ELK RIDGE CITY

CULINARY WATER CAPITAL FACILITIES PLAN

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1. EXECUTIVE SUMMARY

This Culinary Water Capital Facilities master plan (Master Plan) will provide an outline of the existing system components, such as storage, system piping, water rights, and sources. The plan also provides recommendations for the City to supply water for the projected growth through 2044. The recommendations in this plan are given to meet the minimum level of service required by the State while providing the best value to Elk Ridge City.

Based on the growth projection of 2.98%, Elk Ridge City is expected to grow from 5,191 people to approximately 7,603 by 2044. This population is comparable to 2,037 equivalent residential connections, see Sections 4.1 and 5.1.

Elk Ridge City currently has three storage tanks with a combined capacity of 2 million gallons. The current storage meets the existing requirements of the system as determined by the new State of Utah Division of Drinking water rules. The storage capacity will remain sufficient through 2044 and buildout capacity, see Sections 7.1 and 7.1.1.

Elk Ridge City has three active sources: namely the Cloward Well, Loafer Canyon Well, and Sky Hawk Well. The current combined well test capacity is 2,767 gpm. The Division of Drinking Water considers 2/3 of the pumping rate from the aquifer drawdown test (2,767 gpm) as the safe yield of the well. The safe yield is used for planning purposes and determines the number of ERCs a well source can support. Based on the pumps installed at each well, the current combined pumping rate of all wells is 2,530 gpm. Comparing the well safe yield capacity and the pumping capacity, there is approximately 237 gpm of water than can be further extracted from the wells through increasing the pumping rate. By 2034 the City will need approximately 500 gpm of additional water production. This increase can be achieved by changing the pump settings on existing wells to increase the pumping rate to the safe yield. This could also be achieved by developing new wells and sizing them appropriately (Section 7.2.1).

A hydraulic model was created using Innovyze InfoWater Pro Version 2023 modeling software from existing data provided by Aqua Engineers. The model was calibrated to the existing system for accuracy. The model then projected water demands based on the State's guidelines for minimum pressures during different flow scenarios for the existing model (2024) and project model in 2044 (see Section 7). The model results show that the system can adequately provide fire flow and minimum pressures during the various demand patterns.

As part of the Master Plan, there are existing pipelines that have been identified for a pipeline replacement program due to their age/condition or capacity needs. See Table 1 and Table 2 below.

Currently, Elk Ridge City has water rights for 2,611 ERCs, which is sufficient for the current system, see Section 7.5. Future water right acquisition won't be needed but current water rights will need to be maintained.

A summary of the recommended capital improvements and construction schedule are shown in Table 1. The recommended pipeline replacement projects are shown in Table 2 - Pipeline Replacement Projects.

Table 1 - Capital Improvements List

10 YEAR CAPITAL IMPROVEMENTS				
Map ID	**Improvement Name**	**Description**	**Year**	**Years from 2024**
	Source and Capacity Improvements			
TBD	New Well	New Well	2034	10

Table 2 - Pipeline Replacement Projects

Pipeline Replacement Program (See Section 7.3)			
Map ID	**Improvement Name**	**Description**	**Purpose for Replacement**
P-1	11200 South	New 10" pipe installation	Capacity
P-2	Elk Ridge Drive	New 10" pipe installation	Capacity
P-3	Upper Tank Line	Replace existing 8" pipe with 10" pipe	Capacity
P-4	Sunset Ave	Replace existing 6" pipe with 10" pipe	Capacity
P-5	Park Drive Connection	Loop Park Drive	Capacity
P-6	Loafer Canyon Drive	Replace existing 6" pipe with 8" pipe	$458,640.00
PRV-1	Golden Eagle Way PRV	New 8" PRV	High Pressures
PRV-2	South Elk Ridge Drive PRV	New 8" PRV	High Pressures
PRV-3	Sky Hawk Way PRV	New 8" PRV	High Pressures
PRV-4	Canyon View PRV	New 8" PRV	High Pressures
PRV-5	New Subdivision PRV	New 8" PRV	High Pressures

2. INTRODUCTION

Elk Ridge City is one of the fastest growing communities in Utah County, Utah. The reason for the growth Elk Ridge is experiencing is due to new residential developments, which make up most land use within the City's service area. To support and sustain this development, Elk Ridge has updated its Culinary Water Capital Facilities master plan (Master Plan). This Master Plan will evaluate the system capacity, limitations, and associated strategic improvements that will allow the City to plan for sufficient source, storage, and distribution capacity necessary to sustain a safe, reliable system and support future growth.

3. DEFINITIONS

ADD	Average Day Demand	LCC	Life Cycle Cost
MG	Million Gallons	PDD	Peak Day Demand
ac-ft	Acre-feet	PID	Peak Instantaneous Demand
DDW	Division of Drinking Water	PRV	Pressure Reducing Valve
DWR	Division of Water Rights	psi	pounds per square inch
ERC	Equivalent Residential Connections	SRF	State Revolving Fund
gpm	gallons per minute	WR	Water Right
IFC	International Fire Code	LOS	Level of Service

4. DEMOGRAPICS

4.1. POPULATION PROJECTIONS

Growth projections were developed using historic Census data (1970-2023), Kem C Gardener Policy Institute Projected Utah County Growth, and data reported by Elk Ridge City to the Division of Water Rights (2020-2023). To calculate the projected population, the future value formula was used, see Equation 1.

$$FP = CP \times (1 + r)^t \tag{1}$$

Where:
FP = Future Population
CP = Current Population
r = Annual Growth Rate (%)
t = Number of Years Between Current and Future Population

Elk Ridge City has experienced significant growth in recent years. From 2000 to 2010 the population grew at a pace of 3.10% annually, from 2010 to 2020 the growth increased to 7.50% annually. In 2021 the growth rate returned to 3.00%. Since the more recent growth rate of 3.00% is more typical for the state and this area, it was used to determine the future growth projections. In 2030, Elk Ridge's population is projected to be approximately 5,755, and approximately 7,015 in 2040 (see Figure 1).

A comprehensive Development Capacity map from the Elk Ridge City General Plan identifying future growth areas, their zoning, and the number of units that would be able to be constructed was used to model the build-out condition for the model. This map identifies a maximum of 997 additional units to the system. A significant portion of these units have already been built or are currently under construction. Upon reaching full buildout, Elk Ridge City is expected to have a maximum population of approximately 8,500.

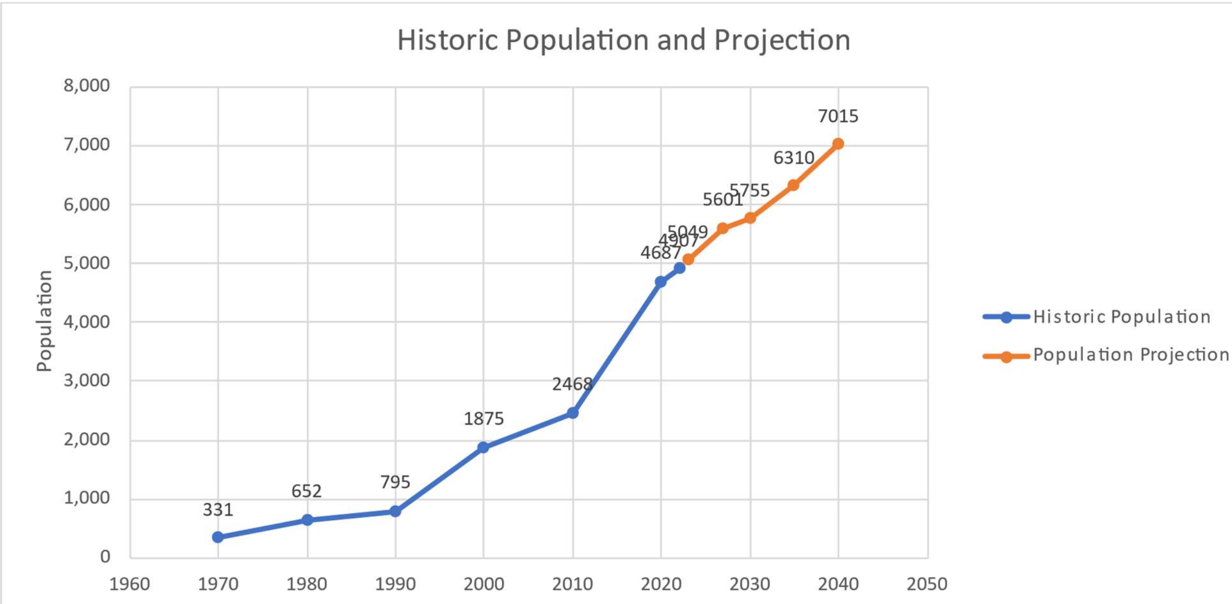


Figure 1 - Population Projections

5. CONNECTIONS

Elk Ridge is primarily a residential community with a few commercial and institutional connections. Water usage for these connections was based on the data reported to the Division of Water Rights by Elk Ridge City for 2022. The standard unit of measurement typically used in the planning process to define the capacities of system components is an equivalent residential unit (ERC). One ERC is the amount of water that one average permanent household use in a day. Businesses and other establishments are converted into ERCs based on water usage. Because the water usage data doesn't differentiate the water between indoor and outdoor use and most of the residential culinary water use is for irrigating lawns, the calculation for converting connections to ERCs is straightforward and combines indoor and outdoor use. Equations 2 and 3 show the conversion for connections to ERCs. A breakdown of connections and their ERC is shown in Table 3.

$$\text{Water Usage per ERC} = \frac{\text{Total Water Used by Residential Connections}}{\text{Number of Residential Connections}} \tag{2}$$

$$\text{Number of ERCs} = \frac{\text{Water Usage by Type of Connection}}{\text{Water Usage per ERC}} \tag{3}$$

Table 3 - 2022 Culinary Water Connections

2022	Connections	ERC
Residential	1,248	1,248
Commercial	1	6
Industrial	0	0
Institutional	13	59
Total Connections	1,262	1,313

5.1. ERC PROJECTIONS

To project future water demands, it was assumed that the system ERCs would grow at the same rate as the population. This assumes that the residential, institutional, and commercial connections grow proportionally. Figure 2 shows existing and projected number of ERCs through 2044.

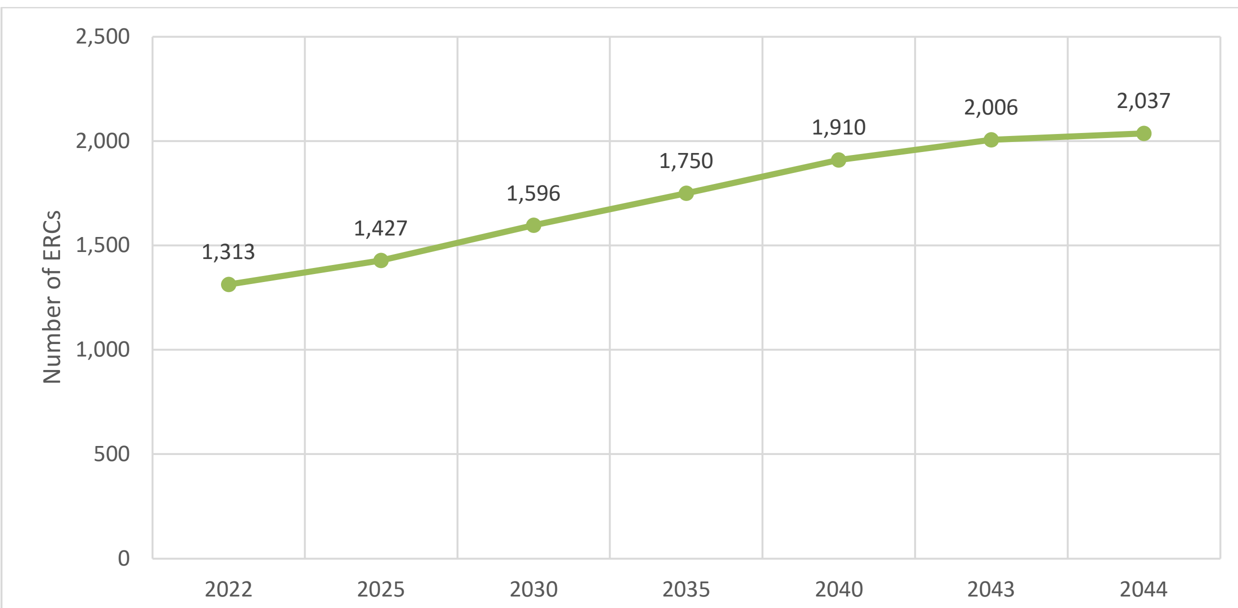


Figure 2 - Projected ERC Growth

6. LEVEL OF SERVICE

The State of Utah Division of Drinking Water (DDW) Rules and the International Fire Code (IFC) outline the minimum Level of Service (LOS) that water systems are required to provide. Recently, the DDW has updated the requirements or calculations to determine the LOS for water systems serving more the 500 people (see Appendix A for a summary of the new rules and calculations). The LOS for Water Rights is determined by the peak flow (based on peak day demand) and the annual diversion limit (based on the average day demand over a year). The LOS for Elk Ridge's water system is as follows:

Storage

- Equalization storage of 777 gallons per ERC for indoor and outdoor use
  - Fire storage 1,500 gpm for 2 hours (180,000 gallons)
- Emergency storage based upon an assessment of risk and the desired degree of system dependability.

Source

- Peak Day Demand of 1.47 gpm per ERC for indoor and outdoor use

Distribution Minimum Water Pressure Requirements

- Peak Day Demand is defined as 1.47 gpm/ERC with 40 psi residual system pressure during peak day demands.
- Peak Instantaneous Demand is defined as 1.92 gpm/ERC with 30 psi during peak instantaneous demands.
  - Peak Instantaneous Demand was calculated for every pipe according to DDW guidelines:
    - Indoor use (gal/year) is defined as 10.8 x (Number of ERCs)$^{0.64}$
    - Outdoor use (gal/year), Elk Ridge is located in Irrigation Zone 3, which states that each irrigated acre equates to 6.78 gallons per minute (3,563,568 gallons per year per irrigated acre) for peak instantaneous demand. A sample of 10 homes was taken to find the average irrigated acres per ERC (0.283 acres). This number was then multiplied by the total number of ERCs and the peak instantaneous demand for irrigated use.
    - The sum of the indoor and outdoor peak instantaneous demand was converted to gpm and then divided by the total number of ERCs.
- Peak Day Demand with Fire Flow Demand is defined as 1.47 gpm/ERC with 20 psi during peak day demands with fire.
  - 1,500 gpm for residential homes >3,600 square feet

Water Rights

- Diversion Limit (peak flow or PDD) = 0.00328 cfs/ERC (1.47 gpm/ERC)
  Annual Diversion Volume (ADD projected for one year) = 0.871 ac-ft/ERC (0.540 gpm/ERC)

7. SYSTEM CAPACITY ANALYSIS

A map of the current system layout can be found in Appendix B.

7.1. STORAGE CAPACITY ANALYSIS

Currently, there are three water storage tanks that serve Elk Ridge City and provide the total storage capacity for the water system of 2 million gallons. The existing ERC capacity was evaluated by first estimating the required fire storage based on the International Fire Code 2021, Appendix B. For Elk Ridge City, the largest fire flow demand is commercial space, which requires 1,500 gpm and 2 hours of storage, totaling 180,000 gallons of fire storage.

After the fire storage is accounted for, the tanks need additional storage for emergencies. Currently, the DDW does not specify the amount of storage volume required for emergencies but states,

> "Emergency storage shall be considered during the design process. The amount of emergency storage shall be based upon an assessment of risk and the desired degree of system dependability. The Director may require emergency storage when it is warranted to protect public health and welfare."[1]

Since the existing storage tanks have not been planned or constructed with emergency storage, the current emergency storage LOS is 0%.

Using the ERC's calculated in Section 5 and the equalization storage requirements outlined in Section 6**Error! Reference source not found.**, the required equalization storage was determined for the City. A breakdown of the existing storage translated into ERCs is shown in Table 4. The current existing storage can sustain 2,342 ERCs, which is sufficient for the current storage needs.

Table 4 – Existing Storage Tank Capacity

Name	Total Volume (gal)
Tank 1	500,000
Tank 2	500,000
Tank 3	1,000,000
Total Existing Storage	**2,000,000**
Fire Storage (gal)	180,000
Emergency Storage	0
Equalization Storage	1,820,000
ERCs (Equalization Storage/ Equalization Storage per ERC)	**2,342**

[1] Utah Admin Code 309-510-8.4 https://rules.utah.gov/publicat/code/r309/r309-510.htm#T8

7.1.1. STORAGE CAPACITY IMPROVEMENTS

Elk Ridge City has a comprehensive development plan in place for the construction of 997 more ERCs, with a significant portion of these units already built or currently under construction. Upon reaching full buildout, the city is expected to have a maximum of 2,310 ERCs. According to the LOS criteria, no extra storage is required in this scenario, see Table 5.

Table 5 - Storage Improvements

Planning Period	Year	Population	ERC	Additional Storage (MG)	Additional Equalization (ERC)	Cumulative Storage (MG)	Available Storage Capacity (ERC)
Short Term Planning Period	2024	5,191	1,390			1.82	2,033
	2025	5,331	1,427			1.82	2,033
	2026	5,469	1,464			1.82	2,033
	2027	5,601	1,500			1.82	2,033
	2028	5,724	1,533			1.82	2,033
	2029	5,844	1,565			1.82	2,033
Long Term Planning Period	2034	6,421	1,719			1.82	2,033
	2039	7,013	1,878			1.82	2,033
	2044	7,369	1,973			1.82	2,033

7.2. SOURCE CAPACITY ANALYSIS

The system is currently supplied water from three wells, the Cloward Well, the Skyhawk Well, and the Upper Loafer Canyon Well. The source capacity evaluation is based on the physical pumping capacity of the wells along with the safe yield capacity. The current combined rate at which the City is pumping these wells is approximately 2,530 gpm, whereas the combined safe yield capacity is approximately 2,767 gpm. Given that each ERC requires 1.47 gpm of source capacity, the number of ERCs that can be supported at the current pumping rate is 1,719 ERCs. The number of ERCs that can be supported at the well's safe yield capacity is 1,800 ERUs, as shown in Table 6. Since the pumping duration and speed of the wells is not fully utilized and the well safe yield capacity is greater than the current pumping rate, increase the pumping rate of the wells will increase the number of ERC's that can be served by approximately 161. The City will need to drill an additional well source by 2034, see Table 7.

Table 6 - System Source Capacities

	Current Source Pump Production		Well Test Capacity		Well Safe Yield*	
Cloward Well	850	gpm	1,500	gpm	1,000	gpm
Loafer Canyon Well	800	gpm	1,650	gpm	1,100	gpm
Sky Hawk Well	880	gpm	1,000	gpm	667	gpm
Total	**2,530**	**gpm**	**4,150**	**gpm**	**2,767**	**gpm**
Capacity	**1,719**	**ERC**		**Capacity**	**1,880**	**ERC**

*Safe yield capacity calculated as 2/3 the well test capacity (Rule R309-515-6(10)(c)).

7.2.1. SOURCE CAPACITY IMPROVEMENTS

The safe yield capacity of the wells is sufficient to handle the needs for the immediate future. Increasing the pumping rates and pump duration at the wells can supply the needed amount of water until 2034. To accommodate the growth to 2035, it is recommended to drill an additional well. An additional 500 gpm safe yield of source water (3,267 gpm total capacity) will need to be added to the system, see Table 7. To optimize the location of the wells, it is recommended that they pump water into the system upstream of the existing PRV vaults, which will allow the wells to pump water to the tanks as well as the distribution system.

Table 7 - Source Capacity Improvements

Planning Period	Year	Population	ERC	Additional Source Needed (gpm)	Additional ERC	Cumulative Source Capacity (gpm)	Capacity (ERC)
Short Term Planning Period	2024	5,191	1,390			2,767	1,880
	2025	5,331	1,427			2,767	1,880
	2026	5,469	1,464			2,767	1,880
	2027	5,601	1,500			2,767	1,880
	2028	5,724	1,533			2,767	1,880
	2029	5,844	1,565			2,767	1,880
Long Term Planning Period	2034	6,421	1,719	500	340	3,267	2,220
	2039	7,013	1,878			3,267	2,220
	2044	7,603	2,037			3,267	2,220

7.3. DISTRIBUTION SYSTEM CAPACITY ANALYSIS

7.3.1. HYDRAULIC MODELING

To accurately evaluate the hydraulics that result from a major water line network needed for the study, a hydraulic model was set up. The base model was created using the existing Elk Ridge system water model, provided by Aqua Engineering; the older model files were used to create an updated model. A Digital Elevation Model (DEM) created by the JDE GIS department for the purpose of extracting spot elevations. After creating the base model in ArcGIS Pro, the proposed water system's major water line network was modeled using the Innovyze InfoWater Pro Version 2023 program. This model allows for the evaluation of pressure zones, size pipes, locate pressure reducing valve (PRV) locations, optimize system layouts and configurations, test tank elevations and locations, and analyze different iterations of the system based on specific common scenarios. Due to the iterative nature of modeling, this software is extremely useful for providing a comprehensive, optimized view of the existing and future systems.

The hydraulic model was used to check multiple scenarios for system health in accordance with Utah drinking water laws and rules. The scenarios evaluated include Average Day Demand (ADD), Peak Day Demand (PDD), Peak Instantaneous Demand (PID) and Peak Day Demand + Fire Flow (PDD+Fire), see Table 8. The scenarios include minimum system pressures that must be checked for function of the system.

Table 8 - Model Flows

	ADD	PDD	PID
Flow per ERC	0.540 gpm	1.472 gpm	1.92 gpm
Required Pressure	>60 psi	40	30

The hydraulic model was created to check existing conditions and evaluate future buildout. The Elk Ridge water system is large enough, and there are enough scenarios to evaluate that setup was vital to ensure smooth model transitions into the future buildouts. Elk Ridge's reported water data from 2020, 2021, and 2022 were used in conjunction with the Utah Division of Administrative Rules (DAR) to determine the flow rate values per ERC. These calculations were used as a global demand factor and adjusted for the required scenario. The residential and commercial fire values for the model were used from the International Fire Code (IFC).

The existing system information was reviewed and used as the template for the future system to keep system components as uniform as possible. Since data was not known about the operation of pumps throughout the system, it was assumed they are off during all scenarios and turn on to refill tanks at night.

To achieve system representation, junctions were strategically placed at the beginning, middle, and end of pipes; along major roads and intersections; and at other locations as necessary. Junctions were used to represent the nearby demand values based on the future land-use categories. The demand allocator tool within InfoWater was used to assign storage-demand data to the placed junctions, based on the nearest connection locations.

Upon completing the base existing system model, dependent scenarios were created for 2044 and full buildout. By creating dependent scenarios, any changes to the base or parent model were carried out through the rest of the project. The system was continually updated as adjustments were made during the design process.

Buildout calculations were used to estimate future ERC values and were based on current growth data and the City's development plan. The additional ERC's were divided into several junctions and placed along areas on the outer boundaries of the city and conservatively add flows to the existing system. The additional demand locations were placed by using aerial imagery and the Elk Ridge City development plan map.

7.3.2. EXISTING DISTRIBUTION SYSTEM CAPACITY

The existing system underwent evaluation for ADD, PDD, PID, and PDD + Fire scenarios. Due to the significant changes in elevation across the system, the system has several pressure zones that make the operation of the system quite complex. For the ADD, PDD, and PID scenarios, the system generally meets flow and pressure requirements with a few exceptions as outlined in the following paragraphs.

In Section R309-550-5 of the Utah Administrative Code, the maximum allowable static pressure in distribution pipelines containing service connections is 150 psi. As a general practice, however, it is recommended that the pressures be kept below 130 psi. The model results for the ADD scenario showed several locations where the static pressures exceeded 130 psi. The first two areas are along the two transmission mains coming from the Cloward Well and the Skyhawk Well. As the pipelines are acting as a transmission line without any service connections (along the section of pipe exceeding the pressure limit), they are not in violation of the rule.

The second area is in the west end of pressure Zone 6. The pipelines in Gladstan Drive and Cove Drive exceed 150 psi and the pipeline in Elk Ridge Drive, north of Salem Hills Drive exceeds 130 psi.

In the west end of pressure Zone 5, there is one short section that exceeds 150 psi in Parkside Loop and several pipes that exceed 130 psi. These include the rest of the Parkside Loop, Hillside Drive between the Parkside Loop intersections, a section of Park Drive near the Parkside Loop, Elk Ridge Drive, and Lighthouse Circle. In addition to this area the pressures along the northern edge of the Zone exceed 130 psi, but all remain below 150 psi.

There is also one scenario in pressure Zone 5 where the pressures along Canyon View Drive, Alexander Drive, and Highland Drive drop below 40 psi. Water for this zone is boosted from the Fairways Tank directly into the distribution piping for the zone and up to the Hillside Tank. If the pumps are not engaged during the PID scenario, the pressures drop as low as 15 psi.

In the northwest corner of pressure Zone 2 on the south side of 11200 South, there are several sections of pipe that exceed 130 psi, but do not exceed 150 psi. Under the current demand system demands, this area can be regulated by reducing the pressure setting of the Burke Lane and Elk Ridge Drive PRVs so that the high end of the zone just barely meets the minimum required 40 psi, see Table 9.

For the fire flow scenario, the IBC requires fire hydrants to have a minimum specified flow combined with no less than 20 psi through the system during PDD. The minimum flow varies based on building size, type, and use. In general, 1,500 gpm is required for resident protection fire hydrants at 20 psi through the system. Schools and other large commercial buildings may require greater flows, but the same minimum 20 psi pressure must be maintained. Facilities constructed prior to this rule requirement may not meet these conditions; however, when improvements are made to older facilities or newer facilities are constructed, they should provide the necessary system improvements to meet their required fire flow conditions.

In pressure zones 3 & 5 in the scenario where the pumps are not operating as described above, there are several areas where the system cannot provide the minimum flows while maintaining the required 20 psi if the Fremont valve is closed.

Pressure zone 7 also has several areas with the same issue. This zone is supplied by water from the upper zone tank. Water can be boosted from the Hillside Tank to the distribution system and up to the tank, or it can be fed from the Loafer Canyon Well down to the tank. When the system is only gravity flowing from the Upper Tank, the system cannot provide the minimum flows while maintaining the required 20 psi.

The pipeline in Loafer Canyon Road also fails to provide the minimum flows while maintaining the required 20 psi. This pipeline is located in both pressure zones 4 and 6. Although the pressures in this pipeline are at the upper end of the allowable range, it is considered a dead-end line with only 1 connection to the system.

7.3.3. DISTRIBUTION SYSTEM CAPACITY IMPROVEMENTS

As indicated in the previous section, the existing system has been analyzed for ADD, PDD, PID, and PDD + Fire situations and has several deficiencies. The same scenarios were also evaluated for the future projected demands on the system.

The existing distribution system meets flow and pressure demands for all system areas except the main line connecting the Upper Tank, suggesting an upgrade to a 10-inch diameter pipe. Furthermore, a new Pressure Reducing Valve (PRV) is recommended for South Elk Ridge Drive as detailed in Appendix F. There are several PRV settings that require adjustment to mitigate high pressures in the lower zones of the system, as specified in Table 9.

Table 9 – Recommended PRV Settings*

	Existing Setting	Recommended Setting
Elk Ridge Drive PRV	95	63
Burke Lane PRV	65	45
Hillside PRV	60	60
Sunset Ave PRV	70	70
Oak Lane PRV	70	70
Park Drive PRV	80	80
Cortez PRV	80	68
Loafer Canyon PRV	62	62
South Loafer Canyon PRV	60	60
Bear Hollow PRV	80	80
South Elk Ridge Drive PRV	-	88
Golden Eagle Way PRV	-	70
Sky Hawk Way PRV	-	65
Canyon View PRV	-	54
New Subdivision PRV	-	60

*For average day demands. If the PRV has a low flow bypass, the main valve should be set 5 psi lower.

Several methods were modeled to determine the required improvements for the 20-year buildout, of which, two options were viable to meet the water demand. The recommended option is to add three new PRVs, creating a larger pressure zone 1, adjusting pressure zone 6, and replacing several sections of pipe, see Appendix G.

The new PRVs should be installed on Golden Eagle Way, Sky Hawk Way, and South Elk Ridge Drive. These improvements should be made a priority and installed as soon as possible to alleviate high pressures in existing and future homes in the surrounding pressure zone (see Table 9). Costs for these improvements may be seen in Section 7.5.

Due to lack of data, it was assumed that Elk Ridge's water system is primarily driven by gravity, where the wells feed the tanks during the night and the tanks feed the system during the day. It was also assumed during fire flow scenarios the Fairway booster pump station adds flow to the system. Because of the low cost associated with running a gravity fed system, it is recommended the distribution system improvements be installed in phases.

Additionally, it is recommended that the existing 6” pipe along Loafer Canyon Drive be replaced with an 8” pipe to meet fire flow requirements in the future, see Appendix F. Further development on the south end of Loafer Canyon Drive has not been evaluated in the current study because the cost of complexity and high system improvements cost necessary to meet future growth. If this area is to be developed in the future, it will need to be reevaluated with specific proposals.

7.3.3.1. PIPELINE REPLACEMENT PROGRAM

These improvements may happen when funding becomes available, or the pipe needs to be replaced due to failure. To account for these and other potential pipe replacements, it is recommended that Elk Ridge City start a Pipeline Replacement Program. This program is an annual budget amount set aside by the city to help cover the costs of pipe replacements when they need to occur. Table 10 has a list of recommendations for existing pipes that could be replaced and budgeted for with a pipeline replacement fund. Costs and dates for these Pipeline Replacement Projects can be found in Table 14.

Table 10 – Pipeline Replacement Projects

PIPELINE REPLACEMENT PROJECTS		
Improvement Name	**Description**	**Cost**
11200 South	New 10” pipe installation	$247,772.67
Elk Ridge Drive	New 10” pipe installation	$140,450.67
Upper Tank Line	Replace existing 8” pipe with 10” pipe	$382,470.00
Sunset Ave	Replace existing 6” pipe with 10” pipe	$133,323.00
Park Drive Connection	Loop Park Drive	$492,122.59
Loafer Canyon Drive	Replace existing 6” pipe with 8” pipe	$458,640.00
Golden Eagle Way PRV	New 8" PRV	$96,000.00
South Elk Ridge Drive PRV	New 8" PRV	$96,000.00
Sky Hawk Way PRV	New 8" PRV	$96,000.00
Canyon View PRV	New 8" PRV	$96,000.00
New Subdivision PRV	New 8” PRV	$96,000.00

7.4. WATER RIGHTS ANALYSIS

Currently, Elk Ridge City has approximately 2,274 ac-ft per year of water rights (see

Table 11). Given that each ERC is based on the Average Day Demand, each ERC requires 0.871 ac-ft (0.540 gpm). The number of ERCs that Elk Ridge has sufficient water rights for is 2,611 ERCs.

Table 11 - Current Water Rights

WR No.	Owner	Flow (cfs)	Volume (AF)	Source	Use	Status	Application Status
51-1138	Elk Ridge City	0.1885	136.50	Underground Water Wells (3)	Municipal		Certificated
51-1356	Elk Ridge City	0.0024	1.73	Underground Water Wells (5)	Municipal		Certificated
51-1531	Elk Ridge City	0.0125	9.03	Underground Water Wells (5)	Municipal		Certificated
51-1720	Elk Ridge City	0.0114	15.00	Underground Water Wells (3)	Municipal		Certificated
51-1912	Elk Ridge City	1.0000	80.00	Underground Water Wells (4)	Municipal		Approved
51-2247	Elk Ridge City	0.0032	2.29	Underground Water Wells (3)	Municipal		Certificated
51-2717	Elk Ridge City	0.0007	0.54	Underground Water Wells (3)	Municipal		Certificated
51-2911	Elk Ridge City	0.0553	40.00	Underground Water Well	Municipal		Approved
51-3496	Elk Ridge City	0.0125	7.73	Underground Water Well	Municipal		Certificated
51-4885	Elk Ridge City	0.1656	119.88	Underground Water Wells (3)	Municipal		Certificated
51-5203	Elk Ridge City	0.0054	3.88	Underground Water Wells	Municipal		Certificated
51-6662	Elk Ridge City	0.0235	17.00	Underground Water Wells (4)	Municipal		Certificated
51-6753	Elk Ridge City	0.0553	40.00	Underground Water Wells (4)	Municipal		Certificated
51-6783	Elk Ridge City	0.0354	25.60	Underground Water Wells (5)	Municipal		Certificated
51-6854	Elk Ridge City	0.0193	14.00	Underground Water Well (6)	Municipal		Certificated
51-6855	Elk Ridge City	0.0354	25.60	Underground Water Wells (3)	Municipal		Certificated
51-6887	Elk Ridge City	0.0069	5.00	Underground Wate Wells (5)	Municipal		Certificated
51-6889	Elk Ridge City	0.1105	80.00	Underground Water Wells (6)	Municipal		Certificated
51-6900	Elk Ridge City	0.0354	25.64	Underground Water Wells	Municipal		Certificated
51-6943	Elk Ridge City	0.0180	13.00	Underground Water Wells (4)	Municipal		Certificated
51-6950	Elk Ridge City	0.0014	1.00	Underground Water Wells (5)	Municipal		Certificated

WR No.	Owner	Flow (cfs)	Volume (AF)	Source	Use	Status	Application Status
51-6972	Elk Ridge City	0.0207	15.00	Underground Water Wells (6)	Municipal		Certificated
51-6973	Elk Ridge City	0.0138	10.00	Underground Water Wells (6)	Municipal		Certificated
51-6974	Elk Ridge City	0.0055	4.00	Underground Water Wells (6)	Municipal		Certificated
51-7112	Elk Ridge City	0.0028	2.00	Underground Water Wells (4)	Municipal		Certificated
51-7271	Elk Ridge City	0.1433	103.74	Underground Water Wells (3)	Municipal		Certificated
51-7281	Elk Ridge City	0.0144	10.40	Underground Water Wells (3)	Municipal		Certificated
51-7755	Elk Ridge City	0.3282	237.60	Underground Water Wells (3)	Municipal		Certificated
51-8343	Elk Ridge City	0.0262	19.00	Underground Water Well	Municipal		Certificated
51-8564	Elk Ridge City	0.0302	21.90	Underground Water Drain	Municipal		Approved
51-8593	Elk Ridge City	0.1504	108.90	Underground Water Wells (3)	Municipal		Approved
51-9032	Elk Ridge City	0.0083	6.00	Underground Water Wells (3)	Municipal		Certificated
55-12340	Elk Ridge City	0.1795	129.93	Underground Water Wells (4)	Municipal		Approved
59-5886	Elk Ridge City	0.1920	138.98	Underground Water Wells (3)	Municipal		Approved
59-5996	Elk Ridge City	0.0507	36.72	Underground Water Well	Municipal		Approved
59-6004	Elk Ridge City	0.2259	163.52	Underground Water Wells (4)	Municipal		Approved
59-6008	Elk Ridge City	0.0309	22.36	Underground Water Wells	Municipal		Approved
59-6049	Elk Ridge City	0.0570	41.28	Underground Water Wells (4)	Municipal		Approved
59-6050	Elk Ridge City	0.5579	403.92	Underground Water Wells (4)	Municipal		Approved
59-6053	Elk Ridge City	0.1024	74.12	Underground Water Wells (4)	Municipal		Approved
59-6060	Elk Ridge City	0.0819	59.30	Underground Water Wells (4)	Municipal		Approved
54-1224	Elk Ridge City	0.0028	2.00	Underground water Wells	Municipal		Approved
Total Water Rights		**4.0231**	**2,274.09**				

Elk Ridge City has sufficient water rights for all future growth in the next 20 years and up to full buildout, see Table 12.

Table 12 – Required Water Rights

	Year	Population	ERC	Additional Water Right Required (ac-ft/yr)	Additional ERC	Cumulative Water Rights (Ac-ft/yr)	Capacity (ERC)
Short Term Planning Period	2024	5,191	1,390			2,274	2,611
	2025	5,331	1,427			2,274	2,611
	2026	5,469	1,464			2,274	2,611
	2027	5,601	1,500			2,274	2,611
	2028	5,724	1,533			2,274	2,611
	2029	5,844	1,565			2,274	2,611
Long Term Planning Period	2034	6,421	1,719			2,274	2,611
	2039	7,013	1,878			2,274	2,611
	2044	7,603	2,037			2,274	2,611

7.5. IMPROVEMENT COSTS

A summary of costs for each improvement are given in Table 13 - Capital Improvements Cost Summary and Table 14 – Pipeline Replacement Program Costs. The costs are shown in 2024 dollars.

Table 13 - Capital Improvements Cost Summary

10 YEAR CAPITAL IMPROVEMENTS					
Improvement Name	**Description**	**Cost**	**Financial Planning Period**	**Construction Planning Year**	**Year Needed**
Source and Capacity Improvements					
New Well	New Well in location determined in the future	TBD	TBD	TBD	2034
TOTAL 5 YEAR SOURCE AND CAPACITY IMPROVEMENTS					

Table 14 - Pipeline Replacement Program Costs

Pipeline Replacement Program				
Map ID	**Improvement Name**	**Description**	**Purpose for Replacement**	**Cost**
P-1	11200 South	New 10" pipe installation	Capacity	$247,772.67
P-2	Elk Ridge Drive	New 10" pipe installation	Capacity	$140,450.67
P-3	Upper Tank Line	Replace existing 8" pipe with 10" pipe	Capacity	$382,470.00
P-4	Sunset Ave	Replace existing 6" pipe with 10" pipe	Capacity	$133,323.00
P-5	Park Drive Connection	Loop Park Drive	Capacity	$492,122.59
P-6	Loafer Canyon Drive	Replace existing 6" pipe with 8" pipe	Fire Flow/Capacity	$458,640.00
PRV-1	Golden Eagle Way PRV	New 8" PRV	High Pressures	$96,000.00
PRV-2	South Elk Ridge Drive PRV	New 8" PRV	High Pressures	$96,000.00
PRV-3	Sky Hawk Way PRV	New 8" PRV	High Pressures	$96,000.00
PRV-4	Canyon View PRV	New 8" PRV	High Pressures	$96,000.00
PRV-5	New Subdivision PRV	New 8" PRV	High Pressures	$96,000.00
TOTAL WATERLINE REPLACEMENT IMPROVEMENTS				**$2,334,779**

8. WATER RATE STUDY AND FUNDING

Included in Appendix H

8.1. FUNDING SOURCES

8.1.1. UTAH DEPARTMENT OF ENVIRONMENTAL QUALITY DIVISION OF DRINKING WATER

The Utah Division of Drinking Water offers low interest loans from the Federal State Revolving Funds (Federal SRF) and the State Revolving Funds (SRF). These funds are available to all political entities of the state. The typical interest rate ranges between 1.5-4% with a 20-year term.

- The Federal SRF is provided to the states from the Environmental Protection Agency (EPA). These funds are federal dollars and require compliance with the Davis Bacon

Wage Act, the American Iron and Steel Act (Buy America), and the other federal programs.

- The SRF is administered by the state and offers low interest loans (2-4%) and grants. Typically, only about 5% of the SRF funds are awarded as grants.

8.1.2. PERMANENT COMMUNITY IMPACT FUND BOARD (CIB)

The CIB is an entity of the State that provides loans and grants to cities. The typical conditions of a loan are a 20-30-year term at the going interest rate (currently 2.5%).

8.1.3. UTAH BOARD OF WATER RESOURCES

The Utah Board of Water Resources offers low interest loans for projects that conserve, protect, or more efficiently use present water supplies, develop new water, or provide flood control. This option is likely less favorable funding option for culinary water infrastructure improvements. Typical loan terms are 20-30 years at 2-4%.

8.1.4. USDA EMERGENCY COMMUNITY WATER ASSISTANCE GRANT (ECWAG)

The ECWAG grant can be applied for to aid communities that have experienced a significant decline in water quantity or quality from their sources due to a natural disaster or other emergency event, such as: drought, flood, fire, earthquake, disease outbreak, chemical or leakage spill. 70% or more of funding is to be used for work at the source, 30% can be used in piping.

8.1.5. AGENCY FUNDING (SELF-FUND)

This option is for agencies to self-fund individual projects. Although self-funding is the least expensive money over the life of the project, this option is likely not financially possible for all agencies.

The most likely source to leverage the most favorable and obtainable funding terms for Nibley City culinary water infrastructure improvements is the Utah Division of Drinking Water.

For more information on available funding programs, please visit our funding website at: https://funding.jonesanddemille.com/

9. SYSTEM OPTIMIZATION

9.1. WELLS

With the current system layout and operation, the wells turn on during the night to fill the tanks. This is the most cost-effective way to operate the wells because the City can avoid higher daytime electricity rates. Peak electricity charges occur during the day when most users are consuming electricity, especially during the warmer seasons when air conditioners are in use. Our recommendation is to continue to operate the wells during the night to keep the system cost efficient.

The wells are currently located upstream of system PRVs. This allows the wells to pump into the system and fill the water storage tanks. Our recommendation is to locate future wells in the upper pressure zone. This will minimize costs associated with wells pumping only into the system and not to a water storage tank.

9.2. TANKS

The current location of the water storage tanks is sufficient to provide the State DDW minimum pressure requirements. To ensure proper system operation in the most cost-effective way, future water storage tanks should be constructed with similar floor and ceiling elevations as the existing tanks.

9.3. PRVS

The existing PRVs reduce the pressure 20 psi on average. This ensures that the lower elevation areas of the system do not experience pressures that are too high. With the current PRV operation, the highest pressure in the system is approximately 135 psi during Average Day Demand. Without the PRVs, the pressure climbs to 160 psi during Average Day Demand. 160 psi is a high enough pressure to potentially cause problems in homes without residential PRVs, especially to the hot water lines and appliances. Recommendations for existing and proposed PRV settings are found in Table 9.

10. CONCLUSIONS AND RECOMMENDATIONS

The current system meets the needs of the population. As the City grows water pipelines will need to be developed to meet the demand. This report has estimated areas where growth is likely to occur. As growth occurs, it is important for Elk Ridge City to update its current hydraulic model. In addition, several distribution lines will need to be improved or replaced and PRVs installed to maintain pressures and flows throughout the system.

10.1. NEXT STEPS

Since new PRVs are the next major water infrastructure improvement need, the City should consider the following as next steps in planning process:

- Conduct a Well and PRV siting and investigate funding options by 2030.
- Begin property and or easement acquisitions through 2031.
- Planning, engineering, and construction of the Well and PRVs through 2032.

10.2. SECONDARY WATER SYSTEM CONSIDERATION

As the city continues to expand, the culinary water system will continue to be the source of water for most of the outdoor watering needs. Since outdoor watering accounts for up to, and possibly more than 50% of the system use, and is generally more expensive than untreated raw water, many communities are turning to secondary water systems. A separate secondary water system reduces the burden on the culinary water system and provides less expensive water for outdoor uses. However, the large initial capital investment for a new system in an existing and established community may not reduce the cost to the end user. Some of the advantages and disadvantages of a secondary system include:

Benefits of a secondary water system:

- Decreases the timing and need to expand/improve culinary water system
- Additional revenue source for city
- May lower homeowner cost of water for outdoor uses.

However, it is worthwhile to consider the disadvantages to secondary water, such as:

- Additional utility for city to operate and maintain requiring additional resources.
- High capital investment to install a system in an existing community
- May require filtering source water
- Decreased revenue from culinary water system.

If the City desires to further investigate how a secondary water system could benefit them and the water users, it is recommended that a feasibility study be conducted and that the following be addressed:

1. Capital cost investment to install secondary water system.
    a. Analyze annual costs related to system operation, maintenance, and replacement.
2. Analysis for water rights required
    a. Not recommended to move water amounts from culinary water to provide secondary water.
3. Response plan for droughts
4. Analysis of rate structure and resulting revenue
5. Analysis of cash flows and position over the life of the system or payback time of any loan
6. Benefit/cost analysis
    a. Installing secondary water system vs culinary system improvements
        i. Costs to operate and maintain secondary water system vs culinary water system
    b. Income from secondary water vs income lost from culinary water use

In some cases, the City can use new development to help with the initial system capital investment by requirement new developments to install secondary water infrastructure. However, the means of providing the water to these areas will be an investment by the City. Given the moderate growth of Elk Ridge, an initial, less expensive study that could evaluate the potential return on investment and system user costs for a secondary system as the next best step. If a secondary system is a priority for the City, a higher-level study could be completed for an estimated $25,000 to $50,000.

APPENDIX A. NEW DDW CALCULATIONS FOR SOURCE & STORAGE REQUIREMENTS

DIVISION OF DRINKING WATER - SIZING REQUIREMENTS STUDY

TECHNICAL MEMORANDUM

PREPARED FOR:

Elk Ridge City
October, 2023

PREPARED BY:

Jones & DeMille Engineering

1-800-748-5275
Project #: 2211-036

Authors:
Ted Mickelsen, P.E.
Michael Hartvigsen, P.E.
Ryan Seele, P.E.

RICHFIELD ▪ PRICE ▪ MANTI ▪ ROOSEVELT ▪ UTAH VALLEY ▪ ST. GEORGE ▪ MONTICELLO ▪ VERNAL▪ EVANSTON

CONTENTS

TABLES

October 18, 2023

Jerry Clark
80 East Park Drive
Elk Ridge, UT 84651

RE: Minimum Drinking Water Sizing Requirements Study

Dear Mr. Clark:

We appreciate the opportunity to work with Elk Ridge (City) on this important process to review the Utah Division of Drinking Water (DDW) sizing requirements and fire suppression storage for your system. Please consider this memo as record of our review.

The following items were evaluated, and our findings and recommendations are summarized as follows:

1. INTRODUCTION

In 2018, legislative revisions to Utah Code 19-4-104 and 114 introduced a new procedure for calculating the minimum culinary water system sizing requirements. These new sizing requirements are based on actual system usage; based on source production for the peak day in the year, peak monthly usage, and total annual usage. This annual data is submitted by the City every year to the Utah Division of Water Rights and recorded. The DDW then calculates sizing standards using the three most recent years of data. This memo outlines those calculations for the years 2020 through 2022 and may be provided to the State as confirmation of their draft sizing calculations.

2. SYSTEM ERCS

The City has provided the following usage data shown in Table 1 (2020 through 2022) for the City's Residential, Commercial and Institutional connections. The usage data was then used to calculate the total number of ERC's for each year.

Table 1: City Provided Usage Data

Year	Reported ERC's	Residential Water Use (Ac-ft/yr)	Commercial Water Use (Ac-ft/yr)	Institutional Water Use (Ac-ft/yr)
2020	1,229	949.89	3.91	57.13
2021	1,239	805.54	2.88	24.02
2022	1,313	810.94	4.03	38.32

3. SYSTEM SIZING CRITERIA PER ERC

Using the usage data provided by the City for the years 2020-2022, the equalization storage per ERC was calculated as shown in Table 2. The results of these calculations vary slightly from the draft DDW Minimum Sizing Standards worksheet that was provided to the City. It is unclear what the difference between the two calculations are.

Table 2: 2020-2022 DDW Minimum Sizing Requirements

MINIMUM SIZING STANDARD CALCULATIONS (Based on 2020- 2022 Data)							
Max Peak Day Source Demand Per ERC (gal/day): 2,119 x 100% =						2,119	
Max Average Annual Demand Per ERC (gal/year): 284,426 x 100% =						284,426	
Max Equalization Storage Per ERC (gal/day): 777 x 100% =						777	
DWRI WATER USE DATA REPORTED							
Data Year	Peak Day Source Demand (gal/day)	Average Annual Demand (gallons)	ERCs	Peak Demand per ERC (gal/day)	Avg Annual Demand per ERC (gal/year)	Equalization Storage per ERC (gal/day)	Op days
2020	2,388,488	349,559,919	1,229	1,943	**284,426**	**777**	365
2021	1,740,044	290,036,717	1,239	1,404	234,089	641	365
2022	2,782,768	332,579,823	1,313	**2,119**	253,298	694	365

Following the State guidelines, the year with the highest value for the Peak Day Source Demand Per ERC, the Average Annual Demand Per ERC, and the Equalization Storage Per ERC was selected and identified as the maximum expected value for the system and thereby becomes the minimum system sizing requirement. Each of the three values have been identified int table 2 by bolded text.

4. SOURCE

The source capacity of the City has been summarized in Table 3. The table identifies all of the wells associated with the system. However, several of the wells are no longer in use and should not be included in the ERC calculations. For this reason, the sources listed here do not correspond with what is on record with the Division of Drinking Water, and it is recommended that records be reconciled, and the appropriate sources and flow rates be held as the governing record.

Based on the requirement of 2,119 gallons/day/ERC, the City currently has approximately 2,016 ERCs of capacity as indicated below.

Table 3 Summary of City Sources

Source Name	Quantity (gpm)	ERCs (Based on 2,119 gpd/ERC)
Well #1 (inactive)	0	0
Dugway Well (inactive)	0	0
Oak Lane Well (inactive)	0	0
Cloward Well	1,200	815
Old Well #5 (inactive)	0	0
Well #6 (inactive)	0	0
Loafer Canyon Well	1,100	748
Skyhawk Well	667	453
Total:	**2,967**	**2,016**

5. FIRE STORAGE

The City's own fire department is the governing fire authority for the City. The fire department has adopted the 2018 International Fire Code (IFC). The Fire Authority contact information is:

Seth Waite
Fire Chief
firechief@elkridgecity.org

In determining the governing fire suppression storage needs for the City, the largest buildings in the City were considered. This includes several church buildings and a Senior Living Facility. The average church was identified to be approximately 21,000 sq ft, building material type V-B, with automatic fire sprinklers. According to Table B105.1 in the 2018 IFC, this size and type of building with automatic sprinklers requires a fire suppression flow of 1000 gal/min for 4 hours, for a total storage requirement of 240,000 gal.

The required 240,000 gallons of fire suppression storage is assumed to be shared between the upper and lower storage tanks (120,000 gallons in each tank). These tanks are able to service all of the lower pressure zones through PRVs. This storage requirement also varies from what is on record with the Division of Drinking Water, and it is recommended that records be reconciled, and the appropriate storage capacity be held as the governing record.

6. SYSTEM STORAGE SUMMARY

Based on the fire storage requirements identified previously, Table 4 summarizes the water system storage capacity.

Table 4: Tank Storage Summary

Tank Name	Total Volume (gal)	Fire Storage (gal)	Equalization Storage (gal)	Tank Capacity-ERCs (777 gal/day/ ERC)
ST-001 Lower Tank	500,000	120,000	380,000	489
ST-002 Upper Tank	500,000	120,000	380,000	489
ST-003 Fairway Tank	1,000,000		1,000,000	1,287
Total	**2,000,000**	**240,000**	**1,760,000**	**2,265**

7. CONCLUSION

7.1.1. SOURCE

As determined in section 4, the City's culinary water system currently has source capacity for 2,016 ERCs (2,967 gpm) and at the end of 2022 there were approximately 1,313 ERCs (1,932 gpm) in the system. Therefore, the City has a surplus source capacity of 703 ERCs (1,035 gpm) and no deficiencies in their system supply.

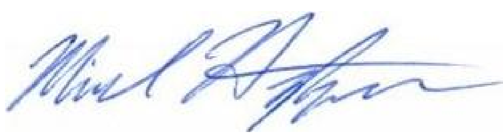
7.1.2. STORAGE

As determined in section 6, the City's culinary water system currently has storage capacity for 2,265 ERCs (1,760,000 gal) and at the end of 2022 there were approximately 1,313 ERCs (1,020,201 gal) in the system. Therefore, the City has a surplus storage capacity of 952 ERCs (739,799 gal) an no deficiencies in their storage system.

Please review this memo and let us know if there are any questions or details that we might be able to further clarify.

Sincerely,

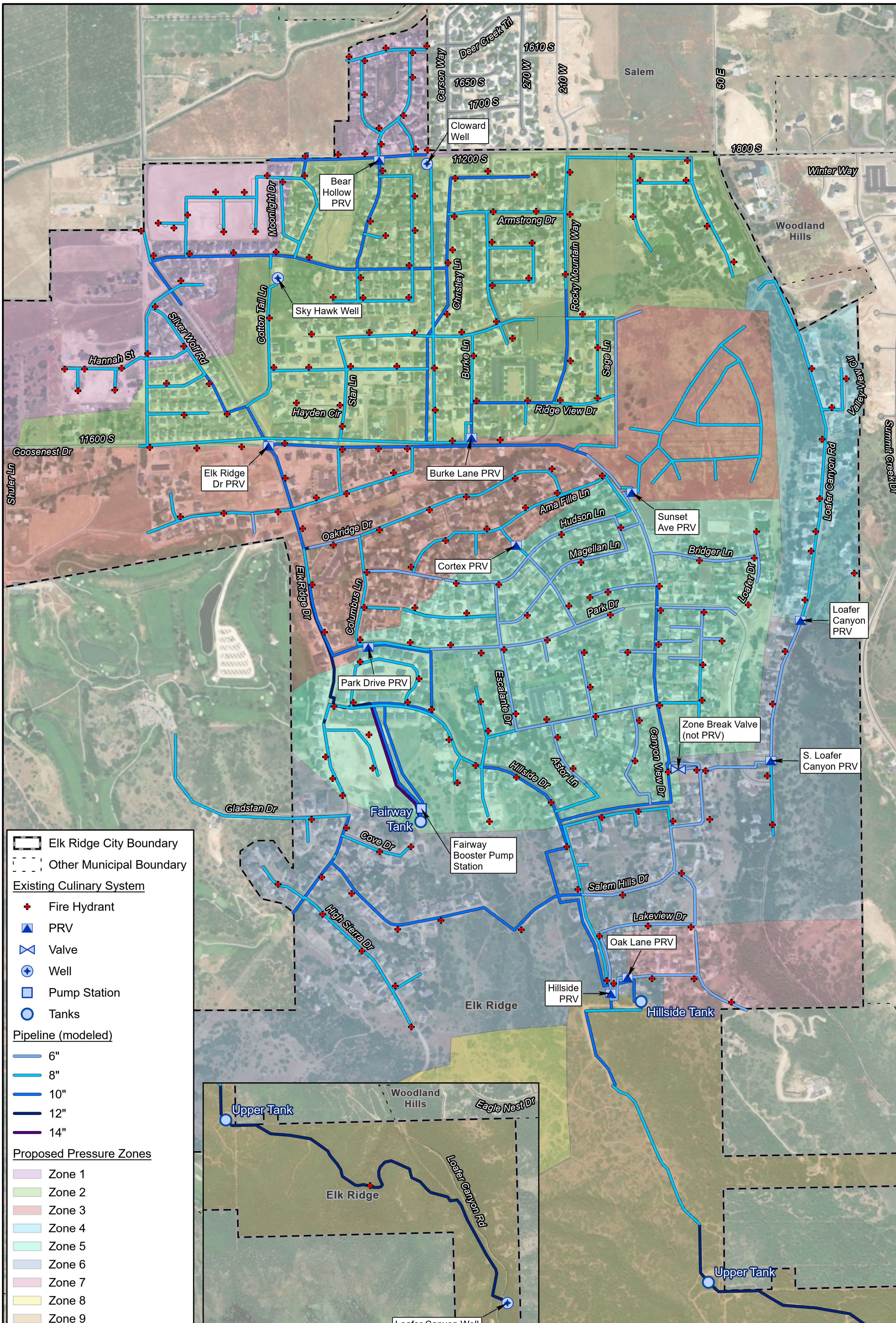
JONES & DeMILLE ENGINEERING, INC.



Michael Hartvigsen, P.E.

Project Manager

APPENDIX B. EXISTING SYSTEM LAYOUT



Jones & DeMille Engineering

Elk Ridge City

Culinary Water - Capital Facility Plan
Existing System Overview

Map Name: H:\JD\Proj\2211-036\003 2023 Water Modeling\Design\GIS\Projects\2211-036_Model\2211-036_Model.aprx - 1. Exh Elk Ridge City - Culinary Water - Existing System Overview 11x17P

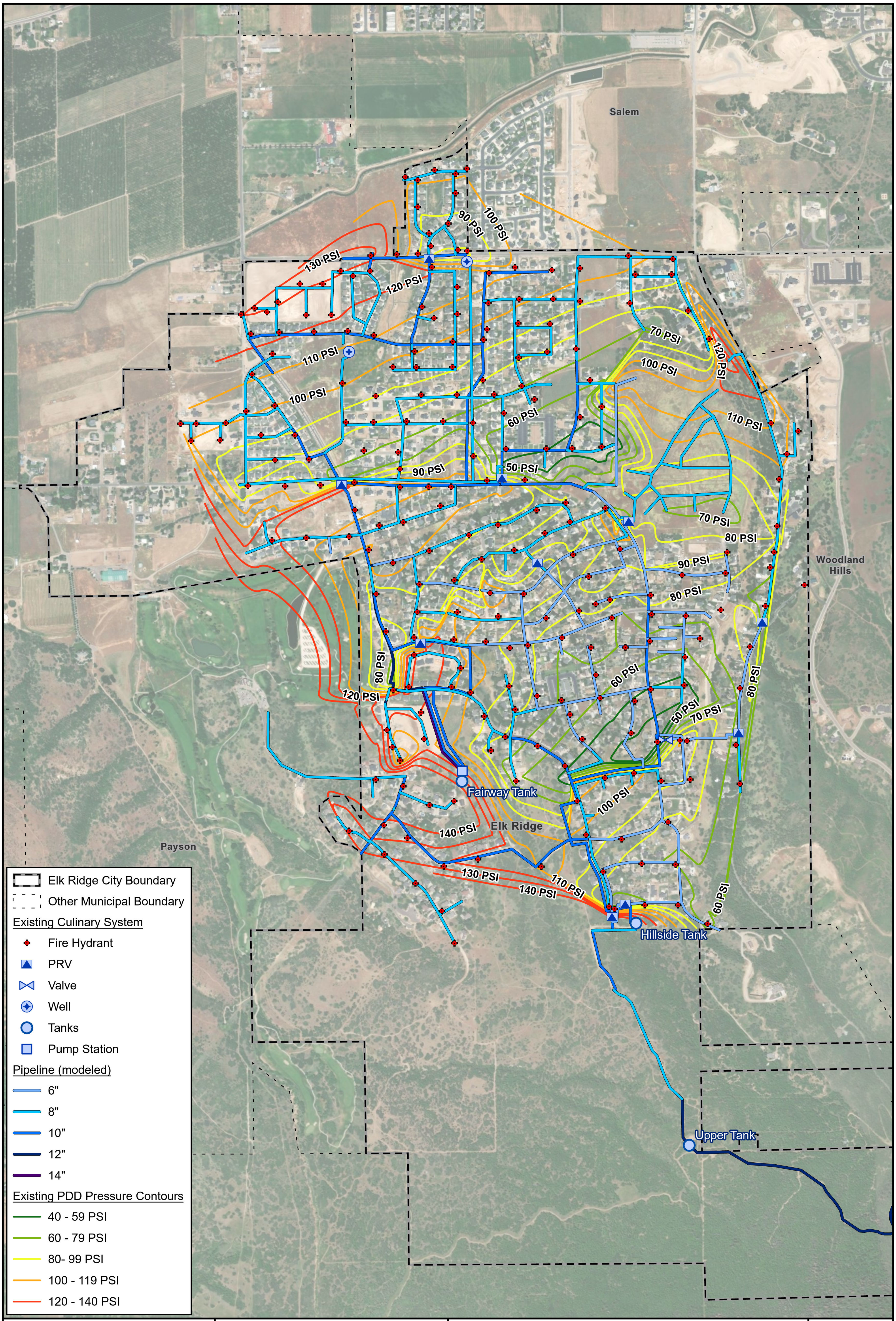
Project Number: 2211-036 | Drawn by: JEM 04-24 | Last Edit: 07/09/2024

Utah County, Utah

Scale: 1" = 800'

Appendix B

APPENDIX C. EXISTING SYSTEM HYDRAULIC MODEL RESULTS PEAK DAY DEMAND



Jones & DeMille Engineering

Elk Ridge City

Utah County, Utah

Culinary Water - Capital Facility Plan
Existing System Modeling Results - Peak Daily Demand

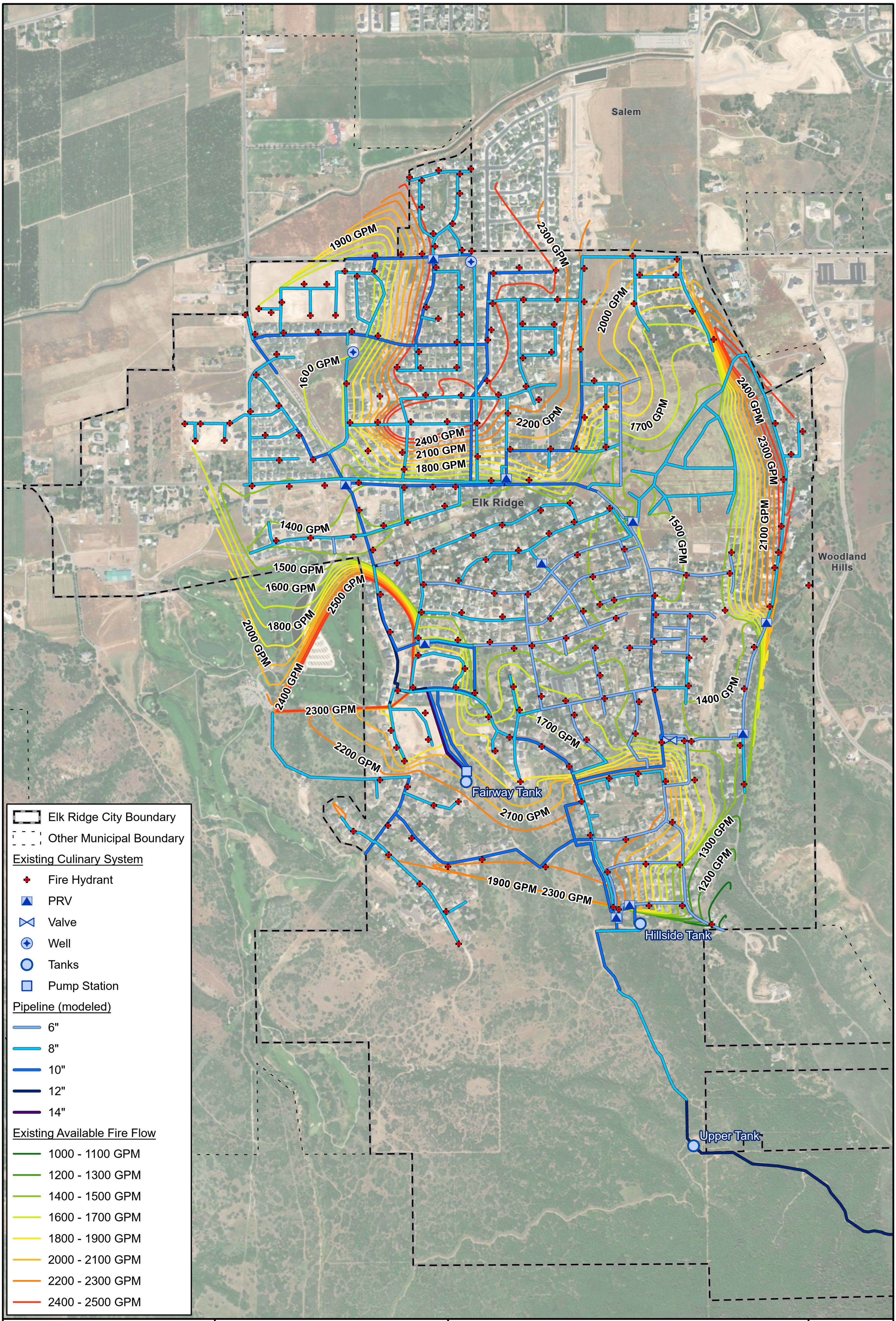
Scale: 1" = 1,000'

Appendix C

Map Name: H:\JD\Proj\2211-036\003 2023 Water Modeling\Design\GIS\Projects\2211-036_Model\2211-036_Model.aprx - 2. Exh Elk Ridge City - Culinary Water - Existing PDD Overview 11x17P

Project Number: 2211-036 | Drawn by: JEM 04-24 | Last Edit: 05/21/2024

APPENDIX D. EXISTING SYSTEM HYDRAULIC MODEL RESULTS AVAILABLE FIRE FLOW



N

0 500 1,000 Feet

Jones & DeMille Engineering

Elk Ridge City

Culinary Water - Capital Facility Plan
Existing System Modeling Results - Available Fire Flow

Map Name: H:\JD\Proj\2211-036\003 2023 Water Modeling\Design\GIS\Projects\2211-036_Model\2211-036_Model.aprx - 3. Exh Elk Ridge City - Culinary Water - Existing Fire Flow Overview 11x17P

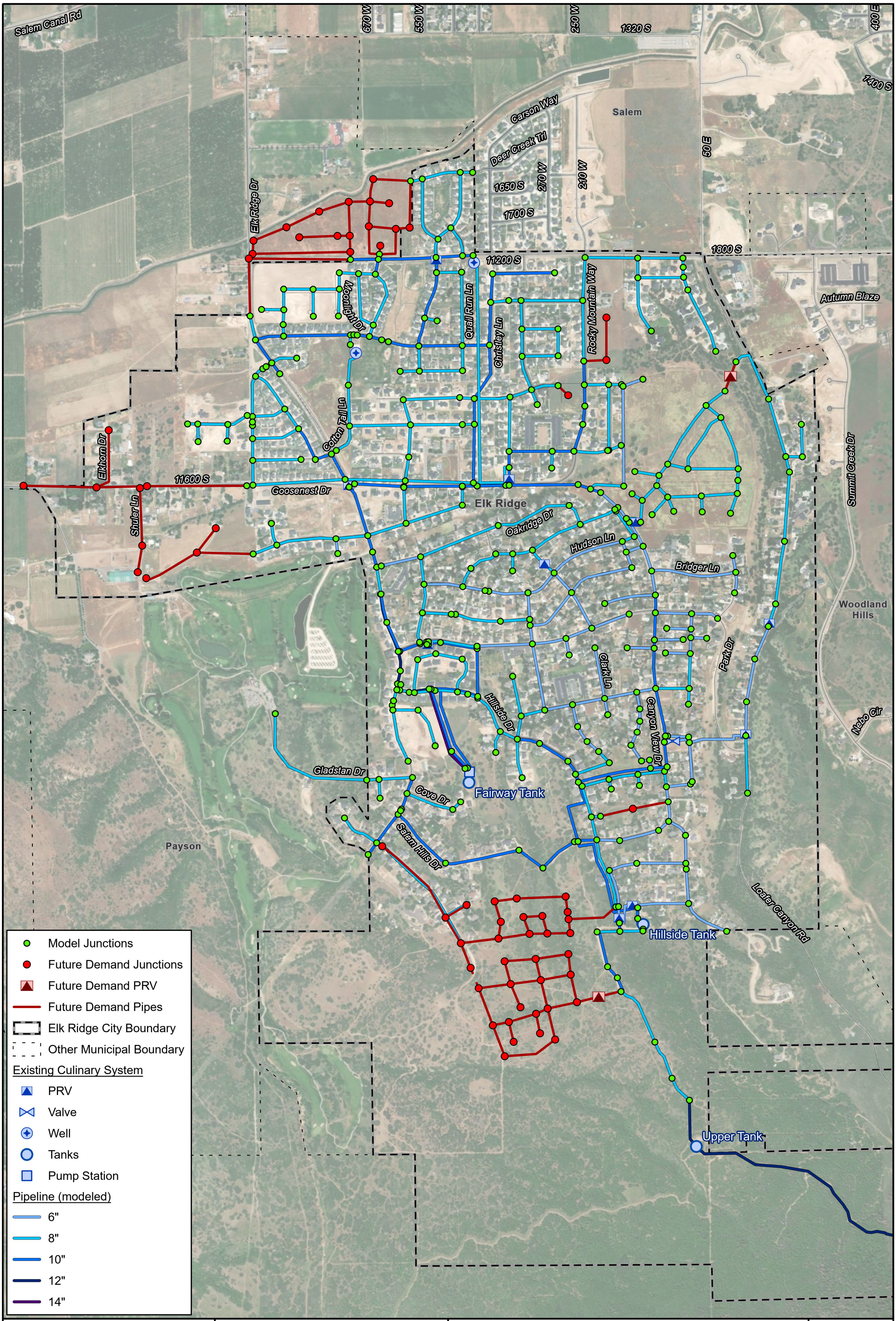
Project Number: 2211-036 | Drawn by: JEM 04-24 | Last Edit: 07/08/2024

Utah County, Utah

Scale: 1" = 1,000'

Appendix D

APPENDIX F. PROPOSED IMPROVEMENTS



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0 500 1,000 Feet

Jones & DeMille Engineering

Elk Ridge City

Culinary Water - Capital Facility Plan
Model Junction Overview

Map Name: H:\JD\Proj\2211-036\003 2023 Water Modeling\Design\GIS\Projects\2211-036_Model\2211-036_Model.aprx - 4. Exh Elk Ridge City - Culinary Water - Modeled Junctions Overview 11x17P

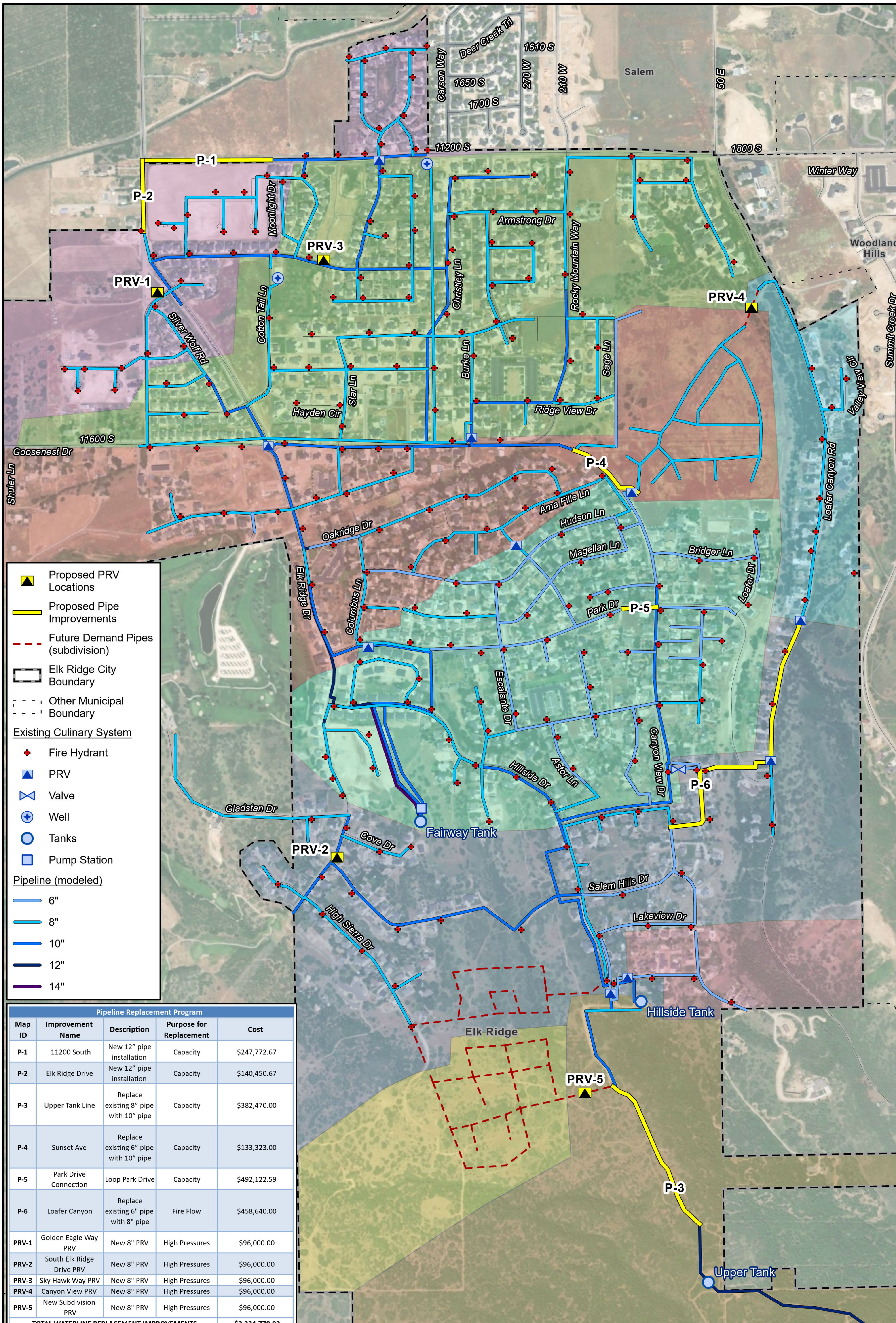
Project Number: 2211-036 | Drawn by: JEM 04-24 | Last Edit: 07/09/2024

Utah County, Utah

Scale: 1" = 1,000'

Appendix E

APPENDIX E. HYDRAULIC MODEL JUNCTIONS MAP



Pipeline Replacement Program				
Map ID	Improvement Name	Description	Purpose for Replacement	Cost
P-1	11200 South	New 12” pipe installation	Capacity	$247,772.67
P-2	Elk Ridge Drive	New 12” pipe installation	Capacity	$140,450.67
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P-5	Park Drive Connection	Loop Park Drive	Capacity	$492,122.59
P-6	Loafer Canyon	Replace existing 6" pipe with 8" pipe	Fire Flow	$458,640.00
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PRV-3	Sky Hawk Way PRV	New 8" PRV	High Pressures	$96,000.00
PRV-4	Canyon View PRV	New 8" PRV	High Pressures	$96,000.00
PRV-5	New Subdivision PRV	New 8" PRV	High Pressures	$96,000.00
TOTAL WATERLINE REPLACEMENT IMPROVEMENTS				$2,334,778.92

N

0 400 800 Feet

Jones & DeMille Engineering

Elk Ridge City

Utah County, Utah

Culinary Water - Capital Facility Plan
Proposed Improvements Overview

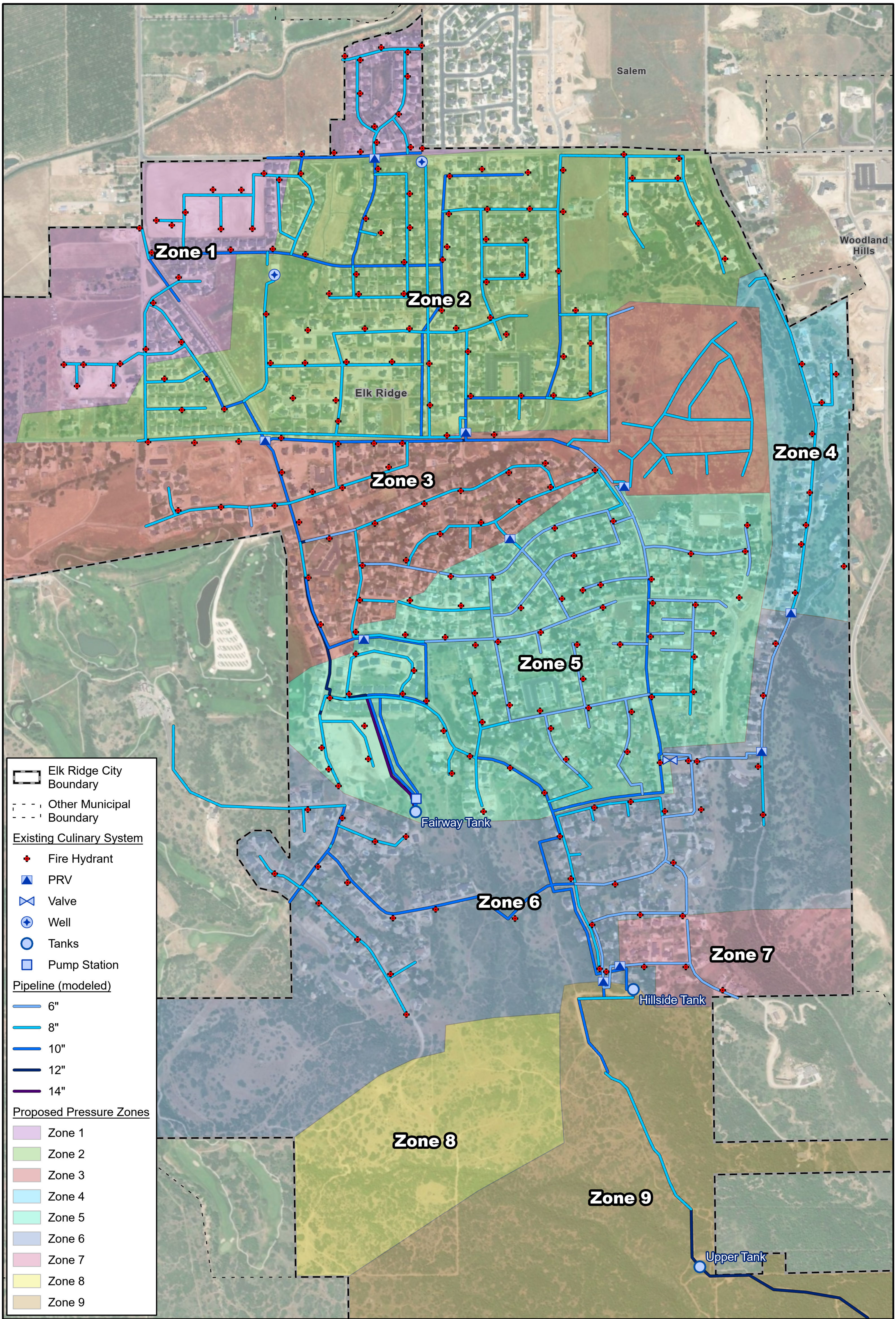
Scale: 1" = 800'

Map Name: H:\JD\Proj\2211-036\003 2023 Water Modeling\Design\GIS\Projects\2211-036_Model\2211-036_Model.aprx - 5. Exh Elk Ridge City - Culinary Water - Proposed Improvements Overview 11x17P

Project Number: 2211-036 | Drawn by: JEM 04-24 | Last Edit: 07/09/2024

Appendix F

APPENDIX G. PROPOSED PRESSURE ZONES AND SYSTEM SCHEMATIC



Elk Ridge City

Utah County, Utah

Culinary Water - Capital Facility Plan
Proposed Pressure Zones Overview

Scale: 1" = 800'

Map Name: H:\JD\Proj\2211-036\003 2023 Water Modeling\Design\GIS\Projects\2211-036_Model\2211-036_Model.aprx - 6. Exh Elk Ridge City - Culinary Water - Proposed Pressure Zones Overview 11x17P

Project Number: 2211-036 | Drawn by: JEM 04-24 | Last Edit: 07/09/2024

Appendix G

APPENDIX H. WATER RATE STUDY