PRELIMINARY WATER DESIGN MEMORANDUM

To: Erwin Architecture & Development

From: Andrew Baird, P.E.

Kimley-Horn and Associates, Inc.

Date: December 14, 2022

Subject: Arabella Spa

BACKGROUND

This Preliminary Water Design Memorandum for the Arabella Spa has been prepared to address the water system requirements outlined in the City of Sedona – Design, Review, Engineering and Administrative Manual (DREAM), Arizona Water Company (AWC) and Arizona Department of Environmental Quality (ADEQ). The main purposes of this memo are the following:

- Illustrate compliance with the DREAM, AWC, ADEQ.
- Establish water demand and fire flow criteria for design.
- Establish the feasibility of the development of the site.

The project site (Site) is located along Sombart Ln. east of State Route 179. The Site is bounded to the north by property that is zoned commercial but is currently being utilized as parking for trailheads, east by a hotel complex, south by single family residential properties, and the west by property zoned open space and Coconino National Forest. The Site is located within the City of Sedona, Section 21, Township 4 South, Range 03 East. The Site consists of parcel 401-22-034B approximately 7.0 acres. See **Appendix A** for the Location Map and Vicinity Map, respectively.

As part of this project, a new spa will be constructed, including four buildings, walkways and patio space, and utilities to service the site. The water system design will include the future additions, and the infrastructure designed accounts for the ultimate condition of the Site.

METHODOLOGY

The water system serving the Arabella Spa Site has been modeled using WaterCAD, developed using the Haestad Method. The program utilizes the fluid mechanic head loss theory known as the Hazen-Williams method. This is the generally accepted method used to evaluate water distribution systems.

EXISTING WATER SYSTEM

An existing 8-inch DIP water line is located near the northwest corner of the existing hotel building in Sombart Lane. Hydrants are located west and north of the site in Sombart Lane.

FIRE FLOW TEST

A Fire Hydrant Flow Test was conducted to determine capacity of the existing infrastructure to service the proposed development. Residual and static pressures were obtained from a flow test performed on three fire hydrants near the site, west of the project site in Sombart Lane and on Highway 179, by Arizona Water Company (see **Appendix C** for fire flow test results). The residual and static pressures from the flow test are included in Table 2.

Table 1: Fire Hydrant Flow Rate Test Results

Hydrant No.		Hydrant Flow Test		*Calculated Maximum	
Hydrant No.	Static Pressure (psi)	Flow (gpm)	Residual Pressure (psi)	Flow (gpm)	Minimum Pressure (psi)
FH 179	120	1379	110	4782	20
FH 181	120	1379	108	4333	20
FH 125	110	1060	65	1541	20

HYDRAULIC MODEL

From the static and residual pressures obtained, the calculated maximum operating flow was found to be 4,782 GPM at 20 psi. Using this data, the WaterCAD v8i water system modeling software was used to model the proposed water network. The model is calibrated with the provided existing system information and tested fire flow conditions. A fire flow test was performed to determine the residual and static pressure of the existing system. As stated above three fire flow tests were performed. However, only the flow and pressure data from hydrant 179 was used. Using the fire flow test from fire hydrant 179, a supply curve was generated, as shown below in **Figure 1**. The supply curves help model the expected flow from the existing system to the Arabella Spa water distribution system. Within the model the supply curve, and existing system connection, are modeled as a pump connected to a reservoir.

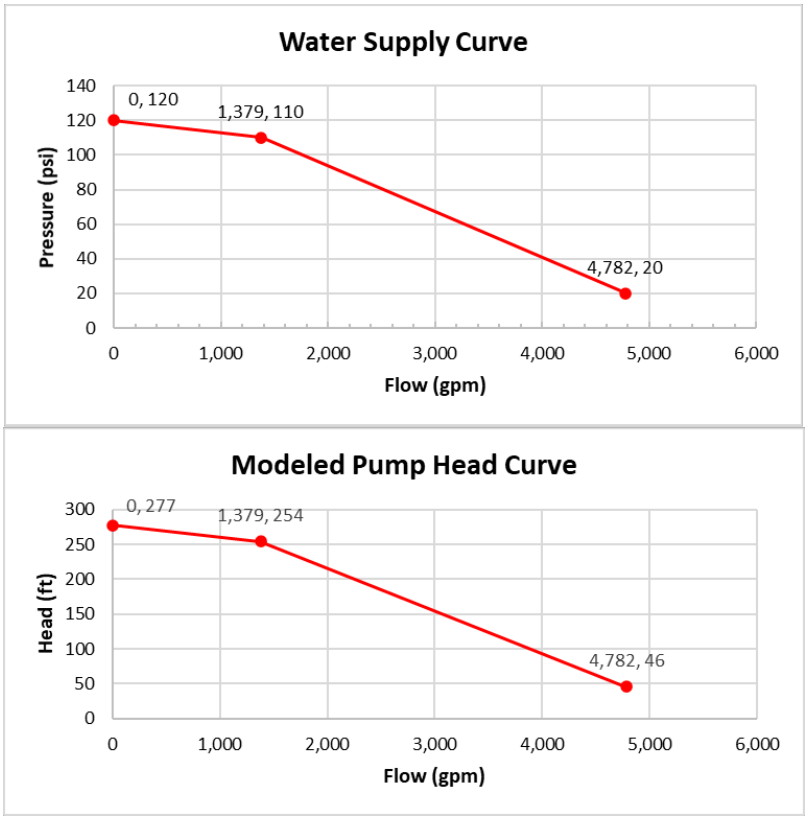


Figure 1. Pump Supply Curve

PROPOSED WATER SYSTEM

An 8-inch DIP water line is proposed in Sombart Lane to provide domestic and fire service to the site. An 8" DIP domestic and fire service line is proposed, which will tie into an existing 8" water main on Sombart Lane near the entrance to Arabella. The 8" DIP line will connect to the line on Sombart Lane with a tapping sleeve and valve. The new 8" fire and domestic line will run from the line on Sombart southwest, as shown in the utility exhibit, with an 8" tee and reducer and a 6" DIP line that will run to building 4. A second 8" line will run south from the tee to a proposed fire suppression standpipe near the center of the site. The remainder of this run past the standpipe will be 6" PVC. The laterals to building 1 and 2 will also be 6" DIP lines. A proposed hydrant will be placed at the northwest corner of the site as well, next to the domestic service connection and will connect to the 8" main on Sombart separately. The domestic service throughout the site will be treated as a private line and will not require an easement. See **Appendix B** for the system layout.

FIRE FLOW DEMAND

The proposed PDAB is a Construction Type I-B. The required fire flow per building was determined using the 2012 International Fire Code as adopted by City of Sedona and is based on construction type, building square footage, and provision of an approved sprinkler system. The City of Sedona allows for a maximum 75% reduction of the required fire flow for building provided that the building is equipped with an interior fire suppression sprinkler system to an absolute minimum of 1,500gpm. The minimum fire flow requirements for the proposed buildings are shown in **Table 3**. **Table 3** also shows the required building fire flow based upon a maximum fire flow reduction of 75% allowed.

Table 2: Design Criteria for Public Water Infrastructure

Building	Building Construction Type[1]	Building Area[2] (ft^2)	Required Fire Flow[3] (gpm)	Reduction[3]	Required Fire Flow[4] (gpm)
1	I-B	16859	1500		1500
2	I-B	524	1500		1500
3	I-B	1915	1500		1500
4	I-B	1304	1500		1500

[1]Construction Type based on IBC
[2]Areas based on Site Plan (Appendix A)
[3]Fire flow requirements per Sedona Fire District use of 2012 International Fire Code. Maximum reduction = 75% [4]Minimum Fire Flow Requirement of 1,500 gpm per 2006 IFC

WATER ANALYSIS AND RESULTS

The Average Daily Demand, Maximum Daily Demand, and Maximum Day Demand plus Fire Flow Demand analyses were performed, for the development, to evaluate the proposed water infrastructure. The system was analyzed to ensure that the existing and proposed public water infrastructure meets the following criteria as set forth in the DREAM and the AWC guidelines. See **Appendix C** for domestic water demand calculations.

Table 3: Design Criteria for Public Water Infrastructure

Scenario	*Criteria*	*Constraint*
Max Day + Fire Flow	Minimum Pressure	20 psi
Max Day + Fire Flow	Maximum Velocity	*10 fps
Max Day	Minimum Pressure	55 psi

The fire flow demand of 1,500 GPM was applied at the proposed fire hydrant and at the proposed standpipe in the area between the buildings. An assumed demand of 30 GPM was added at the building connections as a demand flow for a fire suppression system at each building. The minimum PSI was recorded at each node. These flows were determined based on the assumption that one building requires fire suppression at a time and the hydrant requires full flow.

As previously discussed, Maximum Day Demand plus Fire Flow Demand analyses were performed for the existing adjacent off-site water infrastructure and the proposed on-site water system. See **Appendix D** for the proposed system's Water Model Schematics and Results. A summary of the water analysis results for the public distribution main is tabulated below:

Table 4: Fire Flow and Maximum Daily Demand Water Model Result Summary

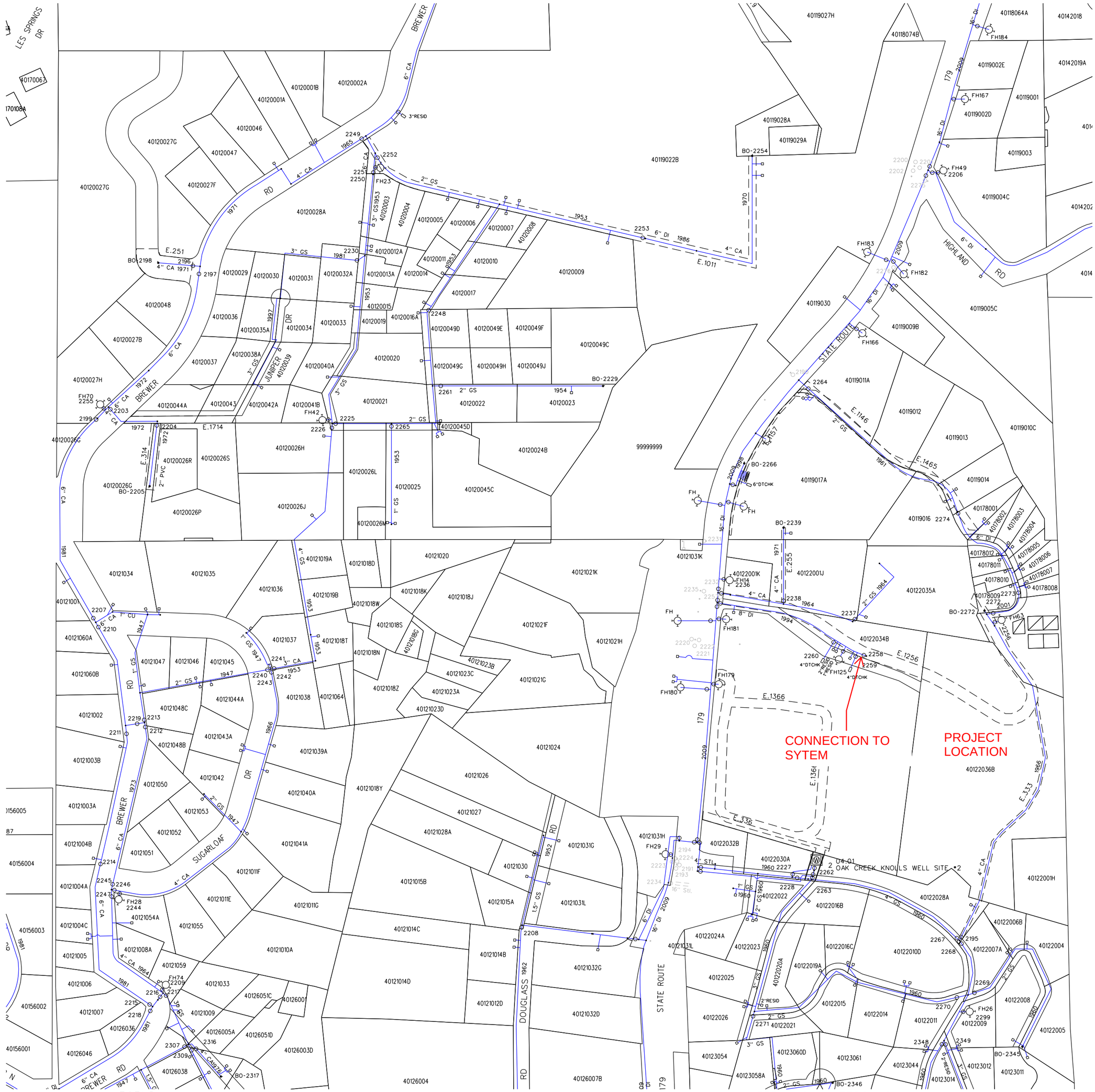
Criteria	*Constraint*	*Max Day*	*Max Day + FF*
Minimum System Pressure	53 psi		20 psi
Maximum Velocity	10 fps*		Yes
Minimum System Pressure	55 psi	Yes	

RECOMMENDATION

*Although standard practice requires a maximum velocity of 10 fps during maximum day plus fire flow demand scenarios, Arizona Water Company desires a maximum velocity of 8 fps in the system. Kimley-Horn is requesting a variance for using 10 fps as the maximum velocity requirement, as our system with 8" DIP meets this requirement with a velocity of 9.68 ft/s and maintains adequate pressure.

The proposed on-site water system and the existing, adjacent off-site public water infrastructure, as outlined by this analysis, is adequate and is sufficient to meet the required domestic water demand and fire flow demand for the proposed Arabella Spa project.

Appendix A – Site Location Map



LEGEND:

- EX. WATER VALVE & REFERENCE NUMBER
- EX. FIRE HYDRANT & REFERENCE NUMBER
- EX. WATER MAIN W/ DIAMETER AND YEAR CONSTRUCTED
- METER
- TEE
- FITTING
- BLOW OFF VALVE & REFERENCE NUMBER
- AIR RELIEF VALVE
- EASEMENT
- WASH

WATER MAIN MATERIALS:

CA	CEMENT ASBESTOS
PVC	POLYVINYL CHLORIDE
CLC	CONCRETE LINED CYLINDER
CU	COPPER
STL	STEEL
CI	CAST IRON
DI	DUCTILE IRON
HDPE	HIGH DENSITY POLYETHYLENE
GS	GALVANIZED STEEL
UNS	UNSPECIFIED

NE1/4 SEC.18-T.17N.,R.6E.

WATER DISTRIBUTION

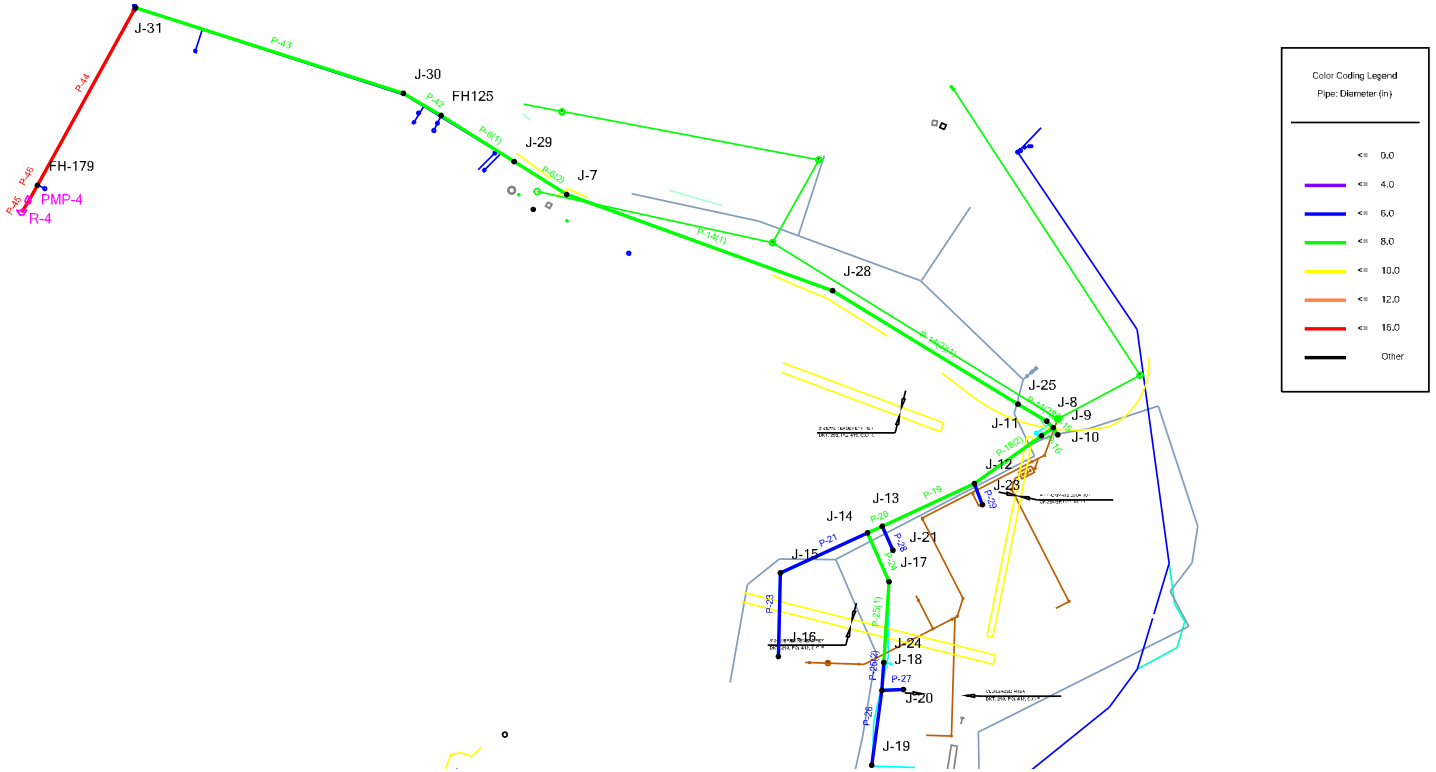
ARIZONA *WATER* COMPANY

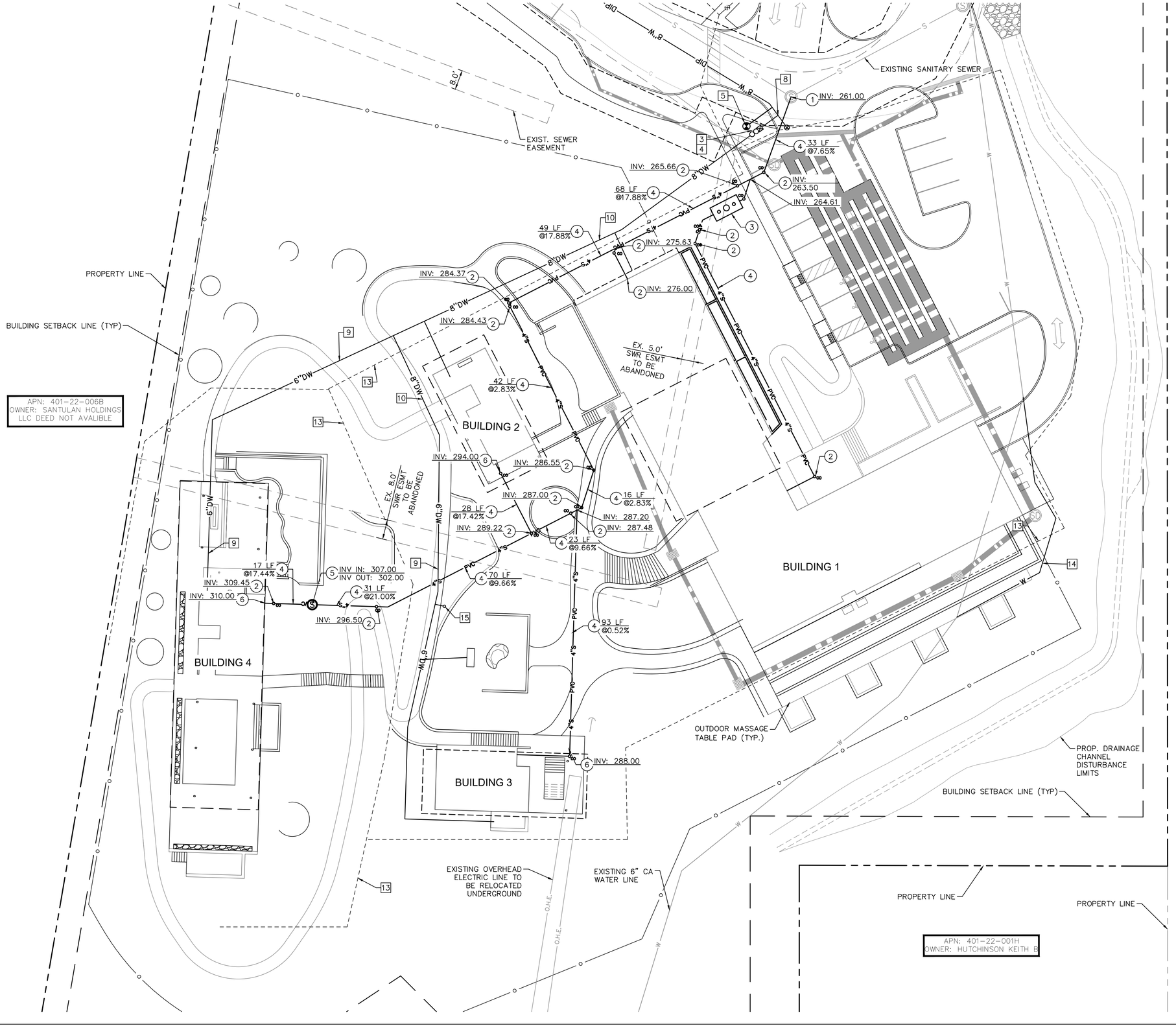
PHOENIX, ARIZONA

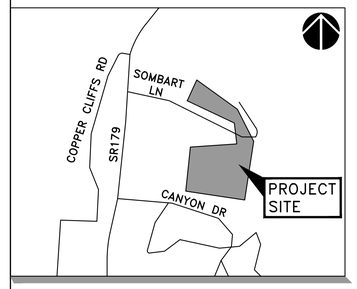
SCALE: 1"= 200'-0" DATE: 8/28/2018

Appendix B– Proposed Water System Layout

Scenario: Base







VICINITY MAP

CITY OF SEDONA
N.T.S.

WATER CONSTRUCTION NOTES

3 6" WATER METER ASSEMBLY & VALVE

4 6" BACKFLOW PREVENTER

5 FIRE HYDRANT ASSEMBLY

8 TAPPING SLEEVE AND VALVE

9 6" DIP DOMESTIC WATER LINE

10 8" DOMESTIC FIRE LINE

13 1.5" IRRIGATION MAIN LINE, SEE LANDSCAPE PLANS

14 RELOCATE EXISTING WATER MAIN PER LOCATION SHOWN

15 FIRE RISER STANDPIPE, REFER TO PLUMBING PLANS

SEWER CONSTRUCTION NOTES

1. CONNECT TO EXISTING SEWER MANHOLE, INVERT PER PLAN
2. INSTALL 4" CLEANOUT PER MAG STD DTL 441, INVERT PER PLAN
3. INSTALL GREASE INTERCEPTOR WITH TWO-WAY CLEANOUT, SIZE PER MANUFACTURER.
4. INSTALL 4" PVC SDR 35 SEWER LINE, LENGTH AND SLOPE PER PLAN. TRENCH, BEDDING, AND BACKFILL PER MAG STD DTL 200-1.
5. 5' DIA. PRECAST CONCRETE SEWER MANHOLE PER MAG STD DTL 420-1, 426Q-1 AND 30" CAST IRON MANHOLE FRAME AND COVER PER MAG STD DTL 423-2, INVERT PER PLAN
6. CONNECT TO BUILDING, REFER TO PLUMBING PLANS

PRIVATE UTILITY NOTES

1. PRIVATE UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED. PROPOSED UTILITY ROUTING ARE SHOWN FOR TRENCHING, CONDUIT, AND BACKFILL ESTIMATION. COORDINATE WITH UTILITY OWNER ON EXACT LOCATIONS AND CONSTRUCTION INFORMATION.

NORTH

GRAPHIC SCALE IN FEET
0 10 20 40

Call at least two full working days before you begin excavation.
ARIZONA 811 Arizona Blue Stake, Inc.
Dial 8-1-1 or 1-800-STAKE-IT (782-5348)
In Maricopa County: (602) 263-1100

NO.	REVISION	BY	DATE	APPR.

Kimley»Horn

201 NORTH MONTEZUMA, SUITE 206
PRESCOTT, ARIZONA 86301 (928) 458-7121

SCALE (H): 1"=20'
SCALE (V): N/A

DESIGNED BY: JWL
DRAWN BY: JTH
CHECKED BY: ACB

DATE: OCT 2022

ARABELLA SPA PRELIMINARY IMPROVEMENT PLANS
UTILITY SHEET
95 N SOMBART LANE SEDONA, AZ

PRELIMINARY
FOR REVIEW ONLY
NOT FOR CONSTRUCTION
Kimley»Horn
ENGINEER ANDREW BAIRD
PE NO. 48841 DATE 12/22

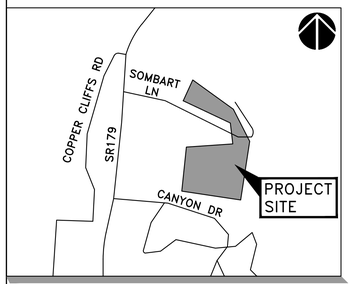
PROJECT NO.
291659000

DRAWING NAME
UT01

APN: 401-22-035A
OWNER: SEDONA GRAND VIEW LLC

EXISTING SANITARY SEWER
PROPERTY LINE
EXISTING 8" DIP WATER MAIN
RIGHT OF WAY
EXIST. GAS MAIN
SOMBART LANE
EXISTING SEWER MANHOLE
518 LF
EXISTING SEWER MANHOLE
EXISTING SEWER MANHOLE
EXISTING SANITARY SEWER
EXISTING SANITARY SEWER
EXIST. GAS MAIN
EXISTING HOTEL BUILDINGS
EXISTING HOTEL PARKING
SOMBART LANE
EXISTING SEWER MANHOLE
PROPERTY LINE
8.0' EX. SEWER ESMT TO BE ABANDONED
BUILDING SETBACK LINE (TYP)
5.0' EX. SEWER ESMT TO BE ABANDONED
8"DW
8"W
8"SS
8"PVC

MATCHLINE SEE SHEET 05 FOR CONT.



VICINITY MAP

CITY OF SEDONA
N.T.S.

WATER CONSTRUCTION NOTES

1. 8" DIP WATER MAIN
3. 6" WATER METER ASSEMBLY & VALVE
4. 6" BACKFLOW PREVENTER
5. FIRE HYDRANT ASSEMBLY
6. FIRE DEPARTMENT CONNECTION PER SEDONA FIRE DEPARTMENT STD DTL
7. CONNECT TO EXISTING WATER MAIN
11. 2" IRRIGATION METER, SEE LANDSCAPE PLANS
12. 2" BACKFLOW PREVENTER, SEE LANDSCAPE PLANS
13. 1.5" IRRIGATION MAIN LINE, SEE ARCHITECTURAL PLANS

PRIVATE UTILITY NOTES

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PE NO. 48841 DATE 12/22

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291659000

DRAWING NAME
UT02

Appendix C– Water Demand Flows/Fire Flow Test Results

Design Water Demand Calculations												
Location	***Use***	***Water Demand Rate***		***Demand Criteria***		***Water Design Flow [GPD]***	***Avg. Day Demand [GPD]***	***Avg. Day Demand [gpm]***	****Max. Day Demand [GPD]***	****Max. Day Demand [gpm]***	****Peak Hour Demand [GPD]***	****Peak Hour Demand [gpm]***
		gpd	***unit***	***No.***	***unit***							
Building 1	Commercial (Building Area)	3000	acre	0.25	acres	746	746	0.52	1491	1.04	2237	1.55
	Restaurant	1.3	sqft	1951	sqft	2536	2536	1.76	5073	3.52	7609	5.28
	Developed Open Space (Patio)	3500	acre	0.39	acres	1348	1348	0.94	2696	1.87	4044	2.81
	Hot Pool	720	pool	1	pool	720	720	0.50	1440	1.00	2160	1.50
					Subtotal	**5,350**	**5,350**	**3.72**	**10,700**	**7.43**	**16,050**	**11.15**
Building 2	Commercial (Building Area)	3000	acre	0.04	acres	109	109	0.08	218	0.15	327	0.23
	Developed Open Space (Patio)	3500	acre	0.02	acres	62	62	0.04	124	0.09	186	0.13
	Cold Pool	120	pool	1	pool	120	120	0.08	240	0.17	360	0.25
					Subtotal	**291**	**291**	**0.20**	**582**	**0.40**	**873**	**0.61**
Building 3	Commercial (Building Area)	3000	acre	0.04	acres	131	131	0.09	261	0.18	392	0.27
	Developed Open Space (Patio)	3500	acre	0.04	acres	149	149	0.10	298	0.21	447	0.31
	Cold Pool	230	pool	1	pool	230	230	0.16	460	0.32	690	0.48
					Subtotal	**510**	**510**	**0.35**	**1,019**	**0.71**	**1,529**	**1.06**
Building 4	Commercial (Building Area)	3000	acre	0.10	acres	286	286	0.20	573	0.40	859	0.60
	Developed Open Space (Patio)	3500	acre	0.08	acres	269	269	0.19	537	0.37	806	0.56
	Hot Pool	1500	pool	1	pool	1500	1500	1.04	3000	2.08	9000	6.25
					Subtotal	**2,055**	**2,055**	**1.43**	**4,110**	**2.85**	**6,164**	**4.28**
Next to Building 3	Hot Pool	885	pool	1	pool	885	885	0.61	1770	1.23	2655	1.84
					Subtotal	**885**	**885**	**0.61**	**1,770**	**1.23**	**2,655**	**1.84**
Grounds	Xeriscape	1170	acre	1.97	acres	2305	2305	1.60	4610	3.20	6915	4.80
					Subtotal	**2,305**	**2,305**	**1.60**	**4,610**	**3.20**	**6,915**	**4.80**
					Total	**11,395**	**11,395**	**7.91**	**22,790**	**15.83**	**34,186**	**23.74**

*Max Day Demand is based on a Peaking Factor of 2.0

**Average Daily Demands were taken from estimates provided by Arizona Water Company based on land use

From: Casey Goff <cgoff@azwater.com>
Sent: Thursday, September 30, 2021 7:51 AM
To: Warne, James
Subject: Arabella Hydrant Flows
Attachments: Scan2021-09-30_075026.pdf

James,

Here are the hydrant flows for the surrounding fire hydrants at Arabella. These flows are somewhat old so if you need updated information, please let me know and we can schedule some flow tests. Also, see the attached portion of the ¼ section map for reference.

FH 125 Static – 110 psi
Kinetic – 65 psi
GPM – 1060

FH 179 Static – 120 psi
Kinetic – 110 psi
GPM – 1379

FH 181 Static – 120 psi
Kinetic – 108 psi
GPM – 1379

I hope this information helps.

Thanks,

Casey Goff | Arizona Water Company
Distribution Superintendent
Verde Valley Division
65 Coffeepot Dr. Ste #7 | Sedona, AZ 86336
D: 928-282-7092 ext 4102 | cgoff@azwater.com
Visit us at www.azwater.com

Appendix D- Water Model Results

Kimley»Horn

AVERAGE DAY

FlexTable: Junction Table

FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
39	FH125	4,241.70	0.00	4,502.00	113
41	J-7	4,246.87	0.00	4,502.00	110
60	J-8	4,269.00	0.00	4,502.00	101
62	J-9	4,269.60	0.00	4,502.00	101
64	J-10	4,270.30	0.00	4,502.00	100
66	J-11	4,270.00	0.00	4,502.00	100
68	J-12	4,281.40	0.00	4,502.00	95
70	J-13	4,294.60	0.00	4,502.00	90
71	J-14	4,299.00	0.00	4,502.00	88
72	J-15	4,310.30	0.00	4,502.00	83
73	J-16	4,315.00	1.43	4,502.00	81
74	J-17	4,298.40	0.00	4,502.00	88
75	J-18	4,300.40	0.00	4,502.00	87
76	J-19	4,299.90	0.35	4,502.00	87
77	J-20	4,294.50	0.61	4,502.00	90
78	J-21	4,296.80	0.20	4,502.00	89
90	J-23	4,280.00	3.72	4,502.00	96
92	J-24	4,299.60	0.00	4,502.00	88
115	J-25	4,269.70	1.60	4,502.00	101
130	J-28	4,256.20	0.00	4,502.00	106
143	J-29	4,244.84	0.00	4,502.00	111
156	J-30	4,240.00	0.00	4,502.00	113
158	J-31	4,225.50	0.00	4,502.00	120
160	FH-179	4,225.00	0.00	4,502.00	120

FlexTable: Pipe Table

FlexTable: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
63	P-15	8	J-8	J-9	8.0	Ductile Iron	120.0	6.31	0.04	0.0000
65	P-16	7	J-9	J-10	8.0	Ductile Iron	120.0	0.00	0.00	0.0000
67	P-17	12	J-9	J-11	8.0	Ductile Iron	120.0	6.31	0.04	0.0000
79	P-19	86	J-12	J-13	8.0	Ductile Iron	120.0	2.59	0.02	0.0000
80	P-20	14	J-13	J-14	8.0	Ductile Iron	120.0	2.39	0.02	0.0000
81	P-21	81	J-14	J-15	6.0	Ductile Iron	120.0	1.43	0.02	0.0000
84	P-23	71	J-15	J-16	6.0	Ductile Iron	120.0	1.43	0.02	0.0069
85	P-24	45	J-14	J-17	8.0	Ductile Iron	120.0	0.96	0.01	0.0000
87	P-26	64	J-18	J-19	6.0	Ductile Iron	120.0	0.35	0.00	0.0000
88	P-27	18	J-18	J-20	6.0	Ductile Iron	120.0	0.61	0.01	0.0000
89	P-28	22	J-13	J-21	6.0	Ductile Iron	120.0	0.20	0.00	0.0000
91	P-29	19	J-12	J-23	6.0	Ductile Iron	120.0	3.72	0.04	0.0000
93	P-25(1)	69	J-17	J-24	8.0	Ductile Iron	120.0	0.96	0.01	0.0000
94	P-25(2)	24	J-24	J-18	6.0	Ductile Iron	120.0	0.96	0.01	0.0000
117	P-18(2)	70	J-11	J-12	8.0	Ductile Iron	120.0	6.31	0.04	0.0000
131	P-14(1)	240	J-7	J-28	8.0	Ductile Iron	120.0	7.91	0.05	0.0020
144	P-6(1)	73	FH125	J-29	8.0	Ductile Iron	120.0	7.91	0.05	0.0000
145	P-6(2)	53	J-29	J-7	8.0	Ductile Iron	120.0	7.91	0.05	0.0093
148	P-14(2)(1)	184	J-28	J-25	8.0	Ductile Iron	120.0	7.91	0.05	0.0026
149	P-14(2)(2)	28	J-25	J-8	8.0	Ductile Iron	120.0	6.31	0.04	0.0000
157	P-42	37	FH125	J-30	8.0	Ductile Iron	120.0	-7.91	0.05	0.0000
159	P-43	239	J-30	J-31	8.0	Ductile Iron	120.0	-7.91	0.05	0.0041
161	P-44	172	J-31	FH-179	16.0	Ductile Iron	120.0	-7.91	0.01	0.0000
164	P-45	11	R-4	PMP-4	16.0	Ductile Iron	120.0	7.91	0.01	0.0000

FlexTable: Pipe Table

FlexTable: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
165	P-46	15	PMP-4	FH-179	16.0	Ductile Iron	120.0	7.91	0.01	0.0000

Kimley»Horn

MAXIMUM DAY

FlexTable: Junction Table

FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
39	FH125	4,241.70	0.00	4,501.99	113
41	J-7	4,246.87	0.00	4,501.99	110
60	J-8	4,269.00	0.00	4,501.99	101
62	J-9	4,269.60	0.00	4,501.99	101
64	J-10	4,270.30	0.00	4,501.99	100
66	J-11	4,270.00	0.00	4,501.99	100
68	J-12	4,281.40	0.00	4,501.99	95
70	J-13	4,294.60	0.00	4,501.99	90
71	J-14	4,299.00	0.00	4,501.99	88
72	J-15	4,310.30	0.00	4,501.98	83
73	J-16	4,315.00	2.85	4,501.98	81
74	J-17	4,298.40	0.00	4,501.99	88
75	J-18	4,300.40	0.00	4,501.99	87
76	J-19	4,299.90	0.71	4,501.99	87
77	J-20	4,294.50	1.23	4,501.99	90
78	J-21	4,296.80	0.40	4,501.99	89
90	J-23	4,280.00	7.43	4,501.99	96
92	J-24	4,299.60	0.00	4,501.99	88
115	J-25	4,269.70	3.20	4,501.99	100
130	J-28	4,256.20	0.00	4,501.99	106
143	J-29	4,244.84	0.00	4,501.99	111
156	J-30	4,240.00	0.00	4,501.99	113
158	J-31	4,225.50	0.00	4,501.99	120
160	FH-179	4,225.00	0.00	4,501.99	120

FlexTable: Pipe Table

FlexTable: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
63	P-15	8	J-8	J-9	8.0	Ductile Iron	120.0	12.62	0.08	0.0000
65	P-16	7	J-9	J-10	8.0	Ductile Iron	120.0	0.00	0.00	0.0000
67	P-17	12	J-9	J-11	8.0	Ductile Iron	120.0	12.62	0.08	0.0000
79	P-19	86	J-12	J-13	8.0	Ductile Iron	120.0	5.19	0.03	0.0000
80	P-20	14	J-13	J-14	8.0	Ductile Iron	120.0	4.79	0.03	0.0000
81	P-21	81	J-14	J-15	6.0	Ductile Iron	120.0	2.85	0.03	0.0060
84	P-23	71	J-15	J-16	6.0	Ductile Iron	120.0	2.85	0.03	0.0000
85	P-24	45	J-14	J-17	8.0	Ductile Iron	120.0	1.94	0.01	0.0000
87	P-26	64	J-18	J-19	6.0	Ductile Iron	120.0	0.71	0.01	0.0000
88	P-27	18	J-18	J-20	6.0	Ductile Iron	120.0	1.23	0.01	0.0000
89	P-28	22	J-13	J-21	6.0	Ductile Iron	120.0	0.40	0.00	0.0000
91	P-29	19	J-12	J-23	6.0	Ductile Iron	120.0	7.43	0.08	0.0000
93	P-25(1)	69	J-17	J-24	8.0	Ductile Iron	120.0	1.94	0.01	0.0000
94	P-25(2)	24	J-24	J-18	6.0	Ductile Iron	120.0	1.94	0.02	0.0000
117	P-18(2)	70	J-11	J-12	8.0	Ductile Iron	120.0	12.62	0.08	0.0070
131	P-14(1)	240	J-7	J-28	8.0	Ductile Iron	120.0	15.82	0.10	0.0102
144	P-6(1)	73	FH125	J-29	8.0	Ductile Iron	120.0	15.82	0.10	0.0067
145	P-6(2)	53	J-29	J-7	8.0	Ductile Iron	120.0	15.82	0.10	0.0093
148	P-14(2)(1)	184	J-28	J-25	8.0	Ductile Iron	120.0	15.82	0.10	0.0106
149	P-14(2)(2)	28	J-25	J-8	8.0	Ductile Iron	120.0	12.62	0.08	0.0000
157	P-42	37	FH125	J-30	8.0	Ductile Iron	120.0	-15.82	0.10	0.0132
159	P-43	239	J-30	J-31	8.0	Ductile Iron	120.0	-15.82	0.10	0.0102
161	P-44	172	J-31	FH-179	16.0	Ductile Iron	120.0	-15.82	0.03	0.0000
164	P-45	11	R-4	PMP-4	16.0	Ductile Iron	120.0	15.82	0.03	0.0000

FlexTable: Pipe Table

FlexTable: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
165	P-46	15	PMP-4	FH-179	16.0	Ductile Iron	120.0	15.82	0.03	0.0000

PEAK HOUR

FlexTable: Junction Table

FlexTable: Junction Table

ID	Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
39	FH125	4,241.70	0.00	4,501.98	113
41	J-7	4,246.87	0.00	4,501.98	110
60	J-8	4,269.00	0.00	4,501.97	101
62	J-9	4,269.60	0.00	4,501.97	101
64	J-10	4,270.30	0.00	4,501.97	100
66	J-11	4,270.00	0.00	4,501.97	100
68	J-12	4,281.40	0.00	4,501.97	95
70	J-13	4,294.60	0.00	4,501.97	90
71	J-14	4,299.00	0.00	4,501.97	88
72	J-15	4,310.30	0.00	4,501.97	83
73	J-16	4,315.00	4.28	4,501.97	81
74	J-17	4,298.40	0.00	4,501.97	88
75	J-18	4,300.40	0.00	4,501.97	87
76	J-19	4,299.90	1.06	4,501.97	87
77	J-20	4,294.50	1.84	4,501.97	90
78	J-21	4,296.80	0.61	4,501.97	89
90	J-23	4,280.00	11.15	4,501.97	96
92	J-24	4,299.60	0.00	4,501.97	88
115	J-25	4,269.70	4.80	4,501.97	100
130	J-28	4,256.20	0.00	4,501.97	106
143	J-29	4,244.84	0.00	4,501.98	111
156	J-30	4,240.00	0.00	4,501.98	113
158	J-31	4,225.50	0.00	4,501.99	120
160	FH-179	4,225.00	0.00	4,501.99	120

FlexTable: Pipe Table

FlexTable: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
63	P-15	8	J-8	J-9	8.0	Ductile Iron	120.0	18.94	0.12	0.0618
65	P-16	7	J-9	J-10	8.0	Ductile Iron	120.0	0.00	0.00	0.0000
67	P-17	12	J-9	J-11	8.0	Ductile Iron	120.0	18.94	0.12	0.0000
79	P-19	86	J-12	J-13	8.0	Ductile Iron	120.0	7.79	0.05	0.0000
80	P-20	14	J-13	J-14	8.0	Ductile Iron	120.0	7.18	0.05	0.0000
81	P-21	81	J-14	J-15	6.0	Ductile Iron	120.0	4.28	0.05	0.0060
84	P-23	71	J-15	J-16	6.0	Ductile Iron	120.0	4.28	0.05	0.0069
85	P-24	45	J-14	J-17	8.0	Ductile Iron	120.0	2.90	0.02	0.0000
87	P-26	64	J-18	J-19	6.0	Ductile Iron	120.0	1.06	0.01	0.0000
88	P-27	18	J-18	J-20	6.0	Ductile Iron	120.0	1.84	0.02	0.0000
89	P-28	22	J-13	J-21	6.0	Ductile Iron	120.0	0.61	0.01	0.0000
91	P-29	19	J-12	J-23	6.0	Ductile Iron	120.0	11.15	0.13	0.0256
93	P-25(1)	69	J-17	J-24	8.0	Ductile Iron	120.0	2.90	0.02	0.0071
94	P-25(2)	24	J-24	J-18	6.0	Ductile Iron	120.0	2.90	0.03	0.0000
117	P-18(2)	70	J-11	J-12	8.0	Ductile Iron	120.0	18.94	0.12	0.0140
131	P-14(1)	240	J-7	J-28	8.0	Ductile Iron	120.0	23.74	0.15	0.0204
144	P-6(1)	73	FH125	J-29	8.0	Ductile Iron	120.0	23.74	0.15	0.0200
145	P-6(2)	53	J-29	J-7	8.0	Ductile Iron	120.0	23.74	0.15	0.0279
148	P-14(2)(1)	184	J-28	J-25	8.0	Ductile Iron	120.0	23.74	0.15	0.0212
149	P-14(2)(2)	28	J-25	J-8	8.0	Ductile Iron	120.0	18.94	0.12	0.0000
157	P-42	37	FH125	J-30	8.0	Ductile Iron	120.0	-23.74	0.15	0.0132
159	P-43	239	J-30	J-31	8.0	Ductile Iron	120.0	-23.74	0.15	0.0225
161	P-44	172	J-31	FH-179	16.0	Ductile Iron	120.0	-23.74	0.04	0.0000
164	P-45	11	R-4	PMP-4	16.0	Ductile Iron	120.0	23.74	0.04	0.0000

FlexTable: Pipe Table

FlexTable: Pipe Table

ID	Label	Length (Scaled) (ft)	Start Node	Stop Node	Diameter (in)	Material	Hazen-Williams C	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/1000ft)
165	P-46	15	PMP-4	FH-179	16.0	Ductile Iron	120.0	23.74	0.04	0.0000

Kimley»Horn

MAX DAY PLUS FIRE FLOW

Fire Flow Node FlexTable: Fire Flow Report

Fire Flow Node FlexTable: Fire Flow Report

Label	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Pressure (Calculated Residual) (psi)	Pressure (Calculated Zone Lower Limit) (psi)	Velocity of Maximum Pipe (ft/s)
J-11	2	True	1,500.00	1,501.00	1,500.00	1,501.00	71	52	9.68
J-16	2	True	30.00	31.00	32.85	33.85	81	83	0.38
J-19	2	True	30.00	31.00	30.71	31.71	87	81	0.37
J-21	2	True	30.00	31.00	30.40	31.40	89	81	0.36
J-23	2	True	30.00	31.00	37.43	38.43	96	81	0.44
J-24	2	True	1,500.00	1,501.00	1,500.00	1,501.00	53	48	9.68