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 01/07/2025 Date

# Hydraulic Calculations

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

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

***HYDRAULIC CALCULATIONS***
***for***

***JOB NAME*** East Town Crossing Building B
***Location*** 2902 E PIONEER PUYALLUP, WA 98372
***Drawing #*** FP-3.0
***Contract #*** 24-093CM
***Date*** 1/2/2025

***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 @ 34.1711 - 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:***

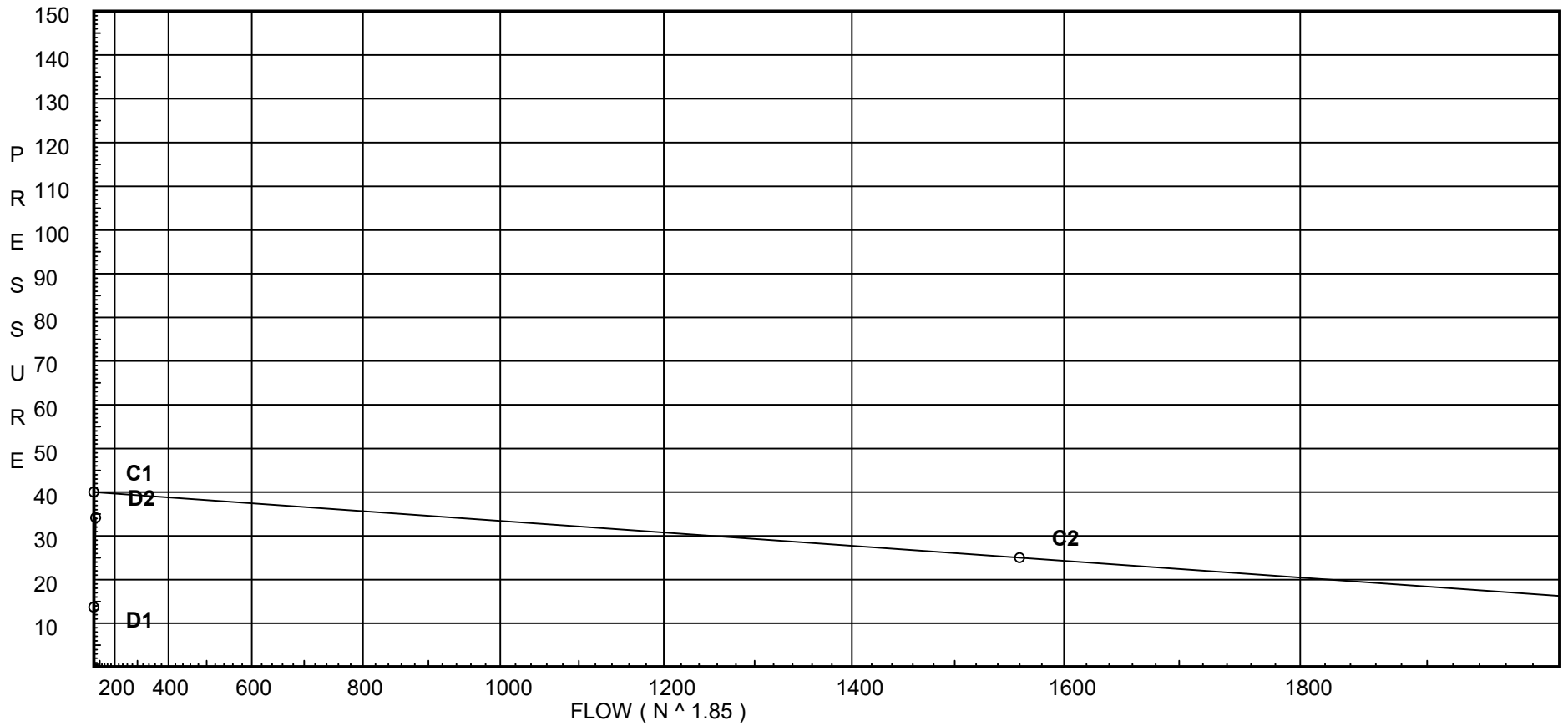
# Water Supply Curve

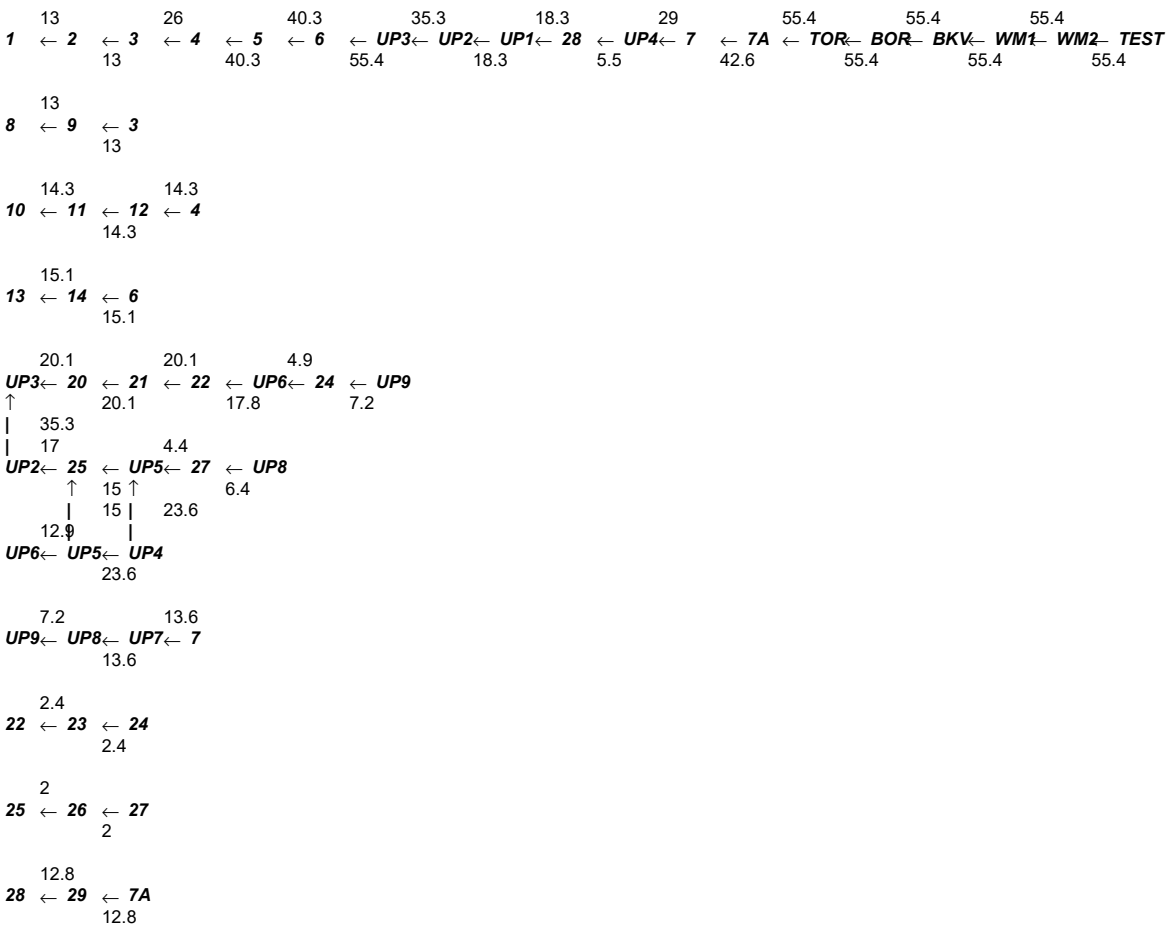
SPRINX FIRE PROTECTION INC.
ETC Building B


Date 1/2/2025

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 : 34.171
- Hose ( Demand ) : _____
- D3 - System Demand : 55.435
- Safety Margin : 5.798




1 2 3 4 5 6 UP3 UP2 UP1 28 UP4 7 7A TOR BOR BKV WM1 WM2 TEST
8 9 3
10 11 12 4
13 14 6
UP3 20 21 22 UP6 24 UP9
UP2 25 UP5 27 UP8
UP6 UP5 UP4
UP9 UP8 UP7 7
22 23 24
25 26 27
28 29 7A

# 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 | 34.171 |

## 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 | | | |
| UP3 | 110.08 | | 10.38 | | | |
| UP2 | 99.83 | | 14.94 | | | |
| UP1 | 89.58 | | 19.44 | | | |
| 28 | 89.58 | | 19.75 | | | |
| UP4 | 89.58 | | 19.76 | | | |
| 7 | 89.58 | | 19.92 | | | |
| 7A | 89.58 | | 20.35 | | | |
| TOR | 89.58 | | 22.1 | | | |
| BOR | 80.0 | | 27.01 | | | |
| BKV | 78.0 | | 34.15 | | | |
| WM1 | 78.0 | | 34.17 | | | |
| WM2 | 78.0 | | 34.17 | | | |
| TEST | 78.0 | | 34.17 | | | |
| 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 | | 10.55 | | | |
| 21 | 110.08 | | 10.63 | | | |
| 22 | 110.08 | | 10.72 | | | |
| UP6 | 110.08 | | 10.76 | | | |
| 24 | 110.08 | | 10.76 | | | |
| 25 | 99.83 | | 15.19 | | | |
| UP5 | 99.83 | | 15.21 | | | |
| 27 | 99.83 | | 15.22 | | | |
| UP9 | 110.08 | | 10.82 | | | |
| UP8 | 99.83 | | 15.26 | | | |
| UP7 | 89.58 | | 19.74 | | | |
| 23 | 110.08 | | 10.73 | | | |
| 26 | 99.83 | | 15.2 | | | |
| 29 | 89.58 | | 20.07 | | | |

| 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 | 7.640 | 150 | 9.950 | |
| to | | | | | | | 10.000 | | 0.0 | |
| UP3 | 110.080 | | 55.43 | 2.003 | | | 17.640 | 0.0244 | 0.430 | Vel = 5.64 |
| UP3 | 110.080 | | -20.14 | 2 | R | 1.0 | 10.250 | 150 | 10.380 | |
| to | | | | | | | 1.000 | | 4.439 | |
| UP2 | 99.830 | | 35.29 | 2.003 | | | 11.250 | 0.0105 | 0.118 | Vel = 3.59 |
| UP2 | 99.830 | | -17.03 | 2 | O | 10.0 | 10.250 | 150 | 14.937 | |
| to | | | | | | | 10.000 | | 4.439 | |
| UP1 | 89.580 | | 18.26 | 2.003 | | | 20.250 | 0.0032 | 0.064 | Vel = 1.86 |
| UP1 | 89.580 | | 0.0 | 2 | 9R | 9.0 | 70.830 | 150 | 19.440 | |
| to | | | | | 2O | 20.0 | 29.000 | | 0.0 | |
| 28 | 89.580 | | 18.26 | 2.003 | | | 99.830 | 0.0031 | 0.311 | Vel = 1.86 |
| 28 | 89.580 | | -12.80 | 2 | 2R | 2.0 | 10.670 | 150 | 19.751 | |
| to | | | | | | | 2.000 | | 0.0 | |
| UP4 | 89.580 | | 5.46 | 2.003 | | | 12.670 | 0.0003 | 0.004 | Vel = 0.56 |
| UP4 | 89.580 | | 23.58 | 2 | R | 1.0 | 11.000 | 150 | 19.755 | |
| to | | | | | O | 10.0 | 11.000 | | 0.0 | |
| 7 | 89.580 | | 29.04 | 2.003 | | | 22.000 | 0.0074 | 0.162 | Vel = 2.96 |
| 7 | 89.580 | | 13.60 | 2 | 3R | 3.0 | 26.000 | 150 | 19.917 | |
| to | | | | | | | 3.000 | | 0.0 | |
| 7A | 89.580 | | 42.64 | 2.003 | | | 29.000 | 0.0150 | 0.434 | Vel = 4.34 |
| 7A | 89.580 | | 12.79 | 2 | 5R | 5.0 | 36.000 | 150 | 20.351 | |
| 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 | 22.103 | |
| 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 | 53.000 | 140 | 27.008 | |
| to | | | | | 3E | 60.252 | 103.289 | | 7.127 | * * Fixed Loss = 6.261 |
| BKV | 78 | | 55.43 | 6.16 | Ziw | 0.0 | 156.289 | 0.0001 | 0.019 | Vel = 0.60 |
| BKV | 78 | | 0.0 | 6 | T | 43.037 | 55.000 | 140 | 34.154 | |
| to | | | | | E | 20.084 | 67.425 | | 0.0 | |
| WM1 | 78 | | 55.43 | 6.16 | G | 4.304 | 122.425 | 0.0001 | 0.014 | Vel = 0.60 |

| 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 | T | 55.354 | 39.000 | 140 | 34.168 | |
| to | | | | | | | 55.354 | | 0.0 | |
| WM2 | 78 | | 55.43 | 8.27 | | | 94.354 | 0 | 0.002 | Vel = 0.33 |
| WM2 | 78 | | 0.0 | 8 | | | 26.000 | 140 | 34.170 | |
| to | | | | | | | | | 0.0 | |
| TEST | 78 | | 55.43 | 8.27 | | | 26.000 | 0 | 0.001 | Vel = 0.33 |
| | | | 0.0 | | | | | | | |
| TEST | | | 55.43 | | | | | | 34.171 | K Factor = 9.48 |
| 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 |
| UP3 | 110.080 | | 20.14 | 2 | 4R | 4.0 | 31.670 | 150 | 10.380 | |
| to | | | | | O | 10.0 | 14.000 | | 0.0 | |
| 20 | 110.080 | | 20.14 | 2.003 | | | 45.670 | 0.0037 | 0.170 | Vel = 2.05 |
| 20 | 110.080 | | 0.0 | 2 | 3R | 3.0 | 19.000 | 150 | 10.550 | |
| to | | | | | | | 3.000 | | 0.0 | |
| 21 | 110.080 | | 20.14 | 2.003 | | | 22.000 | 0.0037 | 0.082 | Vel = 2.05 |
| 21 | 110.080 | | 0.0 | 2 | 3R | 3.0 | 20.170 | 150 | 10.632 | |
| to | | | | | | | 3.000 | | 0.0 | |
| 22 | 110.080 | | 20.14 | 2.003 | | | 23.170 | 0.0038 | 0.087 | Vel = 2.05 |
| 22 | 110.080 | | -2.35 | 2 | 2R | 2.0 | 10.670 | 150 | 10.719 | |
| to | | | | | | | 2.000 | | 0.0 | |
| UP6 | 110.080 | | 17.79 | 2.003 | | | 12.670 | 0.0030 | 0.038 | Vel = 1.81 |

| 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 ****** |
|---|---|---|---|---|---|---|---|---|---|---|
| UP6 | 110.080 | | -12.94 | 2 | 2R | 2.0 | 11.000 | 150 | 10.757 | |
| to | | | | | | | 2.000 | | 0.0 | |
| 24 | 110.080 | | 4.85 | 2.003 | | | 13.000 | 0.0002 | 0.003 | Vel = 0.49 |
| 24 | 110.080 | | 2.36 | 2 | 10R | 10.0 | 70.830 | 150 | 10.760 | |
| to | | | | | 2O | 20.0 | 30.000 | | 0.0 | |
| UP9 | 110.080 | | 7.21 | 2.003 | | | 100.830 | 0.0006 | 0.057 | Vel = 0.73 |
| | | | 0.0 | | | | | | | |
| UP9 | | | 7.21 | | | | | | 10.817 | K Factor = 2.19 |
| UP2 | 99.830 | | 17.04 | 2 | 10R | 10.0 | 71.000 | 150 | 14.937 | |
| to | | | | | O | 10.0 | 20.000 | | 0.0 | |
| 25 | 99.830 | | 17.04 | 2.003 | | | 91.000 | 0.0027 | 0.250 | Vel = 1.73 |
| 25 | 99.830 | | -2.01 | 2 | 2R | 2.0 | 10.670 | 150 | 15.187 | |
| to | | | | | | | 2.000 | | 0.0 | |
| UP5 | 99.830 | | 15.03 | 2.003 | | | 12.670 | 0.0022 | 0.028 | Vel = 1.53 |
| UP5 | 99.830 | | -10.64 | 2 | 2R | 2.0 | 11.000 | 150 | 15.215 | |
| to | | | | | | | 2.000 | | 0.0 | |
| 27 | 99.830 | | 4.39 | 2.003 | | | 13.000 | 0.0002 | 0.003 | Vel = 0.45 |
| 27 | 99.830 | | 2.00 | 2 | 9R | 9.0 | 70.830 | 150 | 15.218 | |
| to | | | | | 2O | 20.0 | 29.000 | | 0.0 | |
| UP8 | 99.830 | | 6.39 | 2.003 | | | 99.830 | 0.0004 | 0.044 | Vel = 0.65 |
| | | | 0.0 | | | | | | | |
| UP8 | | | 6.39 | | | | | | 15.262 | K Factor = 1.64 |
| UP6 | 110.080 | | 12.94 | 2 | R | 1.0 | 10.250 | 150 | 10.757 | |
| to | | | | | | | 1.000 | | 4.439 | |
| UP5 | 99.830 | | 12.94 | 2.003 | | | 11.250 | 0.0017 | 0.019 | Vel = 1.32 |
| UP5 | 99.830 | | 10.64 | 2 | O | 10.0 | 10.250 | 150 | 15.215 | |
| to | | | | | | | 10.000 | | 4.439 | |
| UP4 | 89.580 | | 23.58 | 2.003 | | | 20.250 | 0.0050 | 0.101 | Vel = 2.40 |
| | | | 0.0 | | | | | | | |
| UP4 | | | 23.58 | | | | | | 19.755 | K Factor = 5.31 |
| UP9 | 110.080 | | 7.21 | 2 | R | 1.0 | 10.250 | 150 | 10.817 | |
| to | | | | | | | 1.000 | | 4.439 | |
| UP8 | 99.830 | | 7.21 | 2.003 | | | 11.250 | 0.0005 | 0.006 | Vel = 0.73 |
| UP8 | 99.830 | | 6.39 | 2 | O | 10.0 | 10.250 | 150 | 15.262 | |
| to | | | | | | | 10.000 | | 4.439 | |
| UP7 | 89.580 | | 13.6 | 2.003 | | | 20.250 | 0.0018 | 0.037 | Vel = 1.38 |
| UP7 | 89.580 | | 0.0 | 2 | 8R | 8.0 | 71.000 | 150 | 19.738 | |
| to | | | | | 2O | 20.0 | 28.000 | | 0.0 | |
| 7 | 89.580 | | 13.6 | 2.003 | | | 99.000 | 0.0018 | 0.179 | Vel = 1.38 |
| | | | 0.0 | | | | | | | |
| 7 | | | 13.60 | | | | | | 19.917 | K Factor = 3.05 |
| 22 | 110.080 | | 2.36 | 1.25 | 3R | 3.0 | 26.000 | 150 | 10.719 | |
| to | | | | | O | 6.0 | 9.000 | | 0.0 | |
| 23 | 110.080 | | 2.36 | 1.394 | | | 35.000 | 0.0004 | 0.015 | Vel = 0.50 |
| 23 | 110.080 | | 0.0 | 1.25 | 5R | 5.0 | 47.580 | 150 | 10.734 | |
| to | | | | | 2O | 12.0 | 17.000 | | 0.0 | |
| 24 | 110.080 | | 2.36 | 1.394 | | | 64.580 | 0.0004 | 0.026 | Vel = 0.50 |
| | | | 0.0 | | | | | | | |

| Node1<br>to<br>Node2 | Elev1<br><br>Elev2 | K<br><br>Fact | Qa<br><br>Qt | Nom<br><br>Act | Fitting<br>or<br>Eqiv | Len | Pipe<br>Ftngs<br>Total | CFact<br><br>Pf/Ft | Pt<br>Pe<br>Pf | ******* | Notes | ****** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | | | 2.36 | | | | | | 10.760 | K Factor = 0.72 | | |
| 25 | 99.830 | | 2.00 | 1.25 | 3R | 3.0 | 26.000 | 150 | 15.187 | | | |
| to | | | | | O | 6.0 | 9.000 | | 0.0 | | | |
| 26 | 99.830 | | 2.0 | 1.394 | | | 35.000 | 0.0003 | 0.011 | Vel = 0.42 | | |
| 26 | 99.830 | | 0.0 | 1.25 | 5R | 5.0 | 47.580 | 150 | 15.198 | | | |
| to | | | | | 2O | 12.0 | 17.000 | | 0.0 | | | |
| 27 | 99.830 | | 2.0 | 1.394 | | | 64.580 | 0.0003 | 0.020 | Vel = 0.42 | | |
| | | | 0.0 | | | | | | | | | |
| 27 | | | 2.00 | | | | | | 15.218 | K Factor = 0.51 | | |
| 28 | 89.580 | | 12.80 | 1.25 | 2R | 2.0 | 26.000 | 150 | 19.751 | | | |
| to | | | | | O | 6.0 | 8.000 | | 0.0 | | | |
| 29 | 89.580 | | 12.8 | 1.394 | | | 34.000 | 0.0094 | 0.321 | Vel = 2.69 | | |
| 29 | 89.580 | | 0.0 | 1.25 | 2R | 2.0 | 21.580 | 150 | 20.072 | | | |
| to | | | | | O | 6.0 | 8.000 | | 0.0 | | | |
| 7A | 89.580 | | 12.8 | 1.394 | | | 29.580 | 0.0094 | 0.279 | Vel = 2.69 | | |
| | | | 0.0 | | | | | | | | | |
| 7A | | | 12.80 | | | | | | 20.351 | K Factor = 2.84 | | |

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

01/07/2025
Date

# Hydraulic Calculations

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

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

***HYDRAULIC CALCULATIONS***
***for***

***JOB NAME*** East Town Crossing Building B
***Location*** 2902 E PIONEER PUYALLUP, WA 98372
***Drawing #*** FP-3.0
***Contract #*** 24-093CM
***Date*** 1/2/2025

***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)*** 60.3415 - GPM @ 33.3383 - Psi
***Type of system*** WET-CPVC
***Volume of system (dry or pre-action)*** N/A - Gal

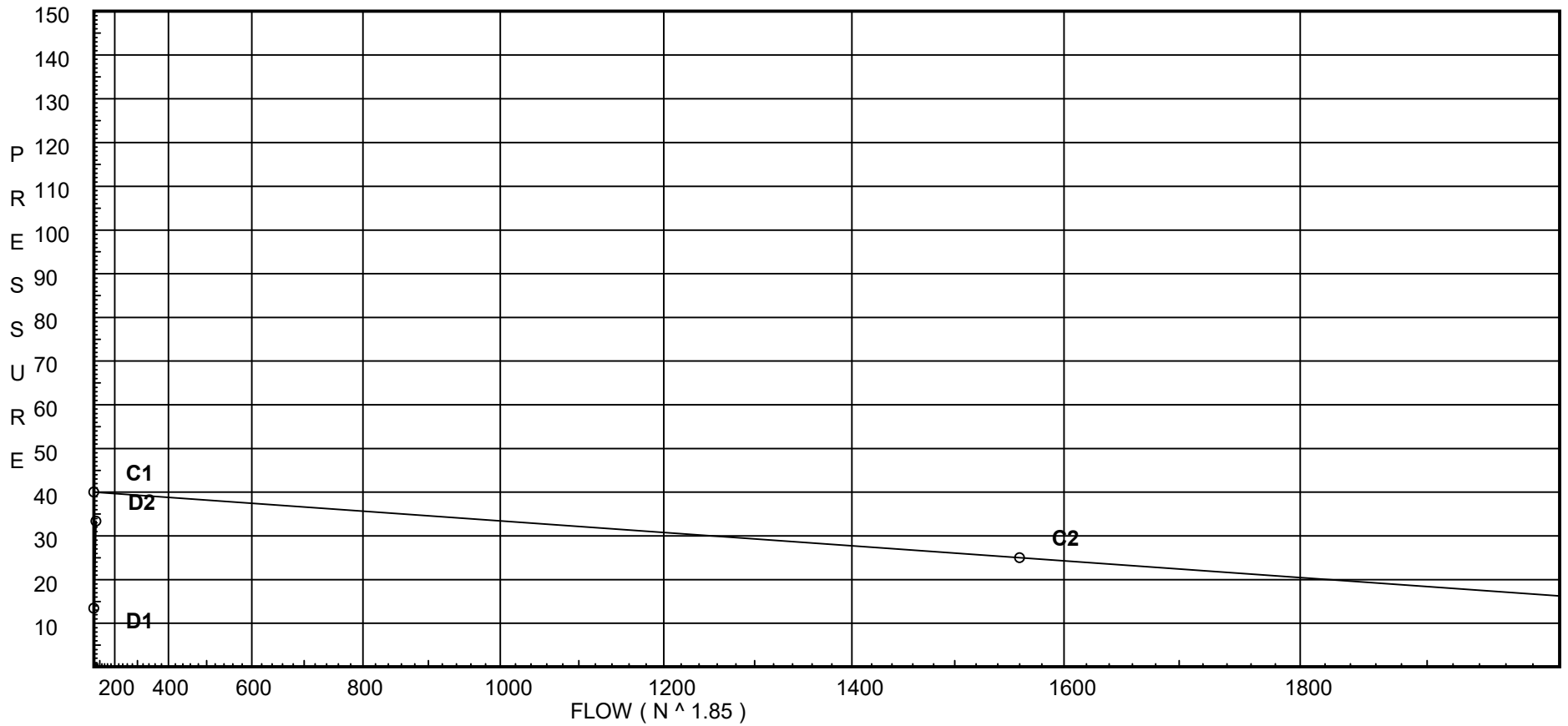
***WATER SUPPLY INFORMATION***

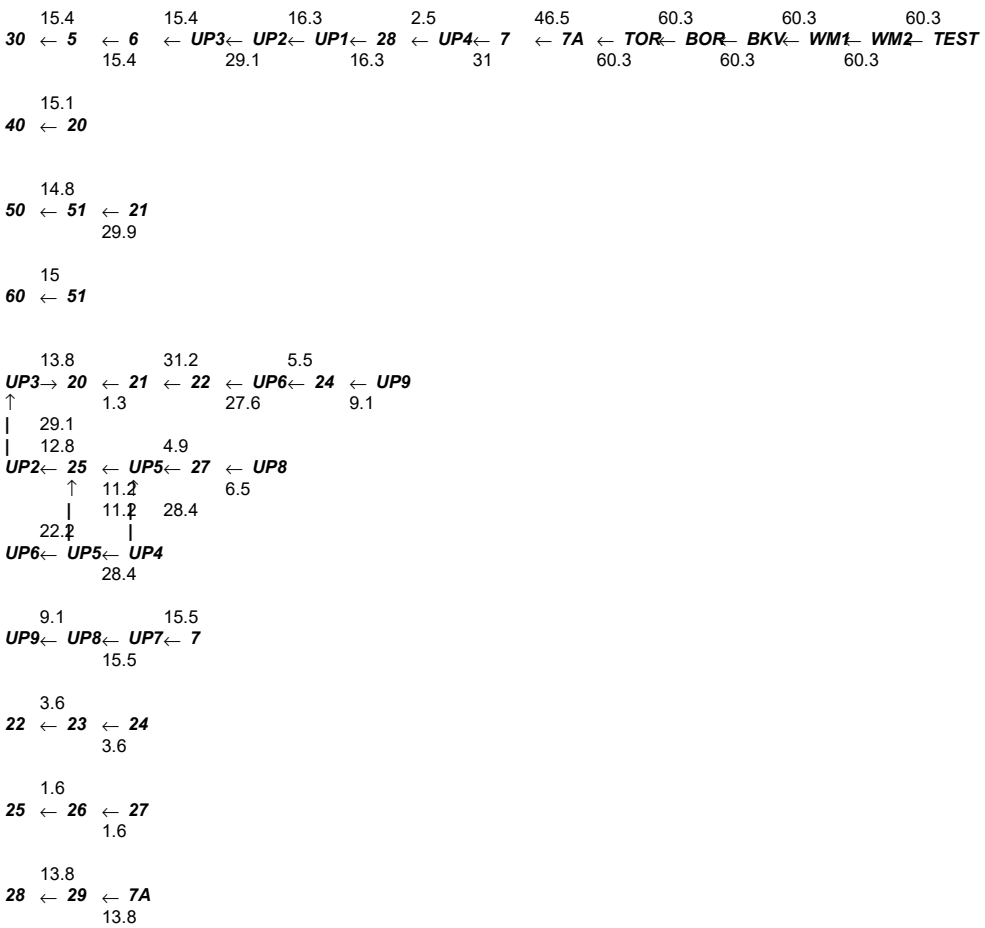
***Test date*** 4/16/2024
***Location*** 2902 E PIONEER
***Source of info*** CITY OF PUYALLUP WATER DIVISON

***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 : 60.342
- D2 - System Pressure : 33.338
- Hose ( Demand ) : _____
- D3 - System Demand : 60.342
- Safety Margin : 6.625




15.4 15.4 16.3 2.5 46.5 60.3 60.3 60.3
30 ← 5 ← 6 ← UP3 ← UP2 ← UP1 ← 28 ← UP4 ← 7 ← 7A ← TOR ← BOR ← BKV ← WM1 ← WM2 ← TEST
15.4 29.1 16.3 31 60.3 60.3 60.3
15.1
40 ← 20
14.8
50 ← 51 ← 21
29.9
15
60 ← 51
13.8 31.2 5.5
UP3 → 20 ← 21 ← 22 ← UP6 ← 24 ← UP9
1.3 27.6 9.1
29.1
12.8 4.9
UP2 ← 25 ← UP5 ← 27 ← UP8
11.2 6.5
11.2 28.4
22.2
UP6 ← UP5 ← UP4
28.4
9.1 15.5
UP9 ← UP8 ← UP7 ← 7
15.5
3.6
22 ← 23 ← 24
3.6
1.6
25 ← 26 ← 27
1.6
13.8
28 ← 29 ← 7A
13.8

# 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 | 39.963 | 60.34 | 33.338 |

## NODE ANALYSIS

| Node Tag | Elevation | Node Type | Pressure at Node | Discharge at Node | Notes | |
|---|---|---|---|---|---|---|
| 30 | 109.0 | 5.6 | 7.53 | 15.37 | 0.1 | 130.24 |
| 5 | 110.08 | | 9.1 | | | |
| 6 | 110.08 | | 9.15 | | | |
| UP3 | 110.08 | | 9.19 | | | |
| UP2 | 99.83 | | 13.71 | | | |
| UP1 | 89.58 | | 18.2 | | | |
| 28 | 89.58 | | 18.46 | | | |
| UP4 | 89.58 | | 18.46 | | | |
| 7 | 89.58 | | 18.64 | | | |
| 7A | 89.58 | | 19.15 | | | |
| TOR | 89.58 | | 21.2 | | | |
| BOR | 80.0 | | 26.23 | | | |
| BKV | 78.0 | | 33.32 | | | |
| WM1 | 78.0 | | 33.33 | | | |
| WM2 | 78.0 | | 33.34 | | | |
| TEST | 78.0 | | 33.34 | | | |
| 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 | | 9.11 | | | |
| 21 | 110.08 | | 9.11 | | | |
| 22 | 110.08 | | 9.3 | | | |
| UP6 | 110.08 | | 9.39 | | | |
| 24 | 110.08 | | 9.39 | | | |
| 25 | 99.83 | | 13.86 | | | |
| UP5 | 99.83 | | 13.88 | | | |
| 27 | 99.83 | | 13.88 | | | |
| UP9 | 110.08 | | 9.48 | | | |
| UP8 | 99.83 | | 13.93 | | | |
| UP7 | 89.58 | | 18.41 | | | |
| 23 | 110.08 | | 9.33 | | | |
| 26 | 99.83 | | 13.87 | | | |
| 29 | 89.58 | | 18.83 | | | |

| 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 | 15.37 | 1 | 4N | 28.0 | 20.830 | 150 | 7.529 | |
| to | | | | | | | 28.000 | | -0.468 | |
| 5 | 110.080 | | 15.37 | 1.101 | | | 48.830 | 0.0418 | 2.041 | Vel = 5.18 |
| 5 | 110.080 | | 0.0 | 1.25 | R | 1.0 | 2.750 | 150 | 9.102 | |
| to | | | | | | | 1.000 | | 0.0 | |
| 6 | 110.080 | | 15.37 | 1.394 | | | 3.750 | 0.0133 | 0.050 | Vel = 3.23 |
| 6 | 110.080 | | 0.0 | 2 | O | 10.0 | 7.640 | 150 | 9.152 | |
| to | | | | | | | 10.000 | | 0.0 | |
| UP3 | 110.080 | | 15.37 | 2.003 | | | 17.640 | 0.0023 | 0.040 | Vel = 1.56 |
| UP3 | 110.080 | | 13.76 | 2 | R | 1.0 | 10.250 | 150 | 9.192 | |
| to | | | | | | | 1.000 | | 4.439 | |
| UP2 | 99.830 | | 29.13 | 2.003 | | | 11.250 | 0.0074 | 0.083 | Vel = 2.97 |
| UP2 | 99.830 | | -12.78 | 2 | O | 10.0 | 10.250 | 150 | 13.714 | |
| to | | | | | | | 10.000 | | 4.439 | |
| UP1 | 89.580 | | 16.35 | 2.003 | | | 20.250 | 0.0026 | 0.052 | Vel = 1.66 |
| UP1 | 89.580 | | 0.0 | 2 | 9R | 9.0 | 70.830 | 150 | 18.205 | |
| to | | | | | 2O | 20.0 | 29.000 | | 0.0 | |
| 28 | 89.580 | | 16.35 | 2.003 | | | 99.830 | 0.0025 | 0.253 | Vel = 1.66 |
| 28 | 89.580 | | -13.84 | 2 | 2R | 2.0 | 10.670 | 150 | 18.458 | |
| to | | | | | | | 2.000 | | 0.0 | |
| UP4 | 89.580 | | 2.51 | 2.003 | | | 12.670 | 0.0002 | 0.002 | Vel = 0.26 |
| UP4 | 89.580 | | 28.45 | 2 | R | 1.0 | 11.000 | 150 | 18.460 | |
| to | | | | | O | 10.0 | 11.000 | | 0.0 | |
| 7 | 89.580 | | 30.96 | 2.003 | | | 22.000 | 0.0083 | 0.182 | Vel = 3.15 |
| 7 | 89.580 | | 15.55 | 2 | 3R | 3.0 | 26.000 | 150 | 18.642 | |
| to | | | | | | | 3.000 | | 0.0 | |
| 7A | 89.580 | | 46.51 | 2.003 | | | 29.000 | 0.0176 | 0.510 | Vel = 4.74 |
| 7A | 89.580 | | 13.83 | 2 | 5R | 5.0 | 36.000 | 150 | 19.152 | |
| to | | | | | 2O | 20.0 | 36.000 | | 0.0 | |
| TOR | 89.580 | | 60.34 | 2.003 | N | 11.0 | 72.000 | 0.0285 | 2.049 | Vel = 6.14 |
| TOR | 89.580 | | 0.0 | 2 | B | 8.183 | 9.500 | 120 | 21.201 | |
| to | | | | | S | 15.003 | 23.186 | | 4.149 | |
| BOR | 80 | | 60.34 | 2.203 | | | 32.686 | 0.0271 | 0.885 | Vel = 5.08 |
| BOR | 80 | | 0.0 | 6 | T | 43.037 | 53.000 | 140 | 26.235 | |
| to | | | | | 3E | 60.252 | 103.289 | | 7.062 | * * Fixed Loss = 6.195 |
| BKV | 78 | | 60.34 | 6.16 | Ziw | 0.0 | 156.289 | 0.0001 | 0.021 | Vel = 0.65 |
| BKV | 78 | | 0.0 | 6 | T | 43.037 | 55.000 | 140 | 33.318 | |
| to | | | | | E | 20.084 | 67.425 | | 0.0 | |
| WM1 | 78 | | 60.34 | 6.16 | G | 4.304 | 122.425 | 0.0001 | 0.016 | Vel = 0.65 |
| WM1 | 78 | | 0.0 | 8 | T | 55.354 | 39.000 | 140 | 33.334 | |
| to | | | | | | | 55.354 | | 0.0 | |
| WM2 | 78 | | 60.34 | 8.27 | | | 94.354 | 0 | 0.003 | Vel = 0.36 |
| WM2 | 78 | | 0.0 | 8 | | | 26.000 | 140 | 33.337 | |
| to | | | | | | | | | 0.0 | |
| TEST | 78 | | 60.34 | 8.27 | | | 26.000 | 0 | 0.001 | Vel = 0.36 |
| | | | 0.0 | | | | | | | |
| TEST | | | 60.34 | | | | | | 33.338 | K Factor = 10.45 |
| 40 | 109 | 5.60 | 15.11 | 1 | 4N | 28.0 | 20.580 | 150 | 7.282 | |
| to | | | | | 3R | 3.0 | 36.000 | | -0.468 | |
| 20 | 110.080 | | 15.11 | 1.101 | O | 5.0 | 56.580 | 0.0405 | 2.293 | Vel = 5.09 |

| 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 | | | | | | | |
| 20 | | | 15.11 | | | | | | 9.107 | 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 |
| UP3 | 110.080 | | -13.77 | 2 | 4R | 4.0 | 31.670 | 150 | 9.192 | |
| to | | | | | O | 10.0 | 14.000 | | 0.0 | |
| 20 | 110.080 | | -13.77 | 2.003 | | | 45.670 | -0.0019 | -0.085 | Vel = 1.40 |
| 20 | 110.080 | | 15.12 | 2 | 3R | 3.0 | 19.000 | 150 | 9.107 | |
| to | | | | | | | 3.000 | | 0.0 | |
| 21 | 110.080 | | 1.35 | 2.003 | | | 22.000 | 0 | 0.001 | Vel = 0.14 |
| 21 | 110.080 | | 29.86 | 2 | 3R | 3.0 | 20.170 | 150 | 9.108 | |
| to | | | | | | | 3.000 | | 0.0 | |
| 22 | 110.080 | | 31.21 | 2.003 | | | 23.170 | 0.0084 | 0.194 | Vel = 3.18 |
| 22 | 110.080 | | -3.59 | 2 | 2R | 2.0 | 10.670 | 150 | 9.302 | |
| to | | | | | | | 2.000 | | 0.0 | |
| UP6 | 110.080 | | 27.62 | 2.003 | | | 12.670 | 0.0067 | 0.085 | Vel = 2.81 |
| UP6 | 110.080 | | -22.16 | 2 | 2R | 2.0 | 11.000 | 150 | 9.387 | |
| to | | | | | | | 2.000 | | 0.0 | |
| 24 | 110.080 | | 5.46 | 2.003 | | | 13.000 | 0.0004 | 0.005 | Vel = 0.56 |
| 24 | 110.080 | | 3.59 | 2 | 10R | 10.0 | 70.830 | 150 | 9.392 | |
| to | | | | | 2O | 20.0 | 30.000 | | 0.0 | |
| UP9 | 110.080 | | 9.05 | 2.003 | | | 100.830 | 0.0009 | 0.086 | Vel = 0.92 |
| | | | 0.0 | | | | | | | |
| UP9 | | | 9.05 | | | | | | 9.478 | K Factor = 2.94 |
| UP2 | 99.830 | | 12.78 | 2 | 10R | 10.0 | 71.000 | 150 | 13.714 | |
| to | | | | | O | 10.0 | 20.000 | | 0.0 | |
| 25 | 99.830 | | 12.78 | 2.003 | | | 91.000 | 0.0016 | 0.147 | Vel = 1.30 |
| 25 | 99.830 | | -1.57 | 2 | 2R | 2.0 | 10.670 | 150 | 13.861 | |
| to | | | | | | | 2.000 | | 0.0 | |
| UP5 | 99.830 | | 11.21 | 2.003 | | | 12.670 | 0.0013 | 0.016 | Vel = 1.14 |
| UP5 | 99.830 | | -6.29 | 2 | 2R | 2.0 | 11.000 | 150 | 13.877 | |
| to | | | | | | | 2.000 | | 0.0 | |
| 27 | 99.830 | | 4.92 | 2.003 | | | 13.000 | 0.0002 | 0.003 | Vel = 0.50 |
| 27 | 99.830 | | 1.57 | 2 | 9R | 9.0 | 70.830 | 150 | 13.880 | |
| to | | | | | 2O | 20.0 | 29.000 | | 0.0 | |
| UP8 | 99.830 | | 6.49 | 2.003 | | | 99.830 | 0.0005 | 0.046 | Vel = 0.66 |

| 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 | | | | | | | |
| UP8 | | | 6.49 | | | | | | 13.926 | K Factor = 1.74 |
| UP6 | 110.080 | | 22.16 | 2 | R | 1.0 | 10.250 | 150 | 9.387 | |
| to | | | | | | | 1.000 | | 4.439 | |
| UP5 | 99.830 | | 22.16 | 2.003 | | | 11.250 | 0.0045 | 0.051 | Vel = 2.26 |
| UP5 | 99.830 | | 6.29 | 2 | O | 10.0 | 10.250 | 150 | 13.877 | |
| to | | | | | | | 10.000 | | 4.439 | |
| UP4 | 89.580 | | 28.45 | 2.003 | | | 20.250 | 0.0071 | 0.144 | Vel = 2.90 |
| | | | 0.0 | | | | | | | |
| UP4 | | | 28.45 | | | | | | 18.460 | K Factor = 6.62 |
| UP9 | 110.080 | | 9.05 | 2 | R | 1.0 | 10.250 | 150 | 9.478 | |
| to | | | | | | | 1.000 | | 4.439 | |
| UP8 | 99.830 | | 9.05 | 2.003 | | | 11.250 | 0.0008 | 0.009 | Vel = 0.92 |
| UP8 | 99.830 | | 6.49 | 2 | O | 10.0 | 10.250 | 150 | 13.926 | |
| to | | | | | | | 10.000 | | 4.439 | |
| UP7 | 89.580 | | 15.54 | 2.003 | | | 20.250 | 0.0024 | 0.048 | Vel = 1.58 |
| UP7 | 89.580 | | 0.0 | 2 | 8R | 8.0 | 71.000 | 150 | 18.413 | |
| to | | | | | 2O | 20.0 | 28.000 | | 0.0 | |
| 7 | 89.580 | | 15.54 | 2.003 | | | 99.000 | 0.0023 | 0.229 | Vel = 1.58 |
| | | | 0.0 | | | | | | | |
| 7 | | | 15.54 | | | | | | 18.642 | K Factor = 3.60 |
| 22 | 110.080 | | 3.59 | 1.25 | 3R | 3.0 | 26.000 | 150 | 9.302 | |
| to | | | | | O | 6.0 | 9.000 | | 0.0 | |
| 23 | 110.080 | | 3.59 | 1.394 | | | 35.000 | 0.0009 | 0.032 | Vel = 0.75 |
| 23 | 110.080 | | 0.0 | 1.25 | 5R | 5.0 | 47.580 | 150 | 9.334 | |
| to | | | | | 2O | 12.0 | 17.000 | | 0.0 | |
| 24 | 110.080 | | 3.59 | 1.394 | | | 64.580 | 0.0009 | 0.058 | Vel = 0.75 |
| | | | 0.0 | | | | | | | |
| 24 | | | 3.59 | | | | | | 9.392 | K Factor = 1.17 |
| 25 | 99.830 | | 1.58 | 1.25 | 3R | 3.0 | 26.000 | 150 | 13.861 | |
| to | | | | | O | 6.0 | 9.000 | | 0.0 | |
| 26 | 99.830 | | 1.58 | 1.394 | | | 35.000 | 0.0002 | 0.007 | Vel = 0.33 |
| 26 | 99.830 | | 0.0 | 1.25 | 5R | 5.0 | 47.580 | 150 | 13.868 | |
| to | | | | | 2O | 12.0 | 17.000 | | 0.0 | |
| 27 | 99.830 | | 1.58 | 1.394 | | | 64.580 | 0.0002 | 0.012 | Vel = 0.33 |
| | | | 0.0 | | | | | | | |
| 27 | | | 1.58 | | | | | | 13.880 | K Factor = 0.42 |
| 28 | 89.580 | | 13.83 | 1.25 | 2R | 2.0 | 26.000 | 150 | 18.458 | |
| to | | | | | O | 6.0 | 8.000 | | 0.0 | |
| 29 | 89.580 | | 13.83 | 1.394 | | | 34.000 | 0.0109 | 0.371 | Vel = 2.91 |
| 29 | 89.580 | | 0.0 | 1.25 | 2R | 2.0 | 21.580 | 150 | 18.829 | |
| to | | | | | O | 6.0 | 8.000 | | 0.0 | |
| 7A | 89.580 | | 13.83 | 1.394 | | | 29.580 | 0.0109 | 0.323 | Vel = 2.91 |
| | | | 0.0 | | | | | | | |
| 7A | | | 13.83 | | | | | | 19.152 | K Factor = 3.16 |

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<br>CITY OF PUYALLUP, PIERCE COUNTY, WASHINGTON<br>G&O #21415.19 |

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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 15$^{th}$ 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.

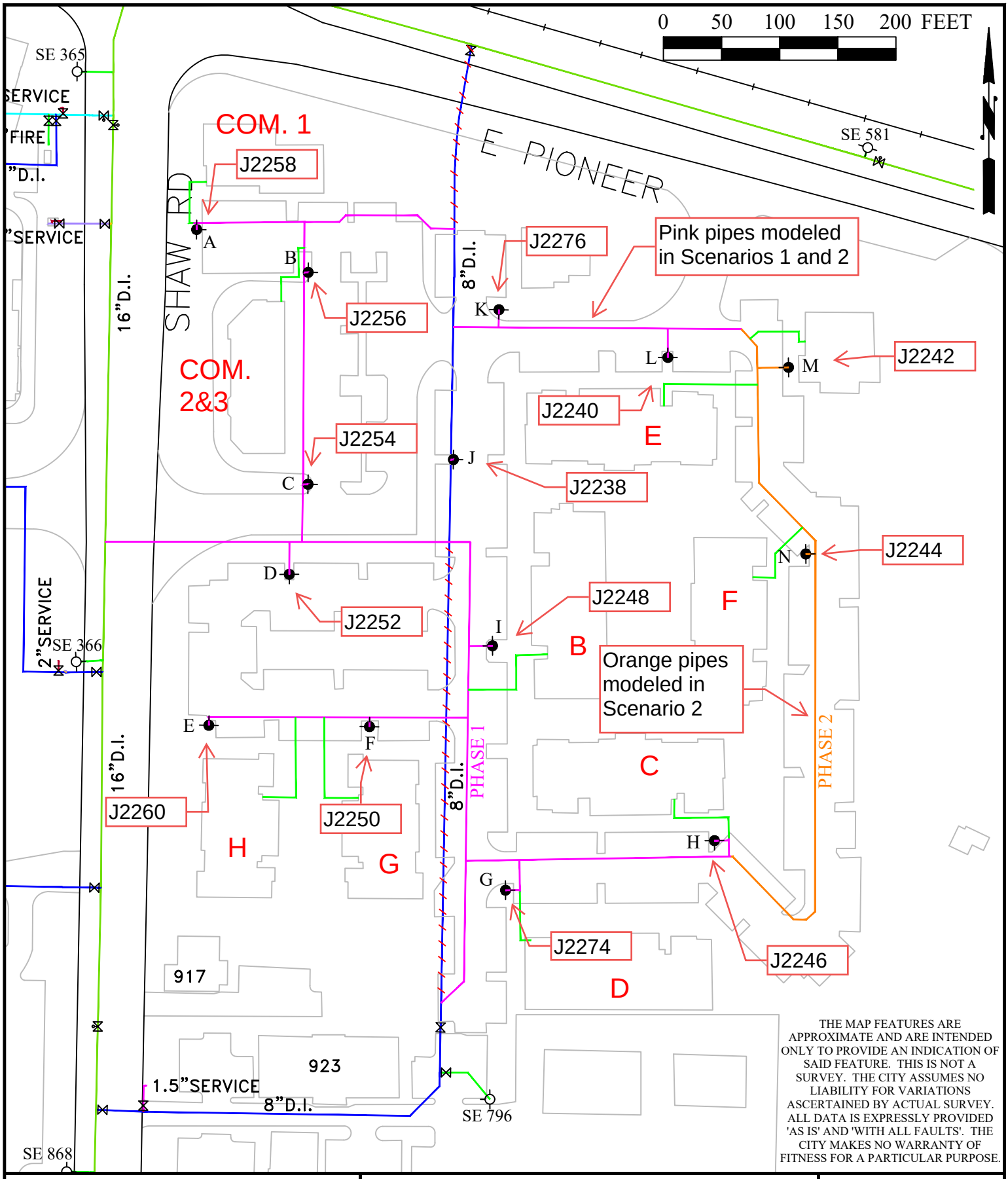
Fire flow to the hydrants is limited by the 10-fps maximum velocity through the existing and proposed 8-inch pipes.

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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