# DESIGN MEMO

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| ☐ | Overnight |
| ☐ | Regular Mail |
| ☐ | Hand Delivery |
| ☒ | Other: email |

| | |
|---|---|
| **TO:** | Jim Eden<br>220 SE Green St.<br>Lee's Summit, MO 64063 |
| **FROM:** | Adam Hilgedick, PE<br>Olsson Associates |
| **RE:** | Kessler Ridge Apartments, Water Line Design |
| **DATE:** | 6/12/2018 |
| **OA PROJECT #:** | 017-3697 |

**NOTES:**

This memo identifies the purpose and procedure for developing a water model for the proposed development and infrastructure improvements at Kessler Ridge Apartments in Lee's Summit, Jackson County, Missouri.

The City of Lee's Summit (City) provides water around the proposed 5.5-acre residential development including apartments and townhouses. Plans for private water service extensions to the project site will be designed in accordance with City and Missouri Department of Natural Resources (MDNR) standards.

The Developer intends to extend a 10-inch private service around the building and branch to 8-inch private services within the development, tying into the existing system along SW Longview Boulevard. The private services will be routed around the proposed buildings to provide fire suppression water needs. A backflow preventer will be installed after the connection to the public main. Domestic needs will be served from the existing public mains surrounding the development.

The hydraulic model was created with H2ONET software and calibrated using hydrant tests provided by the City, included as Appendix A. The hydrant tests yielded pressures from 84 to 90 pounds per square inch (psi) static and 80 to 84 psi residual, with observed flows ranging from 1,374 to 1,444 gallons per minute (gpm).

The static and residual pressures, and flow rates from this test were used to calibrate the water model to conditions experienced by the system. A *reservoir* was used to represent the existing distribution system and *junctions* were used to connect *pipes* and represent service connections, fittings, and hydrants. Elevations from Google Earth were used throughout the model at *junctions*. When the base model is constructed, flows obtained from field testing are entered as a demand at a *junction* and the corresponding pressure at an adjacent *junction* is compared to the residual pressure from the field test. Once calibrated to existing conditions, proposed improvements were added into the model. Two scenarios, steady state and fire flow analysis, have been analyzed using the modeling software. Exhibit 1 (attached) illustrates the hydraulic model.

The steady state scenario represents how the system is performing in its current condition, with no additional demands placed on the system. This is comparable to the static pressures experienced at hydrants during testing. Results of the steady state scenario are presented in Appendix B, which includes information about *junctions*, *pipes*, and *reservoirs*.

A domestic demand was applied to *junctions* representing water usage on a peak day. Residential and commercial rates were assumed, based on the building use and corresponding Equivalent Dwelling Unit determinations. A peaking factor of 5 was applied to the flow rates. Multiple residences and businesses are accounted for on individual *junctions*.

For the fire flow analysis, a fire flow demand of 800 gpm was applied to five *junctions* which represent new private hydrants within the development. Domestic demands were also included in the fire flow analysis at the assumed peak day demand. Results of the fire flow analysis are presented in Appendix C. The analysis shows sufficient capacity in the private service line to provide required demand while meeting statutory pressure requirements. Water velocities in the pipes of this test were under the maximum recommended 20 feet per second, and pressures in all junctions were at least 20 psi, satisfying safety requirements of MDNR.

Flow reports with negative values are representative of the direction of flow and do not indicate water loss. Water loss has not been calculated in this model. Headloss calculations were determined using the Hazen-Williams method. Roughness coefficients of 140 were used which correspond to the age, material, and condition of water mains within the existing and proposed system. The majority of the pipe in the model area is recently constructed PVC and is expected to be in good condition.

The proposed private service extension, as analyzed, has capacity to provide a sufficient flow volume, in the event of a fire and during a peak day condition for domestic demands. While maintaining pressure in the line greater than the minimum design standard.

Should you have any questions regarding this memo, please contact me at 816.299.4364 or ahilgedick@olssonassociates.com.

Sincerely,

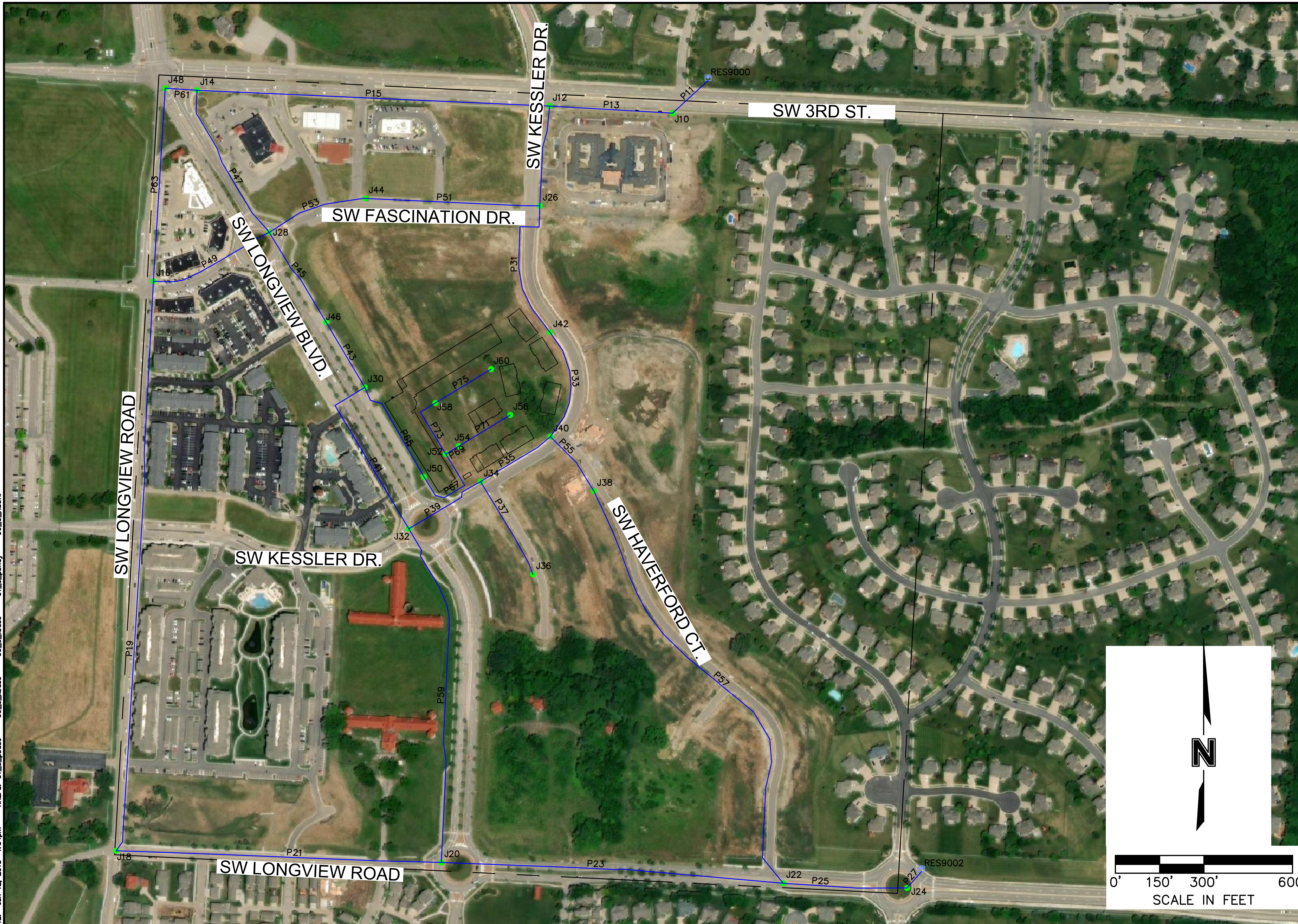
Adam Hilgedick

Adam Hilgedick, PE

cc. Nick Heiser– Olsson Associates

STATE OF MISSOURI
ADAM
HILGEDICK
NUMBER
PE-2014016961
PROFESSIONAL ENGINEER
6-12-18

DWG: F:\2017\3501-4000\017-3697\40-Design\Reports\GNCV\Water Model\017-3697_Water Model.dwg USER: ahilgedick
DATE: Jun 12, 2018 1:34pm XREFS: 01_c_pbase 00_c_xbase 00_c_fbase 01_c_pbndy 00_C_XSURF

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REVISIONS

| REV. NO. | DATE | REVISIONS DESCRIPTION |
| --- | --- | --- |
| 0 | 05/23/18 | INITIAL ISSUE |

WATER MODEL LAYOUT

KESSLER RIDGE APARTMENTS

LEE'S SUMMIT, MISSOURI

2018

drawn by: NDH
checked by: NDH
approved by: NDH
project no.: 017-3697
drawing no.: EX-009

SHEET
EXHIBIT 1

# APPENDIX "A"

## Hydrant Test Information

**Project Name:** Kessler Ridge Apartments **Date:** 6/12/2018
**Project Number:** 017-3697 **By:** AKH

| | Pressure (psi) | | | Inches | | Flow (GPM) | | (psi) | |
|---|---|---|---|---|---|---|---|---|---|
| **Hydrant #** | **Static** | **Residual** | **Pitot** | **Orifice Size** | **Coefficient** | **Observed** | **Available** | pressure drops | |
| 1 | 84 | 80 | 67 | 2.5 | 0.9 | 1373 | 6138 | 64 | 4 |
| 2 | 90 | 85 | 74 | 2.5 | 0.9 | 1443 | 6002 | 70 | 5 |
| 3 | 88 | 84 | 74 | 2.5 | 0.9 | 1443 | 6666 | 68 | 4 |
| | | | p | d | c | $Q/Q_F$ | $Q_R$ | $h_r$ | $h_f$ |

| Residual Baseline |
|---|
| **20** psi |

$$Q = 29.83\, cd^2\sqrt{p}$$

$$Q_R = Q_F \times \frac{h_r^{0.54}}{h_f^{0.54}}$$

**STATIC PRESSURE**
Pressure reading before water flows.

**RESIDUAL PRESSURE**
Pressure reading while water is flowing (from an outlet other than the flow outlet.)

**PITOT PRESSURE**
Reading taken by a pitot gauge inserted into the center of the flowing outlet, at a distance away from the lip of the outlet of about half the nozzle's diameter.

**COEFFICIENT**

Since hydrant nozzles typically don't produce perfect discharge columns, this is a correction factor which is often used to compensate for errant pitot readings. Hydrant manufacturers should be able to provide coefficients for their products. For hydrants where the coefficient is unknown, we use .95 or .9 depending upon how uniform the discharge stream looks when the hydrant is opened. If a flow tube or "stream straightner" is used on the hydrant, the coefficient would be 1.

**RESIDUAL BASELINE**
A pressure which you determine is the lowest that the hydrant would be pulled down during actual use. NFPA states that the basis for fire flow calculations will be 20 psi residual, however in low pressure areas they allow calculations based on one-half the static pressure. Ergo, flow from a hydrant that has only a 30 psi static pressure can be calculated on a basis of drawing it down to 15 psi rather than 20.

**OBSERVED FLOW**
This is a calculation in GPM of the actual flow from one outlet flowing fully opened.

**AVAILABLE FLOW**
This is the calculated maximum capacity of the hydrant if it is pumped down to the basis residual pressure (usually 20 psi).

**Q FORMULA**
The Q formula produces a value in GPM based on the nozzle diameter and pitot pressure (solving

for "Q".)

$$Q = 29.83\, cd^2\sqrt{p}$$

Where Q=observed flow, c=coefficient, d=outlet diameter, p=pitot pressure.

**HAZEN-WILLIAMS FORMULA**
This formula calculates available flow based on the readings taken before and during the single outlet flow test (solving for "QR".)

$$Q_R = Q_F \times \frac{h_r^{0.54}}{h_f^{0.54}}$$

Where $Q_F$=observed flow, $h_r$ is the drop in pressure from the static pressure to the desired residual baseline and $h_f$ is the drop in psi from static pressure to the actual residual pressure that was measured during the test. Please note that we are calculating to the .54 power (a fractional number.)
We loaded these formulas into a computer program to make them practical to work, however a programmable scientific calculator can also provide efficient results.
**Note:**

In most instances the Hazen-Williams formula will calculate available flows that are greater than observed flows. However on extremely weak water mains hydrants may fall below the baseline residual when an outlet is opened up. If there is sufficient residual pressure to take an accurate reading, the formula will still calculate what the hydrant produces at 20 psi (or half the static pressure) which in these cases will be slightly less than the observed flow. According to NFPA, these hydrants are to be rated at their available flows at the appropriate residual pressure so the lower GPM reading is the one to be used for rating the hydrant. If the residual pressure is too low to take accurate readings discharging an "open butt" outlet, a small smooth bore tip can be attached to the outlet, the calculations based on the size of the tip, and the formula will still work.

# APPENDIX “B”

## Steady State Scenario

| | | ID | Demand (gpm) | Elevation (ft) | Head (ft) | Pressure (psi) |
|---|---|---|---|---|---|---|
| 1 | ☐ | J10 | 0.00 | 950.00 | 1,203.30 | 109.75 |
| 2 | ☐ | J12 | 0.00 | 969.00 | 1,203.30 | 101.52 |
| 3 | ☐ | J14 | 0.00 | 1,015.00 | 1,203.30 | 81.59 |
| 4 | ☐ | J16 | 0.00 | 1,006.00 | 1,203.30 | 85.49 |
| 5 | ☐ | J18 | 0.00 | 973.00 | 1,203.30 | 99.79 |
| 6 | ☐ | J20 | 0.00 | 990.00 | 1,203.30 | 92.42 |
| 7 | ☐ | J22 | 0.00 | 982.00 | 1,203.30 | 95.89 |
| 8 | ☐ | J24 | 0.00 | 986.00 | 1,203.30 | 94.16 |
| 9 | ☐ | J26 | 0.00 | 982.00 | 1,203.30 | 95.89 |
| 10 | ☐ | J28 | 0.00 | 1,006.00 | 1,203.30 | 85.49 |
| 11 | ☐ | J30 | 0.00 | 1,005.00 | 1,203.30 | 85.92 |
| 12 | ☐ | J32 | 0.00 | 1,011.00 | 1,203.30 | 83.32 |
| 13 | ☐ | J34 | 0.00 | 1,007.00 | 1,203.30 | 85.06 |
| 14 | ☐ | J36 | 0.00 | 995.00 | 1,203.30 | 90.26 |
| 15 | ☐ | J38 | 0.00 | 978.00 | 1,203.30 | 97.62 |
| 16 | ☐ | J40 | 0.00 | 982.00 | 1,203.30 | 95.89 |
| 17 | ☐ | J42 | 0.00 | 999.00 | 1,203.30 | 88.52 |
| 18 | ☐ | J44 | 0.00 | 1,000.00 | 1,203.30 | 88.09 |
| 19 | ☐ | J46 | 0.00 | 1,008.00 | 1,203.30 | 84.62 |
| 20 | ☐ | J48 | 0.00 | 1,007.00 | 1,203.30 | 85.06 |
| 21 | ☐ | J50 | 0.00 | 1,007.70 | 1,203.30 | 84.75 |
| 22 | ☐ | J52 | 0.00 | 997.00 | 1,203.30 | 89.39 |
| 23 | ☐ | J54 | 0.00 | 996.00 | 1,203.30 | 89.82 |
| 24 | ☐ | J56 | 0.00 | 992.50 | 1,203.30 | 91.34 |
| 25 | ☐ | J58 | 0.00 | 996.00 | 1,203.30 | 89.82 |
| 26 | ☐ | J60 | 0.00 | 994.70 | 1,203.30 | 90.39 |

Steady State - Pipe

| | | ID | From Node | To Node | Length (ft) | Diameter (in) | Roughness | Flow (gpm) | Velocity (ft/s) | Headloss (ft) | HL/1000 (ft/k-ft) | Status | Flow Reversal Count |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ☐ | P11 | RES9000 | J10 | 4,000.00 | 16.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 2 | ☐ | P13 | J10 | J12 | 416.00 | 16.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 3 | ☐ | P15 | J12 | J14 | 1,195.00 | 16.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 4 | ☐ | P19 | J16 | J18 | 1,940.00 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 5 | ☐ | P21 | J18 | J20 | 1,102.00 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 6 | ☐ | P23 | J20 | J22 | 1,160.00 | 12.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 7 | ☐ | P25 | J22 | J24 | 421.00 | 12.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 8 | ☐ | P27 | RES9002 | J24 | 4,000.00 | 12.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 9 | ☐ | P29 | J12 | J26 | 341.00 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 10 | ☐ | P31 | J26 | J42 | 524.00 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 11 | ☐ | P33 | J42 | J40 | 389.00 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 12 | ☐ | P35 | J40 | J34 | 282.00 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 13 | ☐ | P37 | J34 | J36 | 361.00 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 14 | ☐ | P39 | J34 | J32 | 298.00 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 15 | ☐ | P41 | J32 | J30 | 605.00 | 12.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 16 | ☐ | P43 | J30 | J46 | 257.00 | 12.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 17 | ☐ | P45 | J46 | J28 | 360.00 | 12.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 18 | ☐ | P47 | J14 | J28 | 553.00 | 12.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 19 | ☐ | P49 | J28 | J16 | 435.00 | 8.00 | 140.00 | 0.03 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 20 | ☐ | P51 | J26 | J44 | 590.00 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 21 | ☐ | P53 | J44 | J28 | 353.00 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 22 | ☐ | P55 | J40 | J38 | 238.00 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 23 | ☐ | P57 | J38 | J22 | 1,567.00 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 24 | ☐ | P59 | J20 | J32 | 1,168.00 | 12.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 25 | ☐ | P61 | J14 | J48 | 108.19 | 16.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 26 | ☐ | P63 | J16 | J48 | 655.01 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 27 | ☐ | P65 | J30 | J50 | 374.36 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 28 | ☐ | P67 | J50 | J52 | 310.03 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 29 | ☐ | P69 | J52 | J54 | 51.39 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 30 | ☐ | P71 | J54 | J56 | 203.83 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 31 | ☐ | P73 | J52 | J58 | 225.61 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 32 | ☐ | P75 | J58 | J60 | 220.69 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |

| | | ID | Flow (gpm) | Head (ft) |
|---|---|---|---|---|
| 1 | ☐ | RES9000 | 0.00 | 1,203.30 |
| 2 | ☐ | RES9002 | 0.00 | 1,203.30 |

# APPENDIX "C"

## Fire Flow Analysis

| | | ID | Demand (gpm) | Elevation (ft) | Head (ft) | Pressure (psi) |
|---|---|---|---|---|---|---|
| 1 | ☐ | J10 | 0.00 | 950.00 | 1,184.19 | 101.47 |
| 2 | ☐ | J12 | 0.00 | 969.00 | 1,182.20 | 92.38 |
| 3 | ☐ | J14 | 3.00 | 1,015.00 | 1,178.99 | 71.06 |
| 4 | ☐ | J16 | 53.00 | 1,006.00 | 1,176.08 | 73.70 |
| 5 | ☐ | J18 | 0.00 | 973.00 | 1,175.63 | 87.80 |
| 6 | ☐ | J20 | 0.00 | 990.00 | 1,175.37 | 80.32 |
| 7 | ☐ | J22 | 0.00 | 982.00 | 1,179.37 | 85.52 |
| 8 | ☐ | J24 | 0.00 | 986.00 | 1,181.65 | 84.77 |
| 9 | ☐ | J26 | 30.00 | 982.00 | 1,178.07 | 84.96 |
| 10 | ☐ | J28 | 0.00 | 1,006.00 | 1,175.11 | 73.28 |
| 11 | ☐ | J30 | 0.00 | 1,005.00 | 1,167.48 | 70.40 |
| 12 | ☐ | J32 | 345.00 | 1,011.00 | 1,170.73 | 69.21 |
| 13 | ☐ | J34 | 178.00 | 1,007.00 | 1,172.50 | 71.71 |
| 14 | ☐ | J36 | 0.00 | 995.00 | 1,172.50 | 76.91 |
| 15 | ☐ | J38 | 0.00 | 978.00 | 1,175.78 | 85.70 |
| 16 | ☐ | J40 | 0.00 | 982.00 | 1,175.23 | 83.73 |
| 17 | ☐ | J42 | 0.00 | 999.00 | 1,176.44 | 76.89 |
| 18 | ☐ | J44 | 9.00 | 1,000.00 | 1,176.19 | 76.34 |
| 19 | ☐ | J46 | 214.00 | 1,008.00 | 1,170.37 | 70.36 |
| 20 | ☐ | J48 | 0.00 | 1,007.00 | 1,178.97 | 74.52 |
| 21 | ☐ | J50 | 800.00 | 1,007.70 | 1,141.02 | 57.77 |
| 22 | ☐ | J52 | 22.00 | 997.00 | 1,126.48 | 56.10 |
| 23 | ☐ | J54 | 800.00 | 996.00 | 1,124.53 | 55.69 |
| 24 | ☐ | J56 | 800.00 | 992.50 | 1,122.38 | 56.28 |
| 25 | ☐ | J58 | 800.00 | 996.00 | 1,117.90 | 52.82 |
| 26 | ☐ | J60 | 800.00 | 994.70 | 1,115.58 | 52.38 |

Fire Flow with Domestic - 10in Header w/ 8in Branches - Pipe

| | | ID | From Node | To Node | Length (ft) | Diameter (in) | Roughness | Flow (gpm) | Velocity (ft/s) | Headloss (ft) | HL/1000 (ft/k-ft) | Status | Flow Reversal Count |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ☐ | P11 | RES9000 | J10 | 4,000.00 | 16.00 | 140.00 | 3,231.81 | 5.16 | 19.11 | 4.78 | Open | 0 |
| 2 | ☐ | P13 | J10 | J12 | 416.00 | 16.00 | 140.00 | 3,231.81 | 5.16 | 1.99 | 4.78 | Open | 0 |
| 3 | ☐ | P15 | J12 | J14 | 1,195.00 | 16.00 | 140.00 | 2,368.90 | 3.78 | 3.21 | 2.69 | Open | 0 |
| 4 | ☐ | P19 | J16 | J18 | 1,940.00 | 8.00 | 140.00 | 101.94 | 0.65 | 0.45 | 0.23 | Open | 0 |
| 5 | ☐ | P21 | J18 | J20 | 1,102.00 | 8.00 | 140.00 | 101.94 | 0.65 | 0.26 | 0.23 | Open | 0 |
| 6 | ☐ | P23 | J20 | J22 | 1,160.00 | 12.00 | 140.00 | -1,271.07 | 3.61 | 4.00 | 3.45 | Open | 0 |
| 7 | ☐ | P25 | J22 | J24 | 421.00 | 12.00 | 140.00 | -1,622.19 | 4.60 | 2.28 | 5.41 | Open | 0 |
| 8 | ☐ | P27 | RES9002 | J24 | 4,000.00 | 12.00 | 140.00 | 1,622.19 | 4.60 | 21.65 | 5.41 | Open | 0 |
| 9 | ☐ | P29 | J12 | J26 | 341.00 | 8.00 | 140.00 | 862.91 | 5.51 | 4.13 | 12.12 | Open | 0 |
| 10 | ☐ | P31 | J26 | J42 | 524.00 | 8.00 | 140.00 | 413.72 | 2.64 | 1.63 | 3.11 | Open | 0 |
| 11 | ☐ | P33 | J42 | J40 | 389.00 | 8.00 | 140.00 | 413.72 | 2.64 | 1.21 | 3.11 | Open | 0 |
| 12 | ☐ | P35 | J40 | J34 | 282.00 | 8.00 | 140.00 | 764.84 | 4.88 | 2.73 | 9.69 | Open | 0 |
| 13 | ☐ | P37 | J34 | J36 | 361.00 | 8.00 | 140.00 | 0.00 | 0.00 | 0.00 | 0.00 | Open | 0 |
| 14 | ☐ | P39 | J34 | J32 | 298.00 | 8.00 | 140.00 | 586.84 | 3.75 | 1.77 | 5.93 | Open | 0 |
| 15 | ☐ | P41 | J32 | J30 | 605.00 | 12.00 | 140.00 | 1,614.86 | 4.58 | 3.25 | 5.37 | Open | 0 |
| 16 | ☐ | P43 | J30 | J46 | 257.00 | 12.00 | 140.00 | -2,407.14 | 6.83 | 2.89 | 11.24 | Open | 0 |
| 17 | ☐ | P45 | J46 | J28 | 360.00 | 12.00 | 140.00 | -2,621.14 | 7.44 | 4.74 | 13.16 | Open | 0 |
| 18 | ☐ | P47 | J14 | J28 | 553.00 | 12.00 | 140.00 | 1,865.49 | 5.29 | 3.88 | 7.01 | Open | 0 |
| 19 | ☐ | P49 | J28 | J16 | 435.00 | 8.00 | 140.00 | -345.46 | 2.21 | 0.97 | 2.22 | Open | 0 |
| 20 | ☐ | P51 | J26 | J44 | 590.00 | 8.00 | 140.00 | 419.19 | 2.68 | 1.88 | 3.18 | Open | 0 |
| 21 | ☐ | P53 | J44 | J28 | 353.00 | 8.00 | 140.00 | 410.19 | 2.62 | 1.08 | 3.06 | Open | 0 |
| 22 | ☐ | P55 | J40 | J38 | 238.00 | 8.00 | 140.00 | -351.12 | 2.24 | 0.55 | 2.29 | Open | 0 |
| 23 | ☐ | P57 | J38 | J22 | 1,567.00 | 8.00 | 140.00 | -351.12 | 2.24 | 3.59 | 2.29 | Open | 0 |
| 24 | ☐ | P59 | J20 | J32 | 1,168.00 | 12.00 | 140.00 | 1,373.01 | 3.89 | 4.64 | 3.97 | Open | 0 |
| 25 | ☐ | P61 | J14 | J48 | 108.19 | 16.00 | 140.00 | 500.41 | 0.80 | 0.02 | 0.15 | Open | 0 |
| 26 | ☐ | P63 | J16 | J48 | 655.01 | 8.00 | 140.00 | -500.41 | 3.19 | 2.89 | 4.42 | Open | 0 |
| 27 | ☐ | P65 | J30 | J50 | 374.36 | 10.00 | 140.00 | 4,022.00 | 16.43 | 26.47 | 70.70 | Open | 0 |
| 28 | ☐ | P67 | J50 | J52 | 310.03 | 10.00 | 140.00 | 3,222.00 | 13.16 | 14.54 | 46.89 | Open | 0 |
| 29 | ☐ | P69 | J52 | J54 | 51.39 | 8.00 | 140.00 | 1,600.00 | 10.21 | 1.95 | 38.02 | Open | 0 |
| 30 | ☐ | P71 | J54 | J56 | 203.83 | 8.00 | 140.00 | 800.00 | 5.11 | 2.15 | 10.53 | Open | 0 |
| 31 | ☐ | P73 | J52 | J58 | 225.61 | 8.00 | 140.00 | 1,600.00 | 10.21 | 8.58 | 38.03 | Open | 0 |
| 32 | ☐ | P75 | J58 | J60 | 220.69 | 8.00 | 140.00 | 800.00 | 5.11 | 2.32 | 10.53 | Open | 0 |

| | | ID | Flow (gpm) | Head (ft) |
|---|---|---|---|---|
| 1 | ☐ | RES9000 | -3,231.81 | 1,203.30 |
| 2 | ☐ | RES9002 | -1,622.19 | 1,203.30 |