SANTA CLARA CITY, UTAH

WATER IMPACT FEE FACILITIES PLAN
&
CULINARY WATER MASTER PLAN

June 2018

INCLUDES:
FIVE POINT ANALYSIS
RECOMMENDED SYSTEM IMPROVEMENTS,
20 YR CASHFLOW PROJECTIONS,
AND
WRITTEN ANALYSIS FOR IMPACT FEES

PREPARED BY
SUNRISE ENGINEERING, INC.
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Washington, UT
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TABLE OF CONTENTS

TABLES

EXHIBITS

CHARTS

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A. PREFACE

For more than two decades several previous master plans have been completed on behalf of Santa Clara City and have provide valuable recommendations, directions and master planning.

Of particular note was the 2007 Master Plan update complete by Sunrise Engineering, which included an analysis to help the City decide whether or not to participate in the Washington County Water Conservancy District (WCWCD) Regional Water Supply Agreement (RWSA) as a solution for additional water sources for future needs. The City did join the regional agreement which has substantially simplified the master planning for water. The City no longer needs to worry about having City owned water rights and water sources necessary for growth. That agreement provides the mechanism for this water to be supplied by the WCWCD. The Water Master Plan completed in 2010 incorporated then current impact fee act provisions and was written with the WCWCD RWSA in place.

Sunrise Engineering, Inc. is contracted to update the plan and bring a Master Plan forward to current conditions and regulations. To conform with the Impact Fee Act the Master Plan will be titled IMPACT FEE FACILITIES PLAN & CULINARY WATER MASTER PLAN, August 2018. It will provide a master planning finding and recommendations that outline proposed culinary water facilities for the impact fee analysis.

X INTRODUCTION

This Culinary Water Master Plan has been prepared for Santa Clara City, located west of St. George, Utah in Washington County, along Highway 91. An area map showing the location of Santa Clara City, is provided on Exhibit 1.1. Santa Clara City has experienced growth, which has been relatively high over the past 40 years. As in all communities that experience growth, the culinary water system required substantial improvements and expansions to support increased demands caused by growth and development in the City.

The culinary water system has been analyzed under The State of Utah Department of Drinking Water Regulations (as of the signing of the agreement) to determine existing system conditions and needs. House bill 303 with revisions to the Utah Code 19-4 has slightly different requirements. HB303 went into effect in May which will require Santa Clara City to provide additional data to the State no later than 3/1/2019. To which the State will establish system specific source and storage sizing requirements based on data or engineering study submitted. It is not anticipated this will change the recommendations of the study because future source supply needs will be supplied under the WCWCD Regional Water Service Agreement, and the storage sizing is based on average day, which is well defined in this study.

Additionally, to determine projected system needs as the community grows to the potential represented by undeveloped land with projected growth over the next 20 years and at build-out. Culinary water system improvements have been recommended. This plan will also serve as a Impact Fee Facilities Plan for the culinary water system providing a basis for the impact fee calculations. The resultant recommended impact fees along with the projected user rates have been analyzed in support of the recommended system improvements. The projected culinary water rates and impact fees are fair and reasonable and should allow the City to continue to maintain the level of service that is required of public water systems through the duration of the planning horizon.

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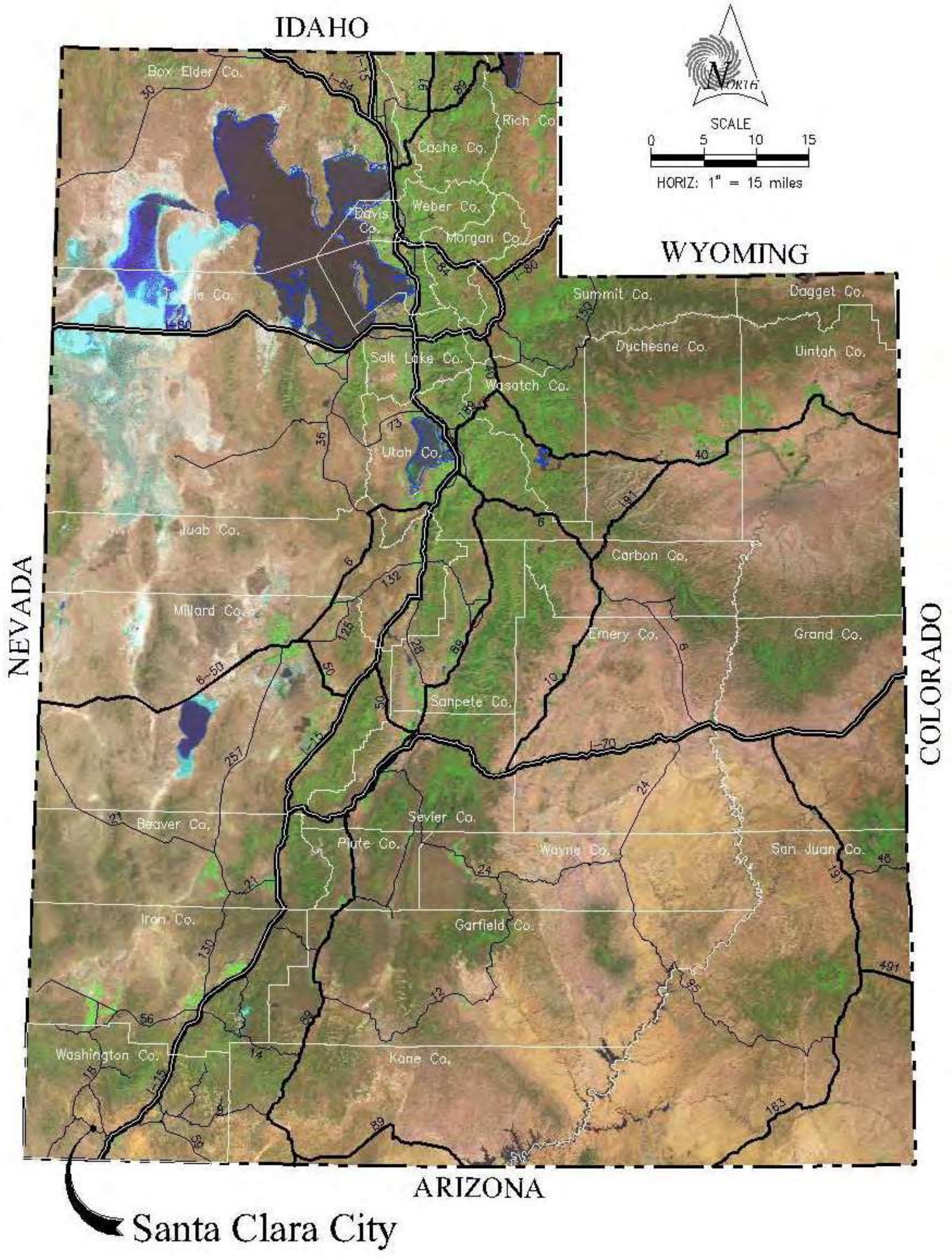

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A. PROJECTED GROWTH RATE

An important element in the development of a Culinary Water Master Plan is the growth rate ‰Œ}i š]}v }(šZ]šÇ[• water system users. The growth rate gives the planner a glimpse of the (µšµŒ u v • šZ š uÇ v š} }uu} š Ç šZ]šÇ[• µo]v

Projecting the number of future culinary water connections with any degree of accuracy can be a subjective process. With this in mind, Table II.A1 below •Z}Á• šZ]šÇ[• Z]•š}Œ] PŒ} according to the US Census Data and provides an idea of how the community has grown from 1970 through 2017.

1. POPULATION DATA:

Table II.A1 Historic Growth for Santa Clara City

Year	Census Population	Percent Growth
1970	271	
1980	1,091	14.9 %
1990	2,322	7.8 %
2000	4,630	7.1 %
2010	6,003	2.6 %
2017	7,418	3.1 %

The City of Santa Clara has experienced significant PŒ}ÁšZ •]v šZ íõóì[•X According to the US Census Data, the City grew at almost 15% per year µŒ]vP šZ íõóì[•U šZ íõôì[• v íõõì[• šZ]šÇ PŒ Á š }À Œ ó9% rapid population growth, there has been very little commercial development in Santa Clara City. The recession of 2007/2008 brought a drastic drop in the growth rate. However, during the last couple of years the growth rate has rebounded to around 6%. Santa Clara is primarily a residential community supporting the St. George area. Because Santa Clara is bordered by other municipalities, lava flows, flood plains, and environmentally sensitive areas, it is not expected to grow as fast as it historically has.

2. CONNECTION DATA:

Table II.A2 on the following page illustrates the growth in residential culinary water connections from 1994 to 2017.

Table II.A.2					
Year	Residential Conn.	% Growth	Year	Residential Con	% Growth
1994	985		2006	1,848	4.0%
1995	1,055	7.1%	2007	1,921	4.0%
1996	1,150	9.0%	2008	1,936	0.8%
1997	1,246	8.3%	2009	1,960	1.2%
1998	1,309	5.1%	2010	1,936	-1.2%
1999	1,350	3.1%	2011	2,018	4.2%
2000	1,377	2.0%	2012	2,048	1.5%
2001	1,418	3.0%	2013	2,076	1.4%
2002	1,525	7.5%	2014	2,136	2.9%
2003	1,541	1.0%	2015	2,207	3.3%
2004	1,620	5.1%	2016	2,301	4.3%
2005	1,777	9.7%	2017	2,459	6.9%

3. FUTURE GROWTH:

'Œ}ÁšZ }µo ‰}••] oÇ]v šZ ^^}µšZ ,]oo•_X µŒŒ všoÇU u} the Santa Clara River is owned by the Bureau of Land Management (BLM). This portion represents 1,100 acres of the property in the South Hills that was identified in a congressional land bill passed around 10 years ago, although its presence in the bill is no guarantee of BLM disposal (sale). If šZ >D Á Œ š} • oo šZ o v]v šZ ^^}µšZ ,]oo•_ š} À o}‰ expected in this area.

Regardless of what the BLM does with the property, there is a small portion of the South Hills that is private. That privately-owned area will likely grow fairly quickly as the City has already seen conceptual layouts for some parcels of South Hills.

The BLM portion of the South Hills area that may be developed has been reduced as the BLM has identified areas where threatened and endangered plants are located. Exhibit II.A.1 on the following page shows the build-out area; including the original City area and the proposed South Hills area. The South Hills area shown is the current area that the BLM might sell. The area has been adjusted in the past and may be adjusted again.

If the South Hills develop, the City of Santa Clara is not expected to develop all available land within the planning period. Nevertheless, the calculations and projections for build-out are included in the study. Although the City has included the South Hills area in their general plan and future improvements in the South Hills area have been recommended in this Master Plan as related to that potential growth, the City has elected to not include the South Hills improvements in the final impact fee calculations.

Since there is a possibility that development in the South Hills may not occur, or that it may not occur until the latter portion of, or following, the 20-year planning period. This IFFP/Master Plan will show projected numbers with South Hills area and without the South Hills in the build-out

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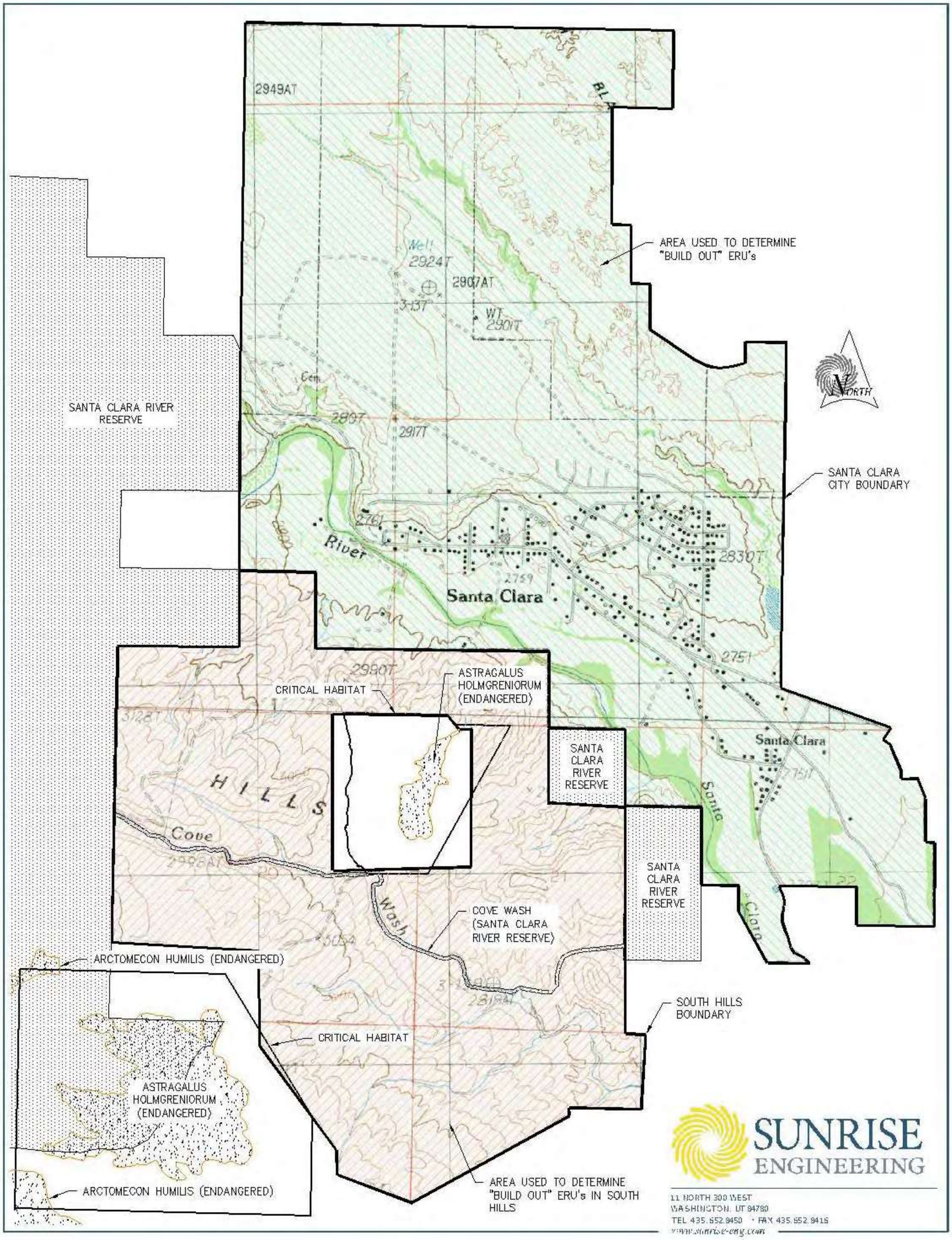


numbers. Thus, estimating the additional growth and basic improvements necessary should the South Hills be developed and providing the necessary foundation to update the IFFP and IF analysis quickly in case the development in the South Hills does occur. Regardless, build-out would be expected after the 20-year planning period.

Data from the Santa Clara General Plan and General Plan Update was used in determining build-out projections. Estimates from the General Plan for build-out were 3,000 Á Œ •] v š] o Z h [• for the proposed South Hills area and 3,060 Á Œ •] v š] o Z h [• (} Œ š Z Œ v] P Z } Œ Z } } •] v š Z] š Ç X d Z Œ (} Œ U š Z š } š o • š] u š v µ u 6,060. The number with South Hills total build-out] v µ • š Z h [• š } µ • Ç š Z] • D • š Œ 9,607. The number of total build-out without South Hills } µ š Z ,] o o • Z h [• š } Based on] • a ò U ó ð í X household size between 3.10 and 3.78 people, it is estimated that build-out population will be approximately 28,100 people. Table II ï A • Z } Á • š Z ‰ Œ } i š ‰ } ‰ µ o š] } v v Z h for South Hills and without South Hills. Based on these growth rates, build-out would most likely occur beyond the 20-year planning period; it is realized that the growth will most likely taper off as the City approaches build-out.

Table 11.A3 Build-out Projections

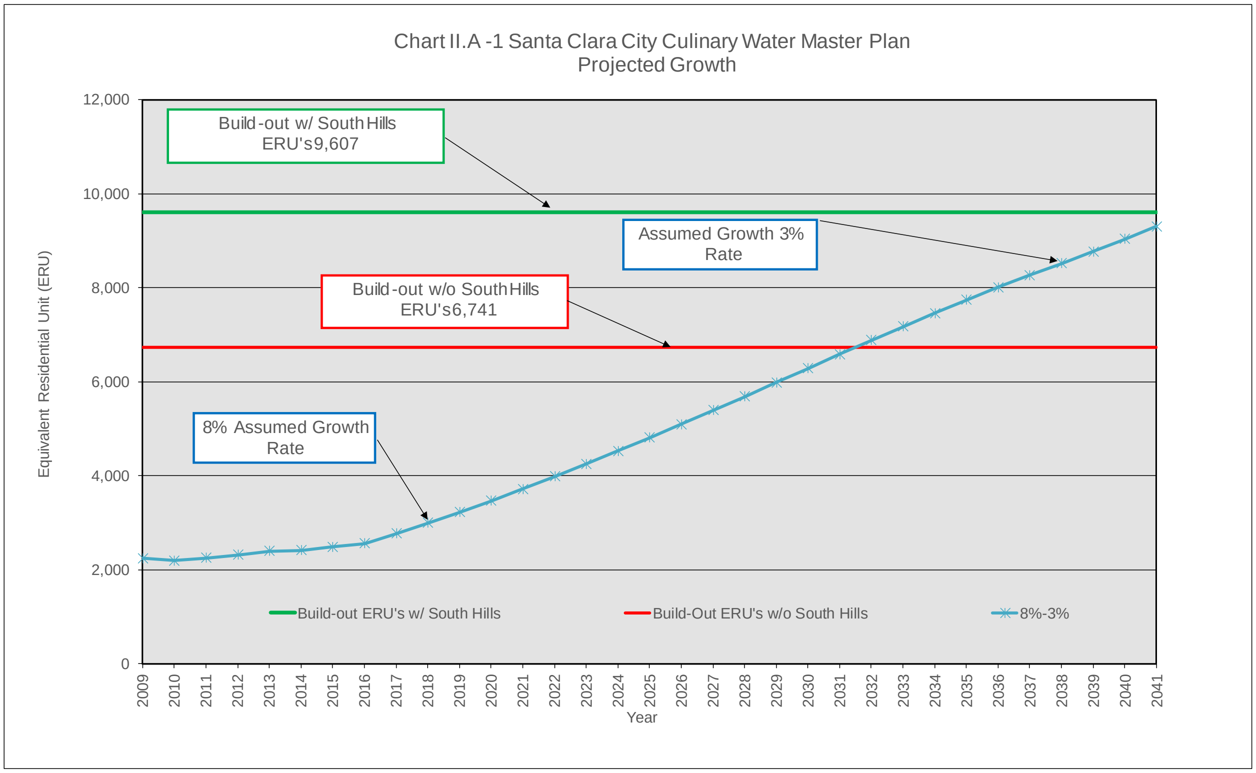
Includes South Hills

Population	28,100
Estimated Residential ERU's	8,519
Estimated Commercial ERU's	253
Estimated Other ERU's	835
Total ERU's	9,607

Excludes South Hills

Population	20,300
Estimated Residential ERU's	5,978
Estimated Commercial ERU's	177
Estimated Other ERU's	586
Total ERU's	6,741

Chart II.A1 illustrates the projected ERU growth for the planning period.



It is important to understand that projected population figures are not the cornerstone of this master plan. If the maximum number of system connections projected is reached earlier or later than projected, then future improvements to support growth may either come earlier or later. Impact fees should not be significantly affected if the actual rate of growth varies from the rate used in the plan.

B. LENGTH OF PLANNING PERIOD

This culinary water master plan uses a 20-year planning period, beginning in fiscal year 2018, and running through fiscal year 2038. We have also considered build-out projections in the plan. This period will allow an adequate evaluation of the system for potential infrastructure improvements or other needs. Revenue sources should be carefully evaluated each year as the City Council sets budgets and anticipates system requirements

C. CULINARY WATER CONNECTIONS

1. EXISTING CULINARY WATER CONNECTIONS

According to Santa Clara City data, the number of existing culinary connections in 2017 was 2,533. After consultation with the mayor and staff, this number has been projected for at a diminishing rate from 8% in 2018 to 3% at the end of the planning period. Which gave us the assumed numbers for 2018 that the City of Santa Clara has 2,736 connections, including 2,656 residential connections, 33 commercial connections and 46 ^}šZŒ_ vv š]}v•X ^KšZŒ_ connections include churches, schools, feed yards, City owned facilities, irrigation for parks, and streetscape.

To calculate how much water is used at an average residential connection, the total amount of water used by all Santa Clara City residential customers over the course of several years was calculated. Table II.C1 summarizes historic data from Santa Clara City records from 2000 to 2017 (full data found in Appendix C). The average daily use per residential connection over the last five-year period was 572 gal/day. This is a more conservative figure than the 3 year average, which may be what the State of Utah defaults to as they determine the actual requirement.

TABLE II.C1 Santa Clara City Average Usage Per Residential Connection

Year	Average (since 2000)	5 year Average	3 year Average
Residential			
Usage (gallons)	449,071,513	465,506,200	468,218,000
Connections	1,895	2,236	2,322
Usage Per Connection (gal/year)	241,315	208,707	201,723
Daily Usage Per Connection (gal/day)	661	572	553
3-year Average Usage (gal/day/connection)			
5-year Average Usage (gal/day/connection)			
Commercial			
Usage (gallons)	10,833,056	9,949,200	10,885,000
Connections	50	42	29
Usage Per Connection (gal/year)	300,470	302,068	371,263
Daily Usage Per Connection (gal/day)	823	828	1,017
Equivalent Residential Unit	1.28	1.47	2.00
Non-Residential ERUs	46	48	54
Other			
Usage (gallons)	50,663,602	50,924,600	46,492,667
Connections	32	37	44
Usage Per Connection (gal/year)	1,750,168	1,803,904	1,060,110
Daily Usage Per Connection (gal/day)	4,795	4,942	2,904
Equivalent Residential Unit	7.38	8.42	5.00
Non-Residential ERUs	214	243	231
Total ERUs	2,155	2,527	2,607

In the subsequent calculations throughout the rest of the plan a value of 572 gal/day will be used for the average daily flow per residential connection. This number is lower than the 683 gal/day used in the 2010 Culinary Water Master Plan. Records indicate that the average use per water connection has significantly decreased since the 1999 Master Plan. The following were the average residential consumptions that were used in those years.

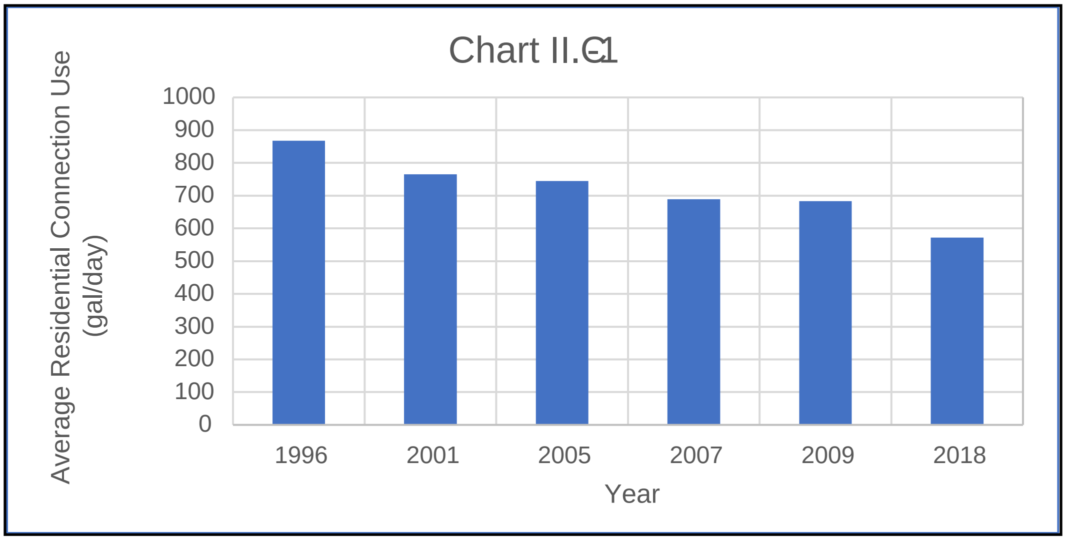
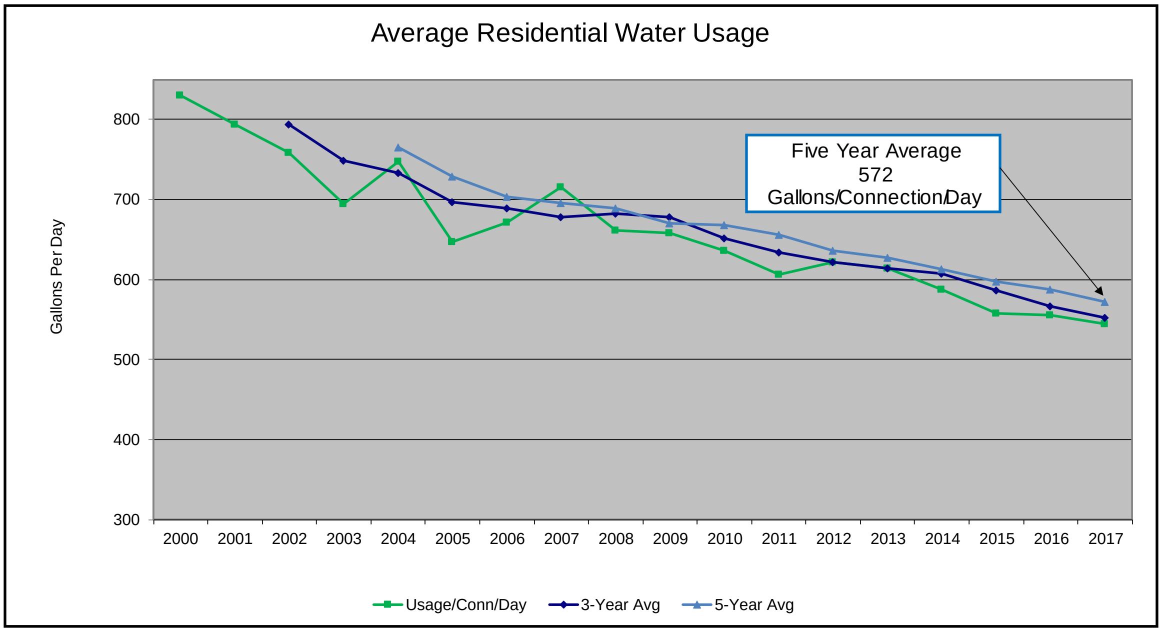


Chart II.C-2



In a typical culinary water master plan, the volume of water required by nonresidential connections is compared to the volume of water required by residential connections. Often, commercial users consume two or three times as much water as residential users. Between the years of 2001 and 2005, the usage per commercial connection was actually lower than the average daily consumption than residential connections. While, between the years of 2005 and 2009, the daily usage for commercial was significantly higher than the residential connection. The increase might have been from the booming economy and the growth in commercial. In 2010, the usage in commercial starts to decrease, in the year 2011, the total usage per commercial connection was 1/3 the residential usage. The following years, 2012, 2013, 2014 were all consistently 1/2 to 1/3 of the residential usage. The commercial usage per connection started increasing and passing the residential usage per connection in 2015. Since 2015, the commercial usage has increased and has been about 2 times as much as the residential usage, which is more in line than the consumption of commercial is two or three times as much as residential usage. Based on past results this variation between the commercial and residential connection will likely continue to be instable. Nevertheless, for the purposes of this plan it is necessarily assumed that the current usage relationship holds into the future, last year the commercial usage was just 3% of the residential which makes the above observation unstable ratios less significant.

An Equivalent Residential Unit (ERU) represents the ratio of the volume of water required for commercial users compared to the amount used by an average residential connection. The ERU value is determined by comparing the average daily use per commercial connection to the average daily use per residential connection. During the year 2017, the total water usage by commercial connections was approximately 14,424,000 gallons, distributed to an average of 31 commercial users. The average daily use for commercial users can be calculated as follows:

14,424,000 gallons / 365 days / 31 connections = 1,275 gpd/connection

Each commercial connection uses just over twice the amount used by the average residential connection in 2017 (544 total usage in residential). For the purpose of this master plan, an <u>ERU value for each commercial connection of 2.34, (which is the same number used in the 2009 report</u>) will be used.

}vv š]}v• o ••](]]v šZ]• u •š Œ ‰o v • ^}šZ Œ_]v oµ u}•š parks, churches, and City facilities. The culinary water connections that are grouped in this category typically require more water than that required by a residential customer. An Equivalent Z •] vš] o hv]š ~Zh• Œ ‰Œ •vš• šZ]š]}v o À}oµu }(Á š above and beyond the amount used by an average residential connection. The ERU value is determined by comparing the average daily µ• ‰ Œ ^}šZ Œ_ }vv š]}v š} šZ À per residential connection. During the year 2017 U šZ š}š o ^}šZ Œ_ }vv š]}v Á was approximately 47,903,000 gallons, distributed to an average of 43 ^}šZ Œ_ µ• Œ•X dZ À daily use for ^}šZ Œ_ µ• Œ• v o µo š • (}oo}Á•W

47,903,000 gallons / 365 days / 43 connections = 3,052 gpd/connection

Z ^}šZ Œ_ }vv š]}v µ• • 5.6 times the amount used by the average residential connection in 2017 (544). In this WMP, the factor of 5.6 will be used to determine the Zh }(šZ ^}šZ Œ_. T}vv ‰š]}v‰}Œ•}Æ]u š š}š o Á š Œ µ• P (}Œ ^} during the year 2017 was 47,903,000 gal distributed to an average of 43 ^}šZ Œ_ µ• Œ•X dZ À Œ P]oÇ µ• (}Œ ^}šZ Œ_ µ• Œ• v o µo š • (}oo}Á•W

Current ERU's (End of 2017)

Residential ERU's	=	2,459
Commercial (312.34 ERU's)	=	73
"Other" (435.61 ERU's)	=	241
Total ERU's	=	2,773

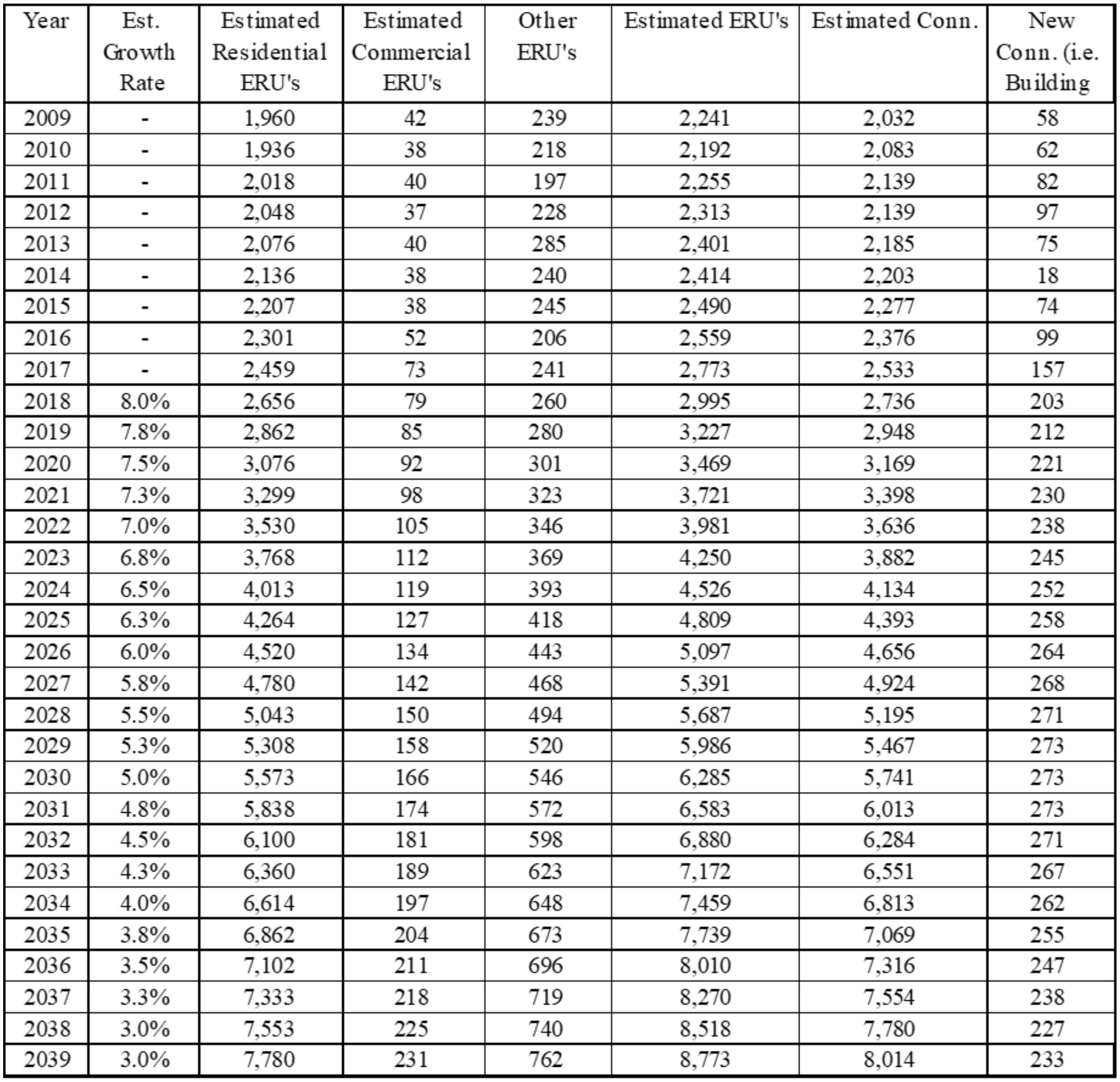
2. PROJECTED CULINARY WATER CONNECTIONS AND ERU'S

The number of future culinary connections can be calculated using the simple interest formula and inserting the projected growth rate, the existing number for each year.

As stated in a previous section, this IFFP estimates that the growth rate changes each year from 8% to 3%. Over the course of 20 years, that is a change of .25% per year. Please refer to Table II.C-2.

With the change in growth rate each year, each years growth will be calculated using the simple interest formula by multiplying the year before by the new estimated growth rate for that current year.

Table II.C-2



Year	Est. Growth Rate	Estimated Residential ERU's	Estimated Commercial ERU's	Other ERU's	Estimated ERU's	Estimated Conn.	New Conn. (i.e. Building
2009	-	1,960	42	239	2,241	2,032	58
2010	-	1,936	38	218	2,192	2,083	62
2011	-	2,018	40	197	2,255	2,139	82
2012	-	2,048	37	228	2,313	2,139	97
2013	-	2,076	40	285	2,401	2,185	75
2014	-	2,136	38	240	2,414	2,203	18
2015	-	2,207	38	245	2,490	2,277	74
2016	-	2,301	52	206	2,559	2,376	99
2017	-	2,459	73	241	2,773	2,533	157
2018	8.0%	2,656	79	260	2,995	2,736	203
2019	7.8%	2,862	85	280	3,227	2,948	212
2020	7.5%	3,076	92	301	3,469	3,169	221
2021	7.3%	3,299	98	323	3,721	3,398	230
2022	7.0%	3,530	105	346	3,981	3,636	238
2023	6.8%	3,768	112	369	4,250	3,882	245
2024	6.5%	4,013	119	393	4,526	4,134	252
2025	6.3%	4,264	127	418	4,809	4,393	258
2026	6.0%	4,520	134	443	5,097	4,656	264
2027	5.8%	4,780	142	468	5,391	4,924	268
2028	5.5%	5,043	150	494	5,687	5,195	271
2029	5.3%	5,308	158	520	5,986	5,467	273
2030	5.0%	5,573	166	546	6,285	5,741	273
2031	4.8%	5,838	174	572	6,583	6,013	273
2032	4.5%	6,100	181	598	6,880	6,284	271
2033	4.3%	6,360	189	623	7,172	6,551	267
2034	4.0%	6,614	197	648	7,459	6,813	262
2035	3.8%	6,862	204	673	7,739	7,069	255
2036	3.5%	7,102	211	696	8,010	7,316	247
2037	3.3%	7,333	218	719	8,270	7,554	238
2038	3.0%	7,553	225	740	8,518	7,780	227
2039	3.0%	7,780	231	762	8,773	8,014	233

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3. BUILD-OUT h>/E Zz t dZ KEE d/KE^ E Zh[^

This Water Master plan will include two build out scenarios, one with South Hills and one without South Hills developments.

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To determine the number of residential connections at build-out, data from SC General Plan and

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A. EXISTING WATER RIGHT

The existing Santa Clara City water rights used for culinary water are identified in Table III.A-1 below. The water rights are listed according to number, source, and flow and separated between Snow Canyon Source and Spring source. Santa Clara is not currently using the Springs as a source; therefore, the total available Culinary source is 2,550.6 acre feet from the Snow Canyon sources. According to an agreement with St. George City, the usage of the water from the springs is in Saint George City at the fish ponds and softball complex.

It is recommended that Santa Clara City protect those rights with a written formal agreement with St. George City and to consult a water rights professional to make sure that all the water rights are protected. Santa Clara City owns water rights that are not currently being used in the culinary water system. These rights are not included in the analysis but are significant and represent the right to provide more secondary water if so desired. The same recommendation applies to them as above, that water rights should be protected. It is not in the scope of this report to delve any further into these water rights issues or provide detailed analysis of protections or strategies.

Table III.A-1

Culinary Water Rights		Flow		
W.R. #	Source	gpm	cfs	AcFt.
81-782	Snow Canyon Compact	224.4	0.50	362.0
81-973	Snow Canyon Compact	439.8	0.98	709.5
81-893	Snow Canyon Wells # 6 & 7	897.6	2.00	1447.9
81-4123	Snow Canyon Wells # 6 & 7	1.7	0.00	2.7
81-4225	Snow Canyon Wells # 6 & 7	12.4	0.03	20.0
81-4226	Snow Canyon Wells # 6 & 7	5.2	0.01	8.4
	WCWCD Regional Supply Agreement			
Sub Total		1,581.2	3.5	2,550.6
81-149	Sheep Spring	8.1	0.02	13.0
81-741	Miller, Beecham & Gray Springs	79.9	0.18	128.9
81-742	Miller, Beecham & Gray Springs	25.1	0.06	40.5
81-1061	Miller Springs	4.9	0.01	8.0
Sub Total		118.0	0.3	190.4
Total		1699.2	3.79	2741.4

B. EXISTING REQUIRED WATER RIGHT

The previous State of Utah Public Drinking Water Regulations, stated that a community should have adequate water right to supply each culinary connection with 400 gallons per day for indoor water use, plus an amount for outdoor use as dictated by irrigated acreage and a consumptive use value obtained from the State Guidelines. If allowed, the community may substitute historical use data for indoor and outdoor requirements. The new regulations dictate that the State will determine these amounts based on the reporting received. For planning purposes, the Santa Clara City average daily use is assumed to be the 5 year average of 572 gallons per ERU over the 3 year average because it is slightly higher thus more conservative. It is not anticipated to vary from that significantly after the State reviews the data and issues a determination. This amount includes all water usage, indoor and outdoor, provided by the culinary water system.

Santa Clara City has the ability and right to use all the available water rights out of Wells 6 & 7, besides those of the springs. Exhibit III.B-1 shows the points of diversion for each water right owned by Santa Clara.

From Table III.A-1, the total amount of culinary water rights that are at least partially used by Santa Clara City is 2,550.6 acre-feet. Based on an average of 572 gallons per day per ERU and 2,773 Æ]•š]vP Zh[•U šZ Æ]•š]vP Œ‹µ]Œ Á š Œ Œ]PZš]• calculated as follows:

Existing required water right

2,773 Zh[• Æ 572gpd x 1 day = 1,101gpm
ERU 1440 min.

1,101gpm x 1.613 Ac-ft/gpm = 1,777 Ac-ft

The existing water right surplus or deficit is determined by subtracting the existing required water right of 1,777 Ac-ft from the total available culinary water right of 2550.6 Ac-ft, which yields a surplus of 773.6 Ac-ft.

C. PROJECTED REQUIRED WATER RIGHT (YEAR 2038)

The projected required water right at the end of the 20-year planning period is calculated by using the same information and calculations explained in Part B, except the number of projected µo]v ŒÇ Á š Œ Zh[• at the end of the 20-year planning period is substituted into the calculations.

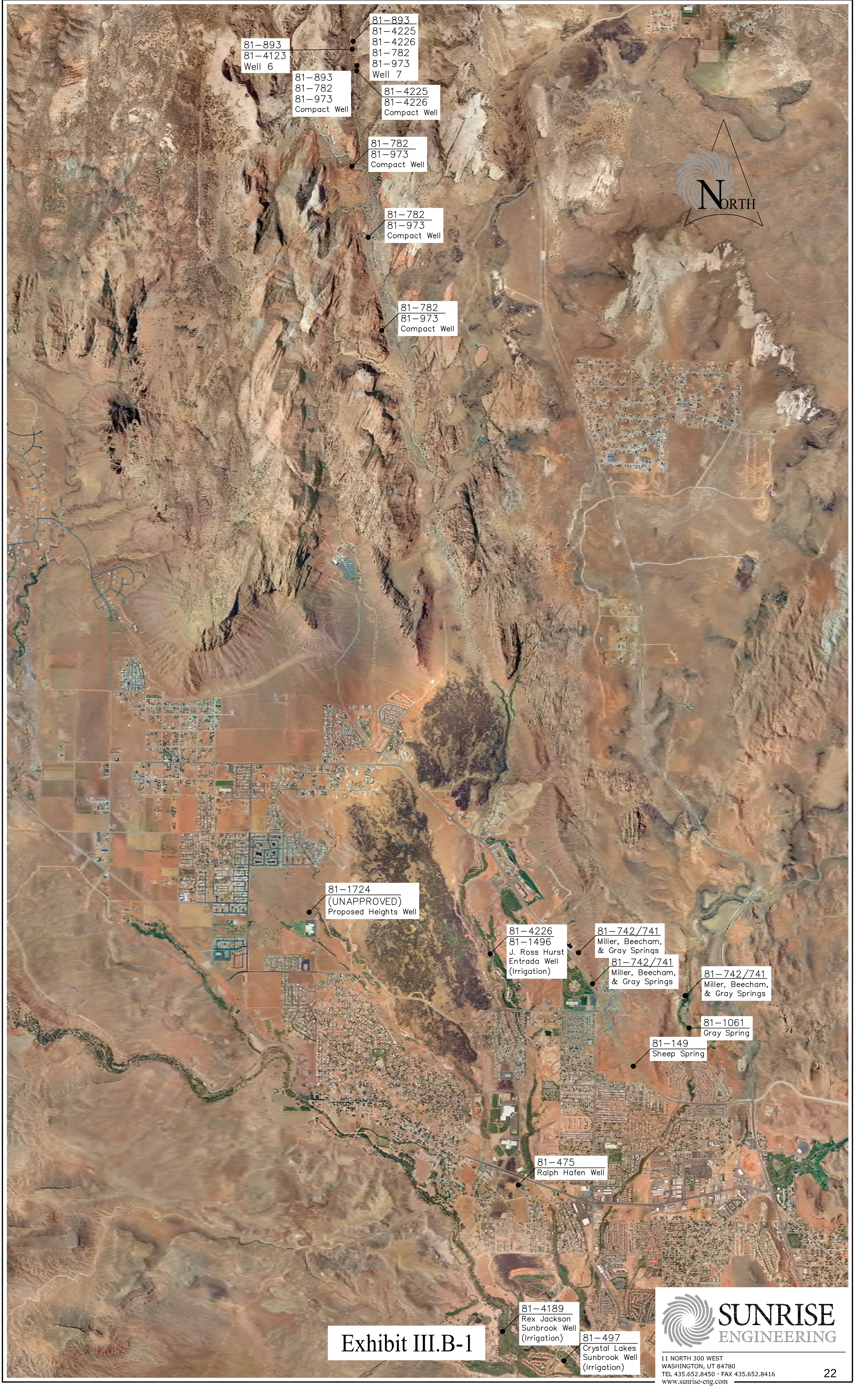


Exhibit III.B-1

SUNRISE
ENGINEERING

11 NORTH 300 WEST
WASHINGTON, UT 84780
TEL 435.652.8450 · FAX 435.652.8416
www.sunrise-eng.com

Table III.C-1

Culinary Water Rights Only: excluding springs			With South Hills	Excluding South Hills		
Average Water Right Required	Year 2017	Year 2038	Build-Out	Build-Out	Year 2058	
ERU's	2,773	8,518	9,607	6,741	9,607	ERU's
Average Water Use (Indoor + Outdoor)	572	572	572	572	572	gpd/ERU
Required Culinary Water Right (Indoor + Outdoor)	1,101	3,384	3,816	2,678	3,816	gpm
Required Culinary Water Right (Indoor + Outdoor)	1,777	5,458	6,156	4,319	6,156	Ac-Ft
Culinary Water Right Surplus/(Deficit)	479.7	(1,802.4)	(2,235.0)	(731)	(2,235.0)	gpm
Culinary Water Right Surplus/(Deficit)	773.6	(2,907.4)	(3,605.4)	(1,073)	(3,605.4)	Ac-Ft

Projected required water right in year 2038:

$$\frac{8{,}518 \text{ ERU} \times 572 \text{ gpd} \times 1 \text{ day}}{1{,}440 \text{ min} \quad \text{ERU}} = 3{,}384 \text{ gpm}$$

$$\frac{3{,}384 \text{ gpm} \times 1.613 \text{ Ac - ft}}{\text{gpm}} = 5{,}458 \text{ Ac - ft}$$

The projected water right surplus or deficit is determined by subtracting the projected required water right of 5,457.6 Ac-ft from the grand total available water right of 2,550.6 Ac-ft, which yields a shortage of 2,907 Ac-ft.

D. PROJECTED REQUIRED WATER RIGHT (BUILD-OUT)

The projected required water right at build-out is calculated using the same information and o µo š]}v• Æ‰o]v]v W Œš U Æ ‰š šZ vµu Œ -}(‰Œ}i out is substituted into the calculations.

Projected required water right at build-out with South Hills

$$\frac{9{,}607 \text{ ERU} \times 572 \text{ gpd} \times 1 \text{ day}}{1{,}440 \text{ min} \quad \text{ERU}} = 3{,}816 \text{ gpm}$$

$$\frac{3{,}816 \text{ gpm} \times 1.613 \text{ Ac - ft}}{\text{gpm}} = 6{,}155 \text{ Ac - ft}$$

The projected water right surplus or deficit is determined by subtracting the projected required water right of 6,155.4 Ac-ft from the grand total available water right of 2550.6 Ac-ft, which yields a shortage of 3,604.8 Ac-ft.

Projected required water right at build-out without South Hills

$$\frac{6{,}741 \text{ ERU} \times 572 \text{ gpd} \times 1 \text{ day}}{1{,}440 \text{ min} \quad \text{ERU}} = 2{,}678 \text{ gpm}$$

$$\frac{2{,}678\ \text{gpm} \times 1.613\ \text{Ac-ft}}{\text{gpm}} = 4{,}319\ \text{Ac-ft}$$

The projected water right surplus or deficit is determined by subtracting the projected required water right of 4,319.1 Ac-ft from the grand total available water right of 2550.6 Ac-ft, <u>which yields a shortage of 1,768.5 Ac-ft.</u>

E. PROJECTED REQUIRED WATER RIGHT (YEAR 2058)

For planning purposes, and to have the capability of requiring new subdivisions to supply their own water rights, the projected water right at the end of the 40 years was also included for the water right analysis. Because build-out is projected to be reached prior to the end of the 40 years, 40-year requirements are equivalent to build-out requirements.

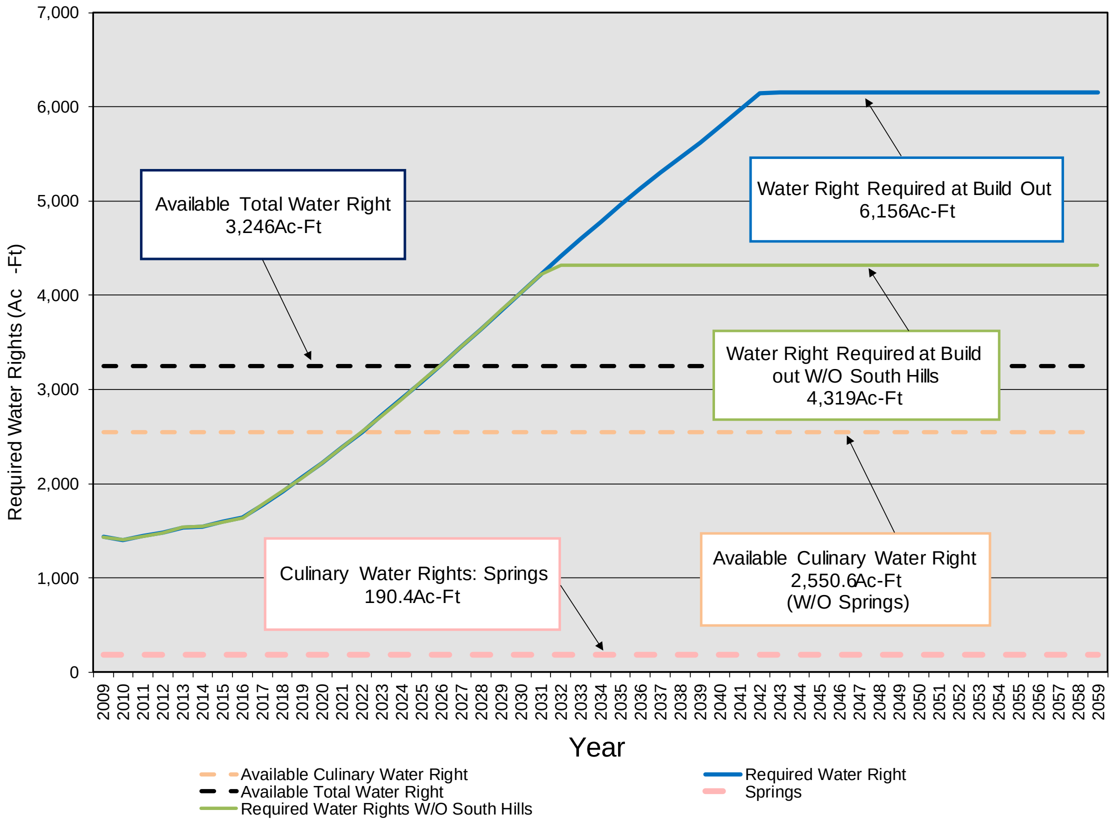
F. TOTAL WATER RIGHTS

Also of interest is the amount of total water rights owned by the City. Table III.H-1 shows the existing total water rights capacity including those rights not included with the culinary system but utilized for secondary water, etc.

Table III.H-1

Total Water Rights		Flow		
W.R. #	Source	gpm	cfs	AcFt.
81-149	Sheep Spring	8.1	0.02	13.0
81-741	Miller, Beecham & Gray Springs	79.9	0.18	128.9
81-742	Miller, Beecham & Gray Springs	25.1	0.06	40.5
81-1061	Miller Springs	4.9	0.01	8.0
Sub Total		118.0	0.26	190.4
81-782	Snow Canyon Compact	224.4	0.50	362.0
81-973	Snow Canyon Compact	439.8	0.98	709.5
81-893	Snow Canyon Wells # 6 & 7	897.6	2.00	1447.9
81-4123	Snow Canyon Wells # 6 & 7	1.7	0.00	2.7
81-4225	Snow Canyon Wells # 6 & 7	12.4	0.03	20.0
81-4226	Snow Canyon Wells # 6 & 7	5.2	0.01	8.4
81-1496	J. Ross Hurst Entrada Well (Irrigation)	16.3	0.04	26.2
Sub Total		1,597.4	3.56	2,576.8
81-4189	Rex Jackson Sunbrook Well (Irrigation)	58.9	0.13	95.0
81-497	Crystal Lakes Sunbrook Well (Irrigation)	74.4	0.17	120.0
81-475	Ralph Hafen Well (Irrigation)	4.7	0.01	7.6
81-4184	McDermitt Well	93.0	0.21	150.0
	Irrigation Company 24 Shares (McDermitt)	0.0	0.00	96.2
	Irrigation Company Shares (Santa Clara)	0.0	0.00	10.0
Sub Total		231.0	0.5	478.8
Total		1,946.4	4.34	3,246.0

CHART III.F-1 Existing Water Rights vs. Projected Requirements



G. RECOMMENDED WATER RIGHT IMPROVEMENTS

It is recommended that Santa Clara City protect all existing water rights not currently being used in their system. It is not in the scope of this report to derive specific recommendations for each individual right or provide detailed analysis of protections or strategies. However, it is recommended that the spring water rights be protected with a written formal agreement with St. George City. Further consultations with a water rights professional to make sure that all water rights are protected is recommended.

Santa Clara City owns water rights that are not currently being used in the culinary water system. These rights are not included in the analysis but are significant and represent the right to provide more secondary water if so desired. The same recommendation applies to them as above, that water rights should be protected.

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A. EXISTING WATER SOURCE CAPACITY

To analyze source capacity, all available culinary water sources are first identified and listed in Table IV.A-1 below. The flow capacity numbers were determined from actual meter readings and are based on a maximum flow if all the wells are running at maximum capacity. In the absence of historical records for Well #5, a best estimate from operators was used.

Table IV.A-1

Shared Wells	Total Flow gpm	Santa Clara's 24.7% CFS	 gpm
Snow Canyon #3a	539	0.297	133
Snow Canyon #2	587	0.323	145
Snow Canyon #3	428	0.235	106
Snow Canyon #4	511	0.281	126
Snow Canyon #5	218	0.120	54
Sub-total Shared Wells =		1.256	564
Santa Clara Owned Sources		CFS	gpm
Snow Canyon Well #6		2.048	919
Snow Canyon Well #7		2.345	1,052
Regional Water Line / Wash. County water district		1.560	700
Sub-total Santa Clara Owned Water =		5.952	2,671
Total Culinary Water Source=		7.209	3,235

B. EXISTING REQUIRED WATER SOURCE CAPACITY

State of Utah Public Drinking Water Regulations at the time the scope of work was established for this study state that a community should have an adequate water source capacity to supply a peak day demand for indoor use and the regulations also require the source to be capable of meeting peak irrigation demands, where no secondary source of irrigation water is available. As mentioned in previous sections HB 303 may change those requirements.

In this master plan, the peak day demand for source capacity requirement is assumed to be equal to the peak month demand based on historic use figures. Although the peak day demand will be larger than the peak month demand because of fluctuations in usage throughout the month, such fluctuations can be expected to be relatively small and in this case are mitigated by the extra storage capacity of the system as will be shown in Section V of this Master Plan. The source capacity required was selected as the 90th percentile of readings during the months of June, July, August, and September as allowed by R309-510-5 of the State of Utah Drinking Water Regulations when using historical data. The 90th percentile of readings, or source capacity required, was converted to source capacity required per ERU by dividing by the current number }(Zh[•X }v• ‹µ všoÇU šZ Œ ‹µ]Œ •}µŒ ‰]šÇ ‰ Œ Zh be 1,155 gallons per day per ERU. The required existing source capacity is calculated below:

Existing required source capacity

$$\frac{2{,}773 \text{ ERU} \times 1{,}155 \text{ gpd} \times 1 \text{ day}}{1{,}440 \text{ min} \quad \text{ERU}} = 2{,}224.8 \text{ gpm}$$

The existing source capacity surplus or deficit is determined by subtracting the existing required source capacity of 2,225 gpm from the total available source capacity of 2,535 gpm, which yields a surplus of 310 gpm.

Table IV.B-1

Average Source Required	Year 2017	Year 2038	Build Out With South Hills	Build Out Excluding South Hills	
ERU's	2,773	8,518	9,607	6,741	ERU's
Peak Day Water Use	1,155	1,155	1,155	1,155	gpd/ERU
Required Water Source	2,225	6,834	7,708	5,408	gpm
Culinary Water Source Surplus/(Deficit)	310	(4,299)	(5,173)	(2,873)	gpm

C. PROJECTED REQUIRED WATER SOURCE CAPACITY (YEAR 2038)

Projected required water source capacity at the end of the planning period is determined from the same information and calculations explained in Part B, except the projected number of µo]v ŒÇ Á š Œ Zh[• š šZ v }(šZ ‰o vv]vP ‰ Œ]} Œ •µ ‰o }(šZ µŒŒ vš vµu Œ }(Zh[•X

Projected required source capacity in year 2038:

$$\frac{8{,}518 \text{ ERU} \times 1{,}155 \text{ gpd} \times 1 \text{ day}}{1{,}440 \text{ min} \quad \text{ERU}} = 6{,}834 \text{ gpm}$$

The projected source capacity surplus or deficit is determined by subtracting the projected required source capacity of 6,834 gpm from the total available source capacity of 2,535 gpm, which yields a projected shortage of 4,299 gpm at the end of the 20-year planning period.

D. PROJECTED REQUIRED WATER SOURCE CAPACITY (BUILD-OUT)

Projected required water source capacity at build-out is determined from the same information and calculations explained in Part B, except the projected number of culinary water ERU's at build-}µš Œ •µ •š]šµš]vš} šZ o µo š]}v•]v ‰o }(šZ µŒ

<u>Projected required source capacity at build-out with South Hills</u>

$$\frac{9,607\ \text{ERU} \times 1,155\ \text{gpd} \times 1\ \text{day}}{1,440\ \text{min} \qquad \text{ERU}} = 7,707.8\ \text{gpm}$$

The projected source capacity surplus or deficit is determined by subtracting the projected required source capacity of 7,708 gpm from the total available source capacity of 2,535 gpm, which yields a <u>projected shortage of 5,173 gpm at build-out</u>.

Chart IV.C‑í • Z } Á • ^ v š o Œ] š Ç [• µ Œ Œ v š Á š Œ • } µ Œ ‰] š Ç
requirements.

<u>Projected required source capacity at build-out without South Hills</u>

$$\frac{6,741\ \text{ERU} \times 1,155\ \text{gpd} \times 1\ \text{day}}{1,440\ \text{min} \qquad \text{ERU}} = 5,408.4\ \text{gpm}$$

The projected source capacity surplus or deficit is determined by subtracting the projected required source capacity of 5408 gpm from the total available source capacity of 2,535 gpm, which yields a <u>projected shortage of 2,873 gpm at build-out.</u>

Chart IV.C‑í • Z } Á • ^ v š o Œ] š Ç [• µ Œ Œ v š Á future water µ Œ ‰] š Ç
source requirements.

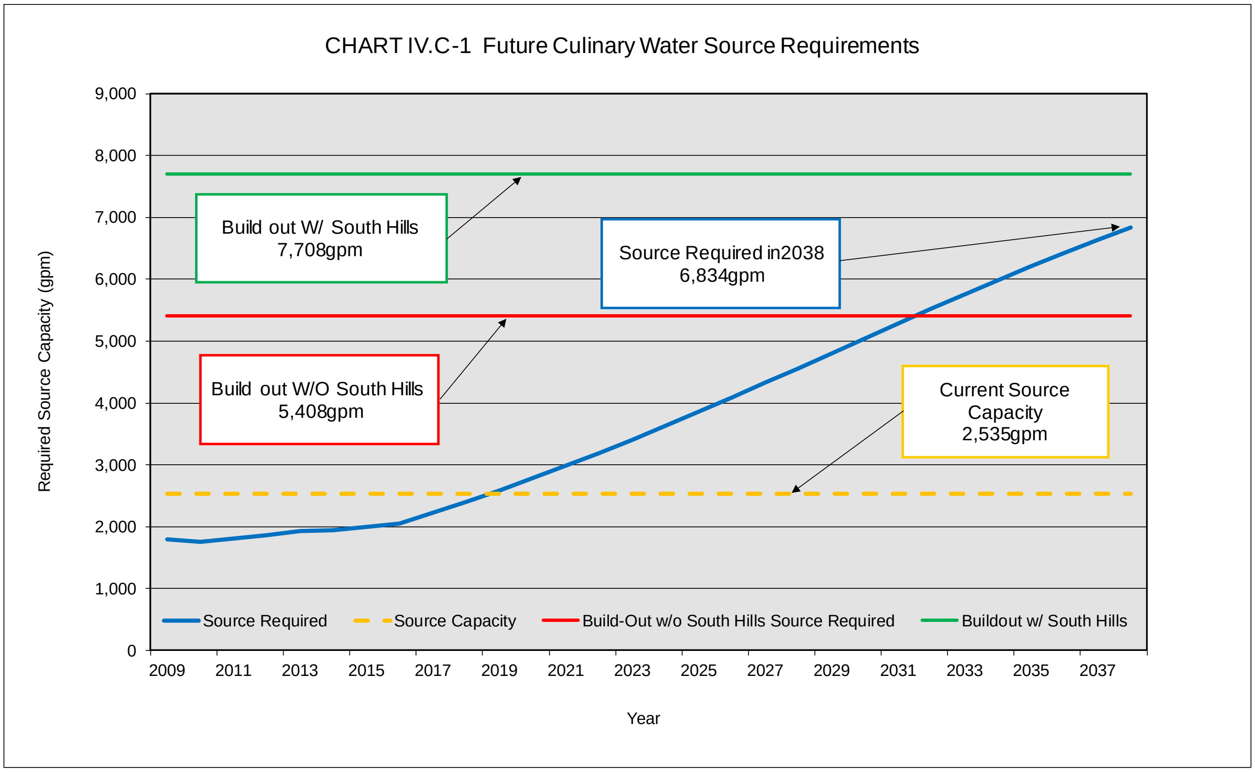
CHART IV.C-1 Future Culinary Water Source Requirements

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A. EXISTING WATER STORAGE CAPACITY

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TableV.A-1

Existing Storage Capacity:	
Snow Canyon Compact tanks	600,000 gal.
Concrete tank at Snow Canyon	2,500,000 gal.
South Hills Tank	1,000,000 gal.
Total Existing Capacity =	4,100,000 gal.

B. EXISTING REQUIRED WATER STORAGE CAPACITY

Water storage capacity requirements have been found in the State of Utah Public Drinking Water Regulations. These regulations require•š}Œ P (}Œ }uuµv]šÇ[• µo]v ŒÇ Á š amount of the average day use for all connections in each community plus sufficient storage to provide fire flows for a minimum of two hours.

As shown in previous sections, the historic average use per ERU in Santa Clara City is assumed to be 572 gallons per day. Storage requirements for fire protection vary from community to community. In general, fire flow requirements are set by the local Fire Chief or are based on building size, and type of construction. The statewide minimum fire flow for one and two-family dwellings under 3,600 square feet is 1,000 gpm. Fire flows of 1,500 gpm or greater are required (}Œ oo }šZ Œ•X dZ]šÇ[• Æ]•š]vP •Ç•š u v šZ u i}Œ]šÇ recommended for the distribution system will be analyzed and designed to a minimum fire flow of 1,250gpm ‰ Œ šZ o} o (]Œ Z] ([• Œ ‹µ]Œ.u vš• (Œ}u ‰Œ À]}µ•

Based on the above data Santa Clara City storage capacity is calculated below:

Existing Required Storage Capacity

Using Santa Clara City's 5 year Historic Average Consumption

$$\frac{572\ \text{gpd}}{\text{ERU}} \times 2{,}773\ \text{ERU's} = 1{,}586{,}156\ \text{gpd}$$

$$1250\ \text{gpm} \times \frac{60\ \text{min}}{1\ \text{hr}} \times 2\ \text{hr} = 150{,}000\ \text{gal.}$$

Total Existing Required Storage	1,736,156	gal.
Total Existing Capacity	4,100,000	gal.
Existing Capacity Surplus	2,363,844	gal.

The existing water storage capacity surplus or deficit is determined by subtracting the existing required water storage capacity of 1,736,156 gallons from the total available water storage capacity of 4,100,000 gallons, which yields an existing surplus of 2,363,844 gallons

C. PROJECTED REQUIRED WATER STORAGE CAPACITY (YEAR 2038)

Projected required culinary water storage capacity at the end of the planning period is determined from the same information and calculations explained in part B, but the projected vµu Œ }(µo]v ŒÇ Á š Œ Zh[• š šZ v }(šZ ‰o vv]vP ‰ Œ

Year 2038 Required Storage Capacity With South Hills
Using Santa Clara City's 5 year Historic Average Consumption

	572 gpd / ERU	X	8,518	ERU's	=	4,872,296	gpd
1250 gpm	X	60 min / 1 hr	X	2 hr	=	150,000	gal.
			Total Existing Required Storage			5,022,296	gal.
			Total Existing Capacity			4,100,000	gal.
			Future Capacity Deficit			(922,296)	gal.

The projected water storage capacity surplus or deficit is determined by subtracting the projected required water storage capacity of 5,022,296 gallons from the total available water storage capacity of 4,100,000 gallons, which yields a projected deficit of 922,296 gallons at the end of the planning period.

D. PROJECTED REQUIRED WATER STORAGE CAPACITY (BUILD-OUT)

Projected required culinary water storage capacity at build-out is determined from the same information and calculations explained in part B, but the projected number of culinary water Zh[• š -out are used. In this section, the calculation of projected required water storage, šZ vµu Œ }(Zh[• Á]oo }v•] Œ • v Œ]}• }(developing South Hills.

Required Storage Capacity at Build Out With South Hills
Using Santa Clara City's 5 year Historic Average Consumption

$$\frac{572\ \text{gpd}}{\text{ERU}} \times 9{,}607\ \text{ERU's} = 5{,}495{,}204\ \text{gpd}$$

$$1250\ \text{gpm} \times \frac{60\ \text{min}}{1\ \text{hr}} \times 2\ \text{hr} = 150{,}000\ \text{gal.}$$

Total Required Storage	5,645,204	gal.
Total Existing Capacity	4,100,000	gal.
Future Capacity Deficit	(1,545,204)	gal.

The projected water storage capacity surplus or deficit is determined by subtracting the capacity of 5,645,204 gallons from the total available water storage capacity of 4,100,000 gallons, which yields a projected shortage of 1,545,204 gallons at build-out.

Required Storage Capacity at Build Out Without South Hills
Using Santa Clara City's 5 year Historic Average Consumption

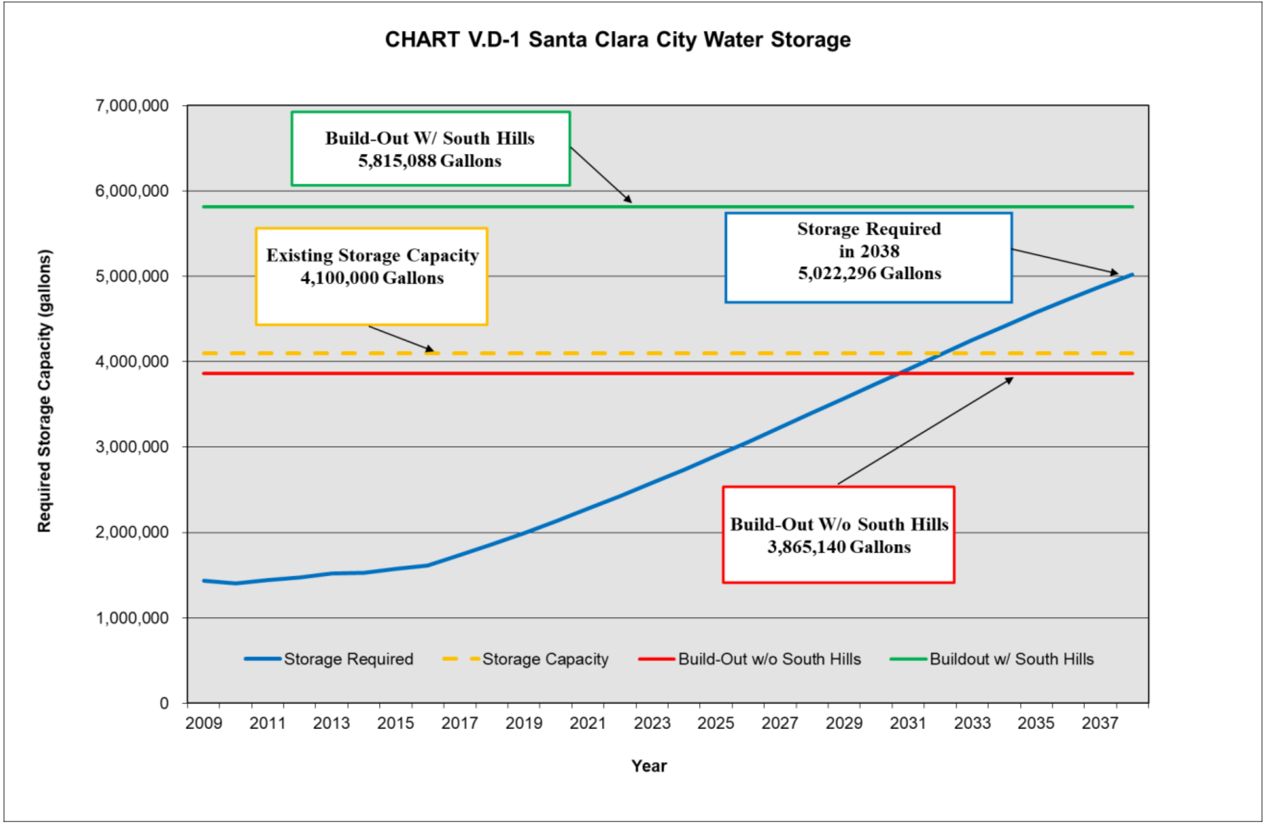
$$\frac{572\ \text{gpd}}{\text{ERU}} \times 6{,}741\ \text{ERU's} = 3{,}855{,}852\ \text{gpd}$$

$$1250\ \text{gpm} \times \frac{60\ \text{min}}{1\ \text{hr}} \times 2\ \text{hr} = 150{,}000\ \text{gal.}$$

Total Required Storage	4,005,852	gal.
Total Existing Capacity	4,100,000	gal.
Future Capacity Surplus	94,148	gal.

The projected water storage capacity surplus or deficit is determined by subtracting the projected required water storage capacity of 4,005,852 gallons from the total available water storage capacity of 4,100,000 gallons, which yields a projected surplus of 94,148 gallons at build-out when excluding the South Hills.

Chart V.D-1 shows Santa Clara City's current and future water storage requirements.



E. RECOMMENDED WATER STORAGE CAPACITY IMPROVEMENTS

Santa Clara City has adequate water storage to meet existing demands according to past Utah Division of Drinking Water standards. It appears regardless of the impending system-specific storage requirement to be established by the Division of Drinking Water that the amount of storage will suffice through build-out excluding the South Hills.

An additional tank may be needed in the South Hills area if development expands into areas of higher elevations that are too high for the existing tank to serve. This tank should be sized to accommodate the build-out in the South Hills area. The new tank should be 1.5 million gallons in storage capacity. The recommended new tank would also compensate for the build-out storage capacity shortage. It is recommended that the new tank be placed at an elevation that would serve the entire South Hills area. This would require coordination with the Bureau of Land Management (BLM) because the recommended tank location is in or near the Santa Clara River Reserve. If the tank were instead built on the highest location within the South Hills boundary, a portion of the South Hills area would not be able to realistically maintain the required pressures without using a booster pump system to artificially provide the pressures and flows.

SECTION VI

WATER TREATMENT REQUIREMENTS

A. EXISTING TREATMENT SYSTEM ANALYSIS

Santa Clara City currently does not chlorinate its culinary water as it is already chlorinated by the Snow Canyon Compact. However, the tank facility in the South Hills was designed with the capability to generate and dose water in the tank with sodium hypochlorite should the chlorine level in the tank drop below acceptable levels. No additional water treatment is anticipated with šZ]šÇ[• µŒŒ vš •Ç•š uX ,}Á À ŒU }vš]vµ À]P]o v]• Œ chlorine residual is maintained at various points in the system. Should the water need a chlorine residual, there are several options that the City can consider. One option is to add a sodium hypochlorite plant to generate the chlorine onsite, which can then be injected into the system.

The Snow Canyon Compact wells currently provide water that exceeds the maximum arsenic levels allowed by the E.P.A. for drinking water. The current practice is to treat this water as necessary by dilution with WCWCD Regional Water at the approximate ratio of 63:37 compact water to regional water and mixing with water from Wells 6 and 7. There are no plans to modify this procedure; however, the City of St. George is nearing the completion of an arsenic treatment plant for the Gunlock Well Fields. This may provide additional treated source for exchange or mixing. There are treatment options available if necessary.

B. RECOMMENDED TREATMENT SYSTEM IMPROVEMENTS

If the recommended 1.5 million-gallon tank is built in the South Hills area, an additional capability should be produced to add chlorine to the water stored there. The water coming from the tank should be carefully monitored to ensure that there is sufficient chlorine residual.

SECTION VII.
WATER DISTRIBUTION SYSTEM ANALYSIS

A. EXISTING DISTRIBUTION SYSTEM ANALYSIS

State of Utah Public Drinking Water Regulations require distribution systems to be sized to supply peak day flows and fire flow, while maintaining a minimum system pressure of 20 psi. The system must also maintain a pressure of 30 psi throughout the system while providing peak instantaneous flows without fire flows and 40 psi throughout the system while providing peak day flows without fire flows. As a general guideline it is recommended that pressures be maintained between 50 and 90 psi during normal system operations. The regulations require a minimum fire flow of 1,000 gpm for residential buildings less than 3,600 square feet and 1,500 gpm for all others. Santa Clara City has identified 1,250 gpm as a goal for all hydrants throughout the City.

Past experience of Santa Clara City and other southwest Utah communities have shown that the peak instantaneous flow can be considerably higher than state guidelines might indicate. The climate and irrigation needs, along with public service announcements, tend to promote early morning irrigation by the majority of users at the same time. As a community grows in size, the peaks and valleys of the demands on a system should tend to even out. Previous reports have identified a peaking factor for Santa Clara City at 5.7 times the average day. With the growth since 2010 there is a point to consider reducing that factor but in light of the significant reduction in average day demand it is our opinion that it should be kept at the 5.7. We have used this 5.7 peaking factor in our analysis for peak instantaneous flow.

Average Day Demand and Peak Day Demands were identified under the Storage and Source section and were used in the model accordingly. Changes in the system specific requirements from the state may alter those. After they make that determinati
they will change significantly. Peak instantaneous flow was not addressed in the latest guidance of the DDW as to whether they will require something different than current regulations or require further study. For the purposes of this plan we will stick with the past methodology used for Santa Clara until additional information or guidance is received. We would recommend the installation of metering systems that can measure and record accurate peak instantaneous flows.

Existing Average Day Demand:

$$\text{Q Avg Day} = \frac{572 \text{ gpd x } 2{,}773 \text{ ERU}}{1{,}440 \text{ min}} = 1{,}101 \text{ gpm}$$

Peak Day Demand:

$$\text{Q Peak Day} = \frac{1{,}155 \text{ gpd x } 2{,}773 \text{ ERU}}{1{,}440 \text{ min}} = 2{,}224 \text{ gpm}$$

Existing Design Peak Instantaneous Dema										
Peaking Factor =			5.7							
	5.7	X	572	gpd	X	2,773	Conn	X	1 day	= 6,279 gpm
				Conn					1440 min	

dZ]šÇ[• Æ]•š]vP •Ç•š u v oo ‰Œ}i š]u‰Œ}Àu vš• Œ system will be analyzed and designed to minimum fire flow of 1,250 gpm.

Existing Peak Day Demand w/ Fire Flow:

$$Q_{\text{Peak Day w/ Fire Flow}} = Q_{\text{Peak Day}} + Q_{\text{Fire Flow}} = \underline{3475\text{ gpm}}$$

State Drinking Water Regulations require all fire hydrants to be supplied from 8-inch diameter or larger lines, unless it can be proven through the use of modeling that a smaller line is sufficient.

The existing Santa Clara City culinary water distribution system has been modeled, using the computer program H2O NET by MWH Soft, Inc.

dZ u]v v šÁ}Œl }(^ vš oŒ]šÇ[•]•šŒ] µš]}v •Ç•š u ‰‰ to the majority of connections. At the existing peak day demand, the model shows that all the junctions in the system are able to produce the required fire flows while maintaining the minimum required pressure of 20 psi at all other connections. The system was capable of maintaining pressures of 30 psi at all nodes while experiencing peak instantaneous demands and 40 psi while experiencing peak day demands.

B. PROJECTED DISTRIBUTION SYSTEM ANALYSIS (YEAR 2038)

The projected distribution system analysis is performed using the same assumptions as used in the existing system analysis, except that the projected number of connections in the year 2038 are inserted into the calculations along with the projected peaking factor in the year 2038 of 5.7. The projected distribution peak instantaneous demand and total instantaneous peak demand are calculated below:

Year 2038 Distribution Requirements Peak Instantaneous Demand Without South Hills										
Peaking Factor =			5.7							
	5.7	X	572	gpd	X	6,741	Conn	X	1 day	= 15,263 gpm
				Conn					1440 minutes	

Year 2038 Distribution Requirements Peak Instantaneous Demand With South Hills

Peaking Factor = 5.7

$$5.7 \times 572 \frac{\text{gpd}}{\text{Conn}} \times 8{,}518 \text{ Conn} \times \frac{1 \text{ day}}{1440 \text{ minutes}} = 19{,}286 \text{ gpm}$$

The fire flow demand added to the Peak Day Demand used in the projected system analysis was generally the same as that used in the existing analysis, or 1,250 gpm for the majority of the distribution system.

In the previous points of analysis, it was not necessarily important to project where in the system growth would occur. However, for the distribution system it is important to try to model the growth where it will most likely take place. The General Plan was used to distribute the growth out over different areas in the City. The following charts indicate the distribution of that growth from current to end of planning period or buildout which ever comes first.

Chart VII.B-1

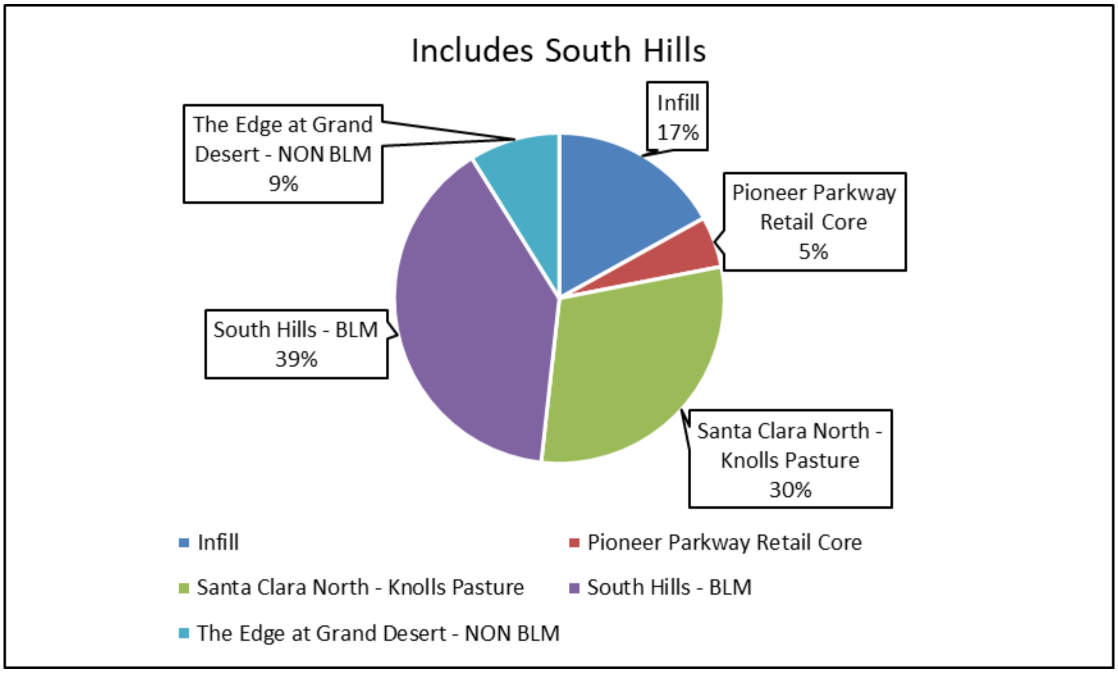
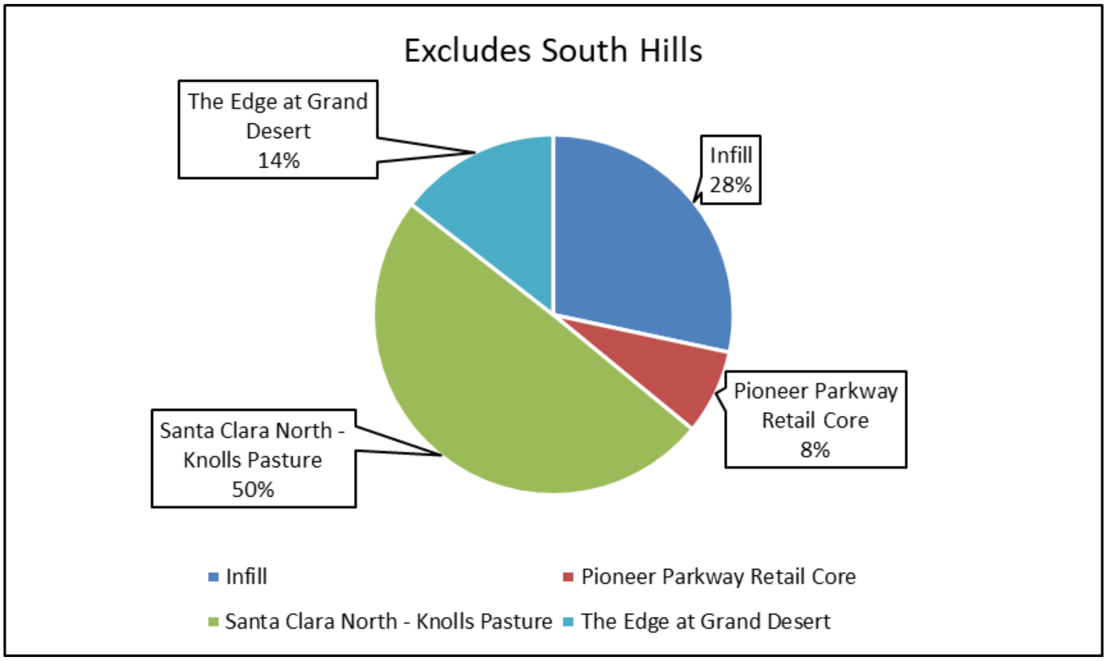


Chart VII.B-2



A computer model of the projected distribution system has been created. In this model, all recommended distribution system changes have been incorporated and modeled. The system was capable of maintaining pressures of 30 psi at all nodes while experiencing peak instantaneous demands and 40 psi while experiencing peak day demands.

C. RECOMMENDED DISTRIBUTION SYSTEM IMPROVEMENTS

1. City / Developer Financed Improvements

The City/Developer Financed Improvements should be constructed as development takes place and should be paid for by the developer (See Exhibit VII.C-1). However, for pipelines o ŒP Œ šZ v ô_U šZ]šÇ Á}µo Œ ‹µ]Œ š} }À Œ šZ larger line and an 8 o]v X

2. Other System Improvements

Inadequate pipes that were not addressed in the above improvement projects have been lumped into Miscellaneous System Improvements (See Exhibit VII.C-1).

When modeled with build-out peak instantaneous demands, the system failed to meet the minimum pressure requirement of 30 psi in the Heights East area on a number of nodes. A pipeline is recommended to connect the line in Santa Clara Drive to that of Valley View Circle.

3. South Hills Improvements

/v }Œ Œ š} (šZ ‰}••] o v Á š vl]v šZ ^}µšZ ,]oo• Œ pump station would be necessary. Also, transmission lines are recommended from the ‰Œ}‰}• v Á ^}µšZ , transmission line is recommended to be installed to serve the area south of Cove W •ZU v íî_ šŒ v•u]••]}v o]v • Œ Œ }u installed to connect to the existing system (see Exhibit VII-1). A PRV is also required to create a separate pressure zone for the South Hills phase II area. It should be noted that the tank and pipelines will need to be coordinated with the Bureau of Land Management (BLM) because the recommended tank site is on the Santa Clara River Reserve. Also, all efforts should be made to not align pipelines through the critical habitat areas. All other improvements should be required by the developer.

The City determined not to include the BLM portion of the South Hills area in their impact fee. Regardless, If the BLM disposes of the property and development of the land is eminent, the City will need to work closely with the potential developers to ensure that the IFFP is valid for the expansion using this plan as a foundation; and recalculate their impact fees if necessary.

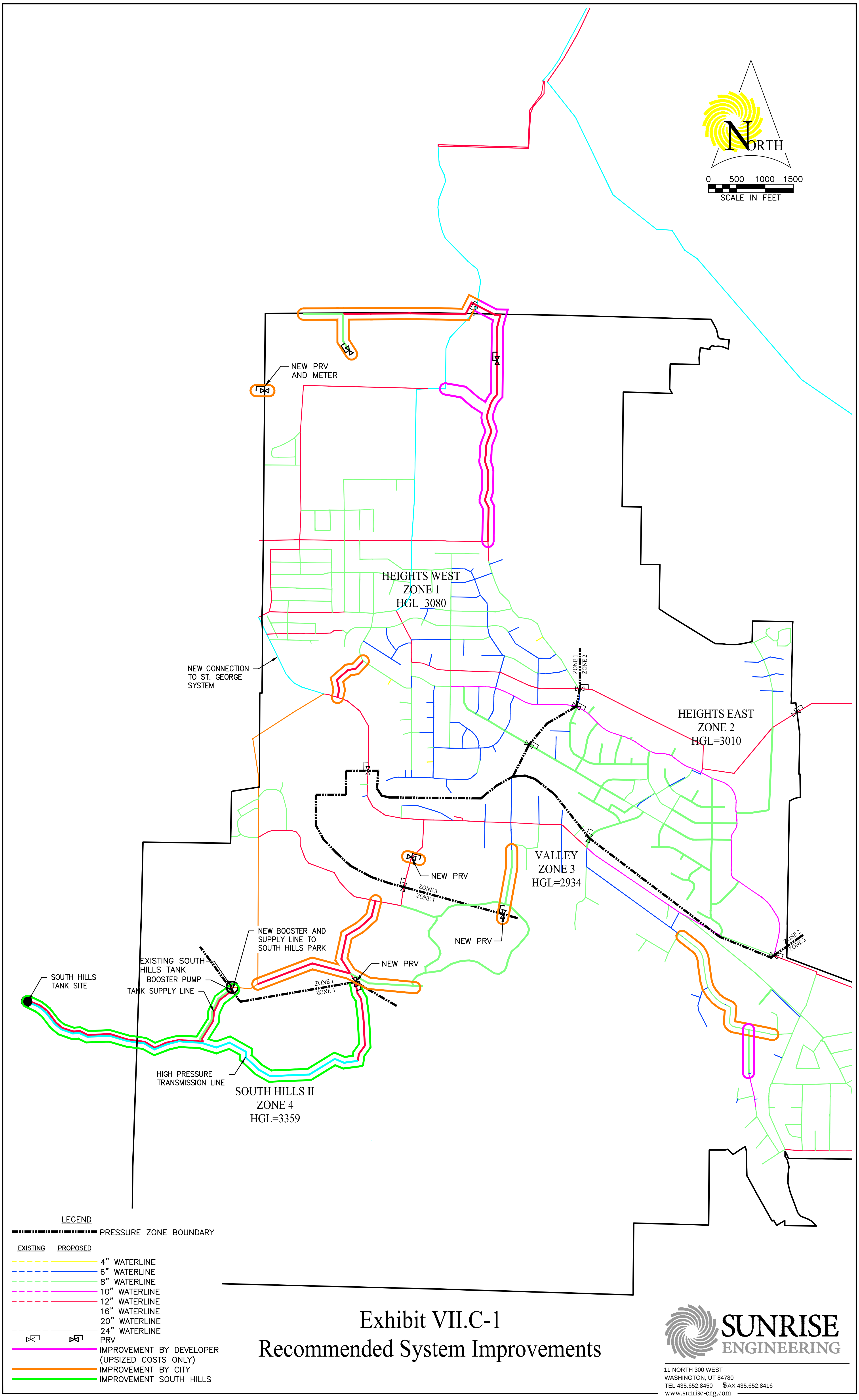


Exhibit VII.C-1
Recommended System Improvements

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