

CITY OF SPIRIT LAKE, IDAHO
WATER SYSTEM CONSERVATION PLAN

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Water System Conservation Plan

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I. Introduction

The City of Spirit Lake operates a water system that has approximately 17 miles of waterlines, utilizes four groundwater wells, has two water storage tanks, and has two pressure zones with the lower pressure zone created by a pressure reducing station.

The water system is supplied water from the Rathdrum Prairie-Spokane Valley (RPSV) Aquifer. This aquifer supplies drinking water for approximately 500,000 people in Northern Idaho and Eastern Washington. Maintaining and conserving this water supply has become a significant focus for water utilities and purveyors drawing water from this aquifer.

A Groundwater Management Plan was adopted by the Idaho Department of Water Resources (IDWR) in 2005. One of the goals of the Management Plan is to "Encourage water conservation efforts by all users of the resource." Part of this goal requires that a water conservation plan be in place for all municipal purveyors that request new water rights, or changes to their existing water rights.

After the Management Plan was adopted, the Idaho Department of Water Resources developed a document for "Water Conservation Measures and Guidelines for Preparing Water Conservation Plans." These guidelines include the recommended components to be included in a water conservation plan. The recommended components are as follows, and are those components included within this plan:

- Development of a water system profile
- Preparation of a demand forecast
- Description of planned facilities
- Development of conservation goals and methods for stakeholder involvement
- Identification of water conservation measures
- Analysis of conservation measures
- Integration of resources and forecast modification
- Implementation and evaluation strategies

This Water System Conservation Plan has been developed to meet the requirements of the Management Plan and the IDWR Guidelines for the purpose of applying for future water rights or modifying existing water rights for the City of Spirit Lake as necessary. The recommended components are discussed and addressed hereinafter.

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II. Water System Profile

A. Source Water

The source water for the City of Spirit Lake is the Rathdrum Prairie-Spokane Valley (RPSV) Aquifer. The RPSV Aquifer is supplied with water from several large surface water sources including Lake Pend Oreille, Coeur d'Alene Lake, Hayden Lake, and the Spokane River. Other smaller lakes also supply smaller amounts of water to the aquifer, including Spirit Lake, Twin Lakes and Hauser Lake. Precipitation supplies about 25% of the aquifer recharge water.

According to the 2007 "Bi-State" aquifer study completed by the U.S. Geologic Survey, the annual estimated aquifer withdrawals were approximately 22% of the estimated annual recharge for the aquifer. While adequate aquifer supply appears to exist for the future, the water demand will continue to rise and low precipitation has occurred as shown by the 2015 water year. Increased water usage and potential low precipitation lead to increased pressure to reduce per capita consumption, in order to maintain Spokane River flows and a high water quality.

The RPSV Aquifer is the only source of drinking water for the City of Spirit Lake. It would not be cost effective to treat and use water from Spirit Lake, which would also remove water from the RPSV Aquifer. The City will continue to use the RPSV Aquifer as the sole water supply.

B. Existing Water Rights

The City of Spirit Lake currently has a total of 4.67 cfs in claimed groundwater rights and 1.5 cfs in a pending groundwater right application. A summary of the rights and their priority dates is included in **Table 1**.

Table 1 - Summary of Water Rights

Water Right No.	Priority	Amount (cfs)	Nature of Use	Period of Use
96-4022	6/17/1962	0.7	Municipal	1/1 - 12/31
96-7059	5/12/1971	0.7	Municipal	1/1 - 12/31
96-7106	5/29/1972	1.82	Municipal	1/1 - 12/31
96-08834	1/25/1995	1.45	Municipal	1/1 - 12/31
Total		4.67		

Application Pending

96-9340	1.5	Municipal	1/1 - 12/31
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C. Spirit Lake Water Service Boundaries

The Spirit Lake Water Department serves an area that differs somewhat from the City Limits. The existing water service boundary encompasses approximately 1,838 acres as shown in **Figure A-1**. The service area includes two benches of differing elevations, which include the two pressure tiers. The ground surface within each bench is relatively flat.

D. Spirit Lake Population and Connections Served

The U.S. Census data indicates that the Spirit Lake City population was 1,376 in the year 2000, 1,945 in the year 2010, and 2,001 in the year 2014. This indicates rapid growth from 2000 to 2012, but a much reduced growth rate since 2010. For the purposes of future planning, an approximate 2% growth rate has been assumed.

The City Water Department service area is largely contained within the City Limits. As of 2014, the Water Department has 1039 metered connections and a total of 953 equivalent residential connections. There are a number of vacant properties that are metered, which account for the disparity between metered connections and ERU's.

E. Existing Facilities and Water Use Categories

The City water system is currently supplied water by four groundwater wells. These wells and their capacities as follows:

Well No. 1	91 gpm
Well No. 2	136 gpm
Well No. 3	799 gpm
Well No. 4	<u>650 gpm</u>
Total Pumping Capacity =	1,676 gpm

The City uses Well No. 4 as its lead well with Wells No. 2 and No. 3 operated as secondary wells which are activated when Well No. 4 cannot keep up with the system demands. Well No. 1 is used on an emergency/standby basis and operated manually. Water produced from wells No. 1, 2, and 3 is corrosive, therefore these wells can only be used as emergency/standby/secondary sources. A pressure transducer at the City's standpipe water storage tank No. 2 determines the water level within the standpipe and sends an electronic signal to a pump control panel in the Well No. 4 pumphouse, which automatically controls the activation of the lead and secondary well pumps. Sodium hypochlorite solution is injected into the discharge water of Well No. 4 to provide disinfection of the water supply. The other three wells are not currently disinfected. Wells No. 1 and No. 3 are housed within small CMU pumphouses. Well No. 2 is housed within a small wood framed pumphouse. Water storage tank No. 1 is an elevated storage tank with a capacity of 100,000 gallons. Water storage tank No. 2 is a standpipe storage tank with a total capacity of 265,746 gallons and a usable capacity of 130,980 gallons.

The following Table is based on historical data provided by the City of Spirit Lake.

Table 2 – City of Spirit Lake Historical Water System Demand

	1999	2006	2007	2008	2010	2011	2012	2013	2014
ERUs	600	841	868	884	906	914	919	948	953
ADD (gpm) (gpd/ERU)	316 (759)	299 (512)	243 (403)	248 (403)	243 (386)	260 (410)	256 (402)	272 (413)	281 (425)
MDD (gpm) (gpd/ERU)	569* (1,366)	596 (1,020)	568 (942)	579 (942)	501 (796)	540 (850)	566 (887)	572 (869)	546 (825)
PHD (gpm)	1,142*	1,131	1,161	1,091	944	1,014	1,062	1,069	1,020

* Values for MDD and PHD are estimated as historical data for the MDD was not available during this year.

The historical information above indicates the City of Spirit Lake Water System is trending toward decreasing use of water per ERU. Water system ERUs have increased during the last 12 years, while ADD, MDD, and PHD have trended downward. This information is more clearly represented in **Figure A-2**.

F. Water System Loss

The City water production is measured on an ongoing basis at the wells with flow meters located within the pumphouses. Individual services are all metered to accurately account for water sold. The service line meters are read on a monthly basis. For 2014, the water produced was 147,826,904 gallons and the total water sold 85,679,000 gallons. The unaccounted water usage was 42 percent in 2014. This unaccounted water total includes volumes for City owned facilities such as parks, City Hall, police station and the City shop, all of which are not metered. It is estimated that these facilities account for over half the unaccounted water usage.

G. Water System Growth and Planning Period

The majority of the expected growth in the City of Spirit Lake is generally progressing to the northeast corner of the City Limits as this area currently has undeveloped areas with existing water and sewer utility lines installed in this area, as shown in **Figure A-1**. Water system growth is expected to take place largely within the existing City Limits, which have large tracts of land that are currently undeveloped or partially developed. According to the *Development Impact Fee Program/Capital Improvement Plan* prepared by Hofman Planning Associates in 2007 and as updated in 2012, the total number of ERUs that could be generated in addition to the existing ERUs within the city limits in the future is approximately 2,888.

H. Large Water Users

There was one primary water user identified as year-round large user when reviewing the meter data from August 2015. The consistent large user is the Lakeland School District, which accounted for nearly 9% of the total 29,297,000 gallons of water sold during the month August. The highest water users are listed in the following **Table 3**.

Table 3 – Highest Water Users

User	Water Use (gallons)	Percent of Monthly Total
1. Blackwell Blvd Irrigation – Lakeland School District	1,913,000	6.52
2. Lakeland School District	619,000	2.11
3. Sedlmayers Resort	207,000	0.71
4. Chautauqua Resort	182,000	0.62
5. Rose Terrace Country Homes	160,000	0.55
6. Viridian Management	125,000	0.43
7. Lake Haven Home Owners Assoc.	72,000	0.25
Total	3,278,000	11.19

III. System Demand Forecast

Considering the 2,888 ERUs established by Hofman, at the time of the *Development Impact Fee Program/Capital Improvement Plan* the existing number of water system ERUs was 791 in 2007. Added to the existing ERUs at the time the report was completed, the total number of ERUs possible within the city limits is 3,679. According the City historical records there were 953 water ERUs within the City in 2014. The following Table provides water system demand data for the last ten years:

Table 4 – Historical Water Demand

Year	Water System ERUs	Annual Increase in Demand (ERUs)
2004	696	-
2005	791	95
2006	841	50
2007	868	27
2008	884	16
2009	896	12
2010	906	10
2011	914	8
2012	919	5
2013	948	39
2014	953	5

Avg. Annual Increase – 26.7

The calculated average annual water system demand increase from 2005 to the present is 27 ERUs, which has been rounded up to 30 ERUs per year to calculate future water system demand. Using the 30 ERUs per year average water system growth rate, the estimated 20 year (2034) and 40 year (2054) water system growth is 1,553 ERUs and 2,153 ERUs, respectively. At a growth rate of 30 ERUs per year, the projected full buildout of 3,679 ERUs will be realized in the year 2104.

A. Current and Future Water Consumption Demands

Water system demands within the City are similar to nearby municipalities, with peak summer demands nearing three times the average daily demand (ADD). The terms below are typically used to define water consumption demands:

Average Day Demand (ADD): The average number of gallons of water consumed per day as calculated over the course of a year.

Maximum Day Demand (MDD): The maximum number of gallons of water used in one day as determined from well production records.

Peak Hour Demand (PHD): The maximum amount of water used in a one-hour period. This number is extrapolated from well production records.

Monthly meter records are kept for each well. The maximum historical recorded monthly demand was July, 2014 at 24.4MG, which equates to a maximum daily demand of 787,097 gallons per day. The observed production has generally increased from 2013 to 2014, largely as a result of population growth. However, as indicated in Section E, above, water demand per ERU has generally decreased. The ADD during 2014 for the City of Spirit Lake was found to be 425 gpd/ERU. This value for the ADD was used for the purpose of designing the water supply and storage as it is supported by historical information. The maximum daily demand was 825gpd/ERU for 2014. These values are used in conjunction with a growth rate of 30 ERUs per year to establish future system demands. **Table 5** illustrates current and future water use within the City's water service area.

Table 5 – Current and Future Water Demand

Date	2014	2034	2054	2104 Buildout
ERUs	953	1553	2153	3679
ADD (gpd)	405,025	660,025	915,025	1,563,575
MDD (gpd)	786,225	1,281,225	1,776,225	3,035,175
PHD (gpd)	1,468,800	2,260,800	3,052,800	5,067,360

Peak hour demand represents the highest rate of water use occurring in a one-hour period during the maximum day. Historical data indicates that the PHD is approximately 1.8 times higher than the MDD. This peak hour generally occurs at approximately 9am, with a second lesser peak at approximately 8pm.

Domestic water use varies throughout the year primarily due to irrigation utilization. In addition to domestic water use and irrigation, typical system demands include fire flow.

VI. Planned Facilities

In order to meet the project buildout demands, new water supply sources will be required for the City in addition to other improvements outlined in the Comprehensive Plan Update. The City currently needs to install (1) groundwater well to supplement the existing City water system and bring the water system back into compliance with DEQ requirements. The well will be 10" in diameter and will contain a submersible well pump. It is expected that the well will be capable of producing approximately 650 gpm using a 150 hp submersible well pump.

The City will also need to construct a 300,000 gallon water storage tank to store water and a 12" waterline interconnection for domestic use and fire protection within the next 20 years. A total of 290,176 gallons of usable storage is required at full buildout. The bottom portion of standpipe water tanks is dead storage due to inadequate system pressures. A 300,000 gallon standpipe storage tank is proposed based on the full buildout needs. Future needs also include an additional water well (No. 6) with a 750 gpm capacity. The following **Table 6** shows the estimated year in which the improvements are required.

Table 6 – Water System Design Criteria

Growth Condition – Year	2015	20 year – 2035	40 year – 2055	49 year – 2065	Full Buildout – 2104
Water System Demand (ERU)	1,344	1,553	2,153	2,454	3,679
Additional Required Source	650 gpm (Well No. 5)	None	None	750 gpm (Well No. 6)	None
Additional Storage	300,000 gallons	None	None	None	None
Standby Power Supply	Well No. 4	None	None	Well No. 5	None

The proposed immediate construction and design of the water source, pumphouse, and water storage required for the City to provide service at the full buildout condition is shown in the table below.

Table 7 – Water System Construction Cost Summary

Item	Cost
Phase 1 – New Well and Pumphouse	
<i>Subtotal</i>	<i>\$1,038,621</i>
Phase 2 – New Water Tank and Interconnection	
<i>Subtotal</i>	<i>\$1,047,300</i>
Total Estimated Project Cost for Phase 1 and 2	\$2,085,921

In addition to the foregoing construction, a future 750gpm well will also be required, based on anticipated growth predictions and current usage rates.

V. Conservation Goals

A. The City has implemented a number of conservation measures that have had an impact on water production.

The City implemented water service metering in 1998 in order to better track water use and mitigate waste. The City is continuing water resource conservation efforts using goals established with the use of the Idaho Department of Water Resources Water Conservation Guidelines for preparing water conservation plans.

The goals of the City are as follows:

1. Maintain a low unaccounted for water measurement. Industry standard for lost water is approximately 10 percent, and the City has a current value of approximately 42 percent. Reaching the 10 percent lost water over the next few years is a goal for the City.
2. Implement their public education program and encourage smart controllers for irrigation to reduce the peak hour demands on the system.
3. Install meters at City owned facilities to monitor usage and potential leaks at City property.

VI. Water Conservation Measures

This section includes a discussion of the conservation measures the City has implemented and is currently using.

A. Water Rate Structure

The City of Spirit Lake Water System users are currently charged \$15 per month for up to 12,000 gallons, then \$1.25 per 1,000 gallons over the base charge amount of 12,000 gallons thereafter.

B. Data Collection

Water production and sales are closely monitored by the City. Residential water meter data is collected monthly with the exception of the winter months. Commercial and pumping data is collected monthly year around. These data are used to monitor non-revenue water on a regular basis. The city is also in the process of converting the existing water meters to radio read meter capabilities in order obtain meter readings throughout the year for all meters.

C. Non-Revenue Water Control

The city has been reading meters on a monthly basis since 1998. The billing software allows City employees to identify severe changes in monthly charges, which aids identification of potential leaks.

VII. Effects of Conservation Measures

The impact of several of the conservation measures discussed previously began at specific times and can be measured when looking at water use over a period of years. The measures that are easily tracked are the following:

- Overage rate for all customers, which is currently in place.
- Monthly meter reading of water meters, which was implemented in 1998.

In order to analyze potential impacts, the water source demand was tracked prior to and after implementation of metered services. This chart is included in **Figure A-2**.

City-wide, the per capita average daily water use in 1998 was 759 gallons per day per ERU. After meter implementation, the per capita average daily water use in 2006 was 299 gallons per day per ERU, which represents a 60 percent reduction.

VIII. Expected Savings

While it is difficult to identify the impact of specific conservation measures, the U.S. Environmental Protection Agency has provided benchmark data for what can be expected. Specific conservation measures and the expected savings for these measures are included in Appendix B of the USEPA Water Conservation

Guidelines. A summary of the expected savings for some specific measures according to EPA is included in **Table 8**.

Table 8. USEPA Water Conservation Measure Benchmark Savings

Conversation Measure	Expected Reduction in Use (%)	Water Use Category Impacted
Universal Metering	20	All
10% Increase in residential rates	2-4	Residential
10% Increase in non-residential rates	5-8	Non-Residential
Public Education	2-5	All
Large Landscape Water Audits	10-20	Non-Residential
Low Water Use Plants	7.5	All

The implementation of any or all of these measures would be expected to reduce peak water demand and not expected to drastically impact revenue from water sales.

IX. Future Conservation Measures

Conservation Goals: The City has three main conservation goals moving forward:

- 1) To maintain water loss at a level below 10 percent.
- 2) To reduce or maintain the peak day and peak month consumption to optimize use of their existing supply capacity
- 3) Continue to participate in education programs, data collection, non-revenue water control, and implementing partnerships that promote conservation

In order to meet these goals, the City should continue with the water conservation measures they have been implementing, with continued focus on the following activities:

- Complete installation of radio read meters within the existing water system. Already the City has completed 80% of meter conversions to this technology and intends to finish the installations within the next 2 years. This will allow year-round meter reading for all water customers.
- Install meters at City owned facilities to monitor usage and potential leaks at City property

- Implement several Water Wise conservation measures in the future. These may include limiting the time of day when irrigation is allowed and limiting the days in which residences can irrigate.
- Monitor meter reads to identify potential leaks at metered connections
- Compare monthly pumped data with billed data to identify potential distribution system leaks
- Use of compound meters for larger connections for better accuracy of actual use
- Immediate leak repairs

Some other measures the City may want to consider in the future are as follows:

- Encourage the use of hose bib timers and moisture sensors by homeowners to prevent accidental excess lawn watering by providing qualifying installations with credit on their utility bill for a portion of the cost of the timers or sensors.
- Use of smart controllers, especially for large irrigated spaces
- Implement a new water rate policy increasing the usage fee charged to \$15 per month for up to 12,000 gallons, then \$1.25 per 1,000 gallons over the base charge, then \$1.50 per 1,000 gallons for 30,000 gallons through 60,000 gallons and \$1.75 per 1,000 gallons for 60,000 and above.

Figure A-1. Water System Planning Boundary.

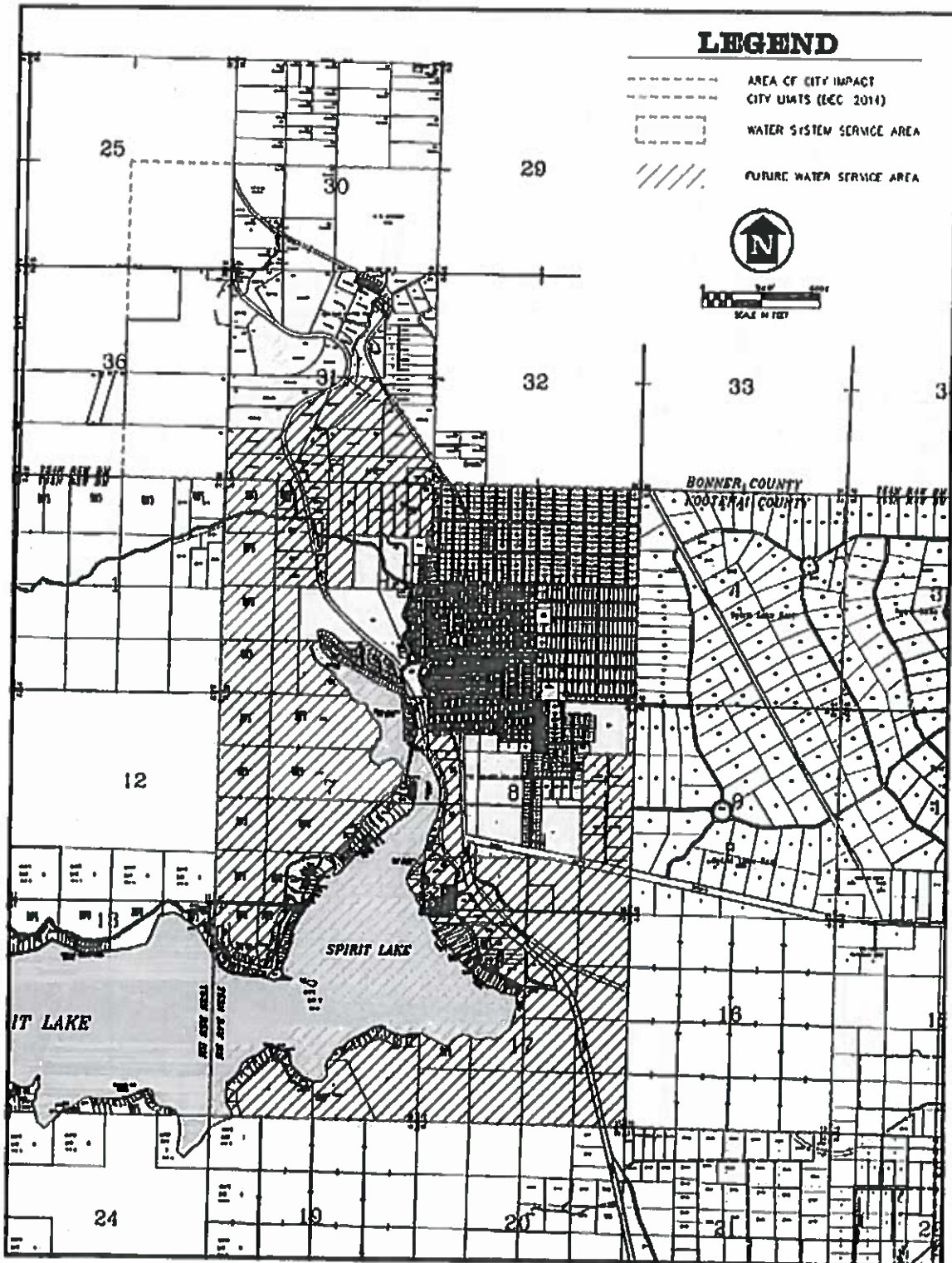


Figure A-2. Historical Water System Data.

