**MEMORANDUM**

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

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

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

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

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

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

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

**TABLE 1**

**Peak Hour Pressure**

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

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

**SCENARIO 1**

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

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

**TABLE 2**

**Modeled Fire Flow Availability, Scenario 1**

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

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

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

**SCENARIO 2**

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

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

**TABLE 3**

**Modeled Fire Flow Availability, Scenario 2**

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

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

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

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

The Department of Health and City Standards for water distribution systems are to meet the peak hourly demand of the system while providing a minimum pressure of 30 psi, system-wide. Under peak daily demand with a fire flow, the system is designed to maintain a minimum pressure of 20 psi, system-wide. Although the peak hourly demand pressure may currently be higher than these standards, the Developer must recognize that
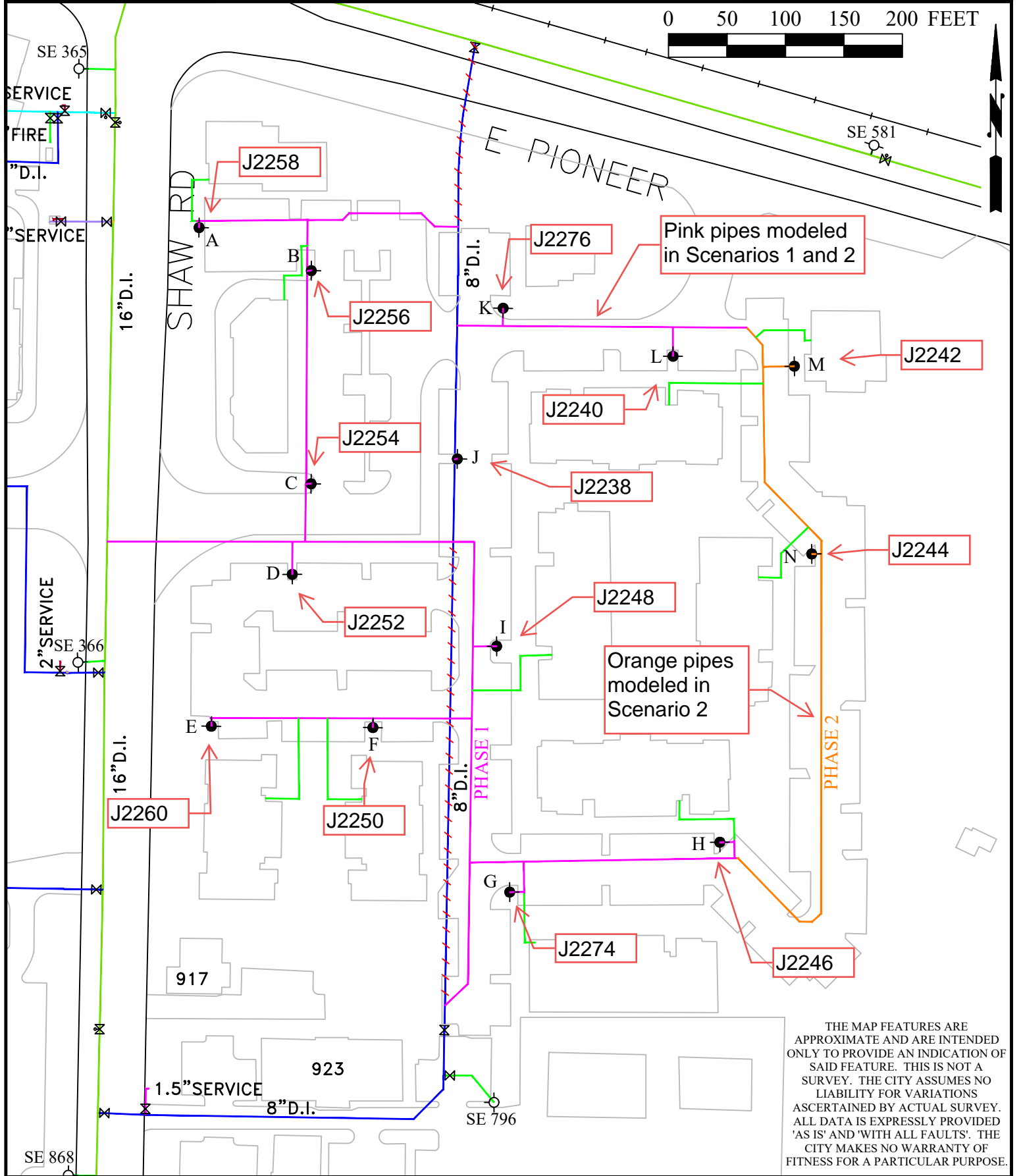
the City may not provide pressure higher than 30 psi in the future. The flows and pressures determined in this memo are based on the approximate hydrant elevation at ground level. The Developer may design their sprinkler system for whatever pressure they wish, however they must recognize and be responsible for conditions when the pressure may be less than currently exists.

KS/sr

0  50  100  150  200 FEET

SE 365

SERVICE
'FIRE
''D.I.
''SERVICE

16"D.I.

SHAW RD

E PIONEER

SE 581

J2258
A
B
J2256
8"D.I.
J2276
K
Pink pipes modeled
in Scenarios 1 and 2

L
M
J2242
J2240
J2254
C
J2238
J
J2248
2"SERVICE
SE 366
D
J2252
N
J2244
I
Orange pipes
modeled in
Scenario 2

16"D.I.
E
F
J2260
J2250
PHASE 1
PHASE 2
H
8"D.I.
G
J2274
J2246

917

923

1.5"SERVICE
8"D.I.
SE 796
SE 868

THE MAP FEATURES ARE
APPROXIMATE AND ARE INTENDED
ONLY TO PROVIDE AN INDICATION OF
SAID FEATURE. THIS IS NOT A
SURVEY. THE CITY ASSUMES NO
LIABILITY FOR VARIATIONS
ASCERTAINED BY ACTUAL SURVEY.
ALL DATA IS EXPRESSLY PROVIDED
'AS IS' AND 'WITH ALL FAULTS'. THE
CITY MAKES NO WARRANTY OF
FITNESS FOR A PARTICULAR PURPOSE.

**CITY OF PUYALLUP
PUBLIC WORKS
WATER DIVISION**

**HYDRAULIC MODEL FOR
EAST TOWN CROSSING**

SCALE AS SHOWN

04/10/2024

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PG104\MODEL EAST TOWN CROSSING