A WATER SYSTEM REPORT

FOR

The Fimbrez Estates Subdivision Waterline Extension

June 27, 2022

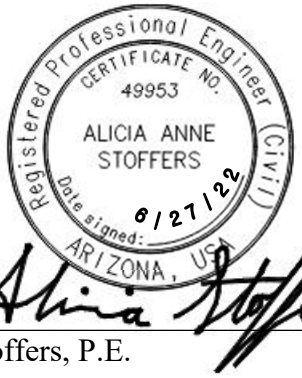
Project Locations:

1300 W Lower Coconino Ave
City of Flagstaff

Prepared For:

Ben Fimbrez

Prepared By:



Alicia Stoffers, P.E.

WOODSON

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WES Project No. 120053

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INTRODUCTION

This is the Water System Report, part of the ADEQ Submittal, for the construction of the public water for the Fimbrez Estates Subdivision in Flagstaff, Arizona. The 10.04 acre project site is currently vacant. This project will construct the infrastructure to provide water service to 6 new residential lots. A vicinity map of the project area is Appendix A-1. This report is submitted with the Fimbrez Estates Subdivision construction plans dated June 2022.

The waterline improvements for Fimbrez Estates Subdivision will consist of approximately 3,130 linear feet of new 8" PVC (C-900) to extend to the project site and provide services. This includes installation of all valves and fire hydrants within a new Public Utility Easement dedicated to the City of Flagstaff. six 3/4" water potable meter and three fire hydrants will be constructed.

City of Flagstaff code requires two sources of water supply on all lines over 1000 ft. in length or has three or more fire hydrants coming from it. The Fimbrez Estates Subdivision is at the end of the existing system. In order to provide 2 sources of water, the public City of Flagstaff system will be extended with dual waterlines from the west. The existing subdivision to the west, Flagstaff Mesa Estates (COF 04-173, ADEQ 12-05-002), constructed dual waterlines in 2006 1250' west of our property boundary. This project will extend the dual lines to the project site and then an additional 950' of single 8" water main extension to provide service to the new lots. All waterline construction will be completed within the existing public utility tract in the neighboring subdivision and in the new Tract in the Fimbrez Estates Subdivision.

The existing homes to the east of this project are served by the City of Flagstaff water system as well but are in a different pressure zone. Connection to the mains in different pressure zones are not allowed. The Fimbrez Estates Subdivision is the last vacant parcel in the vicinity. No future extension of this watermain will be needed.

WATER SYSTEM

The Fimbrez Estates Subdivision will construct an extension of dual 8" PVC waterlines to the site. Within the private roadway and public utility easement, two connections will be made to the existing 10" waterline in the City of Flagstaff water system.

All distribution system facilities will be constructed in accordance with regulations of the City of Flagstaff, and the Arizona Department of Environmental Quality (ADEQ). Detailed hydraulic results of the water modeling are presented in Appendix B.

Water System Hydraulic Analysis

An analysis of the proposed system was performed using WaterGEMS Version 8.0 with the following criteria from the COF Engineering Design Standards (Table 9-4):

Avg. pop. density for SFR	= 3.5 persons
Avg flow for residential (LD)	= 120 gallons/cap/day x 3.5 persons/unit x 6 units
	= 2,520 gpd
	= 1.75 gpm

Peak day flow for residential (LD) = 300 gallons/cap/day x 3.5 persons/unit x 6 units
= 6,300 gpd
= 4.38 gpm

Peak Hour Factor = 1.7 x peak day flow
= 7.44 gpm

Required Fire Flow
Fire Flow requirements are from COF Engineering Design Standards (Table 13-09-003-03)

1000 gpm for Single Family Residential (2 hr*)

An analysis of the proposed system was performed using WaterGEMS Version 8.0. An onsite hydraulic model was used to evaluate the proposed waterline.

The existing system was calibrated from data in the City of Flagstaff WaterGEMs model. The City maintains a city wide water model that was developed and calibrated with hydrant tests and flow data. Below is the hydrant test date from the nearest existing hydrant.

Location	=	Lower Coconino Ave 191637
Static Pressure	=	100 psi
Residual Pressure	=	85 psi
Fire Flow Rate	=	1364 gpm

Static Pressure North Source= 82.91 psi
Static Pressure South Source= 83.21 psi

Two different scenarios were modeled for the project. The first was a Steady State Analysis to analyze the static pressures in the system. Due to the elevation change within the project, high pressures are produced at the lowest eastern end of the waterline extension. A pressure reducing valve (PRV) will be required at each home downstream of the individual meters. The lowest static pressure for the peak day flows was found to be 120.0 psi at Junction 12, the highest point in the waterline. With peak hour flows applied, the lowest pressure does not change. The individual results can be found in Appendix B - Water System Calculations.

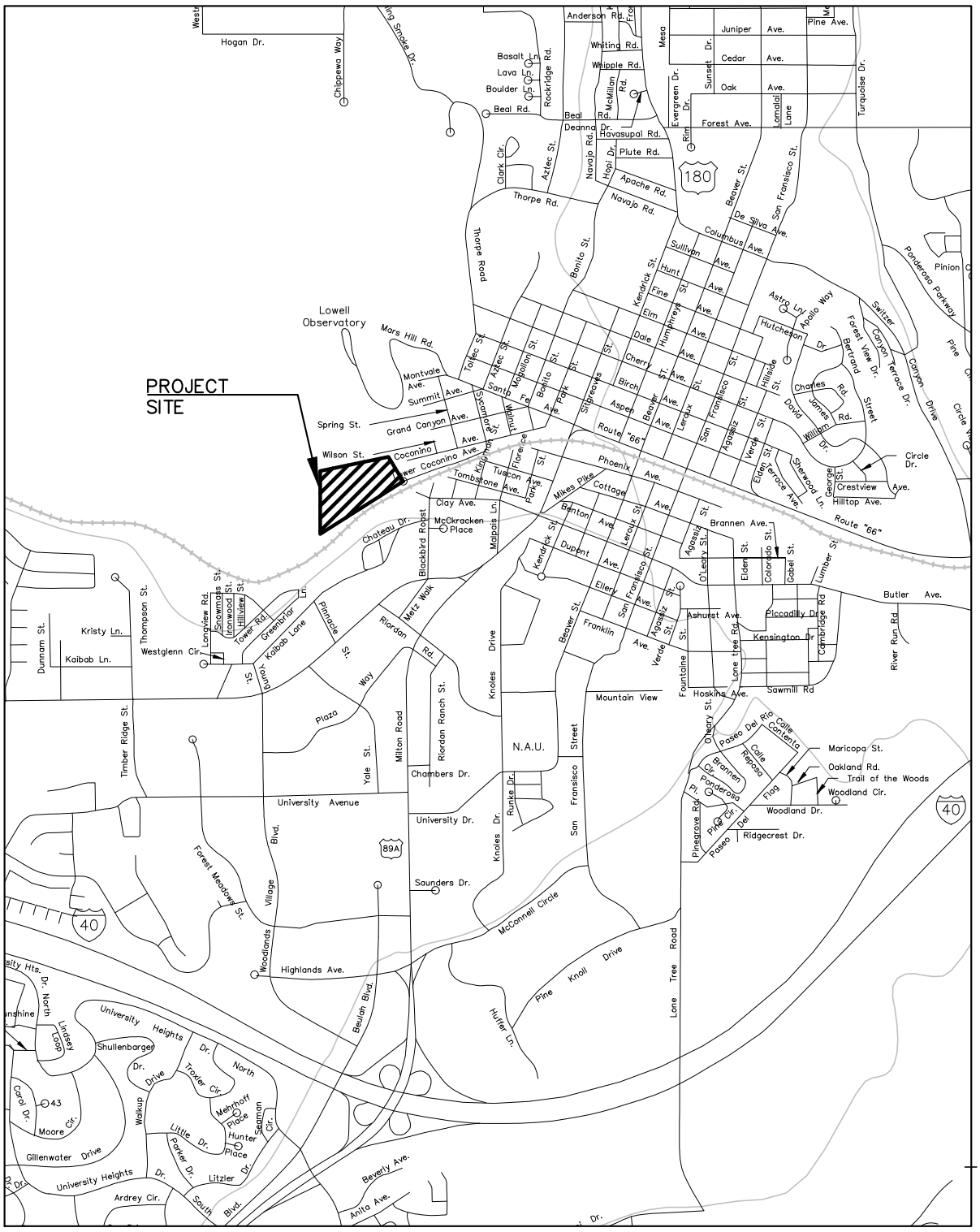
The second scenario is a fire flow analysis. The improvements proposed for the water system will provide the required fire flow for the property while maintaining residual pressures greater than 20 psi in the entire system. The entire system was able to exceed the required 1000 gpm Fire Flow with a residual pressure of 20 psi. The individual results and a system map can be found in Appendix B – Water System Calculations.

SUMMARY AND CONCLUSIONS

This Water System Report show that the design of the water system for the Fimbrez Estates Subdivision follows the Arizona Department of Environmental Quality standards and the City of Flagstaff Engineering Design Standards and will provide service to the proposed six lots.

APPENDIX A: EXHIBITS

1. Vicinity Map

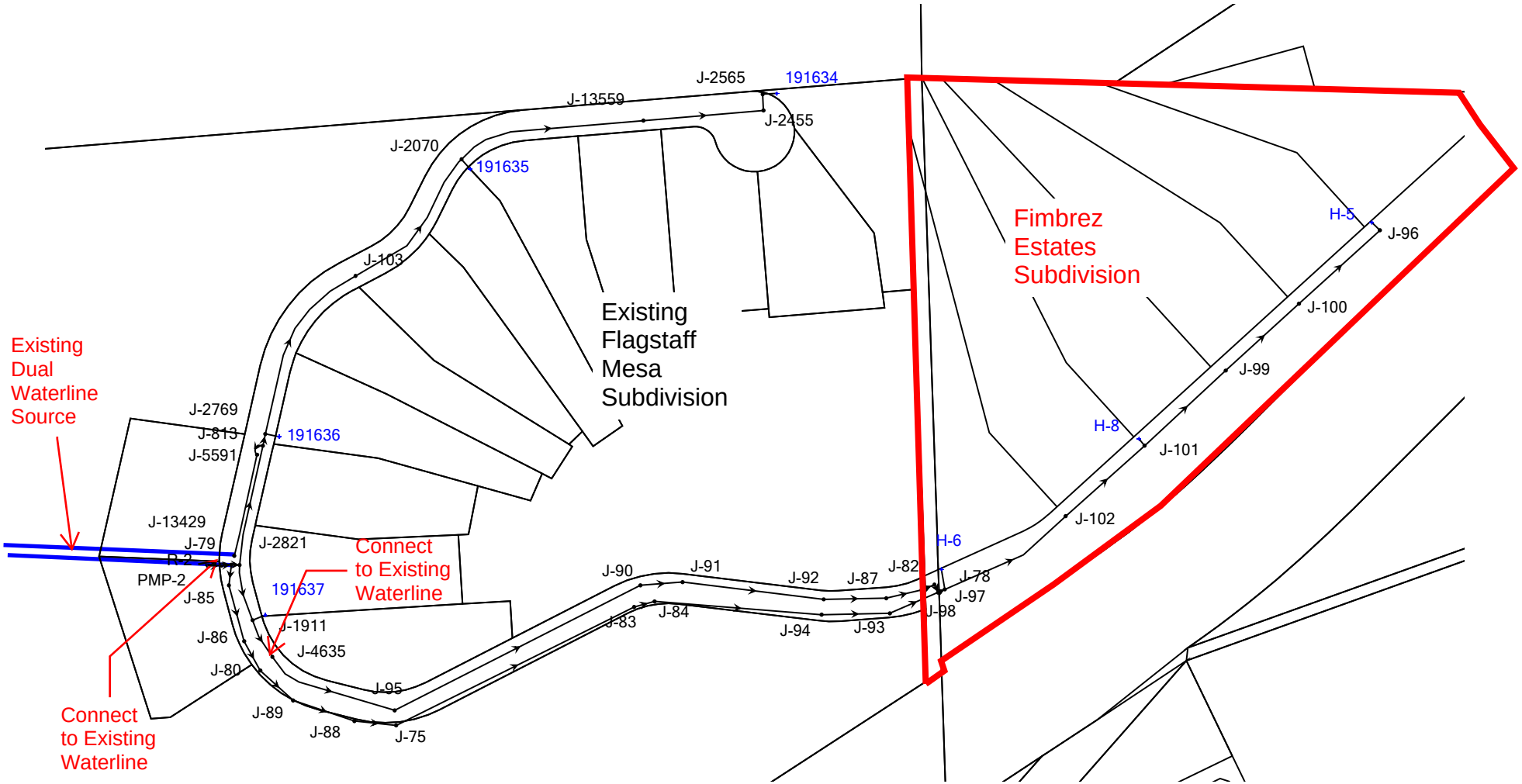


NOT TO SCALE

DRAFTED BY: AS DATE: 6/27/22 PROJ. NO.: 120053 FN: VIC MAP	**WOODSON** **ENGINEERING & SURVEYING** (928)774-4636 | WWW.WOODSONENG.COM	VICINITY MAP FIMBREZ ESTATES FLAGSTAFF, AZ

APPENDIX B: WATER SYSTEM HYDRAULIC ANALYSIS

Scenario: Fire Flow Scenario



FlexTable: Junction Table

Label	Elevation (ft)	Demand (gal/min)	Pressure (psi)
J-2565	7,218.28	0.00	60.02
J-2455	7,217.10	0.58	60.53
J-13559	7,214.49	0.58	61.66
J-2070	7,198.16	0.58	68.72
J-103	7,174.17	0.58	79.10
J-2769	7,145.96	0.58	91.31
J-813	7,144.17	0.00	92.08
J-5591	7,142.85	0.29	92.65
J-13429	7,127.05	0.00	99.49
J-2821	7,126.35	0.00	99.79
J-79	7,126.00	0.00	99.94
J-85	7,122.00	0.00	101.67
J-1911	7,118.05	0.00	103.38
J-86	7,114.00	0.29	105.13
J-4635	7,113.24	0.29	105.46
J-80	7,110.00	0.00	106.86
J-89	7,104.00	0.00	109.46
J-88	7,095.00	0.00	113.35
J-75	7,090.00	0.00	115.52
J-95	7,090.00	0.00	115.52
J-83	7,051.00	0.00	132.39
J-90	7,051.00	0.00	132.39
J-91	7,049.00	0.00	133.26
J-84	7,048.00	0.00	133.69
J-92	7,024.00	0.00	144.07
J-94	7,024.00	0.00	144.07
J-87	7,014.00	0.00	148.40
J-93	7,014.00	0.00	148.40
J-82	7,010.00	0.00	150.13
J-78	7,009.00	0.00	150.56
J-97	7,009.00	0.00	150.56
J-98	7,009.00	0.00	150.56
J-101	7,008.00	0.29	151.00
J-102	7,008.00	0.58	151.00
J-99	7,001.00	0.29	154.02
J-100	6,995.00	0.29	156.62
J-96	6,989.00	0.29	159.22

Fire Flow Node FlexTable: Fire Flow Results Table

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gal/min)	Fire Flow (Available) (gal/min)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
191636	True	1,000.00	2,171.21	46.20	20.00	20.00	191634
191637	True	1,000.00	2,284.24	56.99	20.00	20.00	191634
191634	True	1,000.00	1,691.89	20.00	23.14	23.14	J-2565
191635	True	1,000.00	1,937.27	24.35	20.01	20.01	191634
H-5	True	1,000.00	2,287.90	84.58	20.00	20.00	191634
H-6	True	1,000.00	2,287.90	97.02	20.00	20.00	191634
H-8	True	1,000.00	2,287.90	89.81	20.00	20.00	191634

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gal/min)	Pressure (psi)
J-2565	7,218.28	0.00	60.02
J-2455	7,217.10	1.46	60.52
J-13559	7,214.49	1.46	61.65
J-2070	7,198.16	1.46	68.72
J-103	7,174.17	1.46	79.10
J-2769	7,145.96	1.46	91.31
J-813	7,144.17	0.00	92.08
J-5591	7,142.85	0.73	92.65
J-13429	7,127.05	0.00	99.48
J-2821	7,126.35	0.00	99.79
J-79	7,126.00	0.00	99.94
J-85	7,122.00	0.00	101.67
J-1911	7,118.05	0.00	103.38
J-86	7,114.00	0.73	105.13
J-4635	7,113.24	0.73	105.46
J-80	7,110.00	0.00	106.86
J-89	7,104.00	0.00	109.46
J-88	7,095.00	0.00	113.35
J-75	7,090.00	0.00	115.52
J-95	7,090.00	0.00	115.52
J-83	7,051.00	0.00	132.39
J-90	7,051.00	0.00	132.39
J-91	7,049.00	0.00	133.25
J-84	7,048.00	0.00	133.69
J-92	7,024.00	0.00	144.07
J-94	7,024.00	0.00	144.07
J-87	7,014.00	0.00	148.40
J-93	7,014.00	0.00	148.40
J-82	7,010.00	0.00	150.13
J-78	7,009.00	0.00	150.56
J-97	7,009.00	0.00	150.56
J-98	7,009.00	0.00	150.56
J-101	7,008.00	0.73	150.99
J-102	7,008.00	1.46	150.99
J-99	7,001.00	0.73	154.02
J-100	6,995.00	0.73	156.62
J-96	6,989.00	0.73	159.21

Fire Flow Node FlexTable: Fire Flow Results Table

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gal/min)	Fire Flow (Available) (gal/min)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
191636	True	1,000.00	2,163.21	46.23	20.00	20.00	191634
191637	True	1,000.00	2,275.93	57.02	20.00	20.00	191634
191634	True	1,000.00	1,686.20	20.00	23.12	23.12	J-2565
191635	True	1,000.00	1,930.45	24.36	20.00	20.00	191634
H-5	True	1,000.00	2,279.57	84.76	20.00	20.00	191634
H-6	True	1,000.00	2,279.57	97.10	20.00	20.00	191634
H-8	True	1,000.00	2,279.57	89.91	20.00	20.00	191634

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gal/min)	Pressure (psi)
J-2565	7,218.28	0.00	60.01
J-2455	7,217.10	2.48	60.52
J-13559	7,214.49	2.48	61.65
J-2070	7,198.16	2.48	68.71
J-103	7,174.17	2.48	79.09
J-2769	7,145.96	2.48	91.30
J-813	7,144.17	0.00	92.07
J-5591	7,142.85	1.24	92.64
J-13429	7,127.05	0.00	99.48
J-2821	7,126.35	0.00	99.78
J-79	7,126.00	0.00	99.93
J-85	7,122.00	0.00	101.67
J-1911	7,118.05	0.00	103.37
J-86	7,114.00	1.24	105.13
J-4635	7,113.24	1.24	105.45
J-80	7,110.00	0.00	106.86
J-89	7,104.00	0.00	109.45
J-88	7,095.00	0.00	113.35
J-75	7,090.00	0.00	115.51
J-95	7,090.00	0.00	115.51
J-83	7,051.00	0.00	132.38
J-90	7,051.00	0.00	132.38
J-91	7,049.00	0.00	133.25
J-84	7,048.00	0.00	133.68
J-92	7,024.00	0.00	144.06
J-94	7,024.00	0.00	144.06
J-87	7,014.00	0.00	148.39
J-93	7,014.00	0.00	148.39
J-82	7,010.00	0.00	150.12
J-78	7,009.00	0.00	150.55
J-97	7,009.00	0.00	150.55
J-98	7,009.00	0.00	150.55
J-101	7,008.00	1.24	150.99
J-102	7,008.00	2.48	150.99
J-99	7,001.00	1.24	154.02
J-100	6,995.00	1.24	156.61
J-96	6,989.00	1.24	159.21

Fire Flow Node FlexTable: Fire Flow Results Table

Label	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gal/min)	Fire Flow (Available) (gal/min)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Pressure (Calculated System Lower Limit) (psi)	Junction w/ Minimum Pressure (System)
191636	True	1,000.00	2,153.88	46.26	20.00	20.00	191634
191637	True	1,000.00	2,266.21	57.07	20.00	20.00	191634
191634	True	1,000.00	1,679.55	20.00	23.10	23.10	J-2565
191635	True	1,000.00	1,922.21	24.39	20.00	20.00	191634
H-5	True	1,000.00	2,269.85	84.98	20.00	20.00	191634
H-6	True	1,000.00	2,269.84	97.18	20.00	20.00	191634
H-8	True	1,000.00	2,269.84	90.04	20.00	20.00	191634