

# Hydraulic Calculations

MURRIETA PUBLIC LIBRARY  
EXPANSION  
8 TOWN SQUARE, MURRIETA, CA  
92562



TK1SC Collaborative  
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# Hydraulic Calculations Summary

for

Project Name: MURRIETA PUBLIC LIBRARY EXPANSION

Location: 8 TOWN SQUARE, MURRIETA, CA 92562, ,

Drawing Name: FP US0037969.5753 Murrieta PLE R23

Calculation Date:6/6/2025

## Design

Remote Area Name: Children Stack

Occupancy Classification: Ordinary Group II

Density 0.200 GPM/SF

Area of Application: 1500.00 SF (Actual Area: 1540.15 SF)

Coverage per Sprinkler: 120.00 SF (typical)

Type of Sprinklers Calculated:

No. of Sprinklers Calculated: 18

Type of System: S - Fire Protection Wet Volume of Dry or PreAction System: 0.0 gal

In-rack Demand: N/A at Node: N/A

Hose Streams: 250.000 GPM at Node: UG1 Type Allowance at Source

Total Water Required (including Hose Streams where applicable)

FROM: Water Supply at Node UG1: 742.388 GPM @ 32.13 psi

Safety Margin: 31.24 psi

Applied Friction Loss Method: Hazen-Williams

Darcy-Weisbach Suppression Agent: None.

Contact Name CITY OF MURRIETA

Address: ,

Phone Number: Name of Designer: IVAN MONTIJO

Authority Having Jurisdiction:

Notes:

Automatic Peaking Results

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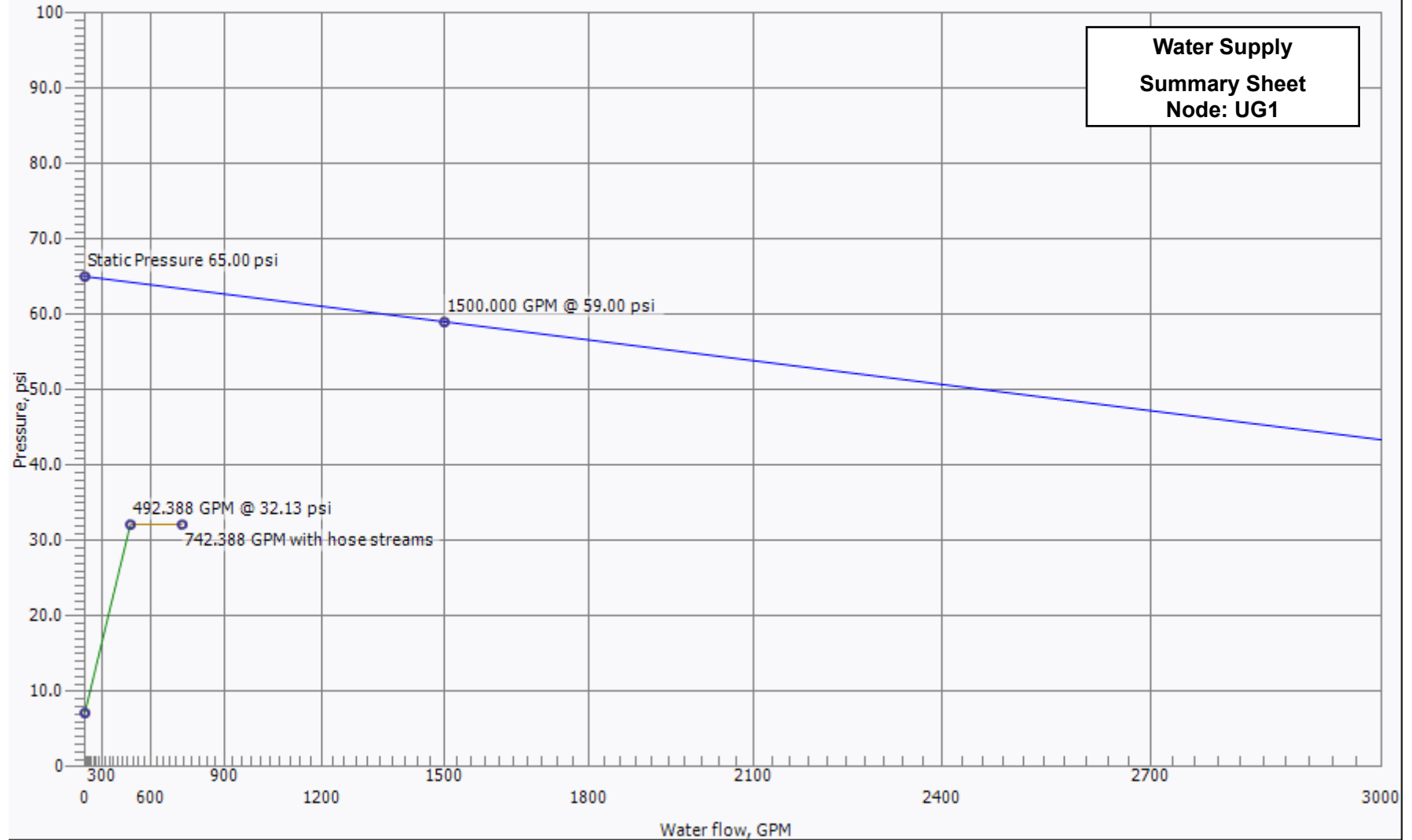
# Hydraulic Graph

Job Name: MURRIETA PUBLIC LIBRARY EXPANSION  
Remote Area Name: Children Stack

N 1.85

Date: 6/6/2025

Water Supply  
Summary Sheet  
Node: UG1



A negative result in Required Pressure indicates that the Pump is capable of furnishing all of the pressure required by the demand reported within this calculation.  
No pressure is being required from the Source/Supply to meet the demand (by a margin of this negative value).

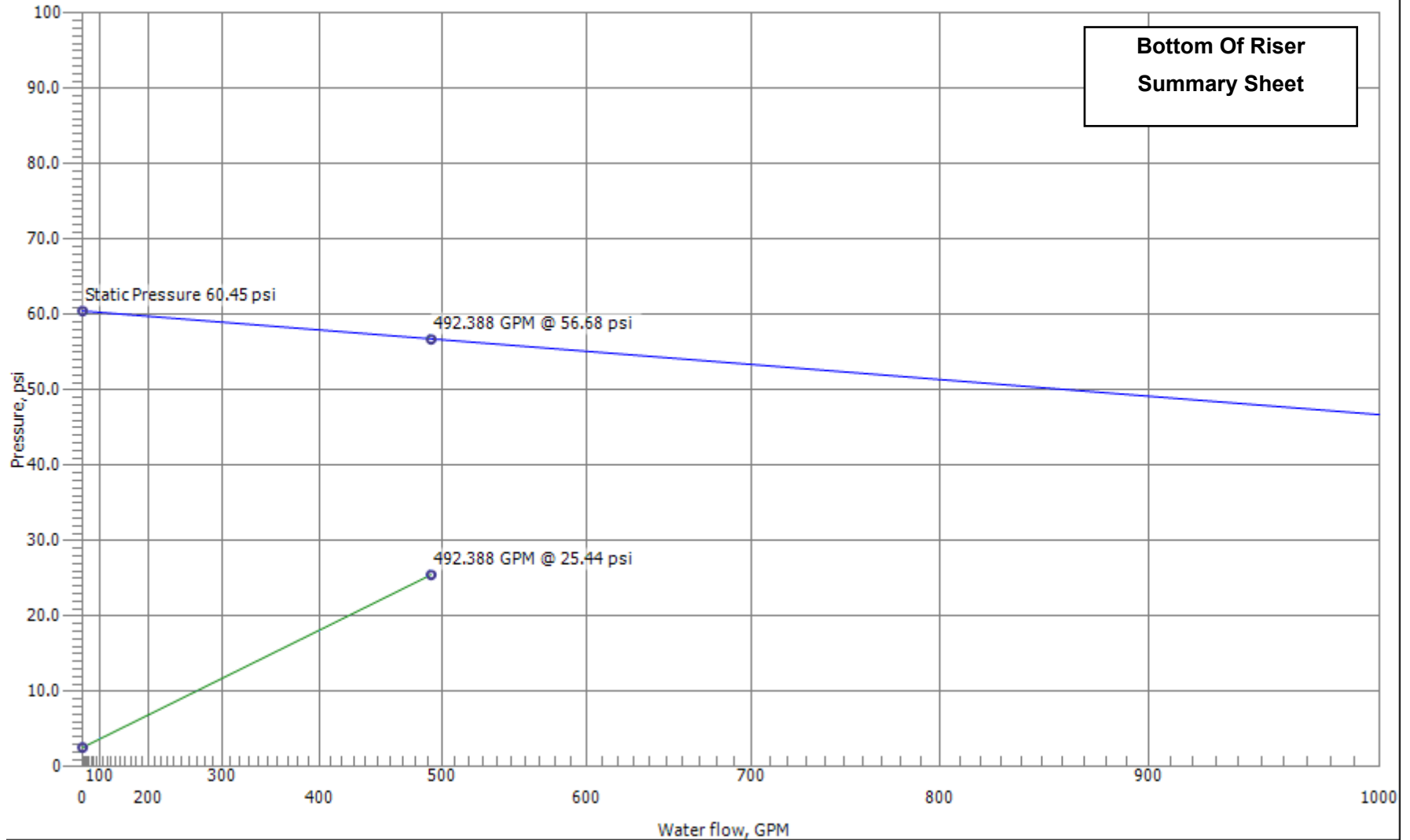
# Hydraulic Graph

Job Name: MURRIETA PUBLIC LIBRARY EXPANSION  
Remote Area Name: Children Stack

N 1.85

Date: 6/6/2025

Bottom Of Riser  
Summary Sheet



A negative result in Required Pressure indicates that the Pump is capable of furnishing all of the pressure required by the demand reported within this calculation.  
No pressure is being required from the Source/Supply to meet the demand (by a margin of this negative value).



## Outflowing Devices

Job Number: 2023-40136  
Report Description: Ordinary Group II

| Device      |     | Actual Flow (GPM) | Minimum Flow (GPM) | K-Factor (K) | Pressure (psi) |  |  |
|-------------|-----|-------------------|--------------------|--------------|----------------|--|--|
| Sprinkler   | 103 | 29.960 GPM        | 24.000 GPM         | 8            | 14.02 psi      |  |  |
| Sprinkler   | 107 | 27.818 GPM        | 24.000 GPM         | 8            | 12.09 psi      |  |  |
| Sprinkler   | 113 | 27.722 GPM        | 24.000 GPM         | 8            | 12.01 psi      |  |  |
| Sprinkler   | 104 | 30.059 GPM        | 24.000 GPM         | 8            | 14.12 psi      |  |  |
| Sprinkler   | 108 | 27.911 GPM        | 24.000 GPM         | 8            | 12.17 psi      |  |  |
| Sprinkler   | 114 | 27.815 GPM        | 24.000 GPM         | 8            | 12.09 psi      |  |  |
| Sprinkler   | 105 | 30.211 GPM        | 24.000 GPM         | 8            | 14.26 psi      |  |  |
| Sprinkler   | 109 | 27.212 GPM        | 24.000 GPM         | 8            | 11.57 psi      |  |  |
| Sprinkler   | 115 | 27.118 GPM        | 24.000 GPM         | 8            | 11.49 psi      |  |  |
| Sprinkler   | 106 | 30.112 GPM        | 24.000 GPM         | 8            | 14.17 psi      |  |  |
| Sprinkler   | 110 | 26.551 GPM        | 24.000 GPM         | 8            | 11.01 psi      |  |  |
| Sprinkler   | 116 | 26.459 GPM        | 24.000 GPM         | 8            | 10.94 psi      |  |  |
| Sprinkler   | 111 | 26.235 GPM        | 24.000 GPM         | 8            | 10.75 psi      |  |  |
| Sprinkler   | 117 | 26.144 GPM        | 24.000 GPM         | 8            | 10.68 psi      |  |  |
| Sprinkler   | 112 | 26.148 GPM        | 24.000 GPM         | 8            | 10.68 psi      |  |  |
| Sprinkler   | 118 | 26.057 GPM        | 24.000 GPM         | 8            | 10.61 psi      |  |  |
| ➡ Sprinkler | 101 | 24.000 GPM        | 24.000 GPM         | 8            | 9.00 psi       |  |  |
| Sprinkler   | 102 | 24.858 GPM        | 24.000 GPM         | 8            | 9.66 psi       |  |  |

➡ Most Demanding Sprinkler Data

| Pipe Information |              |          |                              |            |                        |               |                                     |              |                                                                                                                                                                |
|------------------|--------------|----------|------------------------------|------------|------------------------|---------------|-------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Node 1           | Elev 1<br>ft | K-Factor | Flow added<br>this step<br>Q | Nominal ID | Fittings &<br>Devices  | Length<br>ft  | C Factor or<br>Roughness            | Total(Pt)    | Notes<br><br>Fitting/Device (Equivalent Length)<br><br>Fixed Pressure Losses, when<br>applicable, are added directly to (Pf)<br>and shown as a negative value. |
|                  |              |          |                              |            |                        | Fitting<br>ft | Pf Friction<br>Loss Per Unit<br>psi | Elev(Pe)     |                                                                                                                                                                |
| Node 2           | Elev 2<br>ft | Velocity | Total Flow<br>Q              | Actual ID  | Equiv.<br>Length<br>ft | Total<br>ft   |                                     | Friction(Pf) |                                                                                                                                                                |

|     |               |        |             |         |             |               |          |           |                                                                  |
|-----|---------------|--------|-------------|---------|-------------|---------------|----------|-----------|------------------------------------------------------------------|
| 101 | 8' - 0"       | 8      | 24.000 GPM  | 1"      | (See Notes) | 3' - 3"       | 120      | 9.00 psi  | ••••• Route 1 •••••<br>Sprinkler,<br>E(2' - 0") fd(37' - 0"), HW |
| 8   | 14' - 4 1/2"  | 9 FPS  | 24.000 GPM  | 1 1/16" |             | 39' - 0"      | 0.18 psi | -2.77 psi |                                                                  |
|     |               |        |             |         |             | 42' - 3"      |          | 7.70 psi  |                                                                  |
| 8   | 14' - 4 1/2"  |        |             | 1"      | (See Notes) | 1' - 4 1/2"   | 120      | 13.94 psi | T(5' - 0"), HW                                                   |
| 10  | 14' - 4 1/2"  | 9 FPS  | 24.000 GPM  | 1 1/16" |             | 5' - 0"       | 0.18 psi |           |                                                                  |
|     |               |        |             |         |             | 6' - 4 1/2"   |          | 1.17 psi  |                                                                  |
| 10  | 14' - 4 1/2"  |        |             | 2"      | (See Notes) | 20' - 1 1/2"  | 120      | 15.10 psi | 3Tr, T(10' - 0"), HW                                             |
| 11  | 14' - 4 1/2"  | 2 FPS  | 24.000 GPM  | 2 1/16" |             | 10' - 0"      | 0.01 psi |           |                                                                  |
|     |               |        |             |         |             | 30' - 1 1/2"  |          | 0.20 psi  |                                                                  |
| 11  | 14' - 4 1/2"  |        | 24.858 GPM  | 2"      | (See Notes) | 0' - 10"      | 120      | 15.31 psi | Flow (q) from Route 2<br><br>T(10' - 0"), HW                     |
| 5   | 13' - 7"      | 5 FPS  | 48.858 GPM  | 2 1/16" |             | 10' - 0"      | 0.02 psi | 0.35 psi  |                                                                  |
|     |               |        |             |         |             | 10' - 10"     |          | 0.27 psi  |                                                                  |
| 5   | 13' - 7"      |        |             | 4"      | (See Notes) | 5' - 9"       | 120      | 15.93 psi | Tr, HW                                                           |
| 6   | 14' - 0 1/2"  | 1 FPS  | 48.858 GPM  | 4 1/4"  |             |               | 0.00 psi | -0.21 psi |                                                                  |
|     |               |        |             |         |             | 5' - 9"       |          | 0.00 psi  |                                                                  |
| 6   | 14' - 0 1/2"  |        | 161.314 GPM | 4"      | (See Notes) | 10' - 0"      | 120      | 15.73 psi | Flow (q) from Route 3<br><br>Tr, HW                              |
| 21  | 14' - 10 1/2" | 5 FPS  | 210.172 GPM | 4 1/4"  |             |               | 0.01 psi | -0.36 psi |                                                                  |
|     |               |        |             |         |             | 10' - 0"      |          | 0.11 psi  |                                                                  |
| 21  | 14' - 10 1/2" |        | 161.874 GPM | 4"      | (See Notes) | 15' - 3"      | 120      | 15.48 psi | Flow (q) from Route 5<br><br>2E(10' - 0"), 2Tr, HW               |
| 7   | 14' - 1"      | 8 FPS  | 372.047 GPM | 4 1/4"  |             | 20' - 0"      | 0.03 psi | 0.35 psi  |                                                                  |
|     |               |        |             |         |             | 35' - 3"      |          | 1.13 psi  |                                                                  |
| 7   | 14' - 1"      |        | 120.342 GPM | 4"      | (See Notes) | 28' - 10 1/2" | 120      | 16.95 psi | Flow (q) from Route 15<br><br>3Tr, T(20' - 0"), 2E(10' - 0"), HW |
| TOR | 12' - 1 1/2"  | 11 FPS | 492.388 GPM | 4 1/4"  |             | 40' - 0"      | 0.05 psi | 0.84 psi  |                                                                  |
|     |               |        |             |         |             | 68' - 10 1/2" |          | 3.69 psi  |                                                                  |
| TOR | 12' - 1 1/2"  |        |             | 4"      | (See Notes) | 5' - 7 1/2"   | 120      | 21.48 psi | Bottom Of Riser, RA(-1.21 psi)<br>, HW                           |
| BOR | 6' - 6"       | 11 FPS | 492.388 GPM | 4 1/4"  |             |               | 0.05 psi | 2.44 psi  |                                                                  |
|     |               |        |             |         |             | 5' - 7 1/2"   |          | 1.51 psi  |                                                                  |
| BOR | 6' - 6"       |        |             | 4"      | (See Notes) | 4' - 3"       | 120      | 25.44 psi | red, HW                                                          |
| F1  | 2' - 3"       | 11 FPS | 492.388 GPM | 4 1/4"  |             |               | 0.05 psi | 1.85 psi  |                                                                  |
|     |               |        |             |         |             | 4' - 3"       |          | 0.23 psi  |                                                                  |
| F1  | 2' - 3"       |        |             | 6"      | (See Notes) | 0' - 0"       | 120      | 27.51 psi | PO(30' - 0"), HW                                                 |
| IBR | -4' - 0"      | 5 FPS  | 492.388 GPM | 6 3/32" |             | 30' - 0"      | 0.01 psi | 2.70 psi  |                                                                  |
|     |               |        |             |         |             | 30' - 0"      |          | 0.28 psi  |                                                                  |

| Pipe Information |              |          |                              |            |                        |               |                                     |              |                                                                                                                                                                |
|------------------|--------------|----------|------------------------------|------------|------------------------|---------------|-------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Node 1           | Elev 1<br>ft | K-Factor | Flow added<br>this step<br>Q | Nominal ID | Fittings &<br>Devices  | Length<br>ft  | C Factor or<br>Roughness            | Total(Pt)    | Notes<br><br>Fitting/Device (Equivalent Length)<br><br>Fixed Pressure Losses, when<br>applicable, are added directly to (Pf)<br>and shown as a negative value. |
|                  |              |          |                              |            |                        | Fitting<br>ft | Pf Friction<br>Loss Per Unit<br>psi | Elev(Pe)     |                                                                                                                                                                |
| Node 2           | Elev 2<br>ft | Velocity | Total Flow<br>Q              | Actual ID  | Equiv.<br>Length<br>ft | Total<br>ft   |                                     | Friction(Pf) |                                                                                                                                                                |

|     |              |       |             |         |                |              |          |           |                                                                                                 |
|-----|--------------|-------|-------------|---------|----------------|--------------|----------|-----------|-------------------------------------------------------------------------------------------------|
| IBR | -4' - 0"     |       |             | 6"      | (See<br>Notes) | 52' - 6 1/2" | 120      | 30.50 psi | EE(7' - 0"), 2E(14' - 0"), GV(3' - 0"), HW                                                      |
| B2  | -4' - 0"     | 5 FPS | 492.388 GPM | 6 3/32" |                | 38' - 0"     | 0.01 psi |           |                                                                                                 |
|     |              |       |             |         |                | 90' - 6 1/2" |          | 0.84 psi  |                                                                                                 |
| B2  | -4' - 0"     |       |             | 6"      | (See<br>Notes) | 13' - 0"     | 120      | 31.34 psi | 3E(14' - 0"), BFP, HW                                                                           |
| B1  | -4' - 0"     | 5 FPS | 492.388 GPM | 6 9/32" |                | 42' - 0"     | 0.01 psi |           |                                                                                                 |
|     |              |       |             |         |                | 55' - 0"     |          | 0.44 psi  |                                                                                                 |
| B1  | -4' - 0"     |       |             | 6"      | (See<br>Notes) | 23' - 6 1/2" | 120      | 31.78 psi | E(14' - 0"), S, HW                                                                              |
| UG1 | -4' - 0"     | 5 FPS | 492.388 GPM | 6 3/32" |                | 14' - 0"     | 0.01 psi |           |                                                                                                 |
|     |              |       |             |         |                | 37' - 6 1/2" |          | 0.35 psi  |                                                                                                 |
|     |              |       | 250.000 GPM |         |                |              |          | 32.13 psi | Hose Allowance At Source                                                                        |
| UG1 |              |       | 742.388 GPM |         |                |              |          |           | Total(Pt)    Route 1                                                                            |
| 102 | 8' - 0"      | 8     | 24.858 GPM  | 1"      | (See<br>Notes) | 14' - 3"     | 120      | 9.66 psi  | ***** Route 2 *****<br>Sprinkler,<br>T(5' - 0"), 3Tr, 2E(5' - 0"), T(10' - 0") fd(37' - 0"), HW |
|     |              |       |             |         |                | 62' - 0"     | 0.19 psi | -2.77 psi |                                                                                                 |
| 11  | 14' - 4 1/2" | 9 FPS | 24.858 GPM  | 1 1/16" |                | 76' - 3"     |          | 8.42 psi  |                                                                                                 |
|     |              |       |             |         |                |              |          | 15.31 psi | Total(Pt)    Route 2                                                                            |

|     |               |        |             |         |                |              |          |           |                                                                 |
|-----|---------------|--------|-------------|---------|----------------|--------------|----------|-----------|-----------------------------------------------------------------|
| 118 | 12' - 8"      | 8      | 26.057 GPM  | 1"      | (See<br>Notes) | 10' - 0"     | 120      | 10.61 psi | ***** Route 3 *****<br>Sprinkler,<br><br>T(5' - 0"), 2Tr fd, HW |
| 22  | 14' - 10 1/2" | 10 FPS | 26.057 GPM  | 1 1/16" |                | 5' - 0"      | 0.21 psi | -0.95 psi |                                                                 |
|     |               |        |             |         |                | 15' - 0"     |          | 1.14 psi  |                                                                 |
| 22  | 14' - 10 1/2" |        | 26.144 GPM  | 2"      | (See<br>Notes) | 10' - 0"     | 120      | 10.80 psi | Flow (q) from Route 4<br><br>2Tr, HW                            |
| 20  | 14' - 10 1/2" | 5 FPS  | 52.201 GPM  | 2 1/16" |                |              | 0.03 psi |           |                                                                 |
|     |               |        |             |         |                | 10' - 0"     |          | 0.28 psi  |                                                                 |
| 20  | 14' - 10 1/2" |        | 26.459 GPM  | 2"      | (See<br>Notes) | 10' - 0"     | 120      | 11.08 psi | Flow (q) from Route 7<br><br>2Tr, HW                            |
| 19  | 14' - 10 1/2" | 8 FPS  | 78.660 GPM  | 2 1/16" |                |              | 0.06 psi |           |                                                                 |
|     |               |        |             |         |                | 10' - 0"     |          | 0.60 psi  |                                                                 |
| 19  | 14' - 10 1/2" |        | 27.118 GPM  | 2"      | (See<br>Notes) | 1' - 9 1/2"  | 120      | 11.68 psi | Flow (q) from Route 9<br><br>T(10' - 0"), HW                    |
| 16  | 14' - 10 1/2" | 10 FPS | 105.777 GPM | 2 1/16" |                | 10' - 0"     | 0.10 psi |           |                                                                 |
|     |               |        |             |         |                | 11' - 9 1/2" |          | 1.23 psi  |                                                                 |
| 16  | 14' - 10 1/2" |        | 55.537 GPM  | 2"      | (See<br>Notes) | 0' - 10"     | 120      | 12.91 psi | Flow (q) from Route 11<br><br>T(10' - 0"), HW                   |
| 6   | 14' - 0 1/2"  | 15 FPS | 161.314 GPM | 2 1/16" |                | 10' - 0"     | 0.23 psi | 0.35 psi  |                                                                 |
|     |               |        |             |         |                | 10' - 10"    |          | 2.46 psi  |                                                                 |
|     |               |        |             |         |                |              |          | 15.73 psi | Total(Pt)    Route 3                                            |

| Pipe Information |               |              |                              |                 |                       |                        |                                     |              |                                                                                                                                                                |
|------------------|---------------|--------------|------------------------------|-----------------|-----------------------|------------------------|-------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Node 1           | Elev 1<br>ft  | K-Factor     | Flow added<br>this step<br>Q | Nominal ID      | Fittings &<br>Devices | Length<br>ft           | C Factor or<br>Roughness            | Total(Pt)    | Notes<br><br>Fitting/Device (Equivalent Length)<br><br>Fixed Pressure Losses, when<br>applicable, are added directly to (Pf)<br>and shown as a negative value. |
|                  | Node 2        | Elev 2<br>ft | Velocity                     | Total Flow<br>Q | Actual ID             | Equiv.<br>Length<br>ft | Pf Friction<br>Loss Per Unit<br>psi | Elev(Pe)     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | Total<br>ft            |                                     | Friction(Pf) |                                                                                                                                                                |
| 117              | 12' - 8"      | 8            | 26.144 GPM                   | 1"              | (See<br>Notes)        | 0' - 0"                | 120                                 | 10.68 psi    | ***** Route 4 *****<br>Sprinkler,<br><br>T(5' - 0") fd, HW                                                                                                     |
| 22               | 14' - 10 1/2" | 10 FPS       | 26.144 GPM                   | 1 1/16"         |                       | 5' - 0"                | 0.21 psi                            | -0.95 psi    |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 5' - 0"                |                                     | 1.07 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                                     | 10.80 psi    | Total(Pt)    Route 4                                                                                                                                           |
| 112              | 12' - 8"      | 8            | 26.148 GPM                   | 1"              | (See<br>Notes)        | 10' - 0"               | 120                                 | 10.68 psi    | ***** Route 5 *****<br>Sprinkler,<br><br>T(5' - 0"), 2Tr fd, HW                                                                                                |
| 34               | 15' - 8 1/2"  | 10 FPS       | 26.148 GPM                   | 1 1/16"         |                       | 5' - 0"                | 0.21 psi                            | -1.31 psi    |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 15' - 0"               |                                     | 1.15 psi     |                                                                                                                                                                |
| 34               | 15' - 8 1/2"  |              | 26.235 GPM                   | 2"              | (See<br>Notes)        | 10' - 0"               | 120                                 | 10.52 psi    | Flow (q) from Route 6<br><br>2Tr, HW                                                                                                                           |
| 33               | 15' - 8 1/2"  | 5 FPS        | 52.383 GPM                   | 2 1/16"         |                       | 10' - 0"               | 0.03 psi                            | 0.28 psi     |                                                                                                                                                                |
| 33               | 15' - 8 1/2"  |              | 26.551 GPM                   | 2"              | (See<br>Notes)        | 10' - 0"               | 120                                 | 10.80 psi    | Flow (q) from Route 8<br><br>2Tr, HW                                                                                                                           |
| 32               | 15' - 8 1/2"  | 8 FPS        | 78.934 GPM                   | 2 1/16"         |                       | 10' - 0"               | 0.06 psi                            | 0.61 psi     |                                                                                                                                                                |
| 32               | 15' - 8 1/2"  |              | 27.212 GPM                   | 2"              | (See<br>Notes)        | 1' - 9 1/2"            | 120                                 | 11.41 psi    | Flow (q) from Route 10<br><br>T(10' - 0"), HW                                                                                                                  |
| 29               | 15' - 8 1/2"  | 10 FPS       | 106.145 GPM                  | 2 1/16"         |                       | 10' - 0"               | 0.10 psi                            | 1.24 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 | 11' - 9 1/2"          |                        |                                     |              |                                                                                                                                                                |
| 29               | 15' - 8 1/2"  |              | 55.729 GPM                   | 2"              | (See<br>Notes)        | 0' - 10"               | 120                                 | 12.65 psi    | Flow (q) from Route 13<br><br>T(10' - 0"), HW                                                                                                                  |
| 21               | 14' - 10 1/2" | 15 FPS       | 161.874 GPM                  | 2 1/16"         |                       | 10' - 0"               | 0.23 psi                            | 0.35 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 10' - 10"              |                                     | 2.48 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                                     | 15.48 psi    | Total(Pt)    Route 5                                                                                                                                           |
| 111              | 12' - 8"      | 8            | 26.235 GPM                   | 1"              | (See<br>Notes)        | 0' - 0"                | 120                                 | 10.75 psi    | ***** Route 6 *****<br>Sprinkler,<br><br>T(5' - 0") fd, HW                                                                                                     |
| 34               | 15' - 8 1/2"  | 10 FPS       | 26.235 GPM                   | 1 1/16"         |                       | 5' - 0"                | 0.21 psi                            | -1.31 psi    |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 5' - 0"                |                                     | 1.07 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                                     | 10.52 psi    | Total(Pt)    Route 6                                                                                                                                           |
| 116              | 12' - 8"      | 8            | 26.459 GPM                   | 1"              | (See<br>Notes)        | 0' - 0"                | 120                                 | 10.94 psi    | ***** Route 7 *****<br>Sprinkler,<br><br>T(5' - 0") fd, HW                                                                                                     |
| 20               | 14' - 10 1/2" | 10 FPS       | 26.459 GPM                   | 1 1/16"         |                       | 5' - 0"                | 0.22 psi                            | -0.95 psi    |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 5' - 0"                |                                     | 1.09 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                                     | 11.08 psi    | Total(Pt)    Route 7                                                                                                                                           |
| 110              | 12' - 8"      | 8            | 26.551 GPM                   | 1"              | (See<br>Notes)        | 0' - 0"                | 120                                 | 11.01 psi    | ***** Route 8 *****<br>Sprinkler,<br><br>T(5' - 0") fd, HW                                                                                                     |
| 33               | 15' - 8 1/2"  | 10 FPS       | 26.551 GPM                   | 1 1/16"         |                       | 5' - 0"                | 0.22 psi                            | -1.31 psi    |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 5' - 0"                |                                     | 1.10 psi     |                                                                                                                                                                |

| Pipe Information |               |              |                              |                 |                       |                        |                                     |              |                                                                                                                                                                |
|------------------|---------------|--------------|------------------------------|-----------------|-----------------------|------------------------|-------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Node 1           | Elev 1<br>ft  | K-Factor     | Flow added<br>this step<br>Q | Nominal ID      | Fittings &<br>Devices | Length<br>ft           | C Factor or<br>Roughness            | Total(Pt)    | Notes<br><br>Fitting/Device (Equivalent Length)<br><br>Fixed Pressure Losses, when<br>applicable, are added directly to (Pf)<br>and shown as a negative value. |
|                  | Node 2        | Elev 2<br>ft | Velocity                     | Total Flow<br>Q | Actual ID             | Equiv.<br>Length<br>ft | Pf Friction<br>Loss Per Unit<br>psi | Elev(Pe)     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | Total<br>ft            |                                     | Friction(Pf) |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                                     | 10.80 psi    | Total(Pt)    Route 8                                                                                                                                           |
| 115              | 12' - 8"      | 8            | 27.118 GPM                   | 1"              | (See<br>Notes)        | 0' - 0"                | 120                                 | 11.49 psi    | ••••• Route 9 •••••<br>Sprinkler,<br><br>T(5' - 0") fd, HW                                                                                                     |
| 19               | 14' - 10 1/2" | 10 FPS       | 27.118 GPM                   | 1 1/16"         |                       | 5' - 0"                | 0.23 psi                            | -0.95 psi    |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 5' - 0"                |                                     | 1.14 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                                     | 11.68 psi    | Total(Pt)    Route 9                                                                                                                                           |
| 109              | 12' - 8"      | 8            | 27.212 GPM                   | 1"              | (See<br>Notes)        | 0' - 0"                | 120                                 | 11.57 psi    | ••••• Route 10 •••••<br>Sprinkler,<br><br>T(5' - 0") fd, HW                                                                                                    |
| 32               | 15' - 8 1/2"  | 10 FPS       | 27.212 GPM                   | 1 1/16"         |                       | 5' - 0"                | 0.23 psi                            | -1.31 psi    |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 5' - 0"                |                                     | 1.15 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                                     | 11.41 psi    | Total(Pt)    Route 10                                                                                                                                          |
| 113              | 12' - 8"      | 8            | 27.722 GPM                   | 1"              | (See<br>Notes)        | 10' - 0"               | 120                                 | 12.01 psi    | ••••• Route 11 •••••<br>Sprinkler,<br><br>T(5' - 0"), 2Tr fd, HW                                                                                               |
| 18               | 14' - 10 1/2" | 10 FPS       | 27.722 GPM                   | 1 1/16"         |                       | 5' - 0"                | 0.24 psi                            | -0.95 psi    |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 15' - 0"               |                                     | 1.28 psi     |                                                                                                                                                                |
| 18               | 14' - 10 1/2" |              | 27.815 GPM                   | 2"              | (See<br>Notes)        | 8' - 2 1/2"            | 120                                 | 12.33 psi    | Flow (q) from Route 12<br><br>Tr, T(10' - 0"), HW                                                                                                              |
| 16               | 14' - 10 1/2" | 5 FPS        | 55.537 GPM                   | 2 1/16"         |                       | 10' - 0"               | 0.03 psi                            |              |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 18' - 2 1/2"           |                                     | 0.58 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                                     | 12.91 psi    | Total(Pt)    Route 11                                                                                                                                          |
| 114              | 12' - 8"      | 8            | 27.815 GPM                   | 1"              | (See<br>Notes)        | 0' - 0"                | 120                                 | 12.09 psi    | ••••• Route 12 •••••<br>Sprinkler,<br><br>T(5' - 0") fd, HW                                                                                                    |
| 18               | 14' - 10 1/2" | 10 FPS       | 27.815 GPM                   | 1 1/16"         |                       | 5' - 0"                | 0.24 psi                            | -0.95 psi    |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 5' - 0"                |                                     | 1.20 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                                     | 12.33 psi    | Total(Pt)    Route 12                                                                                                                                          |
| 107              | 12' - 8"      | 8            | 27.818 GPM                   | 1"              | (See<br>Notes)        | 10' - 0"               | 120                                 | 12.09 psi    | ••••• Route 13 •••••<br>Sprinkler,<br><br>T(5' - 0"), 2Tr fd, HW                                                                                               |
| 31               | 15' - 8 1/2"  | 10 FPS       | 27.818 GPM                   | 1 1/16"         |                       | 5' - 0"                | 0.24 psi                            | -1.31 psi    |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 15' - 0"               |                                     | 1.29 psi     |                                                                                                                                                                |
| 31               | 15' - 8 1/2"  |              | 27.911 GPM                   | 2"              | (See<br>Notes)        | 8' - 2 1/2"            | 120                                 | 12.07 psi    | Flow (q) from Route 14<br><br>Tr, T(10' - 0"), HW                                                                                                              |
| 29               | 15' - 8 1/2"  | 5 FPS        | 55.729 GPM                   | 2 1/16"         |                       | 10' - 0"               | 0.03 psi                            |              |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 18' - 2 1/2"           |                                     | 0.58 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                                     | 12.65 psi    | Total(Pt)    Route 13                                                                                                                                          |
| 108              | 12' - 8"      | 8            | 27.911 GPM                   | 1"              | (See<br>Notes)        | 0' - 0"                | 120                                 | 12.17 psi    | ••••• Route 14 •••••<br>Sprinkler,<br><br>T(5' - 0") fd, HW                                                                                                    |
| 31               | 15' - 8 1/2"  | 10 FPS       | 27.911 GPM                   | 1 1/16"         |                       | 5' - 0"                | 0.24 psi                            | -1.31 psi    |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 5' - 0"                |                                     | 1.21 psi     |                                                                                                                                                                |

| Pipe Information |              |          |                              |            |                        |               |                                     |              |                                                                                                                                                                |
|------------------|--------------|----------|------------------------------|------------|------------------------|---------------|-------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Node 1           | Elev 1<br>ft | K-Factor | Flow added<br>this step<br>Q | Nominal ID | Fittings &<br>Devices  | Length<br>ft  | C Factor or<br>Roughness            | Total(Pt)    | Notes<br><br>Fitting/Device (Equivalent Length)<br><br>Fixed Pressure Losses, when<br>applicable, are added directly to (Pf)<br>and shown as a negative value. |
|                  |              |          |                              |            |                        | Fitting<br>ft | Pf Friction<br>Loss Per Unit<br>psi | Elev(Pe)     |                                                                                                                                                                |
| Node 2           | Elev 2<br>ft | Velocity | Total Flow<br>Q              | Actual ID  | Equiv.<br>Length<br>ft | Total<br>ft   |                                     | Friction(Pf) |                                                                                                                                                                |

|           |                       |
|-----------|-----------------------|
| 12.07 psi | Total(Pt)    Route 14 |
|-----------|-----------------------|

|     |               |        |             |         |                |              |          |           |                                                                  |
|-----|---------------|--------|-------------|---------|----------------|--------------|----------|-----------|------------------------------------------------------------------|
| 103 | 12' - 8"      | 8      | 29.960 GPM  | 1"      | (See<br>Notes) | 10' - 0"     | 120      | 14.02 psi | ••••• Route 15 •••••<br>Sprinkler,<br><br>T(5' - 0"), 2Tr fd, HW |
| 26  | 14' - 10 1/2" | 11 FPS | 29.960 GPM  | 1 1/16" |                | 5' - 0"      | 0.27 psi | -0.96 psi |                                                                  |
|     |               |        |             |         |                | 15' - 0"     |          | 1.48 psi  |                                                                  |
| 26  | 14' - 10 1/2" |        | 30.059 GPM  | 2"      | (See<br>Notes) | 7' - 2 1/2"  | 120      | 14.54 psi | Flow (q) from Route 16<br><br>Tr, T(10' - 0"), HW                |
| 24  | 14' - 10 1/2" | 6 FPS  | 60.018 GPM  | 2 1/16" |                | 10' - 0"     | 0.04 psi |           |                                                                  |
|     |               |        |             |         |                | 17' - 2 1/2" |          | 0.63 psi  |                                                                  |
| 24  | 14' - 10 1/2" |        | 60.324 GPM  | 2"      | (See<br>Notes) | 0' - 10"     | 120      | 15.17 psi | Flow (q) from Route 17<br><br>T(10' - 0"), HW                    |
|     |               |        |             |         |                | 10' - 0"     | 0.13 psi | 0.35 psi  |                                                                  |
| 7   | 14' - 1"      | 12 FPS | 120.342 GPM | 2 1/16" |                | 10' - 10"    |          | 1.43 psi  |                                                                  |
|     |               |        |             |         |                |              |          | 16.95 psi | Total(Pt)    Route 15                                            |

|     |               |        |            |         |                |         |          |           |                                                             |
|-----|---------------|--------|------------|---------|----------------|---------|----------|-----------|-------------------------------------------------------------|
| 104 | 12' - 8"      | 8      | 30.059 GPM | 1"      | (See<br>Notes) | 0' - 0" | 120      | 14.12 psi | ••••• Route 16 •••••<br>Sprinkler,<br><br>T(5' - 0") fd, HW |
| 26  | 14' - 10 1/2" | 11 FPS | 30.059 GPM | 1 1/16" |                | 5' - 0" | 0.28 psi | -0.96 psi |                                                             |
|     |               |        |            |         |                | 5' - 0" |          | 1.38 psi  |                                                             |
|     |               |        |            |         |                |         |          | 14.54 psi | Total(Pt)    Route 16                                       |

|     |               |        |            |         |                |              |          |           |                                                                         |                       |
|-----|---------------|--------|------------|---------|----------------|--------------|----------|-----------|-------------------------------------------------------------------------|-----------------------|
| 106 | 12' - 8"      | 8      | 30.112 GPM | 1"      | (See<br>Notes) | 10' - 0"     | 120      | 14.17 psi | ••••• <b>Route 17</b> •••••<br>Sprinkler,<br><br>T(5' - 0"), 2Tr fd, HW |                       |
| 27  | 14' - 10 1/2" | 11 FPS | 30.112 GPM | 1 1/16" |                | 5' - 0"      | 0.28 psi | -0.96 psi |                                                                         |                       |
|     |               |        |            |         |                | 15' - 0"     |          | 1.49 psi  |                                                                         |                       |
| 27  | 14' - 10 1/2" |        | 30.211 GPM | 2"      | (See<br>Notes) | 2' - 9 1/2"  | 120      | 14.70 psi | Flow (q) from Route 18<br><br>T(10' - 0"), HW                           |                       |
| 24  | 14' - 10 1/2" | 6 FPS  | 60.324 GPM | 2 1/16" |                | 10' - 0"     | 0.04 psi |           |                                                                         |                       |
|     |               |        |            |         |                | 12' - 9 1/2" |          | 0.47 psi  |                                                                         |                       |
|     |               |        |            |         |                |              |          |           | 15.17 psi                                                               | Total(Pt)    Route 17 |

|     |               |        |            |         |                |         |          |           |                                                             |
|-----|---------------|--------|------------|---------|----------------|---------|----------|-----------|-------------------------------------------------------------|
| 105 | 12' - 8"      | 8      | 30.211 GPM | 1"      | (See<br>Notes) | 0' - 0" | 120      | 14.26 psi | ••••• Route 18 •••••<br>Sprinkler,<br><br>T(5' - 0") fd, HW |
| 27  | 14' - 10 1/2" | 11 FPS | 30.211 GPM | 1 1/16" |                | 5' - 0" | 0.28 psi | -0.96 psi |                                                             |
|     |               |        |            |         |                | 5' - 0" |          | 1.40 psi  |                                                             |
|     |               |        |            |         |                |         |          | 14.70 psi | Total(Pt)    Route 18                                       |

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

C Value Multiplier

$$\left( \frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$$

|                    |       |      |      |      |
|--------------------|-------|------|------|------|
| Value Of C         | 100   | 130  | 140  | 150  |
| Multiplying Factor | 0.713 | 1.16 | 1.33 | 1.51 |

Notes Legend

|     |                    |     |                |     |                   |
|-----|--------------------|-----|----------------|-----|-------------------|
| BFP | Backflow Preventer | E   | 90° Elbow      | EE  | 45° Elbow         |
| fd  | Flex Drop          | GV  | Gate Valve     | HW  | Hazen-Williams    |
| PO  | Pipe Outlet        | RA  | Riser Assembly | red | Reducer/Adapter   |
| S   | Supply             | Spr | Sprinkler      | T   | Tee Flow Turn 90° |
| Tr  | Tee run            |     |                |     |                   |

# Hydraulic Calculations Summary

for

Project Name: MURRIETA PUBLIC LIBRARY EXPANSION

Location: 8 TOWN SQUARE, MURRIETA, CA 92562, ,

Drawing Name: FP US0037969.5753 Murrieta PLE R23

Calculation Date:6/6/2025

## Design

Remote Area Name: Concealed Space

Occupancy Classification: Light Hazard

Density 0.100 GPM/SF

Area of Application: 1500.00 SF (Actual Area: 1570.37 SF)

Coverage per Sprinkler: 120.00 SF (typical)

Type of Sprinklers Calculated:

No. of Sprinklers Calculated: 17

Type of System: S - Fire Protection Wet Volume of Dry or PreAction System: 0.0 gal

In-rack Demand: N/A at Node: N/A

Hose Streams: 100.000 GPM at Node: UG1 Type Allowance at Source

Total Water Required (including Hose Streams where applicable)

FROM: Water Supply at Node UG1: 367.039 GPM @ 19.71 psi

Safety Margin: 44.85 psi

Applied Friction Loss Method: Hazen-Williams

Darcy-Weisbach Suppression Agent: None.

Contact Name CITY OF MURRIETA

Address: ,

Phone Number: Name of Designer: IVAN MONTIJO

Authority Having Jurisdiction:

Notes:

Automatic Peaking Results

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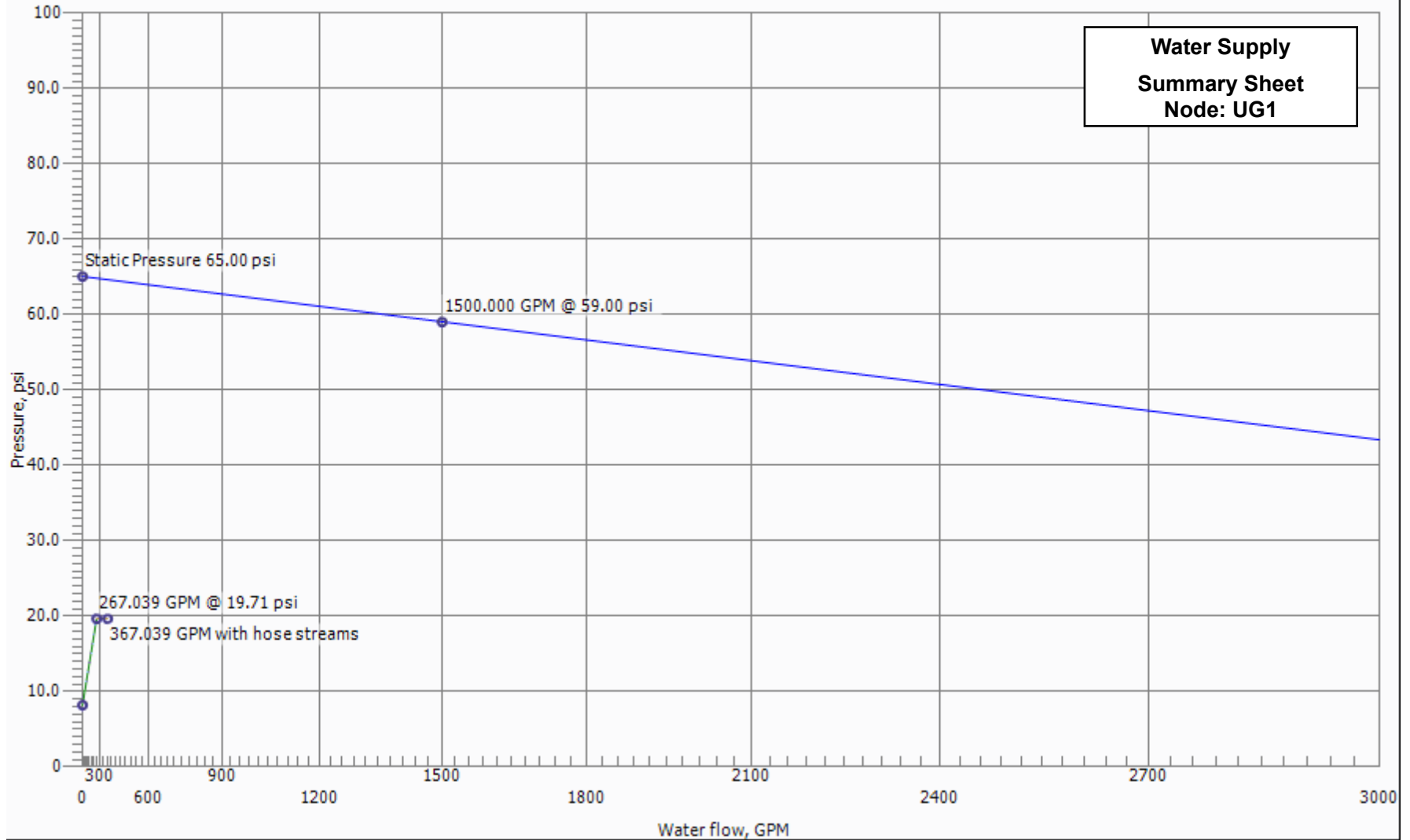
# Hydraulic Graph

Job Name: MURRIETA PUBLIC LIBRARY EXPANSION  
Remote Area Name: Concealed Space

N 1.85

Date: 6/6/2025

Water Supply  
Summary Sheet  
Node: UG1



A negative result in Required Pressure indicates that the Pump is capable of furnishing all of the pressure required by the demand reported within this calculation.  
No pressure is being required from the Source/Supply to meet the demand (by a margin of this negative value).

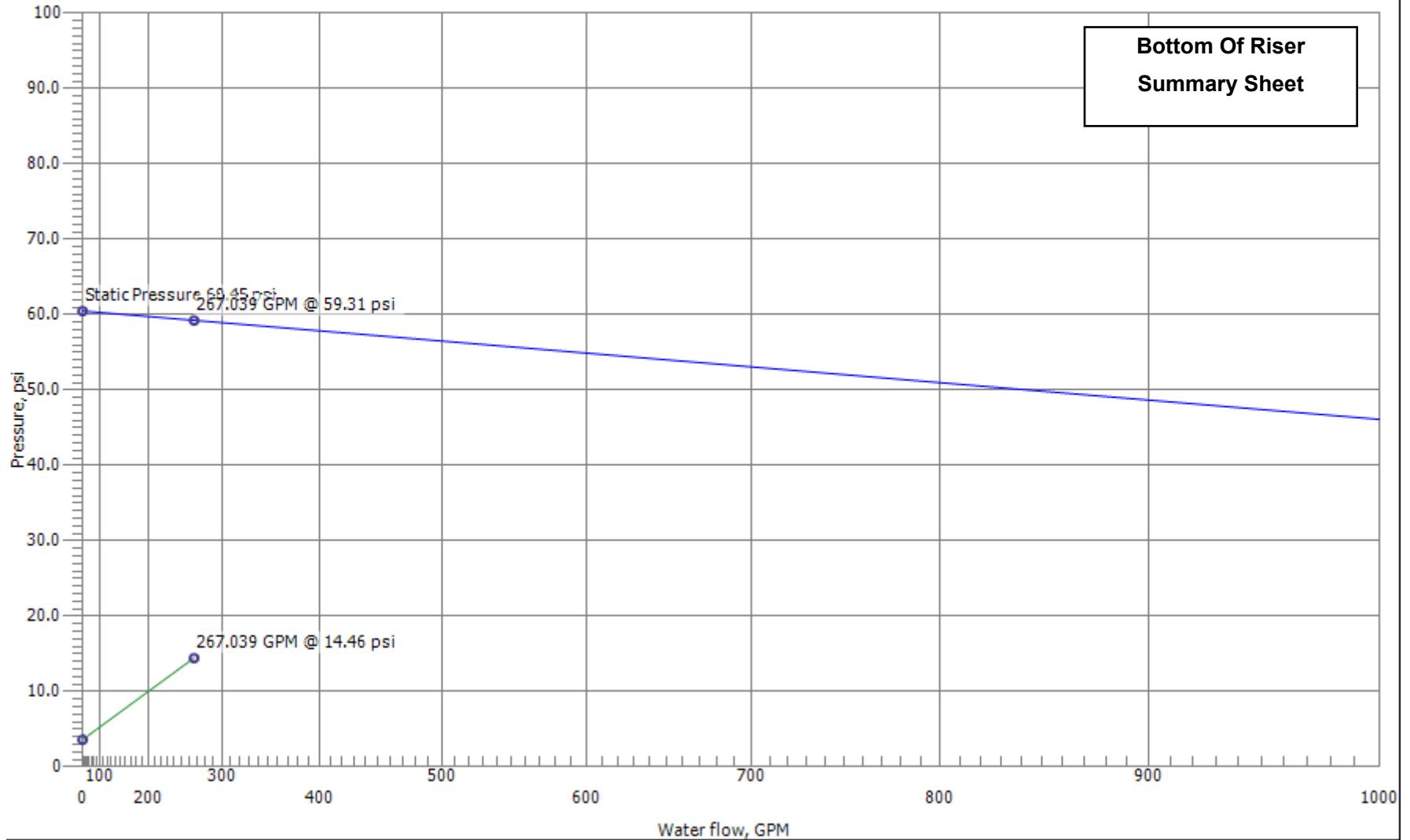
# Hydraulic Graph

Job Name: MURRIETA PUBLIC LIBRARY EXPANSION  
Remote Area Name: Concealed Space

N<sup>1.85</sup>

Date: 6/6/2025

Bottom Of Riser  
Summary Sheet



A negative result in Required Pressure indicates that the Pump is capable of furnishing all of the pressure required by the demand reported within this calculation.  
No pressure is being required from the Source/Supply to meet the demand (by a margin of this negative value).



| Device      |     | Actual Flow (GPM) | Minimum Flow (GPM) | K-Factor (K) | Pressure (psi) |  |  |
|-------------|-----|-------------------|--------------------|--------------|----------------|--|--|
| Sprinkler   | 215 | 16.036 GPM        | 14.816 GPM         | 5.6          | 8.20 psi       |  |  |
| Sprinkler   | 216 | 15.999 GPM        | 14.816 GPM         | 5.6          | 8.16 psi       |  |  |
| Sprinkler   | 212 | 15.232 GPM        | 14.816 GPM         | 5.6          | 7.40 psi       |  |  |
| Sprinkler   | 210 | 15.920 GPM        | 14.816 GPM         | 5.6          | 8.08 psi       |  |  |
| Sprinkler   | 209 | 15.957 GPM        | 14.816 GPM         | 5.6          | 8.12 psi       |  |  |
| Sprinkler   | 205 | 16.224 GPM        | 14.816 GPM         | 5.6          | 8.39 psi       |  |  |
| Sprinkler   | 214 | 15.705 GPM        | 14.816 GPM         | 5.6          | 7.87 psi       |  |  |
| Sprinkler   | 204 | 16.262 GPM        | 14.816 GPM         | 5.6          | 8.43 psi       |  |  |
| Sprinkler   | 217 | 15.411 GPM        | 14.816 GPM         | 5.6          | 7.57 psi       |  |  |
| Sprinkler   | 208 | 15.654 GPM        | 14.816 GPM         | 5.6          | 7.81 psi       |  |  |
| Sprinkler   | 207 | 15.524 GPM        | 14.816 GPM         | 5.6          | 7.68 psi       |  |  |
| Sprinkler   | 203 | 15.954 GPM        | 14.816 GPM         | 5.6          | 8.12 psi       |  |  |
| ➡ Sprinkler | 211 | 14.816 GPM        | 14.816 GPM         | 5.6          | 7.00 psi       |  |  |
| Sprinkler   | 206 | 15.488 GPM        | 14.816 GPM         | 5.6          | 7.65 psi       |  |  |
| Sprinkler   | 202 | 15.822 GPM        | 14.816 GPM         | 5.6          | 7.98 psi       |  |  |
| Sprinkler   | 213 | 15.250 GPM        | 14.816 GPM         | 5.6          | 7.42 psi       |  |  |
| Sprinkler   | 201 | 15.785 GPM        | 14.816 GPM         | 5.6          | 7.95 psi       |  |  |

➡ Most Demanding Sprinkler Data

| Pipe Information |              |          |                              |            |                        |               |                                     |                       |                                                                                                                                                                |
|------------------|--------------|----------|------------------------------|------------|------------------------|---------------|-------------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Node 1           | Elev 1<br>ft | K-Factor | Flow added<br>this step<br>Q | Nominal ID | Fittings &<br>Devices  | Length<br>ft  | C Factor or<br>Roughness            | Total(Pt)             | Notes<br><br>Fitting/Device (Equivalent Length)<br><br>Fixed Pressure Losses, when<br>applicable, are added directly to (Pf)<br>and shown as a negative value. |
|                  | Elev 2<br>ft | Velocity | Total Flow<br>Q              | Actual ID  | Equiv.<br>Length<br>ft | Fitting<br>ft | Pf Friction<br>Loss Per Unit<br>psi | Elev(Pe)              |                                                                                                                                                                |
| Node 2           |              |          |                              |            |                        | Total<br>ft   |                                     | Friction(Pf)          |                                                                                                                                                                |
| 211              | 14' - 2 1/2" | 5.6      | 14.816 GPM                   | 1"         | (See<br>Notes)         | 2' - 0"       | 120                                 | 7.00 psi              | .....Route 1.....<br>Sprinkler,<br><br>T(5' - 0"), HW                                                                                                          |
| 9                | 14' - 4 1/2" | 6 FPS    | 14.816 GPM                   | 1 1/16"    |                        | 5' - 0"       | 0.07 psi                            | -0.07 psi             |                                                                                                                                                                |
|                  |              |          |                              |            |                        | 7' - 0"       |                                     | 0.52 psi              |                                                                                                                                                                |
| 9                | 14' - 4 1/2" |          | 15.250 GPM                   | 2"         | (See<br>Notes)         | 12' - 0"      | 120                                 | 7.45 psi              | Flow (q) from Route 3<br><br>3Tr, HW                                                                                                                           |
| 217              | 14' - 4 1/2" | 3 FPS    | 30.066 GPM                   | 2 1/16"    |                        | 12' - 0"      | 0.01 psi                            | 0.12 psi              |                                                                                                                                                                |
| 217              | 14' - 4 1/2" | 5.6      | 15.411 GPM                   | 2"         | (See<br>Notes)         | 9' - 6"       | 120                                 | 7.57 psi              | Sprinkler,<br><br>Tr, T(10' - 0"), HW                                                                                                                          |
| 11               | 14' - 4 1/2" | 4 FPS    | 45.477 GPM                   | 2 1/16"    |                        | 10' - 0"      | 0.02 psi                            |                       |                                                                                                                                                                |
|                  |              |          |                              |            |                        | 19' - 6"      |                                     | 0.43 psi              |                                                                                                                                                                |
| 11               | 14' - 4 1/2" |          | 30.937 GPM                   | 2"         | (See<br>Notes)         | 0' - 10"      | 120                                 | 8.00 psi              | Flow (q) from Route 2<br><br>T(10' - 0"), HW                                                                                                                   |
| 5                | 13' - 7"     | 7 FPS    | 76.415 GPM                   | 2 1/16"    |                        | 10' - 0"      | 0.06 psi                            | 0.35 psi              |                                                                                                                                                                |
|                  |              |          |                              |            |                        | 10' - 10"     |                                     | 0.62 psi              |                                                                                                                                                                |
| 5                | 13' - 7"     |          | 158.589 GPM                  | 4"         | (See<br>Notes)         | 5' - 9"       | 120                                 | 8.97 psi              | Flow (q) from Route 4<br><br>Tr, HW                                                                                                                            |
| 6                | 14' - 0 1/2" | 5 FPS    | 235.004 GPM                  | 4 1/4"     |                        | 5' - 9"       | 0.01 psi                            | -0.21 psi<br>0.08 psi |                                                                                                                                                                |
| 6                | 14' - 0 1/2" |          | 32.035 GPM                   | 4"         | (See<br>Notes)         | 54' - 1 1/2"  | 120                                 | 8.84 psi              | Flow (q) from Route 7<br><br>6Tr, 4E(10' - 0"), T(20' - 0"),<br>HW                                                                                             |
|                  |              |          |                              |            |                        | 60' - 0"      | 0.02 psi                            | 0.83 psi              |                                                                                                                                                                |
| TOR              | 12' - 1 1/2" | 6 FPS    | 267.039 GPM                  | 4 1/4"     |                        | 114' - 1 1/2" |                                     | 1.97 psi              |                                                                                                                                                                |
| TOR              | 12' - 1 1/2" |          |                              | 4"         | (See<br>Notes)         | 5' - 7 1/2"   | 120                                 | 11.64 psi             |                                                                                                                                                                |
| BOR              | 6' - 6"      | 6 FPS    | 267.039 GPM                  | 4 1/4"     |                        | 5' - 7 1/2"   | 0.02 psi                            | 2.44 psi<br>0.38 psi  |                                                                                                                                                                |
| BOR              | 6' - 6"      |          |                              | 4"         | (See<br>Notes)         | 4' - 3"       | 120                                 | 14.46 psi             |                                                                                                                                                                |
| F1               | 2' - 3"      | 6 FPS    | 267.039 GPM                  | 4 1/4"     |                        | 4' - 3"       | 0.02 psi                            | 1.85 psi<br>0.07 psi  |                                                                                                                                                                |
| F1               | 2' - 3"      |          |                              | 6"         | (See<br>Notes)         | 0' - 0"       | 120                                 | 16.39 psi             | PO(30' - 0"), HW                                                                                                                                               |
|                  |              |          |                              |            |                        | 30' - 0"      | 0.00 psi                            | 2.70 psi              |                                                                                                                                                                |
| IBR              | -4' - 0"     | 3 FPS    | 267.039 GPM                  | 6 3/32"    |                        | 30' - 0"      |                                     | 0.09 psi              |                                                                                                                                                                |
| IBR              | -4' - 0"     |          |                              | 6"         | (See<br>Notes)         | 52' - 6 1/2"  | 120                                 | 19.18 psi             | EE(7' - 0"), 2E(14' - 0"), GV(3' -<br>0"), HW                                                                                                                  |
|                  |              |          |                              |            |                        | 38' - 0"      | 0.00 psi                            |                       |                                                                                                                                                                |
| B2               | -4' - 0"     | 3 FPS    | 267.039 GPM                  | 6 3/32"    |                        | 90' - 6 1/2"  |                                     | 0.27 psi              |                                                                                                                                                                |
| B2               | -4' - 0"     |          |                              | 6"         | (See<br>Notes)         | 13' - 0"      | 120                                 | 19.45 psi             | 3E(14' - 0"), BFP, HW                                                                                                                                          |
|                  |              |          |                              |            |                        | 42' - 0"      | 0.00 psi                            |                       |                                                                                                                                                                |
| B1               | -4' - 0"     | 3 FPS    | 267.039 GPM                  | 6 9/32"    |                        | 55' - 0"      |                                     | 0.14 psi              |                                                                                                                                                                |

| Pipe Information |              |              |                              |                 |                       |                        |                                     |              |                                                                                                                                                                |
|------------------|--------------|--------------|------------------------------|-----------------|-----------------------|------------------------|-------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Node 1           | Elev 1<br>ft | K-Factor     | Flow added<br>this step<br>Q | Nominal ID      | Fittings &<br>Devices | Length<br>ft           | C Factor or<br>Roughness            | Total(Pt)    | Notes<br><br>Fitting/Device (Equivalent Length)<br><br>Fixed Pressure Losses, when<br>applicable, are added directly to (Pf)<br>and shown as a negative value. |
|                  | Node 2       | Elev 2<br>ft | Velocity                     | Total Flow<br>Q | Actual ID             | Equiv.<br>Length<br>ft | Pf Friction<br>Loss Per Unit<br>psi | Elev(Pe)     |                                                                                                                                                                |
|                  |              |              |                              |                 |                       | Total<br>ft            |                                     | Friction(Pf) |                                                                                                                                                                |
| B1               | -4' - 0"     |              |                              | 6"              | (See<br>Notes)        | 23' - 6 1/2"           | 120                                 | 19.59 psi    | E(14' - 0"), S, HW                                                                                                                                             |
| UG1              | -4' - 0"     | 3 FPS        | 267.039 GPM                  | 6 3/32"         |                       | 14' - 0"               | 0.00 psi                            |              |                                                                                                                                                                |
|                  |              |              |                              |                 |                       | 37' - 6 1/2"           |                                     | 0.11 psi     |                                                                                                                                                                |
|                  |              |              | 100.000 GPM                  |                 |                       |                        |                                     | 19.71 psi    | Hose Allowance At Source                                                                                                                                       |
| UG1              |              |              | 367.039 GPM                  |                 |                       |                        |                                     |              | Total(Pt)    Route 1                                                                                                                                           |
|                  |              |              |                              |                 |                       |                        |                                     |              |                                                                                                                                                                |
| 212              | 14' - 2 1/2" | 5.6          | 15.232 GPM                   | 1"              | (See<br>Notes)        | 1' - 0"                | 120                                 | 7.40 psi     | •••••Route 2•••••<br>Sprinkler,<br><br>T(5' - 0"), HW                                                                                                          |
| 13               | 14' - 3 1/2" | 6 FPS        | 15.232 GPM                   | 1 1/16"         |                       | 5' - 0"                | 0.08 psi                            | -0.04 psi    |                                                                                                                                                                |
|                  |              |              |                              |                 |                       | 6' - 0"                |                                     | 0.47 psi     |                                                                                                                                                                |
| 13               | 14' - 3 1/2" |              |                              | 2"              | (See<br>Notes)        | 13' - 0"               | 120                                 | 7.83 psi     | 4Tr, 2E(5' - 0"), HW                                                                                                                                           |
| 214              | 14' - 4 1/2" | 1 FPS        | 15.232 GPM                   | 2 1/16"         |                       | 10' - 0"               | 0.00 psi                            | -0.04 psi    |                                                                                                                                                                |
|                  |              |              |                              |                 |                       | 23' - 0"               |                                     | 0.07 psi     |                                                                                                                                                                |
| 214              | 14' - 4 1/2" | 5.6          | 15.705 GPM                   | 2"              | (See<br>Notes)        | 2' - 6"                | 120                                 | 7.87 psi     | Sprinkler,<br><br>T(10' - 0"), HW                                                                                                                              |
| 11               | 14' - 4 1/2" | 3 FPS        | 30.937 GPM                   | 2 1/16"         |                       | 10' - 0"               | 0.01 psi                            |              |                                                                                                                                                                |
|                  |              |              |                              |                 |                       | 12' - 6"               |                                     | 0.13 psi     |                                                                                                                                                                |
|                  |              |              |                              |                 |                       |                        |                                     | 8.00 psi     | Total(Pt)    Route 2                                                                                                                                           |
| 213              | 14' - 4 1/2" | 5.6          | 15.250 GPM                   | 2"              | (See<br>Notes)        | 12' - 0"               | 120                                 | 7.42 psi     | •••••Route 3•••••<br>Sprinkler,<br><br>3Tr, HW                                                                                                                 |
| 9                | 14' - 4 1/2" | 1 FPS        | 15.250 GPM                   | 2 1/16"         |                       |                        | 0.00 psi                            |              |                                                                                                                                                                |
|                  |              |              |                              |                 |                       | 12' - 0"               |                                     | 0.03 psi     |                                                                                                                                                                |
|                  |              |              |                              |                 |                       |                        |                                     | 7.45 psi     | Total(Pt)    Route 3                                                                                                                                           |
| 206              | 13' - 6 1/2" | 5.6          | 15.488 GPM                   | 2"              | (See<br>Notes)        | 12' - 0"               | 120                                 | 7.65 psi     | •••••Route 4•••••<br>Sprinkler,<br><br>Tr, HW                                                                                                                  |
| 207              | 13' - 6 1/2" | 1 FPS        | 15.488 GPM                   | 2 1/16"         |                       |                        | 0.00 psi                            |              |                                                                                                                                                                |
|                  |              |              |                              |                 |                       | 12' - 0"               |                                     | 0.04 psi     |                                                                                                                                                                |
| 207              | 13' - 6 1/2" | 5.6          | 15.524 GPM                   | 2"              | (See<br>Notes)        | 12' - 0"               | 120                                 | 7.68 psi     | Sprinkler,<br><br>Tr, HW                                                                                                                                       |
| 208              | 13' - 6 1/2" | 3 FPS        | 31.012 GPM                   | 2 1/16"         |                       |                        | 0.01 psi                            |              |                                                                                                                                                                |
|                  |              |              |                              |                 |                       | 12' - 0"               |                                     | 0.13 psi     |                                                                                                                                                                |
| 208              | 13' - 6 1/2" | 5.6          | 15.654 GPM                   | 2"              | (See<br>Notes)        | 9' - 6"                | 120                                 | 7.81 psi     | Sprinkler,<br><br>T(10' - 0"), HW                                                                                                                              |
| 4                | 13' - 6 1/2" | 4 FPS        | 46.666 GPM                   | 2 1/16"         |                       | 10' - 0"               | 0.02 psi                            |              |                                                                                                                                                                |
|                  |              |              |                              |                 |                       | 19' - 6"               |                                     | 0.45 psi     |                                                                                                                                                                |
| 4                | 13' - 6 1/2" |              | 31.877 GPM                   | 2"              | (See<br>Notes)        | 0' - 10"               | 120                                 | 8.26 psi     | Flow (q) from Route 6<br><br>T(10' - 0"), HW                                                                                                                   |
| 3                | 12' - 9"     | 8 FPS        | 78.543 GPM                   | 2 1/16"         |                       | 10' - 0"               | 0.06 psi                            | 0.35 psi     |                                                                                                                                                                |
|                  |              |              |                              |                 |                       | 10' - 10"              |                                     | 0.65 psi     |                                                                                                                                                                |

| Pipe Information |               |              |                              |                 |                       |                        |                                     |              |                                                                                                                                                                |
|------------------|---------------|--------------|------------------------------|-----------------|-----------------------|------------------------|-------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Node 1           | Elev 1<br>ft  | K-Factor     | Flow added<br>this step<br>Q | Nominal ID      | Fittings &<br>Devices | Length<br>ft           | C Factor or<br>Roughness            | Total(Pt)    | Notes<br><br>Fitting/Device (Equivalent Length)<br><br>Fixed Pressure Losses, when<br>applicable, are added directly to (Pf)<br>and shown as a negative value. |
|                  | Node 2        | Elev 2<br>ft | Velocity                     | Total Flow<br>Q | Actual ID             | Equiv.<br>Length<br>ft | Pf Friction<br>Loss Per Unit<br>psi | Elev(Pe)     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | Total<br>ft            |                                     | Friction(Pf) |                                                                                                                                                                |
| 3                | 12' - 9"      |              | 80.046 GPM                   | 4"              | (See<br>Notes)        | 10' - 0"               | 120                                 | 9.26 psi     | Flow (q) from Route 5<br><br>Tr, HW                                                                                                                            |
| 5                | 13' - 7"      | 4 FPS        | 158.589 GPM                  | 4 1/4"          |                       |                        | 0.01 psi                            | -0.36 psi    |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 10' - 0"               |                                     | 0.07 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                                     | 8.97 psi     | Total(Pt)    Route 4                                                                                                                                           |
| 201              | 12' - 8 1/2"  | 5.6          | 15.785 GPM                   | 2"              | (See<br>Notes)        | 12' - 0"               | 120                                 | 7.95 psi     | •••••Route 5•••••<br>Sprinkler,<br><br>3Tr, HW                                                                                                                 |
| 202              | 12' - 8 1/2"  | 2 FPS        | 15.785 GPM                   | 2 1/16"         |                       |                        | 0.00 psi                            |              |                                                                                                                                                                |
|                  |               |              |                              |                 | 12' - 0"              |                        |                                     | 0.04 psi     |                                                                                                                                                                |
| 202              | 12' - 8 1/2"  | 5.6          | 15.822 GPM                   | 2"              | (See<br>Notes)        | 12' - 0"               | 120                                 | 7.98 psi     | Sprinkler,<br><br>2Tr, HW                                                                                                                                      |
| 203              | 12' - 8 1/2"  | 3 FPS        | 31.607 GPM                   | 2 1/16"         |                       |                        | 0.01 psi                            |              |                                                                                                                                                                |
|                  |               |              |                              |                 | 12' - 0"              |                        |                                     | 0.13 psi     |                                                                                                                                                                |
| 203              | 12' - 8 1/2"  | 5.6          | 15.954 GPM                   | 2"              | (See<br>Notes)        | 9' - 6"                | 120                                 | 8.12 psi     | Sprinkler,<br><br>Tr, T(10' - 0"), HW                                                                                                                          |
| 2                | 12' - 8 1/2"  | 5 FPS        | 47.561 GPM                   | 2 1/16"         |                       | 10' - 0"               | 0.02 psi                            |              |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 19' - 6"               |                                     | 0.46 psi     |                                                                                                                                                                |
| 2                | 12' - 8 1/2"  |              | 32.486 GPM                   | 2"              | (See<br>Notes)        | 0' - 10"               | 120                                 | 8.58 psi     | Flow (q) from Route 8<br><br>T(10' - 0"), HW                                                                                                                   |
| 1                | 11' - 11"     | 8 FPS        | 80.046 GPM                   | 2 1/16"         |                       | 10' - 0"               | 0.06 psi                            | 0.35 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 10' - 10"              |                                     | 0.67 psi     |                                                                                                                                                                |
| 1                | 11' - 11"     |              |                              | 4"              | (See<br>Notes)        | 10' - 0"               | 120                                 | 9.61 psi     | Tr, HW                                                                                                                                                         |
| 3                | 12' - 9"      | 2 FPS        | 80.046 GPM                   | 4 1/4"          |                       |                        | 0.00 psi                            | -0.36 psi    |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 10' - 0"               |                                     | 0.02 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                                     | 9.26 psi     | Total(Pt)    Route 5                                                                                                                                           |
| 210              | 13' - 6 1/2"  | 5.6          | 15.920 GPM                   | 2"              | (See<br>Notes)        | 12' - 0"               | 120                                 | 8.08 psi     | •••••Route 6•••••<br>Sprinkler,<br><br>Tr, HW                                                                                                                  |
| 209              | 13' - 6 1/2"  | 2 FPS        | 15.920 GPM                   | 2 1/16"         |                       |                        | 0.00 psi                            |              |                                                                                                                                                                |
|                  |               |              |                              |                 | 12' - 0"              |                        |                                     | 0.04 psi     |                                                                                                                                                                |
| 209              | 13' - 6 1/2"  | 5.6          | 15.957 GPM                   | 2"              | (See<br>Notes)        | 2' - 6"                | 120                                 | 8.12 psi     | Sprinkler,<br><br>T(10' - 0"), HW                                                                                                                              |
| 4                | 13' - 6 1/2"  | 3 FPS        | 31.877 GPM                   | 2 1/16"         |                       | 10' - 0"               | 0.01 psi                            |              |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 12' - 6"               |                                     | 0.14 psi     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                                     | 8.26 psi     | Total(Pt)    Route 6                                                                                                                                           |
| 216              | 14' - 10 1/2" | 5.6          | 15.999 GPM                   | 2"              | (See<br>Notes)        | 12' - 0"               | 120                                 | 8.16 psi     | •••••Route 7•••••<br>Sprinkler,<br><br>2Tr, HW                                                                                                                 |
| 215              | 14' - 10 1/2" | 2 FPS        | 15.999 GPM                   | 2 1/16"         |                       |                        | 0.00 psi                            |              |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 12' - 0"               |                                     | 0.04 psi     |                                                                                                                                                                |

| Pipe Information |               |              |                              |                 |                       |                        |                          |                                     |                                                                                                                                                                |
|------------------|---------------|--------------|------------------------------|-----------------|-----------------------|------------------------|--------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Node 1           | Elev 1<br>ft  | K-Factor     | Flow added<br>this step<br>Q | Nominal ID      | Fittings &<br>Devices | Length<br>ft           | C Factor or<br>Roughness | Total(Pt)                           | Notes<br><br>Fitting/Device (Equivalent Length)<br><br>Fixed Pressure Losses, when<br>applicable, are added directly to (Pf)<br>and shown as a negative value. |
|                  | Node 2        | Elev 2<br>ft | Velocity                     | Total Flow<br>Q | Actual ID             | Equiv.<br>Length<br>ft | Fitting<br>ft            | Pf Friction<br>Loss Per Unit<br>psi |                                                                                                                                                                |
| Total<br>ft      |               |              |                              |                 |                       |                        |                          |                                     |                                                                                                                                                                |
| 215              | 14' - 10 1/2" | 5.6          | 16.036 GPM                   | 2"              | (See<br>Notes)        | 4' - 5"                | 120                      | 8.20 psi                            | Sprinkler,<br><br>T(10' - 0"), HW                                                                                                                              |
| 16               | 14' - 10 1/2" | 3 FPS        | 32.035 GPM                   | 2 1/16"         |                       | 10' - 0"               | 0.01 psi                 |                                     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 14' - 5"               |                          | 0.16 psi                            |                                                                                                                                                                |
| 16               | 14' - 10 1/2" |              |                              | 2"              | (See<br>Notes)        | 0' - 10"               | 120                      | 8.36 psi                            | T(10' - 0"), HW                                                                                                                                                |
|                  |               |              |                              |                 |                       | 10' - 0"               | 0.01 psi                 | 0.35 psi                            |                                                                                                                                                                |
| 6                | 14' - 0 1/2"  | 3 FPS        | 32.035 GPM                   | 2 1/16"         |                       | 10' - 10"              |                          | 0.12 psi                            |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                          | 8.84 psi                            | Total(Pt)    Route 7                                                                                                                                           |
| 205              | 12' - 8 1/2"  | 5.6          | 16.224 GPM                   | 2"              | (See<br>Notes)        | 12' - 0"               | 120                      | 8.39 psi                            | ..... Route 8 .....<br>Sprinkler,<br><br>3Tr, HW                                                                                                               |
| 204              | 12' - 8 1/2"  | 2 FPS        | 16.224 GPM                   | 2 1/16"         |                       |                        | 0.00 psi                 |                                     |                                                                                                                                                                |
|                  |               |              |                              |                 |                       | 12' - 0"               |                          | 0.04 psi                            |                                                                                                                                                                |
| 204              | 12' - 8 1/2"  | 5.6          | 16.262 GPM                   | 2"              | (See<br>Notes)        | 2' - 6"                | 120                      | 8.43 psi                            | Sprinkler,<br><br>T(10' - 0"), HW                                                                                                                              |
|                  |               |              |                              |                 |                       | 10' - 0"               | 0.01 psi                 |                                     |                                                                                                                                                                |
| 2                | 12' - 8 1/2"  | 3 FPS        | 32.486 GPM                   | 2 1/16"         |                       | 12' - 6"               |                          | 0.15 psi                            |                                                                                                                                                                |
|                  |               |              |                              |                 |                       |                        |                          | 8.58 psi                            | Total(Pt)    Route 8                                                                                                                                           |

Equivalent Pipe Lengths of Valves and Fittings (C=120 only)

C Value Multiplier

$$\left( \frac{\text{Actual Inside Diameter}}{\text{Schedule 40 Steel Pipe Inside Diameter}} \right)^{4.87} = \text{Factor}$$

|                    |       |      |      |      |
|--------------------|-------|------|------|------|
| Value Of C         | 100   | 130  | 140  | 150  |
| Multiplying Factor | 0.713 | 1.16 | 1.33 | 1.51 |

Notes Legend

|     |                    |     |                   |    |             |
|-----|--------------------|-----|-------------------|----|-------------|
| BFP | Backflow Preventer | E   | 90° Elbow         | EE | 45° Elbow   |
| GV  | Gate Valve         | HW  | Hazen-Williams    | PO | Pipe Outlet |
| RA  | Riser Assembly     | red | Reducer/Adapter   | S  | Supply      |
| Spr | Sprinkler          | T   | Tee Flow Turn 90° | Tr | Tee run     |