IRIS DEVELOPMENT SERVICES
PLLC

TECHNICAL MEMORANDUM

To: Mike Wolfe, PE

From: Mac Hall, PE

Re: **Villas Estates – Water Distribution System Report**

Date: August 2021
Revised: January 2025

Introduction/Purpose

The Villas Estates is located in Phase 2 of the Havasu Foothills Estates. The recently adopted "Water System Master Plan Update for Havasu Foothills Estates" (Master Plan), prepared by ARQ Engineering on August 22, 2017, was adhered to for the design of the water distribution system in this development. The purpose of this report is to document the design of the water distribution system in the Villas Estates and show that the applicable design requirements are satisfied.

Location

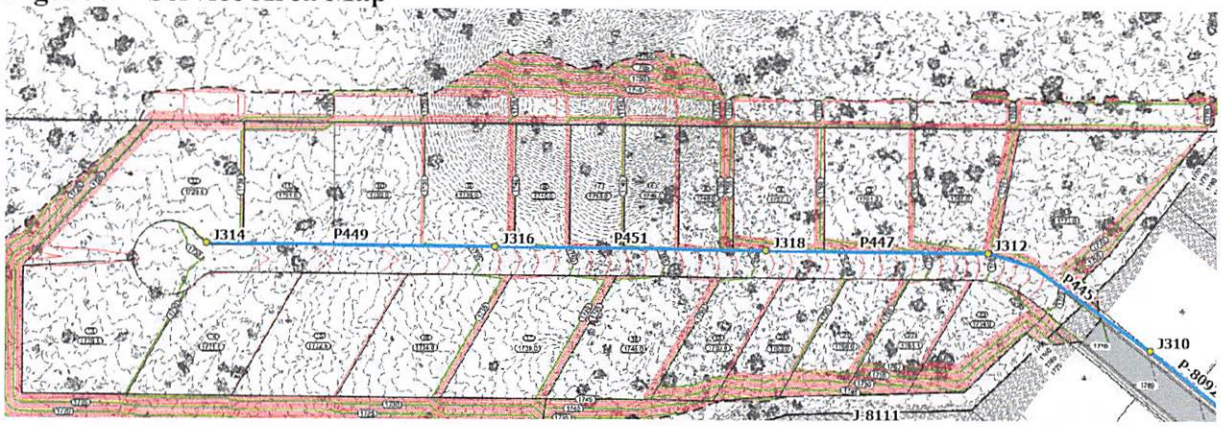
The site is located on the northeastern edge of Lake Havasu City (***Figure 1***).

Figure 1 – Aerial map of Lake Havasu showing the project location.

Service Area

The Villas Estates consists of 21 residential lots and is served by a single 8-inch water main. All of the lots are located within Pressure Zone 7. Pressure Zone 7 is served by the Zone 7 tank (Master Plan). A map of the service area is shown in ***Figure 2***.

Figure 2 – Service Area Map



Water Usage

Based on the Master Plan, Villas Estates has been designed to serve 2.26 persons/dwelling unit, with an average day demand of 172 gal/person/day. Peaking factors for maximum day and peak hour demands were assumed to be 1.6 and 2.5 respectively. The water demands for Phase 3 of the Villas are summarized below in Table 1.

Table 1 - Water Usage

Units	Persons/ Unit	Avg. GPCD	Avg. GPD	Avg. GPM	Max Day GPM	Peak Hour GPM
21	2.26	172	8,163	5.7	9.1	14.3

Design Standards and Performance Requirements

Design standards and performance requirements are summarized below:

1. Minimum static pressure: 50 psi;
2. Minimum pressure under fire-flow conditions: 20 psi;
3. Minimum size of water main shall be 4", unless main is serving a fire hydrant. It that case the minimum size shall be 6";
4. Minimum fire flow at 20 psi: 1,500 gpm for 3 hours;
5. Maximum velocities for distribution mains 16" and smaller: 10 feet per second (fps)

Storage Requirements

The storage criteria used for the Master Plan are summarized in Table 2, as it relates to Villas Estates. For a complete overview of the storage requirements used to size the respective storage tanks, see the adopted Master Plan.

Table 2- Storage Requirements

Avg. GPD	20% of Max Day Demand (GPD)	Fire Flow (GPD)	Required Volume (GAL)
8,163	1,633	270,000	271,633

The tanks at the Tank-6 site provide 673,816 gallons of storage (336,908 gallons in each tank), which satisfies the requirements for the Villas Estates.

Modeling Results

An independent hydraulic model was constructed for Villas Estates using InfoWater Pro. Pipe sizes and elevations from the design plans were followed. Results of the hydraulic model indicate that design standards for minimum pressures under maximum day, peak hour (Figure 3) and fire-flow under peak hour demand (Figure 4) conditions are met.

The fire-flow scenario illustrated in Figure 4 shows the available fire flow at each of the junctions while maintaining a minimum residual pressure of 20 psi throughout the development. The results provided below are for Villas Estates only. The fire flow results assume the fire pump is utilized in addition to the domestic pump to provide sufficient fire flows. Model results for other portions of the Villas have previously been submitted.

Figure 3 – Minimum Pressure – Peak Hour Demands

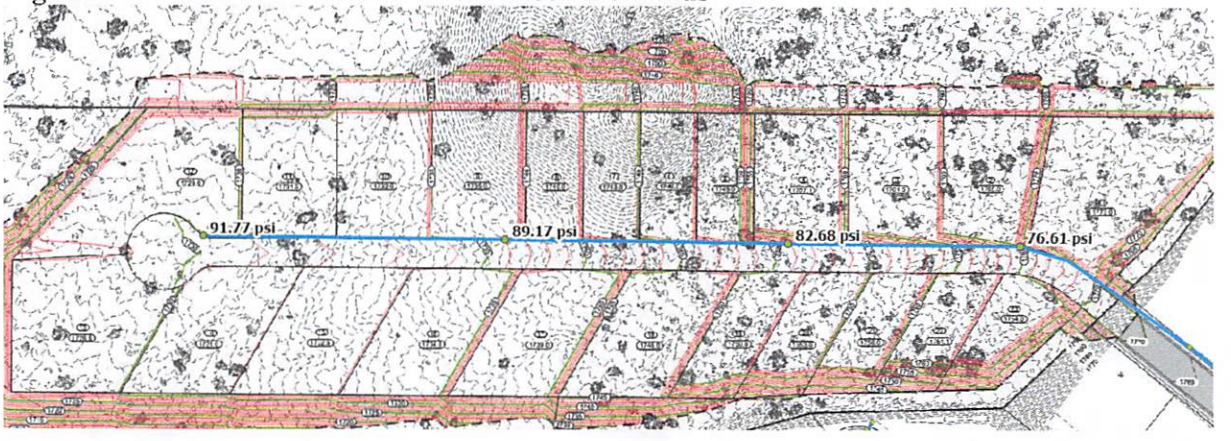


Figure 4 – Available Fire Flow at 20 psi

Summary

Based on this preliminary evaluation and the assumptions previously stated, the proposed water distribution infrastructure shown in the Construction Drawings follow the Master Plan and meets all applicable design requirements.

Model Output

Iris Development services, PLLC is providing this report to summarize the hydraulic model output for Villas Estates. The following pages contain the model output for the peak hour demand scenarios analyzed within Villas Estates only.

Peak Hour Demand

Junctions:

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
J312	6.20	1,762.00	1,938.81	76.61
J314	6.20	1,727.00	1,938.80	91.77
J316	6.20	1,733.00	1,938.80	89.17
J318	6.20	1,748.00	1,938.80	82.68

Pipes:

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
P445	J310	J312	214.71	8.00	135.00	24.80	0.16	0.00	0.02	Open	0
P447	J312	J318	249.51	8.00	135.00	18.60	0.12	0.00	0.01	Open	0
P449	J316	J314	324.86	8.00	135.00	6.20	0.04	0.00	0.00	Open	0
P451	J318	J316	304.23	8.00	135.00	12.40	0.08	0.00	0.01	Open	0

Peak Hour Demand with Fire Flow

ID	Total Demand (gpm)	Hydrant Available Flow (gpm)	Critical Node ID for Design Run	Critical Node Pressure at Available Flow (psi)	Critical Node Pressure at Fire Demand (psi)	Critical Pressure for Design Run (psi)	Hydrant Design Flow (gpm)	Hydrant Pressure at Design Flow (psi)
J312	1,506	1,742	J312	20	42	20	1,742	20
J314	1,506	1,718	J314	20	43	20	1,718	20
J316	1,506	1,750	J316	20	46	20	1,750	20
J318	1,506	1,749	J318	20	44	20	1,749	20

Note: The Design Flow is the maximum flow that can be supplied at the junction (ID) while maintaining 20 psi throughout the system. The controlling node (that drops to 20 psi first) is listed as the "Critical Node ID.