SPRINGVILLE CITY

DRINKING WATER MASTER PLAN AND CAPITAL FACILITY PLAN

January 2026

HANSEN ALLEN & LUCE INC
ENGINEERS

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DRINKING WATER MASTER PLAN
AND CAPITAL FACILITY PLAN

(HAL Project No.: 260.62.100)

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GLOSSARY OF TECHNICAL TERMS

Average Daily Flow: The average yearly demand volume expressed in a flow rate.

Average Yearly Demand: The volume of water used during an entire year.

Buildout: When the development density reaches maximum allowed by planned development.

Culinary Water: Water of sufficient quality for human consumption. Also referred to as Drinking or Potable water.

Demand: Required water flow rate or volume.

Distribution System: The network of pipes, valves and appurtenances contained within a water system.

Drinking Water: Water of sufficient quality for human consumption. Also referred to as culinary or Potable water.

Dynamic Pressure: The pressure exerted by water within the pipelines and other water system appurtenances when water is flowing through the system.

Equivalent Residential Connection (ERC): A measure used in comparing water demand from non-residential connections to residential connections.

Fire Flow Requirements: The rate of water delivery required to extinguish a particular fire. Usually it is given in rate of flow (gallons per minute) for a specific period of time (hours).

Head: A measure of the pressure in a distribution system that is exerted by the water. Head represents the height of the free water surface (or pressure reduction valve setting) above any point in the hydraulic system.

Head loss: The amount of pressure lost in a distribution system under dynamic conditions due to the wall roughness and other physical characteristics of pipes in the system.

Level of service (LOS): The selected level to which the water system will be designed

Peak Day: The day(s) of the year in which a maximum amount of water is used in a 24-hour period.

Peak Day Demand: The average daily flow required to meet the needs imposed on a water system during the peak day(s) of the year.

Peak Instantaneous Demand: The flow required to meet the needs imposed on a water system during maximum flow on a peak day.

Pressure Reducing Valve (PRV): A valve used to reduce excessive pressure in a water distribution system.

Pressure Zone: The area within a distribution system in which water pressure is maintained within specified limits.

Service Area: Typically the area within the boundaries of the entity or entities that participate in the ownership, planning, design, construction, operation and maintenance of a water system.

Static Pressure: The pressure exerted by water within the pipelines and other water system appurtenances when water is not flowing through the system, i.e., during periods of little or no water use.

Storage Reservoir: A facility used to store, contain and protect Drinking water until it is needed by the customers of a water system. Also referred to as a Storage Tank.

Transmission Pipeline: A pipeline that transfers water from a source to a reservoir or from a reservoir to a distribution system.

ABBREVIATIONS AND UNITS

ac	acre [area]
ac-ft	acre-foot (1 ac-ft = 325,851 gal) [volume]
CIP	Capital Improvement Plan
CFP	Capital Facilities Plan
DDW	Utah Division of Drinking Water
DIP	Ductile Iron Pipe
DWR	Utah Division of Water Rights
EPA	U.S. Environmental Protection Agency
EPANET	EPA hydraulic network modeling software
ERC	Equivalent Residential Connection
ft	foot [length]
ft/s	feet per second [velocity]
gal	gallon [volume]
gpd	gallons per day [flow rate]
gpm	gallons per minute [flow rate]
HAL	Hansen, Allen & Luce, Inc.
hr	hour [time]
IFA	Impact Fee Analysis
IFC	International Fire Code
IFFP	Impact Fee Facilities Plan
in.	inch [length]
irr-ac	irrigated acre
kgal	thousand gallons [volume]
MG	million gallons [volume]
MGD	million gallons per day [flow rate]
mi	mile [length]
psi	pounds per square inch [pressure]
s	second [time]
SCADA	Supervisory Control And Data Acquisition
yr	year[time]

CHAPTER 1 INTRODUCTION

PURPOSE AND SCOPE

The purpose of this master plan is to provide direction to the City of Springville regarding decisions that will be made now and well into the future to provide an adequate drinking water system for its customers at the most reasonable cost. Recommendations are based on demand data, growth projections, standards of the Utah Division of Drinking Water (DDW), city zoning, General Plan land uses, known planned developments, and standard engineering practices. The planning horizon for the master plan is approximately 2070. Buildout occurs beyond 2070 and refers to the time period when all parcels are developed within the annexation declaration boundary according to the current General Plan. The service area considered in this master plan is the entire City of Springville, as well as all areas serviced outside City limits, including Kelly's Grove and Grindstone subdivision, and all customers along the Left Fork Hobble Creek Canyon Road between Rotary Park and Bartholomew Tank. Canyon customers include the Holiday Hills and Hobble Creek Haven private water systems supplied by Springville City.

The master plan is a study of the City's drinking water system and customer water use. The following topics are addressed herein: growth projections, source requirements, storage requirements, and distribution system requirements. Operational parameters for the City's drinking water system were reviewed and optimized based on stability, ease of use, and cost. Based on this study, needed capital improvements have been identified and conceptual-level cost estimates for the recommended improvements have been provided. This master plan includes a Capital Facility Plan (CFP) to identify the drinking water facilities that are required to meet the demands placed on the system by future development for the 10-year and 20-year planning period.

The results of the study are limited by the accuracy of growth projections, data provided by the City, and other assumptions used in preparing the study. It is expected that the City will review and update this master plan every 5–10 years as new information about development, system performance, or water use becomes available. This master plan updates the previous plan completed by the City of Springville and adopted in August 2020.

BACKGROUND

Springville was originally settled in 1850 and had an estimated population of 36,500 in 2024 (provided by the City). It is located in central Utah County and has an area of 14.4 square miles. As a result of its location along the I-15 corridor and in the rapidly growing Provo-Orem metropolitan area, Springville is experiencing rapid growth and is expected to grow into the future. Growth rates were determined based on future population estimates produced by Mountainland Association of Governments (MAG) and average annual growth rates produced by Kem C. Gardner. See population estimates in Figure 1-1. Data for this figure is shown in Appendix A as Table A-1. By mid-2024, the City provided water service to approximately 11,400 residential units via approximately 10,130 connections.

The City's existing drinking water system includes seven wells, five springs, nine tanks, two pump stations, eleven pressure zones, and about 221 miles of pipe with diameters of 4 to 30 inches. Existing facilities are shown on Figure 1-2. The City recognizes that its continued growth necessitates proactively planning additional drinking water facilities to maintain the current level of service for indoor water use.

The City also maintains a pressurized irrigation (PI) water system for outdoor use in the newer, western portion of the City, approximately west of 400 West. The eastern boundary of the area served by the PI system is shown on Figure 1-2. The drinking water system supplies both indoor and outdoor water needs for areas east of 400 West, as well as for some customers located within the PI system area who have not yet connected to the PI system. The pressurized irrigation water system is addressed in a separate master plan. The findings and conclusions in this master plan are dependent on the PI system being constructed per its separate master plan.

In 2020, the City prepared a Capital Facilities Plan, with an Impact Fee Facilities Plan (IFFP) and Impact Fee Analysis (IFA) following in 2024 for its drinking water system. This master plan will provide the bases for updating those studies and providing a basic full system layout design to guide new development.

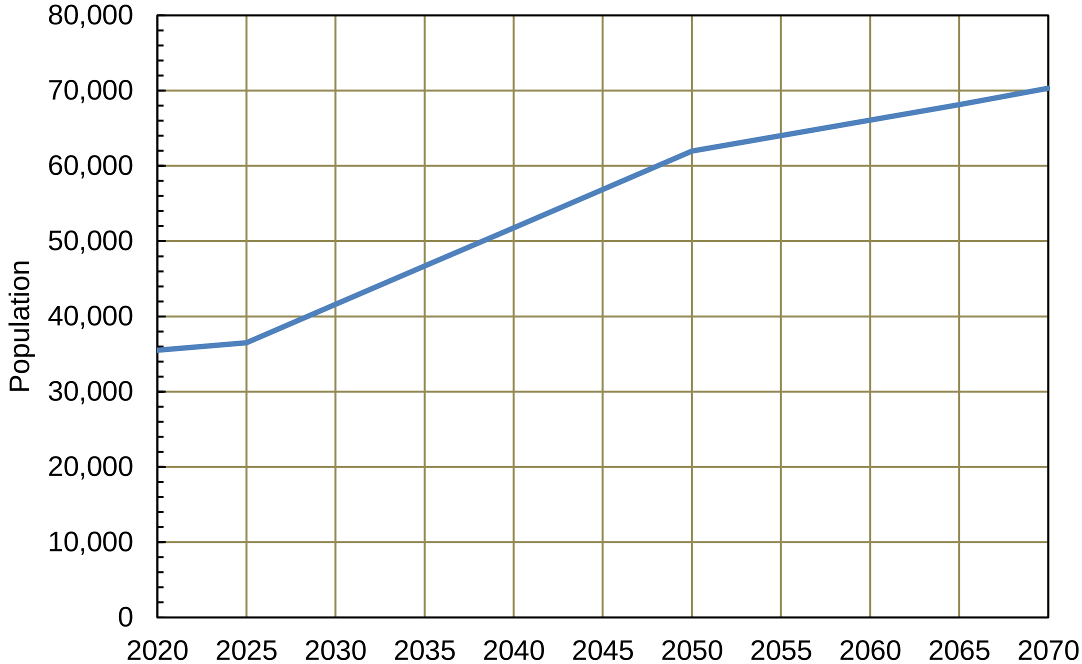
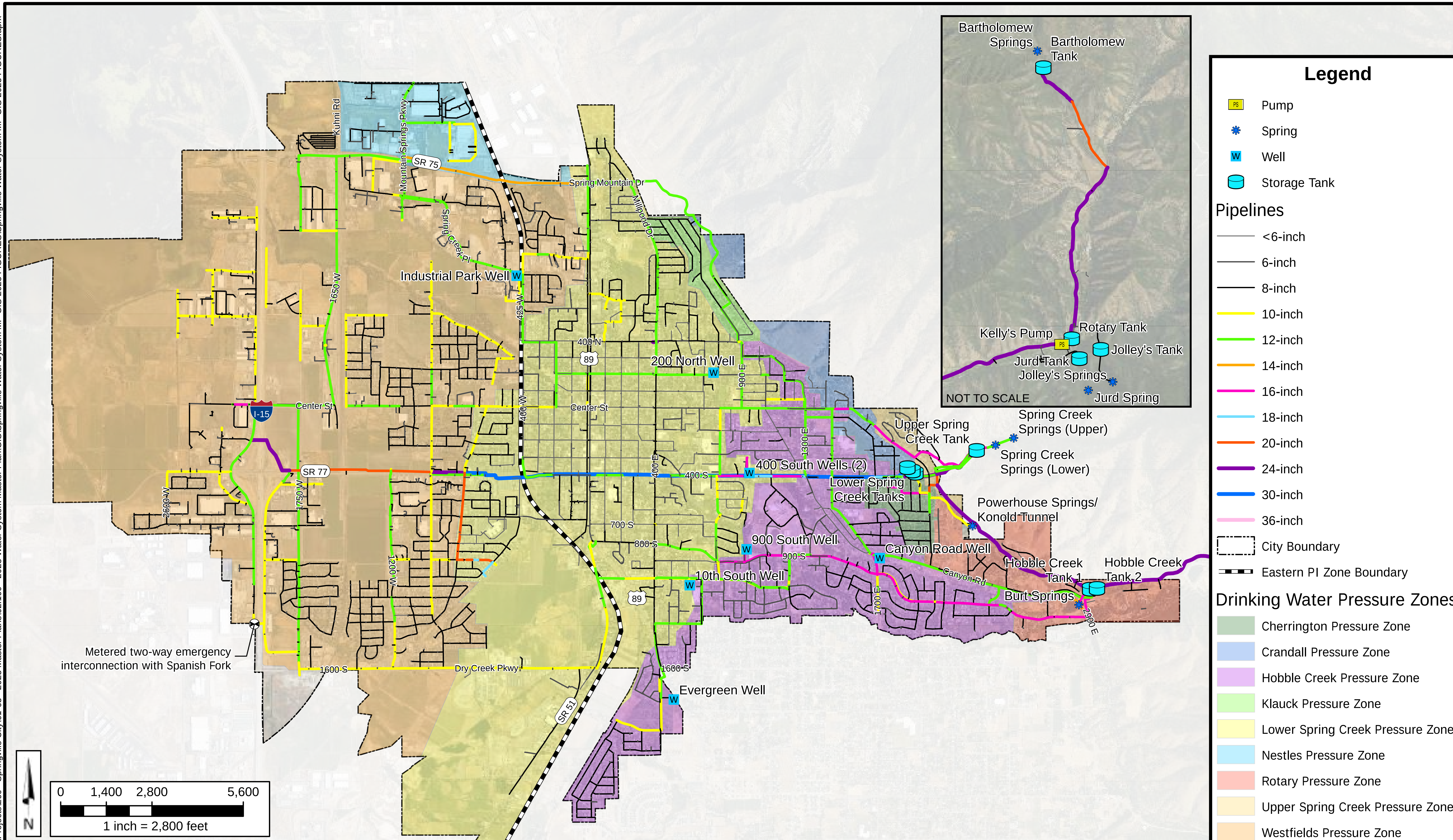


Figure 1-1: Springville Projected Population

MASTER PLANNING METHODOLOGY

Drinking water systems consist of water sources, storage facilities, distribution pipes, pump stations, valves, and other components. Design and operation of the individual components must be coordinated so that they operate efficiently under a range of demands and conditions. The system must be capable of responding to daily and seasonal variations in demand while simultaneously providing sufficient capacity for firefighting and other emergency situations.

Identifying present and future water system needs is essential in the management and planning of a water system. For this study, existing water demands are based on billing data and the level of service established by the City. Future water demands were predicted using this level of service, current zoning and densities provided by the City, and future estimated population growth. Computer models of the City’s drinking water system were prepared to simulate the performance of facilities under existing and future conditions. System improvement recommendations were prepared from the analysis and are presented in this report.



HANSEN ALLEN & LUCE INC ENGINEERS

SPRINGVILLE CITY
DRINKING WATER SYSTEM MASTER PLAN

EXISTING SYSTEM

FIGURE 1-2

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Document Path: H:\Projects\260 - Springville City\61-63 - 2025 Master Plans\62.100 - 2025 Water System Master Plan\GIS\Springville Water System MP GIS 2025 FIGURES\Springville Water System MP GIS 2025 FIGURES.aprx

The development of impact fees requires growth projections over the next ten years. In addition to impact fee projects, this report will also highlight anticipated projects required in the next 10 to 20 years in the "Capital Facilities Plan" section of this report. The master planning period covered in this report continues through 2070, when City population is projected to approach the current planning population of 70,000.

This report follows the DDW requirements of Rule R309-510 ("Facility Design and Operation: Minimum Sizing Requirements") and Rule R309-105 ("Administration: General Responsibilities of Public Water Systems") of the Utah Administrative Code. The report addresses sources, storage, distribution, minimum pressures, hydraulic modeling, capital improvements, funding, and other topics pertinent to Springville's drinking water system.

LEVEL OF SERVICE (LOS)

One Equivalent Residential Connection (ERC) is equal to the average indoor water usage of a typical single family residence in the City. The level of service is the reliable flow or volume the system is designed to provide under normal operating conditions and is usually quantified in terms of flow or volume per ERC for indoor usage and flow or volume per irrigated acre for outdoor usage. HAL analyzed production and billing data provided by Springville City for the previous three years. Once water production and demand patterns were well understood, HAL and the City met to establish a level of service that is based on this data and incorporates appropriate safety factors. A summary of the level of service selected by the City is included in Table 1-1. These values are expected to meet the requirements of the DDW.

Table 1-1: System Level of Service

Criteria	Indoor Level of Service (ERC)	Outdoor Level of Service (irr-ac)
Average Yearly Demand	0.3 ac-ft/ERC	4.0 ac-ft/irr-ac
Peak Day Demand	260 gpd/ERC = 0.18 gpm/ERC	12,240 gpd/irr-ac = 8.5 gpm/irr-ac
Peak Instantaneous Demand	1.5 Peaking Factor = 0.27 gpm/ERC	1.5 Peaking Factor = 12.8 gpm/irr-ac
Storage	230 gal/ERC	6,120 gal/irr-ac

Additional information on level of service calculations for outdoor use is included in the pressurized irrigation system master plan, which is based on the customers in the PI system service zone using the PI system for outdoor watering.

DESIGN AND PERFORMANCE CRITERIA

Summaries of the key design criteria and demand requirements for the drinking water system are included in Table 1-2, with additional details in Table A-2 in Appendix A. The design criteria were used in evaluating system performance and recommending future improvements based on the 2070 planning horizon. Criteria development is described in later chapters.

Table 1-2: System Design Criteria

			Criteria	Existing Requirements	Estimated Future Requirements (2070)
ERCs			Calculated from past water use and projected growth	20,794	35,572
Irrigated Acreage			Calculated from past water use and projected growth	1,209	1,057
Source	**Peak Day Demand**		Section R309-510-7/LOS	14,030 gpm	15,410 gpm
	Average Yearly Demand		Section R309-510-7/LOS	11,070 ac-ft	14,900 ac-ft
Storage	**Equalization**		Section R309-501-8/LOS	12.18 MG	14.65 MG
	Emergency		City Preference	2.02 MG	2.02 MG
	Fire Suppression		IFC/Fire Marshal	1.32 MG	1.32 MG
	Total		-	15.52 MG	17.99 MG
Distribution	**Peak Instantaneous Flow**		1.5x Peak Day Demand	21,050 gpm	23,120 gpm
	Minimum Peak Day Fire Flow	**Residential (East of 400 W)**[1]	IFC/ Fire Marshal	1,000 gpm @ 20psi	1,000 gpm @ 20psi
		Residential (West of 400 W)[1]	IFC/ Fire Marshal	1,500 gpm @ 20psi	1,500 gpm @ 20psi
		Non-Residential	IFC/ Fire Marshal	2,000 gpm @ 20 psi	2,000 gpm @ 20 psi
	Maximum Operating Pressure		LOS	110 psi	110 psi
	Minimum Pressure	**Peak Day**	Section R309-510-9/LOS	50 psi	50 psi
		Peak Instantaneous	Section R309-510-9	30 psi	30 psi

1 – The minimum fire flow requirement is 1,000 gpm east of 400 West/Highway 89/Highway 51, and 1,500 gpm west of this boundary. The boundary coincides with the eastern boundary of the PI service zone, as shown on Figure 1-2.

CHAPTER 2 SYSTEM GROWTH

EXISTING CONNECTIONS

Indoor water demands are expressed in terms of equivalent residential connections (ERCs), which for planning purposes are the same as equivalent residential units (ERUs). The use of ERCs is a standard engineering practice to describe the entire system in a common unit of measurement. One ERC is equal to the average demand of an average residential connection. Non-residential demands are converted to ERCs for planning purposes. For example, a commercial building requiring six times as much water as a typical residential connection is assigned an ERC of 6. The entire water demand then can be described with a single ERC count.

HAL analyzed the City's water use data from May 2021 to April 2024 along with discussion with the City and determined that the existing system serves 20,794 ERCs for indoor usage. An extended-period hydraulic model was updated with current water use and pipe information to represent existing conditions. A breakdown of the existing ERCs by pressure zone is shown in Table 2-1.

Table 2-1: Existing ERCs by Pressure Zone

Zone	ERCs
Bartholomew	56
Kelly/Jurd	167
Rotary	202
Cherrington	186
Hobble Creek	2,388
Lower Spring Creek	6,346
Westfields	6,081
Upper Spring Creek	51
Crandall	125
Klauck	218
Nestlé	4,974
Total	**20,794**

These existing ERCs are shown by customer type in Table 2-2.

Table 2-2: Existing ERCs by Customer Type

Customer Type	ERCs
City Owned	471
Government/Church	498
Commercial	3,586
Residential	11,397
Industrial (Nestlé)	4,842
Total	**20,794**

EXISTING IRRIGATED ACREAGE

Outdoor water demands were estimated based on usage per irrigated acre (irr-ac). Existing irrigated areas were identified using a combination of water use data and remote sensing analysis. The analysis utilized imagery from the National Agricultural Imagery Program (NAIP), available through the Utah Geospatial Resource Center (UGRC), to identify areas of healthy vegetation. Water demand and storage requirements were then determined in accordance with the level of service established by the City.

The Springville City drinking water system provides water for outdoor irrigation in a portion of the system. The area of the City generally west of 400 West, Highway 51, and Highway 89 is master-planned to be served by a separate pressurized irrigation (PI) system. The eastern boundary of the PI system is shown on Figure 1-2. A portion of the City near the mouth of Hobble Creek Canyon is irrigated by the Highline Canal but is planned to be added to the drinking water system. Additionally, the outdoor irrigation for a portion of Plat A near the City center (the area bounded by 400 North, 400 East, 400 South, and 400 West) is served by a separate irrigation system fed by Hobble Creek, but is planned to be added to the drinking water system. The remainder of the irrigated acreage in the City (generally east of 400 West, Highway 51, and Highway 89) is served by the drinking water system. The total area served by the PI system and drinking water system are shown in Table 2-3 below. Table 2-4 lists the area for Plat A and Highline Canal and the area that is within the PI system service boundary but still supplied by the drinking water system.

A portion of the PI system has been constructed and is in use and is addressed in a separate master plan. The PI system will be expanded as development occurs. Some portions of the existing and planned PI service area are currently supplied by the drinking water system because PI infrastructure is not yet available or other factors are preventing customers from connecting to the existing PI network. This includes some customers adjacent to the active PI system ("wet PI pipe") and customers adjacent to PI pipelines that are not yet active ("dry PI pipe"). Currently these connections are assumed to be borrowing capacity in the drinking water system because capacity for these connections is accounted for in the PI system. As the City develops, it is assumed that customers within the PI service area will be served by the PI system.

Table 2-3: Existing Irrigated Acreage

Pressure Zone	Total Irrigated Acreage	Served by Drinking Water System	Served by PI System
Bartholomew	5	5	
Kelly/Jurd	13	13	
Rotary	80	80[1]	
Cherrington	34	34	
Hobble Creek	356	356	
Lower Spring Creek	471	384[2]	87
Westfields	522	247[3]	275
Upper Spring Creek	7	7	
Crandall	16	16	
Klauck	28	28	
Nestlé	39	39[4]	
Total	**1,571**	**1,209**	**362**

1. Includes the Highline Canal service area.
2. Includes approximately 211 irrigated acres within the PI system service zone.
3. Includes approximately 12 irrigated acres within the PI system service zone.
4. Includes approximately 37 irrigated acres within the PI system service zone.

Table 2-4: Summary of Planned Drinking Water System Service Area Alterations

Name	Irrigated Acres	Description
Wet PI Pipe	122	Customers with access to the PI system but who have not connected and are still served by the drinking water system
Dry PI Pipe	138	Areas with PI piping installed that has not yet been connected to the PI system.
Plat A	25	Area in the Lower Spring Creek pressure zone that is currently irrigated by a separate irrigation system but planned to be connected to the drinking water system.
Highline Canal	35	Area in the Rotary pressure zone that is currently irrigated by a separate irrigation system but planned to be connected to the drinking water system.

It is recommended that all existing and future customers in the PI system service zone use the PI system for outdoor watering. This will require many existing customers to make connections to the PI system. The City may explore opportunities to provide hardship funding to assist customers in making these connections. This could include the use of grants to reimburse the City.

FUTURE CONNECTIONS

Future ERCs were calculated based on existing land use patterns, current zoning and General Plan land use designations, and densities allowed by City code or anticipated by planners.

The City has committed to serve approximately 850 ERCs that are not yet connected to the system. These ERCs have been accounted for in the future growth areas of this report.

The area of the City generally east of 400 West and S.R. 51, and north of Hobble Creek, has a relatively small amount of undeveloped land remaining. A substantial portion of existing development in this area is built at a lower density than is allowed by City zoning ordinances. It was assumed that existing land uses would remain similar in the future. Excessively steep areas above the Bonneville Shoreline Trail were assumed to remain undeveloped indefinitely.

The City's General Plan land use classifications were used to determine densities and allocate demands across the City. As these classifications were prepared in 2011, updates to these classifications were made by HAL based on community plans for large developments, city zoning, and nearby development. City code does not specify a development density in units per acre for most zoning types or General Plan land use designations. For all commercial and industrial areas of the City, HAL evaluated the existing development density in ERCs per acre. Future commercial and industrial areas were assumed to have a development density similar to existing areas. Density of residential areas was determined in consultation with City staff. The above analysis of density resulted in the following development densities for future planning, shown in Table 2-5.

Table 2-5: Development Densities

Land Use	ERC Density Per Acre
Agriculture (Placeholder for Future Residential/Mixed Use)	10
Commercial	5
Industrial Manufacturing	3
Low Density Residential	3
Medium Density Residential	10
Medium High Density Residential	15
Medium Low Density Residential	5
Mixed Use	5

The Nestlé USA campus was excluded from the analysis of industrial density because of its very high water use. It was assumed that it is not representative of future industrial development in Springville. Usage for the campus was assumed to stay at existing volumes and flow rates in the future.

Increases to the existing water usage and ERCs (other than for Nestlé) were projected at the growth rates shown in Figure 1-1, resulting in the projected ERCs shown in Table A-1 in Appendix A. In 2070 (the planning horizon or terminus of this master planning period), 35,572 ERCs are expected. This is an increase of 14,778 ERCs beyond the existing 20,794 ERCs. The estimate is based on current zoning and General Plan land use maps (shown in Appendix E), on plans for known future developments which HAL has reviewed, and on the development densities shown above. Springville is projected to reach full development after 2070. Although actual 2070 conditions may be different if zoning and density change significantly, the basic system layout plan developed by this study will help guide the construction of a responsible system. A breakdown of the existing and expected 2070 ERCs by pressure zone is shown in Table 2-6.

Table 2-6: Existing and Future ERCs

Zone	Existing ERCs	2070 ERCs
Bartholomew	56	75
Kelly/Jurd	167	180
Rotary	202	238
Cherrington	186	187
Hobble Creek	2,388	2,469
Lower Spring Creek	6,346	8,787
Westfields	6,081	18,227
Upper Spring Creek	51	51
Crandall	125	135
Klauck	218	249
Nestlé	4,974	4,974
Total	**20,794**	**35,572**

The majority of the anticipated growth is associated with large undeveloped parcels on the western side of the City. They are zoned for a mix of single-family houses and higher-density planned communities. From expected locations and densities of new development, HAL prepared an extended-period hydraulic model and engineering calculations to analyze 2070 conditions.

The City will continue to review individual developments through the Development Review Committee (DRC) process, including analyzing water source, storage, and transmission requirements for any usage that does not fit the typical requirements. Developments located in areas where the water system is not well connected should be analyzed individually to determine necessary pipe sizing in the development.

FUTURE IRRIGATED ACREAGE

Future irrigated acreage was calculated based on actual usage on existing land use types, projected land uses, and their associated proportions of irrigated acreage. Irrigated area based on lot size is shown in Table 2-7.

Table 2-7: Irrigated Acreage by Lot Size

Lot Size Min (sq ft)	Lot Size Max (sq ft)	Irrigated Area		Annual Volume[1] (ac-ft)
		(sq ft)	(acre)	
0	2,000	1,000	0.03	0.09
2,000	3,999	1,100	0.03	0.10
4,000	5,999	2,500	0.06	0.23
6,000	7,999	3,600	0.09	0.33
8,000	10,889	4,400	0.11	0.40
10,990	21,779	6,300	0.15	0.58
≥ 21,780		14,900	0.35	1.37

1. Irrigated areas incorporate green space/common space into each lot.
2. Annual volume calculated based on an outdoor level of service of 4 ac-ft per irrigated acre.

Estimated 2070 irrigated acreage is shown in Table 2-8.

Table 2-8: 2070 Irrigated Acreage

Zone	Total Irrigated Acreage	Served by Drinking Water System[1]	Served by PI System
Bartholomew	7	7	
Kelly/Jurd	14	14	
Rotary	85	85	
Cherrington	34	34	
Hobble Creek	364	364	
Lower Spring Creek	668	421	247
Westfields	1,120	74	1,046
Upper Spring Creek	7	7	
Crandall	18	18	
Klauck	32	32	
Nestlé[1]	40	2	38
Total	**2,388**	**1,057**	**1,331**

1. Includes Plat A and the Highline Canal. Excludes areas within the PI service area.

Only the irrigated acreage served by the drinking water system will be considered in this master plan. The irrigated acreage in the master-planned PI service area is addressed in a separate master plan. The findings and conclusions of this master plan are dependent on the PI system being constructed as shown in the PI master plan.

CHAPTER 3 WATER SOURCES

EXISTING WATER SOURCES

The Springville City drinking water system is supplied by seven drinking water wells and five springs, shown on Figure 1-2. For planning purposes, the City has requested that the analysis consider the lowest summer flows over the past five years as the reliable supply for springs to add an extra measure of safety and plan for future drought. These flows are included in Table 3-1. Well capacity has not been observed to significantly decrease during drought periods, so typical observed flows are shown from the wells.

Table 3-1: Existing Drinking Water Sources

Source	Zone	Flow Rate (gpm)	Annual Source Capacity[1] (ac-ft)
Bartholomew Springs	Rotary	1,000	1,060
Jurd Springs[2]	Jurd	n/a	n/a
Spring Canyon Springs	Upper Spring Creek	620	1,080
Konold Springs	Lower Spring Creek	160	230
Burt Springs	Hobble Creek	760	220
200 North Well	Lower Spring Creek	2,400	2,770
400 South Well #1	Lower Spring Creek	3,000	3,460
400 South Well #2	Lower Spring Creek	3,900	4,490
900 South Well	Hobble Creek	3,000	3,460
1000 South Well	Hobble Creek	550	630
Canyon Road Well	Hobble Creek	1,500	1,730
Evergreen Well[3]	Hobble Creek	350	400
Total Source Capacity		**17,240 gpm**	**19,530 ac-ft**
With Largest Well Out of Service		**13,340 gpm**	**15,040 ac-ft**

1. Annual well capacity assumes about 75% of the year-round flow at the given flow rate. Actual volume may be limited by demand or hydrologic constraints.
2. Jurd Springs is located near the Grindstone subdivision and Jurd tank, but the source is discharged directly into Hobble Creek. Flows are not metered.
3. Evergreen Well is not currently used but could be reintroduced into the system if needed. It could also be transferred to the pressurized irrigation system.

A summary of the water rights owned by Springville is included in Chapter 6. Existing water right capacity for the drinking water system is approximately 15,831 acre feet. Thus, water rights available exceed water available in the case shown in Table 3-1 with the largest well out of service.

PUMP STATIONS

Pump stations allow the City to supply water to zones that do not have their own sources and to supply zones from lower head zones. Springville has two pump stations whose service zones and pump capacity are summarized in Table 3-2.

Table 3-2: Springville City Pump Stations

<table>
<tr><th>Name</th><th>From</th><th>To</th><th>Total Capacity</th></tr>
<tr><td>Kelly's</td><td>Rotary Zone</td><td>Kelly Zone
Jurd Tank</td><td>200 gpm</td></tr>
<tr><td rowspan="2">Spring Creek Pumpback</td><td rowspan="2">Lower Spring Creek Tank</td><td>Upper Spring Creek Tank</td><td rowspan="2">3,300 gpm</td></tr>
<tr><td>Rotary Tank</td></tr>
</table>

EXISTING WATER SOURCE REQUIREMENTS

According to DDW standards (Section R309-510-7), water sources must be able to meet the expected water demand for two conditions:

1. Sources must be able to provide an adequate supply of water for the peak day demand (flow requirement).
2. Sources must be able to produce one year's supply of water, or the average yearly demand (volume requirement).

Because the pressurized irrigation system only provides water for a portion of the city's outdoor use, both indoor demand and outdoor demand are included in the drinking water system for areas not served by the PI system.

Outdoor demand is calculated based on the estimated irrigated area using the irrigation areas shown in Table 2.5.

Peak day and average yearly demand are calculated using the level of service criteria shown in Table 1-1 of this report. The level of service was established based on the DDW standard for minimum source and storage sizing, including computing the demand from an analysis of three years of actual water use data with an added factor of safety.

Existing Peak Day Demand

Peak day demand is the water demand on the day of the year with the highest water use. It is used to determine required source capacity under existing and future conditions. Based on the requirements shown in Table 1-1, the total peak day drinking water demand is 14,030 gpm (20.2 MGD). Table 3-3 summarizes the indoor and outdoor components of this demand.

Table 3-3: Existing Peak Day Demand

Indoor Connections (ERCs)	Peak Day Demand (gpm/ERC)	Indoor Peak Day Demand (gpm)	Irrigated Acres[1]	Peak Day Outdoor Demand (gpm/ irr-ac)	Peak Outdoor Demand (gpm)	Total Peak Day Demand (gpm)
20,794	0.18	3,750	1,209	8.5	10,280	14,030

1. Includes 260 acres that are planned to be served by the PI system.

A breakdown of the existing peak day demand by pressure zone is shown in Table 3-4.

Table 3-4: Existing Source Requirements by Pressure Zone

Zone	ERCs	Irrigated Acres[1]	Demand (gpm)
Bartholomew	56	5	50
Kelly/Jurd	167	13	140
Rotary	202	80	710
Cherrington	186	34	320
Hobble Creek	2,388	356	3,460
Lower Spring Creek	6,346	384	4,410
Westfields	6,081	247	3,200
Upper Spring Creek	51	7	70
Crandall	125	16	160
Klauck	218	28	280
Nestlé	4,974	39	1,230
Total	**20,794**	**1,209**	**14,030**
Total Supply Available			**17,240**
With Largest Well Out of Service			**13,340**

1. Includes 260 acres that are planned to be served by the PI system.

Not all sources are available to all pressure zones in the City. A mass balance matching sources to pressure zones is included in Appendix A as Table A-3. If all sources are in service, the mass balance shows that the existing sources can supply the existing peak day demand for each zone, with approximately 3,210 gpm capacity remaining in the system. With all the irrigated area planned to be supplied by the PI system removed from the drinking water system, the capacity remaining in the system is 5,420 gpm.

The City desires a level of redundancy that will allow the system to have sufficient source even if any of the wells are out of service. With existing usage (including customers planning to transition to the PI system) and with the largest well (3,900 gpm) out of service, the system would have a capacity deficit of 690 gpm. During a non-drought year, some additional capacity is likely available from the springs. However, to achieve full redundancy, an additional source should be added to the system. If all irrigated area planned to be served by the PI system were removed from the drinking water system, there would be 1,520 gpm excess capacity remaining in the system with the largest well out of service. The city plans to transition these customers to the PI system as soon as practicable, but this effort could still take 5 to 20 years, and some customers may have challenges transitioning systems. In addition, some Springville Irrigation Company (SIC) customers using SIC facilities to irrigate outdoor areas (garden tickets) are likely to be added to the drinking water system in the next 5 to 10 years. These garden ticket users could require as much as 400 gpm for peak day flows. It is recommended to add another source to the system to provide full redundancy for the existing system and these potential new uses.

It is also recommended that the City provide backup power for primary water sources sufficient to meet indoor water needs, including the springs and 400 South Well #2. A portable generator could be used to operate spring chlorinators during outages. A permanent generator could be considered at 400 South Well #2.

Each pressure zone will experience different impacts if a source is out of service. Table A-4 in Appendix A shows which sources are available to each zone. This table can be used to evaluate the effect of the loss of each source.

Existing Average Yearly Demand

Average yearly demand is the volume of water used during an entire year and is used to ensure the sources can supply enough volume to meet demand under existing and future conditions.

Based on the requirements shown in Table 1-1, the total existing average yearly demand is 11,070 acre-feet. Table 3-5 summarizes the indoor and outdoor components of this demand.

Table 3-5: Existing Average Yearly Demand

Indoor Connections (ERCs)	Average Yearly Indoor Demand LOS (ac-ft/ ERC)	Average Yearly Indoor Demand (ac-ft)	Irrigated Acres[1]	Average Yearly Outdoor Demand LOS (ac-ft/irr-ac)	Average Yearly Outdoor Demand (ac-ft)	Total Average Yearly Demand (ac-ft)
20,794	0.3	6,240	1,209	4.0	4,830	11,070

1. Includes 260 acres that are planned to be served by the PI system.

A breakdown of the existing average yearly demand by pressure zone is shown in Table 3-6.

Table 3-6: Existing Average Yearly Demand Requirements by Pressure Zone

Zone	ERCs	Irrigated Acres[1]	Demand (acre-feet)
Bartholomew	56	5	40
Kelly/Jurd	167	13	100
Rotary	202	80	380
Cherrington	186	34	190
Hobble Creek	2,388	356	2,140
Lower Spring Creek	6,346	384	3,440
Westfields	6,081	247	2,810
Upper Spring Creek	51	7	40
Crandall	125	16	100
Klauck	218	28	180
Nestlé	4,974	39	1,650
Total	**20,794**	**1,209**	**11,070**
Total Yearly Supply Available (ac-ft)			**19,530**
With Largest Well Out of Service			**15,040**

1. Includes 260 acres that are planned to be served by the PI system.

The current yearly supply available is sufficient to meet existing average yearly demand even with the largest well out of service.

FUTURE WATER SOURCE REQUIREMENTS

Future water source requirements were evaluated based on the same criteria as discussed above for existing water source requirements:

1. Sources must be able to provide an adequate supply of water for the peak day demand (flow requirement).
2. Sources must be able to produce one year's supply of water, or the average yearly demand (volume requirement).

The same conditions were used to evaluate the future source requirements as were used for the existing:

1. Peak day and average yearly demand are calculated using the level of service criteria shown in Table 1-1 of this report.
2. The level of service was set based on the DDW standard for minimum source and storage sizing, including computing the demand from an analysis of three years of actual water use data with an added factor of safety.
3. For all future development scenarios, the pressurized irrigation system is assumed to provide all outdoor demand for any areas within the PI service boundary.

As discussed in Chapter 2 of this report, this master plan covers the planning period through 2070, when the City is projected to reach 35,572 ERCs and approximately 70,000 population. The majority of this growth will occur in the Lower Spring Creek and Westfields pressure zones, with relatively little growth occurring in the areas east of 400 West. The majority of future development is located within the PI service zone boundary, resulting in very little increase in the outdoor irrigated acreage served by the drinking water system.

The City will likely continue to expand beyond the projected 2070 level of development as areas continue to fill in and redevelopment occurs. Detailed analysis of development beyond 2070 is beyond the scope of this master plan.

Future Peak Day Demand

Following the methodology described for existing conditions and estimating 35,572 ERCs in 2070, the peak day source requirement is projected to be 15,410 gpm (22.2 MGD). See Table 3-7.

Table 3-7: 2070 Peak Day Demand

Indoor Connections (ERCs)	Peak Day Demand (gpm/ERC)	Indoor Peak Day Demand (gpm)	Irrigated Acres[1]	Peak Day Outdoor Demand (gpm/ irr-ac)	Peak Outdoor Demand (gpm)	Total Peak Day Demand (gpm)
35,572	0.18	6,420	1,057	8.5	8,990	15,410

1. Excludes areas planned to be served by the PI system.

A breakdown of the 2070 peak day demand by pressure zone is shown in Table 3-8.

Table 3-8: 2070 Source Requirements by Pressure Zone

Zone	ERCs	Irrigated Acres[1]	Demand (gpm)
Bartholomew	75	7	70
Kelly/Jurd	180	14	150
Rotary	238	84	760
Cherrington	187	34	320
Hobble Creek	2,469	364	3,540
Lower Spring Creek	8,787	421	5,170
Westfields	18,227	74	3,920
Upper Spring Creek	51	7	70
Crandall	135	18	180
Klauck	249	32	320
Nestlé[1]	4,974	2	910
Total	**35,572**	**1,057**	**15,410**
Total Supply Available			**17,240**
With Largest Well Out of Service			**13,340**

1. Excludes areas planned to be served by the PI system.

Under 2070 conditions, if all sources are in service there is a projected source capacity excess of 1,830 gpm based on the capacity of all the existing sources, including the Evergreen Well and 400 South Well #2. This capacity is sufficient to meet the requirements stated herein if all sources are in service but is not sufficient to provide redundancy if one of the City's wells pumping larger than 1,830 gpm is out of service. Evergreen Well could potentially be transferred to the pressurized irrigation system. An additional well or increased flow from an existing source is required to provide this redundancy. It is unlikely that existing sources can reliably provide this much additional flow, so an additional well is recommended to provide this redundancy. As discussed previously, SIC users transitioning to the drinking water system are likely to increase the peak day demand of the system.

As with existing conditions, not all sources are available to all pressure zones in the City. The general pattern of the source mass balance shown as Table A-3 in Appendix A for existing conditions will continue to function for 2070 conditions, with 400 South Well #2 being used to provide source capacity for the Lower Spring Creek and Westfields zones. Similarly, Table A-4 in Appendix A will still apply for future conditions and can be used to evaluate the effect of the loss of each source.

Future Average Yearly Demand

Following the methodology described for existing conditions and estimating 35,572 ERCs in 2070, the average yearly source requirement is projected to be 14,900 ac-ft. See Table 3-9.

Table 3-9: 2070 Average Yearly Demand

Indoor Connections (ERCs)	Average Yearly Indoor Demand (ac-ft/ ERC)	Average Indoor Yearly Demand (ac-ft)	Irrigated Acres[1]	Average Yearly Outdoor Demand (ac-ft/ irr-ac)	Average Yearly Outdoor Demand[1] (ac-ft)	Total Average Yearly Demand (ac-ft)
35,572	0.3	10,670	1,102	4.0	4,410	14,900

1. Excludes areas planned to be served by the PI system.

A breakdown of the 2070 average yearly demand by pressure zone is shown in Table 3-10.

Table 3-10: 2070 Average Yearly Demand Requirements by Pressure Zone

Zone	ERCs	Irrigated Acres[1]	Demand (acre-feet)
Bartholomew	75	7	50
Kelly/Jurd	180	14	110
Rotary	238	84	410
Cherrington	187	34	190
Hobble Creek	2,469	364	2,200
Lower Spring Creek	8,787	421	4,320
Westfields	18,227	74	5,770
Upper Spring Creek	51	7	40
Crandall	135	18	110
Klauck	249	32	200
Nestlé	4,974	2	1,500
Total	**35,572**	**1,057**	**14,900**
Total Yearly Supply Available (ac-ft)			**19,530**
With Largest Well Out of Service			**15,040**

1. Excludes areas planned to be served by the PI system.

The current yearly supply available is sufficient to meet anticipated future average yearly demand. However, the City is encouraged to keep acquiring water rights at levels required in City Code and to develop sources to provide redundancy. The City currently has a metered two-way emergency interconnection with Spanish Fork. Additional emergency interconnections with Mapleton and Provo could also provide redundancy.

FUTURE WATER SOURCES AND RECOMMENDATIONS

The City plans to continue to use spring sources to the maximum extent possible, including redeveloping springs as needed. The City is considering moving water rights to Bartholomew Springs to allow the City to fully utilize the flow from Bartholomew Springs when it is available in high water years. If this effort is successful, this will reduce the need for future wells in high water years. It is recommended that the City continue to pursue the transfer of water rights to Bartholomew Springs.

The City's existing source capacity with all sources in service is sufficient to meet the peak day demand and annual volume requirements discussed herein, but with little redundancy. If the largest well is out of service, the City may not have sufficient source capacity to meet the peak day demand. Additionally, Evergreen Well could be transferred from the drinking water system to the pressurized irrigation system, and some SIC users could transition outdoor watering to the drinking water system. An additional source is recommended to meet existing needs with redundancy. As source demand increases over time, an additional source to provide redundancy will become increasingly critical. Additionally, older wells can reduce production or stop producing over time due to a variety of reasons including biofouling and chemical encrusting. It is recommended that an additional well be added to the system within the next five years. A recommended potential location is near the existing 900 South Well. Budgeting for and development of additional wells should continue to be pursued to replace wells as they age. It is recommended that the City install permanent generators at new or rehabilitated wells.

One or more wells in the Westfields zone may be beneficial, allowing the city to avoid pumping water higher than necessary and wasting energy as the water flows through PRVs to the Westfields zone. However, past experience suggests that well production decreases moving westward in Springville. If a good producing well can be located in the Westfields zone, it would be beneficial as a peaking source on high demand days.

It is recommended that the City pursue installing metered two-way emergency interconnections with Mapleton and Provo, to provide redundancy and increase fire flow in the far reaches of the system (discussed in Chapter 5.)

CHAPTER 4 WATER STORAGE

EXISTING WATER STORAGE

The City's existing drinking water system includes nine concrete storage facilities with a total capacity of **15.57 MG**. Their locations are shown on Figure 1-2. Table 4-1 presents a listing of the names and select attributes of the City water storage tanks. Tanks are grouped into four service areas, and volume for fire suppression and emergency storage is distributed among the four tank groups. Fire suppression storage is balanced among the tanks so that the maximum fire flow is available at any point in the city from a tank in the same pressure zone or upstream.

Table 4-1: Existing Storage Tanks

Tank Name	Diameter (ft)	Nominal Volume (MG)	Base/ Outlet Elevation	Emergency Storage Volume (gallons)	Fire Suppression Volume (gallons)	Lowest Level of Equalization Volume (Elevation)	Overflow Elevation
Bartholomew	118	1.5	6219.2	400,000	240,000	7.8 (6,227.0)	6238.2
Jurd Springs	50	0.25	5262.0	20,000	120,000	9.5 (5,271.5)	5282.0
Rotary	135	2.0	5091.9	300,000	300,000	5.6 (5,097.5)	5114.4
Upper Spring Creek	135	2.0	5111.1	100,000	270,000	3.5 (5,114.6)	5132.6
Lower Spring Creek 1	110	1.0	4804.8	0	0	0 (4,804.8)	4818.9
Lower Spring Creek 2	124	2.0	4794.3	430,000	60,000	5.5 (4,799.7)	4817.3
Lower Spring Creek 3	150	3.0	4794.0	670,000	90,000	5.8 (4,799.7)	4817.2
Hobble Creek 1	140	2.0	4878.2	0	0	0 (4878.2)	4898.2
Hobble Creek 2	140	2.0	4874.2	50,000	120,000	3.0 (4877.2)	4898.0
Total		**15.75**		**2,020,000**	**1,320,000**		

EXISTING WATER STORAGE REQUIREMENTS

According to DDW standards outlined in Section R309-510-8, storage tanks must be able to provide: 1) equalization storage volume to make up the difference between source and demand; 2) fire suppression storage to supply water for firefighting; and 3) emergency storage, if deemed necessary. Each of the requirements is addressed below. Because the pressurized irrigation system only provides water for a portion of the City's outdoor use, both indoor demand and outdoor demand are included for customers not connected to the PI system.

Equalization Storage

As shown in Table 1-1, Springville has planned for a level of service of 230 gpd/ERC of equalization storage for indoor use and 6,120 gpd/irr-ac of equalization storage for outdoor use, with irrigated acreage as shown in Table 2-8. With 20,794 ERCs and 1,209 irrigated acres under existing conditions, Springville needs 12.18 MG of equalization storage in its existing drinking water system. Table 4-2 lists the equalization storage requirement by pressure zone.

Table 4-2: Existing Drinking Water Equalization Requirements

Pressure Zone	ERCs	Irrigated Acres	Equalization (MG)
Bartholomew	56	5	0.04
Kelly/Jurd	167	13	0.12
Rotary	202	80[1]	0.54
Cherrington	186	34	0.25
Hobble Creek	2,388	356	2.73
Lower Spring Creek	6,346	384[2]	3.81
Westfields	6,081	247[3]	2.91
Upper Spring Creek	51	7	0.05
Crandall	125	16	0.13
Klauck	218	28	0.22
Nestlé	4,974	39[4]	1.38
Total	**20,794**	**1,209**	**12.18**

1. Includes the Highline Canal service area.
2. Includes approximately 211 irrigated acres within the PI system service zone.
3. Includes approximately 12 irrigated acres within the PI system service zone.
4. Includes approximately 37 irrigated acres within the PI system service zone.

Fire Suppression Storage

Fire suppression storage is required for water systems that provide water for firefighting (Subsection R309-510-8(3)). The local fire authority determines the need for fire suppression storage. Springville's Fire Chief and Fire Marshal have consulted with City Engineering staff and have provided fire flow rate and duration requirements based on the International Fire Code (IFC). The contact information for the Springville Fire department is as follows:

Fire Marshal: Scott Nagle
Phone: 801-491-5602
Address: 75 West Center Street, Springville, Utah

Storage was allocated to each tank according to requirements for fire suppression flow during peak day conditions, considering that fire flow may be supplied by storage in upstream zones. Fire suppression storage was determined based on the following assumptions:

- Typical residential fire flow east of 400 West/Highway 89/Highway 51 (boundary shown on Figure 1-2) – 1,000 gpm for 2 hours (0.12 MG)
- Typical residential fire flow west of 400 West/Highway 89/Highway 51 (boundary shown on Figure 1-2) – 1,500 gpm for 2 hours (0.18 MG)
- Non-Residential Fire Flow – minimum 2,000 gpm for 2 hours (0.24 MG), and can increase depending on building size, building type, and sprinkling system

Some buildings may require approved sprinkling systems to reduce their fire flow requirement to the flow rates available. All new buildings should be constructed to meet these requirements.

Table 4-3 summarizes the fire suppression storage assumed in each storage facility. As described in the Source chapter of this report, one tank group can supply multiple pressure zones in the City. The table shows which pressure zones are directly supplied by which tank and which tank groups are downstream. For example, the Rotary tank and Hobble Creek tank group are located downstream of the Bartholomew tank, so it is assumed that fire requirements in the Hobble Creek pressure zone can be met by a combination of fire storage from all these tanks. In a fire situation, water will be pulled from multiple tanks as the system demands increase. As future storage tanks are constructed, additional fire storage can be provided in those tanks to provide fire storage closer to locations of potential fire demand.

The Upper Spring Creek, Crandall, Klauck, Rotary, and Cherrington pressure zones contain only residential zoning, and storage for these zones is based on the residential fire flow requirements above, as well as storage needed for other zones downstream. Most large buildings in the City include fire sprinkler systems and will not require flows larger than 2,000 gpm. Storage for the Hobble Creek, Nestlé, and Westfields pressure zones is based on a 2,000 gpm fire suppression requirement. The largest fire flow requirement in the Lower Spring Creek pressure zone is 5,000 gpm, and storage for this zone was provided to meet this higher flow rate.

The distribution system evaluation in commercial and industrial areas is generally based on the 2,000 gpm non-residential requirement noted above, except at specific locations where larger required fire flows have been identified. The distribution system is discussed in Chapter 5 of this report.

Table 4-3: Existing Fire Suppression Storage by Tank Group

Tank	Pressure Zones Supplied	Other Tank Groups Downstream	Fire Suppression Storage (MG)
Bartholomew	Bartholomew	All	0.24
Jurd Springs	Kelly's, Jurd	None	0.12
Rotary	Rotary, Cherrington	Hobble Creek, Lower Spring Creek	0.30
Upper Spring Creek	Upper Spring Creek, Crandall, Klauck	Lower Spring Creek	0.27
Lower Spring Creek 1[2]	Lower Spring Creek, Nestlé[1], Westfields	None	0.15
Lower Spring Creek 2[2]			
Lower Spring Creek 3[2]			
Hobble Creek 1	Hobble	None	0.24
Hobble Creek 2			
Total			**1.32 MG**

1. Fire storage for the Nestlé zone is provided in the Upper Spring Creek, Hobble, Rotary, and Bartholomew tanks via interconnects to the Lower Spring Creek zone.
2. Fire storage for the Lower Spring Creek and Westfields zones is provided in the Upper Spring Creek, Bartholomew, Rotary, Hobble Creek, and Lower Spring Creek tanks, totaling 1.2 MG (5,000 gpm for 4 hours).

Emergency Storage

While there are no specific DDW requirements for emergency storage (Subsection R309-510-8(4)), most water systems maintain emergency storage to mitigate risks, provide system reliability, and protect public health and welfare. Emergency storage may be used in case of pipeline failures, equipment failures, power outages, source contamination, and natural disasters.

Springville has planned for a total of approximately 2,000,000 gallons between all the tanks within the City in both existing and future conditions. As future storage tanks are constructed, additional emergency storage can be provided in those tanks to provide emergency storage closer to locations of potential need.

Total Storage

A total of 15.52 MG equalization, fire suppression, and emergency storage is required, as shown in Table 4-4.

Table 4-4: Existing Storage Requirements

Component	Volume (MG)
Equalization[1]	12.18
Fire Suppression	1.32
Emergency	2.02
Total	**15.52**

1. Includes the Highline Canal service area and 260 acres that are planned to be served by the PI system.

The current tanks have a capacity of 15.75 MG, and there is considered to be **no additional storage required** to meet current requirements. Similar to the source mass balance shown in Chapter 3 of this report, not all storage tanks are able to serve all pressure zones in the City. An existing storage mass balance is included as Table A-5 in Appendix A. If all the irrigated area planned to be served by the PI system were removed from the drinking water system, there would be 1.82 MG excess capacity remaining in the storage tanks.

FUTURE WATER STORAGE REQUIREMENTS

As described previously in this report, all area within the PI service zone boundary is assumed to be serviced by the PI system for outdoor watering in all future scenarios. The future requirements cover the planning period through 2070, which primarily occurs in the Lower Spring Creek and Westfields pressure zones, with scattered development in other pressure zones. The City will likely continue to expand beyond the projected 2070 level of development. Detailed analysis of storage for this development is beyond the scope of this master plan.

Equalization Storage

Following the methodology described for existing conditions, and calculating 35,572 ERCs in 2070, the projected indoor equalization storage requirement per the standards shown in Table 1-1 is 8.18 MG. The projected equalization storage requirement for outdoor use is 6.47 MG, for a total of 14.65 MG of storage. Table 4-6 lists the equalization storage requirement by pressure zone.

Table 4-5: 2070 Drinking Water Equalization Requirements

Zone	ERCs	Irrigated Acres[1]	Equalization (MG)
Bartholomew	75	7	0.06
Kelly/Jurd	180	14	0.13
Rotary	238	84	0.57
Cherrington	187	34	0.25
Hobble Creek	2,469	364	2.80
Lower Spring Creek	8,787	421	4.60
Westfields	18,227	74	4.65
Upper Spring Creek	51	7	0.05
Crandall	135	18	0.14
Klauck	249	32	0.25
Nestlé	4,974	2	1.16
Total	**35,572**	**1,057**	**14.65**

1. Excludes areas planned to be served by the PI system.

Fire Suppression Storage

Fire suppression storage is assumed to remain similar to current conditions, as shown in Table 4-3. Volumes may be shifted among tanks, as long as the tank can supply the zones indicated. Up to 1 MG volume for fire suppression can be provided in each new tank, even if other tanks can provide fire flow, so that fire suppression is available close to the area of need.

Emergency Storage

It is recommended that new tanks provide 500,000 gallons or more emergency storage in each tank.

Total Storage

A total of 17.99 MG equalization, fire suppression, and emergency storage is required in 2070, as shown in Table 4-7.

Table 4-6: 2070 Storage Requirements

Component	Volume (MG)
Equalization	14.65
Fire Suppression	1.32
Emergency	2.02
Total	**17.99**

1. Excludes areas planned to be served by the PI system.

As described in the existing storage section of this report, not all storage tanks are available to serve all pressure zones in the city. A mass balance for 2070 storage requirements is included in Appendix A as Table A-6.

The mass balance shows that 2.24 MG additional storage (beyond existing) is required to meet 2070 requirements. Additional storage could be provided to add fire suppression and emergency volumes closer to areas of need as described previously in this chapter.

EXISTING AND FUTURE WATER STORAGE RECOMMENDATIONS

The City currently requires 15.52 MG of drinking water storage. All the irrigated area within the PI system service area is planned to be irrigated by the PI system. This will lower the existing storage requirement to 10.59 MG. The City will need a total of 17.99 MG of drinking water storage in 2070. A total of 15.75 MG storage has already been constructed. An additional 2.24 MG of storage is needed to meet 2070 requirements. Potential locations for future drinking water storage tanks are shown on the Figure 4-1, Drinking Water Master Plan Map and Capital Facilities Plan, located at the end of this chapter. Table 4-8 gives the approximate years additional storage will be needed assuming all the irrigated area planned to be served by the PI system is moved off the drinking water system. Additional storage may be needed sooner if development occurs faster than assumed for this Master Plan.

Table 4-7: Approximate Timeline for Additional Storage

Volume of Storage	Approximate Year Additional Storage is Needed
Existing Storage	2036
Additional 3.0 MG Beyond Existing	2070

As development increase in the Westfields zone, the next tank recommended is a 3+ MG tank located at or near Evergreen Cemetery or Big Hollow Park, due to its proximity to the Westfields zone and new development in the south portion of the city. The tank may need to be larger than 3 MG to account for post-2070 development that is not part of the scope of this master plan.

POTENTIAL LOCATIONS FOR THE NEXT STORAGE TANK

A tank for the Westfields zone would need to be located at elevation 4680 or higher to allow the tank to be buried while maintaining 50 psi or higher in the Westfields zone. The Westfields zone currently operates at a pressure of 75 psi or higher, so a tank at the following locations would require a reduction in pressure in the zone. The following locations were evaluated:

Child Park/Nebo School District Property/Springville Junior High – 200 South 1470 East
A tank at one of these locations would require 12,500 feet of transmission piping to reach the Westfields zone via 400 South. The tank could be buried and Child Park restored on top of the tank to maintain park space. The Nebo School District property west of the intersection of 300 South 1470 East is slightly higher in elevation and would allow slightly higher pressures in the Westfields zone. A third option would be to locate the tank in the hill east of Springville Junior High. This would allow still higher pressures in the Westfields zone.

There is already a major transmission line into the Westfields zone on 400 South. Adding a transmission line for the tank on 400 South would reduce usage of the existing 400 South transmission line. It is possible that one of the existing transmission lines could be used to supply the Westfields zone from this tank.

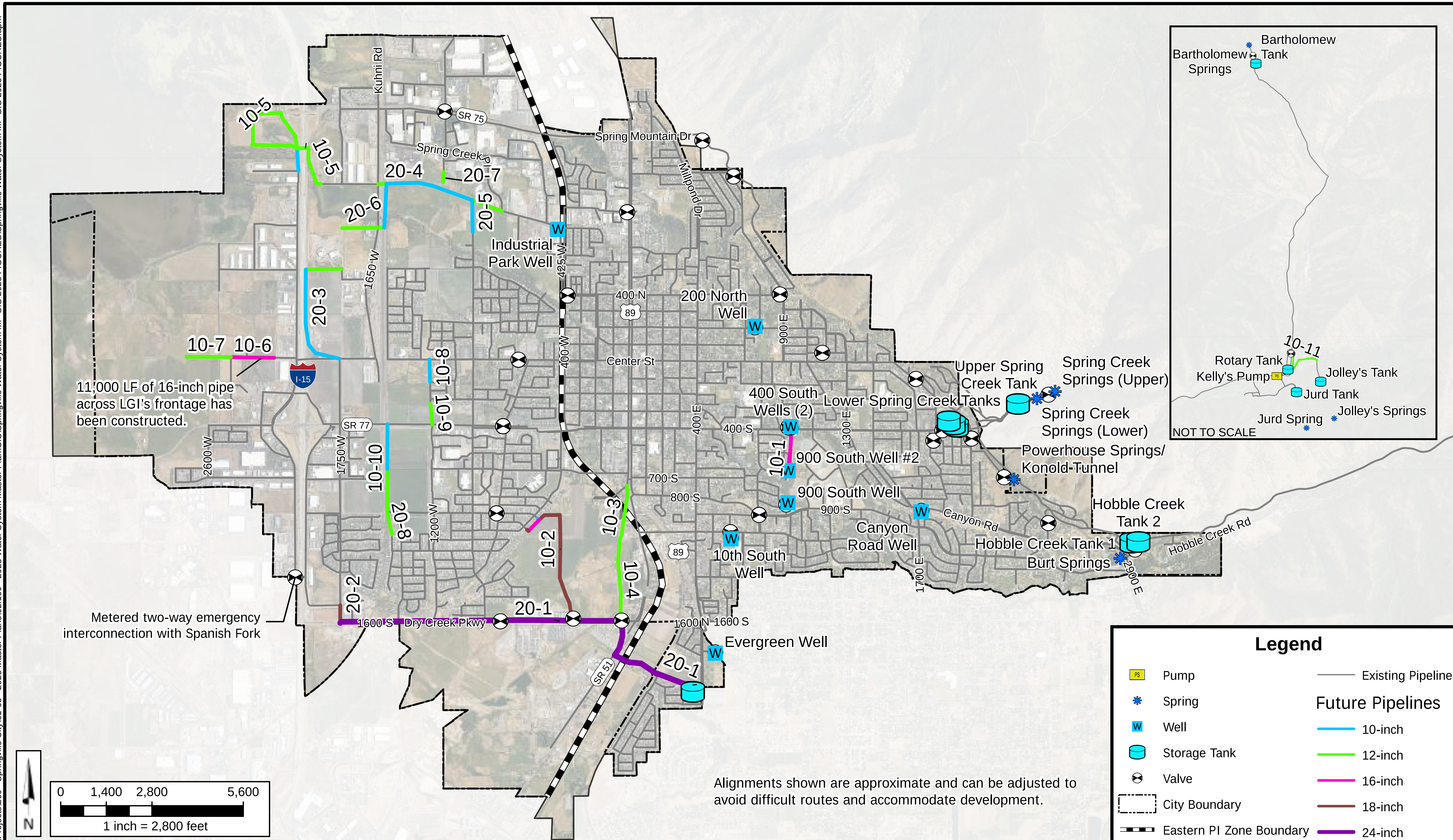
The tank is 3,600 feet away from the 400 South wells and 4,500 feet from the 200 North well. The tank could be filled from either of these sources, with a new transmission line from the well to the tank, or a new source could be located near the tank.

Evergreen Cemetery/Big Hollow Park – 400 East 2000 South
A tank in the eastern portion of the city-owned property at the cemetery would provide sufficient pressure in the Westfields zone. Big Hollow Park, located just south of the cemetery near 400 East Evergreen Road, is another possible tank location. Either location would require about 12,000 feet transmission piping to reach 1750 West in the Westfields zone via Evergreen Road and 1600 South.

The tank could be partially filled from the existing Evergreen well, but customers supplied from this well have experienced aesthetic concerns. Another source should be used to fill the tank, or to dilute water from the Evergreen well. It is likely that a new well drilled near the existing well would experience the same concerns. The tank site is 5,300 feet away from the existing 1000 South well, which is low producing, and about 8,500 feet from the 900 South well, which has a higher production rate. It is assumed that another well can be drilled near the 900 South well and that source from the Lower Spring Creek zone can be used to supply the tank along with Evergreen well.

Table 4-8: Transmission Line Distance to Service Zones

Tank Location		Distance to Westfields Zone (ft)
Child Park/Nebo/Springville Junior High	200-300 South 1470 East	12,500
Evergreen Cemetery/Big Hollow Park	400 East 2000 South	12,600



HANSEN ALLEN & LUCE INC ENGINEERS

SPRINGVILLE CITY
DRINKING WATER SYSTEM MASTER PLAN

CAPITAL FACILITY PROJECTS

FIGURE 4-1

Date: 1/8/2026
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CHAPTER 5 WATER DISTRIBUTION

HYDRAULIC MODEL

Development

A computer model of the City's drinking water distribution system was developed to analyze the performance of the existing and future distribution system and to prepare solutions for existing facilities not meeting the distribution system requirements. The model was developed with the software InfoWater Pro 2026.1 (Innovyze, 2025). InfoWater simulates the hydraulic behavior of pipe networks. Sources, pipes, tanks, valves, controls, and other data used to develop the model were obtained from GIS data of the city's drinking water system and other updated information supplied by the City.

HAL developed models for two phases of drinking water system development. The first phase was a model representing the existing system (existing model). This model was used to calibrate the model and identify deficiencies in the existing system. Calibration was performed by comparing model results to system information gathered by City personnel. Calibration data is included in Appendix B.

The second phase was a model representing future conditions and the improvements necessary to accommodate growth. The future model represents the level of growth projected to be reached by 2070 (Planning Horizon model) and includes 35,572 ERCs and 1,102 irrigated acres.

Model Components

The two basic elements of the model are pipes and nodes. A pipe is described by its inside diameter, length, minor friction loss factors, and a roughness value associated with friction head losses. A pipe can contain elbows, bends, valves, pumps, and other operational elements. Nodes are the endpoints of a pipe and can be categorized as junction nodes or boundary nodes. A junction node is a point where two or more pipes meet, where a change in pipe diameter occurs, or where flow is added (source) or removed (demand). A boundary node is a point where the hydraulic grade is known (a reservoir, tank, or PRV). Other components include tanks, reservoirs, pumps, valves, and controls.

The model is not an exact replica of the actual water system. Pipeline locations used in the model are approximate and not every pipeline may be included in the model, although efforts were made to make the model as complete and accurate as possible. Moreover, it is not necessary to include all of the distribution system pipes in the model to accurately simulate its performance. The model includes all known distribution system pipes of all sizes, as well as all sources, storage facilities, pump stations, pressure reducing valves, control valves, controls, and settings.

<u>Pipe Network</u>

The pipe network layout originated from GIS data provided by the City. Elevation information was obtained from the GIS data provided by the City. Smaller 8-inch and 10-inch pipes are generally PVC. Hazen-Williams roughness coefficients for pipes in this model ranged from 130 - 150, which is typical for these pipe materials in modeling software (Rossman 2000, 31).

The existing water system contains approximately 221 miles of pipe with diameters of 4 inches to 30 inches. Figure 5-1 presents a summary of pipe length by diameter.

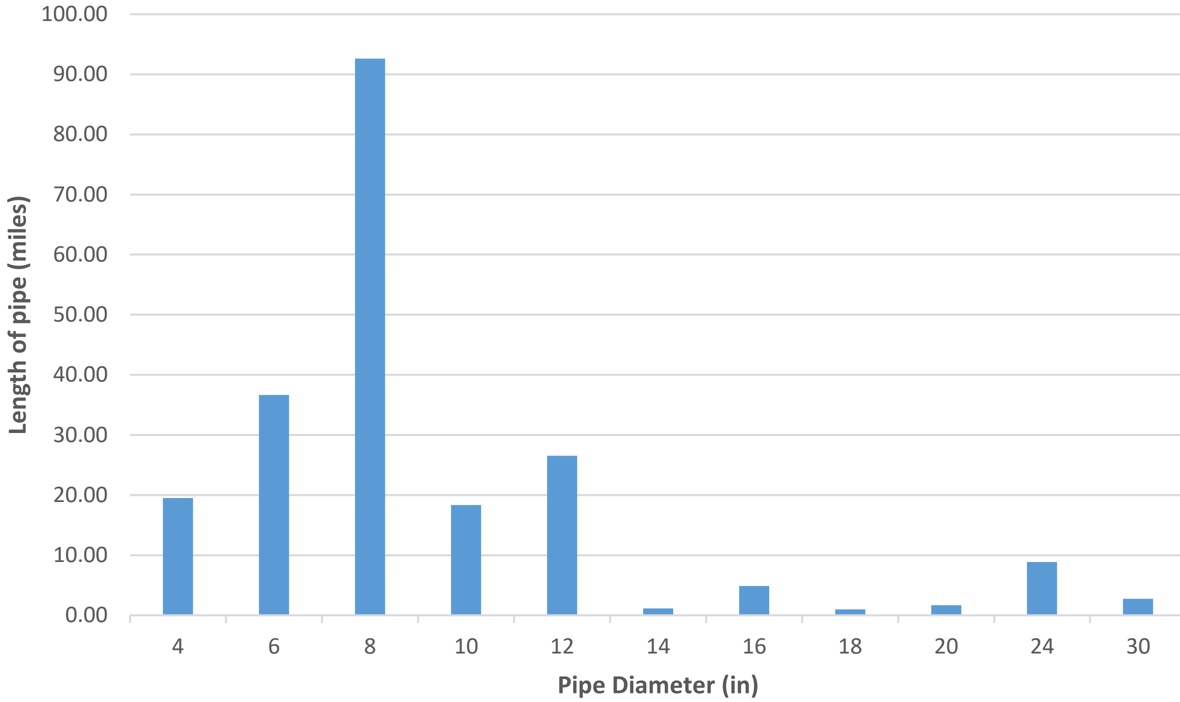


Figure 5-1: Summary of Pipe Length by Diameter

<u>Water Demands</u>

Water demands were allocated in the model based on billed usage and billing locations. Peak month demand was determined for each billing location and linked to the geocoded physical locations for each customer. The geocoded demands were then assigned to the closest model node. With the proper spatial distribution, demands were scaled to reach the peak day demand determined in Chapter 3. For the 2070 model, future demands were estimated according to current zoning and densities and the established level of service, as described previously in this report. Future demands were assigned to new nodes representing the expected location of new development in each pressure zone.

The pattern of water demand over a 24-hour period is called the diurnal curve or daily demand curve. The diurnal curve for this master plan was taken from a system optimization study done in 2014 and is the same diurnal curve used in the City's 2018 Drinking Water Master Plan. This curve was validated using current SCADA data. The diurnal curve for this study has a peaking factor of 1.5. The diurnal curve was input into the model to simulate changes in the water system throughout the day.

In summary, the spatial distribution of demands followed geocoded water use data, the flow and volume of demands followed the level of service standards described in Chapter 1, and the temporal pattern of demand followed a diurnal curve developed from SCADA data.

<u>Water Sources and Storage Tanks</u>

The sources of water in the model are the wells and springs. A well is represented by a reservoir and pump. A spring is represented by a reservoir and a flow control valve, or a reservoir and a pump in cases where that is more appropriate. Tank location, height, diameter, and volume are represented in the model. The extended-period model predicts water levels in the tanks as they fill from sources and as they empty to meet demand in the system.

ANALYSIS METHODOLOGY

HAL used extended-period and steady-state modeling to analyze the performance of the water system with current and projected future demands. An extended-period model represents system behavior over a period of time: tanks filling and draining, pumps turning on or off, pressures fluctuating, and flows shifting in response to demands. A steady-state model represents a snapshot of system performance. The peak day extended period model was used to set system conditions for the steady-state model, calibrate zone to zone water transfers, analyze system controls and the performance of the system over time, and to analyze system recommendations for performance over time. The steady-state model was used for analyzing the peak day plus fire flow conditions.

Two operating conditions were analyzed with the extended period model: peak day conditions and peak instantaneous conditions. Peak day plus fire flow conditions were analyzed using a static model. Each of these conditions is a worst-case situation so the performance of the distribution system may be analyzed for compliance with DDW standards and City preferences.

Existing Peak Day Conditions

The DDW requires that a minimum pressure of 40 psi must be maintained during peak day demand (Subsection R309-105-9(2)). Springville City's designated level of service indicates that 50 psi should be maintained. Peak day demand was evaluated at the level of service of 0.18 gpm/ERC for indoor use and 8.5 gpm/irr-ac for outdoor use, as shown in Table 1-1. This amounts to an existing peak day demand of 14,320 gpm. The hydraulic model indicates that the system is capable of providing at least 40 psi at nearly every point of connection in the system at this level of demand. The paragraphs below describe all locations not meeting Springville's current designated level of service.

Peak Day Pressure < 50 psi

Canyon Road, 2175 East to 2900 East – These points of connection are at the top of the Hobble Creek pressure zone. Each point achieves 29-34 psi. Peak Day pressure meets State Code R309-105-9(1) which requires points of connection constructed before 2007 to achieve a minimum of 20 psi. While pressures meet requirements, customers could be served from the northern Rotary Zone line in Canyon Road to provide higher pressures.

Spring Oaks Drive – Points of connection on the highest switchback in the Spring Oaks subdivision achieve a minimum of 48 psi. No projects are recommended to improve pressure, though possible improvements are discussed in the fire flow section below.

Existing High Pressure Conditions

Some areas in the system experience high pressures, which are greatest during the lowest demand times. The lower (typically downhill/westerly) portions of several zones experience pressures over 110 psi during typical operating conditions, as shown in Table 5-2. None of these locations exceed the DDW maximum pressure of 150 psi.

Table 5-2: High Pressure Conditions

Pressure Zone	Maximum Pressure
Hobble	125 psi
Upper Spring Creek	140 psi
Nestlé	133 psi
Lower Spring Creek	124 psi

The City should continue to require individual PRVs for each new customer connection, particularly in these areas. No pressure changes are recommended for the zones experiencing high pressures, because this would reduce pressures in the upper portions of those zones to levels below the minimum desired. No capital projects are recommended to mitigate high pressures.

Existing Peak Instantaneous Conditions

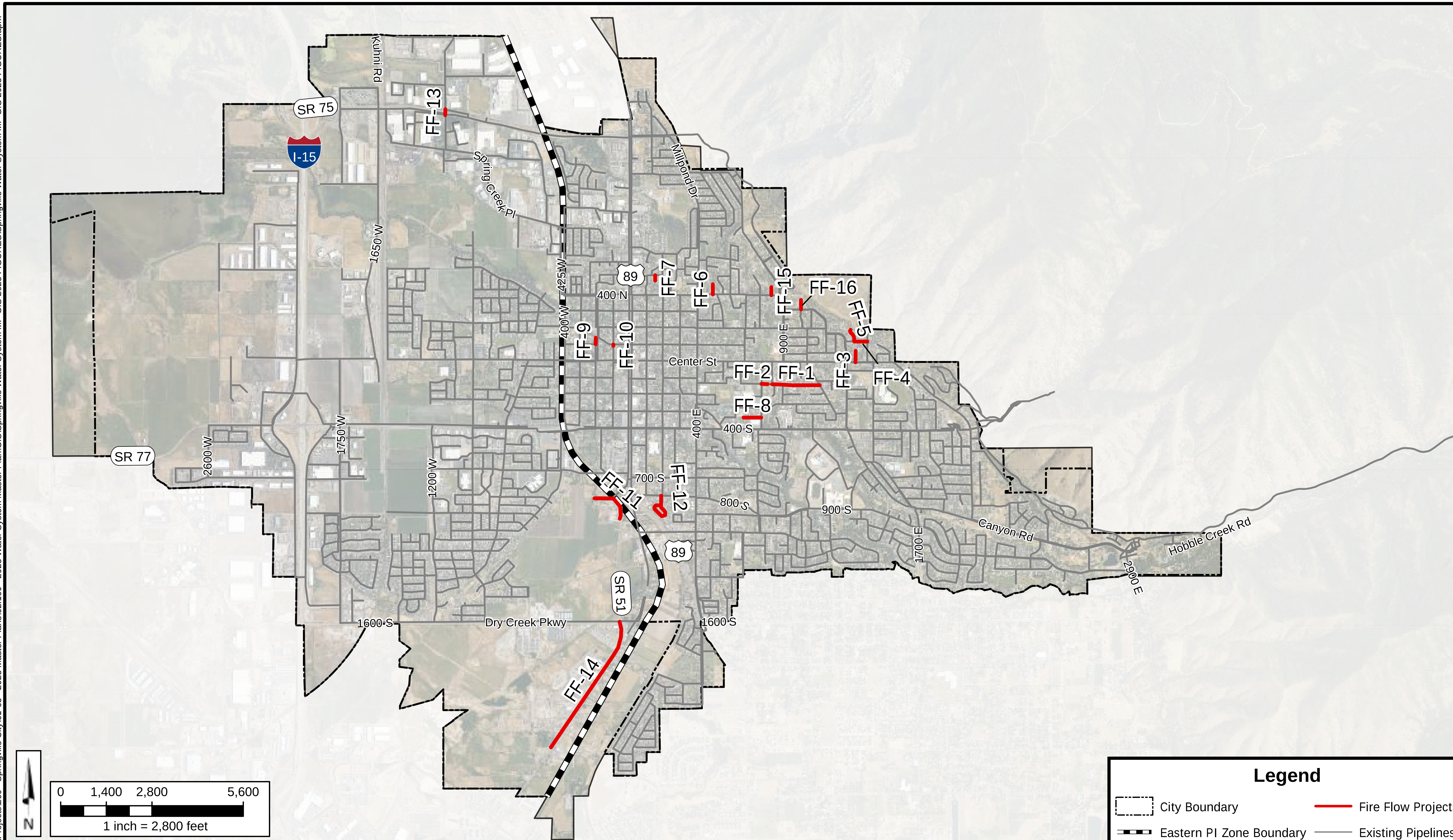
A minimum pressure of 30 psi must be maintained during peak instantaneous demand (Subsection R309-105-9(2)). Peak instantaneous demand was defined based on SCADA data for the peak day demand in Springville. The highest peaking factor present on the peak day was 1.5, resulting in a peak instantaneous demand of 21,050 gpm. The hydraulic model indicates that the system is capable of providing at least 30 psi at every point of connection in the system at this level of demand. There are no existing deficiencies in the system for this demand condition.

Existing Peak Day plus Fire Flow Conditions

A minimum pressure of 20 psi must be maintained while delivering fire flow to a particular location within the system and supplying the peak day demand to the entire system (Subsection R309-105-9(2)). As specified by the Springville Fire Marshal, a minimum fire flow of 1,000 gpm is required for all fire hydrants in residential areas east of 400 West, and 1,500 gpm is required for all residential areas west of 400 West. A fire flow of 2,000 gpm is required for all commercial and industrial areas.

The Available Fire Flow map in Appendix C shows fire flow available at nodes throughout the entire system. Identifying every pipe which is not capable of supplying the required fire flow is beyond the scope of this study. The computer analysis should not replace physical fire flow tests at fire hydrants as the primary method of determining fire flow capacity. The following locations did not meet the desired flows.

Residential <1,000 or 1,500 gpm; Non-Residential < 2,000 gpm
Locations throughout the City experiencing fire flows below desired level of service (less than 1,000 for residential areas east of 400 West, less than 1,500 gpm for residential areas west of 400 West, or less than 2,000 gpm for commercial/industrial areas) are shown on the Available Fire Flow map. The majority of these are cul-de-sacs or long dead-end lines with 4-inch or 6-inch pipe sizes. Projects to increase fire flow at these locations are shown in Table 5-3 and numbered on Figure 5-2. The costs for projects shown as alternates are not included in table totals.



HANSEN ALLEN & LUCE INC ENGINEERS

SPRINGVILLE CITY
DRINKING WATER SYSTEM MASTER PLAN

FIRE FLOW PROJECTS

FIGURE 5-2

Date: 10/30/2025
Document Path: H:\Projects\260 - Springville City\61-63 - 2025 Master Plans\62.100 - 2025 Water System Master Plan\GIS\Springville Water System MP GIS 2025 FIGURES\Springville Water System MP GIS 2025 FIGURES.aprx

Table 5-3: Projects to Resolve Low Fire Flow
Residential East of 400 West < 1,000 gpm
Residential West of 400 West < 1,500 gpm
Non-Residential < 2,000 gpm

Location		Description	Solution	Length	Cost
Projects 1 or 2 mitigate several locations between 800 East and 1300 East, from Center Street to 400 South					
FF-1	100 South, 860 East to Canyon Avenue	4-inch line	Upsize to 8-inch	1500	$ 530,000
Project 2 is an alternative to Project 1. Costs for project 2 are not included in the total.					
FF-2	100 South 800 East	4-inch line	Add check valve to allow flow from lower zone during fire.	Valve	$30,000
FF-3	1360 East, Center Street to 90 North	4-inch cul-de-sac	Upsize to 8-inch if hydrant is installed	360	$130,000
FF-4	130 North, 1350 East to 1440 East	4-inch line	Upsize to 8-inch	400	$150,000
FF-5	1350 East, 130 North to 220 North	4-inch cul-de-sac	Upsize to 8-inch if hydrant is installed	410	$150,000
FF-6	500 East, 400 North to 450 North	4-inch cul-de-sac	Upsize to 8-inch if hydrant is installed	310	$110,000
FF-7	150 East, 500 North to 530 North	4-inch line	Upsize to 8-inch if hydrant is installed	170	$60,000
FF-8	330 South (Chase Lane), 700 East to 800 East	4-inch dead end	Upsize to 8-inch if hydrant is installed	550	$200,000
Projects 9-10 increase flow to hydrants where higher flow is available nearby. However, it is ideal to upgrade every hydrant so the fire department can use any hydrant.					
FF-9	200 West, 100 North to fire hydrant	4-inch line	Upsize to 8-inch	200	$80,000
FF-10	100 West, 100 North to fire hydrant	4-inch line	Upsize to 8-inch	50	$20,000
FF-11	800 South and 50 West	No hydrants on lines	Upsize to 8-inch if hydrants are installed	1290	$460,000
FF-12	Artistic Circle	4-inch lines	Upsize to 8-inch	1370	$490,000
FF-15	850 E, 400 N to 450 N	4-inch line	Upsize to 8-inch if hydrant is installed.	260	$100,000
FF-16	1040 E, 300 N to 400 N	4-inch cul-de-sac	Upsize to 8-inch if hydrant is installed.	290	$110,000
Cost for Fire Flow Projects (Up to 1,000 gpm or 1,500 gpm required for residential and 2,000 gpm for non-residential)			**$2,620,000**		

Locations Requiring Fire Flow Greater Than 2,000 gpm

The City fire marshal has identified selected buildings in each pressure zone requiring the largest fire flows. This does not include an exhaustive analysis of all large buildings in the City but is intended to be representative of maximum needs in each area. Required flows range from 1,500 gpm for relatively smaller buildings with sprinkler systems to 5,000 gpm for large warehouse or industrial buildings. This includes a reduction of 75% for buildings with approved fire sprinkler systems. The locations that did not meet the desired fire flow are shown in Table 5-4 along with a discussion of possible projects to meet the desired flow.

Table 5-4: Projects to Resolve Low Fire Flow
Locations Requiring > 2,000 gpm

<table>
<tr><th colspan="2">Location</th><th>Required Flow (gpm)</th><th>Available Flow (gpm)</th><th>Solution</th><th>Length</th><th>Cost</th></tr>
<tr><td rowspan="2">FF-13</td><td>1400 North Mountain Springs Parkway</td><td>2,000</td><td>1,750</td><td>Add PRV or check valve from Westfields Zone to Nestlé</td><td>PRV</td><td>$390,000</td></tr>
<tr><td colspan="6">A small area within the Nestlé pressure zone does not achieve a fire flow of 2,000 gpm. The remainder of the required flow can be met by installing a PRV or check valve from the Westfields zone to the Nestlé zone at 1400 North Mountain Springs Parkway. This project provides a minimum of 2,000 gpm level at all locations in the Nestlé pressure zone. Future buildings must be constructed to meet available flows. An individual analysis can be performed for new buildings to determine the fire flow available at each location.</td></tr>
<tr><td rowspan="2">FF-14</td><td>1990 South State, Intermountain Lift</td><td>5,000</td><td>1,400</td><td>12-inch loop from end of dead end back to 1600 South</td><td>4,510</td><td>$2,070,000</td></tr>
<tr><td colspan="6">The transmission line on 1600 South is a 10-inch line, which limits flow in the pipe to less than 5,000 gpm. To achieve maximum flows, the 8-inch pipe on SR-51 should be upsized to a 12-inch. Additionally, flow will increase as development provides additional connectivity in the area. Other solutions would likely be more feasible and include compartmentalizing buildings, adding fire sprinklers, or constructing a private tank and pump. However, it is cautioned that other buildings on SR-51 also require high fire flows and must be considered. An emergency/fire flow interconnection with Spanish Fork City at the south City limit of SR-51 would benefit all development along SR-51.</td></tr>
<tr><td colspan="4">Cost for Fire Flow Projects
(Locations requiring >2,000 gpm)</td><td colspan="3">$2,460,000</td></tr>
</table>

Summary of Recommended Projects

Table 5-5 is a summary of costs for recommended projects to mitigate existing fire flow deficiencies in the drinking water system.

Table 5-5: Fire Flow Projects Summary

Project Type	Cost
Fire to 1,500-2,000 gpm	$2,620,000
Fire > 2,000 gpm	$2,460,000
Total Cost for Fire Flow Projects	**$5,080,000**

Emergency interconnections with Mapleton City and Spanish Fork City would help increase fire flows in some areas of the City system, and would provide benefit to all three cities. No costs for these interconnections were included in the recommended projects.

Replacement

In addition to completing projects to resolve deficiencies, the City should continue replacing aging pipes throughout the city on a regular basis. Table 5-6 shows the cost of all pipes in the city (not including pipes previously recommended for replacement), and the cost to replace all of them over its service life.

Table 5-6: Replacement Program for All Existing Pipes

Pipe Diameter (inches)	Length of Pipe (feet)	Cost
4	102,000	$28,440,000
6	181,000	$50,620,000
8	444,000	$124,440,000
10	98,000	$30,690,000
12	144,000	$47,900,000
14	6,000	$2,120,000
16	24,000	$9,660,000
18	5,000	$2,160,000
20	15,000	$6,800,000
24	47,000	$25,350,000
30	14,000	$10,060,000
	Subtotal	$338,980,000
	Contingency (20%) & Engineering (10%)	$101,690,000
	Total Cost for Replacement of All Existing Pipes	**$440,670,000**
	Annual Cost for Replacement of All Pipes Over Service Life	**$4,900,000**

FUTURE (2070) WATER DISTRIBUTION SYSTEM

2070 Peak Day Conditions

A minimum pressure of 40 psi must be maintained at all connections during peak day demand (Subsection R309-105-9(2)). Future peak day demand is discussed in Chapter 3 of this report. With 35,572 ERCs projected, the system's 2070 peak day demand is estimated at 15,790 gpm. Hydraulic modeling indicated that the future system can meet this requirement with the future pipelines shown on the Master Plan Map, Figure 4-1. Alignments shown are approximate and can be adjusted to avoid difficult routes and accommodate development.

The majority of growth in the city is occurring in the western portion of the city. The deficiencies listed above for the existing system are primarily east of 400 West and will not be affected by future growth. The areas of lower than desired pressure listed above for the existing system will persist if the suggested projects are not constructed.

2070 Peak Instantaneous Conditions

Peak instantaneous demands were calculated in a similar manner to existing conditions. The peak day to peak instantaneous peaking factor is 1.5 and the total peak instantaneous demand is 23,120 gpm. Hydraulic modeling indicated that the future system can meet this requirement with the future pipelines shown on the Figure 4-1. As with the 2070 peak day conditions, the existing areas of lower than desired pressure during peak instantaneous conditions will persist if the suggested projects are not constructed.

2070 Peak Day plus Fire Flow Conditions

A minimum pressure of 20 psi must be maintained while delivering fire flow to a particular location within the system and supplying the peak day demand to the entire system (Subsection R309-105-9(2)). The same fire requirements of 1,000 – 1,500 gpm for residential areas and 2,000 gpm for commercial areas are used for future conditions. Hydraulic modeling indicated that new areas of the future system can meet the future fire flow requirements with the 2070 pipelines shown on Figure 4-1. All of the fire flow deficiencies listed above for existing residential areas are located in areas that will experience little growth in the future. These deficiencies will persist if the suggested projects are not constructed.

WATER DISTRIBUTION SYSTEM RECOMMENDATIONS

The model output primarily consists of the computed pressures at nodes and flow rates through pipes. The model also provides additional data related to pipeline flow velocity and head loss to help evaluate the performance of the various components of the distribution system. Due to the large number of pipes and nodes in the model, it is impractical to prepare a figure which illustrates pipe numbers and node numbers.

Recommendations for distribution improvement projects were based on the modeling, as outlined above, guidance provided by Springville personnel, and the 2014 Drinking Water System Optimization Analysis. HAL still recommends implementing the distribution and operational recommendations given in the 2014 Analysis, including:

- Pump the future 900 South well into the Lower Spring Creek zone
- Set PRVs connecting Hobble Creek and Lower Spring Creek zones so that no flow is allowed through during normal operating conditions

In addition to these recommendations, it is also recommended that the city avoid using Canyon Road Well to fill Lower Spring Creek tanks via the 4^{th} South valve. With the new 400 South Well #2 capacity added to the system, it will be more efficient to fill the tanks from the 400 South wells. If the City desires to continue filling the tanks via the 4^{th} South valve, a pressure sustaining valve should be installed to prevent pressures in the Hobble Creek zone from dropping too low during tank filling operations.

The I-15 freeway corridor is a major bottleneck for transmission lines. There are currently three transmission lines under I-15. The system functions well with these lines, but level of service would be compromised if one of the transmission lines was out of service. A fourth transmission line under I-15 for redundancy is recommended in the northerly part of the city, near 1000 to 1400 North.

Major future distribution projects associated with providing transmission capacity to and from future storage tanks and sources may be required depending on the locations chosen for tanks and sources. It is expected that these projects may change somewhat as compared to current projections depending on the availability of land and other considerations that may affect the final locations of the proposed storage tanks.

Additional localized transmission pipelines are expected to be installed as the City develops. The locations and lengths of these transmission pipelines will vary depending on the final location of future streets and the majority will be minimum sized pipes constructed by developers (8-inch in residential zones and 10-inch in non-residential zones). Anticipated future pipes larger than the minimum required size have been located following proposed road alignments and pipes expected to be needed within 20 years are illustrated on the Drinking Water Master Plan Map, Figure 4-1. The City will continue to review individual developments through the Development Review Committee (DRC) process, including analyzing transmission line size requirements, particularly for developments located in areas where the water system is not well connected. Pipe sizes in these developments may need to be increased for initial service, even if the ultimate size requirement (when developments are well connected) is smaller.

Fire Suppression Flow

As discussed in the storage and water distribution chapters of this report, minimum available fire flow typically ranges from 1,000 gpm to 2,000 gpm, though higher flows are available in many locations. A site-specific analysis of available fire flow should be performed for each new development early during the development review process. New buildings should be constructed with appropriate materials or approved fire sprinkler systems so that their fire flow requirement does not exceed the available flow.

CHAPTER 6 WATER RIGHTS

EXISTING WATER RIGHTS

Springville City currently owns water rights designated for municipal use in the drinking water system. Table 6-1 is a summary of the drinking water rights owned by the City with assumed flow and volume capacities.

Table 6-1: Existing Drinking Water System Municipal Water Rights

Water Right Number(s)	Flow (gpm)	Volume (ac-ft)	Source
51-111 (a26443) Includes 51-6666, 51-6990, 51-7242	198	103	City Wells
51-1455 (a28365) Includes 51-1486, 51-1493	4,937	7,964*	City Wells
51-2530 (a29656) Includes 51-3679	2,703	144	City Wells
51-2780 (a28366)	1,346	439	City Wells
51-5450 (a40919)	1,333	14#	City Wells
51-6970 (a28367) Includes 51-1024, 51-1025, 51-1088	1,472	1,746	City Wells
51-8641	35	33	City Wells
51-8793 (a43986)	9	14	City Wells
51-5329	1,300	2,069**	Burt Springs
51-5330	180	290*	Konold Springs
51-5520	662	1,068##	Bartholomew Springs
51-6027	1,200	1,947***	Spring Creek Canyon Springs
Total	**15,375**	**15,831**	

* Potential volume if sources are able to produce designated flow rate year-round. Actual volume may be limited by either source capacity (i.e. a spring may not be able to produce the designated flow rate year round) or by demand.
** W.U.C. indicates that 8 cfs is diverted 24 hours for 5 days out of each 8-1/3 days from April 1 to October 31. This would equal 128.45 days with an estimated volume of 2,038.24 ac-ft.
Springville Irrigation Company water right used by Springville City based on City ownership of 267 shares. Each share equals 4 ac-ft resulting in an annual volume of 1,068 ac-ft.
*** 10-year average yield of the spring from 1999 – 2009

Springville City has a total of 15,831 ac-ft of water rights available for use in its drinking water system. Compared to the existing level of service water requirement of 11,070 ac-ft, the City currently owns a surplus of 4,761 ac-ft in municipal water rights.

By 2070, the City will require a minimum of 14,900 ac-ft of water rights to meet requirements for the drinking water system. Compared to the existing water rights available, the City currently owns a surplus of 931 ac-ft; however, buildout requirements for the City could be significantly higher than the predicted 2070 requirements. Similar to other components of the water system, water rights should have redundancy. Typically, some water rights cannot be used as planned or do not yield the allowed flow, and the City will need to acquire more than the minimum rights calculated in order to have the usable flow and volume required. Table 6-2 is a summary of unapproved change applications that propose converting water from City owned irrigation shares to drinking water municipal water rights in the City wells. If these water rights are approved the City would have additional redundancy recommended for the predicted 2070 requirements. However, it is recommended that the City commission a groundwater capacity study to determine the physically available flow and volume of the water rights the City owns. Other studies in southern Utah Valley have indicated that the physical capacity can be lower than the allowable water right flow or volume. It is also recommended that the City pursue opportunities to move the diversion point for Springville Irrigation Company Hobble Creek water rights to Bartholomew Springs where the water can be used in the drinking water system.

Table 6-2: Potential Drinking Water System Municipal Water Rights

Water Right Number	Flow * (gpm)	Volume (ac-ft)	Irrigation Company	Proposed Source
51-8368 (a35091)	800	834	Springville	City Wells
51-8369 (a35092)	300	322	Mill Pond	City Wells
51-8366 (a35086)	200	205	Wood Springs	City Wells
51-8367 (a35088)	100	24	Coffman Springs	City Wells
51-5790 (a44540)	2,400	2,471	Springville	City Wells
51-8791 (a43637)	400	357	Mill Pond	City Wells
51-8792 (a44541)	200	211	Wood Springs	City Wells
Total	**4,400**	**4,424**		

* Flow assumption based on existing well water rights.

CHAPTER 7 CAPITAL FACILITY PLAN

GENERAL

The purpose of this section is to identify the drinking water facilities that are required, for the 20-year planning period, to meet the demands placed on the system by future development. Projects required to meet existing level of service criteria, including desired fire flow, are not included in this section. Proposed facility capacities were sized to adequately meet the 20-year growth projections and were compared to current master planned facilities. A detailed design analysis will need to be provided before construction of the facilities to ensure that the location and sizing is appropriate for the actual growth that has taken place since this capital facility plan (CFP) was developed. Specific projects with costs are presented at the end of this chapter.

METHODOLOGY

The future water demands were added incrementally by year to the facility analysis. For facilities reaching capacity at any time within 20 years, a solution was identified that will accommodate growth for the 20-year planning period. A hydraulic model was developed for the purpose of assessing the system operation and capacity with future demands added to the system. The model was used to identify problem areas in the system and to identify the most efficient way to make improvements to transmission pipelines, sources, pumps, and storage facilities. The future system was evaluated in the same manner as the existing system, by modeling (1) Peak Instantaneous Demands and (2) Peak Day Demands plus fire flow conditions.

Currently, some customers in the pressurized irrigation service area are borrowing capacity from the drinking water system for their outdoor watering. Customers adjacent to active and dry portions of the PI system should all be connected to the PI system within 20 years. The drinking water system CFP was analyzed assuming that all customers in the PI service area have connected to the PI system within 20 years and no capacity from the drinking water system is used for outdoor watering in the PI service area.

FUTURE WATER SOURCE

Future growth projections indicate that the City will require additional drinking water sources to meet future demands, for redundancy, and to replace aging wells. The following source project is prioritized to meet the source requirements for future growth:

- Move water rights to Bartholomew Springs to allow the City to utilize the full flow available

If efforts to transfer water rights to Bartholomew Springs are unsuccessful or insufficient redundancy is provided through a transfer, the following source project is selected as an alternative to meet source requirements for future growth:

- 900 South well, with 200 North or other suitable location as an alternate

It is recommended that the City continue to budget for well development to replace aging wells. It is also recommended that the City provide backup power for each source, using a portable generator or permanent generators installed at each site.

FUTURE WATER STORAGE

The future 20-year growth projection requires approximately 3 MG additional storage in one or more tanks to supply storage for future growth. One 3+ MG tank is recommended. A 3 MG tank is anticipated to meet future demands through 2070.

The new tank may be located to serve the Westfields zone, with associated transmission piping to a source and to the service zone. It is recommended that the tank be located at the following location:

- Evergreen Cemetery/Big Hollow Park, 400 East 2000 South (3 MG+)

A different location may be required for the tank due to constraints at the chosen sites. Additional investigation should be performed to determine the suitability of the site for the new tank. As discussed in the Storage section of this report, other tank locations are possible to fulfill necessary storage requirements.

FUTURE TRANSMISSION PIPING

A significant portion of the major transmission lines in the growth areas of the City (west of 400 West) are already constructed. A few additional transmission lines would need to be constructed to allow for future growth in these areas. Recommended projects are listed in Table 7-1.

The majority of the waterline projects in the growth areas will be constructed by developers. Only lines larger than 8 inches in residential zones or larger than 10 inches in non-residential zones are included. See Figure 4-1 for future transmission lines.

MASTER PLANNING

Throughout the master planning process, the three main components of the City's water system (source, storage, and distribution) were analyzed to determine the system's ability to meet existing demands and also the anticipated future demands. This section of the report will specifically detail development over the next 20 years. System deficiencies identified in the master planning process and described previously in this report were presented and discussed in an alternatives workshop with City staff. After the workshop, HAL studied the feasibility of the solution alternatives and developed conceptual costs.

One important method of paying for system improvements is through impact fees. Impact fees are collected from new development and should only be used to pay for system improvements related to new development. For this reason, it is important to identify which projects are related to resolving existing deficiencies, and which projects are related to providing anticipated future capacity for new development.

PRECISION OF COST ESTIMATES

When considering cost estimates, there are several levels or degrees of precision, depending on the purpose of the estimate and the percentage of detailed design that has been completed. The following levels of precision are typical:

Type of Estimate	Precision
Master Planning	-50% to +100%
Preliminary Design	±30%
Final Design or Bid	±10%

For example, at the master planning level (or conceptual or feasibility design level), if a project is estimated to cost $1,000,000, then the precision or reliability of the cost estimate would typically be expected to range between approximately $500,000 and $2,000,000. While this may seem very imprecise, the purpose of master planning is to develop general sizing, location, cost, and scheduling information on a number of individual projects that may be designed and constructed over a period of many years. Master planning also typically includes the selection of common design criteria to help ensure uniformity and compatibility among future individual projects. Details such as the exact capacity of individual projects, the level of redundancy, the location of facilities, the alignment and depth of pipelines, the extent of utility conflicts, the cost of land and easements, the construction methodology, the types of equipment and material to be used, the time of construction, interest and inflation rates, permitting requirements, etc., are typically developed during the more detailed levels of design.

At the preliminary or 10% design level, some of the aforementioned information will have been developed. Major design decisions such as the size of facilities, selection of facility sites, pipeline alignments and depths, and the selection of the types of equipment and material to be used during construction will typically have been made. At this level of design the precision of the cost estimate for a $1,000,000 project would typically be expected to range between approximately $700,000 and $1,300,000.

After the project has been completely designed, and is ready to bid, all design plans and technical specifications will have been completed and nearly all of the significant details about the project should be known. At this level of design, the precision of the cost estimate for the same $1,000,000 project would typically be expected to range between approximately $900,000 and $1,100,000.

SYSTEM IMPROVEMENT PROJECTS

As discussed in previous chapters, source, storage and distribution system capacity expansion will be needed to meet the demands of future growth. The City's Drinking Water Master Plan Map and Capital Facilities Plan, Figure 4-1 includes recommended projects over the period from existing conditions through 20 years into the future. The recommended projects that are expected to be needed through 2045 are presented in Table 7-1.

Cost estimates have been prepared for the recommended projects and are included in Table 7-1. Unit costs for the construction cost estimates are based on conceptual level engineering and are shown in the unit costs table in Appendix D. Sources used to estimate construction costs include:

1. “Means Heavy Construction Cost Data, 2025"
2. Price quotes from equipment suppliers
3. Recent construction bids for similar work
4. Springville City records of past project bids/costs

All costs are presented in 2025 dollars. Costs shown below include 20% for contingency and 10% for design. Recent price and economic trends indicate that future costs are difficult to predict with certainty. Engineering cost estimates provided in this study should be regarded as conceptual level for use as a planning guide. Only during final design can a definitive and more accurate estimate be provided for each project.

Table 7-1: Recommended 10-Year and 20-Year Projects

Type	Map ID[1]	Recommended Project	Total Cost[3]	% Impact Fee Eligible	Impact Fee Eligible Cost
Growth Projects, 0-10 Year Phasing (2025-2035)					
Source	10-1	Drill and develop 4,000 gpm well at 900 S Install 1,300 LF 16-inch PVC pipe	$8,430,000	100%	$8,430,000
Transmission	10-2	400 West, 900 South to 1600 South 70 LF 10-inch PVC pipe, 560 LF 16-inch PVC pipe and 4,010 LF 18-inch PVC pipe bored under railroad [cost includes boring]	$3,450,000	100%	$3,450,000
Transmission	10-3	State Street, 700 South to 1060 South 1,690 LF 12-inch PVC pipe across UDOT ROW [cost includes boring]	$780,000	100%	$780,000
Transmission	10-4	State Street, 1600 South 2,520 LF 12-inch PVC pipe across UDOT ROW	$1,160,000	100%	$1,160,000
Transmission	10-5	West of I-15, 1000 North to 1400 North 700 LF 10-inch PVC pipe and 6,060 LF 12-inch PVC pipe bored under I-15 [cost includes boring]	$4,150,000	12%	$510,000
Transmission	10-6	Center Street, 2250 West to 2400 West 490 LF 16-inch PVC pipe	$236,000	22%	$51,000
		Center Street, 2100 West to 2250 West (LGI frontage) 1,100 LF 16-inch PVC pipe[4]	$107,670	-	$107,670 (100%)
Transmission	10-7	Center Street, 2400 West to 2700 W 1,370 LF 12-inch PVC pipe bored under canal [cost includes boring]	$730,000	12%	$90,000

Type	Map ID[1]	Recommended Project	Total Cost[3]	% Impact Fee Eligible	Impact Fee Eligible Cost
Transmission	10-8	1200 West, Center Street to 100 South 700 LF 10-inch PVC pipe bored under canal [cost includes boring]	$390,000	10%	$39,000
Transmission	10-9	1200 West, 200 South to 400 South 650 LF 12-inch PVC pipe	$280,000	16%	$50,000
Transmission	10-10	1500 West, 400 South to 900 South 1,380 LF 10-inch PVC pipe and 1,320 LF 12-inch PVC pipe bored under canal [cost includes boring]	$1,200,000	12%	$150,000
Transmission	10-11	Transmission to Jolley Tank 3,520 LF 12-inch PVC pipe	$1,470,000	0%	$0
Total Cost, Growth Projects, 0-10 Year Phasing (2025-2035)			**$22,390,000**	**66%**	**14,820,000**
Growth Projects, 10-20 Year Phasing (2035-2045)					
Storage	20-1	Big Hollow Park Site – 3 MG tank 2 pressure sustaining valves	$8,840,000	100%	$8,840,000
Transmission		Big Hollow Park to Westfields zone 160 LF 16-inch PVC pipe and 12,610 LF 24-inch PVC pipe bored under railroad [cost includes boring]	$10,000,000	100%	$10,000,000
Transmission	20-2	1750 West, 1600 South to 1450 S 550 LF 18-inch PVC pipe bored under canal [cost includes boring]	$510,000	100%	$510,000
Transmission	20-3	1950 West/ Wavetronix Drive, Center Street to Wavetronix Drive; 1950 West to 1750 West 3,410 LF 10-inch PVC pipe and 1,120 LF 12-inch PVC pipe	$1,760,000	2%	$50,000

Type	Map ID[1]	Recommended Project	Total Cost[3]	% Impact Fee Eligible	Impact Fee Eligible Cost
Transmission	20-4	1000 North, 1650 West to Spring Creek Road 2,720 LF 10-inch PVC pipe and 1,230 LF 12-inch PVC pipe bored under railroad and canal [cost includes boring]	$2,870,000	11%	$320,000
Transmission	20-5	950 West, 800 North to 1000 North 990 LF 10-inch PVC pipe	$380,000	0%	$0
Transmission	20-6	1650 West/ 750 North, 1000 North to 750 North; 1650 West to 1750 West 1,360 LF 10-inch PVC pipe and 1,300 LF 12-inch PVC pipe bored under railroad	$2,230,000	13%	$290,000
Transmission	20-7	1100 West, 1150 North to 1000 N 320 LF 12-inch PVC pipe bored under canal	$290,000	15%	$50,000
Transmission	20-8	1500 West, 900 South to 1025 South 710 LF 12-inch PVC pipe	$300,000	16%	$50,000
Total Cost, Growth Projects, 10-20 Year Phasing (2035-2045)			**$27,180,000**	**74%**	**$20,110,000**
Total Cost, Growth Projects, 0-20 Year Phasing (2025-2045)			**$49,570,000**	**70%**	**$34,930,000**

1. The Map ID corresponds to the project number on the Master Plan Map and Capital Facilities Plan, Figure 4-1.
2. Costs include 20% for contingency and 10% for design.
3. All costs were rounded consistently for presentation. The impact fee eligible percentages were calculated from unrounded values and totals may not sum exactly due to rounding.
4. This cost is for the impact fee eligible cost of upsizing pipe that has been constructed in Center Street by LGI. Cost information was provided by the City.

ADDITIONAL PROJECTS THROUGH 2070

If source, storage, and transmission projects are constructed as shown in the 0-20 year phasing, no additional source or storage projects are anticipated to be required through 2070.

SUMMARY OF COSTS

Table 7-2 includes projects shown in Table 7-1 and is a summary of project costs attributed to future growth through 2070. This cost represents a best estimate for total cost in 2025 dollars to the City to maintain the desired level of service while accommodating future growth through 2070 conditions. This table does not include any financing costs associated with funding options.

Table 7-2: Summary of Costs

Project Type	Cost
Source	$7,800,000
Storage	$8,840,000
Transmission	$32,930,000
Total	**$49,570,000**

REFERENCES

Drinking Water System Operating Requirements, R309-105 *Utah Administrative Code* (2019). http://www.rules.utah.gov/publicat/code/r309/r309-105.htm.

Facility Design and Operation: Minimum Sizing Requirements, R309-510 *Utah Administrative Code* (2015). http://www.rules.utah.gov/publicat/code/r309/r309-510.htm.

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APPENDIX A

Water System Data and Calculations

Table A-1
Growth Projections and Projected ERCs

Year	Projected ERCs				Annual ERC Growth
	Residential	Other	Nestlé	Total	
2025	11,397	4,555	4,842	20,794	0.6%
2026	11,699	4,676	4,842	21,216	2.6%
2027	12,008	4,799	4,842	21,650	2.6%
2028	12,326	4,926	4,842	22,095	2.6%
2029	12,652	5,057	4,842	22,551	2.6%
2030	12,987	5,191	4,842	23,020	2.6%
2031	13,291	5,312	4,842	23,445	2.3%
2032	13,601	5,436	4,842	23,880	2.3%
2033	13,919	5,563	4,842	24,324	2.3%
2034	14,245	5,693	4,842	24,780	2.3%
2035	14,578	5,826	4,842	25,246	2.3%
2036	14,883	5,948	4,842	25,673	2.1%
2037	15,194	6,073	4,842	26,109	2.1%
2038	15,512	6,200	4,842	26,554	2.1%
2039	15,837	6,329	4,842	27,008	2.1%
2040	16,168	6,462	4,842	27,472	2.1%
2041	16,461	6,579	4,842	27,882	1.8%
2042	16,759	6,698	4,842	28,299	1.8%
2043	17,063	6,819	4,842	28,724	1.8%
2044	17,372	6,943	4,842	29,157	1.8%
2045	17,687	7,069	4,842	29,598	1.8%
2046	18,007	7,197	4,842	30,046	1.8%
2047	18,334	7,327	4,842	30,503	1.8%
2048	18,666	7,460	4,842	30,968	1.8%
2049	19,004	7,595	4,842	31,442	1.8%
2050	19,349	7,733	4,842	31,924	1.8%
2051	19,471	7,782	4,842	32,095	0.6%
2052	19,595	7,831	4,842	32,268	0.6%
2053	19,719	7,881	4,842	32,442	0.6%
2054	19,844	7,931	4,842	32,617	0.6%
2055	19,970	7,981	4,842	32,793	0.6%
2056	20,096	8,032	4,842	32,970	0.6%
2057	20,224	8,083	4,842	33,148	0.6%
2058	20,352	8,134	4,842	33,328	0.6%
2059	20,481	8,186	4,842	33,508	0.6%
2060	20,611	8,237	4,842	33,690	0.6%
2061	20,741	8,290	4,842	33,873	0.6%
2062	20,873	8,342	4,842	34,057	0.6%
2063	21,005	8,395	4,842	34,242	0.6%
2064	21,138	8,448	4,842	34,429	0.6%
2065	21,272	8,502	4,842	34,616	0.6%
2066	21,407	8,556	4,842	34,805	0.6%
2067	21,543	8,610	4,842	34,995	0.6%
2068	21,679	8,665	4,842	35,186	0.6%
2069	21,817	8,719	4,842	35,378	0.6%
2070	21,955	8,775	4,842	35,572	0.6%

Table A-3
Existing System Source Mass Balance by Pressure Zone

Pressure Zone	ERCs	Irrigated Acres	Indoor Peak Day Source Required Flow (gpm)	Outdoor Peak Day Source Required Flow (gpm)	Total Peak Day Source Required Flow (gpm)	Source and Available Flow (ac-ft)										
						Bartholomew Springs	Burt Springs	Konold Springs	Spring Creek Springs	200 North Well	400 South Well #1	400 South Well #2	900 South Well	Canyon Road Well	1000 South Well	Evergreen Well
						1000	760	160	620	2400	3000	3900	3000	1500	550	350
Cherrington Pressure Zone	186	34	34	289	323	250	0	0	0	0	0	72	0	0	0	0
Crandall Pressure Zone	125	16	23	136	159	0	0	0	16	0	0	142	0	0	0	0
Hobble Creek Pressure Zone	2388	356	431	3026	3457	0	760	0	0	0	0	0	2129	568	0	0
Klauck Pressure Zone	218	28	39	238	277	0	0	0	28	0	0	249	0	0	0	0
Nestles Pressure Zone	4974	39	898	332	1230	0	0	0	126	0	0	0	871	233	0	0
Rotary Pressure Zone*	202	80	36	680	716	556	0	0	0	0	0	160	0	0	0	0
Upper Spring Creek Pressure Zone	51	7	9	60	69	0	0	0	7	0	0	62	0	0	0	0
Westfields Pressure Zone	6081	247	1098	2100	3197	0	0	67	0	1072	1341	717	0	0	0	0
Lower Spring Creek Pressure Zone**	6346	384	1146	3264	4410	0	0	93	442	1328	1659	888	0	0	0	0
Kelly/Jurd	167	13	30	111	141	141	0	0	0	0	0	0	0	0	0	0
Bartholomew	56	5	10	43	53	53	0	0	0	0	0	0	0	0	0	0
Total	20794	1209	3754	10277	**14,031**	1000	760	160	620	2400	3000	2290	3000	801	0	0
Remaining in Source (ac-ft)					**3,209**	0	0	0	0	0	0	1610	0	699	550	350

* Includes Highline Canal
** Does not include Plat A

Legend	Most Preferred	Next Preferred	Least Preferred	Not Connected

Future System Source Mass Balance by Pressure Zone

Pressure Zone	ERCs	Irrigated Acres	Indoor Peak Day Source Required Flow (gpm)	Outdoor Peak Day Source Required Flow (gpm)	Total Peak Day Source Required Flow (gpm)	Source and Available Flow for Lowest Month on Record (ac-ft)										
						Bartholomew Springs	Burt Springs	Konold Springs	Spring Creek Springs	200 North Well	400 South Well #1	400 South Well #2	900 South Well	Canyon Road Well	1000 South Well	Evergreen Well
						1000	760	160	620	2400	3000	3900	3000	1500	550	350
Cherrington Pressure Zone	187	34	34	289	323	232	0	0	0	0	0	91	0	0	0	0
Crandall Pressure Zone	135	18	24	153	177	0	0	0	17	0	0	161	0	0	0	0
Hobble Creek Pressure Zone	2469	364	446	3094	3540	0	760	0	0	0	0	0	2311	469	0	0
Klauck Pressure Zone	249	32	45	272	317	0	0	0	30	0	0	287	0	0	0	0
Nestles Pressure Zone	4974	2	898	17	915	0	0	0	87	0	0	0	689	140	0	0
Rotary Pressure Zone*	238	84	43	714	757	544	0	0	0	0	0	213	0	0	0	0
Upper Spring Creek Pressure Zone	51	7	9	60	69	0	0	0	6	0	0	62	0	0	0	0
Westfields Pressure Zone**	18227	74	3291	629	3920	0	0	69	0	1094	1368	1389	0	0	0	0
Lower Spring Creek Pressure Zone	8787	421	1587	3580	5167	0	0	91	480	1306	1632	1658	0	0	0	0
Kelly/Jurd	180	14	33	119	152	152	0	0	0	0	0	0	0	0	0	0
Bartholomew	75	7	14	60	73	73	0	0	0	0	0	0	0	0	0	0
Total	35572	1057	6423	8986	15409	1000	760	160	620	2400	3000	3861	3000	608	0	0
Remaining in Source (gpm)						0	0	0	0	0	0	39	0	892	550	350

* Includes Highline Canal
** Includes Plat A

Legend	Most Preferred	Next Preferred	Least Preferred	Not Connected

Table A-4

Existing System Storage Mass Balance by Pressure Zone

Pressure Zone	ERCs	Irrigated Acres	Indoor Required Equalization Storage (MG)	Outdoor Required Equalization Storage (MG)	Total Required Equalization Storage (MG)	Tank and Capacity (MG)								
						Bartholomew	Rotary	Jurd	Hobble Creek 1	Hobble Creek 2	Upper Spring Creek	Lower Spring Creek 1	Lower Spring Creek 2	Lower Spring Creek 3
						1.5	2	0.25	2	2	2	1	2	3
Cherrington Pressure Zone	186	34	0.04	0.21	0.25	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crandall Pressure Zone	125	16	0.03	0.10	0.13	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00
Hobble Creek Pressure Zone	2388	356	0.55	2.18	2.73	0.00	0.00	0.00	2.00	0.73	0.00	0.00	0.00	0.00
Klauck Pressure Zone	218	28	0.05	0.17	0.22	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.00
Nestles Pressure Zone	4974	39	1.14	0.24	1.38	0.00	0.29	0.00	0.00	0.25	0.00	0.17	0.26	0.41
Rotary Pressure Zone*	202	80	0.05	0.49	0.54	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upper Spring Creek Pressure Zone	51	7	0.01	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00
Westfields Pressure Zone	6081	247	1.40	1.51	2.91	0.01	0.57	0.00	0.00	0.00	0.62	0.36	0.55	0.80
Lower Spring Creek Pressure Zone**	6346	384	1.46	2.35	3.81	0.01	0.55	0.00	0.00	0.68	0.60	0.47	0.72	0.77
Kelly/Jurd	167	13	0.04	0.08	0.12	0.01	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00
Bartholomew	56	5	0.01	0.03	0.04	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equalization Total (MG)	20794	1209	4.78	7.40	12.18	0.86	1.40	0.11	2.00	1.66	1.63	1.00	1.54	1.98
Fire Suppression Total (MG)						0.24	0.30	0.12	0.00	0.24	0.27	0.00	0.06	0.09
Emergency Total (MG)						0.40	0.30	0.02	0.00	0.10	0.10	0.00	0.40	0.70
Remaining in Tank (MG)						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.23

* Includes Highline Canal

** Does not include Plat A

Legend	Most Preferred	Next Preferred	Least Preferred	Not Connected

Future System Storage Mass Balance by Pressure Zone

Pressure Zone	ERCs	Irrigated Acres	Indoor Required Equalization Storage (MG)	Outdoor Required Equalization Storage (MG)	Total Required Equalization Storage (MG)	Tank and Capacity (MG)								
						Bartholomew	Rotary	Jurd	Hobble Creek 1	Hobble Creek 2	Upper Spring Creek	Lower Spring Creek 1	Lower Spring Creek 2	Lower Spring Creek 3
						1.5	2	0.25	2	2	2	1	2	3
Cherrington Pressure Zone	187	34	0.04	0.21	0.25	0.24	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crandall Pressure Zone	135	18	0.03	0.11	0.14	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00
Hobble Creek Pressure Zone	2469	364	0.57	2.23	2.80	0.00	0.00	0.00	2.00	0.80	0.00	0.00	0.00	0.00
Klauck Pressure Zone	249	32	0.06	0.20	0.25	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00
Nestles Pressure Zone	4974	2	1.14	0.01	1.16	0.00	0.16	0.00	0.00	0.17	0.00	0.11	0.17	0.27
Rotary Pressure Zone*	238	84	0.05	0.51	0.57	0.55	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upper Spring Creek Pressure Zone	51	7	0.01	0.04	0.05	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.00	0.00
Westfields Pressure Zone**	18227	74	4.19	0.45	4.65	0.00	0.67	0.00	0.00	0.00	0.66	0.45	0.69	1.08
Lower Spring Creek Pressure Zone	8787	421	2.02	2.58	4.60	0.00	0.53	0.00	0.00	0.69	0.52	0.44	0.68	0.86
Kelly/Jurd	180	14	0.04	0.09	0.13	0.00	0.02	0.11	0.00	0.00	0.00	0.00	0.00	0.00
Bartholomew	75	7	0.02	0.04	0.06	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Equalization Total (MG)	35572	1057	8.18	6.47	14.65	0.86	1.40	0.11	2.00	1.66	1.63	1.00	1.54	2.21
Fire Suppression Total (MG)						0.24	0.30	0.12	0.00	0.24	0.27	0.00	0.06	0.09
Emergency Total (MG)						0.40	0.30	0.02	0.00	0.10	0.10	0.00	0.40	0.70
Remaining in Tank (MG)						0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

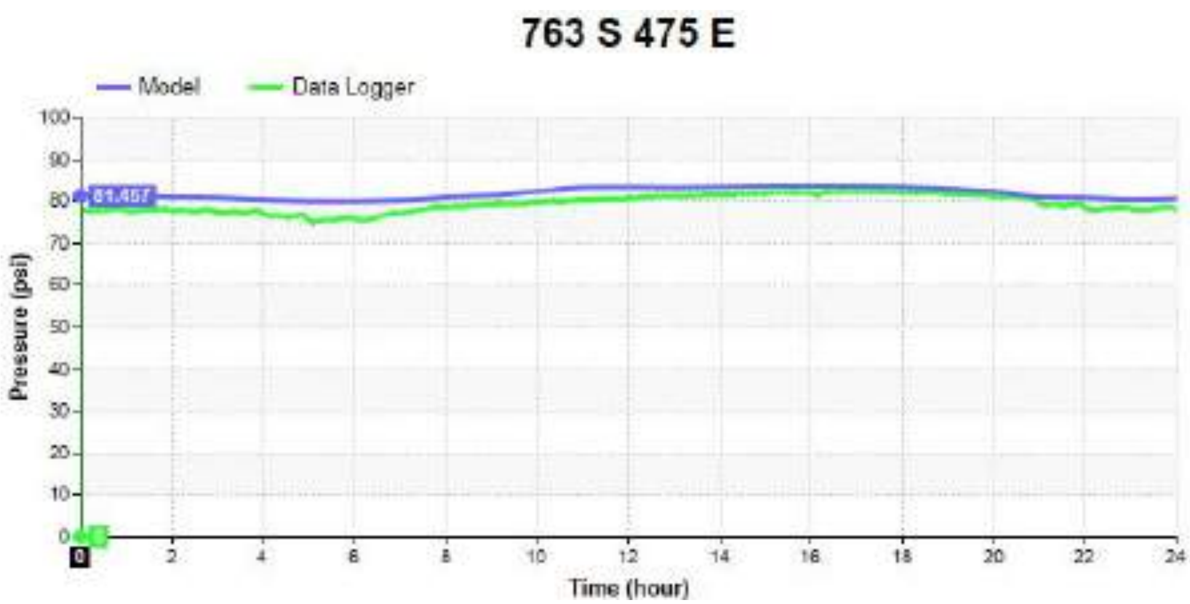
* Includes Highline Canal

** Includes Plat A

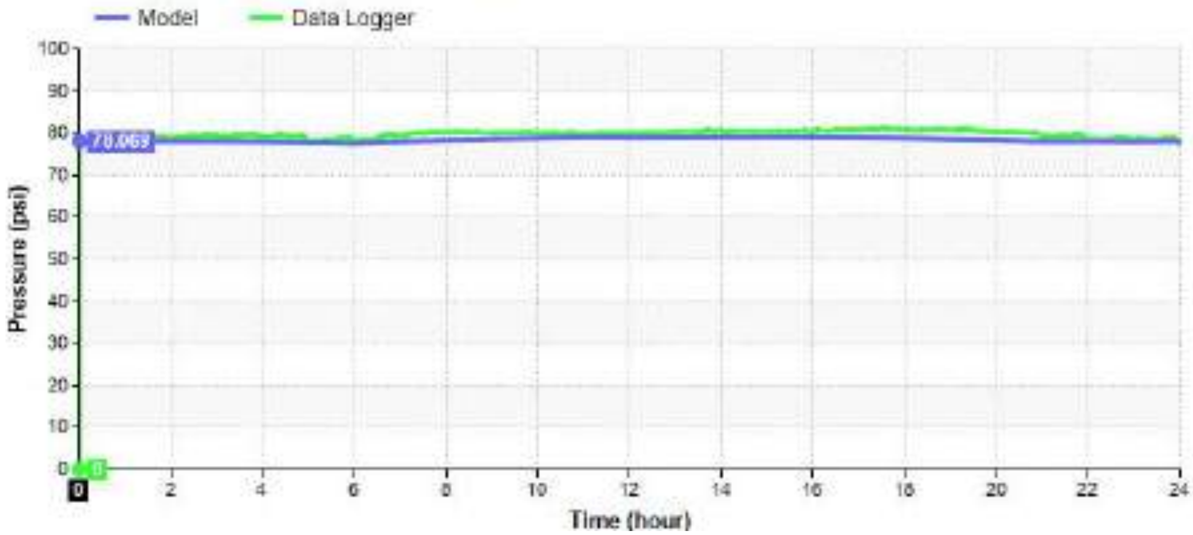
Legend	Most Preferred	Next Preferred	Least Preferred	Not Connected

APPENDIX B
Calibration Data

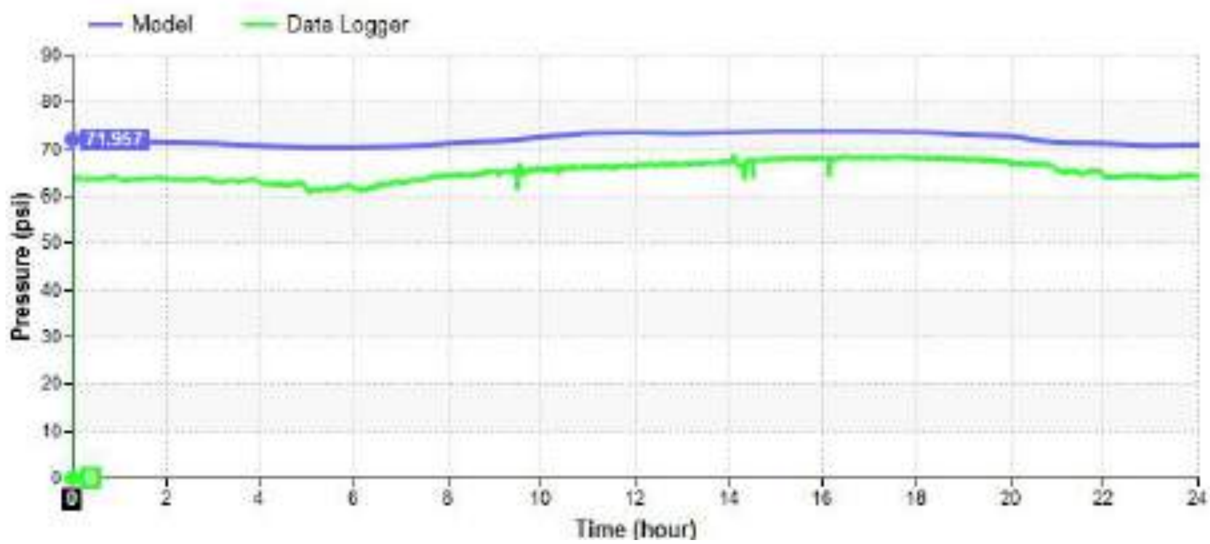
Pressure Logger Calibration Charts



Flowserve South



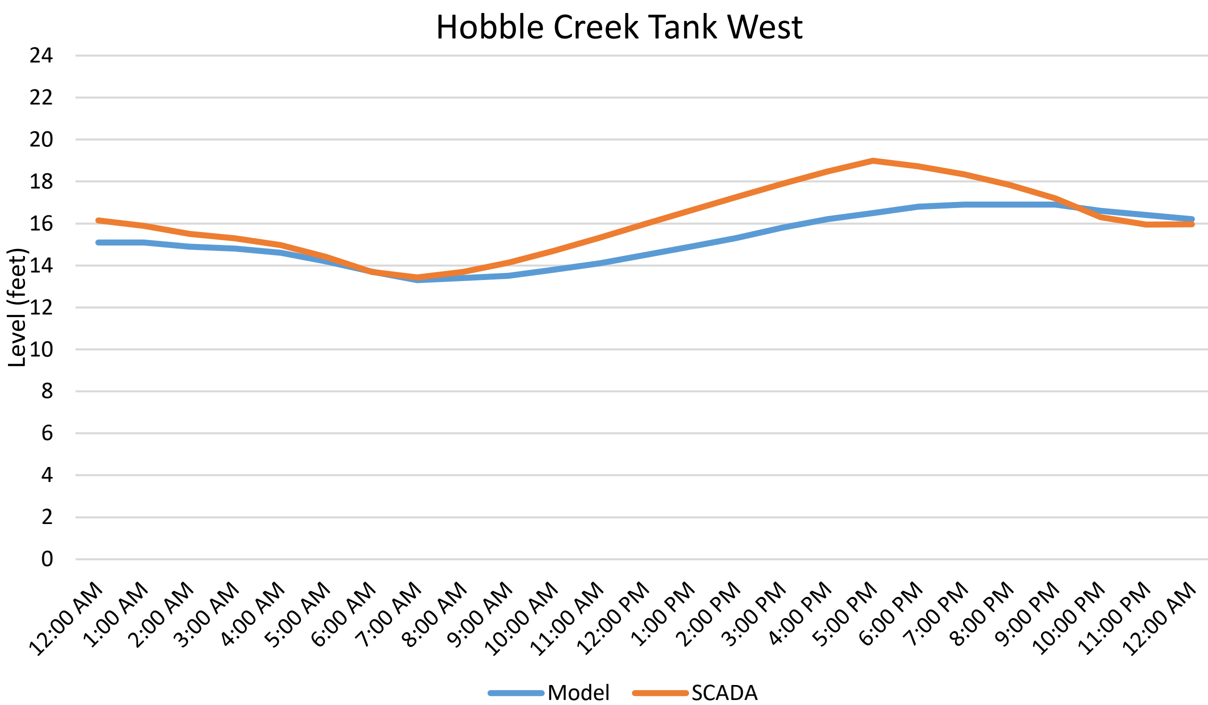
859 E 750 S

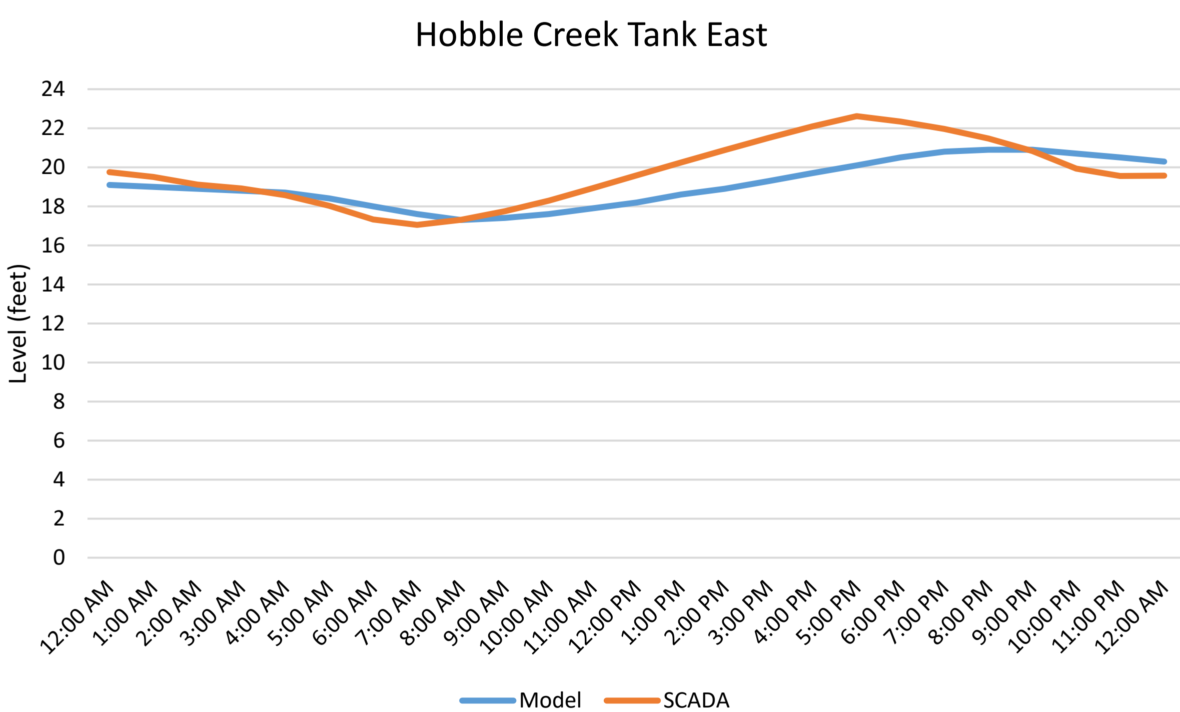


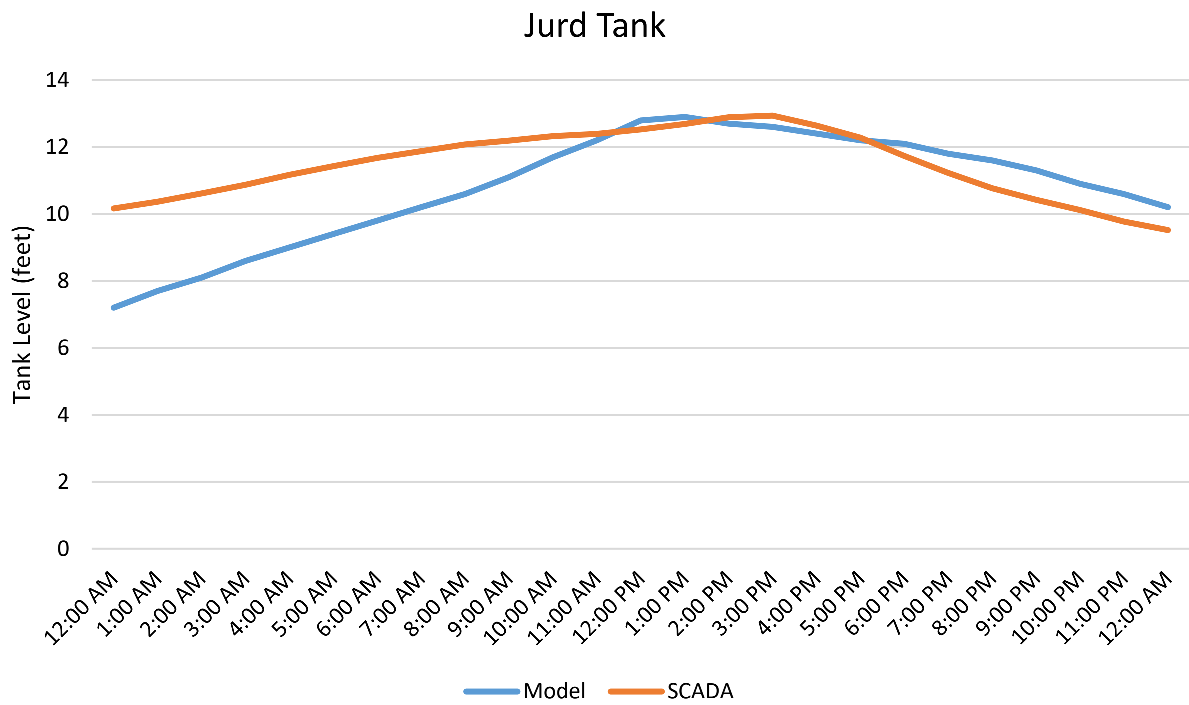
Notes on 859 E 750 S: Tank levels were checked, and Lower Spring Creek Tanks were functioning at the correct levels. PRVs from Hobble Creek Zone to Lower Spring Creek Zone were also checked. PRVs either have no flows or periods of very small flows. Pumps were checked as well. Only a small increase in pressure when the 4th South well turned on. Elevations were also verified and seem reasonable. The data logger at 763 S and 475 E is just a few blocks away and seems to match much better, so likely there is a localized issue that is causing the difference between the model and the data logger.


193 E 2650 S (Santa Fe Dr)
Model
Data Logger
Pressure (psi)
Time (hour)
72.496
100
90
80
70
60
50
40
30
20
10
0
2
4
6
8
10
12
14
16
18
20
22
24

Tank Calibration Charts






Jurd Tank
Tank Level (feet)
14
12
10
8
6
4
2
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
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5:00 PM
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7:00 PM
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9:00 PM
10:00 PM
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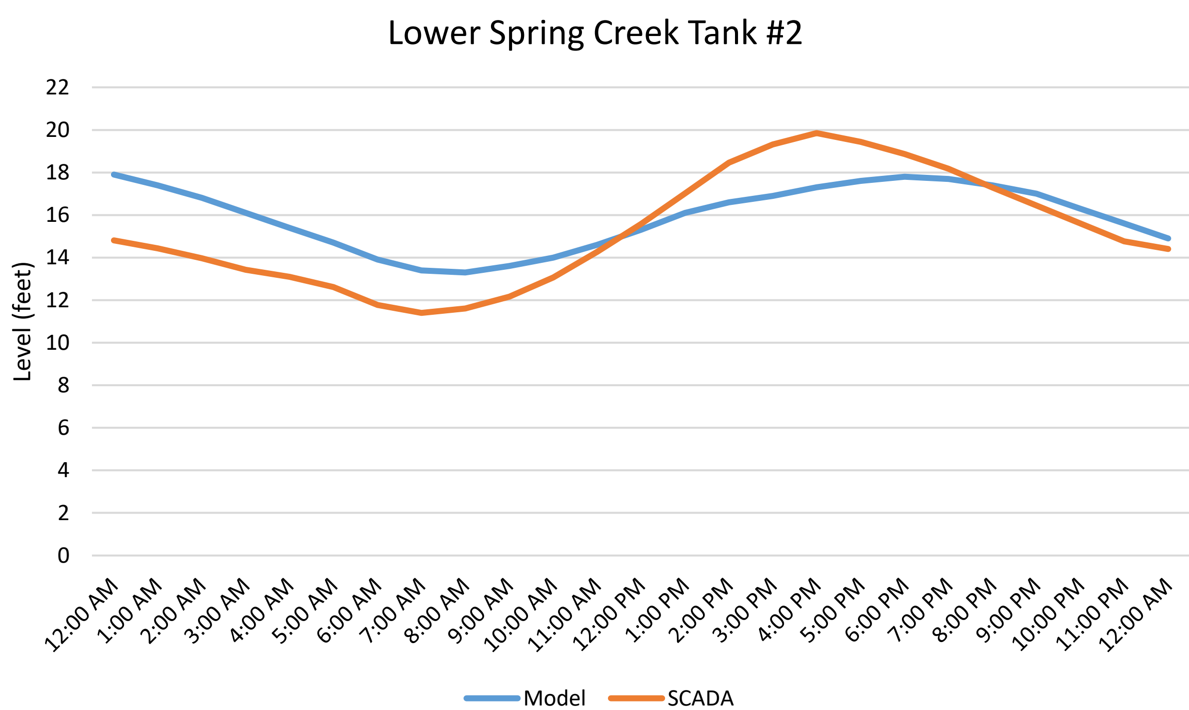
12:00 AM
Model
SCADA


Lower Spring Creek Tank #2
Level (feet)
22
20
18
16
14
12
10
8
6
4
2
0
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1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
9:00 AM
10:00 AM
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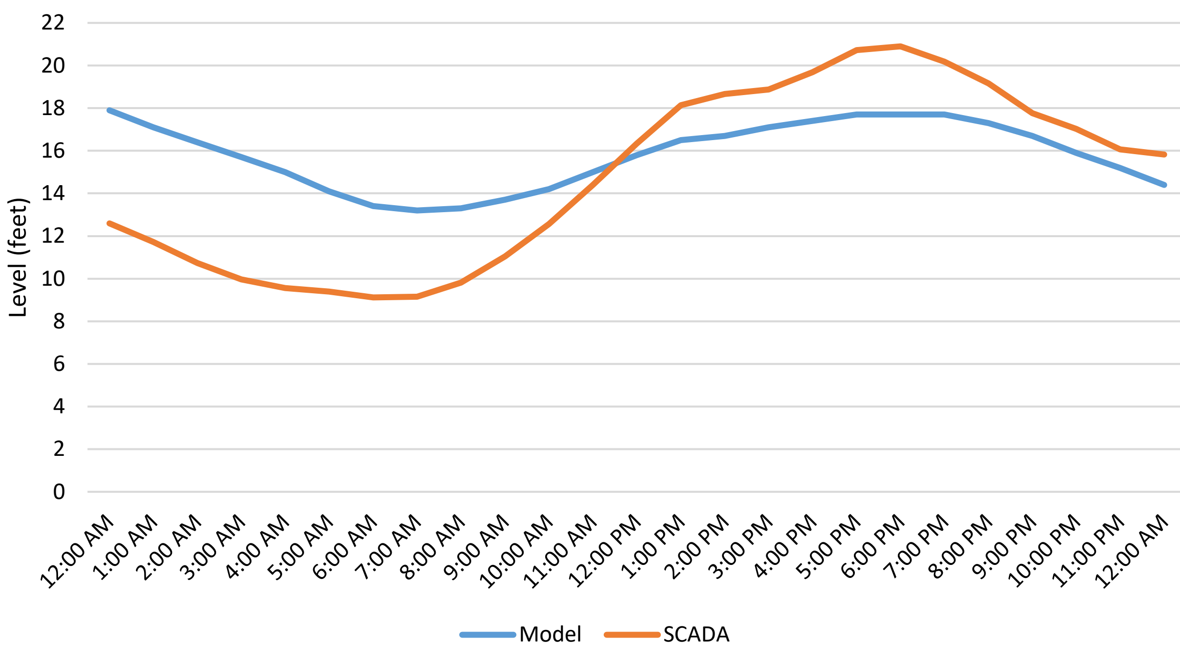
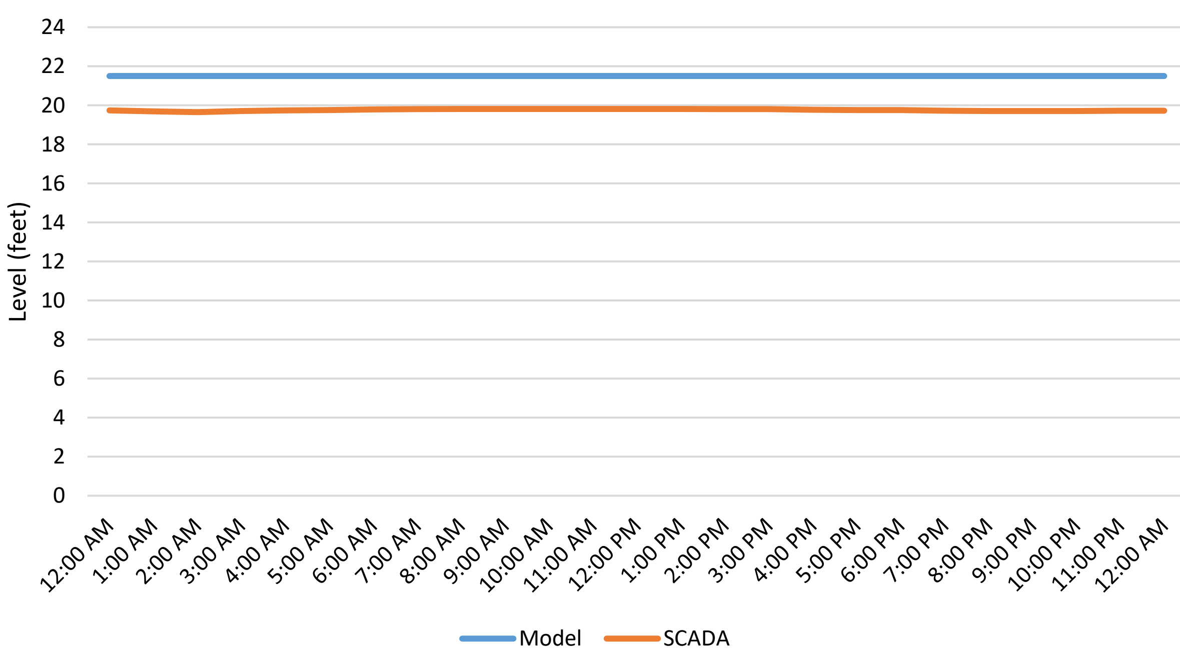
11:00 PM
12:00 AM
Model
SCADA

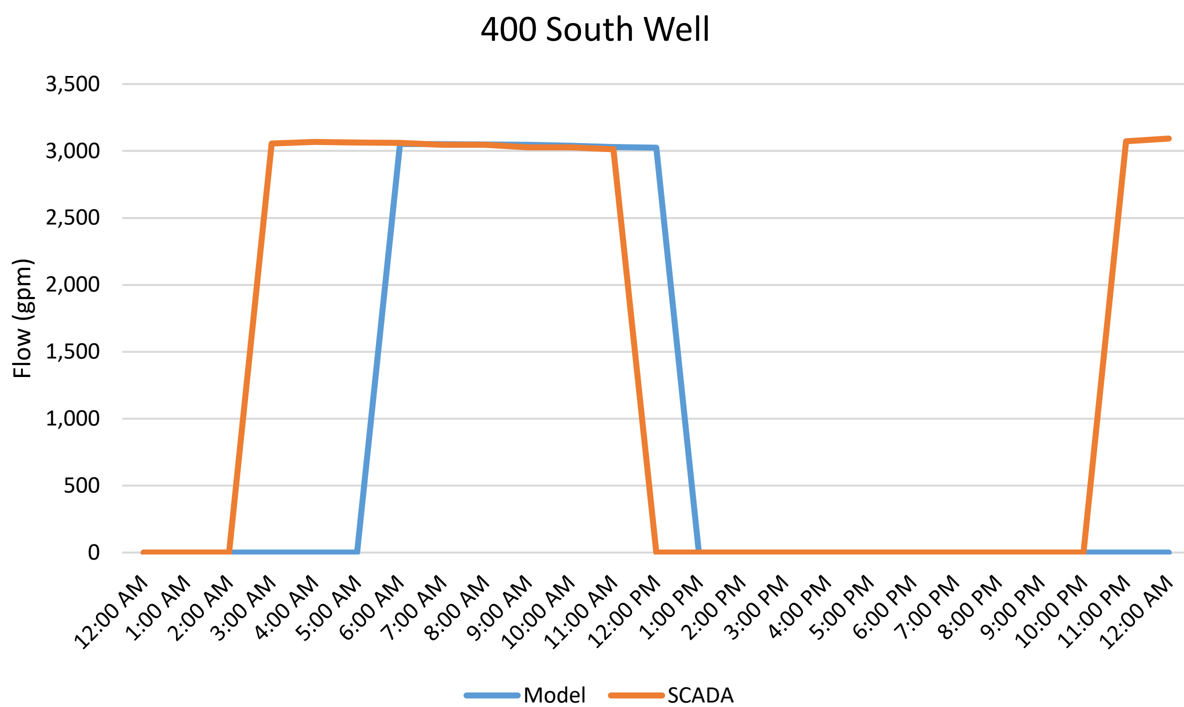
Lower Spring Creek Tank #3

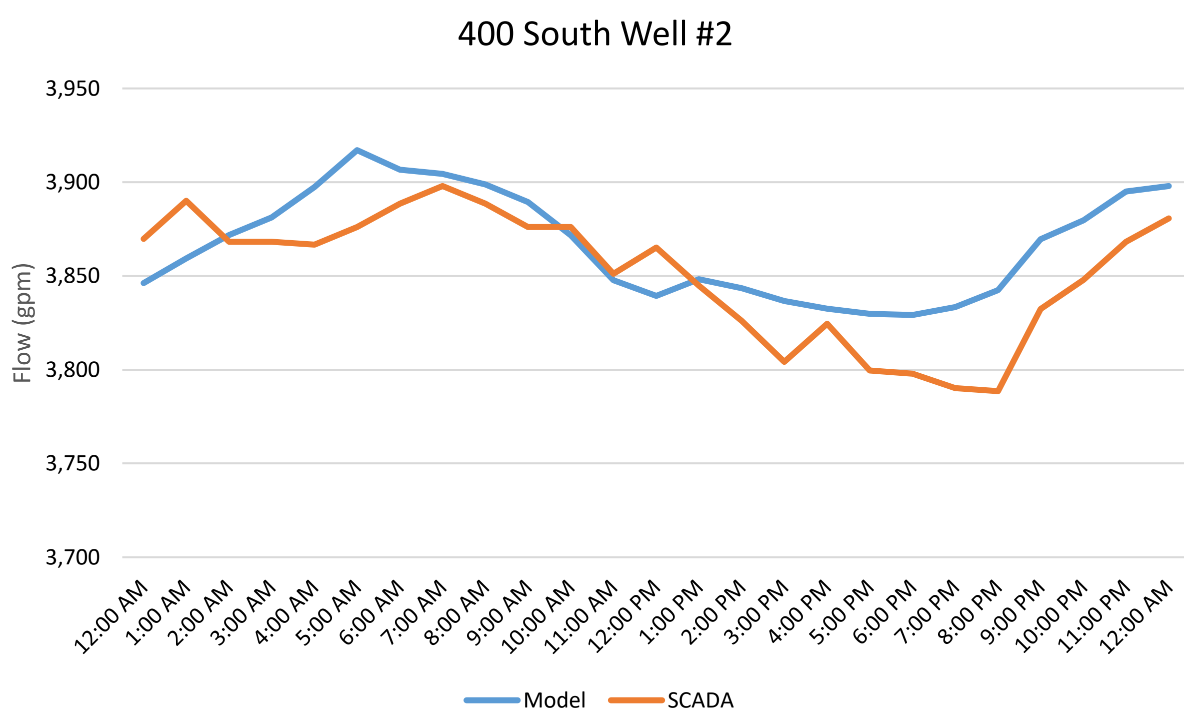


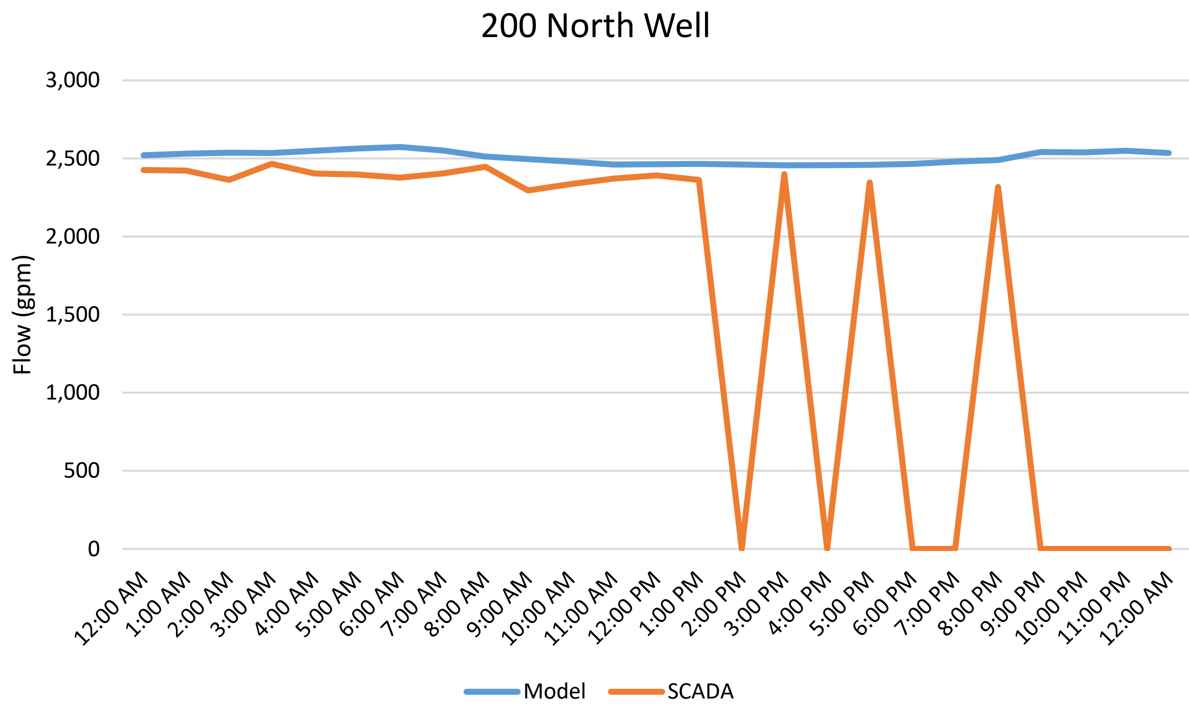
Upper Spring Creek Tank



Well Calibration Charts






200 North Well
Flow (gpm)
3,000
2,500
2,000
1,500
1,000
500
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
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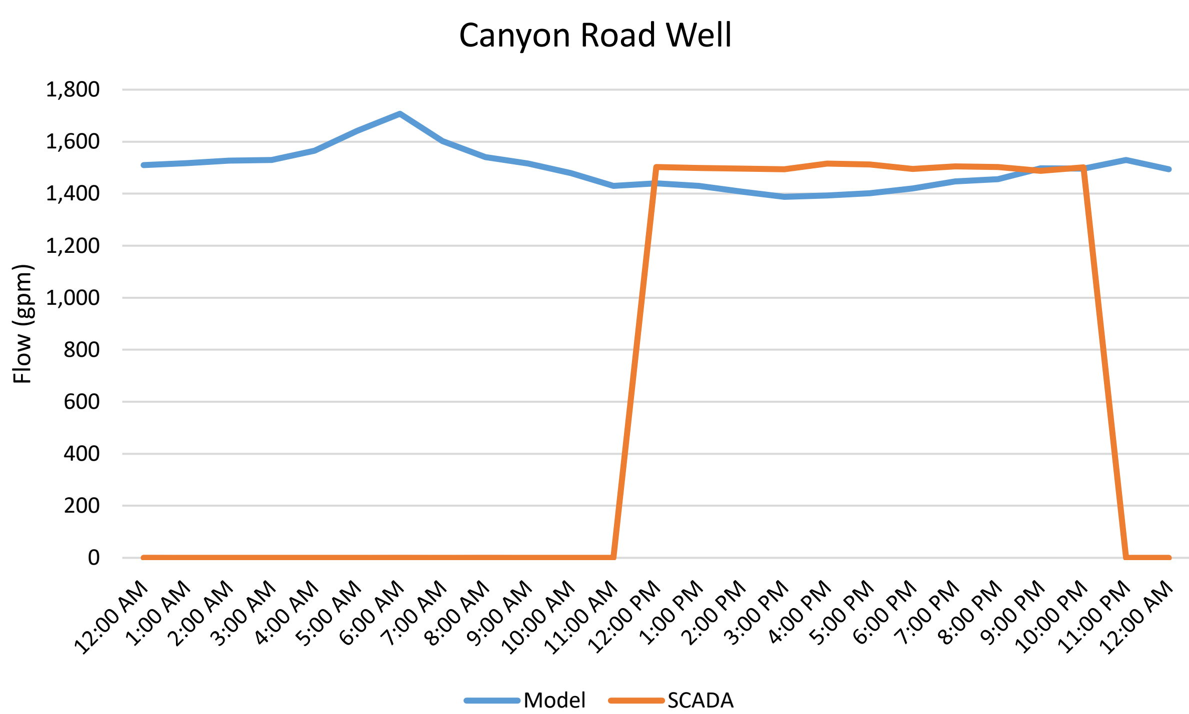
Model
SCADA


Canyon Road Well
Flow (gpm)
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
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Model
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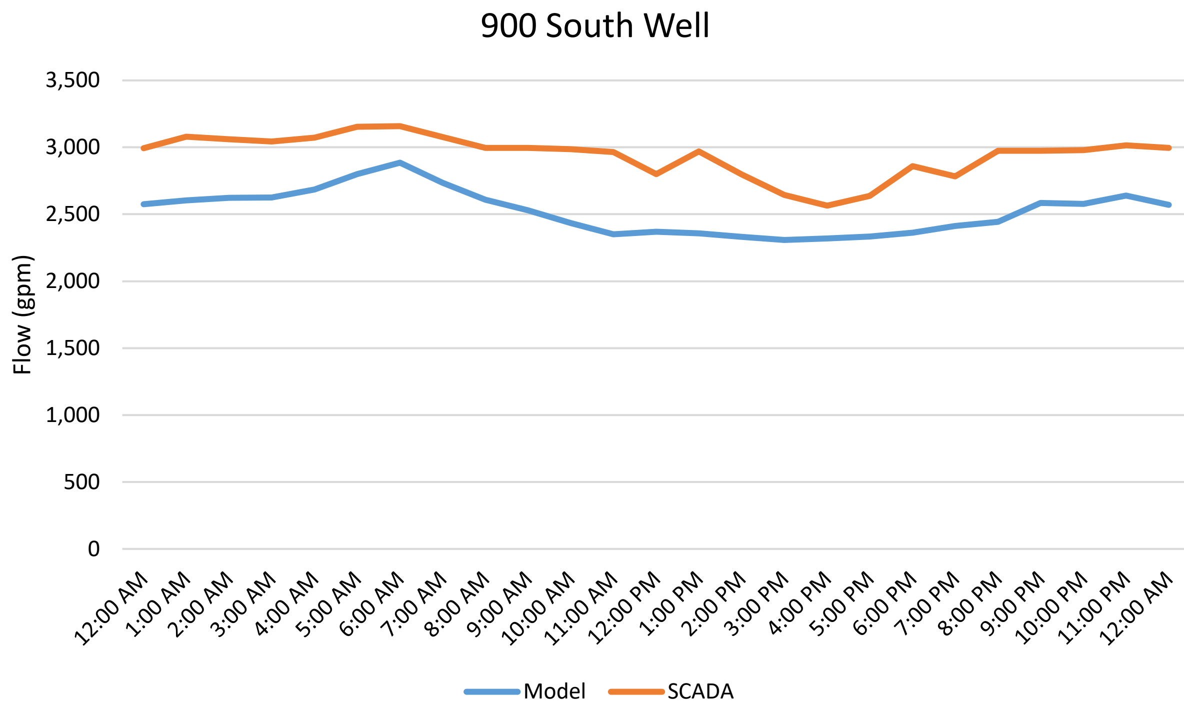
900 South Well
Flow (gpm)
3,500
3,000
2,500
2,000
1,500
1,000
500
0
12:00 AM
1:00 AM
2:00 AM
3:00 AM
4:00 AM
5:00 AM
6:00 AM
7:00 AM
8:00 AM
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11:00 AM
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Model
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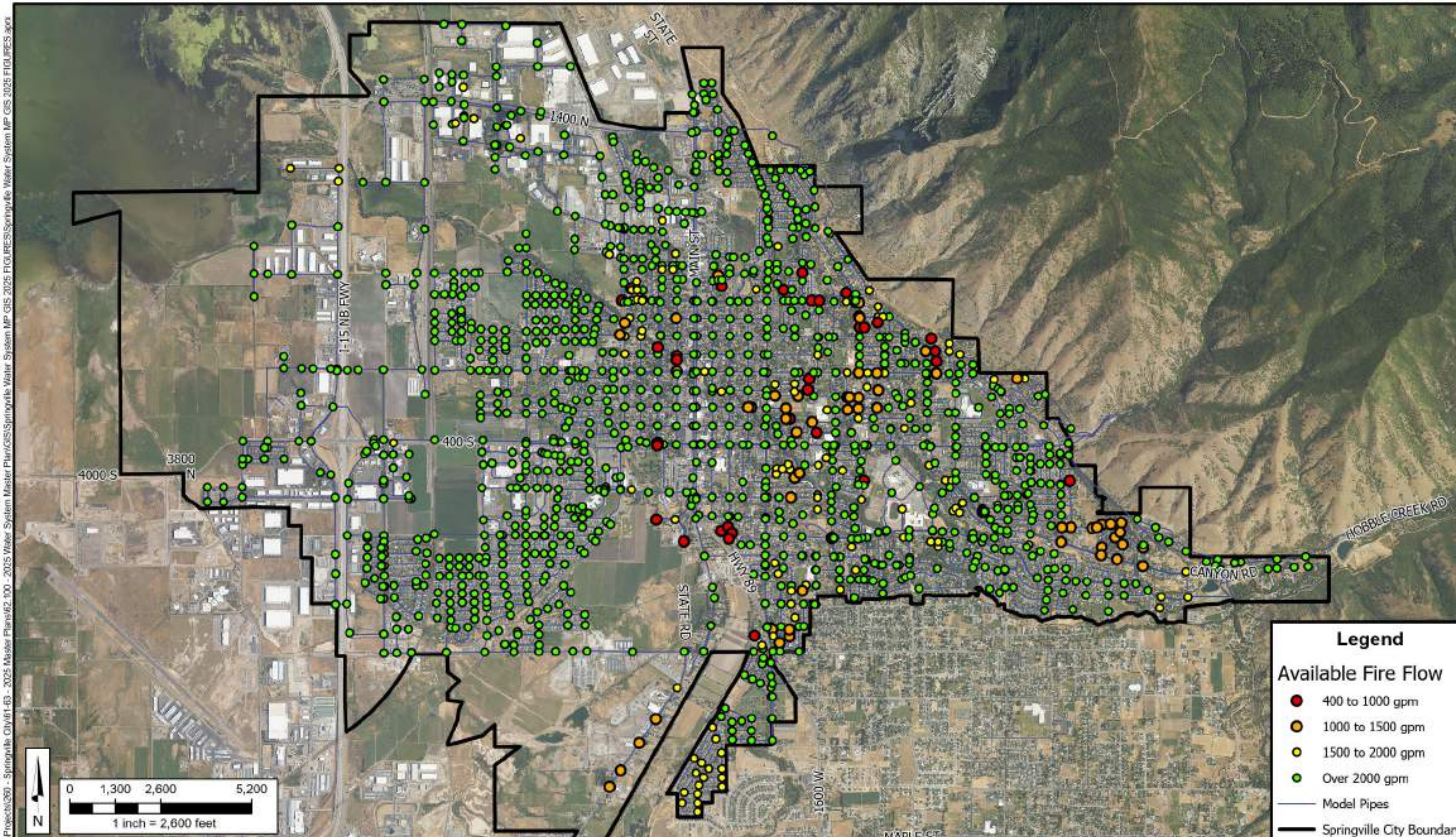
APPENDIX C
Available Fire Flow



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HANSEN ALLEN & LUCE inc ENGINEERS

SPRINGVILLE CITY 2025 MASTER PLANS	EXISTING DRINKING WATER SYSTEM FIRE FLOW - HYDRANT DESIGN FLOWS	APPENDIX C

APPENDIX D

Unit Costs

Springville City Drinking Water Master Plan - Capital Facility Plan Project Cost Estimates
Springville City
by Hansen, Allen & Luce, Inc.
DRAFT
AACE Class: 5

Parts of Project 10-6 have already been constructed. The costs shown for these projects reflect the bid or reimbursement agreement amounts provided by the City.
10-6: Reimbursement agreement - Center Street culinary water lines

Scenario	Project ID	Item Type	Location/Description	Diameter	Quantity	Rounded Quantity	Units	Unit Cost	Base Cost	Contingency (20%)	Engineering (10%)	Project Total Cost	Project Total Cost *Rounded*	Impact Fee Eligible Cost	Impact Fee Eligible Cost *Rounded*	% Impact Fee Eligible
DW Project 10-1																
10-Year	10-1	Pipe	16-inch diameter pipe	16	1290	1300	LF	$ 370	$ 481,000	$ 96,200	$ 48,100	$ 625,300	$ 626,000	$ 625,300	$ 626,000	100%
10-Year	10-1	Well	New well on 9th S		1	1	LF	$ 3,000,000	$ 3,000,000	$ 600,000	$ 300,000	$ 3,900,000	$ 3,900,000	$ 3,900,000	$ 3,900,000	100%
10-Year	10-1	Well House	Well House for new well on 9th S		1	1	LF	$ 3,000,000	$ 3,000,000	$ 600,000	$ 300,000	$ 3,900,000	$ 3,900,000	$ 3,900,000	$ 3,900,000	100%
												DW Project 10-1 Total	**$ 8,430,000**	**10-1 Total**	**$ 8,430,000**	**100%**
DW Project 10-2																
10-Year	10-2	Pipe	10-inch diameter pipe	10	64	70	LF	$ 290	$ 20,300	$ 4,060	$ 2,030	$ 26,390	$ 27,000	$ 26,390	$ 27,000	100%
10-Year	10-2	Pipe	16-inch diameter pipe	16	559	560	LF	$ 370	$ 207,200	$ 41,440	$ 20,720	$ 269,360	$ 270,000	$ 269,360	$ 270,000	100%
10-Year	10-2	Pipe	18-inch diameter pipe	18	4007	4010	LF	$ 400	$ 1,604,000	$ 320,800	$ 160,400	$ 2,085,200	$ 2,086,000	$ 2,085,200	$ 2,086,000	100%
10-Year	10-2	Bore-10	Bore (2) 10-inch diameter pipes across railroad (100')	10	200	200	LF	$ 2,400	$ 480,000	$ 96,000	$ 48,000	$ 624,000	$ 624,000	$ 624,000	$ 624,000	100%
10-Year	10-2	Bore-18	Bore 18-inch diameter pipe across (2) canals (40')	18	80	80	LF	$ 4,200	$ 336,000	$ 67,200	$ 33,600	$ 436,800	$ 437,000	$ 436,800	$ 437,000	100%
												DW Project 10-2 Total	**$ 3,450,000**	**10-2 Total**	**$ 3,450,000**	**100%**
DW Project 10-3																
10-Year	10-3	Pipe	12-inch diameter pipe	12	1683	1690	LF	$ 320	$ 540,800	$ 108,160	$ 54,080	$ 703,040	$ 704,000	$ 703,040	$ 704,000	100%
10-Year	10-3	UDOT	UDOT ROW (SR 51)		1	1	LS	10% project	$ 54,080	$ 10,816	$ 5,408	$ 70,304	$ 71,000	$ 70,304	$ 71,000	100%
												DW Project 10-3 Total	**$ 780,000**	**10-3 Total**	**$ 780,000**	**100%**
DW Project 10-4																
10-Year	10-4	Pipe	12-inch diameter pipe	12	2517	2520	LF	$ 320	$ 806,400	$ 161,280	$ 80,640	$ 1,048,320	$ 1,049,000	$ 1,048,320	$ 1,049,000	100%
10-Year	10-4	UDOT	UDOT ROW (SR 51)		1	1	LS	10% project	$ 80,640	$ 16,128	$ 8,064	$ 104,832	$ 105,000	$ 104,832	$ 105,000	100%
												DW Project 10-4 Total	**$ 1,160,000**	**10-4 Total**	**$ 1,160,000**	**100%**
DW Project 10-5																
10-Year	10-5	Pipe	10-inch diameter pipe	10	696	700	LF	$ 290	$ 203,000	$ 40,600	$ 20,300	$ 263,900	$ 264,000	$ -	$ -	0%
10-Year	10-5	Pipe	12-inch diameter pipe	12	6060	6060	LF	$ 320	$ 1,939,200	$ 387,840	$ 193,920	$ 2,520,960	$ 2,521,000	$ 236,340	$ 237,000	9%
10-Year	10-5	Bore-12	Bore 12-inch diameter pipe under I-15 (350')	12	350	350	LF	$ 3,000	$ 1,050,000	$ 210,000	$ 105,000	$ 1,365,000	$ 1,365,000	$ 273,000	$ 273,000	20%
												DW Project 10-5 Total	**$ 4,150,000**	**10-5 Total**	**$ 510,000**	**12%**
DW Project 10-6 *(Center Street culinary water lines, portion constructed)*												**Total**	**Rounded**			
10-Year	10-6	Pipe	16-inch diameter pipe (constructed)	16	1100	(-)	(-)	(-)	(-)	(-)	(-)	**$ 107,670**	**$ 108,000**	$ 107,670	$ 108,000	100%
10-Year	10-6	Pipe	16-inch diameter pipe	16	489	490	LF	$ 370	$ 181,300	$ 36,260	$ 18,130	$ 235,690	$ 236,000	$ 50,960	$ 51,000	22%
												DW Project 10-6 Total	**$ 350,000**	**10-6 Total**	**$ 160,000**	**46%**
DW Project 10-7															**$ 60,000**	
10-Year	10-7	Pipe	12-inch diameter pipe	12	1365	1370	LF	$ 320	$ 438,400	$ 87,680	$ 43,840	$ 569,920	$ 570,000	$ 53,430	$ 54,000	9%
10-Year	10-7	Bore-12	Bore 12-inch diameter pipe across canal (40')	12	40	40	LF	$ 3,000	$ 120,000	$ 24,000	$ 12,000	$ 156,000	$ 156,000	$ 31,200	$ 32,000	20%
												DW Project 10-7 Total	**$ 730,000**	**10-7 Total**	**$ 90,000**	**12%**
DW Project 10-8																
10-Year	10-8	Pipe	10-inch diameter pipe	10	699	700	LF	$ 290	$ 203,000	$ 40,600	$ 20,300	$ 263,900	$ 264,000	$ 18,200	$ 19,000	7%
10-Year	10-8	Bore-10	Bore 10-inch diameter pipe across canal (40')	10	40	40	LF	$ 2,400	$ 96,000	$ 19,200	$ 9,600	$ 124,800	$ 125,000	$ 20,800	$ 21,000	17%
												DW Project 10-8 Total	**$ 390,000**	**10-8 Total**	**$ 40,000**	**10%**
DW Project 10-9																
10-Year	10-9	Pipe	12-inch diameter pipe	12	642	650	LF	$ 320	$ 208,000	$ 41,600	$ 20,800	$ 270,400	$ 271,000	$ 42,250	$ 43,000	16%
												DW Project 10-9 Total	**$ 280,000**	**10-9 Total**	**$ 50,000**	**16%**
DW Project 10-10																
10-Year	10-10	Pipe	10-inch diameter pipe	10	1380	1380	LF	$ 290	$ 400,200	$ 80,040	$ 40,020	$ 520,260	$ 521,000	$ 35,880	$ 36,000	7%
10-Year	10-10	Pipe	12-inch diameter pipe	12	1315	1320	LF	$ 320	$ 422,400	$ 84,480	$ 42,240	$ 549,120	$ 550,000	$ 85,800	$ 86,000	16%
10-Year	10-10	Bore-10	Bore 10-inch diameter pipe across canal (40')	10	40	40	LF	$ 2,400	$ 96,000	$ 19,200	$ 9,600	$ 124,800	$ 125,000	$ 20,800	$ 21,000	17%
												DW Project 10-10 Total	**$ 1,200,000**	**10-10 Total**	**$ 150,000**	**12%**
DW Project 10-11																
10-Year	10-11	Pipe	12-inch diameter pipe	12	3520	3520	LF	$ 320	$ 1,126,400	$ 225,280	$ 112,640	$ 1,464,320	$ 1,465,000	$ -	$ -	0%
												DW Project 10-11 Total	**$ 1,470,000**	**10-11 Total**	**$ -**	**0%**
DW Project 20-1																
20-Year	20-1	Pipe	16-inch diameter pipe	16	152	160	LF	$ 370	$ 59,200	$ 11,840	$ 5,920	$ 76,960	$ 77,000	$ 76,960	$ 77,000	100%
20-Year	20-1	Pipe	24-inch diameter pipe	24	12607	12610	LF	$ 510	$ 6,431,100	$ 1,286,220	$ 643,110	$ 8,360,430	$ 8,361,000	$ 8,360,430	$ 8,361,000	100%
20-Year	20-1	Tank	3 MG Tank		3	3	MG	$ 2,000,000	$ 6,000,000	$ 1,200,000	$ 600,000	$ 7,800,000	$ 7,800,000	$ 7,800,000	$ 7,800,000	100%
20-Year	20-1	PSV-16	16-inch pressure sustaining valve	16	1	1	LF	$ 400,000	$ 400,000	$ 80,000	$ 40,000	$ 520,000	$ 520,000	$ 520,000	$ 520,000	100%
20-Year	20-1	PSV-16	16-inch pressure sustaining valve	16	1	1	LF	$ 400,000	$ 400,000	$ 80,000	$ 40,000	$ 520,000	$ 520,000	$ 520,000	$ 520,000	100%
20-Year	20-1	Bore-24	Bore 24-inch diameter pipe across (2) railroads (100')	24	200	200	LF	$ 6,000	$ 1,200,000	$ 240,000	$ 120,000	$ 1,560,000	$ 1,560,000	$ 1,560,000	$ 1,560,000	100%
												DW Project 20-1 Total	**$ 18,840,000**	**20-1 Total**	**$ 18,840,000**	**100%**
DW Project 20-2																
20-Year	20-2	Pipe	18-inch diameter pipe	18	544	550	LF	$ 400	$ 220,000	$ 44,000	$ 22,000	$ 286,000	$ 286,000	$ 286,000	$ 286,000	100%
20-Year	20-2	Bore-18	Bore 18-inch diameter pipe across canal (40')	18	40	40	LF	$ 4,200	$ 168,000	$ 33,600	$ 16,800	$ 218,400	$ 219,000	$ 218,400	$ 219,000	100%
												DW Project 20-2 Total	**$ 510,000**	**20-2 Total**	**$ 510,000**	**100%**
DW Project 20-3																
20-Year	20-3	Pipe	10-inch diameter pipe	10	3407	3410	LF	$ 290	$ 988,900	$ 197,780	$ 98,890	$ 1,285,570	$ 1,286,000	$ -	$ -	0%
20-Year	20-3	Pipe	12-inch diameter pipe	12	1112	1120	LF	$ 320	$ 358,400	$ 71,680	$ 35,840	$ 465,920	$ 466,000	$ 43,680	$ 44,000	9%
												DW Project 20-3 Total	**$ 1,760,000**	**20-3 Total**	**$ 50,000**	**2%**
DW Project 20-4																
20-Year	20-4	Pipe	10-inch diameter pipe	10	2714	2720	LF	$ 290	$ 788,800	$ 157,760	$ 78,880	$ 1,025,440	$ 1,026,000	$ -	$ -	0%
20-Year	20-4	Pipe	12-inch diameter pipe	12	1229	1230	LF	$ 320	$ 393,600	$ 78,720	$ 39,360	$ 511,680	$ 512,000	$ 47,970	$ 48,000	9%
20-Year	20-4	Bore-12	Bore 12-inch diameter pipe across railroad (300')	12	300	300	LF	$ 3,000	$ 900,000	$ 180,000	$ 90,000	$ 1,170,000	$ 1,170,000	$ 234,000	$ 234,000	20%
20-Year	20-4	Bore-12	Bore 12-inch diameter pipe across canal (40')	12	40	40	LF	$ 3,000	$ 120,000	$ 24,000	$ 12,000	$ 156,000	$ 156,000	$ 31,200	$ 32,000	20%
												DW Project 20-4 Total	**$ 2,870,000**	**20-4 Total**	**$ 320,000**	**11%**

Springville City Drinking Water Master Plan - Capital Facility Plan Project Cost Estimates
Springville City
by Hansen, Allen & Luce, Inc.
DRAFT
AACE Class: 5

Parts of Project 10-6 have already been constructed. The costs shown for these projects reflect the bid or reimbursement agreement amounts provided by the City.
10-6: Reimbursement agreement - Center Street culinary water lines

Scenario	Project ID	Item Type	Location/Description	Diameter	Quantity	Rounded Quantity	Units	Unit Cost	Base Cost	Contingency (20%)	Engineering (10%)	Project Total Cost	Project Total Cost *Rounded*	Impact Fee Eligible Cost	Impact Fee Eligible Cost *Rounded*	% Impact Fee Eligible
DW Project 20-5																
20-Year	20-5	Pipe	10-inch diameter pipe	10	982	990	LF	$ 290	$ 287,100	$ 57,420	$ 28,710	$ 373,230	$ 374,000	$ -	$ -	0%
												DW Project 20-5 Total	**$ 380,000**	**20-5 Total**	**$ -**	**0%**
DW Project 20-6																
20-Year	20-6	Pipe	10-inch diameter pipe	10	1352	1360	LF	$ 290	$ 394,400	$ 78,880	$ 39,440	$ 512,720	$ 513,000	$ -	$ -	0%
20-Year	20-6	Pipe	12-inch diameter pipe	12	1297	1300	LF	$ 320	$ 416,000	$ 83,200	$ 41,600	$ 540,800	$ 541,000	$ 50,700	$ 51,000	9%
20-Year	20-6	Bore-12	Bore 12-inch diameter pipe across railroad (300')	12	300	300	LF	$ 3,000	$ 900,000	$ 180,000	$ 90,000	$ 1,170,000	$ 1,170,000	$ 234,000	$ 234,000	20%
												DW Project 20-6 Total	**$ 2,230,000**	**20-6 Total**	**$ 290,000**	**13%**
DW Project 20-7																
20-Year	20-7	Pipe	12-inch diameter pipe	12	318	320	LF	$ 320	$ 102,400	$ 20,480	$ 10,240	$ 133,120	$ 134,000	$ 12,480	$ 13,000	9%
20-Year	20-7	Bore-12	Bore 12-inch diameter pipe across canal (40')	12	40	40	LF	$ 3,000	$ 120,000	$ 24,000	$ 12,000	$ 156,000	$ 156,000	$ 31,200	$ 32,000	20%
												DW Project 20-7 Total	**$ 290,000**	**20-7 Total**	**$ 50,000**	**15%**
DW Project 20-8																
20-Year	20-8	Pipe	12-inch diameter pipe	12	705	710	LF	$ 320	$ 227,200	$ 45,440	$ 22,720	$ 295,360	$ 296,000	$ 46,150	$ 47,000	16%
												DW Project 20-8 Total	**$ 300,000**	**20-8 Total**	**$ 50,000**	**16%**

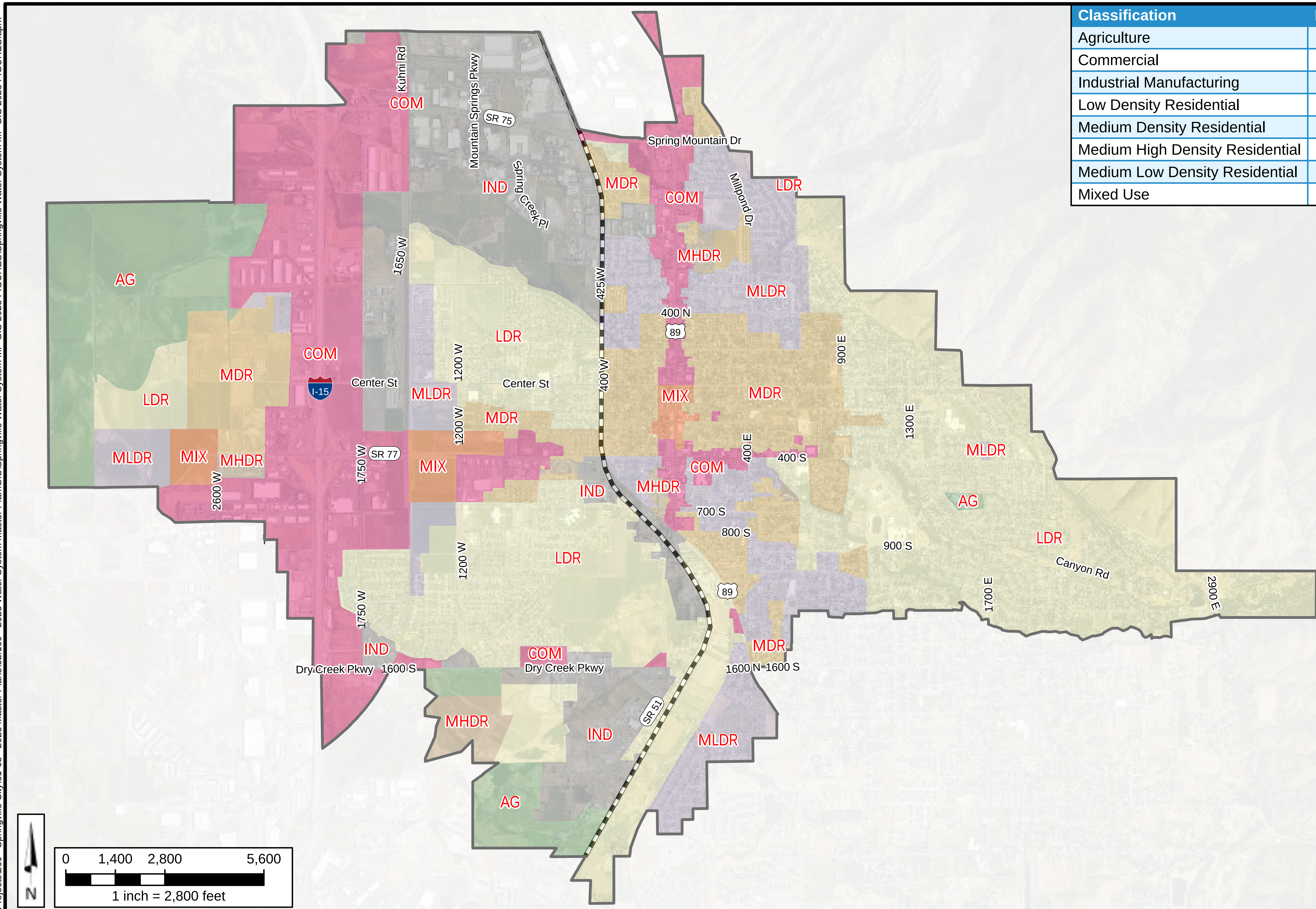
	Totals
10-Year	**$ 22,390,000**
20-Year	**$ 27,180,000**
Total	**$ 49,570,000**

	Impact Fee Eligible	
10-Year	**$ 14,820,000**	**66%**
20-Year	**$ 20,110,000**	**74%**
Total	**$ 34,930,000**	**70%**

APPENDIX E

Future Growth Projections

Classification	Density (ERC/Acre)	Irrigation Factor
Agriculture	10	30%
Commercial	5	15%
Industrial Manufacturing	3	10%
Low Density Residential	3	37%
Medium Density Residential	10	40%
Medium High Density Residential	15	34%
Medium Low Density Residential	5	38%
Mixed Use	5	39%



Legend

- Annexation Boundary
- Eastern PI Zone Boundary
- Agricultural
- Commercial
- Industrial Manufacturing
- Low Density Residential
- Medium Density Residential
- Medium High Density Residential
- Medium Low Density Residential
- Mixed Use

HANSEN ALLEN & LUCE INC ENGINEERS

SPRINGVILLE CITY
DRINKING WATER SYSTEM MASTER PLAN

FUTURE GROWTH PROJECTIONS

APPENDIX E

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APPENDIX F

Checklist for Hydraulic Model Design Elements Report

Hydraulic Analysis Certification for DDW Project

This portion of the Hydraulic Analysis Certification must be completed and sealed by a Professional Engineer. It certifies that the project's hydraulic modeling and analysis comply with Utah Administrative Rules R309. Note: This certification is not required on a project that is only installing water lines up to and including 16 inches in diameter and if the system has approved standards per R309-500-7(1).

PE in charge of Hydraulic Model of this Project	____________________
State of Utah P.E. License No.	____________________
Signature	____________________
Date	____________________

I hereby certify that the hydraulic modeling analysis for:

Project Name	Springville City Drinking Water Master Plan and Capital Improvement Plan
Hydraulic Modeling Software and Version Used	InfoWater
Water System Name	Springville City Water Department (Culinary)
Water System Number	25005
DDW File Number	____________________

meets all requirements as set forth in *R309-511* (*Hydraulic Modeling Rule*) and complies with the provisions thereof, as well as the sizing requirements of *R309-510*, and the minimum water pressures of *R309-105-9*. Where applicable the proposed additions to the distribution system will not cause the pressures at any new or existing connections to be less than those specified in *R309-105-9*. The model is sufficiently calibrated and accurate to represent the conditions within this water system. The velocities in the model are not excessive and are within industry standards.

This portion of the Hydraulic Analysis Certification must be completed by the P.E. designated to oversee the system's hydraulic model.

P.E. Designated to Oversee System's Hydraulic Model	____________________
Signature concurring with incorporation of this project's hydraulic model into system's master hydraulic model	____________________
Date	____________________

HYDRAULIC MODEL DESIGN ELEMENTS & SYSTEM CAPACITY EXPANSION REPORT

HYDRAULIC ANALYSIS CERTIFICATION

I hereby certify that the hydraulic modeling analysis for:

Springville City Drinking Water Master Plan and Capital Improvement Plan

(Project Name or Description)

Springville City Water Department (Culinary)

(Water System Name)

25005

(Water System Number)

____

(DDW File Number, If Available)

Meets all requirements as set forth in *R309-511* (*Hydraulic Modeling Requirements*) and complies with the provisions thereof, as well as the sizing requirements of *R309-510*, and the minimum water pressures of *R309-105-9*. Where applicable the proposed additions to the distribution system will not cause the pressures at any new or existing connections to be less than those specified in *R309-105-9*. The model is sufficiently calibrated and accurate to represent the conditions within this water system. The velocities in the model are not excessive and are within industry standards. The hydraulic modeling method is *[e.g., use of computer software or hand calculations]*, **and the computer software used was** *[software name and version]*.

Signature ______________________________

Print Name ______________________________

State of Utah P.E. License No. ____________________

Date ______________________________

APPENDIX

CHECKLIST FOR HYDRAULIC MODEL DESIGN ELEMENTS REPORT

The hydraulic model checklist below identifies the components included in the Hydraulic Model Design Elements Report for

Springville City Drinking Water Master Plan and Capital Improvement Plan
(Project Name or Description)

25005
(Water System Number)

Springville City Water Department (Culinary)
(Water System Name)

November 4, 2025
(Date)

The checkmarks and/or P.E. initials after each item indicate the conditions supporting P.E. Certification of this Report.

1. The Report contains:

(a) A listing of sources including: the source name, the source type (i.e., well, spring, reservoir, stream etc.) for both existing sources and additional sources identified as needed for system expansion, the minimum reliable flow of the source in gallons per minute, the status of the water right and the flow capacity of the water right. *[R309-110-4 "Master Plan" definition]* ☒ ______

(b) A listing of storage facilities including: the storage tank name, the type of material (i.e., steel, concrete etc.), the diameter, the total volume in gallons, and the elevation of the overflow, the lowest level (elevation) of the equalization volume, the fire suppression volume, and the emergency volume or the outlet. *[R309-110-4 "Master Plan" definition]* ☒ ______

(c) A listing of pump stations including: the pump station name and the pumping capacity in gallons per minute. Under this requirement one does not need to list well pump stations as they are provided in requirement (a) above. *[R309-110-4 "Master Plan" definition]* ☒ ______

(d) A listing of the various pipeline sizes within the distribution system with their associated pipe materials and, if readily available, the approximate length of pipe in each size and material category. A schematic of the distribution piping showing node points, elevations, length and size of lines, pressure zones, demands, and coefficients used for the hydraulic analysis required by (h) below will suffice. *[R309-110-4 "Master Plan" definition]* ☒ ______

(e) A listing by customer type (i.e., single family residence, 40 unit condominium complex, elementary school, junior high school, high school, hospital, post office, industry, commercial etc.) along with an assessment of their associated number of ERCs. *[R309-110-4 "Master Plan" definition]* ☒ ______

(f) The number of connections along with their associated ERC value that the public drinking water system is committed to serve, but has not yet physically connected to the infrastructure. *[R309-110-4 "Master Plan" definition]* ☒ ______

(g) A description of the nature and extent of the area currently served by the water system and a plan of action to control addition of new service connections or expansion of the public drinking water system to serve new development(s). The plan shall include current number of service connections and water usage as well as land use projections and forecasts of future water usage. *[R309-110-4 "Master Plan" definition]* ☒ ______

(h) A hydraulic analysis of the existing distribution system along with any proposed distribution system expansion identified in (g) above. *[R309-110-4 "Master Plan" definition]* ☒ ______

(i) A description of potential alternatives to manage system growth, including interconnections with other existing public drinking water systems, developer responsibilities and requirements, water rights issues, source and storage capacity issues and distribution issues. *[R309-110-4 "Master Plan" definition]* ☒ ______

2. At least 80% of the total pipe lengths in the distribution system affected by the proposed project are included in the model. *[R309-511-5(1)]* ☒ ______

3. 100% of the flow in the distribution system affected by the proposed project is included in the model. If customer usage in the system is metered, water demand allocations in the model account for at least 80% of the flow delivered by the distribution system affected by the proposed project. *[R309-511-5(2)]* ☒ ______

4. All 8-inch diameter and larger pipes are included in the model. Pipes smaller than 8-inch diameter are also included if they connect pressure zones, storage facilities, major demand areas, pumps, and control valves, or if they are known or expected to be significant conveyers of water such as fire suppression demand. *[R309-511-5(3)]* ☒ ______

5. All pipes serving areas at higher elevations, dead ends, remote areas of a distribution system, and areas with known under-sized pipelines are included in the model. *[R309-511-5(4)]* ☒ ______

6. All storage facilities and accompanying controls or settings applied to govern the open/closed status of the facility for standard operations are included in the model. *[R309-511-5(5)]* ☒ ______

7. Any applicable pump stations, drivers (constant or variable speed), and accompanying controls and settings applied to govern their on/off/speed status for various operating conditions and drivers are included in the model. *[R309-511-5(6)]* ☒ ______

8. Any control valves or other system features that could significantly affect the flow of water through the distribution system (i.e. interconnections with other systems, pressure reducing valves between pressure zones) for various operating conditions are included in the model. *[R309-511-5(7)]* ☒ ______

9. Imposed peak day and peak instantaneous demands to the water system's facilities are included in the model. The Hydraulic Model Design Elements Report explains which of the Rule-recognized standards for peak day and peak instantaneous demands are implemented in the model (i.e., (i) peak day and peak instantaneous demand values per *R309-510, Minimum Sizing Requirements*, (ii) reduced peak day and peak instantaneous demand values approved by the Director per *R309-510-5, Reduction of Sizing Requirements*, or (iii) peak day and peak instantaneous demand values expected by the water system in excess of the values in *R309-510, Minimum Sizing Requirements*). The Hydraulic Model Design Elements Report explains the multiple model simulations to account for the varying water demand conditions, or it clearly explains why such simulations are not included in the model. The Hydraulic Model Design Elements Report explains the extended period simulations in the model needed to evaluate changes in operating conditions over time, or it clearly explains (e.g., in the context of the water system, the extent of anticipated fire event, or the nature of the new expansion) why such simulations are not included in the model. *[R309-511-5(8) & R309-511-6(1)(b)]* ☒ ______

10. The hydraulic model incorporates the appropriate demand requirements as specified in *R309-510, Minimum Sizing Requirements*, and *R309-511, Hydraulic Modeling Requirements*, in the evaluation of various operating conditions of the public drinking water system. The Report includes:
    - the methodology used for calculating demand and allocating it to the model;
    - a summary of pipe length by diameter;

- a hydraulic schematic of the distribution piping showing pressure zones, general pipe connectivity between facilities and pressure zones, storage, elevation, and sources; and
- a list or ranges of values of friction coefficient used in the hydraulic model according to pipe material and condition in the system. In accordance with Rule stipulation, all coefficients of friction used in the hydraulic analysis are consistent with standard practices.

  [R309-511-7(4)] ☒ ______

11. The Hydraulic Model Design Elements Report documents the calibration methodology used for the hydraulic model and quantitative summary of the calibration results (i.e., comparison tables or graphs). The hydraulic model is sufficiently accurate to represent conditions likely to be experienced in the water delivery system. The model is calibrated to adequately represent the actual field conditions using field measurements and observations. *[R309-511-4(2)(b), R309-511-5(9), R309-511-6(1)(e) & R309-511-7(7)]* ☒ ______

12. The Hydraulic Model Design Elements Report includes a statement regarding whether fire hydrants exist within the system. Where fire hydrants are connected to the distribution system, the model incorporates required fire suppression flow standards. The statement that appears in the Report also identifies the local fire authority's name, address, and contact information, as well as the standards for fire flow and duration explicitly adopted from *R309-510-9(4), Fireflow,* or alternatively established by the local fire suppression agency, pursuant to *R309-510-9(4), Fireflow.* The Hydraulic Model Design Elements Report explains if a steady-state model was deemed sufficient for residential fire suppression demand, or acknowledges that significant fire suppression demand warrants extended model simulations and explains the run time used in the simulations for the period of the anticipated fire event. *[R309-511-5(10) & R309-511-7(5)]* ☒ ______

13. If the public drinking water system provides water for outdoor use, the Report describes the criteria used to estimate this demand. If the irrigation demand map in *R309-510-7(3), Irrigation Use,* is not used, the report provides justification for the alternative demands used in the model. If the irrigation demands are based on the map in *R309-510-7(3), Irrigation Use,* the Report identifies the irrigation zone number, a statement and/or map of how the irrigated acreage is spatially distributed, and the total estimated irrigated acreage. The indicated irrigation demands are used in the model simulations in accordance with Rule stipulation. The model accounts for outdoor water use, such as irrigation, if the drinking water system supplies water for outdoor use. *[R309-511-5(11) & R309-511-7(1)]* ☒ ______

14. The Report states the total number of connections served by the water system including existing connections and anticipated new connections served by the water system after completion of the construction of the project. *[R309-511-7(2)]*

    ☒ ______

15. The Report states the total number of equivalent residential connections (ERC) including both existing connections as well as anticipated new connections associated with the project. In accordance with Rule stipulation, the number of ERC's includes high as well as low volume water users. In accordance with Rule stipulation, the determination of the equivalent residential connections is based on flow requirements using the anticipated demand as outlined in *R309-510, Minimum Sizing Requirements*, or is based on alternative sources of information that are deemed acceptable by the Director. *[R309-511-7(3)]* ☒ ______

16. The Report identifies the locations of the lowest pressures within the distribution system, and areas identified by the hydraulic model as not meeting each scenario of the minimum pressure requirements in *R309-105-9, Minimum Water Pressure*. *[R309-511-7(6)]* ☒ ______

17. The Hydraulic Model Design Elements Report identifies the hydraulic modeling method, and if computer software was used, the Report identifies the software name and version used. *[R309-511-6(1)(f)]* ☒ ______

18. For community water system models, the community water system management has been provided with a copy of input and output data for the hydraulic model with the simulation that shows the worst case results in terms of water system pressure and flow. *[R309-511-6(2)(c)]* ☒ ______

19. The hydraulic model predicts that new construction will not result in any service connection within the new expansion area not meeting the minimum distribution system pressures as specified in *R309-105-9, Minimum Water Pressure*. *[R309-511-6(1)(c)]* ☐ ______

20. The hydraulic model predicts that new construction will not decrease the pressures within the existing water system such that the minimum pressures as specified in *R309-105-9, Minimum Water Pressure* are not met. *[R309-511-6(1)(d)]* ☒ ______

21. The velocities in the model are not excessive and are within industry standards. ☒ ______