Water Conservation Plan

for

Lehi City, Utah

November, 2019

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INTRODUCTION

In response to the rapid growth occurring throughout the state of Utah, Lehi City citizens and leaders are becoming concerned for the future cost and availability of the water supply. A similar concern has been demonstrated by the state legislature in the Water Conservation Plan Act (House Bill 71) passed and revised in the 2004 legislative session (Section 73-10-32 Utah Code Annotated). Additionally, the City's mission statement and resource management vision (as stated in the Lehi City Strategic Resource Management Plan) further support the need for an official Water Conservation Plan (WCP).

City-Wide Mission Statement:
The City of Lehi, along with the community we serve, will foster a tradition dedicated to:

- *Maintaining a safe, healthy atmosphere in which to live, work and play;*
- *Guiding development to ensure responsible growth while preserving and enhancing our small town character, unique environment and natural amenities;*
- *Providing for the City's long-term stability through promotion of economic vitality and diversity;*

Resulting in a balanced community committed to protecting what is valued today while meeting tomorrow's needs.

Lehi City's Resource Management Vision:
Improve the health of the community we serve, in recognition of the critical linkages between environmental health and public health. It is Lehi City's desire to limit adverse impacts upon the environment by integrating resource management into our organizational policies, decision making, and institutional culture to ensure the most efficient use of resources in our new and existing facilities.

This achievement will be consistent with Lehi City's commitment to be a community leader in Resource Management and Environmental Stewardship in the North Utah County region.

In summary, this WCP is written to address how water conservation programs and practices will play an important role in meeting our future water needs as well as address the concerns of leaders and citizens of both Lehi City and the state of Utah.

1 – DESCRIPTION OF LEHI CITY AND ITS WATER SYSTEMS

Located in the northern part of Utah County, and in the second driest state in the nation, Lehi City's 2018 population was approximately 62,712. Providing water to meet the needs of its citizens has always been a top priority of City leaders and planners. As a result, a well-maintained and operated water system provides the citizens of Lehi City with water when and where needed. Currently, the water system provides water to 21,034 connections; 20,394 residential, 568 commercial, 61 institutional (public), 5 industrial, and 6 stock connections.

In the late 1980's, Lehi City recognized the need for water conservation and the benefits from separating the systems for indoor and outdoor use. An ambitious project was undertaken at a cost of $5 million to provide a secondary water system. The City is currently served by a dual system of culinary and pressurized irrigation. The pressurized irrigation has been functioning since 1990 and has been well accepted by the citizens of Lehi. Currently the pressurized irrigation system is a non-metered system. Culinary water usage records have obviously indicated a major drop since the secondary system was completed. Since the pressurized irrigation system is not metered for each user, a total usage of water can only be determined based on the amount of water measured at the various sources.

Lehi City residents and their leaders place a high value on open space. Consequently, 319 acres of land in the City have been set aside as parks and a cemetery. Golf courses and landscaped areas around schools and churches occupy approximately another 628 acres. As of 2019, Lehi City is about 50 % of total build-out of 27.7 total square miles of incorporated land.

Lehi City is presently receiving a significant portion of the county's residential, commercial and industrial growth. This growth is causing changes in the way the land within the City limits is being utilized and straining the ability of the present water supply and delivery system to meet demands (for both the culinary and secondary water systems). Through careful planning and efficient utilization of available water supplies their increased need can and will be met.

Service area maps for the existing Lehi City Culinary Water System and for the Lehi City existing Pressure Irrigation (Secondary) Water System are given as Figures 1 and 2 in this Plan. As shown, there are 7203 culinary valves, 1579 blowoffs and 333 miles of culinary lines. Culinary pipe sizes range from 2 to 14 inches and are color coded on the culinary service area map. There are also 8354 PI valves, 3432 fire hydrants and 337 miles of PI lines. Pressure Irrigation pipe sizes also range from 2 to 14 inches and are color coded on the PI service area map. Notice, in a unique way, the fire protection system for Lehi City is serviced year-round by the PI system.

Inventory of Water Resources

Lehi City has been withdrawing approximately 5043 acre-feet (in 2018) of culinary water annually from underlying aquifers through four (4) wells. This has supplied about 85% of the total water required to meet the indoor water demands on the culinary system which is a total of 5949 acre-feet. Another ~ 6.5% comes from springs at 390 acre-feet (in 2018) and the other ~ 8.5% comes from CWP (CUWCD) at 515 acre-feet (in 2018). The remaining water needs for outdoor water use of 15,605 acre-feet (in 2018) for the City's 62,712 people must come from City-owned stock in irrigation companies, several wells, and the Central Utah Water Conservancy District (the District).

Potable water for future City residents will, for the most part come from additional wells planned for in the City's Non-Routine Capital Budget (see Table 1). Untreated water for the pressurized irrigation system will come from additional wells and surface sources.

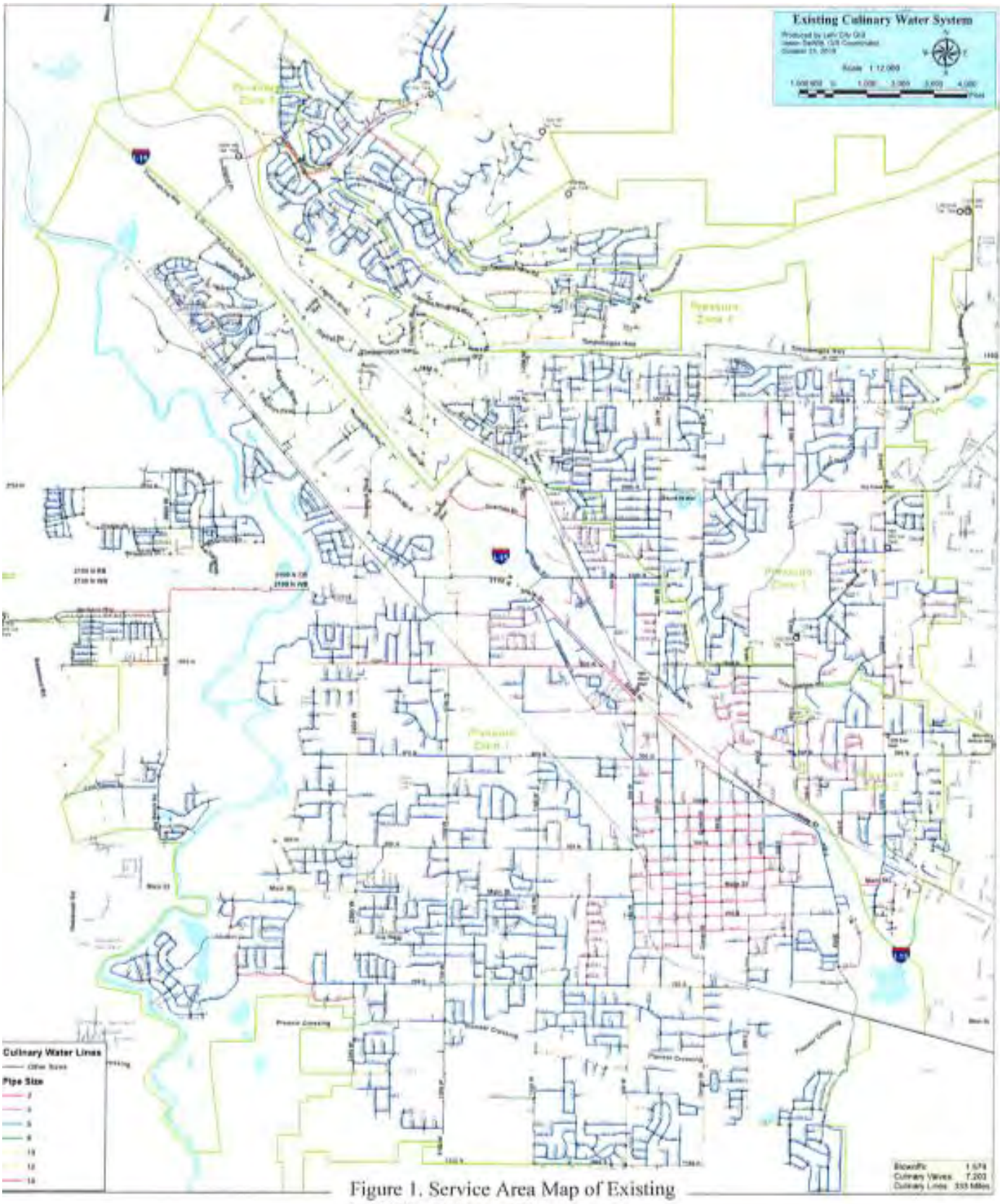


Figure 1. Service Area Map of Existing Lehi City Culinary Water System

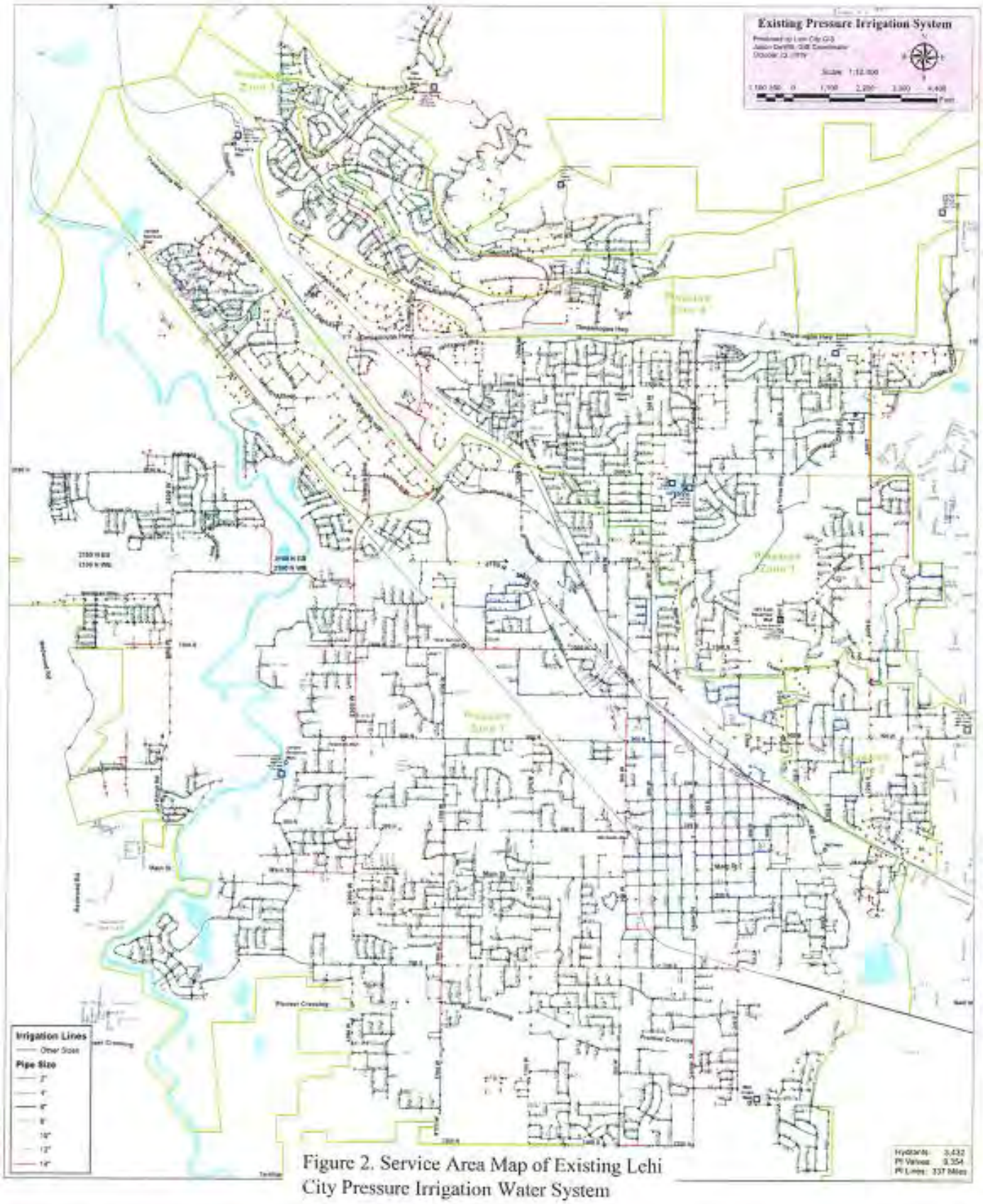


Figure 2. Service Area Map of Existing Lehi City Pressure Irrigation Water System

Table 1. Culinary and Pressurized Irrigation Non-Routine Capital Budget Summary

Project Title	**FY 2019**	**FY 2020**	**FY 2021**	**FY2022**	**Future**
Culinary					
Pipe Upsizing	70,000	72,000	74,000	76,000	
Micron Tank and Lines					1,400,000
Sand Pit Lines West	300,000	1,600,000			
CWP Center/Redwood Pumps		300,000			
900 N & 600 E Lines					1,800,000
Mitchell Pump Facility					1,000,000
Traverse Source		1,300,000	500,000		
Traverse Booster w/ Piping			300,000		
Traverse Tank & Lines					1,500,000
600 East Tank		2,000,000			
Holbrook Upper Tank w/Pump		1,100,000			
Sandpit Tank w/Pump		2,200,000			
Yearly Culinary Sub-Total	**370,000**	**8,572,000**	**874,000**	**76,000**	**5,700,000**
Project Title	**FY 2019**	**FY 2020**	**FY 2021**	**FY 2022**	**Future**
Pressurized Irrigation					
Pipe Upsizing	85,000	85,000	90,000	95,000	
Brooks Reservoir Enlargement					350,000
Cedar Hollow Res. Pump/Well					750,000
West Side Sed. Basin	2,200,000	500,000			
Low Hills Res. Enlargement		400,000			
Micron Reservoir					1,400,000
Traverse Booster w/Piping	900,000	500,000			
West Side PI Reservoirs	300,000	2,000,000	300,000		
Traverse Storage		1,000,000		800,000	
Traverse PI Source		400,000			
Jordan River Res. Pump/ Well	550,000	300,000			
Railroad Well & Piping		80,000			
Dry Creek Reservoir & Piping		3,000,000	9,000,000		
Yearly PI Sub-Total	**4,035,000**	**8,265,000**	**9,390,000**	**895,000**	**2,500,000**

The City owns shares of stock in several irrigation companies as shown below in Table 2. The total number of City water shares at this time is 8030.36. Water provided under these shares is used for both indoor and outdoor water uses.

Table 2. City-Owned Shares in Irrigation Companies

Company Name	Shares
American Fork Irrigation	114.43
Highland Conservation District	772.9
Lake Bottom Irrigation	59.48
Lehi Irrigation	2818.9
Lehi Metro/Central Utah Water District	1145.0
Lehi Spring Creek Irrigation	883.4
Mitchell Hollow Irrigation	184.82
North Bench Irrigation	1018.13
Provo Reservoir Water Users	193.3
Provo River Water Users	500.0
Utah Lake Distributing Company	265.0
Welby Jacobs	75.0
Total Shares	**8030.36**

The City was able to withdraw ~ 5949 acre-feet of culinary water in 2018 from wells and springs and from the CWP (CUWCD) as shown in Table 3.

Table 3. City Culinary Water Sources in 2018

Well / Source Name	Total Ac-Ft
1200 East Well	1527.16
500 West Well	1785.86
Airport Well	1215.16
Dry Creek Well	515.11
Birch, Hamongog, School House Springs	390.29
CWP	515.4
Grand Total:	**5948.98**

In addition, the City's pressurized (secondary) irrigation water system is delivered through the sources shown in Table 4 and accounted for 15,605.52 acre-feet in 2018.

Table 4. City Pressurized Irrigation Water Sources in 2018

Well / Source Name	Total Ac-Ft
Alpine Springs	161.83
300 North Well	337.78
600 East Well	102.83
Bull River North Bench	1174.31

Carter Well	310.15
C.U.P.	1696.00
C.U.P. Rental	675.00
Doc Jones Irrigation	461.76
Geneva	36.72
Jordan Narrows Well	313.24
Lehi and Deer Creek Irrigation / Canal	4956.90
Micron CUP	550.00
Mill Well Irrigation	495.6
Minni Creek Pressurized Irrigation Facility	747.05
Misc Culinary	171.12
Mitchell Hollow Reservoir	253.36
Mitchell Well	427.44
New Survey Well	126.85
Oak Hollow / Traverse Well	884.17
Pilgrims Well	522.37
Spring Creek Irrigation	820.21
Stoker Corner Well	86.85
Sunderland Well	293.98
Grand Total:	**15,605.52**

For a **complete list** of the City's wells, springs and drains water rights with their associated water flows, please refer to Appendix B. The current total of all water rights owned by Lehi City is 42,138.78 acft. This figure is the sum of 11,761.0 acft of "original water rights", 14,685.0 acft of irrigation/district water rights", and 15,692.78 acft of "other well, etc. water rights." However, it should be noted that these quantities could be reduced by as much as 30% to 50% in a dry year condition. The reference / source for these values is Lorin T. Powell, Professional Engineer and Lehi City Engineer, September, 2018.

Water Budgets

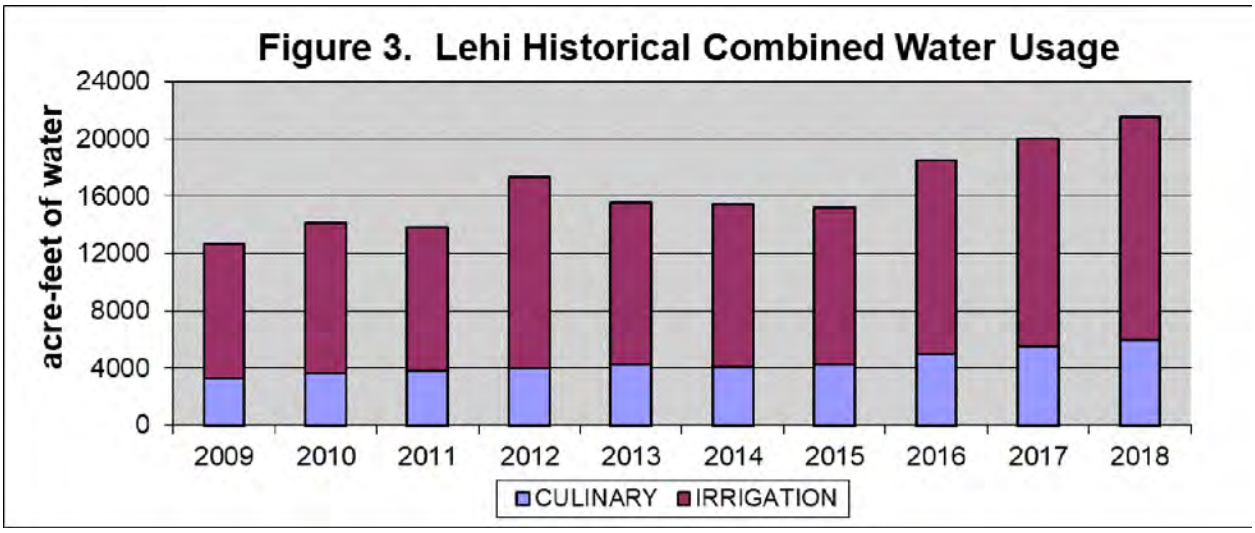
The following table shows the amount of water delivered into the culinary water system and the metered outflows to end-users from the years 2013 to 2018.

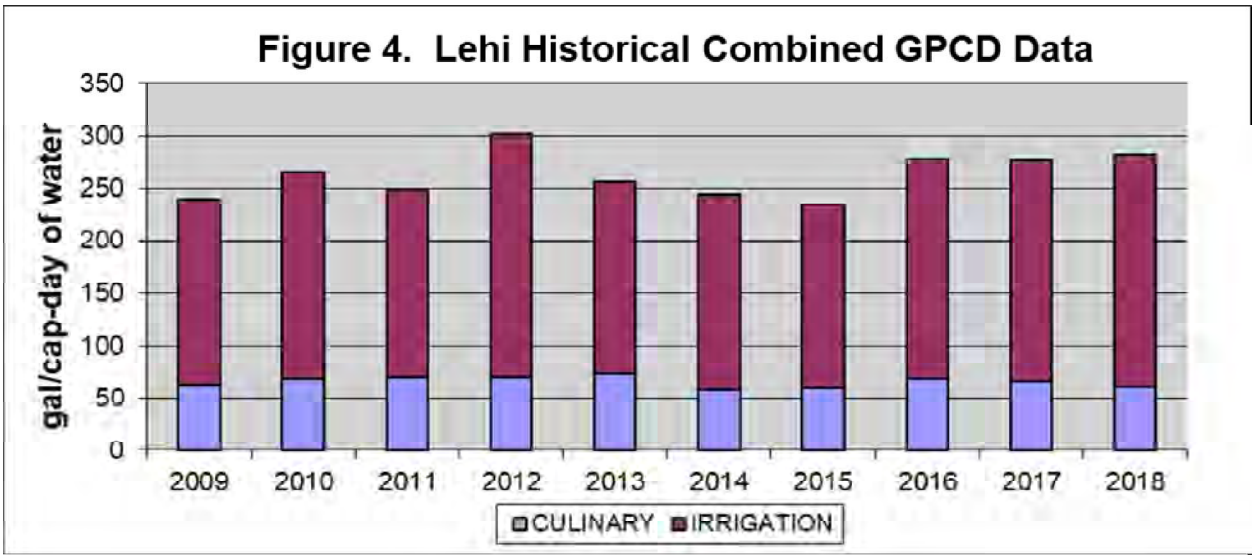
Table 5. City Culinary Water Inflow & Outflow Totals – 2013 through 2018

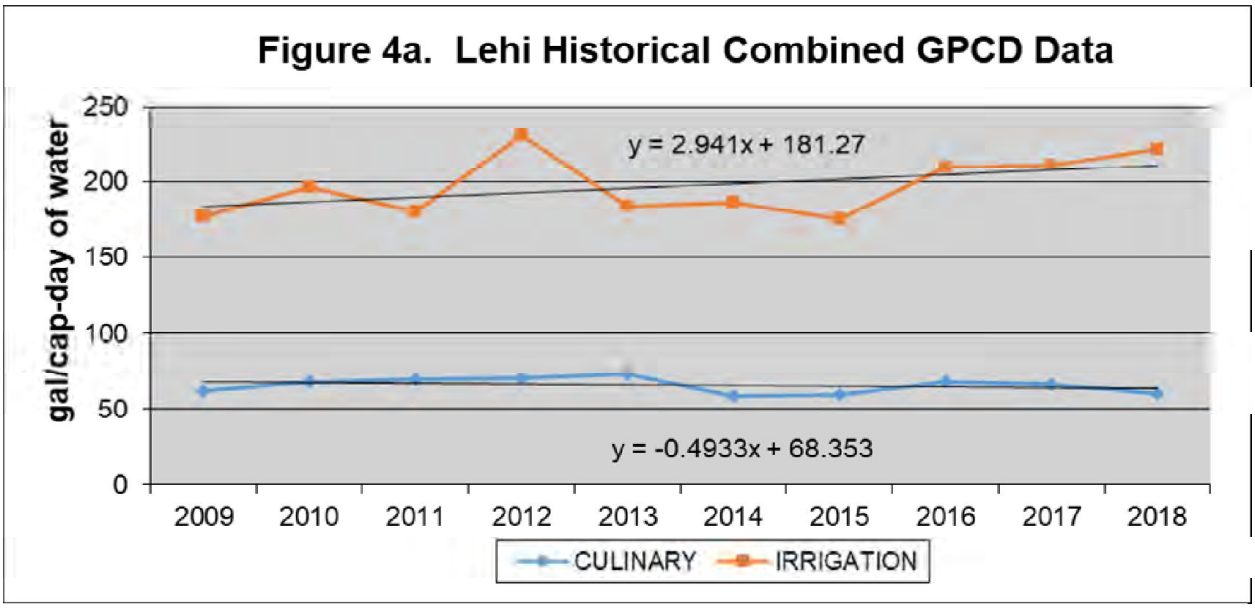
Year	Inflow Total (AF) Wells & Springs	Outflow Total (AF) Metered Water	% Diff
2013	4256	3549	16.6%
2014	4123	3577	13.2%
2015	4242	3722	12.3%
2016	4990	4389	12.0%
2017	5565	4535	18.5%
2018	5949	4249	28.6%

Average difference of the inflow (wells and springs) compared to the outflow (metered water) from the culinary system is 16.9% (but 14.5% w/o 2018 high value) for the six years of record. However, unmetered water does not just include leaks in the system. The % difference shown in the table above also includes new construction, flushing new water mains, unmetered City facilities, and water transfers from the culinary system to the pressurized irrigation system. Some amount of difference will always be with us.

Figure 3 shows that there is an increasing 10-year trend in the total water usage in the City's system, both for the culinary water and the irrigation water. Figure 4 shows the 10-year trends for the gallons per capita per day (gpcd). The City has trended slightly downward in culinary GPCD over the last ten years, but has trended upward in irrigation water GPCD. These trends are better shown on Figure 4a which gives the equations for the trend lines. The trend is negative (downward) for the culinary water, but positive (upward) for the irrigation water. The irrigation (secondary) water use in 2012 was confirmed to be unusually and inexplicably high.







Present Water Use and Future Water Needs

When use of culinary water is compared with the number of people living in Lehi City in 2018 (Lehi population in 2018 = 62,712), residents used 60.5 gallons of culinary water per capita per day (gpcd) (based on outflow / metered water) and 222.1 gallons of secondary water per capita per day (gpcd), together totaling 282.6 gpcd. This is compared to the statewide average of about 250 gpcd and about 100 to 150 gpcd nationally.

Figure 4 shows the gpcd's for the past 10 years. The 10-year average culinary gpcd is 65.6 and the average secondary gpcd is 197.4. However, the past 5-year average culinary gpcd is 62.7, and the 5-year average secondary gpcd is 201.0.

Unmetered secondary irrigation systems, which provide lower quality water to the extensive public and private landscaped areas through separate pipelines, have been installed. As stated previously, since 1990 all residential subdivisions have been incorporated in the pressurized irrigation system as the City has developed.

Total combined monthly water flowing into both the culinary and secondary water systems per month for 2018 (in acre-feet) is shown in Figure 5a. The same monthly water data for 2013 is shown in Figure 5b below in order to compare the 2 years. The 2018 summer flows are about 50% larger than the 2013 summer flows.

The extent of the City's expected future population growth through the year 2050 is shown in Figure 6. The projected Lehi 2050 population is 141,820. Many factors influence this projection, and the estimates shown may vary substantially from the actual population experienced.

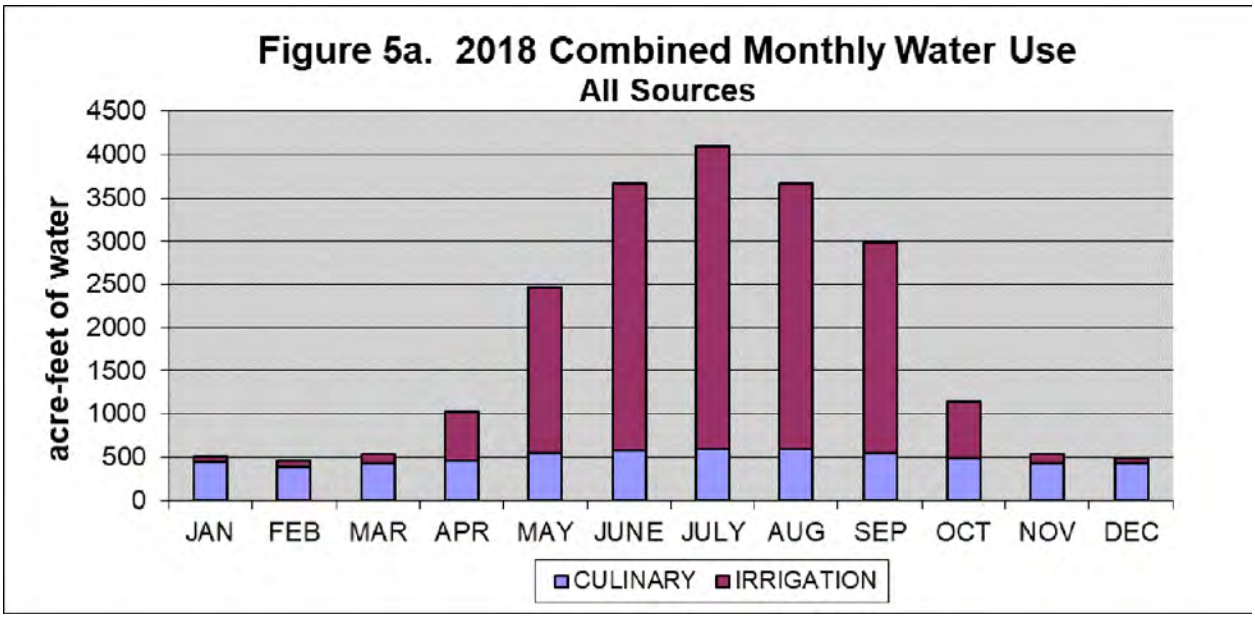


Figure 5a. 2018 Combined Monthly Water Use
All Sources
acre-feet of water
4500
4000
3500
3000
2500
2000
1500
1000
500
0
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEP
OCT
NOV
DEC
CULINARY
IRRIGATION

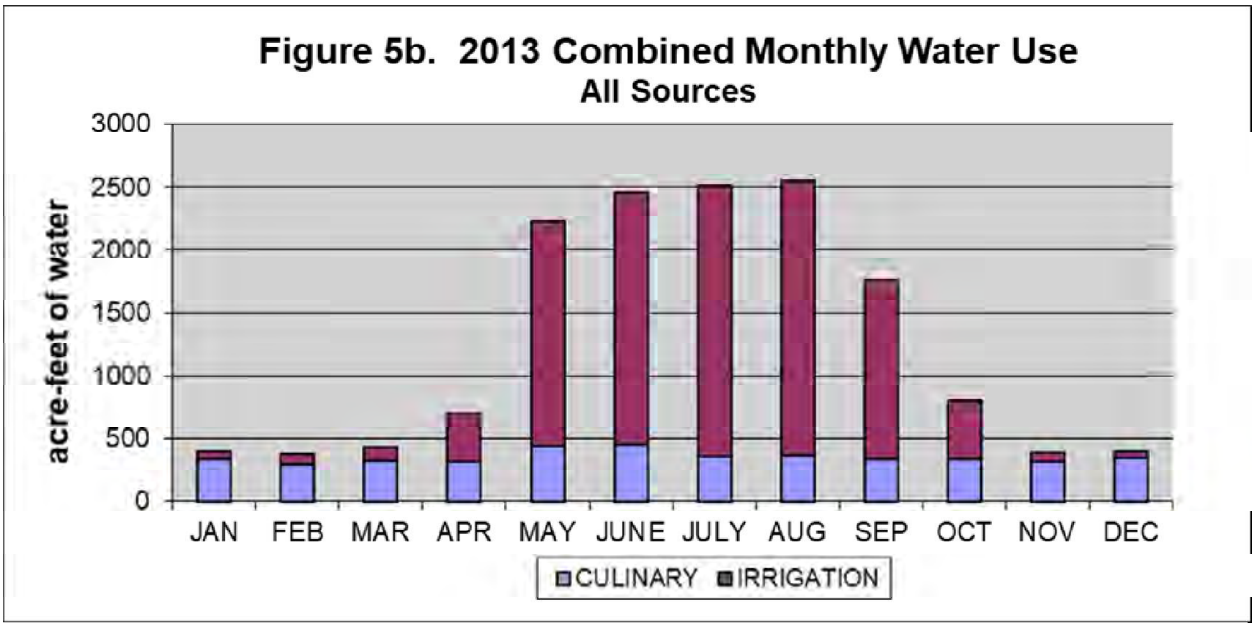


Figure 5b. 2013 Combined Monthly Water Use
All Sources
acre-feet of water
3000
2500
2000
1500
1000
500
0
JAN
FEB
MAR
APR
MAY
JUNE
JULY
AUG
SEP
OCT
NOV
DEC
CULINARY
IRRIGATION

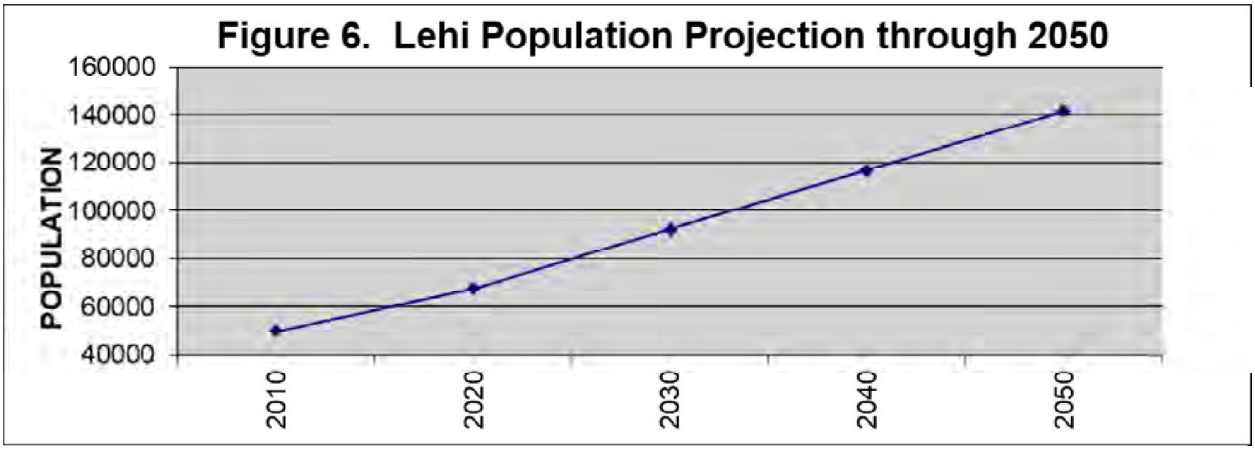


Figure 6. Lehi Population Projection through 2050
POPULATION
160000
140000
120000
100000
80000
60000
40000
2010
2020
2030
2040
2050

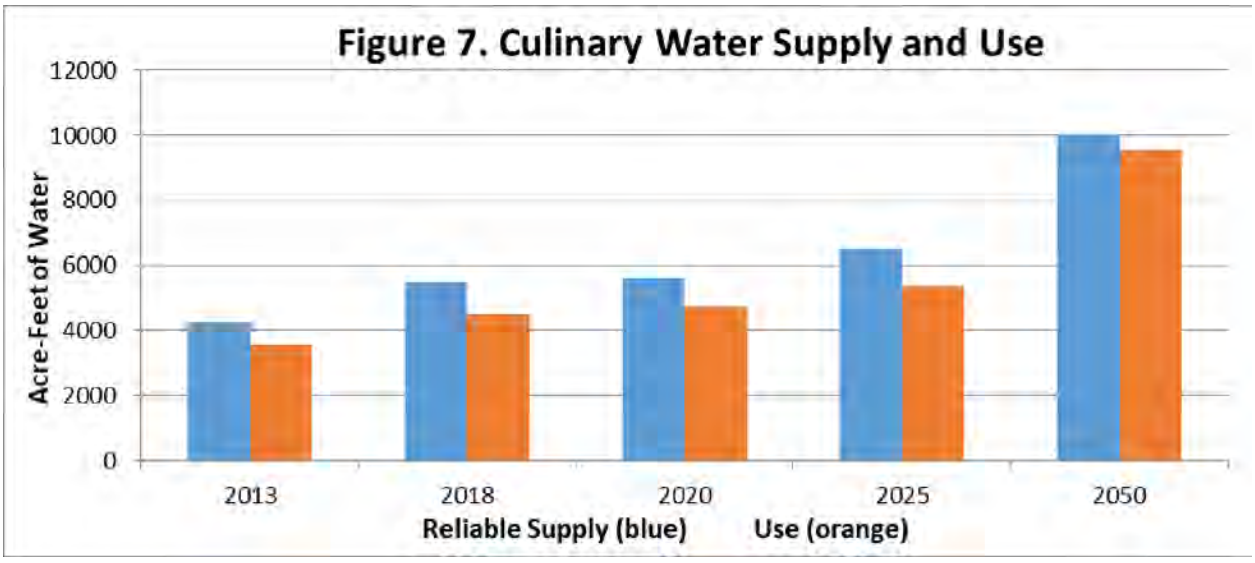
As one of the technological centers of the State of Utah and with 12 miles of Interstate-15 frontage, including 4 on/off ramps; Lehi City has experienced and is projected to continue to experience substantial economic growth. As it is, developments on the west side (west of the Jordan River) and the northwest side (Silicon Slopes Businesses and Thanksgiving Point) will require more development of water resources to satisfy the additional demand. As a part of this growth, new parks and other open spaces are planned in conjunction with new residential and commercial/industrial developments in the areas of new development.

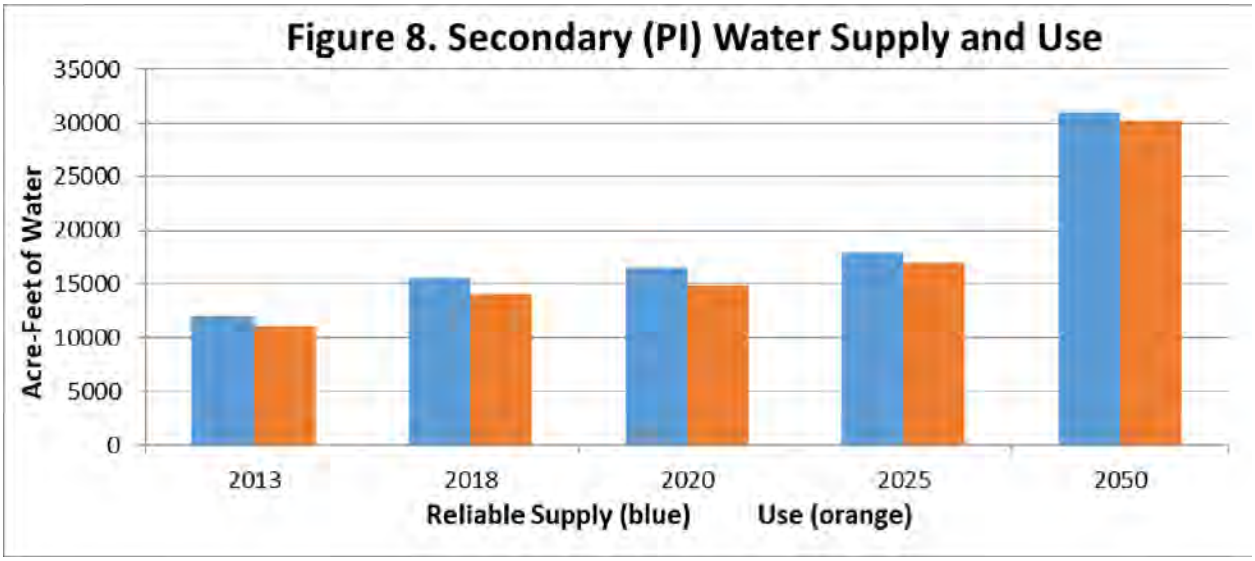
As shown on Figure 4a, the percapita water use of culinary (potable indoor) water is about 60 gallons. The figure also shows that the percapita water use for secondary (non-potable outdoor) water is about 220 gallons. Currently, 97% of water system connections are residential, 2.7% are commercial, 0.3% are institutional (public), and 0.05% are industrial and stock connections. The gal/cap-day of culinary and seconday water for these types of water uses are shown in Table 6.

Table 6. City GPCD Breakdown by Type of Use in 2018

	Potable (Indoor)	**Non-Potable (PI–Outdoor)**	**Total gal/cap-day**
Residential	58.17	213.31	271.48
Commercial	1.62	5.94	7.56
Institutional	0.18	0.64	0.82
Industrial/Stock	0.03	0.11	0.14
Total	60	220	280

Existing reliable water supply and supply projections compared to existing water use and use projections through 2050 are shown on Figures 7 and 8 for culinary water and secondary (PI) water respectively. The projections are based on population projections as shown on Figure 6 and on projected water use with conservation measures as shown later in the Plan on Tables 9 and 10.





2 – WATER PROBLEMS, CONSERVATION MEASURES AND GOALS

Problems identified

Lehi City staff identified and prioritized several problems during the investigative phase of this water conservation planning process.

- Despite many efforts to the contrary, some citizens lack information and understanding of landscaping water requirements and efficient water-use habits and practices. Some residents still don't know how much water is required to maintain healthy landscaped areas and how to consistently use water efficiently indoors. More than a few citizens' irrigation and indoor practices are based on convenience rather than plant needs and water supply considerations.

- Lehi City homes, businesses, institutions, and even many public facilities have landscapes with large areas of grass and other water-intensive landscaping. As shown in Figure 3a above, the 2018 combined monthly water use chart, the irrigation needs usually create water use peaks in June, July and August. They strain the existing water delivery system and necessitate periodic upgrades to main delivery lines and reservoir capacities.
- All of the City's facilities currently do not have culinary or PI water meters. With the number of these facilities increasing, keeping track of water usage at these facilities is important, particularly in order to minimize the % difference between the inflows of culinary water compared to the metered outflow. At this time, on City facilities, there are about 20% culinary water meters and about 5% (10 meters) PI water meters. The City is continuing to place water meters on these facilities as time and resources permit.

- The former Resource Conservation Committee met only a few times during the past few years. There is no plan at the present time for this committee should be reactivated. If it were reactivated, by expanding the scope of this committee to include all City resources, the need to meet regularly would be significantly increased in order to make decisions more effectively and efficiently.

- A City-wide culinary water meter replacement plan took place from 1990 – 2002, which greatly improved the overall efficiency of the City's metering system. At this time, about 50% of the City's 19,000 culinary meters are Sensus iPERL SmartPointM2 meters. The culinary meters are continuing to be replaced at a rate of about 750 meters per year. The entire system is Automated Meter Infrastructure (AMI) with remote system radio transmission over 2 of 3 planned towers. The City's proactive approach will ensure efficiency and accuracy of City culinary water use.

- The PI system also uses these same types of advanced meters. Starting in 2016, all new PI connections have been equipped with these water meters. The PI billing is now still the flat rate, but eventually the billing will be based on the actual water useage measured by the meters. The City has retrofitted the PI services to add meters to large users such as schools, churches, HOA's, private parks, etc. at a cost of about $1,500,000.

Opportunities Identified

Each problem represents an opportunity. Aside from a water education program, the opportunity exists to solve the problems through continuing to require "smart controller" technology to irrigate all public open spaces. The City Parks Department has been converting everything to WeatherTRAK controls. This is now completed as of 2019.

Continued implementation of the phased approach of adding culinary water meters to all City facilities will help resolve the inflow / outflow water difference issue.

Presently the City is xeriscaping at least 20% of any new park areas. Xeriscape landscaping at City parks, facility grounds, and along existing and future roads in the City are more easily maintained if low water-use shrubs and mulches were used instead of Kentucky blue grass. Additionally, there is the opportunity to encourage the use of recycled water in certain cases.

Additional opportunities can be found in the remaining problems, essentially by reinforcing and/or increasing planning efforts. These efforts include continuing to come up with additional creative educational programs, reviewing the approach towards meter replacement, and reinforcing the importance of tracking and improving response times for fixing leaks, but do not include reinstituting the Resource Conservation Committee.

2019 Water Conservation Goals

For context and comparison, see the results of the 2014 Water Conservation Goals given below Table 6. In pursuit of solutions to the problems identified previously, and in light of the variety of conservation measures available to solve these problems, the following 2019 new or revised goals have been identified:

- **<u>Goal # 1</u> – Reduce the City's per capita culinary water use rate by ~ 6 percent in five years.** The 2018 water use rate is 60.5 gallons of treated water per capita per day (gpcd). However, the past 5-year average rate was 62.7 gpcd and the past 10-year average rate was 65.6 gpcd. The goal is to bring the culinary water use rate down by ~ 6% from ~ 64 gpcd to ~ 60 gpcd by 2023.

- **<u>Goal # 2</u> – Reduce the City's per capita secondary water use rate by ~ 5 percent in five years.** The 2018 secondary water-use rate is 222.1 gallons of untreated water per capita per day (gpcd). However, the past 5-year average rate was 201.0 gpcd and the past 10-year average rate was 197.4 gpcd. These 2018 secondary water use rates are higher than the rates in the 2014 goal #2. The new goal is to bring the secondary water use rate down by ~ 5% from 200 gpcd to ~ 190 gpcd by 2023.

- **<u>Goal # 3</u> – Reduce the average percent difference in culinary water delivered into the system compared to the metered outflow by ~ 3 percent in five years.** The current average is 16.9% (14.5% w/o 2018 high value), making the goal for the average down to ~ 14% (or ~ 12% w/o 2018) by 2023. With the possibility of an overall decrease in new construction, continuing to add culinary water meters to City facilities, and reducing the need for water transfers from the culinary system to the pressurized irrigation system; it is hoped that this goal should be feasible.

- **<u>Goal # 4</u> – Improve the appearance of parks, building grounds, street landscapes, open spaces and yards.** Improved irrigation practices and water efficient landscapes can enhance the beauty of the City. Annual surveys of citizen attitudes will continue to measure satisfaction, or lack thereof, with landscapes on City-owned properties. For example, Table 7 shows the results of citizen satisfaction surveys for the past 4 years specifically in regards to services received from taxes paid.

Table 7. How do you rate the services you receive from Lehi for your tax dollars?

	2016	**2017**	**2018**	**2019**
Excellent	15%	15%	17%	17%
Good	62%	60%	57%	56%
Fair	20%	18%	19%	20%
Poor	3%	4%	3%	5%
Don't Know	0%	3%	3%	3%
Citizen Satisfaction				
w/ Culinary Water	76.1%	76.6%	78.0%	76.3%

Results of the 2014 Water Conservation Goals

- **<u>2014 Goal # 1</u> – Reduce the City's per capita culinary water use rate by ~ 5 percent in five years.** The 2013 water use rate is 72.7 gallons of treated water per capita per day (gpcd). However, the past 6-year average rate was 68.9 gpcd and the past 10-year average rate was 70.8 gpcd. The goal is to bring the water use rate down to ~ 65 gpcd.

  Lehi met and exceeded this goal by 2018. Culinary water use rate is down from ~ 70 gpcd to ~ 64 gpcd and below. A new goal will be set to reduce the use rate down to ~ 60 gpcd.

- **<u>2014 Goal # 2</u> – Reduce the City's per capita secondary water use rate by ~ 5 percent in five years.** The 2013 secondary water-use rate is 183.6 gallons of untreated water per capita per day (gpcd). However, the past 6-year average rate was 194.2 gpcd (186.8 w/o the unusually high 2012 year) and the past 10-year average rate was 192.5 gpcd. The goal is to bring the secondary water use rate down to ~ 180 gpcd.

  Lehi did not meet this goal by 2018. Secondary (PI) water use rate is up to ~ 200 gpcd. A new goal will be set to reduce the use rate from ~ 200 gpcd down to ~ 190 gpcd.

- **<u>2014 Goal # 3</u> – Reduce the average percent difference in culinary water delivered into the system compared to the metered outflow by 3 percent in five years.** The current average is 15%, making the goal for the average down to 12% by 2019. With a likely overall decrease in new construction, adding culinary water meters to City facilities, and reducing the need for water transfers from the culinary system to the pressurized irrigation system; this goal should be feasible.

  Lehi did not meet this goal by 2018. See Table 5. The difference in culinary water delivered compared to the metered ouflow is now up to 16.9% (14.5% w/o 2018). A new goal will be set to reduce the difference from ~ 17% down to 14% (or ~ 15% to 12%).

- **<u>2014 Goal # 4</u> – Improve the appearance of parks, building grounds, street landscapes, open spaces and yards.** Improved irrigation practices and water efficient landscapes can enhance the beauty of the City. Annual surveys of citizen attitudes will continue to measure satisfaction, or lack thereof, with landscapes on City-owned properties. For example, 2014 Table 6 shows the results of citizen satisfaction surveys for the past 2 years specifically in regards to landscaping on City roadways.

  In general, Lehi has met this goal by 2018, and will continue to enhance the appearance of City properties and facilities.

  2014 Table 6. Citizen Satisfaction Survey of Beautification & Landscaping on City Roadways

2012 Satisfaction = 3.53 / 5	2013 Satisfaction = 3.82 / 5

3 – CURRENT CONSERVATION PRACTICES

In order to solve the problems identified above and take advantage of the many associated opportunities, specific water conservation measures must be identified and evaluated. Lehi City has already implemented several water conservation measures; these, along with measures the City plans to improve upon and/or implement, should effectively address Lehi City's water problems. Both current conservation practices and improvements to be implemented are discussed in the following pages.

Lehi City's current water conservation program consists of a water conservation contingency plan, water education program for outdoor and indoor water use, meter replacement/leak detection and repair program, a "Smart Controller" technology system, and a landscape conservation program.

Water Shortage Management

The Lehi City Council adopted the "Water Shortage Management Plan – Resident Guide to Conserving Water" on March 11, 2014. The Plan spells out climate and political realities related to outdoor secondary water use during drought or other pressurized irrigation water supply shortages. However, there is concern that with a reduction in pressurized irrigation water use, there may be an increase in culinary outdoor water use.

Below is a reprint of the original letter to residents announcing the 2014 Water Shortage Management Plan.

LEHI CITY COUNCIL ADOPTS WATER SHORTAGE MANAGEMENT PLAN
Plan Aims to Help Residents and Businesses prepare for Coming Summer Months

Lehi, Utah – March 20, 2014 – On Tuesday, March 11, 2014 the Lehi City Council adopted the Lehi City Water Shortage Management Plan. The purpose of the plan is to protect and preserve public health, welfare, and safety in the event of a water shortage. The plan is part of an overall effort by the City to ensure that residents and businesses in the community are prepared for the upcoming summer months. The plan applies to the City's pressurized irrigation system, which is what residents and businesses use for lawn watering, car washing, and other outdoor activities.

One of the key aspects of the plan is a phased conservation system that implements enhanced conservation measures as the severity of a drought increases. City leaders hope that this will allow residents to use as much water as possible while balancing the need to conserve water in times of drought. Residents and businesses will be able to find which phase the City is under on the City's website, social media, newsletter, electronic marquees, and other City-owned communication platforms.

"Lehi City takes water conservation seriously, and we have made great efforts to get out ahead of water conservation need for the upcoming summer" said Lehi City Administrator Derek Todd. Todd continued, "We will be spending a lot of time informing residents and businesses about the City's water conservation standards both as the summer approaches and throughout the summer months. We will also focus on setting a good example as a City by ensuring that we are conserving as much water as possible in regards to our municipally-owned property."

Lehi residents and businesses are encouraged to contact the City offices with any questions they may have about water conservation. The Lehi City Water Shortage Management Plan can be found on the City's website at www.lehi-ut.gov.

Lehi City is committed to transparency and keeping the community informed. All media communications should be direct to the Public Information Office. The Lehi City Public Information Officer, Robert Ranc, can be reached at 801-814-0602, or email Robert at rranc@lehi-ut.gov. Follow us on Facebook or our Twitter handle, @LehiCity.

Lehi City – 153 North 100 East, Lehi Utah 84043 – www.lehi-ut.gov

The new Lehi City Public Information Officer and Assistant City Administrator is Cameron Boyle at 385-201-1000x226 or email Cameron at cboyle@lehi-ut.gov.

The actual 2018 Updated "Water Shortage Management Plan", which only applies to the City's pressurized irrigation system, is reprinted below with revisions in bolded italics and is also attached as Appendix C.

Water Shortage Management Plan

Resident Guide to Conserving Water – with June 2018 Revisions

What is the Water Shortage Management Plan?

The Lehi City Water Shortage Management Plan is intended to protect and preserve public health, welfare, and safety in the event of a water shortage. This plan augments and supports the Lehi City Water Conservation Plan and other relevant City ordinances.

It is important for any Lehi water user (municipal, commercial, and residential) to understand how to appropriately respond to a water shortage. This document explains how a water shortage is defined, what action should be taken by City administration and Lehi water users, and how the provisions will be enforced. The provisions of this plan apply to all persons, customers, and property utilizing water provided by the Lehi City Water Division.

~~Residents should be aware that in order to maintain level pressure throughout the pressurized irrigation system, some municipal property may need to be watered during prohibited hours in Phases II and III. Lehi City will make every effort to water municipal property during prohibited hours only to the extent necessary to ensure the proper operability of the pressurized irrigation system.~~

The complete Secondary Water System Conservation ordinance can be found in the municipal code, Chapter 13.28. Visit www.lehi-ut.gov/government/municipal-code for more information. If you have questions about the management plan, please contact our Lehi City Water Division at ***385-201-1700***

Water Shortage Phases

The Lehi City Water Division regularly monitors the level of City water sources. At the beginning of each month during the peak water usage season (June, July, August, and September), the Lehi City Water Division will use data collected internally, as well as data provided from external sources like the Provo River Water Users Association, to determine the drought condition in Lehi City. Based on the level of water, the Water Division will determine which water shortage phase will be implemented for the month.

The level and severity of water shortage has been categorized into three phases according to the level of water available. Each phase is labeled with a color to better illustrate when a respective phase is in effect. The three phases with their respective color are:

Phase I: Normal Water Condition (Green)
Phase II: Moderate Water Shortage (Yellow)
Phase III: Severe Water Shortage (Red)

Lehi City water users will be informed of which phase is in effect. Each phase includes voluntary and/or required conservation actions to provide clear guidance to water users on how to respond to water shortages. The next section provides detail on required actions for each phase of the management plan.

	Phase I	**Phase II**	**Phase III**
Lawn Watering	Voluntary	Mandatory	Mandatory
Hard-Surface Washing	Voluntary	***Voluntary***	Mandatory
Swimming Pools	Voluntary	Voluntary	***Voluntary***
Outdoor Fountains & Ponds	Voluntary	Voluntary	***Voluntary***
Washing Personal Vehicles	Voluntary	Voluntary	Voluntary
Recreation Sprinklers & Outdoor Water Toys	***Voluntary***	***Voluntary***	***Voluntary***

Water Shortage Response and Actions

Phase I: Normal Water Conditions

Water users are encouraged to follow responsible watering habits; however, Lehi City will not enforce water restrictions during Phase I. ***Common responsible watering practices recommend watering no more than twice a week in May and June, three times a week in July and August, and twice a week in September.***

Phase II: Moderate Water Shortage – ***Revised***

Water users may not use sprinkler irrigation on consecutive days. There must be at least one day in between water cycles. Residents may be exempt if they demonstrate the proper use of a smart controller.

Phase III: Severe Water Shortage – ***Revised***

Lawn Watering: ***Water users may not water more than two days a week. There must be at least two days in between watering cycles.***

Hard-Surface Washing: **No hard-surface washing, except for health or safety reasons.**

Residents may be exempt if they demonstrate the proper use of a smart controller.

Enforcement

In order to conserve water in times of water shortage and ensure that Lehi City can provide fire protection to its residents and businesses, the City has established a progressive enforcement strategy. Enforcement measures are intended to educate water users about proper water conservation and reserves punitive action for repeat violators.

First Violation: Hand-delivered written notice of violation and instructions on necessary corrective action.

Second Violation: $100 fine and a warning of actions consequent to a third violations. The violator may receive a full reimbursement of the fine by attending a water conservation seminar provided by Lehi City.

Third Violation: ***$500 fine***.

Exceptions are made for new lawns that require frequent irrigation within 30 days for establishment purposes. Exceptions are made for short cycles required for testing, inspecting, and maintaining irrigation systems.

Public Notification and Education

Notifying and educating Lehi City water users is vital to the success of the water management plan. As such, Lehi City will focus on notifying and educating the public through the following mechanisms:

Website, Social Media, etc. – The City will rely heavily on its website and social media platforms to communicate with the public regarding the plan. This includes notifying the public regarding the water shortage phases that are in effect, ways to better conserve water, educational information regarding the City's water system, etc.

Direct Email – The City will use its direct email system to notify Lehi water users regarding applicable water shortage and conservation information.

City Newsletter – Not all Lehi water users have access to and/or prefer communicating electronically. Thus, the City will supplement its communication efforts through its newsletter with applicable information including water shortage phases in effect, ways to better conserve water, educational information regarding the City's water system, etc.

City Marquees – The City will post the current water phase on its roadside marquees throughout the peak water usage months.

Direct Mail – When necessary, the City will use direct mail to notify Lehi water users of necessary water shortage and conservation measures. This step will only be taken when it is determined that all other methods of communication are insufficient based on specific circumstances.

The Lehi City Council has also adopted ORDINANCE No. 07-2014. This is "AN ORDINANCE AMMENDING CHAPTER 13.28 (SECONDARY WATER SYSTEM CONSERVATION) OF THE LEHI CITY CODE. The ordinance essentially replaced the previous "EXTRAORDINARY WATER CONSERVATION MEASURES" with the new "WATER SHORTAGE MANAGEMENT PLAN." A copy of the complete ordinance is given as Appendix D.

Water Education Program

The following information on efficient outdoor and indoor water use is available to the citizens of Lehi City through the City website and is occasionally disseminated with the water bill through the City newsletter. In April of 2008, the annual City Utility Fair was started to give an additional opportunity for City departments to advertise what they do for citizens. This tradition has continued and was most recently held during April 2019 at the Lehi Legacy Center. The Lehi City Water Systems Department has used this primarily as another way to educate participants about water conservation, for example, by handing out water conservation fliers.

Outdoor Water Use:

- Water landscape only as much as required by the type of landscape, and the specific weather patterns of your area, including cutting back on watering times in the spring and fall. We encourage our customers to utilize the weekly lawn watering guide located at www.conservewater.utah.gov.
- Group plants in terms of water need, and zone sprinkler systems accordingly.
- Encourage customers to alter parking strips by allowing more water-wise plantings, or eliminate vegetation in parking strips.
- Do not water on hot, sunny, and/or windy days. You may actually end up doing more harm than good to your landscape, as well as wasting a significant amount of water.
- Sweep sidewalks and driveways instead of using the hose to clean them off.
- Wash your car from a bucket of soapy (biodegradable) water and rinse while parked on or near the grass or landscape so that all the water running off goes to beneficial use instead of running down the gutter to waste.
- Check for and repair leaks in all pipes, hoses, faucets, couplings, valves, etc. Verify there are no leaks by turning everything off and checking your water meter to see if it is still running. Some underground leaks may not be visible due to draining off into storm drains, ditches, or traveling outside your property.
- Prevent leaks by winterizing your system no later than early November. Shut off the stop and waste valve to your sprinkler system and drain as needed.
- Use mulch around trees and shrubs, as well as in your garden to retain as much moisture as possible.
- Areas with drip systems will use much less water, particularly during hot, dry and windy conditions.
- Keep your lawn well-trimmed and all other landscaped areas free of weeds to reduce overall water needs of your yard.
- Since 2016, all new City PI connections and several existing large areas have meters installed (but are not billed yet). Eventually all PI connections will have meters.

Indoor Water Use:

About two-thirds of the total water used in a household is used in the bathroom. Concentrate on reducing your bathroom use. The following are suggestions to conserve indoor water.

- Do not use your toilet as a wastebasket. Put all **wipes**, tissues, wrappers, diapers, cigarette butts, etc. in the trashcan.
- Check the toilet for leaks. Is the water level too high? Put a few drops of food coloring in the tank. If the bowl water becomes colored without flushing, there is a leak.
- If you do not have a low volume flush toilet, put a plastic bottle full of sand and water to reduce the amount of water used per flush. However, be careful not to over conserve to the point of having to flush twice to make the toilet work. Also, be sure the containers used do not interfere with the flushing mechanism.
- Take short showers with the water turned on only as necessary. Turn the shower off while soaping up or shampooing. Install low flow showerheads and/or other flow restriction devices.
- Do not let the water run while shaving or brushing your teeth. Fill the sink or a glass instead.
- When doing laundry, make sure you always wash a full load or adjust the water level appropriately if your machine will do that. Most machines use 40 gallons or more for each load, whether it is two socks or a week's worth of clothes.
- Repair any leak within the household. Even a minor slow drip can waste up to 15 to 20 gallons of water a day.
- Know where your main shutoff valve is and make sure that it works. Shuting the water off yourself when a pipe breaks or a leak occurs will not only save water, but also eliminate or minimize damage to your personal property.
- To reduce the risk of freezing outside culinary water faucets connected to the home during winter months, shut off and disconnect hoses, then drain water from your hoses.
- If no heat will be on in your building during winter months, request that your water service be turned off during that time to prevent your pipes from freezing.
- Know which pipes are susceptible to freezing during winter months (those closest to outside walls, places where outside cold air can be felt, etc.). Either insulate outside walls near water pipes with thicker insulation, or wrap pipes with UL-approved heat tape.
- Keep a jar of water in the refrigerator for a cold drink instead of running water from the tap until it gets cold. Several glasses of water are going down the drain for one cold drink.
- Plug the sink when rinsing vegetables, dishes, or anything else; use only a sink full of water instead of continually running water down the drain.

4 – CURRENT PRICING STRUCTURE

Designing an appropriate rate schedule is a complex task. Rate design is a process of matching the costs of operating both the culinary and PI water systems to the unique economic, political and social environments in which the City provides these services. The cost of delivering these services must be evaluated and understood. Each water system has unique assets and constraints. Based on the characteristics of the City's systems, and past capital and operating costs, revenue requirements can be estimated.

City staff has estimated the cost of providing both treated and un-treated water services and proposed a rate schedule designed to cover such costs. The rate schedule shown in Table 8 has been adopted by the Lehi City Council, although a more aggressive conservation-oriented rate schedule could be created, the fee increases are likely to encourage more conscientious water use. Table 8 gives the four-year breakdown of the City's fee schedule for both culinary and secondary (pressurized irrigation) water.

Table 8. Lehi City's 4-Year Water Rates

Culinary Water Fee Information	**Approved FY 2017**	**Approved FY 2018**	**Proposed FY 2019**	**Proposed FY 2020**
Water Connection Fee:				
¾ " Meter	$401.80	$401.80	$401.80	$406.63
1 " Meter	$466.9	$466.90	$466.90	$465.86
1 ½ " Meter	$1447.97	$1447.97	$1447.97	$1490.61
2 " Meter	$1654.29	$1654.29	$1654.29	$1676.93
3 " Meter	$1960.47	$1960.47	$1960.47	$2011.34
4 " Meter	$3207.12	$3207.12	$3207.12	$3310.56
6 " Meter				$5542.59
8 " Meter				$9455.76
Water Impact Fee:				
Residential / dwelling unit	$1200	$1200	$1194.07	$1194.07
Non-Residential				
¾ " Meter	$1200	$1200	$1194.07	$1194.07
1 " Meter	$3246	$3246	$3184.19	$3184.19
1 ½ " Meter	$4048	$4048	$3980.23	$3980.23
2 " Meter	$12,898	$12,898	$12,737	$12,737
3 " Meter	$28,360	$28,360	$27,862	$27,862
4 " Meter	$48,624	$48,624	$50,151	$50,151
6 " Meter	$113,453	$113,453	$111,447	$111,447
8 " Meter	$194,497	$194,497	$191,051	$191,051
Water Service Charge:				
Residential				
Base rate / connection / month	$16.25	$16.25	$16.74	$17.24
per 1000 gallons used from 1 – 30,000 gallons	$1.09	$1.09	$1.12	$1.16
per 1000 gallons > 30,000 gallons	$2.18	$2.18	$2.25	$2.31
Commercial				
Base rate / connection / month	$16.25	$16.25	$16.74	$17.24
per 1000 gallons used	$1.09	$1.09	$1.12	$1.16
	Approved	**Approved**	**Proposed**	**Proposed**

PI Water Fee Information	FY 2017	FY 2018	FY 2019	FY 2020
PI Connection Fee:				
1 " Lateral	$466.90	$466.90	$466.90	$485.22
1 ½ " Lateral	$1110.96	$1110.96	$1110.96	$1954.86
2 " Lateral	$1258.43	$1258.43	$1258.43	$2025.55
3 " Lateral				$5195.12
4 " Lateral				$5217.90
6 " Lateral				$5887.77
8 " Lateral				$7672.42
10 " Lateral				$9079.94
PI Impact Fee:				
Residential (Single and Multi-Family) / acre (0.25 acre min)	$4270	$4270	$4378.63	$4378.63
Non-Resident/pervious(.25 ac min)	$6703	$6703	$6736.35	$6736.35
PI Service Charge:				
Base rate / connection / month	$2.14	$2.14	$5.00	$5.15
+ / sq ft of lot divided by 43560	$41.67	$41.67	$45.84	$47.21
Minimum / month charge	$10.47	$10.47	$14.17	$14.59
Pre-construction water permit base	$85	$85	$85	$85
+ / 1000 sq ft of lot	$1	$1	$1	$1
or + / lot (whichever is less)	$25	$25	$25	$25
Fire Hydrant Non-Metered Usage	$110	$110	$110	$110
Additional cost per lot (if > 1)	$25	$25	$25	$25
Metered Hydrant Permit Processing	$45	$45	$45	$45
(+ / Utility Sign-up Processing)	$30	$30	$30	$30
Fire Hydrant meter deposit	$1550	$1550	$1550	$1550
Base rate / metered fire hydrant connect / month	$4.14	$4.14	$4.14	$4.14
+ / 1000 gallons used	$0.80	$0.80	$0.80	$0.80
Minimum / month charge	$12.47	$12.47	$12.47	$12.47
Shareholder Charge base	$4.14	$4.14	$7.00	$7.21
+ / month / share	$5.84	$5.84	$6.42	$6.62
Penalty for violation of secondary water system conservation code				
First violation	Written notice	Written notice	Written notice	Written notice
Second violation	$100 or seminar	$100 or seminar	$100 or seminar	$100 or seminar
Third violation	$500 fine	$500 fine	$500 fine	$500 fine

This rate schedule is designed to encourage conservation by, 1) increasing the connection fees, 2) increasing the culinary base rate more than the secondary, and 3) increasing only slightly the minimum per month charge for secondary water users. Since the size of the pipe into a lot decides the potential demand on the water systems, increasing those fees encourages developers to construct and connect smaller pipe lines.

Additionally, the culinary base rate was increased more than the secondary water base rate, which will further encourage residents to adjust their sprinkler systems appropriately in the event of dry spots rather than using their hoses that are connected to their house's culinary system. Even with the minimum per month charge increase, secondary water base rate was decreased to encourage residents to use less water in order to maintain the amount they were charged in previous years.

5 – ADDITIONAL CONSERVATION MEASURES

In order to meet Lehi City's future water needs and solve all the water problems identified, both the improvements to the existing conservation measures discussed above and additional water conservation measures will be required. The additional water conservation measures include the 2018 Revised **Water Shortage Management Plan** for water conservation. Presently culinary water meters are gradually being installed at all City facilities. In the future, consideration will be given to using reclaimed or recycled water where feasible.

More Stringent Water Rate Structure

In the future it may be advisable or necessary to establish a more stringent water rate structure for Lehi City water, possibly for both culinary and secondary water. The City may want to provide additional price incentives for efficient water use, to show the customers (citizens) how much water is needed each month, and to provide funding for water conservation assistance and education. Water conservation programs could be paid by those who use water indiscriminately.

Meter Replacement, Leak Detection and Repair

Over time, all meters become less accurate in recording actual flows. This leads to lost revenue to the City and inaccurate data to citizens. Prior to 1999, Lehi City's culinary water meters were read twice per year. It was the responsibility of all Water Department employees to read the meters every six months. Each route consisted of ~ 250 meters and the process took three weeks to complete. Most of the meters at the time were 50+ years old and were no longer efficient.

During the fall of 1997 the process of replacing old meters with an automatic meter reading system began. This process was budgeted and completed five years later, at a cost of $233,000 per year. The new system has allowed all meters to be read on a monthly basis. By receiving high usage reports on a monthly basis, the City is able to detect water leaks and/or if a citizen is using a large amount of water for other reasons. The City also separated the meter reading into two cycles in order to ensure that staff would be available to quickly repair any broken meters or any water leaks. In order to ensure the highest performance in this regard, the City continually reviews and evaluates leaks and response times and goals for improvement. The City doesn't currently track and tabulate these services any more but will consider reinstating that practice.

A major improvement to the City water metering program has been in progress. A water use measuring radio unit is added to every water meter in the City. The SmartPoint M2 radio transceivers provide the City water department with water measurements and ancillary device diagnostics via radio signal. The SmartPoint M2 obtains hourly readings and can monitor continuous flow over a programmable period of time, alerting the City to leak conditions. In addition, the M2 stores up to 35 days of hourly consumption providing the City with the ability to extract detailed usage profiles for consumer information and dispute resolution.

The M2 also allows the City to connect multiple registers and ancillary devices. This results in a compact installation that saves time, space and money – without reducing system performance. By the end of 2019, the SmartPointM2 radios will be installed on 100% of all the City water meters. The cost for this radio unit placement on water meters is significant. Furthermore, the City is using the remote system with towers.

An advanced type of water meter has been installed on all new City water connections. This new meter is the Sensus iPERL Electromagnetic Flow Measurement System. This system has no moving parts, is based on innovative electromagnetic flow measurement technology, and has an operating range as low as 0.03 gpm to 55 gpm. The iPERL system far exceeds the most recent revision of ANSI/AWWA Standard for accuracy and pressure loss requirements. This patented measurement technology allows enhanced accuracy ranges at low and high flows and perpetual accuracy over the life of the product.

These advanced water meters have been installed on most large City areas, like schools and HOA's. They are also being installed on all new PI water connections, but PI water is still being charged at a flat rate. The City will eventually have water meters on all PI connections and will eventually use a rate structure to charge for PI water rather than using a flat rate. Irrigation (secondary) water metering is now a possibility because so-called "dirty water" meters are now available. This will be an effective approach to conserving irrigation water.

Improved Efficiency of Water Use at City Facilities (Both Treated and Untreated Water)

Water Use and Conservation at Lehi City Parks - Upgrading the Irrigation System

The City Parks Department is currently in the process of switching over all irrigation controllers to WeatherTRAK. WeatherTRAK is a cloud-based, smart irrigation controller that uses weather data from 45,000 weather stations to calculate an accurate evapotranspiration rate (ET) based off of 4 weather parameters; temperature, wind, solar radiation, and humidity. This accurate ET data determines how much water should be used on turf grass. Independent studies have shown that this controller can save between 16% and 59% on water use. WeatherTRAK also uses smart scheduling and flow monitoring to reduce water windows and wasted water due to line/head breaks. All other irrigation controllers that the city uses will be replaced by 2022.

Other irrigation controllers the city is currently using include Rain Master and Hunter IMMS central control systems. These give us the ability to have central control benefits, such as local and global adjustments, rain delays, and city-wide flow watch. Smaller streetscape applications utilize battery-powered Rainbird T-BOS Bluetooth controllers that have the ability to read soil moisture sensors as well as collect runtime data to further understand usage habits across the city. We have chosen WeatherTRAK to be a universal replacement because of its ability to calculate accurate ET data, instantaneous flow watching, a web-based central control platform that requires no further software upgrades, and a strong reputation for water savings.

Lehi Parks is also in the process of replacing all traditional spray nozzles with Hunter MP rotator nozzles. This project is set to be completed in 2020. MP nozzles have a slower application rate that is not only more efficient for low-pressure areas but also performs better in windy situations

due to a larger droplet size. Additionally, their slower application rate better matches the soil's percolation rate which reduces runoff and encourages deeper watering. This project has given us the opportunity to evaluate system efficiency and correct minor design flaws through water distribution audits. In addition to the MP rotator nozzles, all spray heads have been replaced with a pressure regulation and check valve style body. This prevents unnecessary drainage from the system after each irrigation cycle.

Higher Standards

The use of meters has been implemented into the city's new installations, and most existing parks are on the schedule to be retrofitted with usage meters. Great examples are Retrofitting at Gateway and Wines Parks, along with Ivory Ridge Detention Basin. This allows for better overall water management, allowing us to see water usage patterns and make adjustments accordingly.

Lehi Parks updated design standards in 2016 and is currently going through another revision. These updated standards for City-maintained properties use up-to-date irrigation design principles such as less turf grass in landscaped areas, including park strips, increased use of xeriscape areas, sound hydraulics, and more efficient irrigation layout.

Flow sensors and master valves are standard installation on all new City-maintained sites, allowing us to optimize the water windows, recognize failures in the irrigation system, and automatically shutting off the problem area until it can be resolved.

Secondary water filtration is used in the majority of our irrigated sites. This allows each system to operate at peak efficiency, reducing the chance of failure of smaller components such as nozzles, valves, and emitters. Cleaner water allows the system to operate as designed and as scheduled.

The Development Code has been revised in regards to water conservation for new development of commercial properties requiring the use of more drip-irrigated areas instead of grass, no turf grass in park strips, more trees in open space areas, and the use of rain sensors.

Trained Staff

Lehi Parks also achieves water conservation by hiring and investing in well-trained staff. Irrigation staff is required to certify and maintain certifications through accredited water-wise organizations, such as the Irrigation Association and QWEL. By doing this, water-wise habits are instilled in day-to-day operations. Staff that has developed and maintained expertise in irrigation BMP's are then included in all relevant meetings that influence water usage in the department.

Educating Residents

Lehi Parks also hopes to encourage water-wise landscape behavior in Lehi's residents by providing a sound example to follow. Lehi Parks puts on an annual irrigation demonstration to train the public on basic irrigation BMP's including topics such as, filtration, spacing, smart controllers, and the benefits of water-wise irrigation components.

Large Landscape Conservation Program

The City's landscape conservation program is designed for both water conservation and ease of maintenance. Over the past several years, City staff have designed and managed implementation of the "xeriscaping" design program in a number of areas including around City Hall and in front of the Water Department building. The design includes use of cobble rock and gravel, interwoven with areas of plantings within recycled heavy wood chips. The formal planting areas include a mix of shrubs, evergreens, shade trees and ornamental trees. Presently the City is xeriscaping at least 20% of any new park areas.

Transition areas are incorporated along the exterior of parks, along pathways, and/or in steeper areas through the use of meadow grasses and wildflowers. The formal planting areas are watered by a drip irrigation system and the more natural "transition" areas are watered by a shrub spray nozzle system. These are serviced from Lehi City's pressurized irrigation system. In support of this program, the Lehi Parks Master Plan has had the vast majority of the City's parks conceptually designed for increased water conservation and ease of maintenance associated with replacing Kentucky blue grass areas with "xeriscaping".

A few years ago, the Lehi City Planning Department made a presentation at a Lehi Water Conservation Work Session. This presentation is still appropriate and applicable this year. They suggested some possible conservation strategies using "xeriscaping". Their slides are shown below.

The first 2 slides discuss 'xeriscaping requirements' for both multi-family residential and commercial properties. They suggest possibly creating xeriscape area requirements of 10% to 20% for commercial, 40% for multi-family residential and 10% for single family residential. These are only suggested possible conservation strategies from the Lehi City Planning Department and are not recommendations or regulations.

The next 2 slides shown below discuss possible 'xeriscaping incentives and rebates' for both residential and commercial properties. As incentives, they suggest possible density bonus considerations for PUDs with xeriscaping in front yards. And allow commercial site design considerations such as reduced parking for xeriscaping. As rebates, they suggest a one-time credit or reduced water bill. Again, these are only suggested possible conservation strategies.

In order to ensure proper culinary water use and track peaks in water use due to potential leaks at City facilities, the City may need to install additional meters. The City could reduce out-of-pocket costs by having the City's water system technicians install these meters during slower time of their day or year.

Although the parks and new rights-of-way in the City are using the smart controller technology, the grounds around the City buildings are not completely set up. This technology senses soil moisture, precipitation and humidity for appropriate water application. In order to improve upon this program and to set an example for Lehi City citizens, the City should complete the process.

Education

In the past, Lehi City Water Department had two individuals who were volunteer water education officials. Their opportunity was to talk with Lehi citizens about the use and misuse of water in the City. The following list presents some questions and answers these officials would talk about. This program is no longer being implemented.

WATER – WHERE ARE WE? WHERE COULD WE BE?

1. Some questions
1.1 What water conservation rules? What water shortage?
1.2 Why do I have to follow City water conservation rules that City agencies don't follow?
1.3 I own water shares. Why do I have to follow the City's rules?
1.4 How can we be short of water? Ponds are full, water's flowing in ditches and Jordan River.
1.5 I pay for water all year; I only use a few months. Can't I use all I need / want?
1.6 You are telling me I can't use water? That pasture / orchard / etc. is my livelihood.

2. A Clear and Concise Message
2.1 What is the message?
2.1.1 We have two kinds of water.
2.1.1.1 Culinary (drinking) water is tested, treated and used inside the house / business.
2.1.1.2 Secondary (irrigation) water is used for all exterior uses except swimming pools.
2.1.2 We have enough water IF we use it wisely.
2.1.2.1 Each year there are more of us & seemingly less water. We need to be smarter each year.
2.2 How does this matter to me? Why do I care?
2.2.1 Working together we can *slow the flow* and still have green and productive surroundings.
2.2.2 Carefully following the Phase II plan will likely avoid the more painful Phase III plan.
2.2.3 Phase IV is not mentioned. All irrigation must cease to preserve water for fire suppression. No one wants this. This is when lawns go brown, gardens die, shrubs and trees are damaged

3. Close the perceived loopholes
3.1 The Water Shortage Management Plan brochure and the Ordinance DO address:
3.1.1 Lawn Watering – Sprinkler Irrigation
3.1.2 Hard-Surface Washing
3.1.3 Swimming Pools
3.1.4 Outdoor Fountains and Ponds
3.1.5 Washing Personal Vehicles
3.2 They DO NOT address:
3.2.1 Use of culinary water outdoors (if the faucet is on the house, it is culinary water)
3.2.2 Lawn Irrigation – Non Sprinkler System Irrigation such as flood irrigation
3.2.3 Garden Irrigation
3.2.4 Field / Orchard / Pasture Irrigation – Private / Commercial
3.2.5 Industrial Use
3.3 The Violation Notice DOES NOT mention:
3.3.1 Culinary usage outdoors
3.3.2 Broken lines / sprinklers

4. Getting the word out
4.1 "Public Notification and Education"
4.1.1 "Website, Social Media, etc." (On the City website the message is "below the fold")
4.1.2 "Direct Email"
4.1.3 "City Newsletter"
4.1.4 "City Marquees" – I have not seen anything on the marquees?
4.1.5. "Direct Mail" - With the water bill?
4.2 Folks that do not get the messages
4.2.1 Tenants – the landlord pays for the secondary water
4.2.2 Auto-payers
4.2.3 Move-ins
4.2.4 The Complacent
4.3 Confusion / Ignorance
4.3.1 Media coverage from other communities that have different restrictions?
4.3.2 How can there be a shortage when the Jordan River is flowing, there is water in the ditches, and City agencies are not all following the restrictions?
4.3.3 What do you mean a hose bib mounted on the house is on the culinary system?

More Education

Educating residents and businesses that irrigate landscapes to use water more efficiently will enhance the likelihood that our water use goals will be met. In addition to the methods in which the City is currently educating residents, the Parks Department has a program designed to give specific irrigation and landscaping recommendations based on the time of year.

The City Parks staff helps citizens learn how to use their sprinklers effectively, which plants will most effectively save water, how to use fertilizers effectively, and all kinds of water conservation advice. Lehi Parks utilizes the information provided by Utah State University Extension Service for "Turfgrass Water Use in Utah" which is given as Appendix F.

Additionally, the City publishes and distributes an Annual Water Quality Report (Consumer Confidence Report – CCR). In the CCR, the City always includes secondary and culinary water conservation tips. This is part of the City's education program for protecting and conserving our valuable water supply. The 2016, 2017 and 2018 Annual Water Quality Reports (CCRs) are given as Appendix E.

Furthermore, the City educates by example through continuing to expand the amount of xeriscaping to replace existing Kentucky blue grass areas as well as through xeriscaping future unimproved land. Benefits and costs of a strong education program are difficult to enumerate but are tracked and accounted for as they unfold.

Responsible Departments and Persons Meet and Work Together

To insure the goals outlined in this plan are reached, appropriate tasks must be determined, responsibility fixed with the logical persons or departments, and a time line set for completion of each task. These appropriate people should regularly meet to discuss goals and report on progress to the City Administrators. These responsible persons would also be charged with responding to contingencies that may arise as well as proposing additional strategies to achieve the goals set forth in this plan, as the availability of additional City resources potentially become available.

Water Recycling

During the construction of the basement of the City Hall addition, it was realized that the groundwater table was higher than originally anticipated. As such, a couple of sump pumps were installed. The groundwater from these pumps has been piped to a water feature and small pond that were landscaped into the east side of the building. In the event that an act is passed that would allow the City to use the groundwater, the infrastructure has been installed whereby the water accumulated into the pond would then be used to water the drought-tolerant plantings and limited turf that has since been installed.

The water recycling portion of this project would also serve as a good example for the City's citizens to follow, given that the residents who live in the area of the City just north of Utah Lake have a relatively high groundwater table as well. With the help of the Resource Conservation Committee, the City will continue to look for and encourage additional opportunities to implement this water conservation measure where feasible.

6 – COST ANALYSIS

Initially, Lehi City will strive to reach **Goal #1** to reduce the City's culinary per capita use rate by ~ 6 percent in five years; from ~ 64 gpcd to ~ 60 gpcd. The short-term and long-term benefits of reaching this goal are discussed below. This discussion is followed by how this water conservation plan will be implemented and updated.

Benefits of Reaching Goal #1:

The simplified result of an effective program to boost the efficiency with which water is used in the City (a reduction of ~ 6 percent in per capita culinary water use) is shown in Table 9 below. Benefits are measured as the savings accruing to the City due to reduced water purchased over the 5 years; 2019 thru 2023.

Table 9. Long-Term Benefits of Culinary Water Conservation Program

Culinary		**Future Use Without Conservation**				**Future Use With Conservation**		
Year	Population	Purchased Water (AF)	Cost** $/AF	Total Cost	gpcd	Purchased Water (AF)	Total Cost	gpcd
2018	62,710*	4496	320	$1,438,700	64	4496	$1,438,720	64
2019	65,182	4673	330	1,540,279	64	4615	1,521,026	63.2
2020	67,654	4850	339	1,646,659	64	4729	1,605,493	62.4
2021	70,127	5028	350	1,758,035	64	4839	1,692,109	61.6
2022	72,599	5205	360	1,874,612	64	4945	1,780,881	60.8
2023	75,071	5382	371	1,996,601	64	5046	1,871,814	60
2024	77,543	5559	382	2,124,222	64	5212	1,991,459	60
2025	80,015	5737	394	2,257,704	64	5378	2,116,598	60
2026	82,488	5914	405	2,397,283	64	5544	2,247,453	60
2027	84,960	6091	418	2,543,204	64	5710	2,384,254	60
2028	87,432	6268	430	2,695,724	64	5877	2,527,241	60
2029	89,904	6446	443	2,855,105	64	6043	2,676,661	60
2030	92,376	6623	456	3,021,624	64	6209	2,832,772	60
2031	94,848	6800	470	3,195,563	64	6375	2,995,841	60
2032	97,321	6977	484	3,377,220	64	6541	3,166,144	60
2033	99,793	7155	499	3,566,900	64	6707	3,343,969	60
2034	102,265	7332	514	3,764,922	64	6874	3,529,614	60
2035	104,737	7509	529	3,971,614	64	7040	3,723,388	60
2036	107,209	7686	545	4,187,320	64	7206	3,925,613	60
2037	109,682	7864	561	4,412,394	64	7372	4,136,619	60
2038	112,154	8041	578	4,647,203	64	7538	4,356,753	60
2039	114,626	8218	595	4,892,130	64	7704	4,586,372	60
2040	117,098	8395	613	5,147,570	64	7871	4,825,847	60
Grand Totals		148,249		$69,312,590		139,870	$65,276,619	

*assuming linear population growth from 62,710 in 2018 to 141,820 in 2050

**assuming 3% / year increase in water cost

If the City can reduce the average culinary water use rate from ~ 64 gpcd to ~ 60 gpcd or about 6 percent, and maintain it for ~ 18 years, until 2040, over $4 million ($4,035,971 = $69,312,590 - $65,276,619) will be saved by purchasing 8379 (148,249 – 139,870) acft less water (Table 9).

Cost of Reaching Goal #1 and Goal #3:

The net increase in costs incurred to achieve the benefit of goal #1 is mainly the cost of educating the water users and reducing the gpcd from 64 to 60 gpcd. The cost to achieve the benefit of goal #3 is mostly associated with the future purchase and installation of culinary water meters at the City facilities. However, some money in labor costs can be saved by doing the work in-house.

Benefit of Reaching Goal #2:

Similar to the benefit of reaching Goal #1, a reduction of about 5 percent per capita pressurized irrigation water use is shown below in Table 10. Benefits are measured as the savings accruing to the City due to reduced PI (secondary) water purchased over the 5 years 2019 thru 2023.

Table 10. Long-Term Benefits of Pressurized Irrigation Water Conservation Program

Press. Irrigation		**Future Use Without Conservation**				**Future Use With Conservation**		
Year	Population	Purchased Water (AF)	Cost** $/AF	Total Cost	gpcd	Purchased Water (AF)	Total Cost	gpcd
2018	62,710*	14,050	160	$2,247,968	200	14,050	$2,247,968	200
2019	65,182	14,604	165	2,406,687	200	14,458	2,382,620	198
2020	67,654	15,158	170	2,572,905	200	14,854	2,521,447	196
2021	70,127	15,711	175	2,746,930	200	15,240	2,664,522	194
2022	72,599	16,265	180	2,929,081	200	15,615	2,811,918	192
2023	75,071	16,819	185	3,119,689	200	15,978	2,963,705	190
2024	77,543	17,373	191	3,319,098	200	16,504	3,153,143	190
2025	80,015	17,927	197	3,527,663	200	17,031	3,351,280	190
2026	82,488	18,481	203	3,745,755	200	17,557	3,558,467	190
2027	84,960	19,035	209	3,973,757	200	18,083	3,775,069	190
2028	87,432	19,589	215	4,212,068	200	18,609	4,001,465	190
2029	89,904	20,142	221	4,461,102	200	19,135	4,238,047	190
2030	92,376	20,696	228	4,721,287	200	19,662	4,485,223	190
2031	94,848	21,250	235	4,993,068	200	20,188	4,743,415	190
2032	97,321	21,804	242	5,276,907	200	20,714	5,013,061	190
2033	99,793	22,358	249	5,573,282	200	21,240	5,294,618	190
2034	102,265	22,912	257	5,882,690	200	21,766	5,588,556	190
2035	104,737	23,466	264	6,205,647	200	22,292	5,895,365	190
2036	107,209	24,020	272	6,542,688	200	22,819	6,215,553	190
2037	109,682	24,574	281	6,894,365	200	23,345	6,549,647	190
2038	112,154	25,127	289	7,261,255	200	23,871	6,898,192	190
2039	114,626	25,681	298	7,643,953	200	24,397	7,261,755	190
2040	117,098	26,235	307	8,043,078	200	24,923	7,640,924	190
Grand Totals		463,277		$108,300,921		442,331	$103,255,958	

*assuming linear population growth from 62,710 in 2018 to 141,820 in 2050
**assuming 3% / year increase in water cost

If the City can reduce the average pressurized irrigation water use rate from ~ 200 gpcd to ~ 190 gpcd, or about 5 percent, and maintain it for 18 years, until 2040, over $5 million ($5,044,963 = $108,300,921 - $103,255,958) will be saved by purchasing 20,946 (463,277 – 442,331) acre-feet less water (see bottom Table 10).

Cost of Reaching Goal #2:

The net increase in costs incurred to achieve the benefit associated with achieving the PI water conservation goal is mostly associated with the cost of expanding the smart controller technology for the grounds surrounding all of the City facilities.

Cost of Reaching Goal #4:

Although xeriscaping costs more upfront, the net increase in upfront cost is recovered by the decrease in maintenance costs and water use costs over time (estimated at about a 4-5 year pay back). As such, the ability to achieve Goal #4 will be largely dependent on finances. However, in order to lessen the upfront cost and speed up implementation to the extent possible, the City will continue to identify small-scale xeriscaping projects to be implemented with in-house labor.

Based on the calculations and estimations in Tables 8 and 9, it appears that the amount of culinary water which will be needed by Lehi City in 2040 is ~ 7871 acre-feet with the proposed conservation and ~ 8395 acre-feet without the proposed conservation, a difference of 524 acft. The amount of secondary water needed in 2040 will be ~ 24,923 acft with the proposed conservation and ~ 26,235 acft without the proposed conservation, a difference of 1312 acft.

7 – IMPLEMENTING AND UPDATING THE WATER CONSERVATION PLAN

The City Administrator has authorized the Water Systems Superintendent, Gary Thomas to have the responsibility for providing oversight and direction for the measures outlined in this plan. Other City staff will be responsible, under the guidance of the Water System Superintendent, to carry out the necessary task within the appropriate time constraints.

This Water Conservation Plan (WCP) was placed on the City Council agenda and adopted by the City Council on December 10, 2019. The City Council is comprised of:

Mark Johnson, Mayor
Paige Albrecht, Council Member
Chris Condie, Council Member
Paul Hancock, Council Member
Johnny Revill, Council Member
Michael Southwick, Council Member

The WCP will be revised and updated as required to meet changing conditions and needs. This Plan will also be updated and resubmitted to the Utah Division of Water Resources in 2024, as required by legislative House Bill 153. The approved resolution for the WCP is attached as Appendix A.

LEHI CITY

RESOLUTION NO. 2019-75

A RESOLUTION OF LEHI CITY PERTAINING TO THE READOPTION OF A WATER CONSERVATION PLAN.

WHEREAS, Lehi City operates both a culinary and pressurized irrigation water system; and

WHEREAS, the City Council understands the pressing need to use both indoor and outdoor water uses in a more efficient manner to allow for future sustained growth of the community; and

WHEREAS, the plan will be amended at least every five years and will continue to play a vital role in the future development of Lehi City, Utah.

THEREFORE, BE IT RESOLVED, the Water Conservation Plan of Lehi City, adopted on the 24th day of March, 1999, first revised on the 27th day of April, 2004, revised again on the 8th day of December, 2009, revised again on the 26th day of August 2014, and revised again on the 10th day of December 2019, is hereby readopted.

Approved and Adopted by the City Council of Lehi City this 10th day of December, 2019.

Mark Johnson, Mayor

ATTEST

Teisha Wilson, City Recorder

CORPORATE SEAL OF LEHI CITY
STATE OF UTAH

APPENDIX B

LEHI CITY WELLS, SPRINGS & DRAINS WATER RIGHTS ACQUIRED AFTER 1978

LEHI CITY - WATER RIGHT INFORMATION			
Water Right Numbers	**Approved MD**	**Quantity (AF)**	**Water Use Type**
54-55, 87, 93, 118, 133, 138, 262	a42413 July 2017	486.80	Municipal
55-169, 7664, 12657	a40179 Jan 2015	21.05	Municipal
55-203	a39178 Jan 2014	2.78	Municipal
55-273, 596	a32299 Oct. 2007	87.70	Municipal
55-276, 406, 459, 2711, 2714, 3735, 3933, 4001, 4002, 6817, 8844, 8845	a40271 March 2015	134.03	Municipal
55-302, 526, 705, 1970, 3745, 3746, 3747	a17243 March 1995	70.00	Municipal
55-381	a42350 Nov 2017	4.90	Municipal
55-477, 619, 784, 2237, 2238, 2735, 2755, 7849, 12706, 12707, 12739, 12818	a42812 Dec 2917	164.70	Municipal
55-501, 2176, 2725, 2729	a39950 May 2017	8.93	Municipal
55-521, 650, 798, 1788, 9536, 9537, 9538	a29879 Dec. 2005	94.41	Municipal
55-562	a31005 Sept 2006	40.00	Municipal
55-567	a22936 May 1999	6.02	Municipal
55-581, 4709, 6107	a19725 Dec. 1996	5.21	Municipal
55-618, 990, 993, 1255, 2311, 2312, 2927, 3299, 3300, 3301, 12232	a30965 Aug. 2006	231.90	Municipal
55-637, 3723	a36180 March 2010	12.00	Municipal
55-676, 5461, 6207	a43042 Dec 2017	19.08	Municipal
55-682, 753, 12642	a40075 January 2015	15.32	Municipal
55-709, 7888, 12999		11.00	Irrigation
55-756	a34148 July 2008	549.01	Municipal
55-776, 789, 1303, 4421		47.00	Irrigation
55-779	a23576 March 2000	100.00	Municipal
55-783, 1003	a40528 May 2015	122.76	Municipal

55-829, 1813, 9053	a30895 Oct. 2006	47.10	Municipal
55-857	a42942 Jan 2018	1.28	Municipal
55-865, 8192	a22608 May 1999	78.32	Municipal
55-867, 3583	a26651 Jan. 2003	2.80	Municipal
55-880, 962	a38795 July 2013	11.99	Municipal
55-1075, 7615		398.00	Irrigation
55-1086	a37622 Nov 2011	2.36	Municipal
55-1117		1.10	Domestic and Irrigation
55-1383, 2593, 3545, 3546, 4240, 7815, 7820, 7821, 7822, 7823, 7824, 7825, 7826, 7985, 7986, 7987, 7988	a32506 Jan 2009	927.97	Municipal
55-1436, 4418, 8056	a22244 Nov. 1998	256.56	Municipal
55-1458	a32093 Feb 2007	36.00	Municipal
55-1581, 8269, 12034	a29976 April 2009	8.57	Municipal
55-1814, 1815, 9440	a23632 Oct. 1999	41.46	Municipal
55-1937, 2706, 4734, 4752, 8332	a41893 July 2017	5.06	Municipal
55-1972, 2935, 2936, 3920	a40559 July 2015	41.06	Municipal
55-2179	a41176 Dec.2016	15.00	Municipal
55-2182	a30944 Aug. 2006	1.45	Municipal
55-2183, 3748, 3749, 8693	a38020 April 2013	28.24	Municipal
55-2248, 6963, 6984, 8678, 13032, 13033		9.00	Domestic and Irrigation
55-2707	a41683 Sept 2016	1.61	Municipal
55-2710	a30566 Dec. 2005	18.50	Municipal
55-2728, 2732, 2733, 2734, 2785, 12114	a30446 Dec. 2005	104.92	Municipal
55-2740, 2825, 9173	a28526 Aug 2005	113.50	Municipal
55-2957	a38021 Aug 14	3.85	Municipal
55-2962	a38569 April 2013	0.76	Municipal
55-3307	a40980 Nov 2015	40.00	Municipal
55-3348, 5512	a32072 Jan 2008	19.44	Municipal
55-3446	a40927 Oct 2015	1.99	Municipal
55-3447		3.00	Irrigation
55-3589, 9027, 9515	a24322 Nov. 2000	37.00	Municipal
55-3849	a22935 May 1999	1.25	Municipal
55-4006	a19396 April 1996	80.00	Municipal
55-4040	a41682 Aug 2016	8.45	Municipal

55-4063, 9065, 12200, 12350, 12351, 12352	a34307 Feb. 2009	44.32	Municipal
55-4170	a42811 Oct. 2017	96.06	Municipal
55-4236	a33429 Feb. 2008	2.41	Municipal
55-4392, 9644	a26279 April 2002	14.56	Municipal
55-4572	a21281 March 1998	1.65	Municipal
55-6092, 6113	a32479 Dec. 2007	3.03	Municipal
55-6470	A26632e March 2009	192.00	Municipal
55-6534	a41227 Feb 2016	1.65	Municipal
55-6884	a22762 Oct. 1999	5.42	Municipal
55-6921, 6942	a39179 Jan 2014	370.16	
55-6925		221.00	Irrigation
55-7616		1.00	Irrigation
55-7623		4.00	Stock
55-7794	a39949 Dec 2015	96.00	Municipal
55-7952, 7953, 12241, 12242	a32507 Feb. 2009	28.20	Municipal
55-8281, 8282, 8283	a28742 June 2004	37.42	Municipal
55-8861	a21717 Feb. 1998	4.73	Municipal
55-8878	a44417 June 2019	17.50	Municipal
55-8940	a19826 Jan. 2019	1,124.00	Municipal
55-9069	a20046 Jan. 1997	3.00	Municipal
55-9101	a19988 Sept 1996	523.64	Municipal
55-9107	a20020 Sept 1996	148.20	Municipal
55-9108	a20021 Sept. 1996	98.80	Municipal
55-9109	a20022 Sept. 1996	74.10	Municipal
55-9186	a20789 Oct. 1997	14.00	Municipal
55-9220	a21783 May 1998	99.02	Municipal
55-9224	a21188 Sept. 1997	503.36	Municipal
55-9233	a21327 Dec. 1997	50.20	Municipal
55-9243	a21453 Jan 1998	333.96	Municipal
55-9253	a21578 Dec. 1998	31.48	Municipal
55-9254	a21243 Nov. 1997	82.10	Municipal
55-9263	a21611 Dec. 1997	121.00	Municipal
55-9270	a21778 April 1999	4.84	Municipal
55-9285	a22214 Oct. 1998	14.52	Municipal
55-9319	a22101 July 1998	251.68	Municipal
55-9379	a22876 March 1999	201.47	Municipal
55-9390	a23027 March 2000	208.12	Municipal
55-9396	a23106 May 1999	341.22	Municipal

55-9404, 9442	a23154 July 1999	101.64	Municipal
55-9410	a23246 March 2000	4.00	Municipal
55-9426	a23642 Nov 1999	89.54	Municipal
55-9449	a23671 Oct. 1999	232.32	Municipal
55-9473	a23899 March 2000	79.86	Municipal
55-9511	a24340 June 2000	217.80	Municipal
55-9514, 9534, 9535	a24317 Oct. 2000	40.82	Municipal
55-9527	a23715 Aug. 2000	170.05	Municipal
55-9569, 8039, 8038, 8108	a25180 Oct. 2001	2,563.00	Municipal
55-9571	a29781 Oct. 2005	53.00	Municipal
55-9581	a25446 April 2002	314.60	Municipal
55-9661 (also see1383)	a34142 March 2009 (623.41 af)	73.41	Municipal
55-9672	a27272 March 2003	1.13	Municipal
55-9679	a29780 Oct. 2005	30.00	Municipal
55-9710	a27257 Feb. 2003	1.35	Municipal
55-12111	a30444 Nov. 2005	27.25	Municipal
55-12118	a32050 July 2007	1.50	Municipal
55-12134	a30798 March 2006	38.36	Municipal
55-12144	a30973 July 2006	729.81	Municipal
55-12173, 12174	a30767 April 2006	32.36	Municipal
55-12222	a32198 Jan. 2008	257.01	Municipal
55-12240	a32535 Dec. 2007	89.10	Municipal
55-12305	a34230 Nov. 2008	551.88	Municipal
55-12723	a41095 Feb 2016	25.60	Municipal
55-12867	a43074 Feb 2017	11.76	Municipal
55-12921	a44032 Dec 2018	3.61	Municipal
	Total:	15,692.78	
LEHI CITY MAJOR WELLS & SPRING WATER RIGHTS PRIOR to 1978			
Water Right #		**Quantity (AF)**	**Use**
55-739		2,434.00	Municipal
55-4119		1,187.00	Municipal
55-4296		796.00	Municipal
55-5828		2,161.00	Municipal
55-6579		1,943.00	Municipal
55-7192		3,240.00	Municipal
	Total:	11,761.00	

LEHI CITY OWNERSHIP IN IRRIGATION COMPANYS AND WATER DISTRICTS (w/o a Change Application)			
Company		**Quantity w/Losses (AF)**	
American Fork		249.00	Irrigation
CUP Water		30.00	Municipal
CUP Water		1,145.00	Municipal
CWP (CUWCD)		2,500.00	Municipal
Highland WCD		781.00	Irrigation
Lehi		6,380.00	Irrigation
Spring Creek		1,321.00	Irrigation
Mitchell Hollow		371.00	Irrigation
North Bench		1,120.00	Irrigation
PRWU (Full)		100.00	Irrigation
PRWU (Late)		263.00	Irrigation
PRWU (Deer Creek)		425.00	Irrigation
	Total:	14,685.00	
SUMMARY OF ABOVE DATA			
	Other Well etc WR:	15,692.78	
	Original WR:	11,761.00	
	Irr/District WR:	14,685.00	
	TOTAL ALL WR:	**42,138.78**	

APPENDIX C

Water Shortage Management Plan –

Resident Guide to Conserving Water

With June 2018 Revisions

Water Shortage Management Plan

Resident Guide to Conserving Water

LEHI CITY

PIONEERING UTAH'S FUTURE

Prsrt Std
US POSTAGE
PAID
Orem, Utah
Permit#1010

ECRWSS

What is the Water Shortage Management Plan?

The Lehi City Water Shortage Management Plan is intended to protect and preserve public health, welfare, and safety in the event of a water shortage. This plan augments and supports the Lehi City Water Conservation Plan and other relevant city ordinances.

It is important for any Lehi water user (municipal, commercial, and residential) to understand how to appropriately respond to a water shortage. This document explains how a water shortage is defined, what action should be taken by city administration and Lehi water users, and how the provisions will be enforced. The provisions of this plan apply to all persons, customers, and property utilizing water provided by the Lehi City Water Division.

The complete Secondary Water System Conservation ordinance can be found in the municipal code, Chapter 13.28. Visit www.lehi-ut.gov/government/municipal-code for more information. If you have questions about the management plan, please contact our Water Division at (385) 201-1700.

Water Shortage Phases

The Lehi City Water Division regularly monitors the level of city water sources. At the beginning of each month during the peak water usage season (June, July, August, and September), the Lehi City Water Division will use data collected internally, as well as data provided from external sources like the Provo River Water Users Association, to determine the drought conditions in Lehi City. Based on the level of water, the Water Division will determine which water shortage phase will be implemented for that month.

The level and severity of water shortage has been categorized into three phases according to the level of water available. Each phase is labeled with a color to better illustrate when a respective phase is in effect. The three phases with their respective color are:

Phase I: Normal Water Condition (Green)
Phase II: Moderate Water Shortage (Yellow)
Phase III: Severe Water Shortage (Red)

Lehi City water users will be informed of which phase is in effect. Each phase includes voluntary and/or required conservation actions to provide clear guidance to water users on how to respond to water shortages. The next section provides detail on required actions for each phase of the management plan.

	Phase I	Phase II	Phase III
Lawn Watering	Voluntary	Mandatory	Mandatory
Hard-Surface Washing	Voluntary	Voluntary	Mandatory
Swimming Pools	Voluntary	Voluntary	Voluntary
Outdoor Fountains & Ponds	Voluntary	Voluntary	Voluntary
Washing Personal Vehicles	Voluntary	Voluntary	Voluntary
Recreation Sprinklers & Outdoor Water Toys	Voluntary	Voluntary	Voluntary

Water Shortage Response and Actions

PHASE I: NORMAL WATER CONDITION

Water users are encouraged to follow responsible watering habits; however, Lehi City will not enforce water restrictions during Phase I. Common responsible watering practices recommend watering no more than twice a week in May and June, three times a week in July and August, and twice a week in September.

PHASE II: MODERATE WATER SHORTAGE

Revised

Water users may not use sprinkler irrigation on consecutive days. There must be at least one day in between water cycles. Residents may be exempt if they demonstrate the proper use of a smart controller.

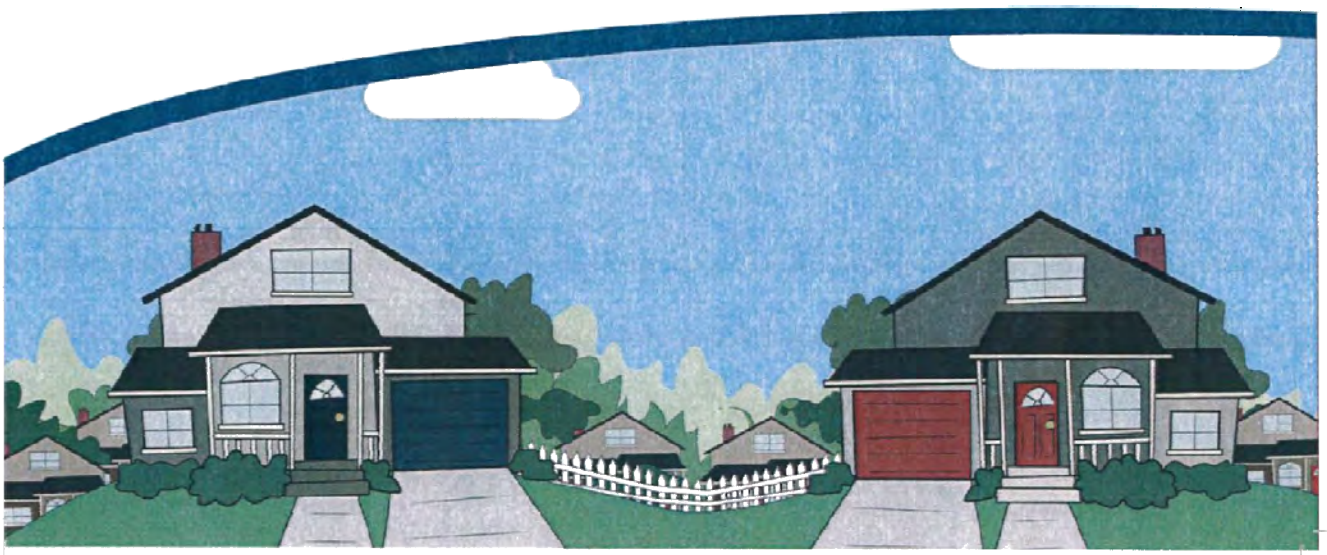
PHASE III: SEVERE WATER SHORTAGE

Revised

Lawn Watering: Water users may not water more than two days a week. There must be at least two days in between watering cycles.

Hard-Surface Washing: No hard-surface washing, except for health or safety reasons.

Residents may be exempt if they demonstrate the proper use of a smart controller.



APPENDIX D

LEHI CITY

ORDINANCE NO: 50-2018

AN ORDINANCE AMENDING CHAPTER 9-2C (SECONDARY WATER SYSTEM CONSERVATION) OF THE LEHI MUNICIPAL CODE

WHEREAS to adapt to changes in the secondary water system supply and implement best practices in conservation measures, it is necessary to amend Chapter 9-2C of the Lehi Municipal Code;

WHEREAS, on June 12, 2018, the Municipal Council held a duly-noticed public meeting to ascertain the facts regarding this matter, which facts and comments are found in the meeting record; and

WHEREAS, after considering the facts and comments presented to the Municipal Council, the Council finds: (i) Chapter 9-2C of the Lehi City code should be amended as set forth in Exhibit "A"; and (ii) such action furthers the health, safety and welfare of the citizens of Lehi.

NOW, THEREFORE, IT IS ORDAINED by the City Council of Lehi City, Utah, as follows:

PART I:

Chapter 9-2C is hereby amended and adopted as shown on the attached Exhibit "A."

PART II:

A. If a provision of this Ordinance 50-2018 conflicts with a provision of a previously adopted ordinance concerning the same title, chapter, and/or section number amended herein, the provision in this Ordinance shall prevail.

B. This ordinance and its various section, clauses and paragraphs are hereby declared to be severable. If any part, sentence, clause or phrase is adjudged to be unconstitutional or invalid, the remainder shall not be affected thereby.

C. The Municipal Council hereby directs that the official copy of the Lehi City Code be updated to reflect the provisions enacted by this Ordinance.

D. This Ordinance shall take effect immediately after being posted or published as required by law.

Approved and adopted by the Lehi City Council this 12th day of June, 2018.

ATTEST

Mark Johnson, Mayor

Marilyn Banasky, City Recorder

EXHIBIT "A"

ARTICLE C. SECONDARY WATER SYSTEM CONSERVATION

9-2C-1: WASTE OF WATER PROHIBITED:

A. Definitions: Waste of water from the secondary water system shall include, but not be limited to:

1. The use of water for any purpose, including landscape irrigation, which is wasteful as determined by the water department, which includes the application of substantial amounts of excess water beyond the reasonable amount required by the use, whether such excess water remains on the site, evaporates, percolates underground, goes into the storm drain system, or is allowed to run into the gutter or street. Every water consumer is deemed to have under his control at all times the water lines and facilities, other than water utility facilities, through which water is being supplied and used to his premises, and to know the manner and extent of his water use and excess runoff.

2. The excessive use, loss or escape of water through breaks, leaks or malfunctions in the water user's plumbing for any period of time after such escape of water should reasonably have been discovered and corrected. It shall be presumed that a period of forty eight (48) hours after the water user discovers such break, leak or malfunction or receives notice from the city of such condition, whichever occurs first, is a reasonable time to correct such condition.

B. Waste Prohibited: Waste of water from the secondary water system is prohibited. (Ord. 05-28-02.29, 5-14-2002)

9-2C-2: WATER SHORTAGE MANAGEMENT PLAN:

A. Declaration Of Policy, Purpose And Intent: The Lehi City water shortage management plan (hereafter referred to as the "plan") is intended to augment and support the Lehi City water conservation plan, as well as relevant ordinances. The primary purpose of the plan is to protect and preserve public health, welfare and safety, as well as minimize the adverse impacts of a water shortage. The plan will also provide clarity to elected officials, city staff, and city residents as to the appropriate actions to take in the event of water shortages.

B. Application: The provisions of this plan shall apply to all persons, customers and property utilizing water provided by the city water division.

C. Pressurized Irrigation Water Sources: The city receives its pressurized irrigation water from the following sources:
Lehi City wells
Central Utah Water
Local irrigation company shares

Deer Creek storage
Miscellaneous sources

D. Determination Of Water Shortage Phases: The city water division regularly monitors the level of city water sources. During the peak water usage season (May, June, July, August and September), the city water division will use data collected internally, as well as data provided from external sources like the Provo River Water Users Association, to determine the drought conditions in the city. Based on the level of water, the water division will determine which water shortage phase will be implemented for that month. The water shortage phases are defined as follows:

Water level at 75% to 100% of capacity: Green

Water level at 50% to 74% of capacity: Yellow

Water level at 49% or below of capacity: Red

E. Phase Responses: To help provide city water users (municipal, commercial and residential) with appropriate clarity regarding how to respond to water shortages, the following phase system has been created. Each phase is labeled with a color to better illustrate when a respective phase is in effect. City water users will be informed of which phase is in effect in accordance with section IX of the plan. The following is a summary of what actions are taken in each phase.

Phase I - Normal Water Condition (Green)
Trigger: Phase I will be in effect when water levels are at seventy-five percent (75%) to one hundred percent (100%) of capacity.

Required actions: While phase I is in effect, water users are encouraged to follow responsible watering habits, Common responsible watering practices recommend watering no more than twice a week in May and June, three times a week in July and August, and twice a week in September,
but there will be no enforcement of water restrictions by the city.

Phase II - Moderate Water Shortage (Yellow)
Trigger: Phase II will be in effect when water levels are at fifty percent (50%) to seventy-four percent (74%) of capacity.

Required actions:

Lawn watering: Sprinkler irrigation is prohibited on consecutive days.~~is permitted only on Monday, Wednesday and Friday for properties with odd numbered city or county street addresses. Sprinkler irrigation is permitted only on Tuesday, Thursday and Saturday for properties with even numbered city or county street addresses. Spot watering is allowed on Sunday for all city or county street addresses.~~

~~Hard surface washing: No hard surface washing (except for health or safety).~~

Phase III - Severe Water Shortage (Red)
~~Trigger: Phase III will be in effect when water levels are at forty nine percent (49%) or below of capacity.~~

Required actions:
Lawn watering: Sprinkler irrigation is limited to no more than two days a week on non-consecutive days.~~permitted only on Monday and Friday for properties with odd numbered city or county street addresses. Sprinkler irrigation is permitted only on Tuesday and Saturday for properties with even numbered city or county street addresses. Spot watering is allowed on Sunday for all city or county street addresses.~~

~~Swimming pools: Use pool covers when pools are not in use and lower the water level by four inches (4") to reduce water loss by splashing.~~

~~Outdoor fountains and ponds: Water may not spray above fountain or pond surface.~~

~~Hard surface washing:~~ No hard surface washing (except for health or safety).

~~Washing personal vehicles: Use a bucket or a positive pressure nozzle on the end of any hose. Wash the vehicle on the lawn or a permeable surface.~~

~~Recreational sprinklers and outdoor water toys: Recreational sprinklers and outdoor water toys, including those using culinary water sources, are prohibited.~~

~~WATER PHASES AND REQUIRED ACTIONS~~

-	~~Phase I Green~~	~~Phase II Yellow~~	~~Phase III Red~~
~~Lawn watering: See above for actions corresponding with each phase.~~	~~Voluntary~~	~~Mandatory~~	~~Mandatory~~
~~Swimming pools: See above for actions corresponding with each phase.~~	~~Voluntary~~	~~Voluntary~~	~~Mandatory~~
~~Outdoor fountains and ponds: See above for actions corresponding with each phase.~~	~~Voluntary~~	~~Voluntary~~	~~Mandatory~~

~~Hard surface washing: See above for actions corresponding with each phase.~~	~~Voluntary~~	~~Mandatory~~	~~Mandatory~~
~~Washing personal vehicles: See above for actions corresponding with each phase.~~	~~Voluntary~~	~~Voluntary~~	~~Mandatory~~
~~Recreational sprinkler and outdoor water toys: See above for actions corresponding with each phase.~~	~~Voluntary~~	~~Voluntary~~	~~Prohibited~~

F. Municipal Use Conservation Strategy: The city recognizes the need to act as an example to the community with regards to water conservation, especially in times of water shortage. To this end, the city will focus on conserving municipal water uses by focusing on the following areas:

Supply	
	Filtration maintenance
	Flow meters
	Valve maintenance
	Sprinkler heads
Evaporation rate	
	Plant species and related variables
	Cultural practice
	Water quality
	Environment above and below ground (climate factors include temperature, solar radiation, humidity and wind velocity)
Cultural practices	
	Mowing heights of three inches (3")
	Sharp mowing blades - sharpen weekly
	Core aeration - spring and early fall
	Slice aeration - as needed throughout the year (compaction issues)
	Overseeding using drought tolerant rye and tall fescue seed varieties
	Top dress using angular sands to maintain porosity (air/gas exchange)

	Nutrient support - N, P, K and Fe established through soil samples
	Amend soils - aggressive, long term mitigation program (amend pH levels, heavy clays/sands, etc.)
Development regulations	
	Create policies to encourage the use of xeriscape on new commercial and multi-family residential projects, such as allowing design exceptions, reduced parking requirements, etc.
	Consider policies to incentivize xeriscape on existing and new single-family residential projects, including density bonuses in PUDs/PRDs, rebates for turf removal, pressurized irrigation bill reduction, etc.
	Create better xeriscape design standards that provide for variety and aesthetic appeal in landscape designs and discourage "zeroscape".

G. Public Notification And Education: Notifying and educating city water users is vital to the success of the plan. As such, the city will focus on notifying and educating the public through the followings mechanisms:

Website, social media, etc.: The city will rely heavily on its website and social media platforms to communicate with the public regarding the plan. This includes notifying the public regarding the water shortage phases that are in effect, ways to better conserve water, educational information regarding the city's water system, etc.

Direct e-mail: The city will use its direct e-mail system to notify city water users regarding applicable water shortage and conservation information.

City newsletter: Not all city water users have access to and/or prefer communicating electronically. Thus, the city will supplement its communication efforts through its newsletter with applicable information, including water shortage phases in effect, ways to better conserve water, educational information regarding the city's water system, etc.

City marquees: The city will post the current water phase on its roadside marquees throughout the peak water usage months.

Direct mail: When necessary, the city will use direct mail to notify city water users of necessary water shortage and conservation measures. This step will only be taken when it is determined that all other methods of communication are insufficient based on specific circumstances. (Ord. 27-2015, 4-28-2015)

9-2C-3: ENFORCEMENT, PENALTY FOR VIOLATIONS:

A. Enforcement Strategy: In order to ensure that the city is able to conserve water in times of water shortage and provide fire protection to its residents and businesses, it is imperative that the city deploy an effective enforcement strategy. The enforcement of water conservation measures outlined in this plan are intended to be progressive in nature, with a focus on educating water users about proper water conservation and reserving punitive action for repeat violators.

B. Enforcement Authority: The city and its designees (the "city") are authorized to enforce the provisions of this article.

C. Violations Of This Article And Penalties:

1. Violations shall be administered in compliance with the civil infraction procedures described in title 7, chapter 3 of this code.

2. First violation: Hand delivered written notice of violation and information regarding how to take corrective action.

3. Second violation: One hundred dollar ($100.00) fine. Violator will have the option to attend an educational seminar (individually or in a group) provided by the city for further education regarding the city's water conservation requirements and ways to conserve water. The violator will have the one hundred dollar ($100.00) fine reimbursed by attending the seminar. The violator will be warned of actions consequent to a third violation.

4. Third violation and each consecutive violation: Five hundred dollar ($500.00) fine.

Exceptions are made for new lawns that require frequent irrigation for establishment purposes for thirty (30) days after installation or planting. Exceptions are also made for short cycles required for testing, inspecting and maintaining irrigation systems. (Ord. 27-2015, 4-28-2015)

APPENDIX E

Lehi City Annual Water Quality Report (Consumer Confidence Report – CCR)

for years 2016, 2017 and 2018

Protect our water!

We at Lehi City work around the clock to provide top quality water to every tap. We ask that all our customers help us protect our water sources, which are the heart of our community, our way of life and our children's future.

Lehi City Water Dept.
PWS ID #25015

LEHI CITY
PIONEERING UTAH'S FUTURE

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US Postage
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Permit 1010

ECRWSS

Lehi City Resident

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PIONEERING UTAH'S FUTURE

Lehi Water

LEHI CITY WATER DEPARTMENT

2016 Annual
Water Quality Report

In the following table you will find many terms and abbreviations you might not be familiar with. To help you better understand these terms we've provided the following definitions:

Non-Detects (ND) - Laboratory analysis indicates that the constituent is not present.
ND/Low - High - For water systems that have multiple sources of water, the Utah Division of Drinking Water has given water systems the option of listing the test results of the constituents in one table, instead of multiple tables. To accomplish this, the lowest and highest values detected in the multiple sources are recorded in the same space in the report table.
Parts per million (ppm) or Milligrams per liter (mg/l) - One part per million corresponds to one minute in two years or a single penny in $10,000.
Parts per billion (ppb) or Micrograms per liter (ug/l) - One part per billion corresponds to one minute in 2,000 years, or a single penny in $10,000,000.
Parts per trillion (ppt) or Nanograms per liter (nanograms/l) - One part per trillion corresponds to one minute in 2,000,000 years, or a single penny in $10,000,000,000.
Picocuries per liter (pCi/L) - Picocuries per liter is a measure of the radioactivity in water.
Nephelometric Turbidity Unit (NTU) - Nephelometric turbidity unit is a measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.
Action Level (AL) - The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Maximum Contaminant Level (MCL) - The "Maximum Allowed" (MCL) is the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.
Maximum Contaminant Level Goal (MCLG) - The "Goal"(MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.
Date - Because of required sampling time frames i.e. yearly, 3 years, 4 years and 6 years, sampling dates may seem out-dated.

Arsenic. Some people who drink water containing arsenic in excess of the MCL over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of getting cancer.

While your drinking water meets EPA's standard for arsenic, it does contain low levels of arsenic. EPA's standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. EPA continues to research the health effects of low levels of arsenic which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

All sources of drinking water are subject to potential contamination by constituents that are naturally occurring or man made. Those constituents can be microbes, organic or inorganic chemicals, or radioactive materials. All drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline at 1-800-426-4791.

Some people who drink water containing thallium in excess of the MCL over many years could experience hair loss, changes in their blood, or problems with their kidneys, intestines, or liver.

MCLs are set at very stringent levels. To understand the possible health effects described for many regulated constituents, a person would have to drink 2 liters of water every day at the MCL level for a lifetime to have a one-in-a-million chance of having the described health effect.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Lehi is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the safe Drinking Water Hotline or at http://www.epa.gov/safewater /lead.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbiological contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

Interesting Water Information

- Water is the most common substance found on Earth. However, 97% of the world's water is salty or otherwise undrinkable. An other 2% is locked in ice caps and glaciers. That leaves just 1% for consumption by all living creatures, including plants and animals.
- With access to just 5 liters of water each day, more than a billion people in the water poor regions around the globe survive on the same amount used to flush a toilet or take a 5 minute shower.
- Collectively, South African women and children walk a daily distance equivalent to 16 trips to the moon and back to get water.
- The average American pays just 25 cents per day for clean drinking water.
- About 6,800 gallons of water is required to grow a day's food for a family of four.
- 780 million people lack access to an improved water source.
- Unsafe water kills 200 children every hour.
- It requires 120 gallons of water for one egg.
- 70% of the human brain is water.
- In Nairobi urban poor pay 10 times more for water than in New York.
- 1 pound of wheat requires 132 gallons of water.
- Refilling a half-liter water bottle 1,740 times with tap water is the equivalent cost of a 99 cent water bottle at a convenience store.
- 1 pound of chicken requires 468 gallons of water.
- The average family of four uses 180 gallons of water per day outdoors. It is estimated that over 50% is wasted from evaporation, wind, or overwatering.
- If the entire world's water were fit into a 4 liter jug, the fresh water available for us would equal only about one tablespoon.
- If everyone in the US used just one less gallon of water per shower every day, we could save some 85 billion gallons of water per year.
- In a 100-year period, a water molecule spends 98 years in the ocean, 20 months as ice, about 2 weeks in lakes and rivers, and less than a week in the atmosphere.
- A small bag of peanut M&M's requires 300 gallons of water to produce.
- One broken sprinkler head could waste up to 25,000 gallons of water over a 6 month irrigation season.
- Lehi City used 4.4 billion gallons of secondary water last year.

TEST RESULTS							
Contaminant	Violation Y/N	Level Detected ND/Low-High	Unit Measurement	MCLG	MCL	Date Sampled	Likely Source of Contamination
MICROBIOLOGICAL CONTAMINANTS							
Total Coliform Bacteria	N	0	N/A	0	Presence of coliform bacteria in 5% of monthly samples	2016	Naturally present in the environment
Turbidity for Ground Water	N	0.05-2.1	NTU	N/A	5	2016	Soil runoff
INORGANIC CONTAMINANTS							
Arsenic	N	ND-3	ppb	0	10	2016	Erosion of natural deposits; runoff from orchards; runoff from glass and electronics production wastes
Barium	N	65-247	ppb	2000	2000	2016	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Copper a. 90% results b. # of sites that exceed the **AL**	N	A. 132 b.0	ppm	1300	AL=1300	2015	Corrosion of household plumbing systems; erosion of natural deposits
Lead a. 90% results b. # of sites that exceed the **AL**	N	a. 2 b. 0	ppb	15	AL=15	2015	Corrosion of household plumbing systems, erosion of natural deposits
Fluoride	N	200-400	ppb	4000	4000	2016	Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories
Nitrate (as Nitrogen)	N	ND-2	ppm	10	10	2016	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Selenium	N	ND-10	ppb	50	50	2016	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines
Sodium	N	5-42	ppm	500	None set by EPA	2016	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills.
Sulfate	N	5-48	ppm	1000	1000	2016	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills, runoff from cropland
Thallium	N	ND-ND	ppt	1	2000	2016	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories
TDS (Total Dissolved solids)	N	90-344	ppm	2000	2000	2016	Erosion of natural deposits
DISINFECTION BY-PRODUCTS							
TTHM [Total trihalomethanes]	N	ND-43	ppb	0	80	2016	By-product of drinking water disinfection
Haloacetic Acids	N	ND-25	ppb	60	60	2016	By-product of drinking water disinfection
Chlorine	N	200	ppb	4000	4000	2016	Water additive used to control microbes
RADIOACTIVE CONTAMINANTS							
Alpha emitters	N	ND-8.2	pCi/l	0	15	2016	Erosion of natural deposits
Combined	N	0.67	pCi/l	0	5	2016	Erosion of natural deposits
Radium 226	N	0.1	pCi/l	0	5	2016	Erosion of natural deposits
Radium 228	N	ND-1.3	pCi/l	0	5	2016	Erosion of natural deposits

Lehi City Water Quality Report 2016

We're pleased to present to you this year's Annual Drinking Water Quality Report. This report is designed to inform you about the quality of the water and services we deliver to you every day. Our constant goal is to provide you with a safe and dependable supply of drinking water. We want you to understand the efforts we make to continually improve the water treatment process and protect our water resources. We are committed to ensuring the quality of your water. Our water sources have been determined to be from five wells and a spring. They provide groundwater. We also utilize as a source the Central Utah Water Conservancy District.

The Drinking Water Source Protection Plan for Lehi City is available for your review.

It contains information about source protection zones, potential contamination sources and management strategies to protect our drinking water. Our sources have been determined to have a low level of susceptibility from potential contamination from sources such as agricultural operations, residential pesticides and herbicides, and residential wastewater disposal systems. We have also developed management strategies to further protect our sources from contamination. Please contact us if you have questions or concerns about our source protection plan.

There are many connections to our water distribution system. When connections are properly installed and maintained, the concerns are very minimal. However, unapproved and improper piping changes or connections can adversely affect not only the availability, but also the quality of the water. A cross connection may let polluted water or even chemicals mingle into the water supply system when not properly protected. This not only compromises the water quality but can also affect your health. So, what can you do? Do not make or allow improper connections at your homes. Even that unprotected garden hose lying in the puddle next to the driveway is a cross connection. The unprotected lawn sprinkler system after you have fertilized or sprayed is also a cross connection. When the cross connection is allowed to exist at your home, it will affect you and your family first. If you'd like to learn more about helping to protect the quality of our water, call us for further information about ways you can help.

If you have any questions about this report or concerning your water utility, please contact Lehi City Water at 385-201-1700. We want our valued customers to be informed about their water utility. If you want to learn more, please attend any of our regularly scheduled meetings. They are held on the second and fourth Tuesday of each month at 153 North 100 East in the City Administration Building Council Room at 7pm. Mayor Bert Wilson and council members Paige Albrecht, Chris Condie, Paul Hancock, Johnny Revill and Mike Southwick will be in attendance.

Lehi routinely monitors for constituents in our drinking water in accordance with the Federal and Utah State laws. The following table shows the results of our monitoring for the period of January 1st to December 31st, 2016. All drinking water, including bottled drinking water, may be reasonably expected to contain at least small amounts of some constituents. It's important to remember that the presence of these constituents does not necessarily pose a health risk. .

As per Lehi City ordinance culinary water is not to be used for any outside watering.

Herbicides and Pesticides

When using herbicides:

- Store in a safe place that children can't get in to.
- Never mix chemicals in street, gutter, sidewalk or driveway, or any area where rinsing into storm drains or ditches is a possibility.
- Mix on an impermeable surface so spills can be cleaned up.
- Measure total square feet and use only amount needed.
- Follow label instructions for mixing proper amount and strength.
- Treat only area that is needed, no need to overuse chemical.
- Clean up spills and dispose of any extra chemical properly by following manufacturer instructions.

When using pesticides:

- Be willing to accept a low level of weed, insect, and plant disease infestation.
- Use pesticides only when absolutely necessary.
- Identify pests correctly and use proper pesticide.
- Read and follow label directions – the label is the law.
- Calibrate spreader/sprayer to keep from applying too much.
- Don't over water after application.
- Store chemicals in a dry, locked cabinet away from children and pets. Proper storage, mixing, spill cleanup, watering, and disposal procedures are essential in protecting our environment.

Culinary Conservation Tips

- Take 5 minute showers instead of baths and save up to 1,000 gallons of water per month.
- When washing hands turn water off while lathering.
- Plug the sink instead of running the water to rinse razors.
- Soak pots and pans instead of letting water run while scraping clean.
- Put left over ice cubes in house plants.
- Drop tissues in trash instead of flushing.
- Designate one glass for drinking water each day, or refill a water bottle to cut down on the number of glasses to wash.
- When buying new appliances, consider cycle and load size adjustments which are more water and energy efficient.

Secondary Water Conservation Tips

1. In almost all circumstances, plants tolerate or prefer variations in soil moisture which means it is fine for soil to dry out moderately between irrigations.
2. Don't rely on timer or controller to irrigate lawns on a set schedule. Instead, determine when lawn actually requires irrigation and manually activate the system as needed. Relatively dry soil under the grass is hard, does not give when stepped on and is slightly uncomfortable to walk on. Wetter soil depresses a bit when weight is applied to it.
3. Don't water between 10 a.m. and 6 p.m. since 50% of water emitted from sprinklers is lost to evaporation. Instead, irrigate when the sun is down or low in the sky.
4. Small areas of lawn can brown out during hot weather because of variations and inefficiencies in sprinkling systems. Supplement water to the area with a small lawn sprinkler or water by hand.
5. Mow lawn at a height of 3 to 3-1/2 inches to allow roots to penetrate deeper into the soil and increase drought hardiness of turf.
6. When irrigating turf, water long enough for the water to penetrate 6 to 12 inches into the soil. This also encourages deeper root development and reduces the frequency of required irrigations.
7. Irrigate shady and sunny areas according to need. Shady areas only require irrigation every 10 days or so. Sunnier areas may only require watering every 5-7 days.
8. Cover bare soil in the garden and flower beds with 2-3 inches of mulch. This saves water and greatly reduces weeding.
9. Hand-water or use drip irrigation to irrigate flowerbeds, vegetable gardens and shrub beds. Water should be placed near plants and penetrate the soil 6 inches deep for flowers and veggies. Water should penetrate 2 feet into the soil for established trees and shrubs.

Protect our water!

We at Lehi City work around the clock to provide top quality water to every tap. We ask that all our customers help us protect our water sources, which are the heart of our community, our way of life and our children's future.

Lehi City Water Dept.
PWS ID #25015

LEHI CITY
PIONEERING UTAH'S FUTURE

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Lehi Water

LEHI CITY WATER DEPARTMENT

2017 Annual Water Quality Report

LEHI CITY
PIONEERING UTAH'S FUTURE

In the following table you will find many terms and abbreviations you might not be familiar with. To help you better understand these terms we've provided the following definitions:

Non-Detects (ND) - Laboratory analysis indicates that the constituent is not present.

ND/Low - High - For water systems that have multiple sources of water, the Utah Division of Drinking Water has given water systems the option of listing the test results of the constituents in one table, instead of multiple tables. To accomplish this, the lowest and highest values detected in the multiple sources are recorded in the same space in the report table.

Parts per million (ppm) or Milligrams per liter (mg/l) - One part per million corresponds to one minute in two years or a single penny in $10,000.

Parts per billion (ppb) or Micrograms per liter (ug/l) - One part per billion corresponds to one minute in 2,000 years, or a single penny in $10,000,000.

Parts per trillion (ppt) or Nanograms per liter (nanograms/l) - One part per trillion corresponds to one minute in 2,000,000 years, or a single penny in $10,000,000,000.

Picocuries per liter (pCi/L) - Picocuries per liter is a measure of the radioactivity in water.

Millirems per year (mrem/yr) - Measure of radiation absorbed by the body.

Million Fibers per Liter (MFL) - Million fibers per liter is a measure of the presence of asbestos fibers that are longer than 10 micrometers.

Nephelometric Turbidity Unit (NTU) - Nephelometric turbidity unit is a measure of the clarity of water. Turbidity in excess of 5 NTU is just noticeable to the average person.

Action Level (AL) - The concentration of a contaminant which, if exceeded, triggers treatment or other requirements which a water system must follow.

Maximum Contaminant Level (MCL) - The "Maximum Allowed" (MCL) is the highest level of a contaminant that is allowed in drinking water. MCLs are set as close to the MCLGs as feasible using the best available treatment technology.

Maximum Contaminant Level Goal (MCLG) - The "Goal"(MCLG) is the level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

Maximum Residual Disinfectant Level (MRDL) - The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfectant Level Goal (MRDLG) - The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

Date- Because of required sampling time frames i.e. yearly, 3 years, 4 years and 6 years, sampling dates may seem out-dated.

Arsenic. Some people who drink water containing arsenic in excess of the MCL over many years could experience skin damage or problems with their circulatory system, and may have an increased risk of getting cancer.

While your drinking water meets EPA's standard for arsenic, it does contain low levels of arsenic. EPA's standard balances the current understanding of arsenic's possible health effects against the costs of removing arsenic from drinking water. EPA continues to research the health effects of low levels of arsenic, which is a mineral known to cause cancer in humans at high concentrations and is linked to other health effects such as skin damage and circulatory problems.

All sources of drinking water are subject to potential contamination by constituents that are naturally occurring or man made. Those constituents can be microbes, organic or inorganic chemicals, or radioactive materials. All drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that the water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the Environmental Protection Agency's Safe Drinking Water Hotline at 1-800-426-4791.

Some people who drink water containing thallium in excess of the MCL over many years could experience hair loss, changes in their blood, or problems with their kidneys, intestines, or liver.

MCLs are set at very stringent levels. To understand the possible health effects described for many regulated constituents, a person would have to drink 2 liters of water every day at the MCL level for a lifetime to have a one-in-a-million chance of having the described health effect.

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. Lehi is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. EPA/CDC guidelines on appropriate means to lessen the risk of infection by cryptosporidium and other microbiological contaminants are available from the Safe Drinking Water Hotline (800-426-4791).

The bathroom is where most of the home's water is used and the place where you can save the most

- Don't use your toilet for a garbage disposal or a trash can.
- Consider installing a low-flow toilet.
- Install a water-saving displacement device.
- For older toilets, buy or make a device that won't harm your plumbing such as a toilet dam or weighted plastic jug full of water.
- Be sure that installation does not interfere with operating parts.
- Don't use a brick – it may disintegrate and cause problems.
- Check overflow pipes to be sure that water is not draining.
- Add dark food coloring to tank water. Don't flush. Check water in toilet bowl 15-20 minutes later. Color in the toilet bowl means you have a leak.

TEST RESULTS							
Contaminant	Violation Y/N	Level Detected ND/Low-High	Unit Measurement	MCLG	MCL	Date Sampled	Likely Source of Contamination
MICROBIOLOGICAL CONTAMINANTS							
Total Coliform Bacteria	N	0	N/A	0	Presence of coliform bacteria in 5% of monthly samples	2016	Naturally present in the environment
Turbidity for Ground Water	N	0.05-2.1	NTU	N/A	5	2016	Soil runoff
INORGANIC CONTAMINANTS							
Arsenic	N	ND-3	ppb	0	10	2016	Erosion of natural deposits; runoff from orchards; runoff from glass and electronics production wastes
Barium	N	65-247	ppb	2000	2000	2016	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Copper a. 90% results b. # of sites that exceed the **AL**	N	A. 132 b.0	ppm	1300	AL=1300	2015	Corrosion of household plumbing systems; erosion of natural deposits
Lead a. 90% results b. # of sites that exceed the **AL**	N	a. 2 b. 0	ppb	15	AL=15	2015	Corrosion of household plumbing systems, erosion of natural deposits
Fluoride	N	200-400	ppb	4000	4000	2016	Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories
Nitrate (as Nitrogen)	N	ND-2	ppm	10	10	2016	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Selenium	N	ND-10	ppb	50	50	2016	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines
Sodium	N	5-42	ppm	500	None set by EPA	2016	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills.
Sulfate	N	5-48	ppm	1000	1000	2016	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills, runoff from cropland
Thallium	N	ND-ND	ppt	1	2000	2016	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories
TDS (Total Dissolved solids)	N	90-344	ppm	2000	2000	2016	Erosion of natural deposits
DISINFECTION BY-PRODUCTS							
TTHM [Total trihalomethanes]	N	ND-43	ppb	0	80	2016	By-product of drinking water disinfection
Haloacetic Acids	N	ND-25	ppb	60	60	2016	By-product of drinking water disinfection
Chlorine	N	200	ppb	4000	4000	2016	Water additive used to control microbes
RADIOACTIVE CONTAMINANTS							
Alpha emitters	N	ND-8.2	pCi/l	0	15	2016	Erosion of natural deposits
Combined	N	0.67	pCi/l	0	5	2016	Erosion of natural deposits
Radium 226	N	0.1	pCi/l	0	5	2016	Erosion of natural deposits
Radium 228	N	ND-1.3	pCi/l	0	5	2016	Erosion of natural deposits

Lehi City Water Quality Report 2017

We're pleased to present to you this year's Annual Drinking Water Quality Report. This report is designed to inform you about the quality of the water and services we deliver to you every day. Our constant goal is to provide you with a safe and dependable supply of drinking water. We want you to understand the efforts we make to continually improve the water treatment process and protect our water resources. We are committed to ensuring the quality of your water. Our water sources have been determined to be from five wells and a spring. They provide groundwater. We also utilize as a source the Central Utah Water Conservancy District.

The Drinking Water Source Protection Plan for Lehi City is available for your review.

It contains information about source protection zones, potential contamination sources and management strategies to protect our drinking water. Our sources have been determined to have a low level of susceptibility from potential contamination from sources such as agricultural operations, residential pesticides and herbicides, and residential wastewater disposal systems. We have also developed management strategies to further protect our sources from contamination. Please contact us if you have questions or concerns about our source protection plan.

There are many connections to our water distribution system. When connections are properly installed and maintained, the concerns are very minimal. However, unapproved and improper piping changes or connections can adversely affect not only the availability, but also the quality of the water. A cross connection may let polluted water or even chemicals mingle into the water supply system when not properly protected. This not only compromises the water quality but can also affect your health. So, what can you do? Do not make or allow improper connections at your homes. Even that unprotected garden hose lying in the puddle next to the driveway is a cross connection. The unprotected lawn sprinkler system, after you have fertilized or sprayed, is also a cross connection. When the cross connection is allowed to exist at your home, it will affect you and your family first. If you'd like to learn more about helping to protect the quality of our water, call us for further information about ways you can help.

If you have any questions about this report or concerning your water utility, please contact Lehi City Water at 385-201-1700. We want our valued customers to be informed about their water utility. If you want to learn more, please attend any of our regularly scheduled meetings. They are held on the second and fourth Tuesday of each month at 153 North 100 East in the City Administration Building Council Room at 7 p.m. Mayor Mark Johnson and council members Paige Albrecht, Chris Condie, Paul Hancock, Johnny Revill and Mike Southwick will be in attendance.

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As per Lehi City ordinance culinary water is not to be used for any outside watering.

Herbicides and Pesticides

When using herbicides:

- Store in a safe place that children can't get in to.
- Never mix chemicals in the street, gutter, sidewalk or driveway, or any area where rinsing into the storm drains or ditches is a possibility.
- Mix on an impermeable surface so spills can be cleaned up.
- Measure the total square feet to be treated and use only the amount needed.
- Read the label and follow instructions for mixing the proper amount and strength.
- Treat only the area that is needed, there is no need to overuse the chemical.
- Clean up spills and dispose of any extra chemical properly by following the manufacturer instructions.

When using pesticides:

- Be willing to accept a low level of weed, insect, and plant disease infestation.
- Use pesticides only when absolutely necessary.
- Identify pests correctly and then use the proper pesticide.
- Read and follow label directions – the label is the law.
- Calibrate spreader/sprayer to keep from applying too much.
- Don't over water after application.
- Store chemicals in a dry, locked cabinet away from children and pests. Proper storage, mixing, spill cleanup, watering, and disposal procedures are essential in protecting our environment.

You can have a successful vegetable garden with only watering two days a week

By watering properly and developing strong roots, you can have a great lawn and garden. Check out these tips to ensure smart water consumption and a bountiful harvest.

- Amend your soil. Adding organic matter, particularly compost, will give better root penetration, greater water retention in your soil, as well as many other beneficial effects.
- Focus on spring crops such as carrots, beets, radishes, lettuce, etc. They can be planted very early and take advantage of spring moisture, and may not need to be watered much at all.
- Use a 3 to 4 inch layer of mulch around all your plants. This will suppress weeds that compete for moisture and nutrients. It will also keep your soil cool and moist by insulating it from sun and drying winds. You will realize increased soil fertility and better structure as well with using organic mulches. Even moisture conditions provided by mulch will also lessen the likelihood of gardening problems such as cracking or blossom end rot on tomatoes.
- Use drip systems or hand water judiciously. Drippers are extremely efficient, and if utilized with timers, will save you time as well as water.
- Water in the evening or at night. This will minimize evaporation and put the water to work growing your plants.
- Plant in wide rows or blocks. This will minimize open areas between plants, allow plants to shade the soil, and increase the ratio of plants to soil allowing for more efficient utilization of water, and your garden space.
- Pull those weeds! Weeds compete for light, nutrients and especially for water.
- Choose drought resistant plants – squash, potatoes, tomatoes, corn, snap and pole beans, New Zealand spinach, eggplant, chard, etc.
- Plant plants with similar water requirements together. This allows you to water efficiently using drip-lines that can be configured with different emitters or spacing to put the right amount of water into each hydro zone to ensure neither over or under-watering plants with different water requirements.
- Protect your garden from drying prevailing winds. Our winds come from the West in summer (southwest). Fences, hedges, the leeward side of the house are all good windbreak areas to plant.

Protect our water!

We at Lehi City work around the clock to provide top quality water to every tap. We ask that all our customers help us protect our water sources, which are the heart of our community, our way of life and our children's future.

Lehi City Water Dept.
PWS ID #25015

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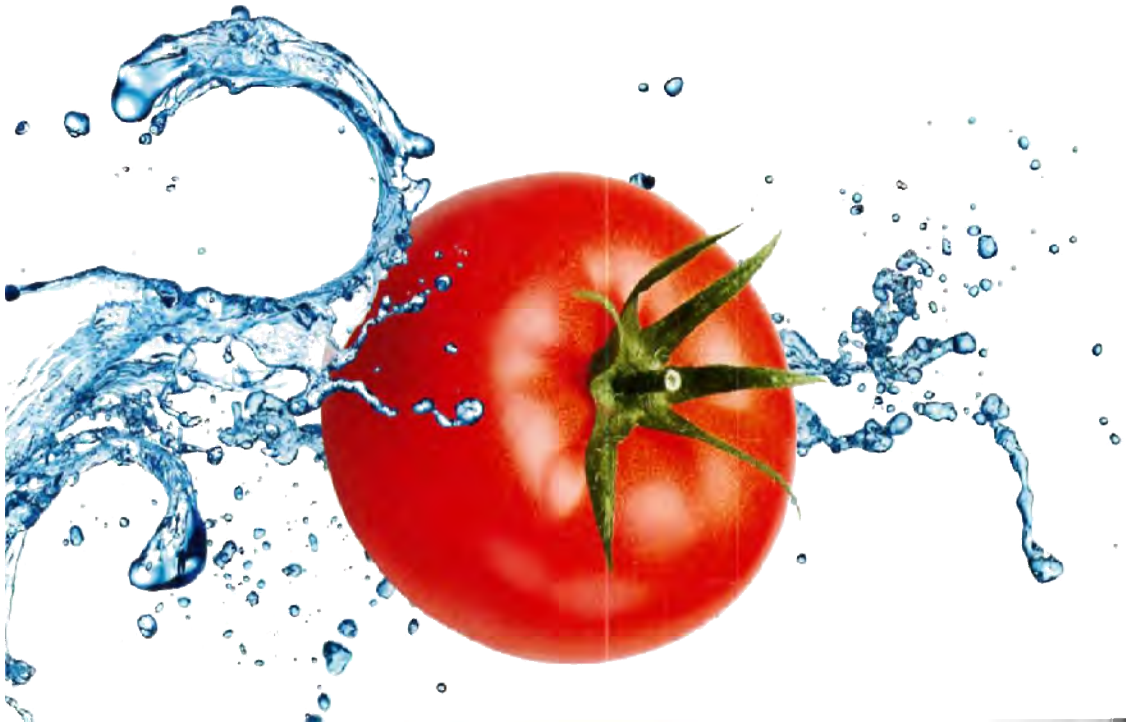

Lehi Water

LEHI CITY
WATER DEPARTMENT

2018 Annual
Water Quality Report

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Around the House

- Evaluate your water habits and determine ways to cut back on water use.
- 22% of water use comes from doing the laundry. You can save water by making sure to adjust the settings on your machine to the proper load size.
- A leaky faucet can waste 100 gallons of water a day.
- You can refill an 8-oz glass of water approximately15,000 times for the price of a six-pack of soda.
- Use a dishwasher, if possible. An automatic dishwasher uses 9 to 12 gallons of water while hand washing dishes can use up to 20 gallons.

The bathroom is where most of the home's water is used and the place where you can save the most

- Start with your toilet because it's responsible for up to 25% of household use. If it's older it wastes gallons of water with every flush. Upgrading to a low-flow toilet can save up to 75%.
- An average family of 4 uses 881 gallons of water per week just by flushing the toilet.
- Don't use your toilet for a garbage disposal or a trash can.
- Consider installing a low-flow toilet.
- Install a water-saving displacement device.
- For older toilets, buy or make a device that won't harm your plumbing such as a toilet dam or weighted plastic jug full of water.
- Be sure that installation does not interfere with operating parts.
- Don't use a brick – it may disintegrate and cause problems.
- Check overflow pipes to be sure that water is not draining.
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TEST RESULTS							
Contaminant	Violation Y/N	Level Detected ND/Low-High	Unit Measurement	MCLG	MCL	Date Sampled	Likely Source of Contamination
MICROBIOLOGICAL CONTAMINANTS							
Total Coliform Bacteria	N	0	N/A	0	Presence of coliform bacteria in 5% of monthly samples	2018	Naturally present in the environment
Turbidity for Ground Water	N	2	NTU	N/A	5	2016	Soil runoff
INORGANIC CONTAMINANTS							
Arsenic	N	0-2.7	ppb	0	10	2016	Erosion of natural deposits; runoff from orchards; runoff from glass and electronics production wastes
Barium	N	0.065-0.247	ppm	2	2	2016	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits
Copper a. 90% results b. # of sites that exceed the **AL**	N	a. 0.12 b. 0	ppm	1.3	AL=1.3	2018	Corrosion of household plumbing systems; erosion of natural deposits
Lead a. 90% results b. # of sites that exceed the **AL**	N	a. 2 b. 0	ppb	0	AL=15	2018	Corrosion of household plumbing systems, erosion of natural deposits
Fluoride	N	0.2-0.4	ppm	4	4	2016	Erosion of natural deposits; water additive which promotes strong teeth; discharge from fertilizer and aluminum factories
Nitrate (as Nitrogen)	N	0.2-1.8	ppm	10	10	2018	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits
Selenium	N	0-2.7	ppb	50	50	2016	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines
Sodium	N	5.3-42.3	ppm	500	None set by EPA	2016	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills.
Sulfate	N	5-40	ppm	1000	1000	2016	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills, runoff from cropland
TDS (Total Dissolved solids)	N	64-322	ppm	2000	2000	2016	Erosion of natural deposits
DISINFECTION BY-PRODUCTS							
Haloacetic Acids	N	5-40	ppb	60	60	2017	By-product of drinking water disinfection
Chlorine	N	200	ppb	4000	4000	2015	Water additive used to control microbes
RADIOACTIVE CONTAMINANTS							
Contaminant	Violation Y/N	Level Detected ND/Low-High	Unit Measurement	MCLG	MCL	Date Sampled	Likely Source of Contamination
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Combined	N	ND-0.67	pCi/l	0	5	2016	Erosion of natural deposits
Radium 226	N	ND-0.1	pCi/l	0	5	2016	Erosion of natural deposits
Radium 228	N	ND-0.82	pCi/l	0	5	2016	Erosion of natural deposits

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APPENDIX F
Utah State University Extension - "Turfgrass Water Use in Utah"

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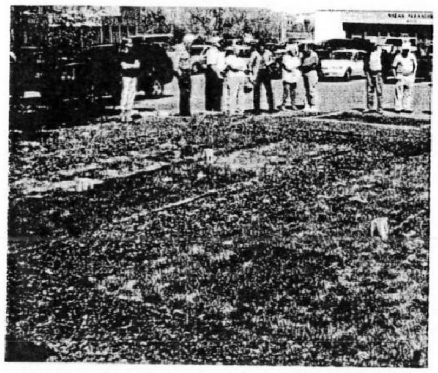

TURFGRASS WATER USE IN UTAH

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The goal of turfgrass irrigation is to maintain quality by replacing water lost to the atmosphere from the soil by evaporation, and from leaf surfaces by transpiration. The combination of evaporation and transpiration is referred to as evapotranspiration (Et), or simply water use. Turfgrass water use is normally presented in units of inches of water per day, week or month. Inches of water is a useful measure since it can be directly related to the inches of water applied by a sprinkler system over time to determine irrigation scheduling.

Turfgrass water use is affected by seasonal variations in air temperature and other weather conditions. Water use is relatively low in the spring, increases in late June through July and early August, then decreases through the end of August into September and October. Table 1 summarizes monthly turfgrass water use rates for various locations throughout Utah. To calculate daily water use, divide the Table 1 monthly estimates by 30. For example, daily turfgrass water use for the month of June in Beaver would be approximately: 4.67 inches ÷ 30 days ≈ 0.16 inch per day. The information from Table 1 is based on long term average water use for each location. Several communities also provide real time water use data from local weather stations. Contact your local County Extension Office to find out if this information is available in your area.

SOIL WATER STORAGE

The amount of water in the soil available for turfgrass use depends on the rooting depth and soil type. Unless there is a limiting layer, most turfgrass roots will be found in the top 1 to 1 ½ feet of soil. Water holding capacities vary from about 1 inch per foot of depth in a sandy soil to about 2 inches per foot of depth in a loam soil. Therefore, in a sandy soil, 1 inch of water is available for plant use in a 1 foot turf root zone. In a loamy soil, 2 inches of water would be available for the turf to use in the same 1 foot root zone. To prevent drought stress, ***irrigation is recommended when 50 percent of the water has been used from the root zone***. In a sandy soil, irrigation should occur when approximately ½ inch of water has been used by turfgrass with a 1 foot rooting depth. In a loam soil, approximately 1 inch of water could be used from the 1 foot root zone between irrigations.

Irrigation Scheduling

As an example of irrigation scheduling, assume turfgrass uses 0.16 inch of water per day in June at Beaver (see above example). To maintain grass with a 1 foot rooting depth in a sandy soil, an irrigation of ½ inch would be needed every 3rd day (0.5 inch water ÷ 0.16 inch use per day ≈ 3 days). In a loam soil, 1 inch of irrigation could be applied every 6 days (1.0 inch water ÷ 0.16 inch use per day ≈ 6 days). The irrigation depths and frequencies calculated here assume uniform application of water by the system and a 1 foot root zone. If water is not applied uniformly, actual irrigation amounts (inches applied) may be higher to insure that areas receiving less water from the system are irrigated adequately. For more information about irrigation scheduling, see the Utah State University Extension web site: extension.usu.edu/drought.

Table 1. Monthly and total seasonal water use estimates (in inches) for turfgrass from various Utah locations.

Location	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Season total
Beaver	–	–	1.35	3.77	4.67	5.31	4.16	2.64	–	–	21.90
Blanding	–	0.30	2.22	3.55	4.28	4.85	4.12	2.87	1.24	–	23.43
Brighton (Silver Lake)	–	–	–	1.25	3.24	3.77	3.23	1.12	–	–	12.61
Castle Dale	–	–	1.77	3.42	5.21	5.62	4.50	3.44	1.23	–	25.21
Cedar City	–	0.32	2.37	3.91	4.69	5.06	4.32	3.26	1.35	–	25.27
Corinne	–	0.27	2.10	3.63	4.76	5.40	4.76	3.17	1.69	–	25.78
Delta	–	0.59	2.39	4.01	4.92	5.59	4.69	3.20	1.07	–	26.45
Farmington	–	0.73	2.10	3.43	4.56	5.13	4.33	2.77	1.44	–	24.49
Heber	–	–	0.88	3.42	4.25	4.91	4.20	2.87	0.56	–	21.10
Kamas	–	–	0.50	3.13	4.07	4.41	3.83	2.61	–	–	18.55
Kanab	–	1.25	2.64	4.20	4.93	5.25	4.46	3.36	2.03	0.19	28.32
Logan	–	0.29	1.90	3.41	4.31	4.78	4.20	2.66	1.14	–	22.68
Manti	–	–	1.36	3.87	4.72	5.32	4.64	3.35	1.05	–	24.32
Moab	0.16	1.77	2.68	4.05	5.00	5.44	4.64	3.58	2.22	0.41	29.95
Nephi	–	–	1.29	3.39	4.36	5.02	4.25	2.88	1.08	–	22.27
Odgen (Sugar Factory)	–	0.64	2.23	3.61	4.78	5.21	4.43	2.74	1.93	–	25.57
Panguitch	–	–	0.30	3.47	4.56	4.73	3.99	3.00	0.37	–	20.43
Park City	–	–	0.48	2.94	3.81	3.96	3.70	2.29	–	–	17.17
Pleasant Grove	–	0.31	2.19	3.70	4.56	5.22	4.25	2.94	1.50	–	24.68
Richfield	–	–	1.82	3.84	4.63	5.15	4.46	3.01	0.99	–	23.90
Roosevelt	–	–	2.20	4.11	4.96	5.38	4.48	2.87	1.25	–	25.25
Salt Lake (Airport)	–	0.31	1.89	3.39	4.64	5.39	4.53	2.72	1.38	–	24.26
St. George	0.12	2.21	3.09	4.83	5.75	6.27	5.01	3.36	2.15	0.69	33.79
Tooele	–	0.45	2.07	3.86	4.73	5.08	4.23	2.59	1.25	–	24.28
Vernal	–	–	1.91	3.88	4.78	5.21	4.46	2.91	1.69	0.13	24.97

Adapted from *Consumptive Use of Irrigated Crops in Utah*. Utah Agriculture Experiment Station Research Report No. 145. Oct 1994. The complete set of crops and sites can be found on the web at: http://waterrights.utah.gov/techinfo/consumpt/default.htm

Irrigating by Intervals

A simplified method of turfgrass irrigation scheduling involves applying the same amount of water each time the system is operated, but varying the interval between irrigations based on the water use estimates described in Table 1. For turfgrass, adjust the sprinkler system clock duration (minutes) to apply ½ (0.50) inch of water each irrigation. The interval between irrigations then varies depending on how long it takes turfgrass to use ½ (0.50) inch of water. System intervals for various Utah locations are presented in Table 2. As an example of irrigating by intervals, in Beaver the irrigation season would begin in April and would require irrigating once every five days. The interval would then vary over the growing season from 5 days to as short as 3 days and as long as 9 days depending on the month. The irrigation intervals shown in Table 2 ignore the occurrence of rainfall.

Table 2. Monthly recommendations for irrigation interval (number of days between irrigations) for various Utah locations, based on the replacement of ½ (0.50) inch of water at each irrigation and ignoring rainfall.

Location	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Beaver	–	5	4	3	3	3	5	9
Blanding	–	5	4	3	3	4	5	9
Brighton (Silver Lake)	–	7	5	4	4	4	6	10
Castle Dale	–	6	4	3	3	3	4	7
Cedar City	–	5	4	3	3	3	4	7
Corinne	–	7	4	3	3	3	6	12
Delta	–	5	4	3	3	3	5	9
Farmington	–	6	4	3	3	3	5	9
Heber	–	7	4	3	3	4	5	10
Kamas	–	7	5	4	4	4	6	10
Kanab	8	5	3	3	3	4	5	7
Logan	–	6	4	3	3	4	6	12
Manti	–	6	4	3	3	3	5	8
Moab	7	5	4	3	3	3	4	6
Nephi	–	6	4	3	3	3	6	10
Odgen (Sugar Factory)	–	6	4	3	3	3	6	10
Panguitch	–	8	4	3	3	4	5	10
Park City	–	7	5	4	4	4	6	10
Pleasant Grove	–	6	4	3	3	3	6	10
Richfield	–	6	4	3	3	3	5	9
Roosevelt	–	6	4	3	3	4	5	10
Salt Lake (Airport)	–	6	4	3	3	3	6	10
St. George*	8	5	4	3	3	3	5	7
Tooele	12	6	4	3	3	3	5	9
Vernal	11	6	4	3	3	3	5	9

*In St. George the recommended irrigation intervals are based on the application of 5/8 (0.63) inch of water at each irrigation.

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APPENDIX

The intervals shown in Table 2 for each site and month were determined by dividing the monthly turfgrass water use estimates (Et) in Table 1 by ½ (0.5) inches or by the desired amount of water replacement (in the case of St. George: 5/8, 0.63 inch). The resulting value was then divided into the number of days per month to obtain the irrigation interval. In equation form:

$$\text{Irrigation interval} = \text{days in month}/(Et/0.5)$$

The recommendation of the ½ (0.5) inch replacement value is based on a consensus reached by experts from USU Extension, the U.S. Bureau of Reclamation, the Utah Division of Water Resources, and the representatives of several Utah water conservancy districts.

Available Water-holding Capacity of Soils

Soil Texture	Inches of available water per foot of moist soil	Permeability rate[1] Inches/Hour
Sands and fine sands	0.5 - 0.75	1.0 - 10
Very fine sands, loamy sand	.8 - 1.0	1.0 - 3
Sandy Loam	1.2 - 1.5	0.5 - 3
Loam	1.9 - 2.0	0.3 - 0.8
Silt loam, silt	2.0	0.2 - 0.4
Silty clay loam	1.9 - 2.0	0.01 - 0.
Sandy clay loam, Clay loam	1.7 - 2.0	0.1 - 0.6

Note: Allowable depletion to avoid crop water stress is usually about 50% of available water holding capacity for plants.
[1]Normal ranges. Intake rates vary greatly with soil structure and structural stability.

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