City of Puyallup
Development & Permitting Services
ISSUED PERMIT
Building | Planning
Engineering | Public Works
Fire | Traffic

SPRINX
FIRE PROTECTION
EST. 1999

2709 Jahn Ave NW, Suite H2, Gig Harbor WA 98335
Ph. (253) 853-7780– www.SprinxFire.com

Expires DEC 31, 25

WASHINGTON STATE CERTIFICATE OF COMPETENCY FIRE SPRINKLER SYSTEMS

Joseph G. Faulkner
9491-0699-CEG Level 3
Sprinx Fire Protection, Inc.
SPRINFP011LS

Signature 03/17/2025 Date

Hydraulic Calculations

SPRINX FIRE PROTECTION INC.
2709 JAHN AVE NW SUITE H2
GIG HARBOR, WA 98335
253-853-7780

Job Name	:	ETC Building D
Drawing	:	FP-3.0
Location	:	2902 E PIONEER PUYALLUP, WA 98372
Remote Area	:	RA#1
Contract	:	24-093CM
Data File	:	ETC Building D Area 1.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME East Town Crossing Building D
Location 2902 E PIONEER PUYALLUP, WA 98372
Drawing # FP-3.0
Contract # 24-093CM
Date 3/13/2025

DESIGN

Remote area # RA#1
Remote area location UNIT 307 - LIVING ROOM
Occupancy classification RESIDENTIAL NFPA 13R
Density 0.05 - Gpm/SqFt
Area of application 256 - SqFt
Coverage/sprinkler 256 16'X16' - SqFt
Type of sprinkler calculated VIKING VK468 RESIDENTIAL PENDENT K=4.9
 # Sprinklers calculated 4
In-rack demand N/A - GPM
Hose streams N/A - GPM
Total water required (including hose streams) 55.4349 - GPM @ 34.3668 - Psi
Type of system WET-CPVC
Volume of system (dry or pre-action) N/A - Gal

WATER SUPPLY INFORMATION

Test date 4/16/2024
Location 2902 E PIONEER
Source of info CITY OF PUYALLUP WATER DIVISON

CONTRACTOR INFO SPRINX FIRE PROTECTION
Address 2709 JAHN AVE. / SUITE H2 / GIG HARBOR
Phone # 253-853-7780
Name of designer ALEXANDER J PARADIS
Authority having jurisdiction CITY OF PUYALLUP
NOTES:

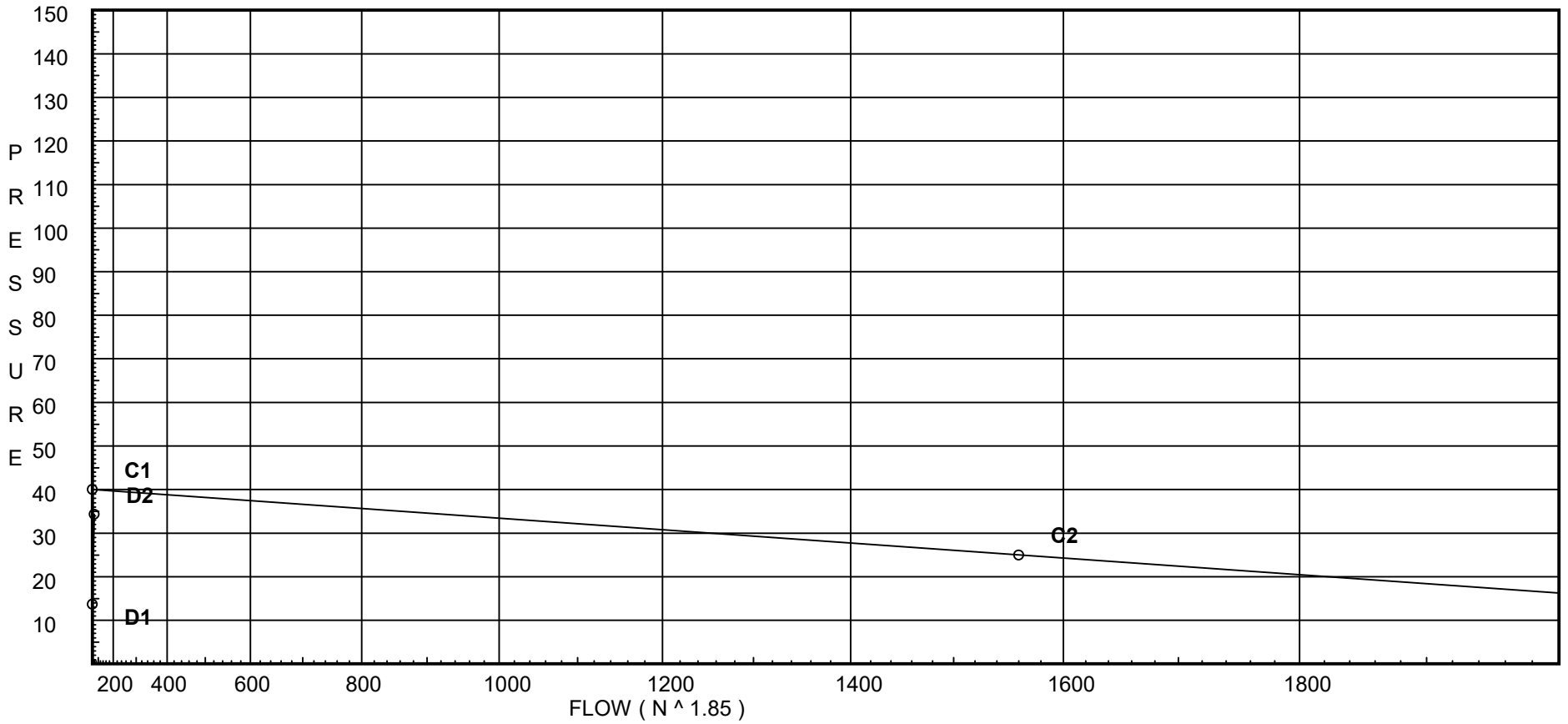
Water Supply Curve

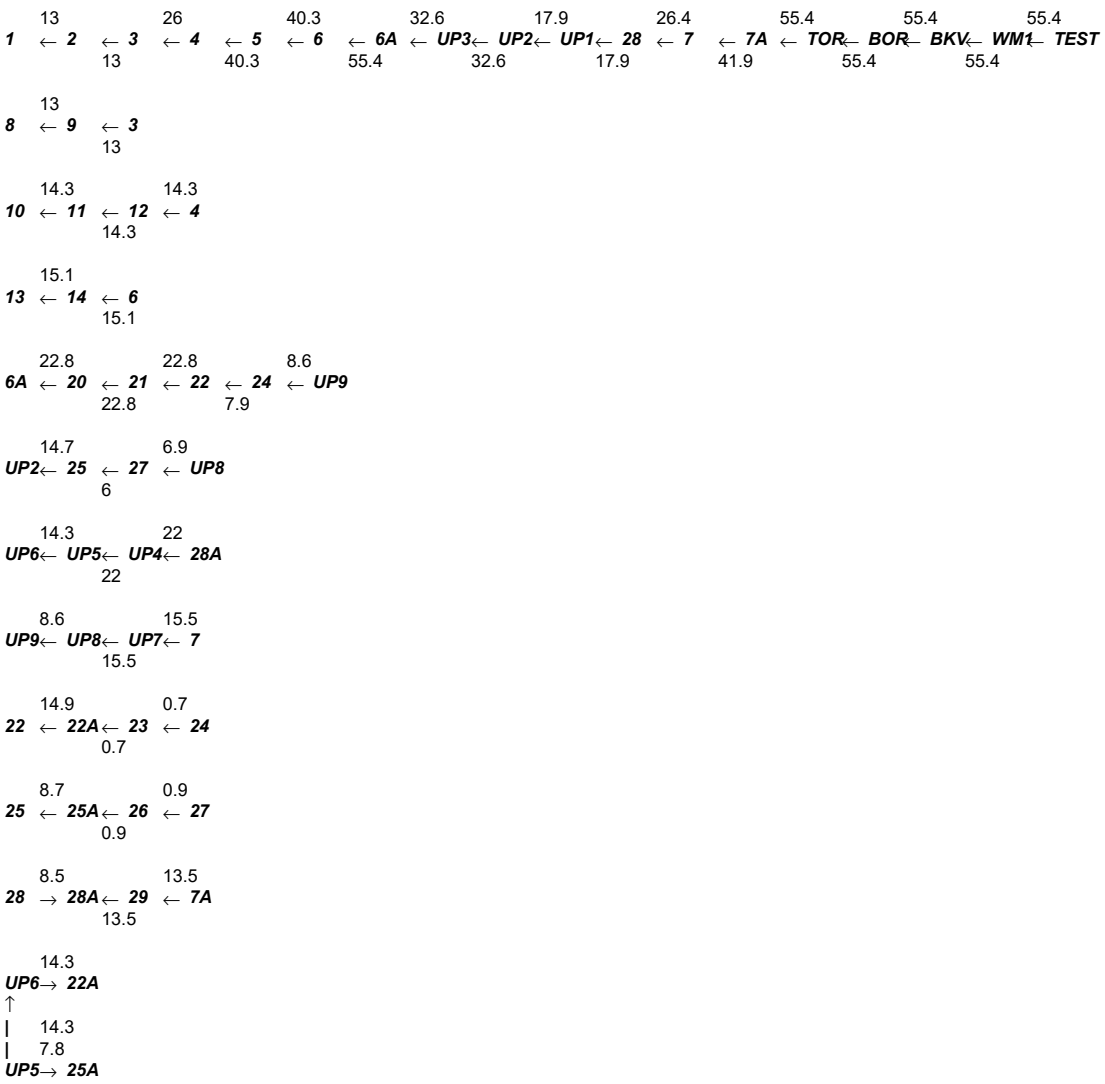
SPRINX FIRE PROTECTION INC.
ETC Building D

Date 3/13/2025

City Water Supply:
- C1 - Static Pressure : 40
- C2 - Residual Pressure: 25
- C2 - Residual Flow : 1560

Demand:
- D1 - Elevation : 13.677
- D2 - System Flow : 55.435
- D2 - System Pressure : 34.367
- Hose (Demand) : _____
- D3 - System Demand : 55.435
- Safety Margin : 5.602




1 2 3 4 5 6 6A UP3 UP2 UP1 28 7 7A TOR BOR BKV WM1 TEST
8 9 3
10 11 12 4
13 14 6
6A 20 21 22 24 UP9
UP2 25 27 UP8
UP6 UP5 UP4 28A
UP9 UP8 UP7 7
22 22A 23 24
25 25A 26 27
28 28A 29 7A
UP6 22A
UP5 25A
13
26
40.3
32.6
17.9
26.4
55.4
55.4
55.4
14.3
14.7
6.9
8.6
15.1
22.8
8.7
8.5
0.7
0.9
13.5
7.8

Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	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
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
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
N *	CPVC 90'Ell Harvel-Spears		7	7	8	9	11	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O *	CPVC Tee - Branch	3	3	5	6	8	10	12	15	0	0	0	0	0	0	0	0	0	0	0	0
R *	CPVC Coupling Tee - Run	1	1	1	1	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
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
Ziw	Wilkins 350AST	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.

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
TEST	40.0	25	1560.0	39.969	55.43	34.367

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
1	109.58	4.9	7.04	13.0	0.05	256
2	110.08		6.99			
3	110.08		7.27			
4	110.08		8.99			
5	110.08		9.65			
6	110.08		9.95			
6A	110.08		10.42			
UP3	110.08		10.56			
UP2	99.83		15.11			
UP1	89.58		19.61			
28	89.58		19.93			
7	89.58		20.14			
7A	89.58		20.56			
TOR	89.58		22.31			
BOR	80.0		27.22			
BKV	78.0		34.36			
WM1	78.0		34.37			
TEST	78.0		34.37			
8	109.58	4.9	7.05	13.01	0.05	256
9	110.08		7.01			
10	108.58	4.9	8.55	14.33	0.05	256
11	110.08		8.21			
12	110.08		8.45			
13	109.58	4.9	9.48	15.09	0.05	256
14	110.08		9.49			
20	110.08		10.63			
21	110.08		10.73			
22	110.08		10.84			
24	110.08		10.86			
25	99.83		15.33			
27	99.83		15.34			
UP6	110.08		10.88			
UP5	99.83		15.34			
UP4	89.58		19.87			
UP9	110.08		10.95			
UP8	99.83		15.4			
UP7	89.58		19.88			
22A	110.08		10.85			
23	110.08		10.85			
25A	99.83		15.33			
26	99.83		15.33			
28A	89.58		19.93			

NODE ANALYSIS (cont.)

Node Tag	*Elevation*	*Node Type*	*Pressure at Node*	*Discharge at Node*	*Notes*
29	89.58		20.25		

Final Calculations : Hazen-Williams

SPRINX FIRE PROTECTION INC.
ETC Building D

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 ******
1	109.580	4.90	13.00	1	O	5.0	0.500	150	7.040	
to							5.000		-0.217	
2	110.080		13.0	1.101			5.500	0.0307	0.169	Vel = 4.38
2	110.080		0.0	1	R	1.0	8.000	150	6.992	
to							1.000		0.0	
3	110.080		13.0	1.101			9.000	0.0307	0.276	Vel = 4.38
3	110.080		13.01	1	O	5.0	10.550	150	7.268	
to							5.000		0.0	
4	110.080		26.01	1.101			15.550	0.1107	1.721	Vel = 8.77
4	110.080		14.33	1.25	R	1.0	7.420	150	8.989	
to							1.000		0.0	
5	110.080		40.34	1.394			8.420	0.0790	0.665	Vel = 8.48
5	110.080		0.0	1.25	R	1.0	2.750	150	9.654	
to							1.000		0.0	
6	110.080		40.34	1.394			3.750	0.0789	0.296	Vel = 8.48
6	110.080		15.09	2	O	10.0	9.250	150	9.950	
to							10.000		0.0	
6A	110.080		55.43	2.003			19.250	0.0244	0.469	Vel = 5.64
6A	110.080		-22.84	2	N	11.0	5.080	150	10.419	
to							11.000		0.0	
UP3	110.080		32.59	2.003			16.080	0.0091	0.146	Vel = 3.32
UP3	110.080		0.0	2	R	1.0	10.250	150	10.565	
to							1.000		4.439	
UP2	99.830		32.59	2.003			11.250	0.0092	0.103	Vel = 3.32
UP2	99.830		-14.69	2	N	11.0	10.250	150	15.107	
to							11.000		4.439	
UP1	89.580		17.9	2.003			21.250	0.0030	0.064	Vel = 1.82
UP1	89.580		0.0	2	11R	11.0	76.000	150	19.610	
to					2O	20.0	31.000		0.0	
28	89.580		17.9	2.003			107.000	0.0030	0.321	Vel = 1.82
28	89.580		8.54	2	2R	2.0	21.580	150	19.931	
to					O	10.0	12.000		0.0	
7	89.580		26.44	2.003			33.580	0.0062	0.208	Vel = 2.69
7	89.580		15.50	2	3R	3.0	26.000	150	20.139	
to							3.000		0.0	
7A	89.580		41.94	2.003			29.000	0.0145	0.421	Vel = 4.27
7A	89.580		13.49	2	5R	5.0	36.000	150	20.560	
to					2O	20.0	36.000		0.0	
TOR	89.580		55.43	2.003	N	11.0	72.000	0.0243	1.752	Vel = 5.64
TOR	89.580		0.0	2	B	8.183	9.500	120	22.312	
to					S	15.003	23.186		4.149	
BOR	80		55.43	2.203			32.686	0.0231	0.756	Vel = 4.67
BOR	80		0.0	6	T	43.037	66.000	140	27.217	
to					3E	60.252	103.289		7.127	* * Fixed Loss = 6.261
BKV	78		55.43	6.16	Ziw	0.0	169.289	0.0001	0.020	Vel = 0.60
BKV	78		0.0	8	T	55.354	21.000	140	34.364	
to					G	6.326	61.680		0.0	
WM1	78		55.43	8.27			82.680	0	0.002	Vel = 0.33

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 ******
WM1	78		0.0	8			20.000	140	34.366	
to									0.0	
TEST	78		55.43	8.27			20.000	0	0.001	Vel = 0.33
			0.0							
TEST			55.43						34.367	K Factor = 9.46
8	109.580	4.90	13.01	1	O	5.0	0.500	150	7.053	
to							5.000		-0.217	
9	110.080		13.01	1.101			5.500	0.0309	0.170	Vel = 4.38
9	110.080		0.0	1	O	5.0	3.540	150	7.006	
to							5.000		0.0	
3	110.080		13.01	1.101			8.540	0.0307	0.262	Vel = 4.38
			0.0							
3			13.01						7.268	K Factor = 4.83
10	108.580	4.90	14.33	1	N	7.0	1.500	150	8.552	
to							7.000		-0.650	
11	110.080		14.33	1.101			8.500	0.0368	0.313	Vel = 4.83
11	110.080		0.0	1	O	5.0	1.500	150	8.215	
to							5.000		0.0	
12	110.080		14.33	1.101			6.500	0.0368	0.239	Vel = 4.83
12	110.080		0.0	1	2O	10.0	4.580	150	8.454	
to							10.000		0.0	
4	110.080		14.33	1.101			14.580	0.0367	0.535	Vel = 4.83
			0.0							
4			14.33						8.989	K Factor = 4.78
13	109.580	4.90	15.09	1	O	5.0	0.500	150	9.484	
to							5.000		-0.217	
14	110.080		15.09	1.101			5.500	0.0405	0.223	Vel = 5.09
14	110.080		0.0	1	O	5.0	6.390	150	9.490	
to							5.000		0.0	
6	110.080		15.09	1.101			11.390	0.0404	0.460	Vel = 5.09
			0.0							
6			15.09						9.950	K Factor = 4.78
6A	110.080		22.85	2	4R	4.0	30.000	150	10.419	
to					O	10.0	14.000		0.0	
20	110.080		22.85	2.003			44.000	0.0047	0.207	Vel = 2.33
20	110.080		0.0	2	3R	3.0	19.000	150	10.626	
to							3.000		0.0	
21	110.080		22.85	2.003			22.000	0.0047	0.104	Vel = 2.33
21	110.080		0.0	2	4R	4.0	20.170	150	10.730	
to							4.000		0.0	
22	110.080		22.85	2.003			24.170	0.0047	0.114	Vel = 2.33
22	110.080		-14.93	2	3R	3.0	15.580	150	10.844	
to							3.000		0.0	
24	110.080		7.92	2.003			18.580	0.0007	0.013	Vel = 0.81
24	110.080		0.67	2	10R	10.0	76.000	150	10.857	
to					2O	20.0	41.000		0.0	
UP9	110.080		8.59	2.003	N	11.0	117.000	0.0008	0.090	Vel = 0.87

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 ******
			0.0							
UP9			8.59						10.947	K Factor = 2.60
UP2	99.830		14.69	2	10R	10.0	76.080	150	15.107	
to					2O	20.0	30.000		0.0	
25	99.830		14.69	2.003			106.080	0.0021	0.221	Vel = 1.50
25	99.830		-8.68	2	3R	3.0	21.580	150	15.328	
to							3.000		0.0	
27	99.830		6.01	2.003			24.580	0.0004	0.010	Vel = 0.61
27	99.830		0.90	2	9R	9.0	70.830	150	15.338	
to					2O	20.0	40.000		0.0	
UP8	99.830		6.91	2.003	N	11.0	110.830	0.0005	0.057	Vel = 0.70
			0.0							
UP8			6.91						15.395	K Factor = 1.76
UP6	110.080		14.26	2	R	1.0	10.250	150	10.878	
to							1.000		4.439	
UP5	99.830		14.26	2.003			11.250	0.0020	0.022	Vel = 1.45
UP5	99.830		7.78	2	N	11.0	10.250	150	15.339	
to							11.000		4.439	
UP4	89.580		22.04	2.003			21.250	0.0044	0.094	Vel = 2.24
UP4	89.580		0.0	2	O	10.0	2.670	150	19.872	
to							10.000		0.0	
28A	89.580		22.04	2.003			12.670	0.0044	0.056	Vel = 2.24
			0.0							
28A			22.04						19.928	K Factor = 4.94
UP9	110.080		8.59	2	R	1.0	10.250	150	10.947	
to							1.000		4.439	
UP8	99.830		8.59	2.003			11.250	0.0008	0.009	Vel = 0.87
UP8	99.830		6.91	2	O	10.0	10.250	150	15.395	
to							10.000		4.439	
UP7	89.580		15.5	2.003			20.250	0.0023	0.047	Vel = 1.58
UP7	89.580		0.0	2	11R	11.0	71.000	150	19.881	
to					3O	30.0	41.000		0.0	
7	89.580		15.5	2.003			112.000	0.0023	0.258	Vel = 1.58
			0.0							
7			15.50						20.139	K Factor = 3.45
22	110.080		14.93	2	R	1.0	2.920	150	10.844	
to							1.000		0.0	
22A	110.080		14.93	2.003			3.920	0.0023	0.009	Vel = 1.52
22A	110.080		-14.26	1.25	3R	3.0	23.080	150	10.853	
to					O	6.0	9.000		0.0	
23	110.080		0.67	1.394			32.080	0	0.001	Vel = 0.14
23	110.080		0.0	1.25	5R	5.0	47.580	150	10.854	
to					2O	12.0	17.000		0.0	
24	110.080		0.67	1.394			64.580	0	0.003	Vel = 0.14
			0.0							
24			0.67						10.857	K Factor = 0.20
25	99.830		8.68	2	R	1.0	2.920	150	15.328	
to							1.000		0.0	
25A	99.830		8.68	2.003			3.920	0.0008	0.003	Vel = 0.88

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	******
25A	99.830		-7.78	1.25	3R	3.0	23.080	150	15.331			
to					O	6.0	9.000		0.0			
26	99.830		0.9	1.394			32.080	0.0001	0.002	Vel = 0.19		
26	99.830		0.0	1.25	5R	5.0	47.580	150	15.333			
to					2O	12.0	17.000		0.0			
27	99.830		0.9	1.394			64.580	0.0001	0.005	Vel = 0.19		
			0.0									
27			0.90						15.338	K Factor = 0.23		
28	89.580		-8.54	2	R	1.0	2.920	150	19.931			
to							1.000		0.0			
28A	89.580		-8.54	2.003			3.920	-0.0008	-0.003	Vel = 0.87		
28A	89.580		22.04	1.25	2R	2.0	23.080	150	19.928			
to					O	6.0	8.000		0.0			
29	89.580		13.5	1.394			31.080	0.0104	0.324	Vel = 2.84		
29	89.580		0.0	1.25	2R	2.0	21.580	150	20.252			
to					O	6.0	8.000		0.0			
7A	89.580		13.5	1.394			29.580	0.0104	0.308	Vel = 2.84		
			0.0									
7A			13.50						20.560	K Factor = 2.98		
UP6	110.080		-14.26	2	O	10.0	2.670	150	10.878			
to							10.000		0.0			
22A	110.080		-14.26	2.003			12.670	-0.0020	-0.025	Vel = 1.45		
			0.0									
22A			-14.26						10.853	K Factor = -4.33		
UP5	99.830		-7.78	2	O	10.0	2.670	150	15.339			
to							10.000		0.0			
25A	99.830		-7.78	2.003			12.670	-0.0006	-0.008	Vel = 0.79		
			0.0									
25A			-7.78						15.331	K Factor = -1.99		

SPRINX
FIRE PROTECTION
EST. 1999

2709 Jahn Ave NW, Suite H2, Gig Harbor WA 98335
Ph. (253) 853-7780– www.SprinxFire.com

Expires DEC 31, 25

WASHINGTON STATE CERTIFICATE OF COMPETENCY FIRE SPRINKLER SYSTEMS

Joseph G. Faulkner
9491-0699-CEG Level 3
Sprinx Fire Protection, Inc.
SPRINFP011LS

Signature 03/17/2025 Date

Hydraulic Calculations

SPRINX FIRE PROTECTION INC.
2709 JAHN AVE NW SUITE H2
GIG HARBOR, WA 98335
253-853-7780

Job Name	:	ETC Building D
Drawing	:	FP-3.0
Location	:	2902 E PIONEER PUYALLUP, WA 98372
Remote Area	:	RA#3
Contract	:	24-093CM
Data File	:	ETC Building D Area 3.WXF

HYDRAULIC CALCULATIONS
for

JOB NAME East Town Crossing Building D
Location 2902 E PIONEER PUYALLUP, WA 98372
Drawing # FP-3.0
Contract # 24-093CM
Date 3/13/2025

DESIGN

Remote area # RA#3
Remote area location STAIRWELL
Occupancy classification LIGHT HAZARD
Density 0.10 - Gpm/SqFt
Area of application 273 - SqFt
Coverage/sprinkler 4 HEADS - SqFt
Type of sprinkler calculated VIKING VK178 QR CHROME DRY HORIZ. SIDEWALL
 # Sprinklers calculated 4
In-rack demand N/A - GPM
Hose streams N/A - GPM
Total water required (including hose streams) 60.0831 - GPM @ 33.4251 - Psi
Type of system WET-CPVC
Volume of system (dry or pre-action) N/A - Gal

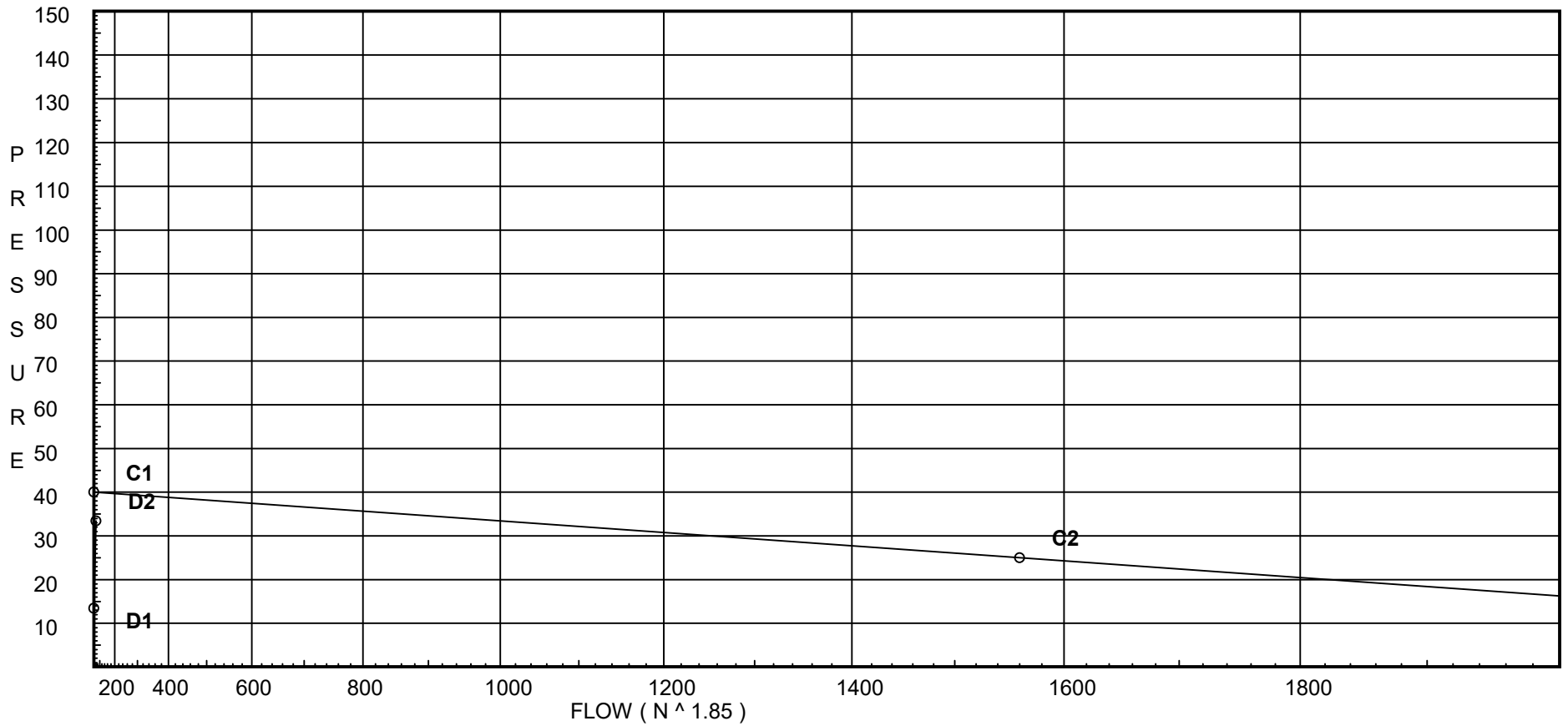
WATER SUPPLY INFORMATION

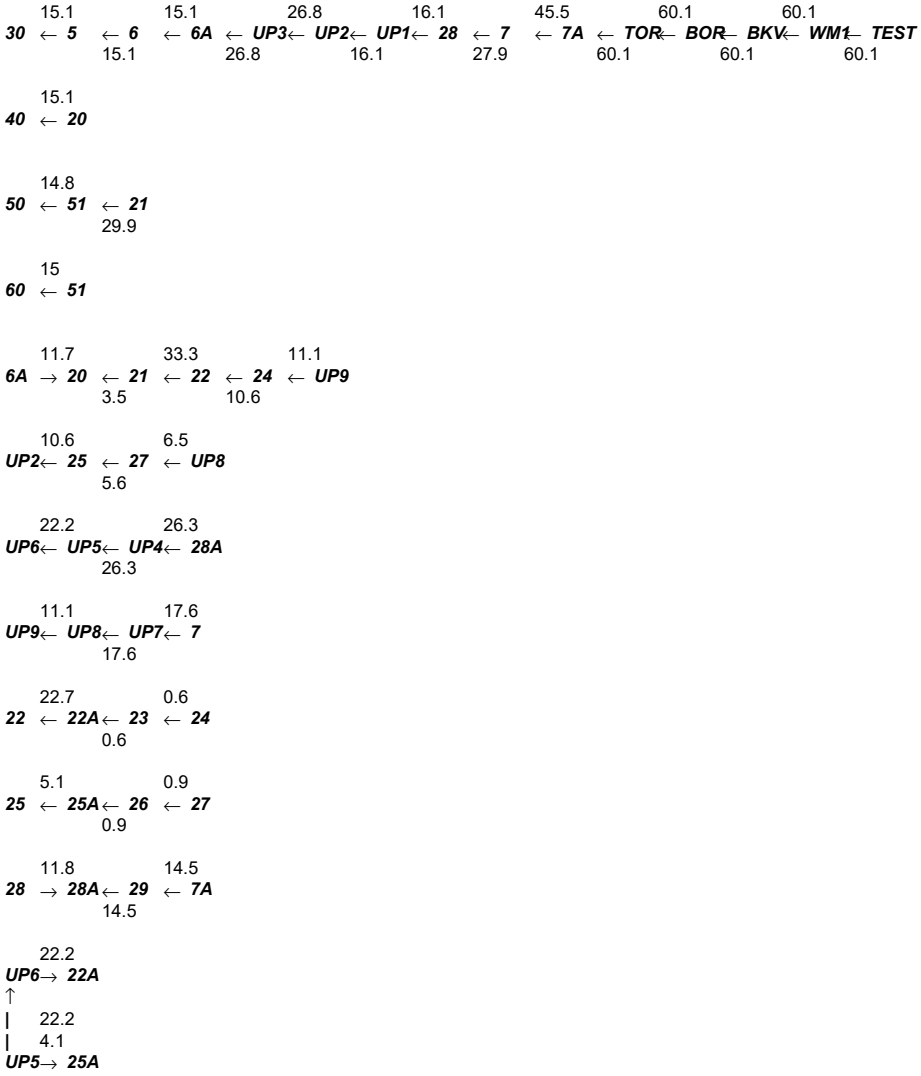
Test date 4/16/2024
Location 2902 E PIONEER
Source of info CITY OF PUYALLUP WATER DIVISON

CONTRACTOR INFO SPRINX FIRE PROTECTION
Address 2709 JAHN AVE. / SUITE H2 / GIG HARBOR
Phone # 253-853-7780
Name of designer ALEXANDER J PARADIS
Authority having jurisdiction CITY OF PUYALLUP
NOTES:

City Water Supply:
- C1 - Static Pressure : 40
- C2 - Residual Pressure: 25
- C2 - Residual Flow : 1560

Demand:
- D1 - Elevation : 13.426
- D2 - System Flow : 60.083
- D2 - System Pressure : 33.425
- Hose (Demand) : _____
- D3 - System Demand : 60.083
- Safety Margin : 6.539




15.1 15.1 26.8 16.1 45.5 60.1 60.1
30 ← 5 ← 6 ← 6A ← UP3 ← UP2 ← UP1 ← 28 ← 7 ← 7A ← TOR ← BOR ← BKV ← WM1 ← TEST
15.1 26.8 16.1 27.9 60.1 60.1 60.1
15.1
40 ← 20
14.8
50 ← 51 ← 21
29.9
15
60 ← 51
11.7 33.3 11.1
6A → 20 ← 21 ← 22 ← 24 ← UP9
3.5 10.6
10.6 6.5
UP2 ← 25 ← 27 ← UP8
5.6
22.2 26.3
UP6 ← UP5 ← UP4 ← 28A
26.3
11.1 17.6
UP9 ← UP8 ← UP7 ← 7
17.6
22.7 0.6
22 ← 22A ← 23 ← 24
0.6
5.1 0.9
25 ← 25A ← 26 ← 27
0.9
11.8 14.5
28 → 28A ← 29 ← 7A
14.5
22.2
UP6 → 22A
↑
| 22.2
| 4.1
UP5 → 25A

Fittings Used Summary

Fitting Legend

Abbrev.	Name	½	¾	1	1¼	1½	2	2½	3	3½	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
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
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
N *	CPVC 90'Ell Harvel-Spears		7	7	8	9	11	12	13	0	0	0	0	0	0	0	0	0	0	0	0
O *	CPVC Tee - Branch	3	3	5	6	8	10	12	15	0	0	0	0	0	0	0	0	0	0	0	0
R *	CPVC Coupling Tee - Run	1	1	1	1	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0
S	NFPA 13 Swing Check	0	0	5	7	9	11	14	16	19	22	27	32	45	55	65					
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
Ziw	Wilkins 350AST	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.

SUPPLY ANALYSIS

Node at Source	Static Pressure	Residual Pressure	Flow	Available Pressure	Total Demand	Required Pressure
TEST	40.0	25	1560.0	39.964	60.08	33.425

NODE ANALYSIS

Node Tag	Elevation	Node Type	Pressure at Node	Discharge at Node	Notes	
30	109.0	5.6	7.28	15.11	0.1	130.24
5	110.08		9.07			
6	110.08		9.12			
6A	110.08		9.16			
UP3	110.08		9.27			
UP2	99.83		13.78			
UP1	89.58		18.27			
28	89.58		18.55			
7	89.58		18.78			
7A	89.58		19.27			
TOR	89.58		21.31			
BOR	80.0		26.33			
BKV	78.0		33.42			
WM1	78.0		33.42			
TEST	78.0		33.43			
40	109.0	5.6	7.28	15.11	0.1	82.25
50	109.0	5.6	7.0	14.82	0.1	123.37
51	110.08		7.96			
60	109.0	5.6	7.22	15.05	0.1	73.5
20	110.08		9.1			
21	110.08		9.11			
22	110.08		9.34			
24	110.08		9.36			
25	99.83		13.9			
27	99.83		13.91			
UP6	110.08		9.41			
UP5	99.83		13.9			
UP4	89.58		18.47			
UP9	110.08		9.5			
UP8	99.83		13.96			
UP7	89.58		18.46			
22A	110.08		9.36			
23	110.08		9.36			
25A	99.83		13.9			
26	99.83		13.9			
28A	89.58		18.55			
29	89.58		18.92			

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 ******
30	109	5.60	15.11	1	4N	28.0	20.830	150	7.280	
to					2R	2.0	35.000		-0.468	
5	110.080		15.11	1.101	O	5.0	55.830	0.0405	2.262	Vel = 5.09
5	110.080		0.0	1.25	R	1.0	2.750	150	9.074	
to							1.000		0.0	
6	110.080		15.11	1.394			3.750	0.0128	0.048	Vel = 3.18
6	110.080		0.0	2	O	10.0	9.250	150	9.122	
to							10.000		0.0	
6A	110.080		15.11	2.003			19.250	0.0022	0.042	Vel = 1.54
6A	110.080		11.65	2	N	11.0	5.080	150	9.164	
to							11.000		0.0	
UP3	110.080		26.76	2.003			16.080	0.0063	0.102	Vel = 2.72
UP3	110.080		0.0	2	R	1.0	10.250	150	9.266	
to							1.000		4.439	
UP2	99.830		26.76	2.003			11.250	0.0063	0.071	Vel = 2.72
UP2	99.830		-10.62	2	N	11.0	10.250	150	13.776	
to							11.000		4.439	
UP1	89.580		16.14	2.003			21.250	0.0025	0.053	Vel = 1.64
UP1	89.580		0.0	2	9R	9.0	76.000	150	18.268	
to					3O	30.0	39.000		0.0	
28	89.580		16.14	2.003			115.000	0.0025	0.286	Vel = 1.64
28	89.580		11.76	2	2R	2.0	21.580	150	18.554	
to					O	10.0	12.000		0.0	
7	89.580		27.9	2.003			33.580	0.0068	0.230	Vel = 2.84
7	89.580		17.64	2	3R	3.0	26.000	150	18.784	
to							3.000		0.0	
7A	89.580		45.54	2.003			29.000	0.0169	0.490	Vel = 4.64
7A	89.580		14.54	2	5R	5.0	36.000	150	19.274	
to					2O	20.0	36.000		0.0	
TOR	89.580		60.08	2.003	N	11.0	72.000	0.0282	2.033	Vel = 6.12
TOR	89.580		0.0	2	B	8.183	9.500	120	21.307	
to					S	15.003	23.186		4.149	
BOR	80		60.08	2.203			32.686	0.0269	0.878	Vel = 5.06
BOR	80		0.0	6	T	43.037	66.000	140	26.334	
to					3E	60.252	103.289		7.065	* * Fixed Loss = 6.199
BKV	78		60.08	6.16	Ziw	0.0	169.289	0.0001	0.023	Vel = 0.65
BKV	78		0.0	8	T	55.354	21.000	140	33.422	
to					G	6.326	61.680		0.0	
WM1	78		60.08	8.27			82.680	0	0.002	Vel = 0.36
WM1	78		0.0	8			20.000	140	33.424	
to									0.0	
TEST	78		60.08	8.27			20.000	0	0.001	Vel = 0.36
			0.0							
TEST			60.08						33.425	K Factor = 10.39
40	109	5.60	15.11	1	4N	28.0	20.580	150	7.280	
to					3R	3.0	36.000		-0.468	
20	110.080		15.11	1.101	O	5.0	56.580	0.0405	2.292	Vel = 5.09
			0.0							

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 ******
20			15.11						9.104	K Factor = 5.01
50	109	5.60	14.82	1	3N	21.0	10.670	150	7.000	
to					O	5.0	26.000		-0.468	
51	110.080		14.82	1.101			36.670	0.0391	1.433	Vel = 4.99
51	110.080		15.04	1.25	2R	2.0	17.250	150	7.965	
to					O	6.0	8.000		0.0	
21	110.080		29.86	1.394			25.250	0.0453	1.143	Vel = 6.28
			0.0							
21			29.86						9.108	K Factor = 9.89
60	109	5.60	15.05	1	3N	21.0	4.170	150	7.220	
to					O	5.0	26.000		-0.468	
51	110.080		15.05	1.101			30.170	0.0402	1.213	Vel = 5.07
			0.0							
51			15.05						7.965	K Factor = 5.33
6A	110.080		-11.65	2	4R	4.0	30.000	150	9.164	
to					O	10.0	14.000		0.0	
20	110.080		-11.65	2.003			44.000	-0.0014	-0.060	Vel = 1.19
20	110.080		15.11	2	3R	3.0	19.000	150	9.104	
to							3.000		0.0	
21	110.080		3.46	2.003			22.000	0.0002	0.004	Vel = 0.35
21	110.080		29.86	2	4R	4.0	20.170	150	9.108	
to							4.000		0.0	
22	110.080		33.32	2.003			24.170	0.0095	0.229	Vel = 3.39
22	110.080		-22.74	2	3R	3.0	15.580	150	9.337	
to							3.000		0.0	
24	110.080		10.58	2.003			18.580	0.0011	0.021	Vel = 1.08
24	110.080		0.55	2	10R	10.0	76.000	150	9.358	
to					2O	20.0	41.000		0.0	
UP9	110.080		11.13	2.003	N	11.0	117.000	0.0012	0.146	Vel = 1.13
			0.0							
UP9			11.13						9.504	K Factor = 3.61
UP2	99.830		10.62	2	10R	10.0	76.080	150	13.776	
to					2O	20.0	30.000		0.0	
25	99.830		10.62	2.003			106.080	0.0012	0.122	Vel = 1.08
25	99.830		-5.06	2	3R	3.0	21.580	150	13.898	
to							3.000		0.0	
27	99.830		5.56	2.003			24.580	0.0003	0.008	Vel = 0.57
27	99.830		0.94	2	9R	9.0	70.830	150	13.906	
to					2O	20.0	40.000		0.0	
UP8	99.830		6.5	2.003	N	11.0	110.830	0.0005	0.052	Vel = 0.66
			0.0							
UP8			6.50						13.958	K Factor = 1.74
UP6	110.080		22.18	2	R	1.0	10.250	150	9.412	
to							1.000		4.439	
UP5	99.830		22.18	2.003			11.250	0.0045	0.051	Vel = 2.26
UP5	99.830		4.12	2	N	11.0	10.250	150	13.902	
to							11.000		4.439	
UP4	89.580		26.3	2.003			21.250	0.0061	0.130	Vel = 2.68

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 ******
UP4	89.580		0.0	2	O	10.0	2.670	150	18.471	
to							10.000		0.0	
28A	89.580		26.3	2.003			12.670	0.0062	0.078	Vel = 2.68
			0.0							
28A			26.30						18.549	K Factor = 6.11
UP9	110.080		11.13	2	R	1.0	10.250	150	9.504	
to							1.000		4.439	
UP8	99.830		11.13	2.003			11.250	0.0013	0.015	Vel = 1.13
UP8	99.830		6.51	2	O	10.0	10.250	150	13.958	
to							10.000		4.439	
UP7	89.580		17.64	2.003			20.250	0.0029	0.059	Vel = 1.80
UP7	89.580		0.0	2	11R	11.0	71.000	150	18.456	
to					3O	30.0	41.000		0.0	
7	89.580		17.64	2.003			112.000	0.0029	0.328	Vel = 1.80
			0.0							
7			17.64						18.784	K Factor = 4.07
22	110.080		22.74	2	R	1.0	2.920	150	9.337	
to							1.000		0.0	
22A	110.080		22.74	2.003			3.920	0.0046	0.018	Vel = 2.32
22A	110.080		-22.18	1.25	3R	3.0	23.080	150	9.355	
to					O	6.0	9.000		0.0	
23	110.080		0.56	1.394			32.080	0	0.001	Vel = 0.12
23	110.080		0.0	1.25	5R	5.0	47.580	150	9.356	
to					2O	12.0	17.000		0.0	
24	110.080		0.56	1.394			64.580	0	0.002	Vel = 0.12
			0.0							
24			0.56						9.358	K Factor = 0.18
25	99.830		5.06	2	R	1.0	2.920	150	13.898	
to							1.000		0.0	
25A	99.830		5.06	2.003			3.920	0.0003	0.001	Vel = 0.52
25A	99.830		-4.12	1.25	3R	3.0	23.080	150	13.899	
to					O	6.0	9.000		0.0	
26	99.830		0.94	1.394			32.080	0.0001	0.002	Vel = 0.20
26	99.830		0.0	1.25	5R	5.0	47.580	150	13.901	
to					2O	12.0	17.000		0.0	
27	99.830		0.94	1.394			64.580	0.0001	0.005	Vel = 0.20
			0.0							
27			0.94						13.906	K Factor = 0.25
28	89.580		-11.76	2	R	1.0	2.920	150	18.554	
to							1.000		0.0	
28A	89.580		-11.76	2.003			3.920	-0.0013	-0.005	Vel = 1.20
28A	89.580		26.30	1.25	2R	2.0	23.080	150	18.549	
to					O	6.0	8.000		0.0	
29	89.580		14.54	1.394			31.080	0.0119	0.371	Vel = 3.06
29	89.580		0.0	1.25	2R	2.0	21.580	150	18.920	
to					O	6.0	8.000		0.0	
7A	89.580		14.54	1.394			29.580	0.0120	0.354	Vel = 3.06

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 ******
			0.0							
7A			14.54						19.274	K Factor = 3.31
UP6	110.080		-22.18	2	O	10.0	2.670	150	9.412	
to							10.000		0.0	
22A	110.080		-22.18	2.003			12.670	-0.0045	-0.057	Vel = 2.26
			0.0							
22A			-22.18						9.355	K Factor = -7.25
UP5	99.830		-4.12	2	O	10.0	2.670	150	13.902	
to							10.000		0.0	
25A	99.830		-4.12	2.003			12.670	-0.0002	-0.003	Vel = 0.42
			0.0							
25A			-4.12						13.899	K Factor = -1.11

Gray & Osborne, Inc.
CONSULTING ENGINEERS

MEMORANDUM

TO:	BRIAN JOHNSON, WATER SYSTEM SPECIALIST
FROM:	KERRI SIDEBOTTOM, P.E.
DATE:	APRIL 16, 2024
SUBJECT:	EAST TOWN CROSSING ADDITIONAL FIRE FLOW AVAILABILITY CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON G&O #21415.19

Per your request, I have analyzed the available fire flow at the proposed East Town Crossing development, in the central part of the City's water service area. Fire flow at this location was previously analyzed in a memo from Gray & Osborne, dated February 14, 2024. The Developer has proposed a Revised Water Piping Plan for the site, which has been analyzed in this memo. The setup of the hydraulic model and the assumptions used to determine the static pressure and available fire flow are noted as follows.

- The available fire flows and pressures are measured at 14 nodes, corresponding to the proposed hydrants within the development, as shown in the attached figure.

- Water system demands are based on projected 2038 demands and reservoirs are depleted of fire suppression and equalizing storage, as established in the *2019 Water System Plan* (WSP), approved by the Department of Health (DOH). The City's water model was updated in 2021 to reflect additional system improvements since the WSP was developed.

- All pump stations are idle, and the Salmon Springs source is operating at 1,100 gallons per minute (gpm).

The development is located in Zone 1, which is supplied by Maplewood Springs and the 15th Avenue SE Reservoirs. The system was modeled as-is, with the proposed piping indicated on the attached figure. The model was run for two different scenarios, all of which include new 8-inch piping. The new piping for Scenario 1 includes the Phase 1 piping shown on the attached figure in pink. Scenario 2 includes additional piping for Phase 2 of the development is shown in orange on the attached figure.

The available pressure under 2038 peak hour demands at the hydrants is included in Table 1.

TABLE 1

Peak Hour Pressure

Node	Hydrant	Elevation, feet	Peak Hour Pressure, psi
J2238	J	71	41
J2240	L	72	41
J2242	M	72	40
J2244	N	76	39
J2246	H	76	39
J2248	I	76	41
J2250	F	73	40
J2252	D	69	42
J2254	C	67	43
J2256	B	66	43
J2258	A	66	43
J2260	E	72	41
J2274	G	75	39
J2276	K	71	41

The peak hour pressures within the development are essentially the same under either of the proposed scenarios, and the looping does not appreciably impact the pressures.

SCENARIO 1

Scenario 1 includes the piping planned for Phase 1, shown in pink on the attached figure. The piping includes 8-inch mains, mostly dead-ends, extending from the existing 8-inch main running from north to south through the site, as well as a connection to the 16-inch main on Shaw Road, to the west. Part of the existing 8-inch main will be replaced during construction of the development.

Available fire flow was modeled at 12 of the proposed hydrants in the development; Hydrants A through L. The hydrants are located on 8-inch pipes throughout the development, many of which are dead-ends. The results of this modeling are included in Table 2. The modeled fire flow is available at any hydrant individually, but not simultaneously.

TABLE 2

Modeled Fire Flow Availability, Scenario 1

Node	Hydrant	Available Fire Flow, gpm	Residual Pressure at Available Fire Flow, psi	Minimum System Pressure at Available Fire Flow, psi
J2238	J	2,140(1)	25	25
J2240	L	1,560(1)	23	23
J2246	H	1,560(1)	22	22
J2248	I	2,580(1)	23	23
J2250	F	1,560(1)	25	25
J2252	D	2,170(1)	28	28
J2254	C	1,920(1)	29	28
J2256	B	2,230(1)	26	26
J2258	A	1,560(1)	28	28
J2260	E	1,560(1)	23	23
J2274	G	1,560(1)	25	25
J2276	K	1,560(1)	27	27

(1) Limited by maximum system-wide velocity of 10 feet per second.

Fire flow to all of the hydrants is limited by the 10-fps maximum velocity through the existing and proposed 8-inch pipes in this scenario.

SCENARIO 2

Scenario 2 includes the piping indicated for Phases 1 and 2, shown in pink and orange on the attached figure. The piping includes 8-inch pipes extending from the existing 8-inch main running from north to south through the site, a connection to the existing 16-inch main on Shaw Road to the west, and improved looping as compared with Scenario 1.

Available fire flow was measured at the 14 proposed hydrants in the development; Hydrants A through N. The hydrants are located on 8-inch pipes throughout the development. The results of this modeling are included in Table. The modeled fire flow is available at any hydrant individually, but not simultaneously.

TABLE 3

Modeled Fire Flow Availability, Scenario 2

Node	Hydrant	Available Fire Flow, gpm	Residual Pressure at Available Fire Flow, psi	Minimum System Pressure at Available Fire Flow, psi
J2238	J	2,430(1)	25	25
J2240	L	2,340(1)	21	21
J2242	M	2,320(2)	20	20
J2244	N	2,120(2)	20	20
J2246	H	2,330(1)	20	20
J2248	I	2,540(1)	24	24
J2250	F	1,560(1)	26	26
J2252	D	2,230(1)	28	28
J2254	C	1,980(1)	29	28
J2256	B	2,340(1)	26	26
J2258	A	1,560(1)	38	38
J2260	E	1,560(1)	23	23
J2274	G	1,980(1)	25	25
J2276	K	2,040(1)	25	25

(1) Limited by maximum system-wide velocity of 10 fps.
(2) Limited by minimum system-wide pressure of 20 psi at all service locations.

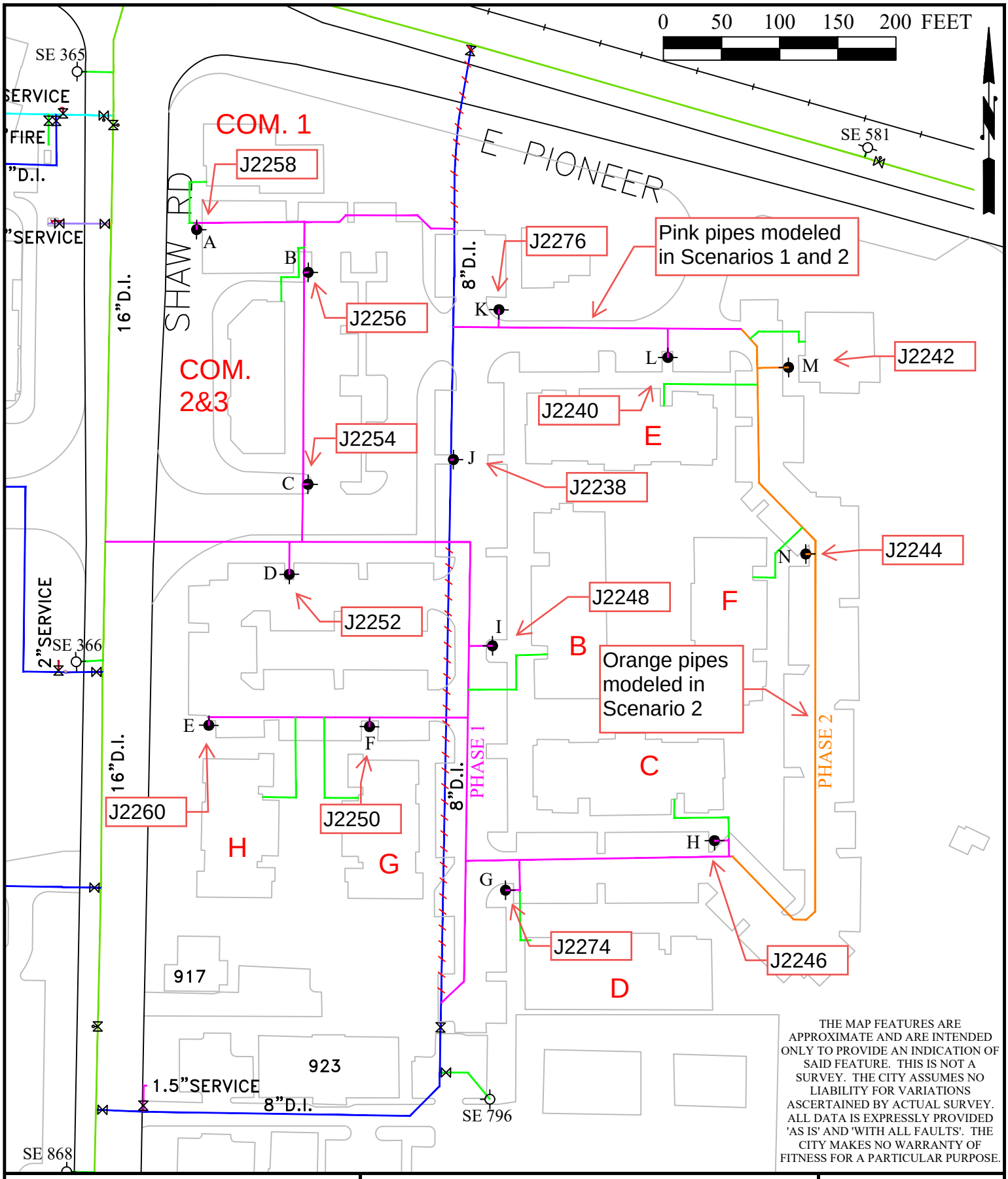
Fire flow to the hydrants is limited by the 10-fps maximum velocity through the existing and proposed 8-inch pipes.

It should be noted that the dead-end 8-inch mains within the proposed site can only provide 1,560 gpm, due to the City's 10-fps velocity limitation considered for the fire flow analysis. Therefore, if 1,500 gpm is required at the hydrant, located on a dead-end main, there is essentially no additional flow available for the sprinkler system supplied by the same dead-end main. This impacts Hydrants A, E, and F in both scenarios, and additionally Hydrants G and H in Scenario 1 only.

The Department of Health and City Standards for water distribution systems are to meet the peak hourly demand of the system while providing a minimum pressure of 30 psi, system-wide. Under peak daily demand with a fire flow, the system is designed to maintain a minimum pressure of 20 psi, system-wide. Although the peak hourly demand pressure may currently be higher than these standards, the Developer must recognize that

the City may not provide pressure higher than 30 psi in the future. The flows and pressures determined in this memo are based on the approximate hydrant elevation at ground level. The Developer may design their sprinkler system for whatever pressure they wish, however they must recognize and be responsible for conditions when the pressure may be less than currently exists.

KS/sr



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CITY OF PUYALLUP
PUBLIC WORKS
WATER DIVISION

HYDRAULIC MODEL FOR EAST TOWN CROSSING

SCALE AS SHOWN

04/10/2024

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