



## SECONDARY WATER MASTER PLAN

Springdale, Utah

March 2021



# SPRINGDALE, UTAH SECONDARY WATER MASTER PLAN

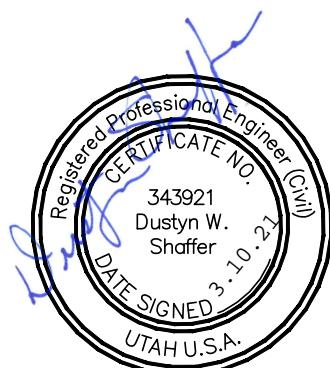
## MARCH 2021

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### EXECUTIVE SUMMARY

Secondary water, or irrigation, has long been a critical service within the Town of Springdale. The Town's residential and commercial outdoor irrigation needs have somewhat been evaluated in the Culinary Water Master Plan. However, the Town of Springdale desired to have a comprehensive Secondary Water Master Plan that looks specifically at irrigation usage and needs. This Master Plan calculates an estimated secondary water usage, analyzes water rights, source capacity, storage, and distribution needs.

The existing secondary water system services three sets of customers. The Town customers, Town properties, and shareholders of the Springdale Consolidated Irrigation Company (SCIC). In addition to the analysis mentioned above, this plan evaluates the difference in usage for each of these sets of customers.

Based on the analyses performed, a list of recommended future improvements is provided for the 10-year planning window. These improvements will help the system meet existing and future demands as well as improve operation and maintenance.

### I. INTRODUCTION

This Secondary Water Master Plan has been prepared for the Town of Springdale. Springdale is located in Washington County, Utah, along Highway 9 and adjacent to Zion National Park.

The irrigation system has multiple categories of users. These categories are the Town customers, Town properties and shareholders of the Springdale Consolidated Irrigation Company (SCIC). The difference in the usage of each set of customers is evaluated in this report.

The secondary water system has been analyzed under existing usage demands and operation to determine the current system status and possible needs. The amount of irrigated land is not likely to grow significantly due to the geographic limitations of the Town. Because of this, the plan does not project an increase in secondary water usage even though the number of connections may increase.

This master plan includes recommended improvements that will present the estimated costs and recommended schedule for the proposed improvements.

### II. SYSTEM USERS ANALYSIS

#### A. PROJECTED GROWTH RATE

The Town continues to experience considerable growth especially with the hotels, restaurants, and other businesses that are in high demand for the local tourist industry. However, this growth is not anticipated to increase the demand on the secondary water system. This is because the growth is not adding to the amount of irrigated land in the Town. This growth will likely decrease the demand on the system as agricultural land is developed.

There are areas of the Town that do not have access to the irrigation system. In the Towns' ordinance it says that these areas could gain access to the irrigation system if they were to pay for the piping and pumping that would be required. This is the only situation where the Town would likely see an increase in secondary water demand. This situation is not anticipated to occur in the foreseeable future. Therefore, in this report only the existing number of connections and existing usage are being used to evaluate the demands on the system.

#### B. LENGTH OF PLANNING PERIOD

This Secondary Water Master Plan uses a 10-year planning period beginning in year 2020 and running through the year 2030. This period will allow an adequate evaluation of the system for potential infrastructure improvements or other needs. Some recommended improvements are set outside this window and will be referred to as future projects.

#### C. EXISTING SECONDARY WATER USERS

The secondary water system has users from the Town as well as from the Springdale Consolidated Irrigation Company (SCIC). The Town customers pay on a monthly basis to have irrigation water provided to them. The irrigation company users have shares of water that they pay for on an annual basis. Users from both the Town and SCIC shareholders are given specific days in which they are allowed to use the irrigation water. According to data provided by Springdale, there are 73 customers that buy their irrigation water through the Town and 107 SCIC shareholders.

In addition to the Town customer's the Town also owns 5 properties that are irrigation using water from the secondary water system. Section IV will go into more detail in the differences between Town customers, Town properties and irrigation company shareholders.

### III. SYSTEM USAGE

Generally, the average usage per user is determined from historical usage data. This plan uses historical usage from the past 3 years. This usage comes from meter reading at the pump house and meters at two of the springs. The water coming through the pump house supplies water to both irrigation and culinary systems. To determine just the secondary water usage the total water through the pump house was subtracted from the amount of water inflow to the culinary water treatment plant. A summary of the historical usage is shown in Figure III-1. This plan will use a total annual secondary water usage of 242,914,000 gallons. This irrigation usage includes usage from all Town customers, Town property, and SCIC shareholders. Appendix A contains a full summary of the historical water usage used for this plan.

Figure III-1: Summary of Historical Town Water Usage

Year	Secondary Water Usage (Gal)
2017	243,350,000
2018	237,407,000
2019	247,985,000
3 Year Average	242,914,000

The 242,914,000 gallons of annual secondary water usage divided by 365 days yields an average total daily usage of 665,500 gpd. Dividing the system gallons per day among the 185 system connections provides an average daily usage of 3,600 gallons per user. The usage from Town customers, Town properties and the SCIC shareholders varies significantly. The difference comes from the average amount of irrigated land per user. The lots of the shareholders and Town properties have more irrigated land per user than do the Town customers. Because of this, the usage of 3,600 gallons per day per user is not an accurate indicator of usage for either customer type. Therefore, a separate usage was calculated for each customer type. Section IV discusses further how this usage is divided up among the different types of customers.

### IV. EVALUATION OF ACCOUNTS AND SHARES

As stated above, there are three sets of users for the existing secondary water system. There are 185 total users on the system: 73 Town customers, 107 irrigation company shareholders and 5 Town properties. This section evaluates and compares the impacts of the different user types on the existing system.

#### A. TOWN CUSTOMERS

Town customers are billed a flat monthly rate to be able to pull water from the system. They are given specific days when they may use the water. There is no mechanism in place to limit the amount of water they can use. The constraint on usage is simply based on the size of the connection piping and their time of use.

Where no meters are in place there is no data on how much water a Town customer uses. This report assumes the Utah State Code R309-510 guidelines for outdoor water usage are applicable. This guideline suggests that in Springdale the average yearly usage should be approximately 3.26 ac-ft per irrigated acre. Random lots were measured via aerial photo to determine the average irrigated acreage per lot. This average is 0.55 irrigated acres per user for this report.

The 0.55 average irrigated acres per user was multiplied by the assumed usage of 3.26 ac-ft per irrigated acre to determine the estimated average usage per user. The result is 1.78 ac-ft per user or approximately 1,600 gpd per user.

$$0.55 \frac{\text{avg irr. acre}}{\text{user}} \times 3.26 \frac{\text{ac - ft}}{\text{irr. acre}} = 1.78 \frac{\text{ac - ft}}{\text{user}}$$

Taking the average usage per customer and multiplying it by the number of customers yields a total daily usage of 116,200 gpd from the Town customers. This results in a yearly usage of 42,410,000 gallons. This usage is used in Section IV.B to compare with the usage of the SCIC shareholders.

$$1,600 \frac{\text{gpd}}{\text{customer}} \times 73 \text{ customers} = 116,200 \text{ gpd}$$

#### B. Town Properties

The 5 Town properties are parcels that receive irrigation water but are owned and operated by the Town such as the parks and cemetery. The same method used to calculate usage for Town customers was used for the Town Properties. The results were 1.54 ac-ft per property and 6,870 gallons per day for the Town properties.

#### C. SCIC SHAREHOLDERS

The irrigation company has 445 shares that are divided among the 107 shareholders. The number of shares per user varies from ½ a share up to just over 60 shares. For every share there is an annual limit on how much water can be used. That annual limit per one share is 1.63 ac-ft or 531,137 gallons.

## SECTION IV – EVALUATION OF ACCOUNTS AND SHARES

Taking the number of shares available and multiplying by the max annual usage of 531,137 gallons per share, the shareholders can use up to 239,224,163 gallons annually. Just like with Town customers, shareholders have specific days on which they can use the water.

As with the Town customers, no meter data is available to show actual individual water usage. To estimate the usage of the SCIC shareholders the usage from Town customers and Town properties was subtracted from the total usage estimated in Section III. The remainder is assumed to be the usage of the shareholders. The result is shown in Figure IV-1.

Figure IV-1: Annual Usage by Customer Type

Total System Usage (Gal)	242,910,000
Town Customer Usage (Gal)	42,410,000
Town Properties Usage (Gal)	2,510,000
SCIC Shareholder Usage (Gal)	198,000,000

The 198,000,000 gallons per year shown in Figure IV-1 is used to compare the SCIC usage with usage from Town customers and Town properties. The SCIC yearly usage divided by 365 days yields a daily usage of 542,500 gpd for all the SCIC shareholders, or about 5,000 gpd per user.

### D. COMPARISON

The total usage from each customer type was put in a ratio to determine the percent of total usage that goes to each type. Figure IV-2 illustrates the comparison by percentage.

Figure IV-2: Percent of Secondary Water Usage by Customer Type

Town Customer Usage %	17%
Town Property Usage %	1%
SCIC Shareholder Usage (Gal)	82%

As stated above, the only known usage info is the total amount coming into the systems. Estimates were made using average irrigated acres and state guidelines. Usage calculations also assumed that SCIC shareholders used the remainder of the total usage that was not estimated to be used by Town customers or properties. This assumption does not take into account any minor losses in the water such as leaks in the pipes.

More accurate usage data will be needed to compare the usage of Town customers, Town properties and SCIC shareholders more accurately. It is recommended that the Town install secondary water meters for all their customers and properties as well as encourage the SCIC to do the same with their users. Adding meters will provide more accurate usage data. This will be discussed further in Section VI.

## SECTION V – WATER RIGHTS, SOURCE, STORAGE & DISTRIBUTION

### V. WATER RIGHTS, SOURCE, STORAGE & DISTRIBUTION

This section summarizes the existing elements of the system and calculates the required demand for water rights, source, storage, and distribution. Each section also includes recommended improvements to either help meet system requirements or improve operations and maintenance. Section VII summarizes the recommended improvements discussed in this section and provides a timeline for those improvements.

Where the Town customers, Town properties and SCIC shareholders have such a difference in average usage, demands and requirements were calculated separately. The separate demands or requirements were then added together to calculate the total demand or requirement on the system.

#### A. WATER RIGHTS

The Town has water rights for Virgin River water as well as a few springs and wells in the area. All the water diverted from the river is pumped into the irrigation system where it either goes to the settling ponds above the culinary water treatment plant or directly to the irrigation users. SCIC also holds water rights for water that is used by its shareholders. The Town's water rights are identified in Figure V-1. These rights are for both culinary water and secondary water use. The required water right amount for culinary water comes from the most recent Culinary Water Master Plan. A map of the water rights listed in Figure V-1 is shown in Appendix B.

Figure V-1: Existing Water Rights Used for Secondary Water

Water Rights (Municipal Use)		Flow	
W.R. #	Source	cfs	Ac-Ft.
Springdale Town			
81-3392	Springdale Town for Municipal Use	1.33	365.95
81-105	Spring above ZNP Campground	0.02	11.58
81-220	Birch Springs East	0.04	30.41
81-274	Birch Springs West	0.07	50.68
81-585	Hummingbird Well	0.33	238.91
81-2413	Big Springs	0.53	380.08
Total Town Water Rights		2.31	1077.61
Total Water Rights Required for Culinary Use			610.00
SCIC			
81-1142	SCIC Water Rights	2.64	726.0

The State of Utah Division of Water Rights require that no entity exceed its water right in usage in any year. The amount of required water rights was determined using the average usage calculated in Section III. Figure V-2 and Figure V-3 show the calculation for water right requirements for the system.

## SECTION V – WATER RIGHTS, SOURCE, STORAGE & DISTRIBUTION

Figure V-2: Water Right Requirement for Town Customers and Properties

<b>Town Customers</b>								
73 Conn X	1592 gpd X	1 day X	1 hr	=		80.69 gpm		
	ERC 24 hr		60 min.					
<b>Town Properties</b>								
5 Conn X	1374 gpd X	1 day X	1 hr	=		4.77 gpm		
	ERC 24 hr		60 min.					
5 Conn X	1374 gpd X	365 day X	1 Ac-ft	=		7.69 Ac-Ft		
	ERC 1 yr		325,851 gal					
<b>Total Water Rights Available</b>						1077.61 Ac-Ft		
<b>Less Water Rights Required for Culinary Use</b>						610.00 Ac-Ft		
<b>Existing Water Rights Surplus</b>						329.76 Ac-Ft		

Figure V-3: Water Requirements for SCIC Shareholders

<b>SCIC Shareholders</b>						
107 Conn X	5134 gpd X	1 day X	1 hr	=		381.48 gpm
	ERC 24 hr		60 min.			
107 Conn X	5134 gpd X	365 day X	1 Ac-ft	=		615.32 Ac-Ft
	ERC 1 yr		325,851 gal			
<b>Existing Water Rights Surplus</b>						110.68 Ac-Ft

Based on the analysis of the Town's water rights the following actions are recommended:

- Historical meter records from the pump station indicate that there are a number of days every year when the system pulls more water from the diversion than is allowed for the combined water rights of the Town and irrigation company. Consistent Metering will help to track where water is going and the Town may be able to install flow control limiting valves on the system to help prevent exceeding water right capacity.
- The water used for municipal purposes (irrigation and culinary) is from the Virgin River, the culinary water is treated. From a water right protection and ease of water right reporting

## SECTION V – WATER RIGHTS, SOURCE, STORAGE & DISTRIBUTION

perspective, it is recommend that the Town explore the concept of adding an “any each or all strategy” to their the water rights. The strategy would include all the Town’s rights because the water produced by the springs either ends up in the river and or the underground sources. The State may want to call this process an exchange from the springs to the river or underground wells.

The advantage of this strategy is that it would allow the Town to use the water rights in the Zion National Park springs for the river diversion or wells. If this strategy is not implemented there is a chance that the category of rights can be lost due to non-use.

The approval of this strategy, is to be discussed internally first to reach a consensus with the Town leaders, then with the Utah Division of Water Rights to see what their opinion is. Adding this management tool to the water rights would require preparation of several change applications to add all Point of Diversions (POD) to each right. It would also require putting a measuring device on each source, including the springs in the national park, and recording the data each month.

- Meter and record all sources. If springs are not used, meter and record the amount of water that is produced from each spring monthly. The data is will be able to help facilitate future water right protection strategies.
- Research to find if any supplemental water rights are available, based on water right or shares which can augment the current inventory of water rights. Each share owned by the Town should be quantified at acre feet values for management purposes.
- Prepare a water right POD Matrix. The matrix will show all PODs whether used or not and tie the annual reported use to each water right. The purpose of this matrix is to determine where water right use could augment the management and protection of the water rights and also be used to decide if a water right proof of beneficial use is possible.
- The Town Board approve the preparation of a 40 Year Water Right Plan. The plan would use growth rates and the current water rights inventory to assess whether a new project would be required to turn over to the Town a water right equal to the water right needs of the Town.

### B. SOURCE



Figure V-4: Point of Diversion at the Virgin River

Most of the secondary irrigation water for the Town of Springdale comes from the Virgin River. The Town does have springs and wells that can also provide some source. Figure V-5 shows the lists of available sources in Springdale as well as the amount of water that they can produce.

Figure V-5: List of Available Water Sources

Sources	CFS	gpm
Virgin River		
Town	1.33	597
Springdale Consolidated Irrigation Company	2.64	1,185
Other Sources		
Big Spring	0.27	120
Hummingbird	0.18	80
<b>Source Total (In Use)=</b>	<b>4.42</b>	<b>1,982</b>

The culinary water system and secondary water system both share the same primary source, the Virgin River. However, these systems are not necessarily operated at the same time. During the day no irrigation is allowed, and all water goes to the culinary system. In the evening the source water is shared or only supplies the irrigation system.

For the calculation below it is assumed that both systems are operating fully at the same time. While this may not be the typical operation it is the most conservative method to ensure the system has enough source to meet the required source demands.

Industry standards for source requirement are that a community should have an adequate water source capacity to supply a peak day demand. The peak day demand for secondary water is calculated using State guidelines for outdoor water usage. The State guidelines recommend that in this area peak day demand be estimated as 4.9 gpm/irr. acre.

The peak day demand is multiplied by the number of irr. acres per connection and number of connections. These calculations are shown in Figure V-6 and Figure V-7. The method to determine

## SECTION V – WATER RIGHTS, SOURCE, STORAGE & DISTRIBUTION

the irrigated acre per connection for Town customers was described in Section IV.A. For shareholders, State guidelines were used to determine the irrigated acre per connection. Taking the annual usage estimated in Section IV and converting it to acre feet and dividing it by the number of shareholders yields a usage of 5.68 ac-ft per user. This usage was divided by the state guideline of 3.26 ac-ft per irrigated acre which results in 1.74 irrigated acre per user for the shareholders.

Figure V-6: Required Source - Town Customers

Existing Required Water Source Capacity Calculations Town Customers		
Required Outdoor Source		
73 Conn. X 0.6 irr. acre	X 4.90 gpm	= 197 gpm
	Conn.	irr. acre

Figure V-7: Required Source - Town Properties

Existing Required Water Source Capacity Calculations SCIC Shareholders		
Required Outdoor Source		
107 Conn. X 1.74 irr. acre	X 4.90 gpm	= 913 gpm
	Conn.	irr. acre

Figure V-8: Required Source - SCIC Shareholders

Existing Required Water Source Capacity Calculations Town Properties		
Required Outdoor Source		
5 Conn. X 0.47 irr. acre	X 4.90 gpm	= 12 gpm
	Conn.	irr. acre

Subtracting the combined source required from the total source available results in a surplus of 860 gpm. The existing water treatment plant has a planned max output of 810 gpm. This plan assumes that 810 gpm of the available source is required for the culinary water system. Subtracting the required source for the culinary system leaves a surplus of 50 gpm.

During storm events the Virgin River contains an extremely high concentration of sediment. During these events, the Town tries not to divert water from the river or pump to the settling ponds. This is done to avoid sediment deposits in the diversion pipeline, wear on the pumps, and sediment accumulation in the ponds. Even with normal river flows the diverted water will carry some sediment. For normal flows and even smaller flood events, the Town desires to minimize sediment in the irrigation system and ponds. It may be feasible to install a pre-sedimentation device between the diversion and the pump house. Typically, this would be another settling pond, but this would be within the boundary of Zion National Park and there is not an area to put such a pond.

An alternative to a settling basin would be a clarifier device similar to the Supersettlers that are located at the new culinary water treatment plant. These units are able to perform the same function of a

## SECTION V – WATER RIGHTS, SOURCE, STORAGE & DISTRIBUTION

settling basin with a much smaller footprint. They filter out the sediment by passing the water through inclined plates that force the sediment to the bottom of the unit. One of these units would be approximately 20' tall and would likely need to be contained in a building.

There are a few challenges associated with installing a pre-sedimentation device. The first is locating a suitable site. It would need to be placed so that it ties into the existing line coming from the diversion. However, this too would place the device inside Zion National Park and would require permission from NPS.

Another challenge is what to do with the sediment that is collected. There are a few options. Where no chemicals are added it is a possibility that the sedimentation waste could be sent back to the river. This would require a pipeline to the river and a permit from the Utah Department of Environmental Quality (DEQ). In order to pursue this option a study would likely be required to determine the solid concentration that would be sent to the river as well as the frequency. The other option would be to install a small concrete basin where the waste could be discharged. The waste would be evaporated, and the solids would then need to be manually disposed of. Where the waste will be primarily sediment and dirt the material could likely be disposed of at any location accepting clean fill.

### C. STORAGE

The existing system does not contain any storage for secondary water. For secondary water there is no regulation that requires a system to have any storage. This report does not look at any calculations or improvements regarding secondary water storage.

### D. DISTRIBUTION

The secondary water distribution system generally gets water directly from the transmission line and pump station near the Virgin River diversion. The system is all operated in the same pressure zone. There is a control valve located on Lion Boulevard that directs water from the pump station either to the storage ponds or straight into the irrigation system. The topography and layout of Town of Springdale is such that the primary secondary water distribution backbone runs along SR-9, with mostly dead-end lines running from side to side. This lack of “looping” is not ideal for water supply, system pressure, and the Town’s ability to shut off lines for maintenance.

Currently there are no dead-end lines that have any form of flushing or relief mechanism. Secondary water can contain sediment that is often deposited in these dead-end lines. The Town has experienced some of these lines filling with sediment. It is recommended to install a “blow-off” valve or other mechanism than can be used to flush water through the lines to scour sediment that may have accumulated. After these are installed, it is recommended that the Town create a schedule and regularly exercise the blow-off valves to keep the lines free of sediment.

Where the system suffers from lack of looping lines, and in those areas where it is possible, it is recommended that a few pipeline segments be added to provide some looping. The following are possible locations to add looping to the system:

## SECTION V – WATER RIGHTS, SOURCE, STORAGE & DISTRIBUTION

- **6" line on Moenave to Paradise Rd. and from Paradise Rd. to the irrigation line in Winderland Ln.** – This segment of road has recently been built / reconstructed. It is recommended that the next time work is done in this section of road an irrigation line be installed at that time. This line would bypass the flow control valve on SR-9 and Lion Blvd. A flow control valve would need to be included in this project and installed at Moenave and Lion Blvd.
- **4" line on Desert Springs Road.** – This line would connect the line on Big Springs and the main trunk line on SR-9. This section of road is private and would require the Town to get an easement.
- **Extend 4" line on Gifford Park Dr.** – This line would only provide minor aid with looping but would provide the ability to isolate connections along Gifford Park Dr and Sage Dr.

Appendix C includes an exhibit that shows the location of potential lines described above.

The water operators have expressed that some of the valves are becoming aged and no longer properly functioning. It is recommended that Town begin to look at replacing these older valves. The most efficient method would be to replace the valves that are located within the boundaries of other improvement projects. There is also a lack of isolation valves in the secondary water system. This means that when water is turned off in an area for repairs or maintenance, the water is off for a large number of connections. It is recommended that the Town add isolation valves to reduce the area that is without water during these repairs. The exhibit in Appendix C shows the location of recommended blow offs and isolation valves.

### VI. METERING ALTERNATIVES

It is recommended that individual meters be installed on all secondary water connections. Meters will provide the Town with actual usage data to better evaluate the demands of the system. Meters can help with water conservation if user rates are implemented based on water usage instead of a flat rate. Meters can identify potential overuse and waste, leading to more efficient secondary water use.

Where the system has users from two different entities there are added challenges to metering the individual connections. The Town has recently been approved for a Water Smart Grant from the Bureau of Reclamation that provides for installation of meters on all the Town customer connections. It is recommended that the Town encourage the SCIC to install meters on all its irrigation connections as soon as possible.

#### A. POSSIBLE USER RATE ALTERNATIVES

Once meters are installed on all the connections, the Town will have multiple options on how to apply user rates for secondary water. One option is to continue to operate with what is being done currently. Currently users are charged a flat monthly fee regardless of how much water they use. The only limit to usage is that a user is only allowed to water on specific days.

Alternatively, a user rate structure could be setup to operate like the culinary water rate structure. This is known as a tiered rate structure. Every user is charged a base rate regardless of how much water they use and then the user pays a separate rate per thousand gallons that they use. Typically, in a tiered rate structure the rate varies per amount of water or “Tier” that a user uses.

For example, the culinary rate charges a base rate of \$16.93 and \$5.15 for every 1,000 gallons used up to 5,000 gallons. Then the user is charged \$7.25 for the water used over 5,000 gallons and up to 10,000 gallons. Similar tiers occur for usage between 10,000 and 25,000, then 25,000 – 50,000, and anything above 50,000.

A rate structure can be setup with different number of tiers, and some communities even include an amount of water that comes with the base rate.

Another option for user rates is to determine an allotment per connection based on lot size and expected consumption of the irrigated area for that particular month and charge a base rate that includes that amount of water. Users that use more than the established allotment would pay a premium for any water over that amount. Spanish Fork City is an example of a city using this rate structure. Information on this rate structure can be found on the Spanish Fork City website.

## SECTION VII – SUMMARY OF RECOMMENDED IMPROVEMENTS

### VII. SUMMARY OF RECOMMENDED IMPROVEMENTS

Section V included recommended improvements for water rights, source, storage, and distribution. Figure VII-1 summarizes these recommended improvements and organizes them by priority window.

Figure VII-1: Recommended Improvement Priority

Improvements	Priority	Estimated Costs
Install Secondary Water Meters for Town Customers	1-2 Years	\$ 180,000.00
Irrigation Blow Off Assemblies	2-5 Years	\$ 181,000.00
Irrigation Isolation Valves / Valve Replacement	2-5 Years	\$ 266,000.00
Pre- Sedimentation	5-10 Years	\$ 822,000.00
Add Looping to System	Future	\$ 428,000.00

An Engineers Opinion of Probable Cost can be found for each project in Appendix D. Included in the Opinion of Probable Cost for the proposed projects are anticipated construction costs, a contingency budget, legal services, fiscal costs, permitting, environmental, rights-of-way, etc. The recommended improvements exhibit in Appendix C shows the location of these projects.

# Appendix A

## System Usage

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Historical Usage for 2017, 2018, and 2019. Data includes meter readings from pump house and springs as well as meter at influent of treatment plant. Total Irrigation is the total water from pump house plus from the two springs minus the water going to the culinary water treatment plant.

	2017				
	Pump House	Treatment	Big Springs	Hummingbird	Total Irrigation
Jan	33,000	4,139,600	661,830	4,742,295	1,297,525
Feb	0	3,899,700	853,880	4,567,690	1,521,870
Mar	10,369,000	6,354,100	2,597,540	4,051,780	10,664,220
Apr	18,815,000	8,808,500	3,822,920	4,550,905	18,380,325
May	34,834,000	9,911,500	548,030	1,397,410	26,867,940
Jun	49,660,000	10,783,900	823,410	436,903	40,136,413
Jul	45,477,000	11,684,000	2,786,390	2,950,699	39,530,089
Aug	53,273,000	12,971,300	3,423,060	3,702,494	47,427,254
Sep	21,361,000	11,982,300	696,340	923,348	10,998,388
Oct	31,834,000	5,310,300	189,210	187,091	26,900,001
Nov	21,009,000	5,310,400	0	0	15,698,600
Dec	9,500,000	5,811,700	0	239,214	3,927,514
Total	296,165,000	96,967,300	16,402,610	27,749,829	243,350,139

	2018				
	Pump House	Treatment	Big Springs	Hummingbird	Total Irrigation
Jan	11,047,000	6,590,600	230	353,576	4,810,206
Feb	7,778,000	4,826,800	0	124,853	3,076,053
Mar	15,028,000	5,719,400	131,220	218,565	9,658,385
Apr	33,946,000	9,433,400	96,020	233,518	24,842,138
May	48,734,000	9,513,200	0	334,867	39,555,667
Jun	45,497,000	11,881,900	1,444,700	2,133,624	37,193,424
Jul	48,918,000	12,147,000	2,814,320	3,846,360	43,431,680
Aug	29,599,000	12,509,900	3,504,720	4,689,989	25,283,809
Sep	44,402,000	11,310,000	1,397,410	2,841,432	37,330,842
Oct	14,879,000	11,134,300	1,132,420	3,047,456	7,924,576
Nov	6,401,000	4,486,600	138,140	1,490,376	3,542,916
Dec	6,367,000	5,474,800	0	-134,556	757,644
Total	312,596,000	105,027,900	10,659,180	19,180,060	237,407,340

	2019				
	Pump House	Treatment	Big Springs	Hummingbird	Total Irrigation
Jan	14,905,000	6,068,900	1,370	-520	8,836,950
Feb	9,434,000	5,380,200	45,380	932,141	5,031,321
Mar	10,434,000	6,180,200	56,030	1,023,341	5,333,171
Apr	21,822,000	8,545,500	299,860	4,004,018	17,580,378
May	20,198,000	10,345,500	376,560	4,084,153	14,313,213
Jun	49,883,000	12,251,600	457,980	5,913,223	44,002,603
Jul	51,487,000	13,417,700	117,390	4,987,885	43,174,575
Aug	80,932,000	12,585,200	0	6,631	68,353,431
Sep	12,586,000	12,053,400	0	-923	531,677
Oct	42,661,000	10,100,300	0	1,953	32,562,653
Nov	14,679,000	7,175,500	0	149	7,503,649
Dec	3,982,000	5,533,030	126,950	2,185,780	761,700
Total	333,003,000	109,637,030	1,481,520	23,137,831	247,985,321

# Appendix B

## Water Right Exhibit

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# Springdale Water Rights

## Legend

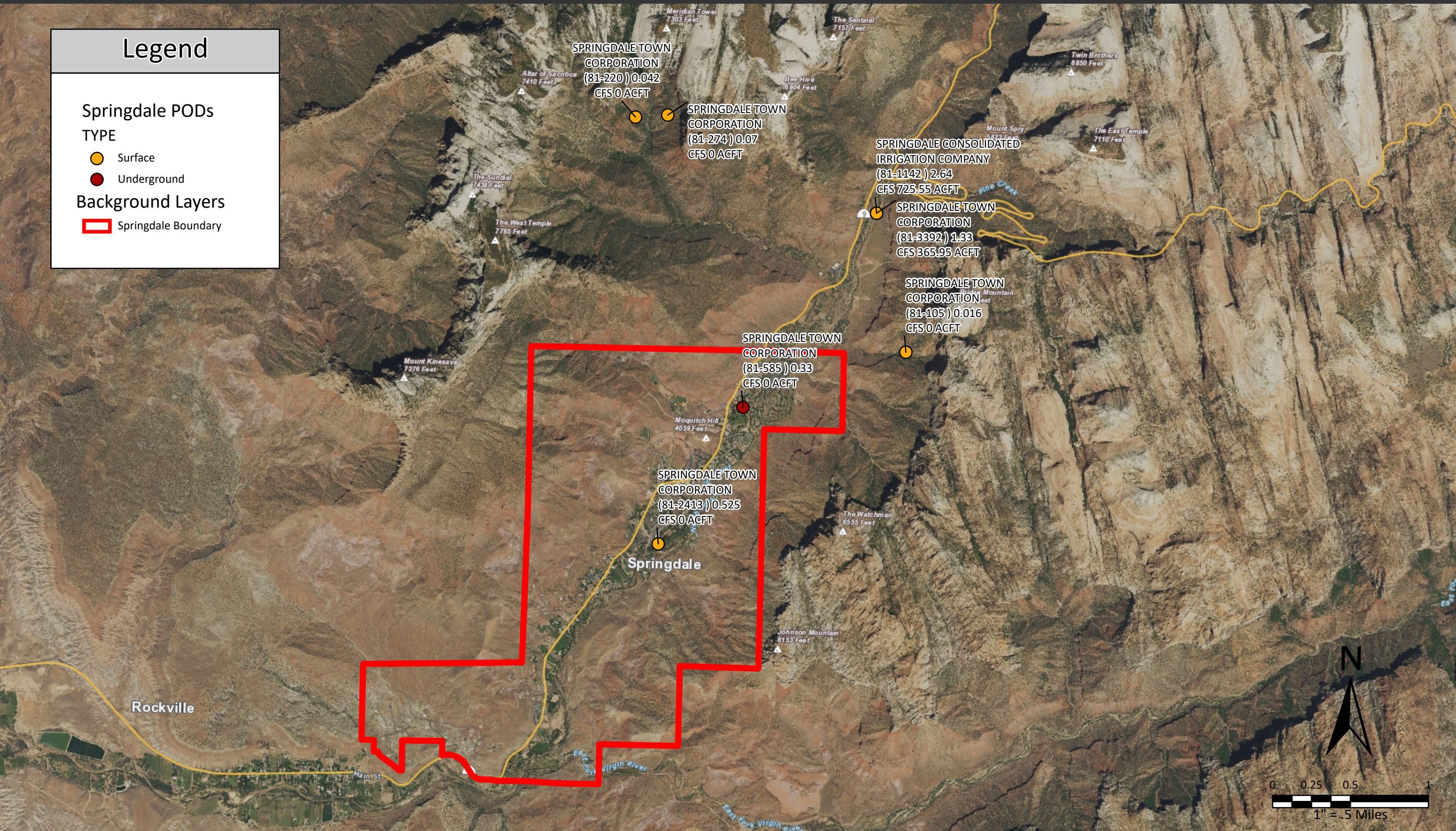
### Springdale PODs

#### TYPE

- Surface
- Underground

### Background Layers

- Springdale Boundary



# Appendix C

## Exhibit of Recommended Improvements

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# RECOMENDED IMPROVEMENTS



0 1,000 2,000

HORIZ. 1" = 1,000 Feet

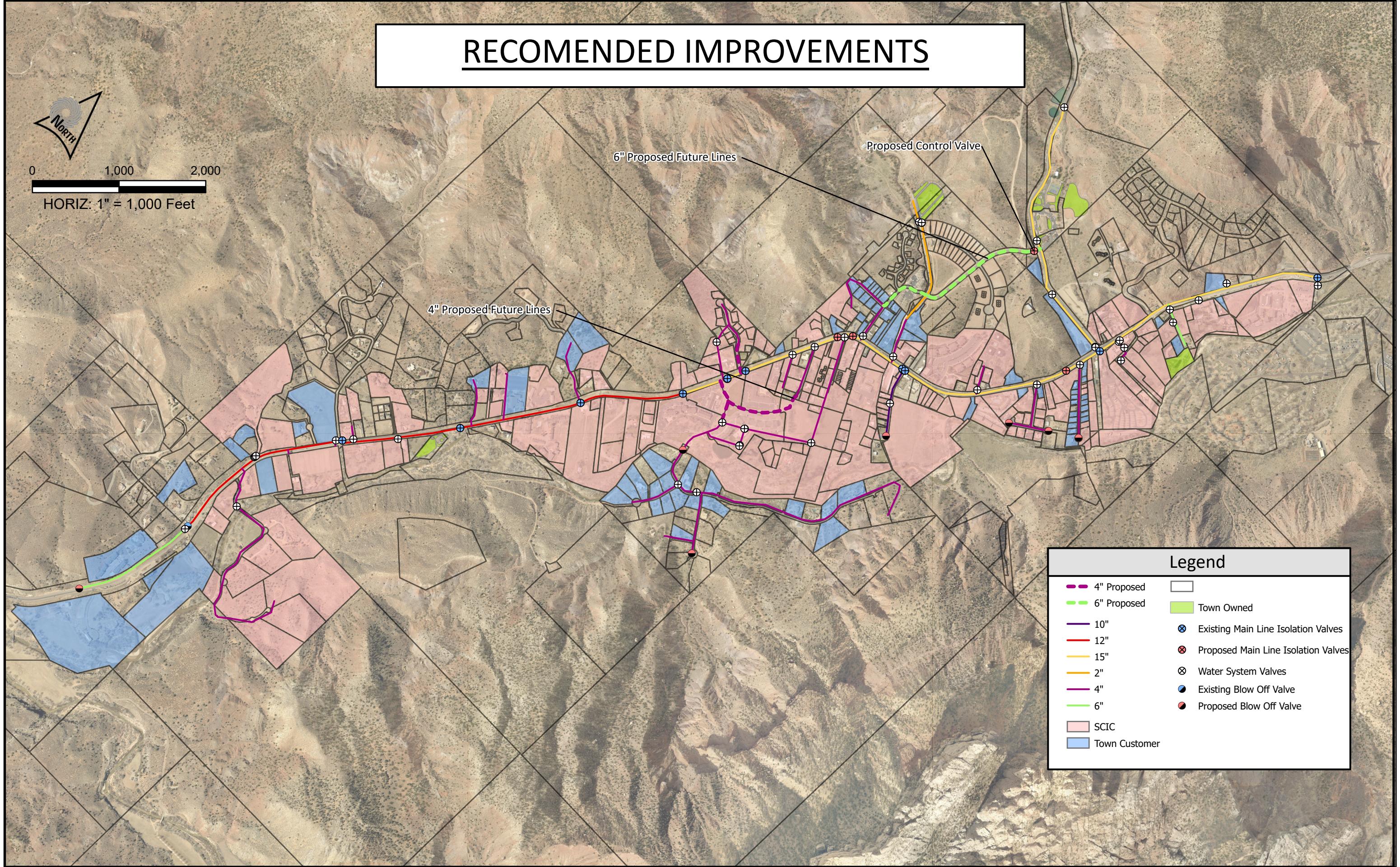
6" Proposed Future Lines

Proposed Control Valve

4" Proposed Future Lines

## Legend

- 4" Proposed
- 6" Proposed
- 10"
- 12"
- 15"
- 2"
- 4"
- 6"
- Town Owned
- Existing Main Line Isolation Valves
- Proposed Main Line Isolation Valves
- Water System Valves
- Existing Blow Off Valve
- Proposed Blow Off Valve
- SCIC
- Town Customer



# Appendix D

## Engineer's Opinion of Probable Cost

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## SUNRISE ENGINEERING, INC.

11 North 300 West, Washington, Utah 84780

Tel: (435) 652-8450 Fax: (435) 652-8416

### Engineer's Opinion of Probable Cost

**Irrigation Blow Off Assembly**

1-Apr-20

Town of Springdale

BCW/dws

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
<b>GENERAL CONSTRUCTION</b>					
1	Mobilization, Traffic Control, Dust Control, etc.	1	LS	\$ 51,125.00	\$ 51,125.00
2	Subsurface Investigation	8	HR	\$ 250.00	\$ 2,000.00
3	Misc Connections, Tie-Ins, and Fittings	1	LS	\$ 20,000.00	\$ 20,000.00
4	6" PVC C900, Installation, Bedding, Tracer Wire, Trench Backfill	50	LF	\$ 45.00	\$ 2,250.00
5	10" PVC C900, Installation, Bedding, Tracer Wire, Trench Backfill	20	LF	\$ 75.00	\$ 1,500.00
6	2" Main Line Blow Off Assembly	5	EA	\$ 4,000.00	\$ 20,000.00
7	4" Main Line Blow Off Assembly	2	LS	\$ 4,500.00	\$ 9,000.00
8	Restore Surface Improvements	1	LS	\$ 7,500.00	\$ 7,500.00
<b>SUBTOTAL</b>					<b>\$ 113,375.00</b>
<b>CONTINGENCY</b>					<b>20%</b>
<b>CONSTRUCTION TOTAL</b>					<b>\$ 136,000.00</b>
<b>INCIDENTALS</b>					
1	Funding & Administrative Services	0.8%	LS	\$ 1,400.00	\$ 1,400.00
2	Engineering Design	8.3%	LS	\$ 15,100.00	\$ 15,100.00
3	Bidding & Negotiating	3.3%	HR	\$ 6,000.00	\$ 6,000.00
4	Engineering Construction Services	8.3%	HR	\$ 15,100.00	\$ 15,100.00
5	Material Sampling and Testing	1.4%	EST	\$ 2,500.00	\$ 2,500.00
6	Construction Staking	2.8%	EST	\$ 5,000.00	\$ 5,000.00
<b>SUBTOTAL</b>					<b>\$ 45,000.00</b>
<b>TOTAL PROJECT COST</b>					<b>\$ 181,000.00</b>

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## SUNRISE ENGINEERING, INC.

11 North 300 West, Washington, Utah 84780

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### Engineer's Opinion of Probable Cost

#### Add Looping to System

Town of Springdale

1-Apr-20

BCW/dws

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
<b>GENERAL CONSTRUCTION</b>					
1	Mobilization, Traffic Control, Dust Control, etc.	1	LS	\$ 57,817.50	\$ 57,817.50
2	Misc Connections, Tie-Ins, and Fittings	1	LS	\$ 32,000.00	\$ 32,000.00
3	4" PVC C900, Installation, Bedding, Tracer Wire, Trench Backfill	2,100	LF	\$ 30.00	\$ 63,000.00
4	6" PVC C900, Installation, Bedding, Tracer Wire, Trench Backfill	1,800	LF	\$ 36.00	\$ 64,800.00
5	4" Gate Valve Assembly	4	EA	\$ 1,500.00	\$ 6,000.00
6	6" Gate Valve Assembly	4	EA	\$ 2,000.00	\$ 8,000.00
7	3" Asphalt Patch	23,400	SF	\$ 3.25	\$ 76,050.00
8	Subsurface Investigation	16	HR	\$ 250.00	\$ 4,000.00
9	Restore Surface Improvements	1	LS	\$ 7,500.00	\$ 7,500.00
10	Flow Control Valve and Vault	1	LS	\$ 85,000.00	\$ 85,000.00
11	SCADA Improvements	1	LS	\$ 10,000.00	\$ 10,000.00
<b>SUBTOTAL</b>					<b>\$ 356,350.00</b>
<b>CONTINGENCY</b>					<b>20%</b>
<b>CONSTRUCTION TOTAL</b>					<b>\$ 428,000.00</b>
<b>INCIDENTALS</b>					
1	Funding & Administrative Services	0.8%	LS	\$ 4,300.00	\$ 4,300.00
2	Engineering Design	7.0%	LS	\$ 37,600.00	\$ 37,600.00
3	SCADA Design & Integration	1.1%	LS	\$ 6,000.00	\$ 6,000.00
4	Bidding & Negotiating	1.1%	HR	\$ 6,000.00	\$ 6,000.00
5	Engineering Construction Services	8.0%	HR	\$ 42,800.00	\$ 42,800.00
6	Material Sampling and Testing	1.4%	HR	\$ 7,500.00	\$ 7,500.00
7	Construction Staking	0.9%	HR	\$ 5,000.00	\$ 5,000.00
<b>SUBTOTAL</b>					<b>\$ 109,000.00</b>
<b>TOTAL PROJECT COST</b>					<b>\$ 537,000.00</b>

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**SUNRISE ENGINEERING, INC.**

11 North 300 West, Washington, Utah 84780

Tel: (435) 652-8450 Fax: (435) 652-8416

**Engineer's Opinion of Probable Cost**

**Pre-Sedimentation**

1-Apr-20

Town of Springdale

BCW/dws

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
<b>GENERAL CONSTRUCTION</b>					
1	Mobilization, Traffic Control, Dust Control, etc.	1	LS	\$ 36,062.50	\$ 36,062.50
2	Clearing and Grubbing	1	LS	\$ 7,500.00	\$ 7,500.00
3	Earthwork and Grading	1	LS	\$ 10,000.00	\$ 10,000.00
4	Building Pad and Building (25' X 35')	1	LS	\$ 43,750.00	\$ 43,750.00
5	Pre-Sedimentation Device	1	LS	\$ 400,000.00	\$ 400,000.00
6	Misc Connections, and Tie-Ins	1	LS	\$ 10,000.00	\$ 10,000.00
7	Misc. Appurtenances (Pipes, Fittings, Valves)	1	LS	\$ 50,000.00	\$ 50,000.00
<b>SUBTOTAL</b>					<b>\$ 557,312.50</b>
<b>CONTINGENCY</b>					20% <b>\$ 111,462.50</b>
<b>CONSTRUCTION TOTAL</b>					<b>\$ 669,000.00</b>
<b>INCIDENTALS</b>					
1	Funding & Administrative Services	0.8%	LS	\$ 6,700.00	\$ 6,700.00
2	Engineering Design	6.6%	LS	\$ 54,000.00	\$ 54,000.00
3	Bidding & Negotiating	0.7%	HR	\$ 6,000.00	\$ 6,000.00
4	Engineering Construction Services	8.1%	HR	\$ 66,900.00	\$ 66,900.00
5	Material Sampling and Testing	1.5%	EST	\$ 12,000.00	\$ 12,000.00
6	Construction Staking	0.9%	EST	\$ 7,500.00	\$ 7,500.00
7	Environmental	0.7%	EST	\$ 5,400.00	\$ 5,400.00
8	Permitting	0.4%	HR	\$ 3,300.00	\$ 3,300.00
<b>SUBTOTAL</b>					<b>\$ 153,000.00</b>
<b>TOTAL PROJECT COST</b>					<b>\$ 822,000.00</b>

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## SUNRISE ENGINEERING, INC.

11 North 300 West, Washington, Utah 84780

Tel: (435) 652-8450 Fax: (435) 652-8416

### Engineer's Opinion of Probable Cost

#### Install Secondary Water Meters

1-Apr-20

Town of Springdale

BCW/dws

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
<b>GENERAL CONSTRUCTION</b>					
1	Mobilization, Traffic Control, Dust Control, etc.	1	LS	\$ 12,800.00	\$ 12,800.00
2	Restore Surface Improvements	1	LS	\$ 11,600.00	\$ 11,600.00
3	1" Water Meter	70	LS	\$ 1,050.00	\$ 73,500.00
4	1.5" Water Meter	3	LS	\$ 2,450.00	\$ 7,350.00
5	2" Water Meter	4	LS	\$ 2,650.00	\$ 10,600.00
6	3" Water Meter	0	LS	\$ 12,200.00	\$ -
7	4" Water Meter	1	LS	\$ 13,750.00	\$ 13,750.00
<b>SUBTOTAL</b>					<b>\$ 129,600.00</b>
<b>CONTINGENCY</b>					<b>\$ 25,920.00</b>
<b>CONSTRUCTION TOTAL</b>					<b>\$ 156,000.00</b>
<b>INCIDENTALS</b>					
1	Environmental	2.8%	LS	\$ 5,000.00	\$ 5,000.00
2	Survey	1.9%	LS	\$ 3,500.00	\$ 3,500.00
3	Engineering Design	2.9%	LS	\$ 5,200.00	\$ 5,200.00
4	Bidding and Negotiating	1.8%	HR	\$ 3,200.00	\$ 3,200.00
5	Engineering Construction Services	3.7%	HR	\$ 6,700.00	\$ 6,700.00
<b>SUBTOTAL</b>					<b>\$ 24,000.00</b>
<b>TOTAL PROJECT COST</b>					<b>\$ 180,000.00</b>

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## SUNRISE ENGINEERING, INC.

11 North 300 West, Washington, Utah 84780

Tel: (435) 652-8450 Fax: (435) 652-8416

### Engineer's Opinion of Probable Cost

#### Install Isolation Valves / Valve Replacement

1-Apr-20

Town of Springdale

BCW/dws

NO.	DESCRIPTION	EST. QTY	UNIT	UNIT PRICE	AMOUNT
<b>GENERAL CONSTRUCTION</b>					
1	Mobilization, Traffic Control, Dust Control, etc.	1	LS	\$ 10,900.00	\$ 10,900.00
2	Restore Surface Improvements	1	LS	\$ 15,000.00	\$ 15,000.00
3	Excavation	1	LS	\$ 7,500.00	\$ 7,500.00
4	Install New 15" Isolation Valve	3	EA	\$ 5,000.00	\$ 15,000.00
5	Replace Existing 15" Valve	6	EA	\$ 6,000.00	\$ 36,000.00
6	Replace Existing 12" Valve	4	EA	\$ 4,500.00	\$ 18,000.00
7	Replace Existing 10" Valve	1	EA	\$ 3,800.00	\$ 3,800.00
8	Replace Existing 6" Valve	2	EA	\$ 3,000.00	\$ 6,000.00
9	Replace Existing 4" Valve	25	EA	\$ 2,500.00	\$ 62,500.00
10	Replace Existing 2" Valve	2	EA	\$ 1,500.00	\$ 3,000.00
<b>SUBTOTAL</b>					<b>\$ 177,700.00</b>
<b>CONTINGENCY</b>					<b>20%</b>
<b>CONSTRUCTION TOTAL</b>					<b>\$ 213,000.00</b>
<b>INCIDENTALS</b>					
1	Funding and Administration Services	0.8%	LS	\$ 2,100.00	\$ 2,100.00
2	Engineering Design	8.1%	LS	\$ 21,600.00	\$ 21,600.00
3	Bidding and Negotiating	2.3%	LS	\$ 6,000.00	\$ 6,000.00
4	Engineering Construction Services	6.4%	HR	\$ 17,000.00	\$ 17,000.00
5	Construction Staking	1.1%	HR	\$ 3,000.00	\$ 3,000.00
6	Material Sampling and Testing	1.1%	HR	\$ 3,001.00	\$ 3,001.00
<b>SUBTOTAL</b>					<b>\$ 53,000.00</b>
<b>TOTAL PROJECT COST</b>					<b>\$ 266,000.00</b>

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