ Fax: (919) 845-7703

Water System Analysis

FOR:

Weaver's Pointe Subdivision



04-17-24

Narrative:

The proposed residential project is located on a 43.10 acre vacant, mostly wooded lot. The proposed development includes construction of 87 single family residential properties. The site is located in Zebulon, NC. The proposed water distribution system will tie to the existing 12” water lines located in the southern and eastern existing road stubs, and be extended into the development. A water system analysis has been performed in order to verify that the system meets all applicable rules regarding minimum pressures and flows.

Procedure:

KY Pipe software was used to model the proposed water system. A pressure supply was used to simulate the existing system conditions, as determined by a hydrant flow test (results are included in Appendix A). The software analyses each hydrant junction in the model by determining the flow that is available at each junction. The model is then run to verify that the required minimum pressure of 30 psi is maintained for non-fire flow conditions.

Fire Flow Requirements:

Per a meeting with the Garner Fire Department, a minimum system pressure of 20 psi shall be maintained, while providing a 500 gpm fire flow at each new hydrant.

Domestic Demand only Requirements:

The NCDEQ requirements state that a minimum pressure of 30 psi be maintained in the proposed system for domestic demands (non-fire flow). The model was run using domestic demands only to verify that the pressure at all nodes exceeds 30 psi. A domestic demand of 1.3 gpm per lot was included, to represent the peak hour demand. The domestic demand was determined from the State Rules 15ANCAC 18C .0802 (table provided in Appendix D)

The domestic demands for the 87 single family lots were applied at the appropriate junctions in the system.

Results:

The analysis shows that all hydrant junctions exceed the required flow of 500 gpm at a pressure of 20 psi. The provided flow at 20 psi ranges from 1,202 psi to 1,519 psi. The fire flow results are provided in Appendix C. The results also show that a minimum pressure of 30 psi is maintained in the proposed system for domestic demands only (non-fire flow). The non-fire flow results are provided in Appendix D.

Appendix A
Hydrant Flow Test



TEST LOCATION

Address/Location Description 600 Yulee Drive, Zebulon
Test hydrant Facility ID WHYD 186269
Flow hydrant Facility ID WHYD 186267

APPLICATION INFORMATION

Name Futrell Development, LLC
Address 4020 Wake Forest Road, Suite 102F, Raleigh, NC 27609
Contact Person Grey Berry Phone 919.606.8956
Email grey@futrellproperty.com

SYSTEM INFORMATION

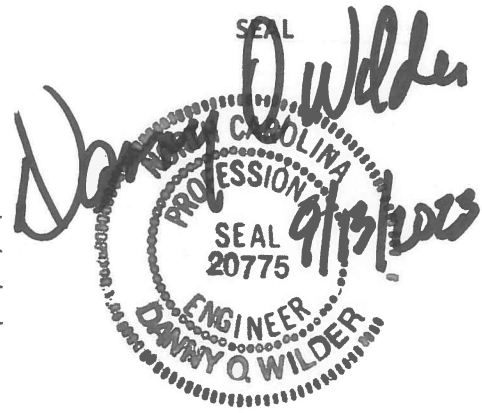
Test Date September 13, 2023 Time of Test 11:30 AM
Nearest Elevated Tank Green Pace Test Hydrant Elevation 368' +/-
Main Size 12" Pressure Zone 462'
Tank Hydraulic Grade 449.3' Use 20ft below pressure zone (tank overflow) for design*
Pump Info Wendell Bypass P1 Theoretical Pressure 35.2 psi

RESULTS

Static Pressure 36 psi Number of Outlets Flowing 2
Residual Pressure 29 psi Flow Hydrant Discharge Pressure 9,10 psi
Outlet Diameter 2 inches Volume of Discharge 494 + 521 = 1,015 gpm
Water usage during test 5,100 +/- Total Gal

Test Completed by: Drew King & Danny Wilder
Testing Company: Associated Fire Protection
Checked by: N/A
Date 9/13/2023

Notes: Flowed (2) 2-1/2" Hose Monster(s)
with 2" Pitotless Nozzle(s). C = 1.38



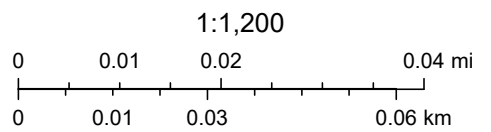
- Please attach the following supporting documentation to this form;
- Labeled map of location of test identifying test hydrant and flow hydrant
- Calculation demonstrating how the discharge flow was determined
- Calculation demonstrating the available fire flow at a residual pressure of 20 psi
- Printout of any recorded data supporting the static and residual pressure at the test hydrant.
- Printout of any recorded data supporting the discharge pressure of the flow hydrant.

*To maintain system water quality, storage tanks may be maintained as low as 20' below overflow.

600 Yulee Drive



9/8/2023, 10:41:50 AM



Lee Kimmel, Sarah Lanier, Andrew Hayes, City of Raleigh GIS

Hydrant Flow Test Report

Test Date 9/13/2023

Test Time 11:30 AM

Location

Purdy Family Property
600 Yulee Drive
Zebulon, NC

Tested by

Associated Fire Protection
PO Box 28022
Raleigh, NC 27611
DKing@afp-nc.com
919-906-5236

Notes

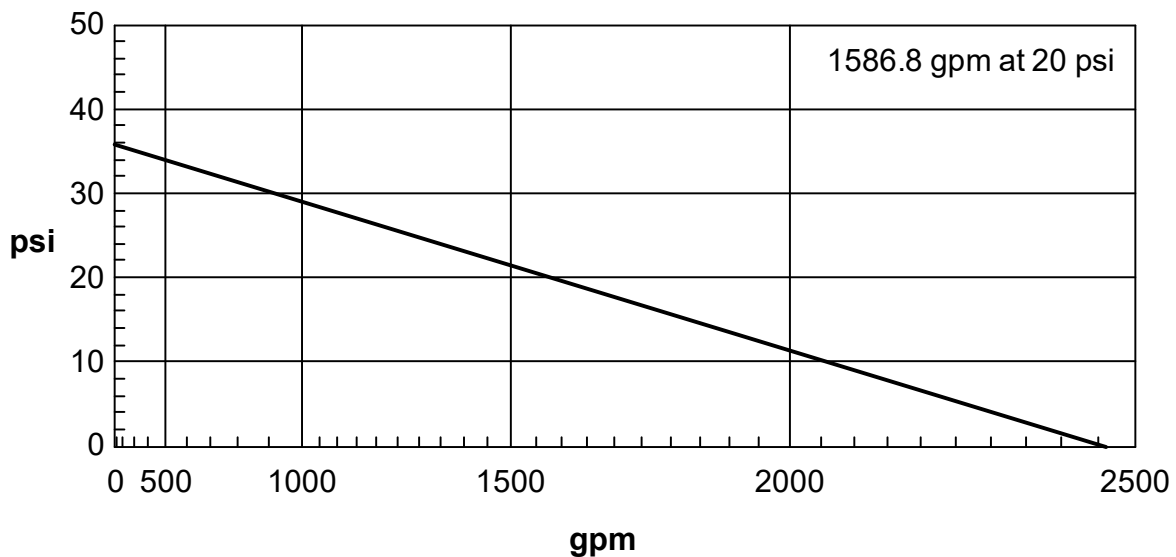
Read Hydrant

36 psi **static pressure**
29 psi **residual pressure**
368 ft **hydrant elevation**

Flow Hydrant(s)

Outlet	Elev	Size	C	Pitot Pressure	Flow
#1	360	2	1.38	9	494 gpm
#2	360	2	1.38	10	521 gpm
Total					1015 gpm

Flow Graph





2"

PITOTLESS NOZZLE™

 PN2THD

FLOW CHART

10 - 40 PSI			41 - 70 PSI			Key Flow Test Points		
2 1/2" Hose Monster Model II			2 1/2" Hose Monster Model II			2 1/2" Hose Monster Model II		
Open Atmosphere			Open Atmosphere			Open Atmosphere		
PSI	GPM	GPM	PSI	GPM	GPM	GPM	PSI	PSI
10	521	529	41	1055	1071	500	9.5	9.1
11	547	555	42	1068	1084	562.5	11.7	11.3
12	571	579	43	1081	1096	750	20.7	20.1
13	594	603	44	1093	1109	1000	36.8	35.8
14	617	626	45	1106	1122	1125	46.6	45.3
15	638	648	46	1118	1134	1500	82.8	80.5
16	659	669	47	1130	1146			
17	679	689	48	1142	1158			
18	699	709	49	1154	1170			
19	718	729	50	1165	1182			
20	737	748	51	1177	1194			
21	755	766	52	1188	1206			
22	773	784	53	1200	1217			
23	790	802	54	1211	1229			
24	807	819	55	1222	1240			
25	824	836	56	1233	1251			
26	840	853	57	1244	1262			
27	856	869	58	1255	1273			
28	872	885	59	1266	1284			
29	887	900	60	1277	1295			
30	903	916	61	1287	1306			
31	918	931	62	1298	1317			
32	932	946	63	1308	1327			
33	947	960	64	1318	1338			
34	961	975	65	1329	1348			
35	975	989	66	1339	1358			
36	989	1003	67	1349	1369			
37	1002	1017	68	1359	1379			
38	1016	1031	69	1369	1389			
39	1029	1044	70	1379	1399			
40	1042	1057						

The readings on this chart are based on which device the Pitotless Nozzle is connected to. It is the user's responsibility to verify that the correct chart and column is being used.

- 2 1/2" Hose Monster Model II or Flusher with flow splitter (HM2H, HM2HF). Use this column if the Pitotless Nozzle is connected to the 2 1/2" Hose Monster or Flusher. The built-in pitot or flow splitter must be installed for accuracy. If you do not have the built-in pitot or flow splitter, please contact us.
- Open Atmosphere. Use this column when the Pitotless Nozzle is connected directly to a test header or hydrant flowing openly to atmosphere.

This chart is FM Approved for flow rate accuracy. Please call us or instruct the Authority Having Jurisdiction to call us if there are any questions. Additional copies of flow charts are available at: www.hosemonster.com/literature.html



Division of Hydro Flow Products, Inc. Updated Jun. 2015

$Q = \sqrt{P} \times K$
 $K = 164.8$
 3psi ≈ 285 gpm
 4 ≈ 330
 5 ≈ 369
 6 ≈ 404
 7 ≈ 436
 8 ≈ 466
 9 ≈ 494

MANUFACTURED BY:
 Hydro Flow Products, Inc.
 888.202.9987 TOLL FREE
 847.434.0073 FAX
 Service@FlowTest.com EMAIL
 www.HoseMonster.com
 U. S. Patent # 6,874,375

Calculating Flow-rates

The flow charts we provide with the Pitotless Nozzle™, Hose Monster® and Nozzle Inserts are correct and should be referred to first. Our flow charts are calculated using K-Factors derived from testing performed at FM Approvals. It is common for third-party software to use the pitot formula to compute flow-rate. The 2½" Hose Monster uses a pitot to measure velocity pressure. The Pitotless Nozzle and 4" and 4½" Hose Monsters do not use a pitot, and the pitot formula has to be tricked into calculating correct flow-rates. Entering the coefficients into a program that uses orifice diameter, coefficient and velocity pressure should give relatively accurate flow-rates. Check results against our flow charts.

Here are the equations used for calculating flow-rates and predicting flow-rates. Use the orifice diameter, coefficient or K-factor found on the next page.

K-factor Formula

Computes a flow-rate in GPM given a psi and a K-factor of the flow device.

$$Q = \sqrt{P} \times K$$

Q = flow-rate in GPM, P = velocity pressure in psi, K = K-factor of flow device

Pitot Formula

Computes a flow-rate in GPM given a psi and coefficient of the flow device.

$$Q = 29.84 \times \sqrt{P} \times D^2 \times C$$

Q = flow-rate in GPM, P = velocity pressure in psi, D = orifice diameter in inches
C = coefficient of flow device

Equation for Determining Rated Capacity

Computes the flow-rate available at a specified residual pressure (a.k.a. Rated Capacity).

The example below enables you to find the predicted flow-rate at 20 psi residual pressure.

$$Q_R = Q_F \times (H_R^{0.54} / H_F^{0.54})$$

Q_R = Flow-rate predicted at the desired residual pressure in GPM

Q_F = Total test flow-rate measured during test in GPM
(GPM measured from Hose Monster or Pitotless Nozzle)

H_R = Pressure drop from static pressure to desired residual pressure
(Static – 20 psi [if 20 psi is the desired residual pressure])

H_F = Actual pressure drop measured during the test (Static – Actual Residual)

(Source: NFPA 291, 2010)

Conversion Factors

Here are some conversion factors for switching between US and metric units:

Flow-rate:

US Gallons per Minute x 3.785 = Liters per Minute
Liters per Minute x 0.264 = US Gallons per Minute

US Gallons per Minute x 0.1337 = Cubic Feet per Minute
Cubic Feet per Minute x 7.481 = US Gallons per Minute

Volume:

US Gallons x 3.785 = Liters
Liters x 0.264 = US Gallons

US Gallons x 0.8327 = Imperial Gallons
Imperial Gallons x 1.201 = US Gallons

Cubic Feet x 7.48051945 = US Gallons
US Gallons x 0.1337 = Cubic Feet

Pressure:

psi x 0.0689 = Bars
Bars x 14.5038 = psi

psi x 6894.757 = Pascals
Pascals x 0.000145 = psi

Bars x 100,000 = Pascals
Pascals x 0.00001 = Bars

Weight of Water:

US Gallons of Water x 8.3454 = Pounds
Cubic Feet of Water x 62.42796 = Pounds

Length:

Meters x 3.2808 = Feet
Feet x 0.3048 = Meters

Coefficient and K-Factor Table for Various Flow Devices

last update: 2/14/2012

Pitotless Nozzle™

Device	K-factor	Coefficient	Orifice Diameter	psi Range	Flow Range (GPM)
2" Pitotless Nozzle + Little Hose Monster™	156.0	1.31	2"	10-70	490-1300
2" Pitotless Nozzle + 2½" Hose Monster Steel	164.8	1.38	2"	10-80	520-1380
2" Pitotless Nozzle + Open Atmosphere	167.2	1.40	2"	10-70	530-1400
1¾" Pitotless Nozzle + Little Hose Monster	104.7	1.15	1.75"	10-90	330-1000
1¾" Pitotless Nozzle + 2½" Hose Monster Steel	106.6	1.17	1.75"	10-90	340-1010
1¾" Pitotless Nozzle + Open Atmosphere	109.7	1.20	1.75"	10-90	350-1040
1½" Pitotless Nozzle + Little Hose Monster	37.2	0.98	1.125"	5-90	80-350
1½" Pitotless Nozzle + 2½" Hose Monster Steel	37.4	0.99	1.125"	5-90	80-350
1½" Pitotless Nozzle + Open Atmosphere	37.0	0.98	1.125"	5-90	80-350
1" Pitotless Nozzle + Little Hose Monster	27.2	0.91	1"	3-90	50-260
1" Pitotless Nozzle + 2½" Hose Monster Steel	27.6	0.93	1"	3-90	50-260
1" Pitotless Nozzle + Open Atmosphere	27.7	0.93	1"	3-90	50-260

In-Line Pitotless Nozzle™

Device	K-factor	Coefficient	Orifice Diameter	psi Range	Flow Range (GPM)
2" In-line Pitotless Nozzle	165.3	1.38	2"	10-75	530-1430
1¾" In-line Pitotless Nozzle	109.9	1.20	1.75"	5-80	250-980
1½" In-line Pitotless Nozzle	38.4	1.02	1.125"	5-70	90-320

BigBoy Hose Monster™

Device	K-factor	Coefficient	Orifice Diameter	psi Range	Flow Range (GPM)
4 to 10 psi (BigBoy Hose Monster)	382.9	1.38	3.05"	4-10	766-1211
11 to 36 psi (BigBoy Hose Monster)	376.0	1.35	3.05"	11-36	1247-2256
37 to 53 psi (BigBoy Hose Monster)	372.0	1.34	3.05"	37-53	2263-2708

Note: Due to the shape and size of the BigBoy Pitotless Nozzle, the BigBoy Hose Monster uses three different k-factors over its operating range.

2½" Hose Monster®

Device	K-factor	Coefficient	Orifice Diameter	psi Range	Flow Range (GPM)
2½" Hose Monster	168.67	0.906	2.5"	10-75	530-1460
1¾" Nozzle Insert	89.04	0.975	1.75"	10-75	280-770
1½" Nozzle Insert	37.36	0.99	1.125"	10-75	120-320

4" and 4½" Hose Monster®

Device	K-factor	Coefficient	Orifice Diameter	psi Range	Flow Range (GPM)
4½" Hose Monster	331.07	0.548	4.5"	10-75	1050-2870
4" Hose Monster	339.65	0.712	4"	10-75	1070-2940

Using Software

Use the table below if you are using software that requires the coefficient input to be less than '1.0'. Notice that the orifice diameter must be changed from its true diameter in order to accommodate the lower coefficient. This is necessary only for the 2" Pitotless Nozzle and the ¾" Pitotless Nozzle.

Device	Coefficient	Orifice Diameter
2" Pitotless Nozzle + Little Hose Monster	0.99	2.30"
2" Pitotless Nozzle + 2½" Hose Monster Steel	0.99	2.36"
2" Pitotless Nozzle + Open Atmosphere	0.99	2.38"
1¾" Pitotless Nozzle + Little Hose Monster	0.99	1.88"
1¾" Pitotless Nozzle + 2½" Hose Monster Steel	0.99	1.90"
1¾" Pitotless Nozzle + Open Atmosphere	0.99	1.93"

Note: If your software uses the Theoretical Discharge Formula, found in NFPA 291, 4.7.3, the coefficient of discharge can be used to produce flow rates that will match our flow charts.

A hand-held pitot directly at a hydrant outlet

Outlet Type	Coefficient
Outlet smooth and rounded	0.9
Outlet square and sharp	0.8
Outlet square and projecting into barrel	0.7
If a stream straightener is used	0.95

Classifying and Marking of Hydrants

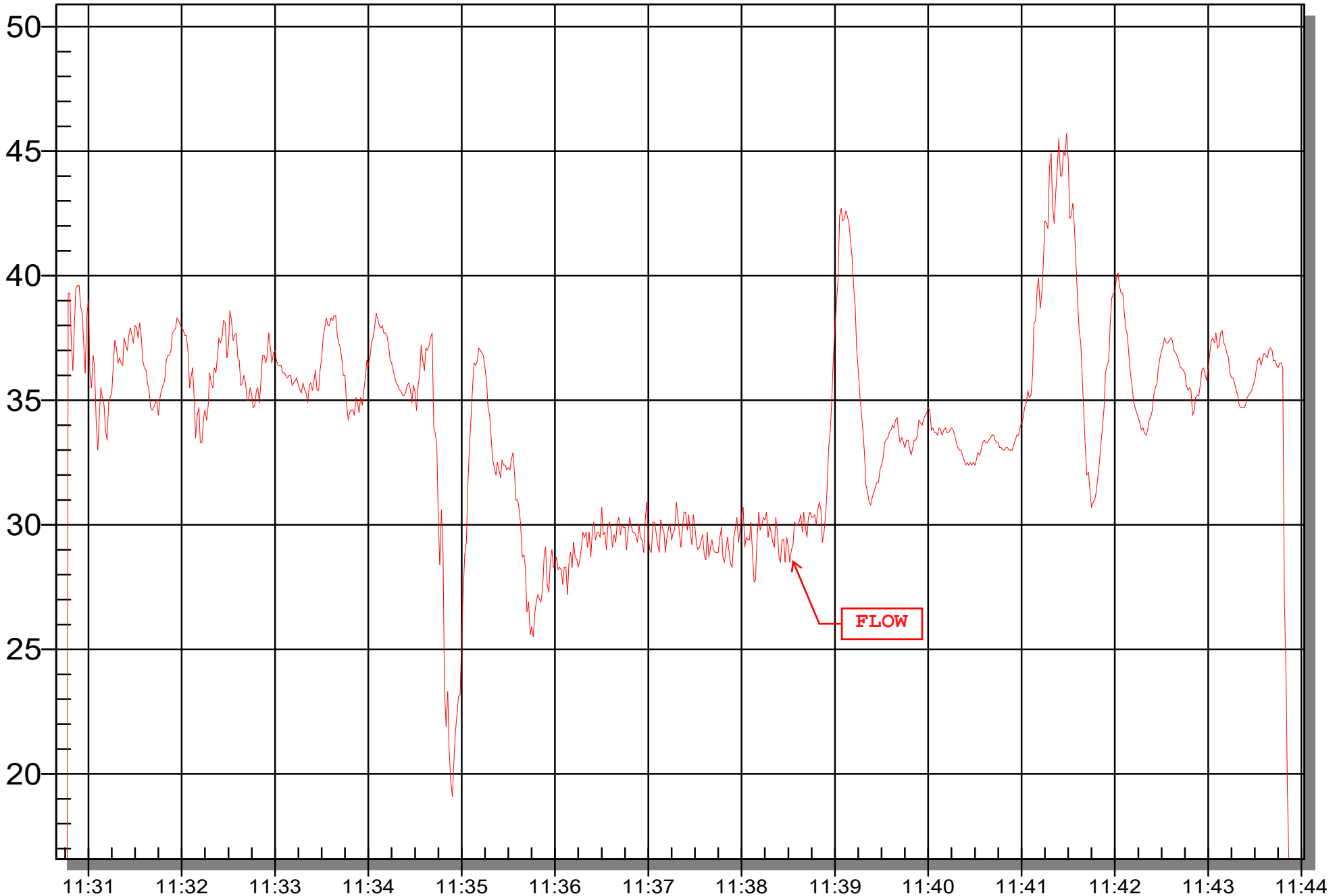
Rated Capacity at 20 psi	Class	Marking Color of Hydrant Tops and Nozzles
≥1500 GPM	AA	Light Blue
1000-1499 GPM	A	Green
500-999 GPM	B	Orange
≤499 GPM	C	Red

The above are the NFPA hydrant classifications and color markings for various rated capacities. Source: NFPA 291, 5.1, 2010.

600 Yulee Drive, Zebulon flow test - Wednesday, September 13, 2023



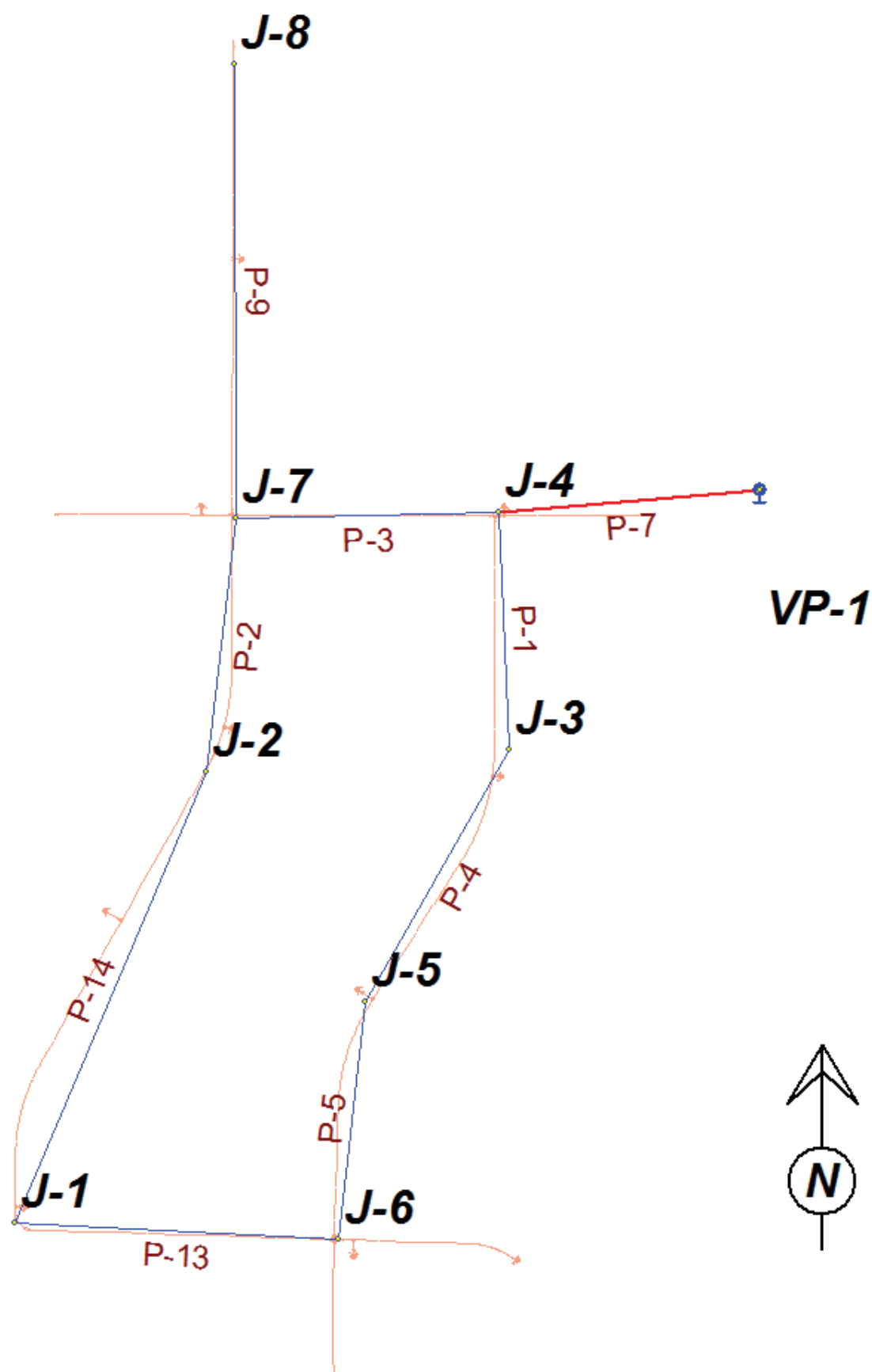
(PR325)-Pressure/psig



13 Wed Sep 2023

Date/Time

Appendix B
System Map



Appendix C
Fire Flow Analysis Results

weavers water system

```

* * * * * K Y P I P E * * * * *
*
* Pipe Network Modeling Software
*
* CopyRighted by KYPIPE LLC (www.kypipe.com)
* Version: 6.025 10/21/2013
* Serial #: 6-5043202
* Interface: Classic
* Licensed for Pipe2012
*
* * * * *
    
```

Date & Time: Tue Apr 16 16:44:44 2024

Master File : f:\projects\fdcpw9\water system analysis\weavers water system.KYP\weavers water system.P2K

 S U M M A R Y O F O R I G I N A L D A T A

U N I T S S P E C I F I E D

FLOWRATE = gallons/minute
 HEAD (HGL) = feet
 PRESSURE = psig

P I P E L I N E D A T A

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE #1	NODE #2	LENGTH (ft)	DIAMETER (in)	ROUGHNESS COEFF.	MINOR LOSS COEFF.
P-1	J-4	J-3	354.10	12.00	120.0000	1.20
P-2	J-2	J-7	382.00	8.00	120.0000	1.20
P-3	J-4	J-7	391.60	12.00	120.0000	1.20
P-4	J-3	J-5	432.60	12.00	120.0000	1.20
P-5	J-5	J-6	355.90	12.00	120.0000	1.20
P-7	VP-1	J-4	389.90	12.00	120.0000	1.20
P-9	J-7	J-8	675.30	12.00	120.0000	1.20
P-13	J-6	J-1	483.80	8.00	120.0000	1.20
P-14	J-1	J-2	731.40	8.00	120.0000	1.20

P U M P / L O S S E L E M E N T D A T A

THERE IS A DEVICE AT NODE VP-1 DESCRIBED BY THE FOLLOWING DATA: (ID= 1)

HEAD (ft)	FLOWRATE (gpm)	EFFICIENCY (%)
83.08	0.00	75.00 (Default)
46.15	1586.00	75.00 (Default)
0.00	2400.00	75.00 (Default)

N O D E D A T A

NODE NAME	NODE TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	EXTERNAL GRADE (ft)
J-1		15.00	366.00	
J-2		15.00	371.00	
J-3		15.00	363.00	
J-4		15.00	363.00	

weavers water system

J-5	15.00	364.00	
J-6	15.00	365.00	
J-7	15.00	365.00	
J-8	15.00	366.00	
VP-1	----	368.00	368.00

OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT
 MAXIMUM AND MINIMUM PRESSURES = 4
 MAXIMUM AND MINIMUM VELOCITIES = 5
 MAXIMUM AND MINIMUM HEAD LOSS/1000 = 5

SYSTEM CONFIGURATION

NUMBER OF PIPES (P) = 9
 NUMBER OF END NODES (J) = 8
 NUMBER OF PRIMARY LOOPS (L) = 1
 NUMBER OF SUPPLY NODES (F) = 1
 NUMBER OF SUPPLY ZONES (Z) = 1

Case: 0

RESULTS OBTAINED AFTER 8 TRIALS: ACCURACY = 0.59885E-04

SIMULATION DESCRIPTION (LABEL)

PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE #1	NODE #2	FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s	HL+ML/1000 ft/f	HL/1000 ft/f
P-1	J-4	J-3	54.83	0.00	0.00	0.16	0.01	0.01
P-2	J-2	J-7	-20.17	0.01	0.00	0.13	0.02	0.02
P-3	J-4	J-7	50.17	0.00	0.00	0.14	0.01	0.01
P-4	J-3	J-5	39.83	0.00	0.00	0.11	0.01	0.01
P-5	J-5	J-6	24.83	0.00	0.00	0.07	0.00	0.00
P-7	VP-1	J-4	120.00	0.02	0.00	0.34	0.06	0.06
P-9	J-7	J-8	15.00	0.00	0.00	0.04	0.00	0.00
P-13	J-6	J-1	9.83	0.00	0.00	0.06	0.00	0.00
P-14	J-1	J-2	-5.17	0.00	0.00	0.03	0.00	0.00

PUMP/LOSS ELEMENT RESULTS

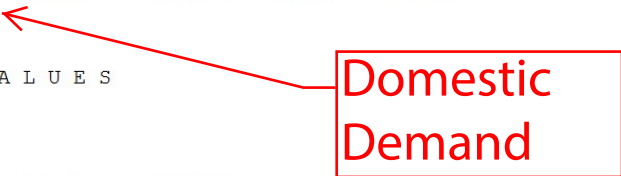
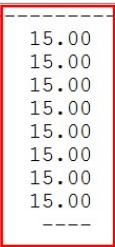
NAME	FLOWRATE gpm	INLET HEAD ft	OUTLET HEAD ft	PUMP HEAD ft	EFFIC-ENCY %	USEFUL POWER Hp	INCREMENTL COST \$	TOTAL COST \$	#PUMPS PARALLEL	#PUMPS SERIES	NPSH Avail. ft	Case
VP-1	120.00	0.00	82.84	82.8	75.00	3.	1.0	13.4	**	**	33.2	0.0000

NODE RESULTS

NODE NAME	NODE TITLE	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
-----------	------------	---------------------	--------------------	-------------------	------------------	-------------------

weavers water system

J-1	15.00	450.80	366.00	84.80	36.75
J-2	15.00	450.81	371.00	79.81	34.58
J-3	15.00	450.81	363.00	87.81	38.05
J-4	15.00	450.82	363.00	87.82	38.05
J-5	15.00	450.81	364.00	86.81	37.62
J-6	15.00	450.81	365.00	85.81	37.18
J-7	15.00	450.81	365.00	85.81	37.18
J-8	15.00	450.81	366.00	84.81	36.75
VP-1	----	450.84	368.00	82.84	35.90



Domestic Demand

MAXIMUM AND MINIMUM VALUES

PRESSURES

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
J-4	38.05	J-2	34.58
J-3	38.05	VP-1	35.90
J-5	37.62	J-1	36.75
J-7	37.18	J-8	36.75

VELOCITIES

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
P-7	0.34	P-14	0.03
P-1	0.16	P-9	0.04
P-3	0.14	P-13	0.06
P-2	0.13	P-5	0.07
P-4	0.11	P-4	0.11

HL + ML / 1000

PIPE NUMBER	MAXIMUM HL+ML/1000 (ft/ft)	PIPE NUMBER	MINIMUM HL+ML/1000 (ft/ft)
P-7	0.06	P-14	0.00
P-2	0.02	P-9	0.00
P-1	0.01	P-5	0.00
P-3	0.01	P-13	0.00
P-4	0.01	P-4	0.01

HL / 1000

PIPE NUMBER	MAXIMUM HL/1000 (ft/ft)	PIPE NUMBER	MINIMUM HL/1000 (ft/ft)
P-7	0.06	P-9	0.00
P-2	0.02	P-14	0.00
P-1	0.01	P-5	0.00
P-3	0.01	P-13	0.00
P-4	0.01	P-4	0.01

SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES
 (-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

NODE NAME	FLOWRATE gpm	NODE TITLE
VP-1	120.00	

NET SYSTEM INFLOW = 120.00

NET SYSTEM OUTFLOW = 0.00
 NET SYSTEM DEMAND = 120.00

=====
 FireFlow/Hydrant Report
 Fireflow/Hydrant Report:

Specified Minimum Pressure (psi): 20.0
 Minimum Static Pressure (psi) : 20.0
 Sp.Min Pres@FirePump Suctn (psi): 0.0

Flow-1: Flowrate to maintain the specified pressure at (hydrant) node
 Node-2: Node that has a lower pressure than specified value at Flow-1
 Flow-2: Flowrate to maintain the specified pressure at Node-2
 Flow-3: Flowrate to maintain the specified pressure at Fire Pump Suction
 (Flow-3 is based on combined value of hydrant and hose constants)

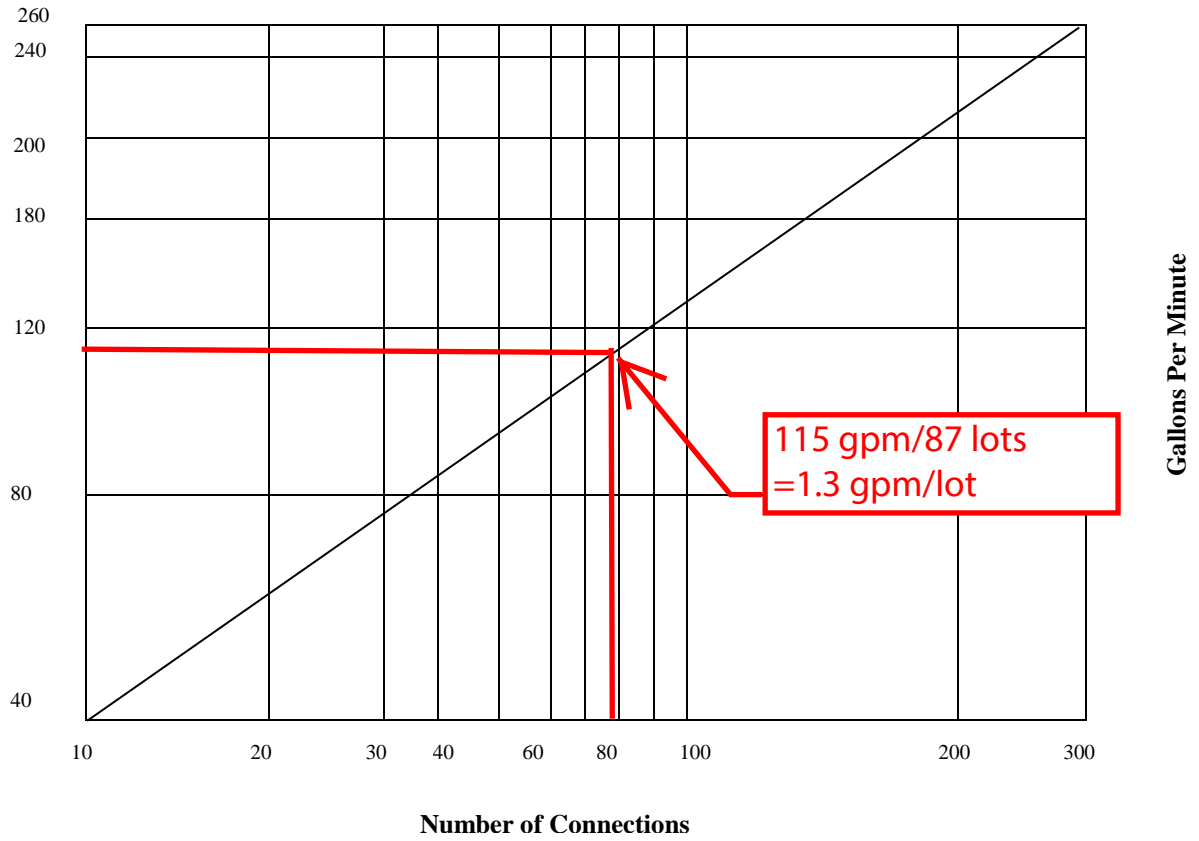
Hose Constant = 0.00

Hydrant Node	Hydrant Constant	Elevation	Demand gpm	Static Pressure	Flow-1 gpm	Flow-2 gpm	Node-2	Flow-3 gpm	Flow Capacity	NFPA Color
J-1	0.0	366.0	15.0	36.7	1272.9					
J-2	0.0	371.0	15.0	34.6	1202.4					
J-3	0.0	363.0	15.0	38.1	1479.3	1341.2	J-2			
J-4	0.0	363.0	15.0	38.1	1519.8	1352.4	J-2			
J-5	0.0	364.0	15.0	37.6	1426.1	1331.7	J-2			
J-6	0.0	365.0	15.0	37.2	1385.0	1324.8	J-2			
J-7	0.0	365.0	15.0	37.2	1437.6	1320.7	J-2			
J-8	0.0	366.0	15.0	36.8	1341.8	1320.7	J-2			

↑
Available Flow at 20 psi

Appendix D
Analysis Results with Domestic Demands
Only

PEAK DEMAND FOR RESIDENTIAL COMMUNITY WATER SYSTEMS
(Number of Connections vs Gallons per Minute)



```

* * * * * K Y P I P E * * * * *
*
* Pipe Network Modeling Software
*
* CopyRighted by KYPIPE LLC (www.kypipe.com)
* Version: 6.025 10/21/2013
* Serial #: 6-5043202
* Interface: Classic
* Licensed for Pipe2012
*
* * * * *
    
```

Date & Time: Wed Apr 17 08:31:47 2024

Master File : f:\projects\fdcpw9\water system analysis\weavers water system.KYP\weavers water system.P2K

 S U M M A R Y O F O R I G I N A L D A T A

U N I T S S P E C I F I E D

FLOWRATE = gallons/minute
 HEAD (HGL) = feet
 PRESSURE = psig

P I P E L I N E D A T A

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE #1	NODE #2	LENGTH (ft)	DIAMETER (in)	ROUGHNESS COEFF.	MINOR LOSS COEFF.
P-1	J-4	J-3	354.10	12.00	120.0000	1.20
P-2	J-2	J-7	382.00	8.00	120.0000	1.20
P-3	J-4	J-7	391.60	12.00	120.0000	1.20
P-4	J-3	J-5	432.60	12.00	120.0000	1.20
P-5	J-5	J-6	355.90	12.00	120.0000	1.20
P-7	VP-1	J-4	389.90	12.00	120.0000	1.20
P-9	J-7	J-8	675.30	12.00	120.0000	1.20
P-13	J-6	J-1	483.80	8.00	120.0000	1.20
P-14	J-1	J-2	731.40	8.00	120.0000	1.20

P U M P / L O S S E L E M E N T D A T A

THERE IS A DEVICE AT NODE VP-1 DESCRIBED BY THE FOLLOWING DATA: (ID= 1)

HEAD (ft)	FLOWRATE (gpm)	EFFICIENCY (%)
83.08	0.00	75.00 (Default)
46.15	1586.00	75.00 (Default)
0.00	2400.00	75.00 (Default)

N O D E D A T A

NODE NAME	NODE TITLE	EXTERNAL DEMAND (gpm)	JUNCTION ELEVATION (ft)	EXTERNAL GRADE (ft)
J-1		15.00	366.00	
J-2		15.00	371.00	
J-3		15.00	363.00	
J-4		15.00	363.00	

weavers water system

J-5	15.00	364.00	
J-6	15.00	365.00	
J-7	15.00	365.00	
J-8	15.00	366.00	
VP-1	----	368.00	368.00

Domestic Demand

OUTPUT OPTION DATA

OUTPUT SELECTION: ALL RESULTS ARE INCLUDED IN THE TABULATED OUTPUT
 MAXIMUM AND MINIMUM PRESSURES = 4
 MAXIMUM AND MINIMUM VELOCITIES = 5
 MAXIMUM AND MINIMUM HEAD LOSS/1000 = 5

SYSTEM CONFIGURATION

NUMBER OF PIPES (P) = 9
 NUMBER OF END NODES (J) = 8
 NUMBER OF PRIMARY LOOPS (L) = 1
 NUMBER OF SUPPLY NODES (F) = 1
 NUMBER OF SUPPLY ZONES (Z) = 1

Case: 0

RESULTS OBTAINED AFTER 8 TRIALS: ACCURACY = 0.59885E-04

SIMULATION DESCRIPTION (LABEL)

PIPELINE RESULTS

STATUS CODE: XX -CLOSED PIPE CV -CHECK VALVE

PIPE NAME	NODE #1	NODE #2	FLOWRATE gpm	HEAD LOSS ft	MINOR LOSS ft	LINE VELO. ft/s	HL+ML/1000 ft/f	HL/1000 ft/f
P-1	J-4	J-3	54.83	0.00	0.00	0.16	0.01	0.01
P-2	J-2	J-7	-20.17	0.01	0.00	0.13	0.02	0.02
P-3	J-4	J-7	50.17	0.00	0.00	0.14	0.01	0.01
P-4	J-3	J-5	39.83	0.00	0.00	0.11	0.01	0.01
P-5	J-5	J-6	24.83	0.00	0.00	0.07	0.00	0.00
P-7	VP-1	J-4	120.00	0.02	0.00	0.34	0.06	0.06
P-9	J-7	J-8	15.00	0.00	0.00	0.04	0.00	0.00
P-13	J-6	J-1	9.83	0.00	0.00	0.06	0.00	0.00
P-14	J-1	J-2	-5.17	0.00	0.00	0.03	0.00	0.00

PUMP/LOSS ELEMENT RESULTS

NAME	FLOWRATE gpm	INLET HEAD ft	OUTLET HEAD ft	PUMP HEAD ft	EFFIC-ENCY %	USEFUL POWER Hp	INCREMENTAL COST \$	TOTAL COST \$	#PUMPS PARALLEL	#PUMPS SERIES	NPSH Avail. ft	Case
VP-1	120.00	0.00	82.84	82.8	75.00	3.	0.1	0.1	**	**	33.2	0.0000

NODE RESULTS

NODE NAME	NODE TITLE	EXTERNAL DEMAND gpm	HYDRAULIC GRADE ft	NODE ELEVATION ft	PRESSURE HEAD ft	NODE PRESSURE psi
-----------	------------	---------------------	--------------------	-------------------	------------------	-------------------

weavers water system

J-1	15.00	450.80	366.00	84.80	36.75
J-2	15.00	450.81	371.00	79.81	34.58
J-3	15.00	450.81	363.00	87.81	38.05
J-4	15.00	450.82	363.00	87.82	38.05
J-5	15.00	450.81	364.00	86.81	37.62
J-6	15.00	450.81	365.00	85.81	37.18
J-7	15.00	450.81	365.00	85.81	37.18
J-8	15.00	450.81	366.00	84.81	36.75
VP-1	----	450.84	368.00	82.84	35.90

MAXIMUM AND MINIMUM VALUES

PRESSURES

JUNCTION NUMBER	MAXIMUM PRESSURES psi	JUNCTION NUMBER	MINIMUM PRESSURES psi
J-4	38.05	J-2	34.58
J-3	38.05	VP-1	35.90
J-5	37.62	J-1	36.75
J-7	37.18	J-8	36.75

VELOCITIES

PIPE NUMBER	MAXIMUM VELOCITY (ft/s)	PIPE NUMBER	MINIMUM VELOCITY (ft/s)
P-7	0.34	P-14	0.03
P-1	0.16	P-9	0.04
P-3	0.14	P-13	0.06
P-2	0.13	P-5	0.07
P-4	0.11	P-4	0.11

HL + ML / 1000

PIPE NUMBER	MAXIMUM HL+ML/1000 (ft/ft)	PIPE NUMBER	MINIMUM HL+ML/1000 (ft/ft)
P-7	0.06	P-14	0.00
P-2	0.02	P-9	0.00
P-1	0.01	P-5	0.00
P-3	0.01	P-13	0.00
P-4	0.01	P-4	0.01

HL / 1000

PIPE NUMBER	MAXIMUM HL/1000 (ft/ft)	PIPE NUMBER	MINIMUM HL/1000 (ft/ft)
P-7	0.06	P-9	0.00
P-2	0.02	P-14	0.00
P-1	0.01	P-5	0.00
P-3	0.01	P-13	0.00
P-4	0.01	P-4	0.01

SUMMARY OF INFLOWS AND OUTFLOWS

(+) INFLOWS INTO THE SYSTEM FROM SUPPLY NODES
 (-) OUTFLOWS FROM THE SYSTEM INTO SUPPLY NODES

NODE NAME	FLOWRATE gpm	NODE TITLE
VP-1	120.00	

NET SYSTEM INFLOW = 120.00

NET SYSTEM OUTFLOW = 0.00
NET SYSTEM DEMAND = 120.00

Total Power Cost

TOTAL POWER COST (\$) FOR THIS SIMULATION = 0.12

***** HYDRAULIC ANALYSIS COMPLETED *****