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C I T Y O F



SARATOGA SPRINGS

**SECONDARY WATER  
CAPITAL FACILITY PLAN,  
IMPACT FEE FACILITIES  
PLAN AND ANALYSIS**

(HAL Project No.: 360.02.100)

**APRIL 2014**

**CITY OF SARATOGA SPRINGS**  
**SECONDARY WATER CAPITAL FACILITY PLAN**

(HAL Project No.:360.02.100)



**Steven C. Jones, P.E.**

**Project Engineer**



**APRIL 2014**

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## **IMPACT FEE CERTIFICATION**

### **IFFP Certification**

Hansen, Allen & Luce, Inc. certifies that the Impact Fee Facilities Plan (IFFP) prepared for the secondary water system:

1. includes only the costs of public facilities that are:
  - a. allowed under the Impact Fees Act; and
  - b. actually incurred; or
  - c. projected to be incurred or encumbered within six years after the day on which each impact fee is paid;
2. does not include:
  - a. costs of operation and maintenance of public facilities;
  - b. costs for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents;
  - c. an expense for overhead, unless the expense is calculated pursuant to a methodology that is consistent with generally accepted cost accounting practices and the methodological standards set forth by the federal Office of Management and Budget for federal grant reimbursement; and
3. complies in each and every relevant respect with the Impact Fees Act.

HANSEN, ALLEN & LUCE, INC.

### **IFA Certification**

Hansen, Allen & Luce, Inc. certifies that the Impact Fee Analysis (IFA) prepared for the secondary water system:

1. includes only the costs of public facilities that are:
  - a. allowed under the Impact Fees Act; and
  - b. actually incurred; or
  - c. projected to be incurred or encumbered within six years after the day on which each impact fee is paid;
2. does not include:
  - a. costs of operation and maintenance of public facilities;
  - b. costs for qualifying public facilities that will raise the level of service for the facilities, through impact fees, above the level of service that is supported by existing residents;
  - c. an expense for overhead, unless the expense is calculated pursuant to a methodology that is consistent with generally accepted cost accounting practices and the methodological standards set forth by the federal Office of Management and Budget for federal grant reimbursement;
  - d. offsets costs with grants or other alternate sources of payment; and
3. complies in each and every relevant respect with the Impact Fees Act.

### **Hansen, Allan & Luce, Inc. makes this certification with the following caveats:**

1. All of the recommendations for implementation of the IFFP made in the IFFP documents or in the IFA documents are followed by City Staff and elected officials.
2. If all or a portion of the IFFP or IFA are modified or amended, this certification is no longer valid.
3. All information provided to Hansen, Allen & Luce, Inc. is assumed to be correct, complete, and accurate. This includes information provided by the City as well as outside sources.

HANSEN, ALLEN & LUCE, INC.

**CITY OF SARATOGA SPRINGS  
SECONDARY WATER CAPITAL FACILITY PLAN**

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# **SECTION 1 INTRODUCTION**

## **1.1 Background**

The City of Saratoga Springs has experienced tremendous growth since the early 2000's that has transformed the once largely agricultural community into an urbanized region of northern Utah County. Residential and commercial developments are being established at a rapid pace with additional open space available for future growth. As this growth continues additional secondary water facilities will be required to provide an adequate water system that meets the City's current level of service for outdoor watering.

The City has recognized the importance to plan for increased demands on its Secondary Water System from new development as a result of the rapid growth. A Secondary Water Capital Facilities Plan (CFP) and Impact Fee Facilities Plan (IFFP) were requested by the City in order to prepare an Impact Fee Analysis (IFA). Hansen Allen and Luce, Inc. (HAL) was retained by the City to prepare this Secondary Water CFP and IFFP. This report was prepared in conjunction with Zions Bank Public Finance (Zions). Growth projections for Saratoga Springs were made by evaluating the history of building permit issuance over the last decade. The City experienced rapid growth at the beginning of 2000 followed by a cooling period from 2007 to 2010 with growth rebounding rapidly in the last few years. The City has conservatively projected growth for the near future with stronger growth occurring in about 6 years due to the planned development of the LDS Church property.

## **1.2 Purpose**

The purpose of the IFFP component of this report is to comply with the requirements of the Utah Impact Fees Act by identifying demands placed on the existing Secondary Water System by new development and by identifying the means by which the City will meet the new demands. The IFFP portion of this report projects the need for new growth-related facilities for the 10-year planning range contemplated by the Impact Fees Act. The CFP portion of this report is more comprehensive. It provides the basis for the Impact Fee Facilities Plan (IFPP) as well as identifies all Capital Facilities required of the Secondary Water System for the 20-year planning range including maintenance, repair, replacement, as well as growth related additions.

This report identifies those items that the Utah Code specifically requires for an IFFP along with facilities required by existing deficiencies in the system. The IFFP is required to identify the following:

1. Demands placed upon existing facilities by new development activity; and
2. The proposed means by which the municipality will meet those demands;

In preparing this report a systematic approach was utilized to evaluate the existing and planned secondary water facilities identified in the City's master planning efforts. Each facility's capacity

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was evaluated in accordance with the selected level of service to determine the appropriate share between existing demand and future demands. This approach was taken in order to determine the “proportional share” of improvement costs between existing users and future development users. The basis for this report was to provide proposed project costs and the fractional cost associated with future development to be used within the impact fee analysis. The following analyses were performed to meet the study’s objectives:

- 1) Identify the existing and proposed City secondary water facilities;
- 2) Identify the existing level of service for the system;
- 3) Identify a proposed level of service for the system;
- 4) Identify if any deficiencies are present in the existing system utilizing the proposed level of service;
- 5) Identify any excess capacity in the existing system facilities using the proposed level of service;
- 6) Identify the phasing of new development and the appropriate facilities needed to support the development;
- 7) Project growth in water demands attributable to new development within the existing system;
- 8) Determine projects required by the new water demands to provide the proposed level of service to future development without compromising the level of service provided to existing residents;
- 9) Establish construction phasing of proposed capital facilities;
- 10) Prepare detailed cost estimates for each proposed project;
- 11) Determine if proposed projects will provide capacity for growth beyond the IFFP planning period
- 12) Separate and identify infrastructure costs to maintain the proposed level of service for existing residents versus infrastructure costs to provide an capacity at the proposed level of service for future development, and then identify and subtract the proportionate cost of any excess capacity for growth that is projected to occur beyond the 10 year planning window for the IFFP;

### **1.3 Impact Fee Collection**

Impact fees enable local governments to finance public facility improvements necessary to service new developments without burdening existing development with capital facility construction costs that are exclusively attributable to growth.

An impact fee is a one-time charge on new development to pay for that portion of a public facility that is required to support that new development.

In order to determine the appropriate impact fee, the cost of the facilities associated with future development must be proportionately distributed. As a guideline in determining the “proportionate share”, the fee must be found to be roughly proportionate and reasonably related to the impact caused by the new development.

## **1.4 Master Planning**

The City's current Secondary Water Master Plan provided the framework for the CFP by identifying the existing secondary water facilities and proposed water improvements that would accommodate current and future demands. Assumptions made within this report are in order with current City policies and standard engineering practices.

An updated existing hydraulic model of the Secondary Water System was prepared by HAL to aid in the analyses performed to complete the Secondary Water System Capital Facilities Plan. The model was used to assess existing performance and level of service, to establish a proposed level of service and to confirm the effectiveness of the proposed capital facility projects to maintain the proposed level of service as growth occurs.

## **SECTION 2 EXISTING SECONDARY WATER SYSTEM**

### **2.1 General**

The purpose of this section is to provide information regarding the existing Secondary Water System, identify the current level of service, identify a proposed level of service and analyze the capacity of the existing system's facilities to meet the proposed level of service.

Saratoga Springs' existing Secondary Water System is comprised of a pipe network, water storage ponds, and water supply sources. The system is Master Planned to be an independent system, but is currently supplemented by excess capacity in the Culinary Water System. Separate culinary water and secondary water pipelines exist in all developments. Some developments, however, rely on the Culinary Water System to provide storage and source water to the secondary water pipelines. Some secondary water pipes in the small isolated systems were not modeled in the Secondary Water System model because the Culinary Water System is supplying all demand source and storage in these areas. Secondary Water System demands on the Culinary Water System are modeled in the Culinary Water System model. As the excess capacity in the Culinary Water System is needed for future growth, Secondary Water System facilities will be constructed to increase the capacity of the Secondary Water System, thus freeing up capacity for future culinary demands. For both the Culinary Water System CFP and the Secondary Water System CFP each system was analyzed with no sharing of capacity for future projections. It was assumed for all calculations that no Secondary Water System facilities are being supplemented by Culinary Water System capacity. Figure 2-1 illustrates the existing secondary water system. This section summarizes the City's current level of service, water demands, existing system facilities and existing system capacity available for new growth.

### **2.2 Pressure Zones**

Currently, the secondary water distribution system serving Saratoga Springs has three pressure zones, though presently the zones are split into the north and south as they are not interconnected yet. Zone 3 areas of the City currently use culinary sources and storage. Pressure zones are identified on Figure 2-1.

### **2.3 Existing Secondary Meters**

The secondary system currently has individual meters on approximately 10% of connections. These connections representing 10% of the City correlated well with the overall City demands and with data from other water systems along the Wasatch Front. The City does not bill residents according to water use. Instead bills are a flat rate for secondary water. However the existing meters are read each month. The information provided by the existing meters provided a great deal of information regarding water use. The water use information was utilized to

understand how much water is used by residents in the Secondary Water System and to compare the existing use to the level of service. Table 2-1 is a summary of residential secondary water meter data for the three complete years available for this analysis. Table 2-2 is a summary of average residential secondary water use per meter and per irrigated acre. Average lot size and irrigated acres of the residential meters was obtained by accessing existing development requirements and measuring existing irrigated area in existing developments using an aerial photo in GIS. Average lot size and irrigated acres of the residential meters was also confirmed by randomly selecting seven meters and delineating the individual lot size and irrigated area using a GIS parcel layer and an aerial photo.

**Table 2-1  
Summary of Residential Secondary Water Meter Data by Year**

	2008	2009	2010
<b>Number of Residential Meters with Data</b>	221	242	243
<b>Average Yearly Water Use per Meter</b> (acre-feet)	0.57	0.62	0.68
<b>Average Peak Month Water Use per Meter</b> (acre-feet)	0.18	0.20	0.22
<b>Average Peak Month Water Use Per Meter</b> (gpd)	1,867	2,133	2,285
<b>Average Peak Month Water Use Per Meter</b> (gpm)	1.30	1.48	1.59

**Table 2-2  
Summary of Residential Secondary Water Use**

	PER METER	PER IRRIGATED ACRE
<b>Average Lot Size</b> (acres)	0.25	NA
<b>Average Irrigated Area</b> (acres)	0.14	NA
<b>Average Yearly Water Use</b> (acre-feet)	0.62	4.46
<b>Average Peak Month Water Use</b> (acre-feet)	0.20	1.42
<b>Average Peak Month Water Use</b> (gpd)	2,095	14,965
<b>Average Peak Month Water Use</b> (gpm)	1.46	10.39
<b>Estimated Average Peak Day Water Use</b> (gpm)	1.61	11.50

## **2.4 Equivalent Residential Connection**

Water demands produced by non-residential water users, such as schools, commercial, industrial, or civic have been converted to an equivalent residential connection (ERC) for analysis purposes. An ERC is equal to the average water demand of one residential connection (0.5 ac-ft per year). The method of using ERC's for analysis is for allocating existing and future demands over non-residential land uses. An ERC quantifies the ratio of non-residential water demands relative to an equivalent residential level of service demand. These ratios may be utilized to establish an equitable cost of service for a non-residential water user.

An ERC is defined as 0.5 acre-feet of secondary water per year, which is consistent with the volume of water rights the City requires for new development. It is recommended that the City consider using irrigated acres instead of ERC. It is also recommended that the City change the way irrigated acres and the percentage of land irrigated is defined for residential development. Currently the City defines an ERC as having 0.25 irrigated acres based on 90% of the total area being irrigated with 2.0 acre-feet per irrigated acre. It is recommended that the City consider changing the percentage of net irrigated areas to 64% of land being developed. This is consistent with actual data and changes the acre-feet per irrigated acre to 3.13. It is recommended that the percentage of irrigated acres for multi-family and non-residential developments remain based on actual landscaped area. It is also recommended that the percentage of irrigated acres remain at 90 percent for land used for irrigated open space and parks.

The total number of existing irrigated acres as of this analysis is 1,214 acres or 3,800 acre-feet. This includes all development that has been platted and assumes the recommended irrigated acres of 64% of land developed and 3.13 acre-feet per irrigated acre. It is the City's policy to receive impact fees and water rights at plat recordation for the secondary water system. Therefore, the existing system provides capacity for these recorded developments whether or not building permits have been issued.

## **2.5 Level of Service**

The level of service as provided by the Secondary Water System has been established by the City to be the standards required to provide outdoor watering for a typical residence. Table 2-3 is a comparison of the actual existing use and the level of service for the Secondary Water System per irrigated acre. Table 2-4 is the same comparison per typical residential connection. The proposed level of service represents the historic level of service the system has been designed to serve, but is not as high as the existing level of service, measured by metered use. As seen from actual use data, city residents have been using more water than the system was designed for. Although the proposed level of service provides for less capacity than a typical resident is currently using, the proposed level of service represents the capacity needed to irrigate turf in Saratoga Springs, when one factors in the poor water quality of available secondary water in the City, and other unavoidable system losses. Secondary water sources

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within Saratoga Springs are high in dissolved salts, which require residents to use more water than the state outdoor irrigation average to maintain irrigated landscaping.

Proposing a level of service at the existing level of service would promote waste and would unnecessarily increase the cost of the Secondary Water System.

Much of the waste in the current system results from unmetered connections and flat rate billing. It is recommended that the City consider retrofitting existing connections with secondary meters and bill for secondary water used. The City should modify the secondary water rate schedule to reduce waste through inadvertent use. The City should implement other conservation measures, such as staggered irrigation schedules to encourage citizens further to reduce secondary water use.

**Table 2-3  
Level of Service Comparison (Per Irrigated Acre)**

	<b>Saratoga Springs 2011 Actual</b>	<b>Proposed Level of Service</b>
<b>Average Yearly Demand</b> (Source Volume) ac-ft/yr per irrigated acre	4.46	<b>3.13</b>
<b>Peak Day Demand</b> (Source Flow) gpm/irrigated-acre	11.50	<b>7.50</b>
<b>Peak Instantaneous Demand</b> (Transmission) gpm/irrigated-acre	23.00	<b>15.00</b>
<b>Storage</b> gal/irrigated-acre	8,011	<b>9,216</b>

**Table 2-4  
Level of Service Comparison (Per Typical Single Family Connection)**

	<b>Saratoga Springs 2011 Actual</b>	<b>Proposed Level of Service</b>
<b>Irrigated Acres</b>	0.14	<b>0.16</b>
<b>Average Yearly Demand</b> (Source Volume) ac-ft/yr per connection	0.62	<b>0.50</b>
<b>Peak Day Demand</b> (Source Flow) gpm/connection	1.61	<b>1.20</b>
<b>Peak Instantaneous Demand</b> (Transmission) gpm/connection	3.22	<b>2.40</b>
<b>Storage</b> gal/connection	1,121	<b>1,475</b>

## **2.6 Methodology Used to Determine Existing System Capacity**

The method for determining the remaining capacity in the system was based on the proposed level of service in terms of irrigated acres. Each component of the Secondary Water System was assessed a capacity in terms of irrigated acres. The components include the following: Source (wells and pump stations), Storage (reservoirs and associated transmission lines), Transmission (main transmission lines not directly associated with source or storage), and water rights. Each component was also assigned a number of existing irrigated acres currently using each component. The difference between the capacity and existing demand for each component is the remaining capacity. For example, to calculate the remaining capacity for source in irrigated acres, the required source for existing users in irrigated acres is subtracted from the capacity of the wells in irrigated acres. For storage, the required storage for existing users in is subtracted from the capacity of the reservoirs in to calculate the remaining capacity for storage.

In addition to the level of service presented in the tables below, pipelines are considered at capacity when velocities reach 5 feet per second (fps) at peak instantaneous demand using the extended period hydraulic model representing the system as a whole under typical peak demand conditions. It was determined, in general, that flows above 5 fps produced unacceptable pressure fluctuations.

HAL developed a hydraulic model for Saratoga Springs to assess its current system operation and capacity. The model calculated a capacity for each pipe line by estimating the flow capacity of each pipe at a velocity of 5 fps divided by the peak instantaneous demand of 15 gpm per irrigated acre.

## **2.7 Water Source & Remaining Capacity**

Saratoga Spring's current secondary water sources are provided by groundwater wells and canal shares. The existing peak summer demands require the northern system to be supplemented by the culinary system through connections with backflow prevention. The canal source capacity is represented by the capacity of pump stations at the canals. Table 2-5 summarizes the information of each secondary source. An operation and maintenance memorandum for wells is included within Appendix B and includes suggestions to increase the wells sustainability. As seen in Table 2-5 there is no remaining capacity in the secondary sources. Demand is higher than supply. Culinary water is used to make up the remaining existing capacity needed.

**Table 2-5  
Existing Secondary Water Sources**

<b>Name</b>	<b>Capacity (gpm)</b>	<b>Total Capacity (Irr-acre)</b>	<b>Remaining Capacity</b>	<b>Notes:</b>
Well No. 1	800	106.7	0	Zone 2 South Source
Well No. 2	0	0	0	Sunrise Meadows Well
Well No. 3	500	66.7	0	Zone 2 North Source
Well No. 4	800	106.7	0	Zone 2 North Source
Well No. 5	3,500	466.7	0	Zone 2 South Source
ULDC Canal	1,100	146.7	0	Zone 1 South Canal Source – Pump Station 1 & Pond 3
Spring Creek Canal	0	0	0	
<b>Total</b>	<b>7,480</b>	<b>893.5</b>	<b>0</b>	

## **2.8 Distribution System & Remaining Capacity**

Pipe diameters range from 6-inches to 24-inches, with the majority being 6 inches within the individual subdivision developments. The larger pipes in the system were provided as transmission lines to deliver water from storage ponds during peak scenarios and to deliver water from sources. All pipes are in good condition as they have been constructed within the last 15 years. The City’s current standard is to utilize Ductile Iron Pipe (DIP) for pipe diameters of 12-inches and larger.

## **2.9 Storage Facilities & Remaining Capacity**

Saratoga Springs currently operates four water storage ponds serving the City. Storage requirements are determined on a per irrigable acre basis. The total storage capacity is 44.7 acre-feet. All ponds were constructed in the last 15 years and are in good condition.

The capacity of each pond was analyzed in respect to the zone it serves. The storage was analyzed as requiring 9,216 gallons per irrigable acre. Table 2-6 summarizes the storage facility information. Some of the ponds are not used for equalization but for pump operation. These ponds do not have usable equalization capacity. Overall the City has 366 irrigated acres of remaining capacity.

**Table 2-6  
Existing Storage Pond Summary**

<b>Service Zone</b>	<b>Pond ID</b>	<b>Capacity (Acre-feet)</b>	<b>Total Capacity (Irr-acre)</b>	<b>Remaining Capacity (Irr-acre)</b>	<b>Remaining Capacity (ERC)</b>
Zone 1 South	Pond 1 (Grandview Blvd)	2.1	74.2	0	0
Zone 2 South	Pond 2 (The Villages)	1.5	53.0	0	0
Zone 1 South	Pond 3 (Church Pond) *	NA	NA	0	0
Zone 2 North	Pond 4 (Sunrise) *	NA	NA	0	0
Zone 1 North	Pond 5 (Loch Lomond) *	NA	NA	0	0
Zone 2 North	Pond 6 (Harvest Hills)	3.1	109.6	0	0
Zone 2 South	Pond 7 (Israel Canyon)	38.0	1,343.2	366	2,288
<b>Total</b>		44.7	1,580.0	366	2,288

\*Storage/staging pond for pump station.

## **2.10 Pump Stations**

The Fox Hollow Pump Station will provide source to the Zone 3 South Zone when a Zone 3 pond has been constructed. Until development proceeds in the new zone and a pond is constructed the pump station will not be operational. The capacity of the Fox Hollow Pump Station is 4,350 gpm (3,625 ERC).

## **2.11 Water Rights & Remaining Capacity**

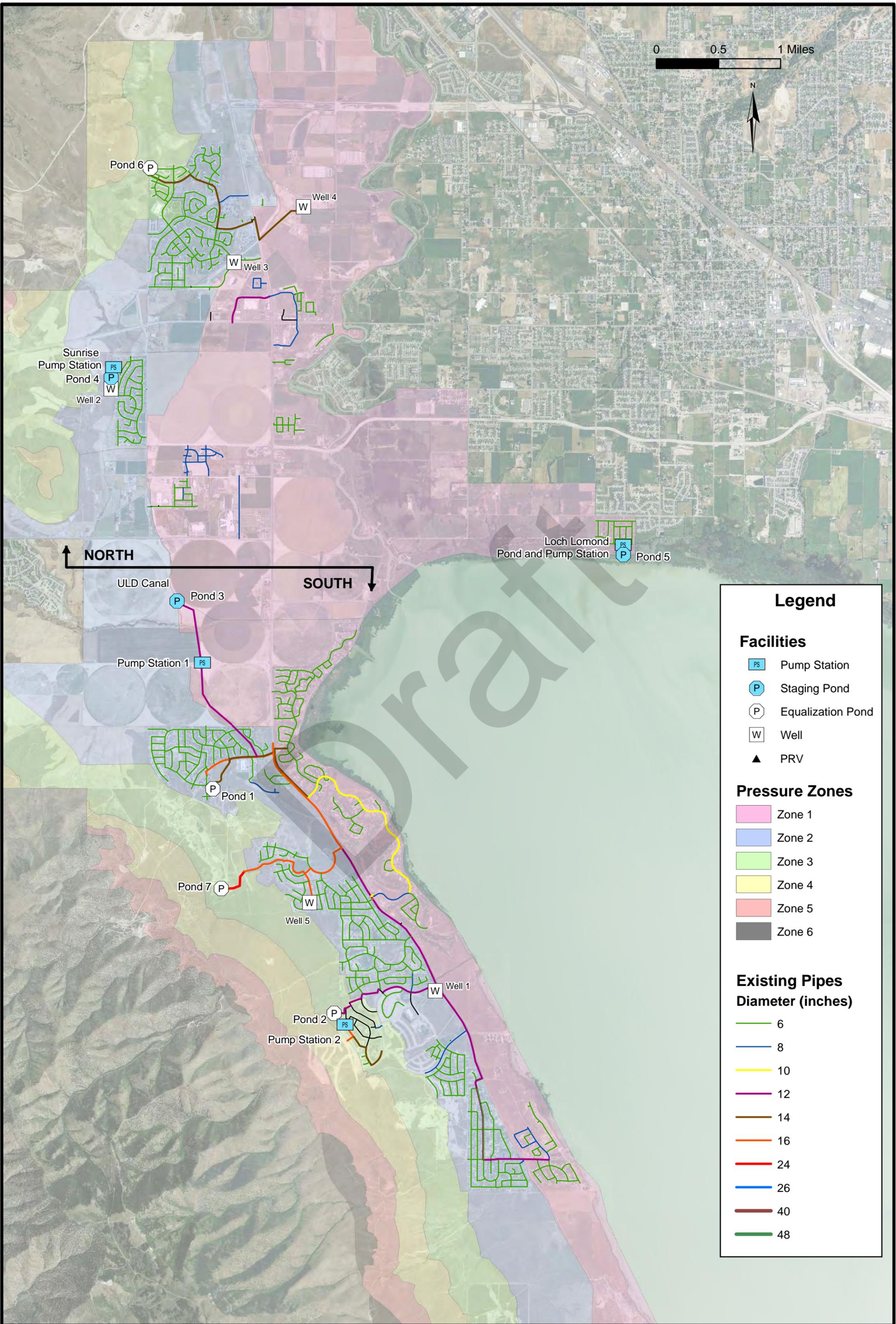
The City owns a total of 4,733 acre-feet of water rights attributed to the Secondary Water System. The existing demand at the proposed level of service of 3.13 acre-feet per irrigated acre is 4,586 acre-feet. Both the 4,733 acre-feet of water rights owned and the 4,586 acre-feet existing demand includes 786 acre-feet of water rights that were given to the City in exchange for development credit agreements for future development. Subtracting 4,586 from 4,733 leaves a remaining capacity available for future development of 147 acre-feet, which is in addition to the existing development credit.

## **2.12 Capital Facilities to Meet System Deficiencies**

Combined with the culinary system, the existing Secondary Water System meets the proposed level of service. The secondary system is master planned to be an independent system, but

currently the Secondary Water System can be supplemented by excess capacity in the Culinary Water System. Separate culinary water and secondary water pipelines exist in all developments. However, a few isolated developments currently rely on the Culinary Water System to provide storage and source water to the secondary water pipelines. As the excess capacity in the Culinary Water System is needed for future growth, Secondary Water System facilities will be constructed to increase the capacity of the Secondary Water System. A Culinary Water System CFP was prepared in conjunction with the Secondary Water System CFP. For both the Culinary Water System CFP and the Secondary Water System CFP each system was analyzed with no sharing of capacity for future projections. It was assumed for all calculations that no Secondary Water System facilities are being supplemented by Culinary Water System capacity. Additional information regarding the Culinary Water System may be found in Culinary Water System CFP.

The City has several capital projects planned to improve existing system operation and provide capacity for future growth. The City is also planning to install meters at each secondary connection to reduce over watering and conserve source capacity. For this reason the proposed level of service requirements are less than the existing level of service. The capital projects are presented in the CFP Section. Only projects that add capacity for future growth are eligible to be included in the calculation of the impact fee. Projects that are not impact fee related have costs provided in the CFP Section for City budgeting purposes only.



0 0.5 1 Miles



NORTH SOUTH

**Legend**

**Facilities**

- PS Pump Station
- P Staging Pond
- P Equalization Pond
- W Well
- ▲ PRV

**Pressure Zones**

- Zone 1
- Zone 2
- Zone 3
- Zone 4
- Zone 5
- Zone 6

**Existing Pipes  
Diameter (inches)**

- 6
- 8
- 10
- 12
- 14
- 16
- 24
- 26
- 40
- 48

## SECTION 3 CAPITAL FACILITIES REQUIRED BY NEW DEVELOPMENT

### 3.1 General

The purpose of this section is to identify the secondary facilities that are required, to meet the demands placed on the system by future development for the IFFP 10-year planning period and the CFP 20-year planning period. Proposed facility capacities were sized to adequately meet the 20-year growth projections and were compared to current master planned facilities. A detailed design analysis will be required before construction of the facilities to ensure that the location and sizing is appropriate for the actual growth that has taken place since this CFP was developed. Specific projects with costs are presented in Section 4.

### 3.2 Growth Projections

Growth projections for Saratoga Springs were made by evaluating the history of building permit issuance over the last decade as summarized in Table 3-1.

**Table 3-1  
Residential Building Permit History**

Year	Annual Residential Permits	Annual Growth
2000	169	63.1%
2001	483	110.5%
2002	369	40.1%
2003	437	33.9%
2004	383	22.2%
2005	656	31.1%
2006	658	23.8%
2007	489	14.3%
2008	193	4.9%
2009	186	4.5%
2010	232	5.4%
2011	464	10.3%

The City experienced rapid growth at the beginning of 2000 followed by a cooling period from 2007 to 2010 with growth rebounding rapidly in the last few years. The City has conservatively projected growth for the near future with stronger growth occurring in about 6 years due to the

projected development of the LDS Church property within City boundaries. Total growth projections for the City are summarized in Table 3-2.

**Table 3-2  
Growth Projections**

<b>Year</b>	<b>Total Projected ERCs</b>	<b>Total Projected Irrigated Acres</b>	<b>Annual Growth</b>
2012	5,059	1,214	-
2013	5,430	1,303	7.3%
2014	5,812	1,395	7.0%
2015	6,194	1,486	6.6%
2016	6,576	1,578	6.2%
2017	7,377	1,770	12.2%
2018	7,986	1,916	8.3%
2019	8,671	2,081	8.6%
2020	9,541	2,290	10.0%
2021	10,207	2,449	7.0%
2022	10,877	2,610	6.6%
2023	11,616	2,787	6.8%
2024	12,401	2,976	6.8%
2025	13,235	3,176	6.7%
2026	14,124	3,389	6.7%
2027	15,066	3,615	6.7%
2028	16,068	3,856	6.7%
2029	17,141	4,113	6.7%
2030	18,270	4,384	6.6%
2031	18,826	4,518	3.0%

### **3.3 Methodology**

Future water demands were based on the growth projections converted into irrigated acreage projections. The demands were added incrementally by year to the facility analysis. A 20-year solution was identified for the year a facility reaches capacity. A hydraulic model was developed for the purpose of assessing the system operation and capacity with future demands added to the system. The model was used to identify problem areas in the system and to identify the most efficient way to make improvements to transmission pipelines, sources, pumps, and storage facilities.

Currently the Culinary Water System supplements the Secondary Water System, as needed, during peak demands in portions of the City. Future culinary water demands require the secondary water system demand to be removed from a Culinary Water System facility, triggering a project required for the Secondary Water System but not the Culinary Water System.

The future system was evaluated in the same manner as the existing system, by modeling (1) Peak Instantaneous Demands and (2) Peak Day Demands.

### **3.4 Future Water Source**

The future system will continue to utilize groundwater sources and canal sources for secondary water. The Central Water Project (CWP) provided by Central Utah Water Conservancy District (CUWCD) should allow the City access to the CWP in 2014. If the City elects to use this water, it would be possible to postpone the cost of drilling new wells. As an option for future sources, the City's Well 7 and Well 8 could be used in the culinary system once the CWP water is available. The City also may utilize shallow wells and canal shares to provide source water for the secondary system.

Future growth projections require the City to provide additional secondary water sources. The CFP analysis utilized the proposed level of service requiring that the system's water sources are capable of meeting a peak day demand of 7.5 gpm per irrigated acre.

The following are source projects selected to meet the source requirements for future growth:

- Zone 2 North Source – Re-equip the existing Sunrise Well to boost directly into Zone 2 North and provide a secondary source to the Sunrise Development and additional source to Zone 2 North, alleviating dependence on the culinary source.
- Zone 2 South Source – Utilize Welby Canal for additional source in Zone 2 South. The project also includes the booster pump, a turnout pond and filter station.
- Zone 1 North Source – Utilize the Welby Canal for additional source in Zone 1 North. The project includes a booster pump, turnout pond, and filter station.

### **3.5 Future Secondary Water Storage**

Based upon the City level of service, the water system must supply a minimum of 9,216 gallons per irrigated acre or 1,475 gallons per ERC. The future 20-year ERCs projection requires a number of storage facilities to supply storage to future pressure zones. The following storage facilities are anticipated to meet future demands:

- Zone 2 North Storage – Expand existing Pond #6 by 6.5 acre-feet.
- Zone 1 North Storage – Zone 1 North Pond with a capacity of 13 acre-feet.
- Zone 3 North Storage – Zone 3 North Pond with a capacity of 11 acre-feet.
- Zone 3 South Storage – Zone 3 South Pond with a capacity of 12 acre-feet.
- Zone 2 South Storage – Zone 2 South Pond with a capacity of 10 acre-feet.
- Zone 2 North Storage – Zone 1 North Pond (Saratoga Heights) with a capacity of 12 acre-feet.
- Zone 4/5 South Storage – Zone 4/5 South Pond with a capacity of 16 acre-feet.

### **3.6 Future Zone Pumping**

Future zone pumping requirements were evaluated to model the peak day future demands. All zones are or are planned to be directly connected to ponds that supply flows above the peak day demand. All zone pumping meets the 7.5 gpm per irrigated acre (1.2 gpm/ERC) level of service standard. The growth model required new pump stations to provide water to existing and future zones. Zone pumping in the lower pump stations must have capacity to provide source to the zone above. These pump stations do not include the pump stations required to lift from canal sources as these were determined to be part of a source project. The required pump stations are shown below:

- Zone 3 North Pump Station – Pump Station for the new Zone 3 North (2100 gpm @ 200 HP).
- Zone 4/5 South Pump Station – Pump Station for the new Zones 4 and 5 South (1000 gpm @ 200 HP).

### **3.7 Future Transmission Piping**

Future transmission lines would need to be constructed to allow for future growth in the undeveloped areas of the City and to connect existing isolated systems together. The model was used to determine the most efficient way to keep waterline velocities and pressures within the criteria limits with added future demands. The level of service selected for pipelines was a peak instantaneous demand of 15.0 gpm per irrigated acre or 2.4 gpm per ERC. Pipelines are considered at capacity when velocities reach 5 fps at peak instantaneous demand using the extended period hydraulic model representing the system as a whole under typical peak

demand conditions. The majority of the waterline projects are required to connect sources to storage tanks and to connect the existing and future areas of the system. These transmission lines are described below:

- Zone 2 North Transmission Line – 12-inch line connecting the Sunrise secondary system to the Harvest Hills Zone 2 system to supply more secondary source.
- Zone 2 South Transmission Line – 14-inch line for Zone 2 Source Project that will connect Welby Source to existing system.
- Zone 1 North Transmission Line – 24-inch line from new Zone 1 Storage to the zone boundary and then a 14-inch line to Redwood Road.
- Zone 3 North Transmission Line – 16-inch line connecting the proposed pump station to the proposed storage pond.
- Zone 3 South Transmission Line – 16-inch line connecting the proposed pump station to the proposed storage pond.
- Zone 2 North Transmission Line – 16-inch line connecting the proposed Saratoga Heights Pond to the existing system.
- Zone 4/5 North Transmission Line – 16-inch line interconnecting the proposed tank and pump station to the existing water lines.
- Zone 1 Transmission Line – 16-inch line interconnecting the existing culinary wells to the secondary system directly for use when the CWP project provides excess culinary source.

### **3.8 Future Water Rights**

Water rights need to be acquired for future growth in the undeveloped areas of the City. The City owns a total of 4,733 acre-feet of water rights attributed to the Secondary Water System. This includes water rights that were given to the City in exchange for development credit agreements. The existing demand at the proposed level of service of 3.13 acre-feet per irrigated acre is 4,586 acre-feet, which includes 786 acre-feet of developer credit. Developer credit is water rights given to the City before the development is actually built. Subtracting 4,586 from 4,733 leaves a remaining capacity available for future development of 147 acre-feet. With an assumed additional demand of 3,584 acre-feet by 2022, the City will need to acquire 3,437 acre-feet by then. By the year 2031 the City will need to have acquired an additional 5,970 acre-feet of secondary water rights or about 600 acre-feet per year.

- 3,437 acre-feet of water rights by the year 2022.
- 5,970 acre-feet of water rights or contract through CUWCD by the year 2031.

## **SECTION 4**

### **CAPITAL FACILITY PLAN, PHASING & COST ESTIMATES**

#### **4.1 General**

The purpose of this section is to provide a detailed list of the proposed Capital Facilities to meet both existing deficiencies and also future growth in the Secondary Water System. Table 4-1 provides a complete list of the CFPs. Also included in the list is the anticipated year of construction based upon current City budgeting and need for the project. The actual phasing of projects will be dependent on actual growth and the location of the growth. The years shown are only a guide for the City and may be revised at any time as the need arises. Figure 4-1 details the locations of each project.

#### **4.2 Cost Estimating**

Cost estimates were prepared for each project and are shown in Table 4-1. Table 4-2 provides a summary of the costs associated with existing deficiencies versus projects required to meet future growth demands.

Unit costs for the construction cost estimates are based on master planning level engineering. Sources used to estimate construction costs include:

- “Means Heavy Construction Cost Data, 2013”
- Price quotes from equipment suppliers
- Recent construction bids for similar work along the Wasatch Front

Costs include construction, land acquisition, planning and engineering. All costs are presented in 2013 dollars. Recent price and economic trends indicate that future costs are difficult to predict with certainty. Engineering cost estimates given in this study should be regarded as conceptual level as appropriate for use as a planning guide. Only during final design can a definitive and more accurate estimate be provided. A cost estimate calculation for each project is provided in Appendix A.

**TABLE 4-1  
CAPITAL IMPROVEMENT PROJECTS**

<b>TYPE &amp; YEAR</b>	<b>MAP ID</b>	<b>RECOMMENDED PROJECT</b>	<b>Existing Deficiency Cost</b>	<b>New Growth Cost</b>
Storage – Growth Project <b>2013</b>	1	Zone 2 North Storage – Expand Pond #6 adding 5.9 acre*feet of capacity. The cost includes acquiring property.	\$0	\$656,000
Source – Growth & Deficiency Project <b>2013</b>	2	Zone 2 North Source – Install 5,200 feet of 12-inch transmission line from the Sunrise Development to the Harvest Hills Development. The transmission line will provide additional secondary source to Harvest Hills. Equip the Sunrise Well to provide water source capacity to Zone 2 North.	\$420,000	\$290,000
Transmission – Existing Deficiency <b>2015</b>	2a	Zone 2 North Transmission – Modeling and City observations show low pressures during peak demands along Winter Wheat Way. A 10-inch line through City open space (550 feet) would increase pressures for the area.	\$46,000	\$0
Source – Growth Project <b>2013</b>	3	Zone 2 South Source - Install 5,400 feet of 14-inch transmission line through non-developed property to existing Zone 2 lines. Construct a filter station, 200 HP & 2,000 gpm Booster Pump Station and modify an existing pond at the Welby Jacob Canal.	\$0	\$1,817,000
Storage & Source – Growth Project <b>2016</b>	4	Zone 1 North Storage/Source – Construct a new 13 acre*feet pond west of the Welby Jacob Canal to support new growth in Zone 1. The project also includes a turnout at the canal with a receiving pond, a filter station and a small booster pump station (3,000 gpm) to lift from the receiving pond to the storage pond.	\$0	\$2,886,000

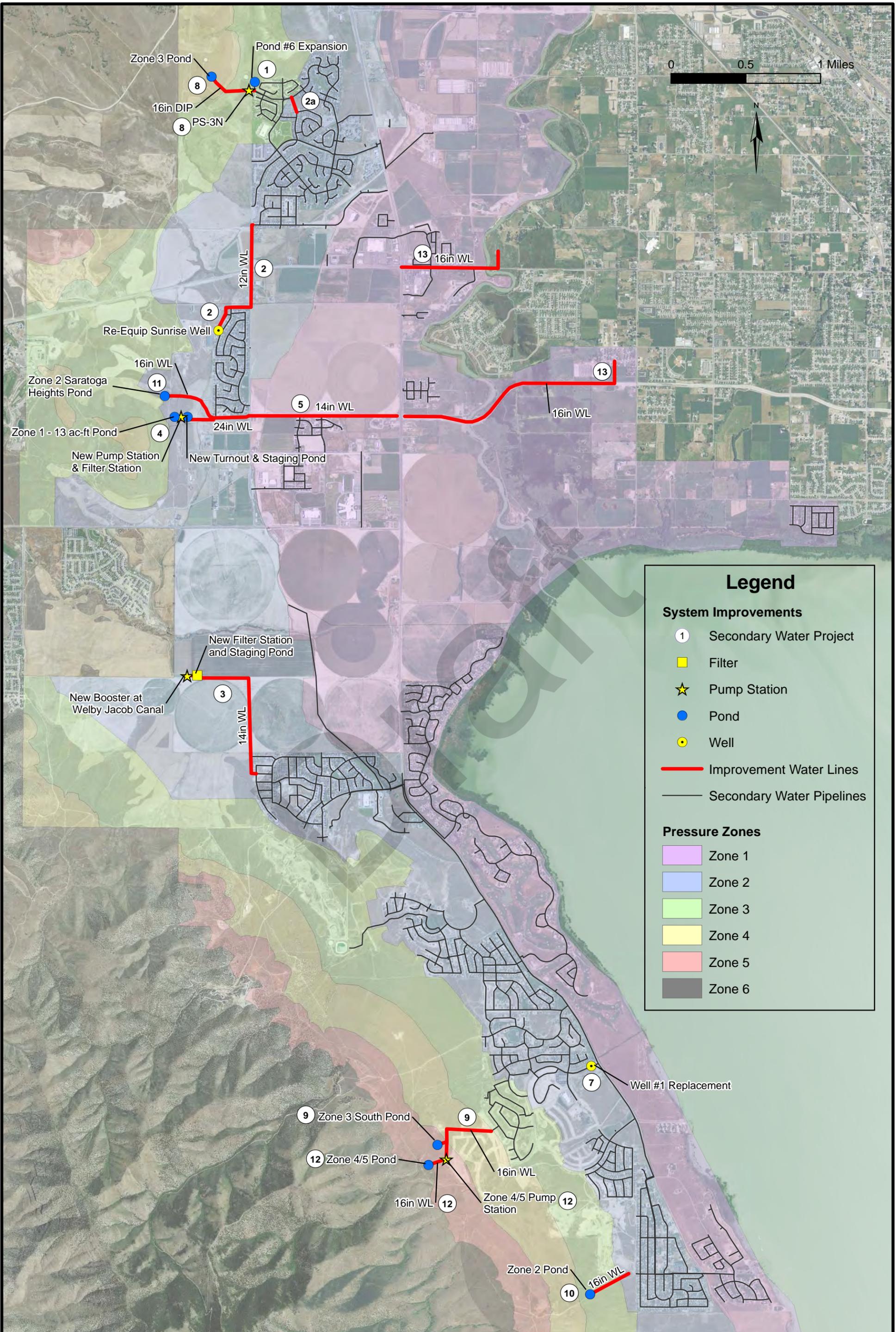
<b>TYPE &amp; YEAR</b>	<b>MAP ID</b>	<b>RECOMMENDED PROJECT</b>	<b>Existing Deficiency Cost</b>	<b>New Growth Cost</b>
Transmission – Growth Project <b>2017</b>	5	Zone 1 North Source/Storage – Provide source to new portions of Zone 1 in anticipation of growth. The project includes 2,600 feet of 24-inch transmission line from the pond to the top of the zone and then 5,300 feet of 14-inch line along 400 N to Redwood Road to connect the source and storage added in the Map ID 4 Zone 1 North storage/source project.	\$0	\$1,481,000
Source – Existing Deficiency <b>2013 &amp; 2016</b>	6	Installation of secondary meters for each connection throughout the City. The meters will assist in appropriate billing of customers and also deter water waste by over irrigating.	\$2,774,000	\$0
Source – Existing Deficiency <b>2020</b>	7	Replacement of Well #1 in the Zone 2 South Zone. The City has reported that the well may fail in the upcoming years. Budget and a project were identified to drill a new well in the vicinity with a new pump station.	\$1,860,000	\$0
Source & Storage – Growth Project <b>2021</b>	8	The Zone 3 North Source and Storage – Added growth projections identify the need to build a pump station and storage pond in Zone 3 that currently utilizes Culinary Water for outdoor irrigation. The project includes an 11 acre*feet pond, a 200 HP (2,100 gpm) pump station and 3,200 feet of 16-inch transmission line from the pump station to the pond.	\$0	\$2,768,000
Water Rights – Growth Project <b>2022</b>	-	The City will need to acquire an additional 3,437 acre-feet of water rights to meet anticipated demand growth by the year 2022.	\$0	\$10,352,000

<b>TYPE &amp; YEAR</b>	<b>MAP ID</b>	<b>RECOMMENDED PROJECT</b>	<b>Existing Deficiency Cost</b>	<b>New Growth Cost</b>
Source – Growth Project <b>2022</b>	-	Source – Added growth projections identify the need add additional source. The project includes two new wells and a pump station (400 irrigated acres of source capacity)	\$0	\$3,060,000
Source & Storage – Growth Project <b>2023</b>	9	The Zone 3 South Source and Storage – Added growth projections identify the need to connect the Fox Hollow Pump Station to a storage pond for the new Zone 3 South Zone. The project includes a 12 acre*feet pond and 3,500 feet of 16-inch transmission line from the pump station to the pond.	\$0	\$2,400,000
Storage – Growth Project <b>2026</b>	10	Growth will require the construction of a new Zone 2 South pond with a capacity of 10 acre*feet. A 16-inch transmission line will be required to connect the pond to the existing system.	\$0	\$1,692,000
Storage – Growth Project <b>2026</b>	11	Growth will require the construction of a new Zone 2 North pond near Saratoga Heights. The project includes a 12 acre*feet pond with 2,500 feet of 16-inch transmission line from the existing system to the pond.	\$0	\$2,328,000
Transmission, Storage & Source – Growth Project <b>2026</b>	12	Growth in the South Zones 4 & 5 will require new storage, source and transmission projects for secondary water. The project includes a dual Zone 4/5 pond with a capacity of 16 acre*feet, a 200 HP (1,000 gpm) pump station and a 16-inch transmission line from the Zone 3 system to the new storage pond.	\$0	\$4,104,000

<b>TYPE &amp; YEAR</b>	<b>MAP ID</b>	<b>RECOMMENDED PROJECT</b>	<b>Existing Deficiency Cost</b>	<b>New Growth Cost</b>
Transmission – Growth Project <b>2026</b>	13	Construct approximately 11,500 feet of 16-inch transmission line from the existing well fields to Redwood Road. The lines are necessary to provide additional source to the secondary system in Zone 1.	\$0	\$2,208,000
Water Rights – Growth Project <b>2031</b>	-	The City will need to acquire an additional 5,970 acre-feet of water rights to meet anticipated demand growth from the year 2023 through 2031. This is about 650 acre-feet per year or about \$2,000,000 a year. (This assumes the City decides not to use CUWCD water other than for the SLR development)	\$0	\$17,982,000
<b>TOTAL</b>			<b>\$5,755,000</b>	<b>\$54,024,000</b>

**TABLE 4-2  
CAPITAL IMPROVEMENT PROJECT SUMMARY**

<b>TYPE</b>	<b>DESCRIPTION</b>	<b>TOTAL COST</b>
Existing Deficiency Projects	Projects required for the system that are necessary to eliminate existing deficiencies.	\$5,755,000
Growth Projects Through 2022	Projects to resolve system deficiencies placed on the system by new growth through the year 2022. These projects may be impact fee projects or projects directly funded by the developer.	\$23,310,000
Growth Projects Beyond 2022	Projects to resolve system deficiencies placed on the system by new growth beyond the year 2022. These projects may be impact fee projects or projects directly funded by the developer.	\$30,714,000
<b>TOTAL</b>		<b>\$59,779,000</b>



**Legend**

**System Improvements**

- ① Secondary Water Project
- Filter
- ★ Pump Station
- Pond
- Well
- Improvement Water Lines
- Secondary Water Pipelines

**Pressure Zones**

- Zone 1
- Zone 2
- Zone 3
- Zone 4
- Zone 5
- Zone 6

## SECTION 5 IMPACT FEE FACILITY PLAN AND ANALYSIS

### 5.1 General

This section relies on the data presented in the previous sections to present a proposed impact fee based on the appropriate proportion of cost of projects planned in the next 10 years to increase capacity for new growth and an appropriate buy-in cost of available existing excess capacity previously purchased by the City.

The following data on the Secondary Water System facilities are presented in previous sections: Growth projections, Definition of the proposed level of service, Existing and future anticipated demand, Existing and excess capacity, Capital facilities analysis to determine projects required to resolve existing deficiencies and projects required in the next ten to twenty years to accommodate anticipated growth.

The Secondary Water System facility projects planned in the next 10 years to increase capacity for new growth included within the impact fee are presented. Also included in this section are the possible revenue sources that the City may consider to fund the recommended projects. The impact fee components are then presented with the proposed fee.

### 5.2 Impact Fee Facilities

The facilities presented in Table 5-1 are essential to maintain the proposed level of service while accommodating future growth. The table lists the project and the number of ERC's that the project will accommodate. All projects have sufficient capacity for the 10-year growth projections. There is no excess capacity in 2022 with the addition of these 10-year growth projects. The facility sizing was based on City planning data and modeling. All projects have a design life greater than 10-years, as required by the Impact Fee Act.

**TABLE 5-1  
IMPACT FEE FACILITY PROJECTS FOR UPCOMING 10-YEARS**

TYPE & PHASING YEAR	MAP ID	RECOMMENDED PROJECT	COST
Storage – <b>2013</b>	1	Zone 2 North Storage – Addition of 230 irrigated acres to the Zone 2 North area.	\$656,000
Source – <b>2013</b>	2	Zone 2 North Source – Addition of 49.0 irrigated acres source capacity to the Zone 2 North area.	\$290,000

<b>TYPE &amp; PHASING YEAR</b>	<b>MAP ID</b>	<b>RECOMMENDED PROJECT</b>	<b>COST</b>
Source – <b>2013</b>	3	Zone 2 South Source - Addition of 266.7 irrigated acres source capacity to the Zone 2 South area.	\$1,817,000
Storage & Source – <b>2016</b>	4	Zone 1 North Storage/Source – Addition of 459.5 irrigated acres storage capacity (\$1,471,860) and 400 source irrigated acres to the Zone 1 North area (\$1,414,140).	\$2,886,000
Storage & Source – <b>2017</b>	5	Zone 1 North Source/Storage – Transmission pipelines to add source and storage to the Zone 1 North area by connecting to the source and storage added in the Map ID 4 Zone 1 North storage/source project. (\$740,500 to storage capacity and \$740,500 to source capacity).	\$1,481,000
Source & Storage – <b>2021</b>	8	The Zone 3 North Source and Storage – Added growth projections identify the need to build a pump station and storage pond in Zone 3 that currently utilizes Culinary Water for outdoor irrigation. The project includes an 11 acre-foot pond (388 irrigated acres of storage capacity, \$1,909,920) and a 200 HP pump station (280 irrigated acres of source capacity, \$858,080)	\$2,768,000
Source – <b>2022</b>	-	Source – Added growth projections identify the need add additional source. The project includes two new wells and a pump station (400 irrigated acres of source capacity)	\$3,060,000
Water Rights – <b>2022</b>	-	The City will need to acquire an additional 3,437 acre-foot of water rights to meet anticipated demand growth by the year 2022. (1,098 irrigated acres of water right capacity)	\$10,352,000
<b>TOTAL</b>			<b>\$23,310,000</b>

Table 5-2 is a summary of the impact fee facility projects for the upcoming 10-years organized by project type. There is a total of \$8,179,720 attributed to source with a capacity of 1,396 irrigated acres, a total of \$4,778,280 for storage with a capacity of 1,077.5 irrigated acres, and a total of \$10,352,000 for water rights with a capacity of 1,098 irrigated acres. Anticipated costs for planning are also included as well as anticipated cost for financing for a total cost of \$29,085,748. See Appendix A for information on cost estimating.

**TABLE 5-2  
SUMMARY OF IMPACT FEE FACILITY PROJECTS FOR UPCOMING 10-YEARS**

<b>PROJECT TYPE</b>	<b>PROJECT COST</b>	<b>FINANCING COST</b>	<b>TOTAL COST</b>
<b>SOURCE</b>	\$8,179,720	\$3,557,558	\$11,737,278
<b>STORAGE</b>	\$4,778,280	\$2,078,190	\$6,856,470
<b>WATER RIGHTS</b>	\$10,352,000	\$0	\$10,352,000
<b>PLANNING</b>	\$140,000	\$0	\$140,000
<b>TOTAL COST</b>	<b>\$23,450,000</b>	<b>\$5,635,748</b>	<b>\$29,085,748</b>

### **5.3 Revenue Options**

Revenue options for the recommended projects, in addition to use fees, could include the following options: general obligation bonds, revenue bonds, State/Federal grants and loans, and impact fees. In reality, the City may need to consider a combination of these funding options. The following discussion describes each of these options.

#### **General Obligation Bonds through Property Taxes**

This form of debt enables the City to issue general obligation bonds for capital improvements and replacement. General Obligation (G.O.) Bonds would be used for items not typically financed through the Water Revenue Bonds (for example, the purchase of water source to ensure a sufficient water supply for the City in the future). G.O. bonds are debt instruments backed by the full faith and credit of the City which would be secured by an unconditional pledge of the City to levy assessments, charges or ad valorem taxes necessary to retire the bonds. G.O. bonds are the lowest-cost form of debt financing available to local governments and can be combined with other revenue sources such as specific fees, or special assessment charges to form a dual security through the City's revenue generating authority. These bonds are supported by the City as a whole, so the amount of debt issued for the water system is limited to a fixed percentage of the real market value for taxable property within the City. For growth related projects this type of revenue places an unfair burden on existing residents as they had previously paid for their level of service.

## **Revenue Bonds**

This form of debt financing is also available to the City for utility related capital improvements. Unlike G.O. bonds, revenue bonds are not backed by the City as a whole, but constitute a lien against the water service charge revenues of a Water Utility. Revenue bonds present a greater risk to the investor than do G.O. bonds, since repayment of debt depends on an adequate revenue stream, legally defensible rate structure /and sound fiscal management by the issuing jurisdiction. Due to this increased risk, revenue bonds generally require a higher interest rate than G.O. bonds, although currently interest rates are at historic lows. This type of debt also has very specific coverage requirements in the form of a reserve fund specifying an amount, usually expressed in terms of average or maximum debt service due in any future year. This debt service is required to be held as a cash reserve for annual debt service payment to the benefit of bondholders. Typically, voter approval is not required when issuing revenue bonds. For growth related projects this type of revenue places an unfair burden on existing residents as they had previously paid for their level of service.

## **State/Federal Grants and Loans**

Historically, both local and county governments have experienced significant infrastructure funding support from state and federal government agencies in the form of block grants, direct grants in aid, interagency loans, and general revenue sharing. Federal expenditure pressures and virtual elimination of federal revenue sharing dollars are clear indicators that local government may be left to its own devices regarding infrastructure finance in general. However, state/federal grants and loans should be further investigated as a possible funding source for needed water system improvements.

It is also important to assess likely trends regarding federal / state assistance in infrastructure financing. Future trends indicate that grants will be replaced by loans through a public works revolving fund. Local governments can expect to access these revolving funds or public works trust funds by demonstrating both the need for and the ability to repay the borrowed monies, with interest. As with the revenue bonds discussed earlier, the ability of infrastructure programs to wisely manage their own finances will be a key element in evaluating whether many secondary funding sources, such as federal/state loans, will be available to the City.

## **Impact Fees**

An impact fee is a one-time charge to a new development for the purpose of raising funds for the construction of improvements required by the new growth and to maintain the current level of service. Impact fees in Utah are regulated by the Impact Fee Statute and substantial case law. Impact fees are a form of a development exaction that requires a fee to offset the burdens created by the development on existing municipal services. Funding the future improvements required by growth through impact fees does not place the burden on existing residents to provide funding of these new improvements.

## User Fees

Similar to property taxes on existing residents, User Fees to pay for improvements related to new growth related projects places an unfair burden on existing residents as they had previously paid for their level of service.

### 5.4 Impact Fee Unit Calculation

Currently, the City assigns non-residential development an ERC value based on irrigated acres that is performed when the new development is plated or when a building permit is issued, whichever one comes first. Irrigated acres are the recommended unit for calculating the impact fee. The proposed level of service defines a single family lot with 0.16 irrigated acres which is also defined as one ERC.

It is recommended that the City have three components to the impact fee for secondary water system facilities—source, storage, and water rights. Each component is discussed separately in the following paragraphs. The major distribution pipelines are sized closely proportionate to the source and storage projects so are included in the source and storage units.

#### Source Impact Fee Unit

The proposed level of service for source in the Secondary Water System is 7.5 gpm per irrigated acre (see Section 1). The total demand by the year 2022 at the proposed level of service is 2,610 irrigated acres. The existing secondary water source demand for the system is 1,214 irrigated acres. Subtracting the existing demand of 1,214 irrigated acres from the total demand at 2022 of 2,610 irrigated acres leaves an additional demand of **1,396 irrigated acres needed by 2022** (see Table 5-3).

**TABLE 5-3  
SOURCE NEEDED BY 2022**

	<b>Irrigated Acres</b>	<b>gpm</b>
Predicted Demand in 2022 at the Proposed Level of Service	2,610	19,575
Existing Demand at the Proposed Level of Service	1,214	9,105
<b>Additional Demand Capacity needed by 2022</b>	<b>1,396</b>	<b>10,470</b>

The Secondary Water system has an existing source capacity of 893.5 irrigated acres. Subtracting the existing demand of 1,214 irrigated acres from the existing capacity of 893.5 irrigated acres leaves a deficiency of 320.5 irrigated acres (see Table 5-4). Currently the

Culinary Water System supplements the Secondary Water System with excess source capacity in the Culinary Water System. Capital Improvement Projects with Map ID 2 and 7 in Table 4-1 are planned to resolve this deficiency as the additional source in the Culinary Water System is needed. The Map ID 2 and 7 projects are not eligible to be included in the impact fee because they resolve existing deficiencies. The Map ID 2 project reequips the existing Sunrise Well and adds source transmission which will cost an estimated \$710,000 and is estimated to add 60 irrigated acres of source capacity. The Map ID 7 project is to replace existing Well 1 which is estimated to cost \$1,860,000 and is estimated to add 260 irrigated acres of source capacity. Both of these projects will be funded through existing funds and user fees.

**TABLE 5-4  
SOURCE EXCESS CAPACITY**

	<b>Irrigated Acres</b>	<b>gpm</b>
Existing Source Capacity	893.5	6,701
Existing Demand at the Proposed Level of Service	1,214	9,105
<b>Excess Capacity (Deficiency)</b>	<b>(320.5)</b>	<b>(2,404)</b>

No excess source capacity leaves **1,396 acre-feet of source capacity needing to be added to the system by 2022 for new growth (see Table 5-5).**

**TABLE 5-5  
SOURCE CAPACITY TO BE BUILT FOR NEW GROWTH**

	<b>Irrigated Acres</b>	<b>gpm</b>
Additional Demand Capacity needed by 2022	1,396	10,470
Excess Capacity	0	0
<b>Capacity to be built by 2022 for new growth</b>	<b>1,396</b>	<b>10,470</b>

The Impact Fee Facilities for Upcoming 10-Years with Map ID 2,3,4,5 and 8 in the Table 5-1 are planned to add 1,407 irrigated acres of source capacity to the Secondary Water System by 2022. With a total cost of the source capacity Impact Fee Facilities for the Upcoming 10-Years of \$11,737,278 (see Table 5-2) and an added capacity of 1,407 irrigated acres, the resulting

proposed impact fee per irrigated acre is \$8,408 or \$2,017 an ERC (see Table 5-6). This leaves no excess capacity in 2022.

**TABLE 5-6  
PROPOSED SOURCE IMPACT FEE**

	<b>Irrigated Acres</b>	<b>ERC</b>
Total Cost of Source Capacity Projects	\$11,737,278	\$11,737,278
Added Capacity for New Growth	1,396	5,818
<b>Proposed Source Impact Fee</b>	<b>\$8,408</b>	<b>\$2,017</b>

**Storage Impact Fee Unit**

The proposed level of service for storage in the Secondary Water System is 9,216 gallons per irrigated acre (see Section 1). The total demand by the year 2022 at the proposed level of service of 9216 is 2,610 irrigated acres. The existing secondary water storage demand for the system is 1,214 irrigated acres. Subtracting the existing demand of 1,214 irrigated acres from the total demand at 2022 of 2,610 irrigated acres leaves an additional demand of **1,396 irrigated acres needed by 2022** (see Table 5-7).

**TABLE 5-7  
STORAGE NEEDED BY 2022**

	<b>Irrigated Acres</b>	<b>Acre-Feet</b>
Predicted Demand in 2022 at the Proposed Level of Service	2,610	73.8
Existing Demand at the Proposed Level of Service	1,214	34.3
<b>Additional Demand Capacity needed by 2022</b>	<b>1,396</b>	<b>39.5</b>

The Secondary Water system has an existing storage capacity of 1,580 irrigated acres. Subtracting the existing demand of 1,214 irrigated acres from the existing capacity of 1,580

irrigated acres leaves an excess capacity of **366 irrigated acres available for new development** (see Table 5-8).

**TABLE 5-8  
STORAGE EXCESS CAPACITY**

	<b>Irrigated Acres</b>	<b>Acre-Feet</b>
Existing Source Capacity	1,580	44.7
Existing Demand at the Proposed Level of Service	1,214	34.3
<b>Excess Capacity (Deficiency)</b>	<b>366</b>	<b>10.4</b>

Subtracting the excess storage capacity of 366 irrigated acres from the additional demand needed by 2022 of 3,584 acre-feet leaves **3,437 acre-feet needing to be purchased by 2022** (see Table 5-9).

**TABLE 5-9  
STORAGE CAPACITY TO BE BUILT FOR NEW GROWTH**

	<b>Irrigated Acres</b>	<b>Acre-Feet</b>
Additional Demand Capacity needed by 2022	1,396	39.5
Excess Capacity	366	10.4
<b>Capacity to be built by 2022 for new growth</b>	<b>1,030</b>	<b>29.1</b>

The Impact Fee Facilities for Upcoming 10-Years with Map ID 1, 4, and 8 in the Table 5-1 are planned to add 1,077.5 irrigated acres of storage capacity to the Secondary Water System by 2022. The storage capacity projects have a total cost of \$6,856,470 (see Table 5-2) and a total capacity of 1,113.5 irrigated acres. The resulting **proposed impact fee per irrigated acre is \$6,158 or \$1,478 an ERC** (see Table 5-10).

**TABLE 5-10  
PROPOSED STORAGE IMPACT FEE**

	<b>Irrigated Acres</b>	<b>ERC</b>
Total Cost of Source Capacity Projects	\$6,856,470	\$6,856,470
Added Capacity for New Growth	1,113.5	4,640
<b>Proposed Storage Impact Fee</b>	<b>\$6,158</b>	<b>\$1,478</b>

**Water Right Impact Fee Unit**

The proposed level of service for water rights is 3.13 acre-feet per irrigated acre which is less than the existing level of service of 4.46 acre-feet per irrigated acre. The total demand by the year 2022 at the proposed level of service is 8,170 acre-feet. The existing secondary water right demand for the system is 4,586 acre-feet. This includes 786 acre-feet of water rights that were given to the City in exchange for development credit agreements for future development. It is assumed this credit will be used by the year 2022 for the anticipated growth. Subtracting the existing demand of 4,586 acre-feet from the total demand at 2022 of 8,170 acre-feet leaves an additional demand of **3,584 acre-feet needed by 2022** (see Table 5-11).

**TABLE 5-11  
WATER RIGHTS NEEDED BY 2022**

	<b>Irrigated Acres</b>	<b>Acre-Feet</b>
Predicted Demand in 2022 at the Proposed Level of Service	2,610	8,170
Existing Demand at the Proposed Level of Service	1,465	4,586
<b>Additional Demand Capacity needed by 2022</b>	<b>1,145</b>	<b>3,584</b>

The City owns a total of 4,733 acre-feet of water rights attributed to the Secondary Water System. Again, this includes the 786 acre-feet of water rights that were given to the City in exchange for development credit agreements. Subtracting the existing demand of 4,586 acre-

feet from the 4,733 acre-feet of total water rights owned leaves an excess capacity of **147 acre-feet available for new development** (see Table 5-12).

**TABLE 5-12  
WATER RIGHTS EXCESS CAPACITY**

	<b>Irrigated Acres</b>	<b>Acre-Feet</b>
Water Rights Owned	1,512	4,733
Existing Demand at the Proposed Level of Service	1,465	4,586
<b>Excess Capacity</b>	<b>47</b>	<b>147</b>

Subtracting the excess capacity of owned water rights of 147 acre-feet from the additional demand needed by 2022 of 3,584 acre-feet leaves **3,437 acre-feet needing to be purchased by 2022** (see Table 5-13). The average price the City has paid for water rights in the last 5 years has been about \$3,012 per acre-foot. This would provide a price of **\$9,428 per irrigated acre or \$2,263 per ERC**.

**TABLE 5-13  
WATER RIGHTS TO BE PURCHASED**

	<b>Irrigated Acres</b>	<b>Acre-Feet</b>
Additional Demand Capacity needed by 2022	1,145	3,584
Excess Capacity	47	147
<b>Total to be purchased by 2022</b>	<b>1,098</b>	<b>3,437</b>

It is recommended that the City accept the water right impact fee in one of three ways: Payment of \$9,428 per irrigated acres for water rights the City has available for new development, use of developer credit, or Deed the City a water right approved by the City Attorney.

### **5.5 Impact Fee Summary**

Adding the proposed Secondary Water System impact fee units together, the total proposed impact fee would be \$23,739 per irrigated acre. A typical single family residential connection

requiring 0.16 irrigated acres would have an impact fee of **\$5,782** with water rights or \$3,519 without water rights (see Table 5-14). This includes \$2,017 for source capacity, \$1,478 for storage capacity, \$24 for planning, and \$2,263 for water rights.

**TABLE 5-14  
TOTAL PROPOSED IMPACT FEE PER IRRIGATED  
ACRE AND TYPICAL SINGLE FAMILY RESIDENT**

	<b>Per Irrigated Acre</b>	<b>Per ERC</b>
Source	\$8,408	\$2,017
Storage	\$6,158	\$1,478
Planning	\$100	\$24
Water Rights	\$9,428	\$2,263
<b>Total</b>	<b>\$24,094</b>	<b>\$5,782</b>

## **Appendix A**

### **Cost Estimates**

**City of Saratoga Springs Capital Facility Plan  
Secondary Water Recommended Improvements  
Preliminary Engineers Cost Estimates**

Year	Item	Unit	Unit Price	Quantity	Total Price
<b>2013</b>	<b>SW 1. Zone 2 North Storage - Expand Pond #6</b>				
	Purchase Additional Property	Acre	\$ 50,000	1.5	\$ 75,000
	Construct Pond Facility - Additional 6.5 ac*ft	AC*FT	\$ 72,500	6.5	\$ 471,250
				Engineering & Admin. (10%)	\$ 54,625
				Contingency (10%)	\$ 54,625
	<b>Total for Zone 2 North Storage - Expand Pond #6</b>				<b>\$ 656,000</b>
<b>2013</b>	<b>SW 2. Zone 2 North Source - Sunrise Well to Harvest Hills</b>				
	Re-equip Sunrise Well	LS	\$ 150,000	1	\$ 150,000
	Furnish & Install 12" DIP Water Line	LF	\$ 85	5200	\$ 442,000
				Engineering & Admin. (10%)	\$ 59,200
				Contingency (10%)	\$ 59,200
	<b>Total for Zone 2 North Source - Sunrise Well to Harvest Hills</b>				<b>\$ 710,000</b>
<b>2015</b>	<b>SW 2a. Zone 2 North Transmission - Winter Wheat Way</b>				
	Furnish & Install 10" PVC Water Line	LF	\$ 70	550	\$ 38,500
				Engineering & Admin. (10%)	\$ 3,850
				Contingency (10%)	\$ 3,850
	<b>Total for Zone 2 North Transmission - Winter Wheat Way</b>				<b>\$ 46,000</b>
<b>2013</b>	<b>SW 3. Zone 2 South Source Project</b>				
	14" Transmission Line from Welby to Ex Lines	LF	\$ 110	5400	\$ 594,000
	Filter Station	LS	\$ 300,000	1	\$ 300,000
	Zone 2 Booster (200 HP & 2000 gpm) w/ VFD	LS	\$ 350,000	1	\$ 350,000
	Existing Pond Modification	LS	\$ 120,000	1	\$ 120,000
	Land Acquisition	Acre	\$ 100,000	1.5	\$ 150,000
				Engineering & Admin. (10%)	\$ 151,400
				Contingency (10%)	\$ 151,400
	<b>Total for Zone 2 South Source Project</b>				<b>\$ 1,817,000</b>
<b>2016</b>	<b>SW 4. Zone 1 North Source &amp; Storage</b>				
	Construct New Pond - PR 11 - 13 AC*FT	AC*FT	\$ 95,000	13	\$ 1,235,000
	Zone Storage Land Acquisition (PR-11)	Acre	\$ 100,000	3	\$ 300,000
	Turnout at Welby Jacob Canal w/ Pond	LS	\$ 120,000	1	\$ 120,000
	Filter Station	LS	\$ 400,000	1	\$ 400,000
	Booster Pump to PR 11 (50 HP & 3000 gpm) w/ VFD	LS	\$ 350,000	1	\$ 350,000
				Engineering & Admin. (10%)	\$ 240,500
				Contingency (10%)	\$ 240,500
	<b>Total for Zone 1 North Source &amp; Storage</b>				<b>\$ 2,886,000</b>
<b>2017</b>	<b>SW 5. Zone 1 North Transmission</b>				
	Furnish & Install 24" DIP	LF	\$ 220	2600	\$ 572,000
	Furnish & Install 14" DIP	LF	\$ 125	5300	\$ 662,500
				Engineering & Admin. (10%)	\$ 123,450
				Contingency (10%)	\$ 123,450
	<b>Total for Zone 1 North Transmission</b>				<b>\$ 1,481,000</b>
<b>2013</b>	<b>SW 6. Installation of Secondary Meters</b>				
<b>2016</b>	Furnish and Install 1" Secondary Meters	EA	\$ 350	1421	\$ 497,350
	Furnish and Install 1-1/2" Secondary Meters	EA	\$ 650	27	\$ 17,550
	Furnish and Install 2" Secondary Meters	EA	\$ 850	50	\$ 42,500
	Furnish and Install 3" Secondary Meters	EA	\$ 3,000	6	\$ 18,000
	Furnish and Install Meters in Harvest Hills (627)	EA	\$ 505,000	1	\$ 505,000
	Furnish and Install Meters in Sunrise Meadows (177)	EA	\$ 151,000	1	\$ 151,000
	Furnish and Install Meters in South City (1860)	EA	\$ 1,245,000	1	\$ 1,245,000
				Admin. & Construction Observation (2%)	\$ 49,528
				Contingency (10%)	\$ 247,640
	<b>Total for Installation of Secondary Meters</b>				<b>\$ 2,774,000</b>

**City of Saratoga Springs Capital Facility Plan  
Secondary Water Recommended Improvements  
Preliminary Engineers Cost Estimates**

Year	Item	Unit	Unit Price	Quantity	Total Price
2020	<b>SW 7. Zone 2 Source - Well #1 Replacement</b>				
	New Well	LS	\$ 1,000,000	1	\$ 1,000,000
	New Pump Station	LS	\$ 500,000	1	\$ 500,000
	New Connection to Transmission Line	LS	\$ 50,000	1	\$ 50,000
					Engineering & Admin. (10%) \$ 155,000
					Contingency (10%) \$ 155,000
					<b>Total for Zone 2 Source - Well #1 Replacement \$ 1,860,000</b>
2021	<b>SW 8. Zone 3 North - Pump Station and Storage</b>				
	16" DIP Transmission Line from PS to Storage	LS	\$ 160	3200	\$ 512,000
	Zone 3 Pump Station (200 HP & 2,100 gpm)	LS	\$ 450,000	1	\$ 450,000
	Zone 3 Storage (11 Ac*ft)	AC*FT	\$ 95,000	11	\$ 1,045,000
	Land Acquisition	Acre	\$ 100,000	3	\$ 300,000
					Engineering & Admin. (10%) \$ 230,700
					Contingency (10%) \$ 230,700
				<b>Total to Zone 3 North - Pump Station and Storage \$ 2,768,000</b>	
2022	<b>Source - Wells</b>				
	New Well	LS	\$ 1,000,000	1	\$ 1,000,000
	New Well	LS	\$ 1,000,000	1	\$ 1,000,000
	New Pump Station	LS	\$ 500,000	1	\$ 500,000
	New Connection to Transmission Line	LS	\$ 50,000	1	\$ 50,000
					Engineering & Admin. (10%) \$ 255,000
					Contingency (10%) \$ 255,000
				<b>Total for Source - Wells \$ 3,060,000</b>	
2026	<b>SW 10. Zone 2 South - Storage</b>				
	16" DIP Transmission Line to Storage	LS	\$ 160	1000	\$ 160,000
	Land Acquisition	Acre	\$ 100,000	3	\$ 300,000
	Zone 2 South Storage PR-17 (10 Ac*ft)	AC*FT	\$ 95,000	10	\$ 950,000
					Engineering & Admin. (10%) \$ 141,000
					Contingency (10%) \$ 141,000
					<b>Total to Zone 2 South - Storage \$ 1,692,000</b>
2026	<b>SW 11. Zone 2 North -Saratoga Heights Storage</b>				
	16" DIP Transmission Line to Storage	LS	\$ 160	2500	\$ 400,000
	Land Acquisition	Acre	\$ 100,000	4	\$ 400,000
	Zone 2 North Storage (12 Ac*ft)	AC*FT	\$ 95,000	12	\$ 1,140,000
					Engineering & Admin. (10%) \$ 194,000
					Contingency (10%) \$ 194,000
					<b>Total to Zone 2 North -Saratoga Heights Storage \$ 2,328,000</b>
2026	<b>SW 12. Zone 4 &amp; 5 South - Pump Station and Storage</b>				
	16" DIP Transmission Line from PS to Storage	LS	\$ 160	5000	\$ 800,000
	Zone 4 & 5 Pump Station (1000 gpm, 200 HP)	LS	\$ 650,000	1	\$ 650,000
	Zone 4/5 Storage (16 Ac*ft)	LS	\$ 95,000	16	\$ 1,520,000
	Land Acquisition	Acre	\$ 100,000	4.5	\$ 450,000
					Engineering & Admin. (10%) \$ 342,000
					Contingency (10%) \$ 342,000
				<b>Total to Zone 4 &amp; 5 South - Pump Station and Storage \$ 4,104,000</b>	
2026	<b>SW 13. Zone 1 - Transmission</b>				
	16" DIP Trans. Line from Well Fields to Redwood	LS	\$ 160	11500	\$ 1,840,000
					Engineering & Admin. (10%) \$ 184,000
					Contingency (10%) \$ 184,000
					<b>Total to Zone 1 - Transmission \$ 2,208,000</b>

Appendix 4:  
DEBT  
Future Debt

Proposed Series 2014 Water Bond - Secondary Water

Year	Principal	Coupon	Interest	Net DS
2014	-	0.00%	-	-
2015	470,000	2.00%	252,459	722,459
2016	350,000	2.00%	369,650	719,650
2017	360,000	2.00%	362,550	722,550
2018	365,000	3.00%	353,475	718,475
2019	380,000	3.00%	342,300	722,300
2020	390,000	3.00%	330,750	720,750
2021	405,000	5.00%	314,775	719,775
2022	425,000	5.00%	294,025	719,025
2023	450,000	5.00%	272,150	722,150
2024	470,000	5.00%	249,150	719,150
2025	490,000	4.00%	227,600	717,600
2026	515,000	4.00%	207,500	722,500
2027	535,000	4.00%	186,500	721,500
2028	555,000	4.00%	164,700	719,700
2029	580,000	4.00%	142,000	722,000
2030	600,000	4.00%	118,400	718,400
2031	625,000	4.00%	93,900	718,900
2032	650,000	4.00%	68,400	718,400
2033	680,000	4.00%	41,800	721,800
2034	705,000	4.00%	14,100	719,100
	<b>\$ 10,000,000</b>		<b>\$ 4,406,184</b>	<b>\$ 14,406,184</b>

Proposed Series 2016 Water Bond - Secondary Water

Year	Principal	Coupon	Interest	Net DS
2017	236,591	5.00%	143,103	379,694
2018	236,591	5.00%	143,103	379,694
2019	236,591	5.00%	143,103	379,694
2020	236,591	5.00%	143,103	379,694
2021	236,591	5.00%	143,103	379,694
2022	236,591	5.00%	143,103	379,694
2023	236,591	5.00%	143,103	379,694
2024	236,591	5.00%	143,103	379,694
2025	236,591	5.00%	143,103	379,694
2026	236,591	5.00%	143,103	379,694
2027	236,591	5.00%	143,103	379,694
2028	236,591	5.00%	143,103	379,694
2029	236,591	5.00%	143,103	379,694
2030	236,591	5.00%	143,103	379,694
2031	236,591	5.00%	143,103	379,694
2032	236,591	5.00%	143,103	379,694
2033	236,591	5.00%	143,103	379,694
2034	236,591	5.00%	143,103	379,694
2035	236,591	5.00%	143,103	379,694
2036	236,591	5.00%	143,103	379,694
<b>Total</b>	<b>\$ 4,731,829</b>		<b>\$ 2,862,055</b>	<b>\$ 7,593,884</b>

## Saratoga Springs, Utah

\$10,000,000 Water Revenue and Refunding Bonds

Series April 29, 2014

(Refund Series 2005, 2006, and 2009)

### Total Issue Sources And Uses

Dated 04/29/2014 | Delivered 04/29/2014

	Refund 2005	Refund 2006	Refund 2009	New Money	Issue Summary
<b>Sources Of Funds</b>					
Par Amount of Bonds	\$1,215,000.00	\$1,850,000.00	\$640,000.00	\$6,295,000.00	\$10,000,000.00
Reoffering Premium	126,255.90	192,534.55	67,408.75	296,627.65	682,826.85
Transfers from Prior Issue DSR Funds	105,938.39	183,400.95	-	-	289,339.34
Transfers from Prior Issue BCF Funds	-	156,166.00	-	-	156,166.00
<b>Total Sources</b>	<b>\$1,447,194.29</b>	<b>\$2,382,101.50</b>	<b>\$707,408.75</b>	<b>\$6,591,627.65</b>	<b>\$11,128,332.19</b>
<b>Uses Of Funds</b>					
Deposit to Project Construction Fund	-	-	-	6,350,000.00	6,350,000.00
Deposit to Escrow Fund	1,412,558.40	2,338,872.53	692,646.61	-	4,444,077.54
Gross Bond Insurance Premium	7,624.74	11,607.89	3,877.85	48,920.44	72,030.92
Total Underwriter's Discount (0.550%)	6,682.50	10,175.00	3,520.00	34,622.50	55,000.00
Underwriter's Counsel	-	-	-	47,000.00	47,000.00
Rating Agency Fee	4,374.00	6,660.00	2,304.00	22,662.00	36,000.00
Financial Advisor	4,071.46	6,199.35	2,144.64	21,094.55	33,510.00
Surety Bond	3,511.60	5,346.87	1,849.73	18,193.81	28,902.01
Bond Counsel	3,037.50	4,625.00	1,600.00	15,737.50	25,000.00
Miscellaneous	-	-	-	20,590.00	20,590.00
Local Counsel	-	-	-	5,000.00	5,000.00
Travel	425.25	647.50	224.00	2,203.25	3,500.00
Additional Cost of Issuance 1	-	-	-	3,400.00	3,400.00
Trustee & Counsel Fees	-	-	-	2,000.00	2,000.00
Trustee Origination	-	-	-	2,000.00	2,000.00
Rounding Amount	4,908.84	(2,032.64)	(758.08)	(1,796.40)	321.72
<b>Total Uses</b>	<b>\$1,447,194.29</b>	<b>\$2,382,101.50</b>	<b>\$707,408.75</b>	<b>\$6,591,627.65</b>	<b>\$11,128,332.19</b>

## **Appendix B**

### **Well Operation and Maintenance Memorandum**

**DATE:** August 20, 2012  
**TO:** Jeremy Lapin, P.E.  
Saratoga Springs City  
**FROM:** William Bigelow, P.E.  
**PROJECT:** Wells Evaluation  
**SUBJECT:** Operations and Maintenance Recommendations

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The purpose of this memo is to provide recommended O&M activities that Saratoga Springs City may consider as a general guideline for all of the City's wells. The underlying assumption of these recommendations is that preventative maintenance is less costly in the long run than emergency maintenance. The following outline shows the typical problems that the City has been having over the past several years, followed by general O&M recommendations.

## **FREQUENT PROBLEMS**

### **Well Problems**

1. Well casings and screens are developing holes from sanding and corrosion problems.
2. Wells are experiencing well screen collapse due to subsidence.
3. Biofouling is showing up in some wells, and it causes decreased well yields.

### **Pumping System Problems**

1. Pumps are failing early due to heavy sand production.
2. Pumps are wearing out due to heavy usage and short life expectancy (3450 RPM vs 1750 RPM pumps)

## **RECOMMENDED SCHEDULED MAINTENANCE TASKS**

### **Well Maintenance**

1. Collecting well data is the first step to maintaining wells.
2. Calculate the specific capacity of each well at least once each month.
3. Collect water level data for each well routinely even when the well is not in service.
4. At least annually, evaluate the specific capacity data for evidence of trends. If specific capacity has dropped more than 15%, investigate the cause.
5. Every time that the pump is pulled for maintenance, do the following:
  - a. Video the well and look for evidence of holes, screens/perforations plugging or biofouling.

## ***Memorandum - Continued***

**Page 2 of 2**

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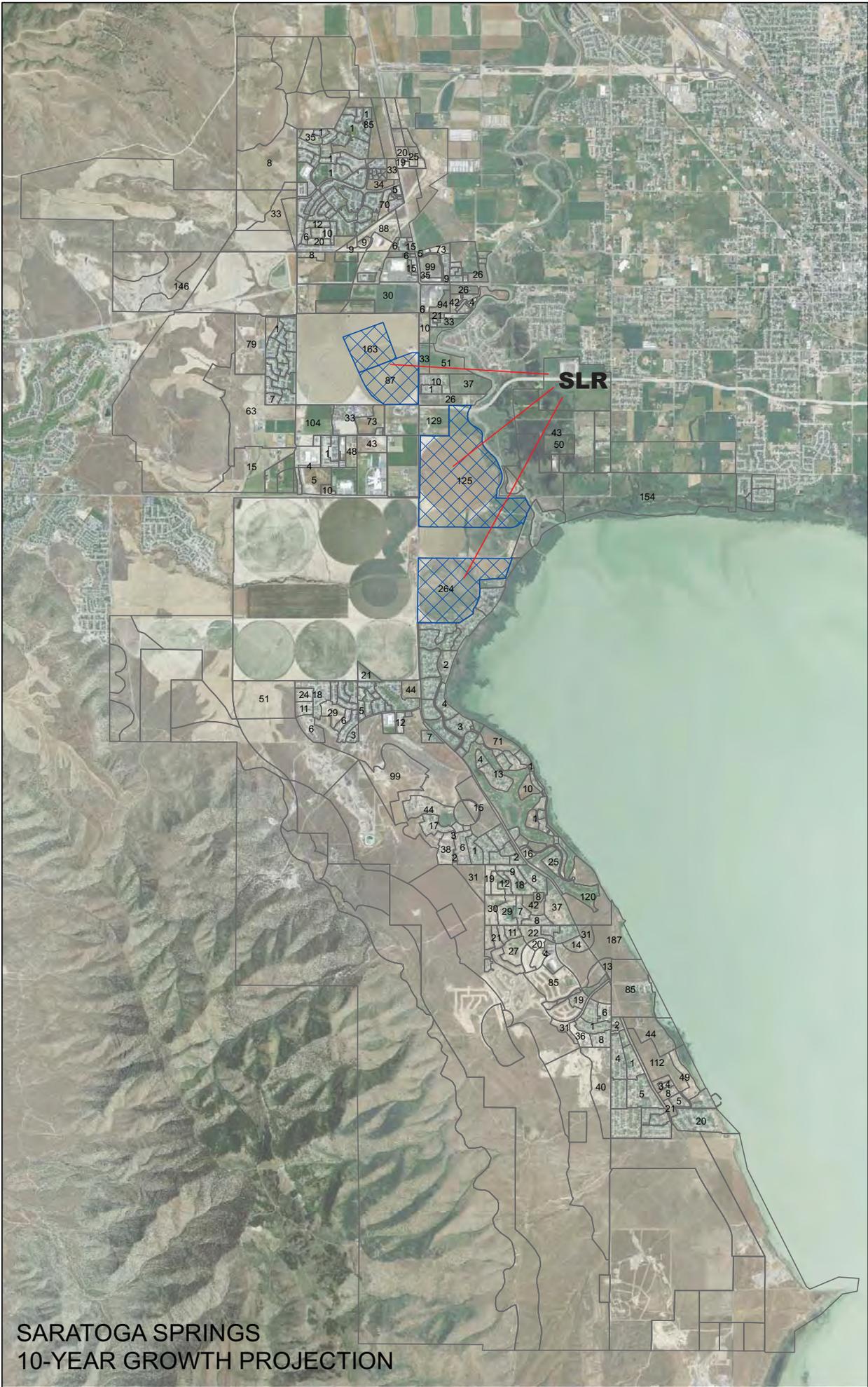
- b. If the well casing needs it, perform scrubbing or brushing to remove rust, scale and biofouling or clogging.
- c. If specific capacity has dropped more than 15%, evaluate whether well re-development or chemical treatment is needed.
- d. If sanding has been an issue, perform aggressive well re-development and gravel pack replenishment to reduce or eliminate sanding. This may take a considerable effort in some wells.
- e. If biofouling is an issue, consider performing chemical treatment to restore the original specific capacity.
- f. If water quality is excessively poor, consider investigating drilling deeper for better water quality or abandoning the well and planning to drill another well where the water quality is better.

### **Pump Maintenance**

1. Collecting pump performance is the first step to maintaining pumps.
  2. Record as a minimum the following parameters every day when the well is in operation: flow rate, system pressure, amps, and water level.
  3. Listen and feel for a change in the pumping system's sound or vibration.
  4. Pull every well pump for preventive maintenance every 8 – 10 years if the pump has not been pulled prior to this time. Have the pump disassembled and checked for problems and clearances. If recommended, rebuild or replace the pump.
  5. When ordering a new pump, perform a life cycle cost analysis to select the lowest cost pump over the long run.
  6. Compare current operating data with previous operating data for evidence of trends.
    - a. If flow is decreasing and amperage is increasing, this could indicate that the pump bearings may be starting to fail.
    - b. If flow is decreasing and amperage is also decreasing, the pump impellers may be worn.
    - c. If water level and flow are decreasing, the well screen/perforations may be clogged or biofouled or the aquifer water level may be dropping.
-

## **Appendix C**

### **Misc. Supporting Data**



SARATOGA SPRINGS  
10-YEAR GROWTH PROJECTION

WR Number	Amount Purchased (Acre-Ft)	Amount Paid	Cost per AF	Purchase Date	Use	Seller
<b>CULINARY PURCHASES</b>						
53-1686	150	\$450,000.00	\$3,000.00	4/22/2010	Culinary	L & V Properties
53-1686	75	\$225,000.00	\$3,000.00	6/2/2010	Culinary	L & V Properties
53-1686	225	\$675,000.00	\$3,000.00	5/12/2011	Culinary	L & V Properties
54-623	100	\$350,000.00	\$3,500.00	2007	Culinary	Jeff Neilson
54-623	100	\$275,000.00	\$2,750.00	2/17/2010	Culinary	Jeff Neilson
54-623	39.25	\$113,825.00	\$2,900.00	12/20/2011	Culinary	Jeff Neilson

**Total**                      **689.25**                      **\$2,088,825.00**                      **\$3,030.58**

WR Number	Amount Purchased (Acre-Ft)	Amount Paid	Cost per AF	Purchase Date	Use	Seller
<b>SECONDARY PURCHASES</b>						
54-1088	15.488	\$54,208.00	\$3,500.00	9/13/2007	Secondary	Darrell & Chris Wendel
59-5851	4.59	\$8,000.00	\$1,742.92	3/6/2008	Secondary	Delvin & Ren Wells
59-5851	18.36	\$32,000.00	\$1,742.92	3/6/2008	Secondary	Gwenda W. Arnold
59-5851	41.31	\$72,000.00	\$1,742.92	3/6/2008	Secondary	Mervyn and De Arnold
55-1849	112.59	\$337,770.00	\$3,000.00	7/29/2009	Secondary	Hal J. Scott Family Trust
55-1849	37.53	\$112,590.00	\$3,000.00	7/28/2009	Secondary	Summit Exchange Service
54-1227	3.672	\$12,852.00	\$3,500.00	7/28/2009	Secondary	Idona Christensen
54-1227	3.672	\$12,852.00	\$3,500.00	7/28/2009	Secondary	Kerkman Fmaily Trust
54-1227	36.72	\$128,852.00	\$3,500.00	7/5/2012	Secondary	Kerkman Fmaily Trust
54-1227	7.344	\$25,204.00	\$3,500.00	7/5/2012	Secondary	Steadman Family Trust
54-1227	3.672	\$12,852.00	\$3,500.00	7/5/2012	Secondary	Bernell Kerkman
54-1227	3.672	\$12,852.00	\$3,500.00	7/5/2012	Secondary	Craig Kerkman
54-1227	3.672	\$12,852.00	\$3,500.00	7/5/2012	Secondary	Julia Kerkman
54-1227	3.672	\$12,852.00	\$3,500.00	7/5/2012	Secondary	Hazelann Griffiths