BEAR RIVER WATER CONSERVANCY DISTRICT

DRINKING WATER SYSTEM MASTER PLAN

September 2017

HANSEN ALLEN & LUCE inc
ENGINEERS

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DRINKING WATER SYSTEM MASTER PLAN

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ACKNOWLEDGMENTS

We sincerely appreciate the cooperation and assistance provided by many agencies and individuals including those listed here.

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GLOSSARY OF TECHNICAL TERMS

Average Daily Flow: The average yearly demand volume expressed in a flow rate.

Average Yearly Demand: The volume of water used during an entire year.

Build-out: When the development density reaches maximum allowed by planned development.

Demand: Required water flow rate or volume.

Distribution System: The network of pipes, valves and appurtenances contained within a water system.

Drinking Water: Water of sufficient quality for human consumption. Also referred to as Culinary or Potable water.

Dynamic Pressure: The pressure exerted by water within the pipelines and other water system appurtenances when water is flowing through the system.

Equivalent Residential Connection: A measure used in comparing water demand from non-residential connections to residential connections.

Fire Flow Requirements: The rate of water delivery required to extinguish a particular fire. Usually it is given in rate of flow (gallons per minute) for a specific period of time (hours).

Head: A measure of the pressure in a distribution system that is exerted by the water. Head represents the height of the free water surface (or pressure reduction valve setting) above any point in the hydraulic system.

Head Loss: The amount of pressure lost in a distribution system under dynamic conditions due to the wall roughness and other physical characteristics of pipes in the system.

Peak Day: The day(s) of the year in which a maximum amount of water is used in a 24-hour period.

Peak Day Demand: The average daily flow required to meet the needs imposed on a water system during the peak day(s) of the year.

Peak Instantaneous Demand: The flow required to meet the needs imposed on a water system during maximum flow on a peak day.

Pressure Reducing Valve (PRV): A valve used to reduce excessive pressure in a water distribution system.

Pressure Zone: The area within a distribution system in which water pressure is maintained within specified limits.

Service Area: Typically, the area within the boundaries of the entity or entities that participate in the ownership, planning, design, construction, operation and maintenance of a water system.

Static Pressure: The pressure exerted by water within the pipelines and other water system appurtenances when water is not flowing through the system, i.e., during periods of little or no water use.

Storage Reservoir: A facility used to store, contain and protect drinking water until it is needed by the customers of a water system. Also referred to as a Storage Tank.

Transmission Pipeline: A pipeline that transfers water from a source to a reservoir or from a reservoir to a distribution system.

Water Conservation: Planned management of water to prevent waste.

ABBREVIATIONS

ac	acre
ac-ft	acre-feet
DDW	The State of Utah Division of Drinking Water
BRWCD	Bear River Water Conservancy District
ERC	Equivalent Residential Connection
GIS	Geographic Information System
gpd	Gallons per Day
gpd/conn	Gallons per Day per Connection
gpm	Gallons per Minute
HAL	Hansen, Allen & Luce, Inc.
MG	Million Gallons
PRV	Pressure Reducing Valve
psi	Pounds per Square Inch
SCADA	Supervisory Control And Data Acquisition

EXECUTIVE SUMMARY

The Bear River Water Conservancy District (BRWCD) has authority to help plan, provide and support water development in Box Elder County. BRWCD now serves 5 unincorporated areas in eastern Box Elder County and has wholesale water service connections to 14 public water supply agencies.

BRWCD's previous 2005 Master Plan recommendations have essentially all been accomplished, so a new Master Plan is needed to provide guidance for the next several decades. Some of the current major questions for Box Elder County that are examined in this master plan are:

- How long will current water supplies last as the County grows?
- How can BRWCD help public water suppliers meet their growing needs in the future?
- How can Bear River Development water help future growth in the County?
- How can BRWCD support and encourage conservation?

As the first phase in the master planning work, BRWCD conducted a wide-ranging outreach effort to individuals and agencies that have an interest in the growth of Box Elder County and the supply of water to its residents. Interviews and public meetings were held with these stakeholders where important questions were asked about water supply and demand in the County. The resulting consensus of water development priorities included the following top three priorities:

- Securing Water Supplies for the Future
- Conserving Water
- Bear River Water Development

Water demand projections were developed based on population projections from the Kem C. Gardner Policy Institute (GPI, 2017), the average historical growth rate of the County, and a projected rapid growth scenario in the case that development pressure from the Wasatch Front extends into the county. Planning for a rapid growth scenario will allow BRWCD to be prepared for rapid growth in case it occurs, but still have the flexibility to delay plans if growth rates are slower.

BRWCD invited all of the water suppliers in the County to share their water system information with BRWCD in order to develop a future water needs projection. Analyses included water supply and water demand for each water supplier, with evaluation of how many new residential connections may be served with existing water supplies. These analyses show that the majority of communities in the County will need additional water supplies between the year 2045 and 2055.

The State of Utah has been studying future development of storage water on the Bear River since the Utah State Legislature adopted the 1990 Bear River Development Act. Box Elder County has actively participated in planning efforts sponsored by the State along with Cache, Weber, Davis and Salt Lake Counties. Recent Bear River Development plans by the State

Division of Water Resources were used to prepare a conceptual level plan for future sizes and locations of water treatment plants and conveyance pipelines for future treatment and use of Bear River Water within eastern Box Elder County.

Suggestions were prepared to help the County make the best possible use of existing groundwater supplies, including conservation strategies and groundwater supplies augmentation through:

- Renovation of Wells and Springs
- Water Treatment of Poor Quality Groundwater
- Blending Poor Quality and High Quality Groundwater
- Pressurized Irrigation Water Systems
- Aquifer Storage and Recovery
- Wastewater Reuse

Lastly, facilities were master planned for the 5 areas that are now served by BRWCD to resolve existing deficiencies and to provide additional capacity to serve existing and new growth. Master planned facilities were developed with the goal to provide water for future demands while minimizing negative impacts on the environment, wildlife, and individual property owners.

CHAPTER 1 - PURPOSE AND SCOPE

MASTER PLANNING PURPOSE

The Bear River Water Conservancy District (BRWCD) was formed in 1988 to assist Box Elder County in providing a broad range of services related to improving water supplies for the County. BRWCD's stated goals are to:

- Conserve and protect water and water rights.
- Develop and provide water for municipal, industrial and agricultural use.
- Use these resources to best serve the residents of Box Elder County.

In 1994, BRWCD constructed their first public drinking water system in the Harper Ward area, which is an unincorporated area located along State Highway 38 between Brigham City and Honeyville. Prior to this project there was no public drinking water system in the area. In 1995, BRWCD constructed another public drinking water system near Tremonton City. The main purpose of this system was to provide wholesale water supplies to Tremonton City and several other water suppliers in the vicinity of Tremonton City.

BRWCD's first master plan was completed in 2005. The 2005 Master plan has provided much needed direction for expanding BRWCD's services in areas of critical need in eastern Box Elder County. All of the major projects identified in the 2005 Master Plan have been constructed and are now in service. Most recently, BRWCD completed a public drinking water system in the Collinston area.

New vision for the future is now needed to guide BRWCD's priorities and decision-making processes for the next several decades. BRWCD is concerned about several issues that will increasingly affect the public water supply in the eastern portion of the County, such as:

- How long will current water supplies last as the County grows?
- How can BRWCD help public water suppliers meet their growing needs in the future?
- How can Bear River Development water help future growth in the County?

WATER SUPPLY IN EASTERN BOX ELDER COUNTY

Public drinking water supplies are provided exclusively by groundwater sources in Box Elder County, including many springs and wells.

The Bear River flows through eastern Box Elder County, but this surface water source is not currently being used for drinking water supplies. The Bear River is the source for most of the irrigation that is being done in the eastern portion of the County via the Bear River Canal Company (BRCC). Several communities including Brigham City, Perry, Willard and South Willard receive irrigation water supplies from Pineview Reservoir east of Ogden. The Bear River and Pineview Reservoir are essentially fully appropriated and are, in any event, not currently available for municipal and industrial uses. However, both Pineview and Bear River Canal Company water are available to be used for pressurized irrigation systems, especially as agriculture lands are turned into residential developments.

In 1990 the State of Utah Legislature passed the Bear River Act to formally adopt a plan to capture and develop spring runoff water on the Bear River. The Act proposed that a new surface storage reservoir be constructed on the Bear River's course through Cache and Box Elder Counties. The Act further estimated the quantities of water that would be available to northern Utah counties as follows:

Cache County	60,000 Acre Feet
Box Elder County	60,000 Acre Feet
Davis & Weber Counties	50,000 Acre Feet
Salt Lake County	50,000 Acre Feet

Over the past decade, the State has completed numerous reservoir site investigations in Cache and Box Elder Counties. Pipeline corridor studies have been conducted in Box Elder County. These studies have resulted in a short list of reservoir sites and corridor alignments that appear to be feasible.

EXISTING BRWCD SERVICE AREAS

BRWCD currently serves retail and wholesale customers in 5 services areas in Box Elder County:

- Beaver Dam
- Bothwell
- Collinston
- Harper-Ward
- South Willard

These BRWCD service areas are briefly described in the following paragraphs:

Beaver Dam Service Area – This water system is located in an unincorporated area in the northeast quadrant of Box Elder County. The service area currently provides water to 27 residential customers. The delivery system includes three spring sources, an arsenic-removal water treatment plant, a storage reservoir, and an 8-inch transmission pipeline.

Bothwell Municipal and Industrial (M&I) Service Area - This water system is located in unincorporated areas both west and north of Tremonton City. This service area currently provides water to 46 residential connections and 6 wholesale connections to water supply agencies in the vicinity:

- Tremonton City
- Thatcher Penrose Service District
- Bothwell Cemetery and Water Company
- UKON Water Company
- Riverside North Garland Water Company
- S&K Water Company

The Bothwell M&I Service area is supplied by 2 deep wells and includes a 0.5 MG storage reservoir and 12-inch, 10-inch and 8-inch transmission pipelines.

Collinston Service Area - This water system is located in unincorporated areas north of Deweyville Town along State Highway 38. This service area currently provides water to 25 residential connections and 30 inactive connections. The system also has 3 wholesale connections to water supply agencies in the vicinity:

- UKON Water Company
- Tremonton City
- Cedar Ridge Subdivision

The Collinston Service area is currently supplied by a surplus water sales contract with Deweyville Town and includes two 0.5 MG storage reservoirs, two booster stations, and 12-inch and 8-inch transmission pipelines.

Harper Ward Service Area - This water system is located in unincorporated areas between Brigham City on the south and Honeyville on the north along State Highway 38. This service area currently provides water to 99 residential connections and has 3 wholesale connections to water supply agencies in the vicinity:

- Honeyville City
- Corinne City
- West Corinne Water Company

The Harper Ward Service area is currently supplied by a surplus water sales contract with Brigham City, and includes 10-inch and 8-inch transmission pipelines.

South Willard Service Area - This water system is located in unincorporated areas south of Willard City along State Highway 89. This service area currently provides water to an LDS Church and has 3 wholesale connections to water supply agencies in the vicinity:

- South Willard Water Company
- Hot Springs Mobile Home Park
- Coleman Mobile Home Park

The South Willard Service area is supplied by 1 deep well and includes a 1.0 MG storage reservoir and 16-inch, 12-inch and 8-inch transmission pipelines.

One of the purposes of this Master Plan is to analyze these service areas and to plan future new facilities to serve BRWCD's growing water service agencies.

MASTER PLAN SCOPE OF WORK

Master planning activities included the following major categories:

Public Process (By The Langdon Group)

At the beginning of the master planning activities, BRWCD wanted to first assess perceptions towards BRWCD by other government agencies, water suppliers and the public. BRWCD regards many of these agencies as important stakeholders in their mission. The master plan scope included plans to conduct stakeholder meetings to invite input and opinions regarding

which water supply challenges are most important, and how to meet these water supply challenges.

BRWCD planned significant public outreach with a wide cross section of individuals representing many different government agencies that are interested in water supply issues in Box Elder County, including local, State and Federal agencies.

In addition to the outreach to government agencies, BRWCD planned meetings with the public drinking water suppliers in the County to evaluate their current and future water supply needs and to assess whether they will need to request assistance from BRWCD in the future.

Population Projections – The key to future water supply forecasting is population growth. BRWCD planned a review of current population and future growth projections in order to quantify water demands both now and in the future for the County.

Evaluate Existing Water Resources & Demands – BRWCD planned technical analyses of the existing water supply and demand for all of the major public water agencies in the County. A forecast of the current and future water needs throughout the County would result from the outcome of the analyses was planned to prepare. In addition, BRWCD planned technical analyses for the retail and wholesale service areas served by BRWCD.

Water Shortage Horizon – This analysis was planned to predict when each water supply agency in the County would need additional water supplies in order to continue to support new growth within their service areas.

Bear River Development Water Supply (By Bowen Collins & Associates) - The State of Utah has been studying water development of more water on the Bear River for several decades. In the past 15 years, the State has invested significant efforts on finding potential dam sites for water storage as well as possible transmission routes for Bear River Development water conveyance pipelines. The master plan scope of work included analyses to determine:

- Where Bear River water would likely be needed in the County
- When the Bear River Development water would be needed
- Locations for future water treatment plants, storage and transmission pipelines where Bear River Development water could be treated, stored and distributed for use within the County

Conservation – The role of conservation is an important factor in future water planning for the County and for the entire State. BRWCD planned to evaluate current per capita water use in the County and make comparisons with the State of Utah's conservation goals. The scope of work included a list of conservation strategies and incentives to help the County with efforts to encourage future conservation by water users.

Extending Existing Groundwater Supplies - Currently the County is 100% reliant on groundwater supplies for public drinking water. Some communities are already almost fully utilizing their groundwater sources. The master plan scope of work included study to discuss idea to help these communities extend and optimize existing groundwater sources to allow more future growth.

Master Planning BRWCD Facilities – In some of the areas now served by BRWCD, the existing capacity is not sufficient to meet the demands. New projects are needed to serve these areas. In some areas, BRWCD facilities need extensions to serve new areas that have requested BRWCD water service. One of the major goals of this master plan is to plan new and upsized BRWCD facilities in these areas.

CHAPTER 2 - BOX ELDER COUNTY POPULATION PROJECTIONS

PLANNING PERIOD

BRWCD has identified two planning periods that correspond with two major goals of this Master Plan. The first goal is to identify capital facilities necessary for meeting BRWCD's potential water demands within the next 20 years. The second goal is to forecast long range water supply needs through the year 2060 so that BRWCD can be begin preparing to meet these needs. BRWCD also needs to determine when they may expect to need Bear River Development project water. The determination of anticipated water demands is dependent upon the projected population growth throughout the planning periods.

GROWTH PROJECTIONS

Average Historical Growth Projection

Based on U.S. Census records, Box Elder County has grown at an average rate of approximately 1.7% per year from about 1950 through 2010. With a 2010 population of 49,975, continuation of this growth rate through the planning period would result in a 2060 population of approximately 109,600.

State of Utah Projections

In 2012, the Utah Governor's Office of Management and Budget (GOMB) prepared population projections through the year 2060. GOMB assumed a rural growth rate of 0.9% per year for Box Elder County, resulting in a 2060 population of 77,030. This growth rate is just over half of the average historical growth rate since the year 1950.

GOMB has contracted with the University of Utah's Kem C. Gardner Policy Institute (GPI) to update the State's population projections. 50-year statewide and county projections have recently been released. Data from GPI indicates a growth rate from 1.4% to 1.5% per year through the year 2021 and then dropping to 1% or below by the year 2026 and stabilizing at about 0.7% by 2047. The 2060 population projected by GPI is 83,248.

Potential for More Rapid Growth

As part of this master plan, interviews were conducted with representatives of Box Elder County, municipalities, public water suppliers, and the Bear River Association of Governments (BRAG). Based on these interviews, there are indications that Box Elder County may be poised for more rapid growth than they have experienced over the past several years. The following statements represent the general opinions of the stakeholders regarding growth within Box Elder County.

- Municipality "getting weekly calls" for development and "construction is as fast as I've ever seen." Expects higher growth rate as a result.
- Another municipality has seen increased building permits and is receiving interest from "big developments" to come in.

- County planning and economic development are currently working on 5 to 6 large projects for new industries to move into the county. This would increase employment opportunities and draw more people into the county.
- Water suppliers have seen consistent growth and expect to see either sustained growth or increasing growth.

Because of Box Elder County's location relative to the larger population centers along the Wasatch Front, and because it is located along the primary transportation corridor leading to these areas, there is reasonable likelihood that development pressure could extend into Box Elder County within the next couple of decades. This is supported by the recent expansion of I-15 through Brigham City and by Utah Department of Transportation (UDOT) plans to extend the FrontRunner commuter rail to Brigham City.

Some communities are already seeing this development pressure affect them. For example, the number of connections to the Perry City water system has increased at an average rate of about 5% per year since 2000. Similarly, Tremonton water connections have increased by almost 3% per year since 2000.

Rapid Growth Scenario

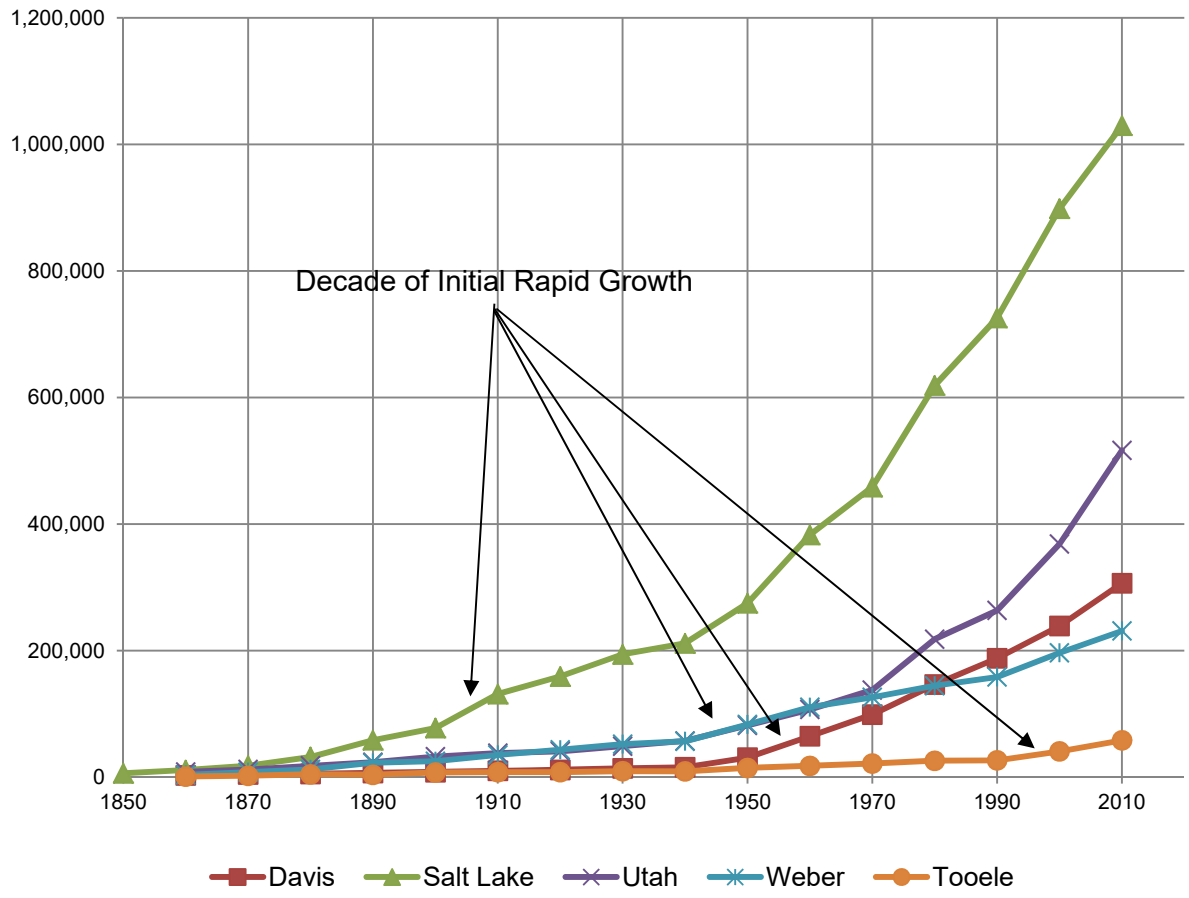
BRWCD's mission is to assist in providing future water supplies to Box Elder County communities where needed. Because development of additional water sources can take many years of planning, it is in BRWCD's best interests to plan their future water sources for a more rapid growth scenario so they are prepared to meet increased water demands. If actual growth doesn't keep pace with the rapid growth scenario, then the plans will already be in place and BRWCD can delay the plans as necessary.

Population growth patterns from the U.S. Census data were analyzed for five counties in Utah that have experienced rapid growth, including Salt Lake, Utah, Davis, Weber, and Tooele counties. Evaluation of the data revealed similar patterns for each of the counties. Figure 2-1 charts the population of these counties since 1850.

It can be seen from this chart that each of these counties initially had a relatively flat growth rate until experiencing a notable increase in growth. This was then followed by a period of sustained increased growth. The average growth rate experienced by these counties in the initial decade of increased growth was 6.1% per year with an average growth rate in the following 3 decades ranging from approximately 3% to 4.7% per year.

The population density of the counties in the decade before rapid growth ranged from 124 to 344 people per square mile with an average density of 204 people per square mile. The current density of the main Bear River Valley area of Box Elder County is just over 200 people per square mile. As population density increases, the value of land for development also increases. This induces owners of large parcels of land to subdivide and develop their land for commercial and residential uses, which in turn attracts people from neighboring urbanized areas seeking either more space or larger homes.

Figure 2-1
County Population (U.S. Census)



The following list summarizes the reasons that BRWCD believes that Box Elder County is likely to experience more rapid growth than historical growth rates and current projections.

- Population density in Box Elder County is about the same as Salt Lake, Utah, Davis, Weber, and Tooele counties were just prior to their experiencing rapid growth.
- Box Elder County is located adjacent to a rapidly growing county that has a much higher density resulting in development pressure (Population density of Weber County was about 1,400 people per square mile in 2010).
- Box Elder County is located along the major transportation route (I-15) connecting the urbanized areas of Weber, Davis, Salt Lake, and Utah counties.
- Recent expansion of I-15 to three lanes through Box Elder County has made the commute into the more urbanized areas quicker and more convenient.
- UDOT plans to extend the Front Runner commuter rail to Brigham City would provide additional convenience for commuting into the more urbanized areas.

- Some communities are already experiencing more rapid growth.
- Community planners and other stakeholders are seeing increased building permit requests.
- Multiple large industries are showing interest in locating in Box Elder County due to the availability of large parcels at a significantly lower cost relative to the more populated counties along the Wasatch Front. An example of this is the Proctor & Gamble plant that was constructed west of Bear River City within the last 10 years.

It was assumed that the maximum growth rate for a Box Elder County rapid growth scenario would be 3% per year. It was also assumed that rapid growth would progress in stages instead of occurring throughout the County in the same decade as described below and as shown on Figure 2-2.

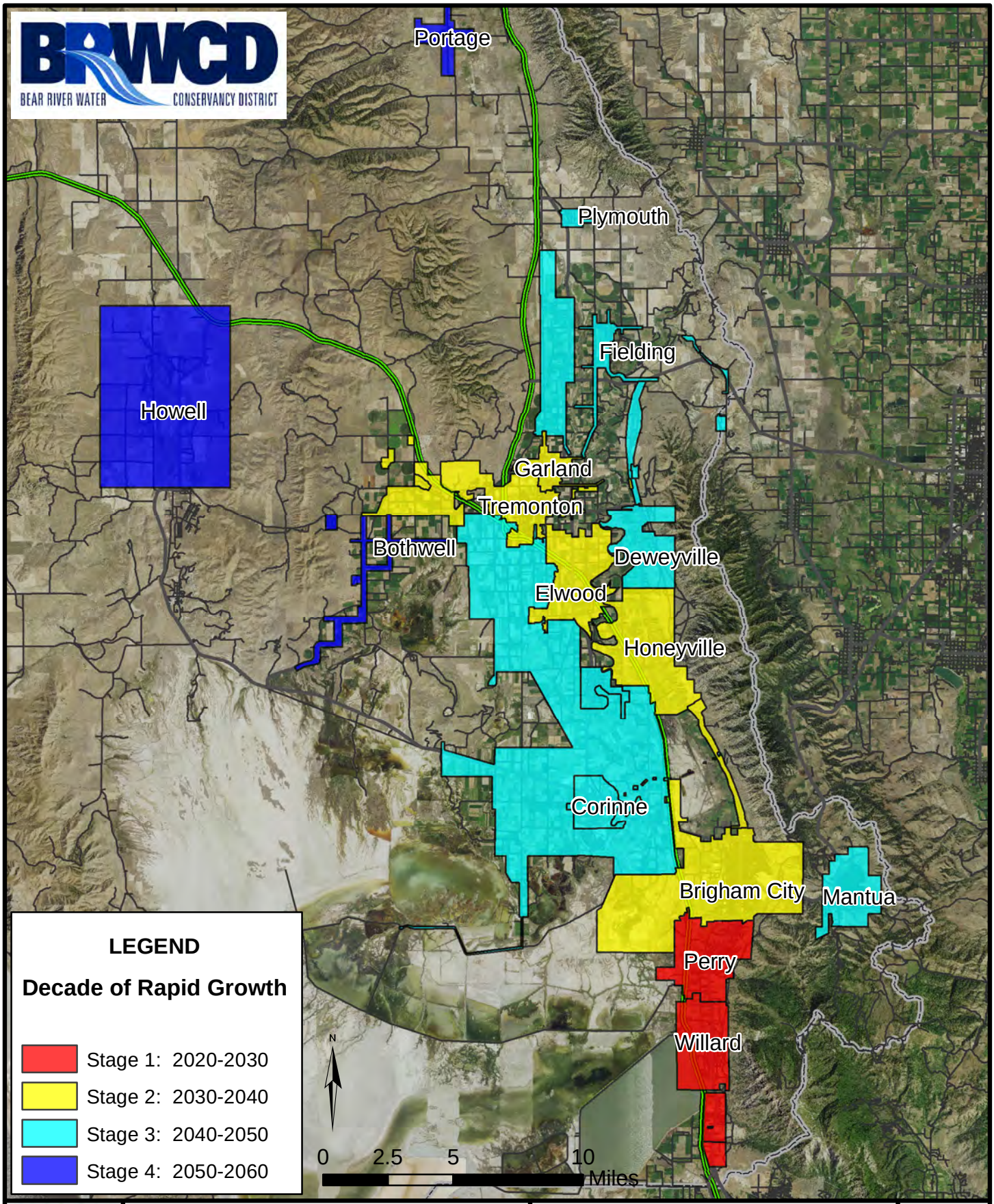
1. Stage 1 (2020-2030): 3% per year growth begins in communities closest to the Wasatch Front. Includes Perry, Willard, and South Willard.
2. Stage 2 (2030-2040): 3% per year growth begins in communities adjacent to I-15. Includes Brigham City, Honeyville, Elwood, Tremonton, Garland, and the retail area served by BRWCD north of Bothwell.
3. Stage 3 (2040-2050): 3% per year growth begins in remaining portion of Bear River Valley and Mantua. Includes Mantua, Corinne, Bear River City, Deweyville, Riverside, North Garland, Fielding, and Plymouth.
4. Stage 4 (2050-2060): 3% per year growth begins in remainder of Box Elder County. Includes Bothwell, Thatcher, Howell, and Portage.

The projected 2060 population for Box Elder County using this staged rapid growth approach is approximately 148,000.

COMPARISON OF POPULATION PROJECTIONS

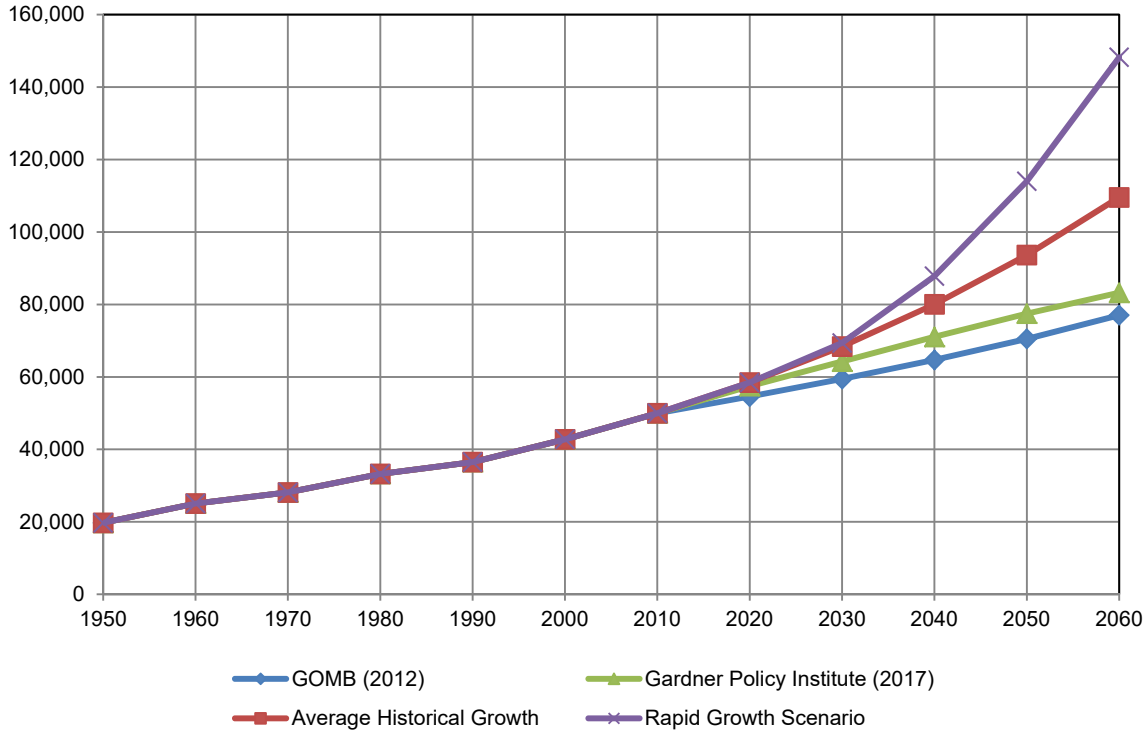
Figure 2-3 compares the population projections prepared by GOMB (2012) and Kem C. Gardner Policy Institute (2017) with the Average Historical Growth projection and the Rapid Growth Scenario.

BRWCD recognizes that there is a great deal of uncertainty with projecting population growth. There are numerous social, economic, political, and infrastructural factors that could influence growth one way or the other. While BRWCD acknowledges the work that went into the population projections developed by the State of Utah and the Kem C. Gardner Policy Institute, BRWCD also has the responsibility to be prepared to meet the potential water supply demands of a more rapid growth scenario. Therefore, the Rapid Growth Scenario was used for planning purposes to secure water supplies for Box Elder County.



HANSEN ALLEN & LUCE INC ENGINEERS	**Bear River Water Conservancy District 2017 Master Plan**	**Projected Decade For Rapid Growth**	**Figure 2-2**

Figure 2-3
Population Growth Estimates



CHAPTER 3 - PUBLIC PROCESS

INTRODUCTION

Water is a very important resource and plays an important role in social and physical needs. The water interests of stakeholders in the County play a major role in the design of a comprehensive water strategy. Water stakeholders include those representing agricultural, environmental, and municipal interests. BRWCD's master plan team implemented a strategic stakeholder involvement campaign with key stakeholders in the planning process.

BRWCD desired an engagement process for the 2015 Master Plan Update that was genuine, authentic and effective. The primary objective was to create a master plan that reflected the needs and interests of the community and key stakeholders through a process that built trust and identified community solutions to community problems. This strategy has helped regional water leaders feel ownership in the process of evaluating existing water resources and demands, determining future water demands, educating and building consensus, deciphering which management structure best meets the County's needs, and ultimately creating a plan for the future.

The strategy involved executing a situational assessment to develop an understanding of influential individuals and agencies (stakeholders) about BRWCD and their mission, developing and consulting with a steering committee, updates to BRWCD's Board and holding additional meetings with other entities for a comprehensive understanding of issues at hand.

A comprehensive list of stakeholders that have participated in the public process through interviews or attendance at planning meetings is given in Appendix A.

STAKEHOLDERS INPUT

One of the first steps of the master plan was to identify key planning stakeholders, meet with the stakeholders, and discover their perceptions of BRWCD and their suggestions for future BRWCD priorities. Stakeholders to be interviewed included individuals and organizations such as the following:

- Culinary water users and providers;
- Communities;
- Government Agencies;
- County; and
- Other key interest groups (agriculture, developers, etc.).

Once a list of key planning stakeholders was created, interviews were scheduled to enhance BRWCD's relationship with the stakeholders, facilitate efforts to obtain funding for the master plan, build social capital and trust and receive valuable input to BRWCD's master planning effort.

Stakeholders Interviewed

Representatives from a variety of water backgrounds and positions were interviewed, including the following individuals:

- Box Elder County, Scott Lyons, Mitch Zundel
- Dept. of Agriculture, LuAnne Adams
- NRCS, Dave Brown
- PacifiCorp, Claudia Conder, Conley Baldwin
- Weber Basin Water Conservancy District, Tage Flint, Mark Anderson, Scott Paxman
- Jordan Valley Water Conservancy District, Richard Bay
- Utah Department of Environmental Quality, Walt Baker
- Utah Division of Water Resources, Eric Millis, Todd Adams
- Utah Division of Drinking Water, Ken Bousfield
- Rep. Scott Sandal
- Rep. Pete Knudson
- Rep. Lee Perry
- Bear River Canal Company, President, Charles Holmgren
- Cache County, Bob Fotheringham (Water Manager)
- Bear River Association of Governments
- Bird Refuge, Bob Barrett

Stakeholder Kick-off Meeting

BRWCD also invited many of the key stakeholders and representatives from water supply agencies in the County to a master planning kick-off meeting. BRWCD wanted the stakeholders to be part of the process with the goal to effectively collaborate and coordinate with them to more fully understand their current and future water needs. Gathering this initial input and feedback was key to guiding the master plan development. Establishing the desire for and expectation of continued collaboration throughout the master planning process was also helpful.

Key Stakeholder Committee Report-Back Meeting

The key stakeholders that were involved in the Kick-off Meeting and that were interviewed were asked to participate in a Report-Back Meeting. The purpose of the Report-Back meeting was to provide key themes and insights gathered and receive input and guidance during the creation of the master plan and recommendations. The purpose of this meeting was to review synthesized data collected through the key interviews and meetings with water stakeholders. The key themes that came from the situational assessment were presented, and input was received from the group.

Information Gathered from the Stakeholder Interviews

The interviews and the meeting with the stakeholders provided valuable information about the key water issues, needs and concerns. A summary of the key points are given in Figure 3-1, Figure 3-2 and Figure 3-3.

The data presented in Figure 3-1 makes it clear that the top three priorities for water in Box Elder County include securing water supply for the future, water conservation and Bear River Development. Figure 3-2 data shows again that water conservation and Bear River Development are top priorities. The data collected and presented in Figure 3-3 show that a regional approach to water supply planning is most highly valued.

Figure 3-1
Stakeholder Kickoff Meeting Input

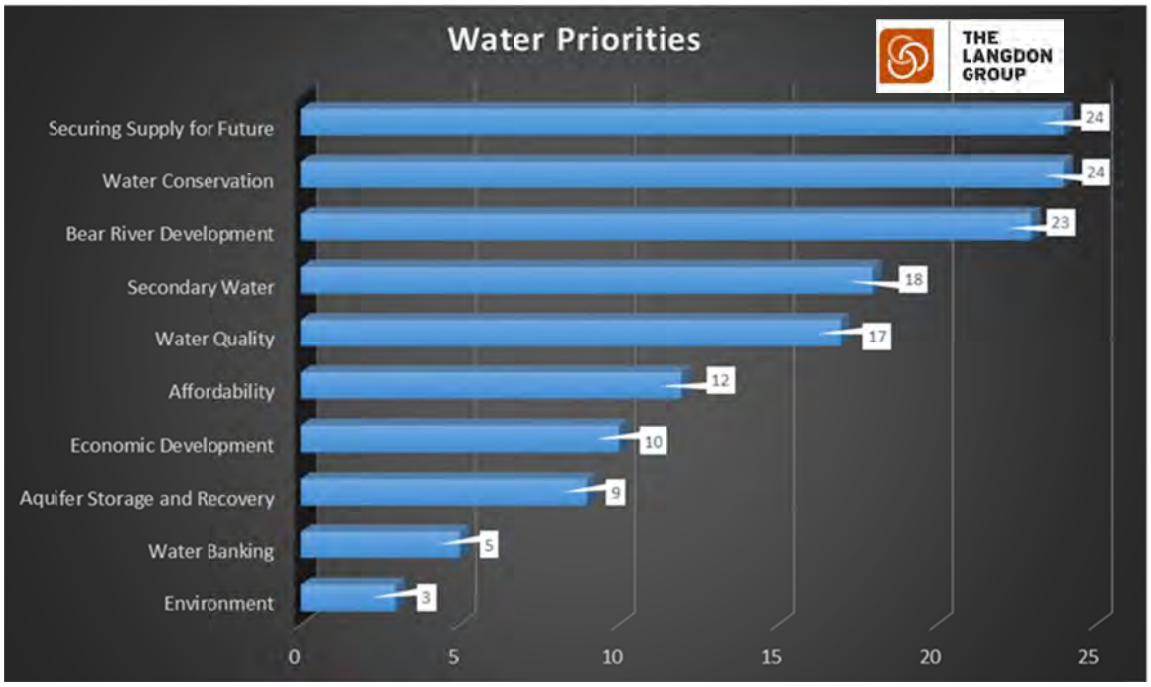


Figure 3-2
Stakeholder Kickoff Meeting Input

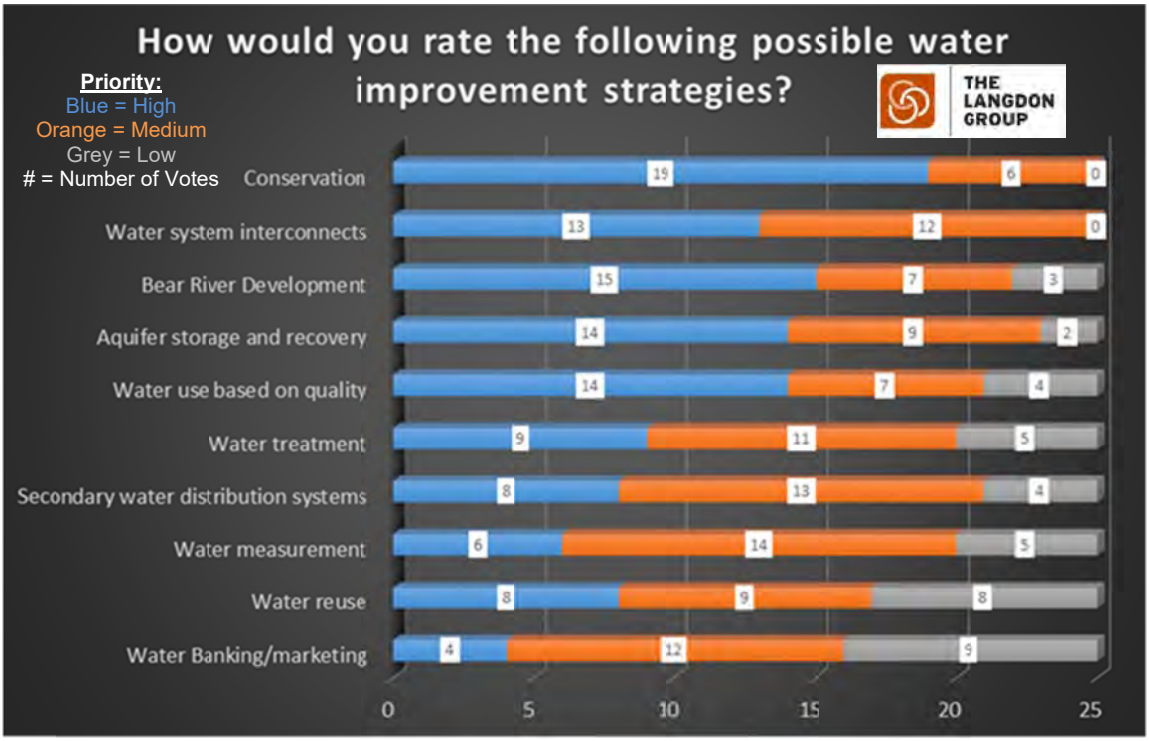
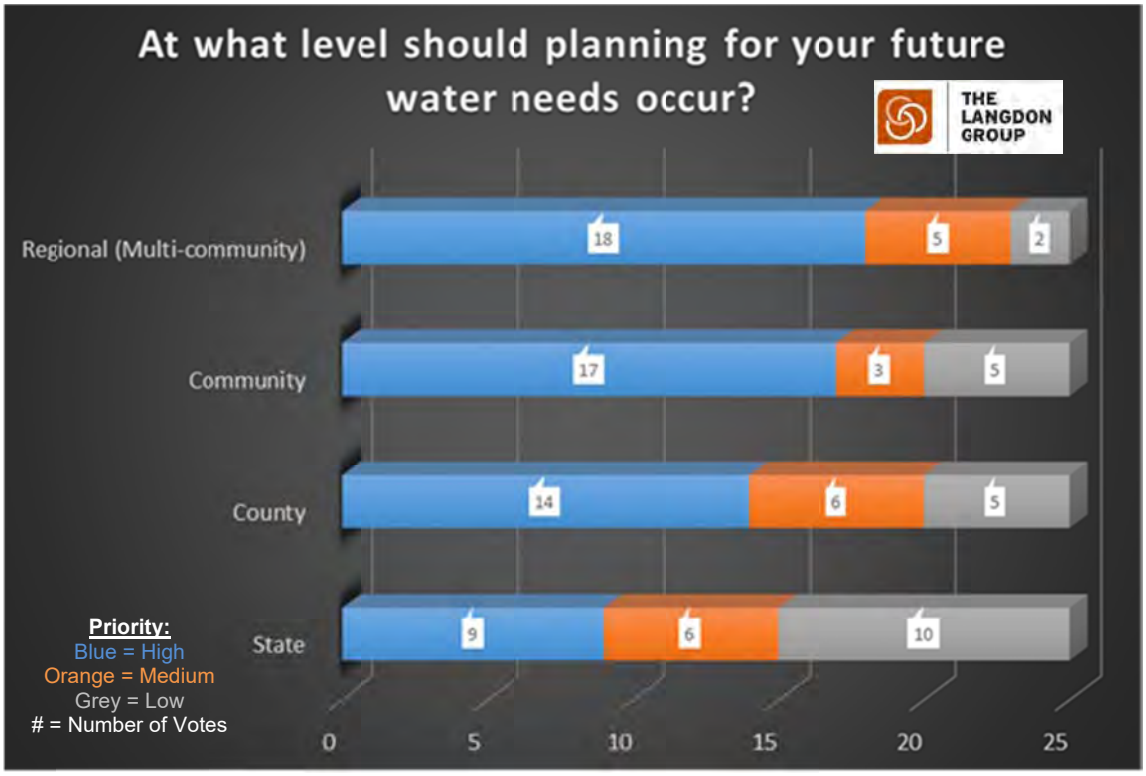


Figure 3-3
Stakeholder Water Planning Preferences



WATER SUPPLY AGENCY INTERVIEWS

The next step of the master plan was to conduct interviews with the water supply agencies in Box Elder County. The interviews were planned to emphasize effective communication and collaboration between BRWCD and the water agencies. A facilitator was present at the interviews as well as BRWCD's General Manager and an engineer to help gather technical information.

Goals of Water Agency Interviews

The goals of the interviews with the water agencies were to:

- Gather information about each of the water systems in the area;
- Identify their water concerns and goals
- Understand their water development priorities
- Understand their views about how to plan water supplies for the future
- Understand positions with regards to development of the Bear River
- Hear their views of potential water management options
- Identify opportunities, needs, and communication strategies
- Build trust through an open and inclusive process

Summary of Information Gathered

The interviews with the stakeholders provided valuable information about the key water issues, needs and concerns.

Stakeholder Input Implementation

Based on responses from stakeholders, the preferred model for meeting water demands in Box Elder County is a community to regional water supply system with priorities placed on water conservation and securing sufficient water supply for future demands. BRWCD's mission statement focuses on conserving and protecting water and water rights in Box Elder County by developing and providing water for municipal, industrial, and agricultural uses to serve the residents of the County. The goal of this master plan is to identify when individual communities will need additional water supply and how much they will need and then develop plans for BRWCD to help these communities meet their needs as a regional water supplier.

The scope of the master plan is tailored to address stakeholder objectives by addressing how the County can use their allotment from the Bear River Development project, identifying the County's water conservation goal, planning for compliance with the State's conservation goal, and planning how the District can effectively meet water supply needs in the county as a regional water supplier. Additionally, during interviews with individual stakeholders, BRWCD identified specific concerns and supply needs for local water systems. These needs and concerns have been incorporated into the development of master planned projects.

CHAPTER 4 - WATER SUPPLY AND DEMAND

INTRODUCTION

As the population within Box Elder County continues to grow, additional water supplies will be needed to meet the increasing water demand. A necessary first step in identifying how to supply water to the growing population of Box Elder County is to identify where water will be needed in the future.

In the 2005 Master Plan, BRWCD met with the water supply agencies in the County to get a sense of which water supply agencies needed future water service from BRWCD. From that information, the Master Plan was developed and several needed water supply projects were identified.

A similar approach was taken with this Master Plan. An outreach was made to the water suppliers in the County, including a data review of each water supplier's water supply and demands. This data was then analyzed to help identify where future water supply deficiencies would be located within the County.

This chapter documents the outreach to the public water suppliers in the County, describes the methodology for evaluating the water supply and demand analyses, and the results of the analyses.

OUTREACH INTERVIEWS

Interviews were held with the public drinking water suppliers in Box Elder County in May, June and July 2016. Topics of discussion included descriptions of the water suppliers' water system facilities, current challenges or problems, future water supply plans and possible BRWCD assistance in the future.

AVAILABLE DRINKING WATER SUPPLIES

Box Elder County is currently completely dependent upon groundwater for drinking water sources. According to USGS Technical Publication No. 44 (Bjorklund & McGreevy 1974), recharge to the groundwater system in the Bear River Valley area of Box Elder County is from precipitation falling within the mountains and foothills surrounding the valley and infiltration from canals, the Bear River, and the Malad River.

Although there is a large groundwater reservoir in the valley, most of the water is not of drinking water quality. Utah Division of Drinking (DDW) has defined drinking water quality as less than 1,000 mg/L total dissolved solids (TDS). TDS concentrations exceed 1,000 mg/L throughout most of the valley. High quality groundwater (TDS <500 mg/L) is primarily available along the eastern benches of the valley in the foothills of the Wellsville and Clarkston Mountains and in the benches east of the West Hills near Portage. There is some moderate quality water (TDS from 500 to 1,000 mg/L) in the Bothwell Pocket that is used for drinking water.

Existing drinking water supplies within the county are from developed springs and wells. Most of these sources are located along the benches of the Wellsville Mountains. All of the drinking water quality springs in the area have previously been developed for drinking water use. Therefore, any new development of groundwater supplies will have to be wells.

Based on conversations with representatives of the Division of Water Rights, there is currently a moratorium on new water right appropriations within the Bear River Valley area while they complete a study of the area. It is anticipated, based on preliminary data from the study, that if they don't close the water right area to new appropriations, there will be very little groundwater remaining to new appropriations. Therefore, only a small portion of future drinking water supplies will be able to be developed from groundwater and it will be necessary for BRWCD to develop surface water resources for drinking water supply.

Currently, most smaller surface water sources within the County, such as Box Elder Creek, are fully developed for agricultural purposes. Because there are still large tracts of land available for farming that are currently not irrigated, it is unlikely that existing surface water sources will be able to be converted to municipal use. Because of this, the Bear River Development project water will be critical for the future drinking water supply for Box Elder County.

WATER SUPPLY AND DEMAND ANALYSES

Data analyses were prepared for each public water supply agency in the County. The main purpose of the analyses was to estimate how much excess capacity each public water supply agency has available to serve new connections within their service area. Another important purpose was to identify areas that would need additional water supplies in the future, how much water may be needed, and how the District may be of service.

Calculations Methodology

The method that was used to calculate a water supplier's excess capacity is outlined as follows:

1. Document the number of water connections served currently and historically.
2. Project future connections every decade through 2060.
3. Calculate the annual water volume requirements using the State Division of Drinking Water criteria for public drinking water systems.
4. Estimate the amount of outdoor irrigation on the public drinking water system. The information obtained in the interviews was used to document the presence or absence of secondary water for outdoor irrigation. The estimated amount of outdoor irrigation on the public water system was calculated by 1) comparing the total public drinking water system use reported divided by the number of connections and 2) calibrating the average outdoor use per connection so that the calculated total matches the actual total.
5. Calculate the peak day water demand using the State Division of Drinking Water criteria for public drinking water systems.
6. Document the water agency's water sources and document the reported physical capacity and water rights capacity for each source.
7. Apply a safety factor and calculate how much water supply is available as a "dependable" supply for the water system.
8. Calculate how many new residential connections the water system can safely serve beyond the current number served without using more water than is available.

The results of the water supply and demand analyses show which water supply agencies have significant excess water reserves, and which agencies are already having difficulties keeping up with the current demands on their system. The results are presented in Tables 4-1 and 4-2.

Data Sources

The analyses were performed by using information obtained in the outreach interviews and by using existing public information about the annual usage, number of service connections and source data for each water supplier. All public water suppliers are required to submit this data annually to the Utah Division of Water Rights.

Data Precision

The calculations were limited in precision to the data that was submitted by the individual water suppliers to the Utah Division of water rights and to data provided by water suppliers during the interview process. In some cases there were data gaps for years when no data was submitted. Also, some data was inconsistent from year to year for a given water source. Wherever there was missing or inconsistent data, the best and most consistent data was used to calculate the available water supply.

Drought Effects on Water Supply

The data showed that the ground water supply varied dramatically from wet to dry years, especially for springs. It was interesting to note that some springs had their worst and best flow years on different years than others, even within the same water supplier's systems. It was also interesting to note that some of the springs showed their worst flow year in 2013 or in the following year 2014 for data submitted over a period of 30 years. Other springs showed their worst flow years during or immediately following other drought years, including 1988/89, 2003, and 2013. Apparently, drought conditions are not affecting all areas within the County to the same degree on the same drought year.

Because water systems still need to meet demands in dry years when spring flows are low, the dependable spring supply is limited to the dry year flows. Therefore, the dry year spring flows were used in determining water system physical source capacity.

Limiting Factor

Tables 4-1 and 4-2 include a report of the limiting factor for allowing new growth within each water supply agency in the county. The criteria for limiting factors included the following possibilities:

1. Peak Day Physical Source Capacity
2. Annual Volume Physical Source Capacity
3. Water Rights Peak Day Capacity
4. Water Rights Annual Volume Physical Source Capacity

Table 4 – 1
Water Suppliers' Future Service Capacity

Water Supplier	Number of Connections Served in 2015	Number of Additional Connections That Can Be Served	Limiting Factor
Acme Water Company (Bear River City)	344	709	Peak Day Physical Source Capacity
Bothwell Cemetery and Water Company	118	99	
Brigham City	5494	1,942	
Cedar Ridge Subdivision	33	44	
Coleman Trailer Court	28	0	Water Rights
Corinne City	304	399	Peak Day Physical Source Capacity
Deweyville Town	132	89	
Elwood Town	364	294	
Five C's Trailer Court	26	26	Water Rights
Garland City	831	150	Peak Day Physical Source Capacity
Grouse Creek	45	35	
Honeyville City	489	403	
Hot Springs Trailer Court	45	-4	Water Rights
Howell Town	109	101	Peak Day Physical Source Capacity
Mantua Town	246	158	Water Rights
Marble Hills Subdivision	75	-19	Peak Day Physical Source Capacity
Perry City	1570	370	
Plymouth Town	168	61	
Portage Town	108	-7	Water Rights
Riverside North Garland Water Company	634	175	Peak Day Physical Source Capacity
Snowville Town	130	109	Peak Day Physical Source Capacity
South Willard Water Company	450	60	Water Rights
Sunset Park Subdivision	15	12	
Thatcher Penrose Service District	259	194	
Tremonton City	2506	-123	Peak Day Physical Source Capacity
Ukon Water Company (Fielding)	384	39	
West Corinne Water Company	619	162	
Willard City	652	682	
Willow Creek Water Company	59	6	
Totals	16,237	6,166	
Averages	560	212 (32%)	72% Peak Day Demand 28% Water Rights

Table 4 – 2
BRWCD Service Areas Future Service Capacity

Water Supplier	Number of Connections Served in 2015	Number of Additional Connections That Can Be Served	Limiting Factor
BRWCD Beaver Dam	23	13	Peak Day Demand
BRWCD Bothwell M&I	44	826	Water Rights
BRWCD Collinston	21	16	Peak Day Demand
BRWCD Harper Ward	83	121	
BRWCD South Willard	96	408	
Totals	267	1384	
Averages	53	277 (600%)	80% Peak Day Demand 20% Water Rights

The data presented in Tables 4-1 and 4-2 shows that the most common limitation in the water supply agencies and BRWCD's five service areas is peak day physical source capacity. The water supply agencies' average is 72% and BRWCD's service area average is 80% of the systems limited by peak day capacity, respectively.

The other less common limiting factor is water rights. An average of 28% of the water supply agencies are limited by water rights factors, while 1 of BRWCD's 5 service areas, or 20%, is limited by water rights issues. Some of the systems have peak day capacity water rights flow limitations while others have annual volume water rights limitations.

Dependable Peak Day Supply

Box Elder County is 100% dependent on groundwater for public drinking water supply. Most of Box Elder County's water supply agencies use springs in part for water supply, and a few are totally dependent on springs. To the degree that water suppliers rely on springs they are also restricted by the flow patterns of the springs that they use.

Compared to wells, the nature of springs as a source of water supply makes it difficult to rely on as dependable sources of supply. This is due to the natural fluctuations of spring flows in wet and dry years. During wet years, there is generally plenty of water flowing from the springs to satisfy water demand. However, in dry years the flows can drop dramatically to a small fraction of the average flows. Pumping systems in wells, in contrast, can be turned on and off as desired, thus preserving the groundwater for times when the wells are most beneficial.

The result of the County's heavy reliance on springs is that the dependable source of supply, especially for meeting peak day demand, is curtailed because of the uncertainty of spring flows from year to year.

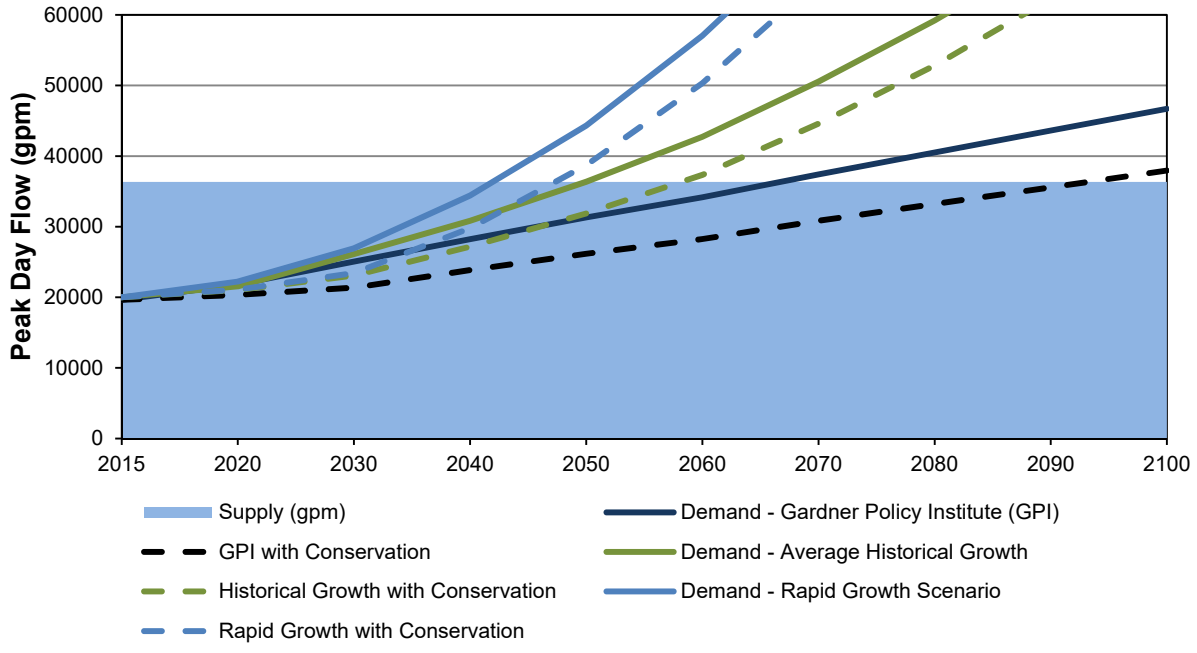
An additional factor limiting the peak day supply is the County's sole reliance upon groundwater in general. Areas in the State of Utah that have access to storage reservoirs and water treatment plants are provided with additional peak day supply during drought conditions due to the large volumes that can be stored in the reservoirs during wetter years. Box Elder County, however, has to meet all peak day demands during drought periods with only what flows from springs and can be pumped from wells, which are both reduced during drought due to declining groundwater levels.

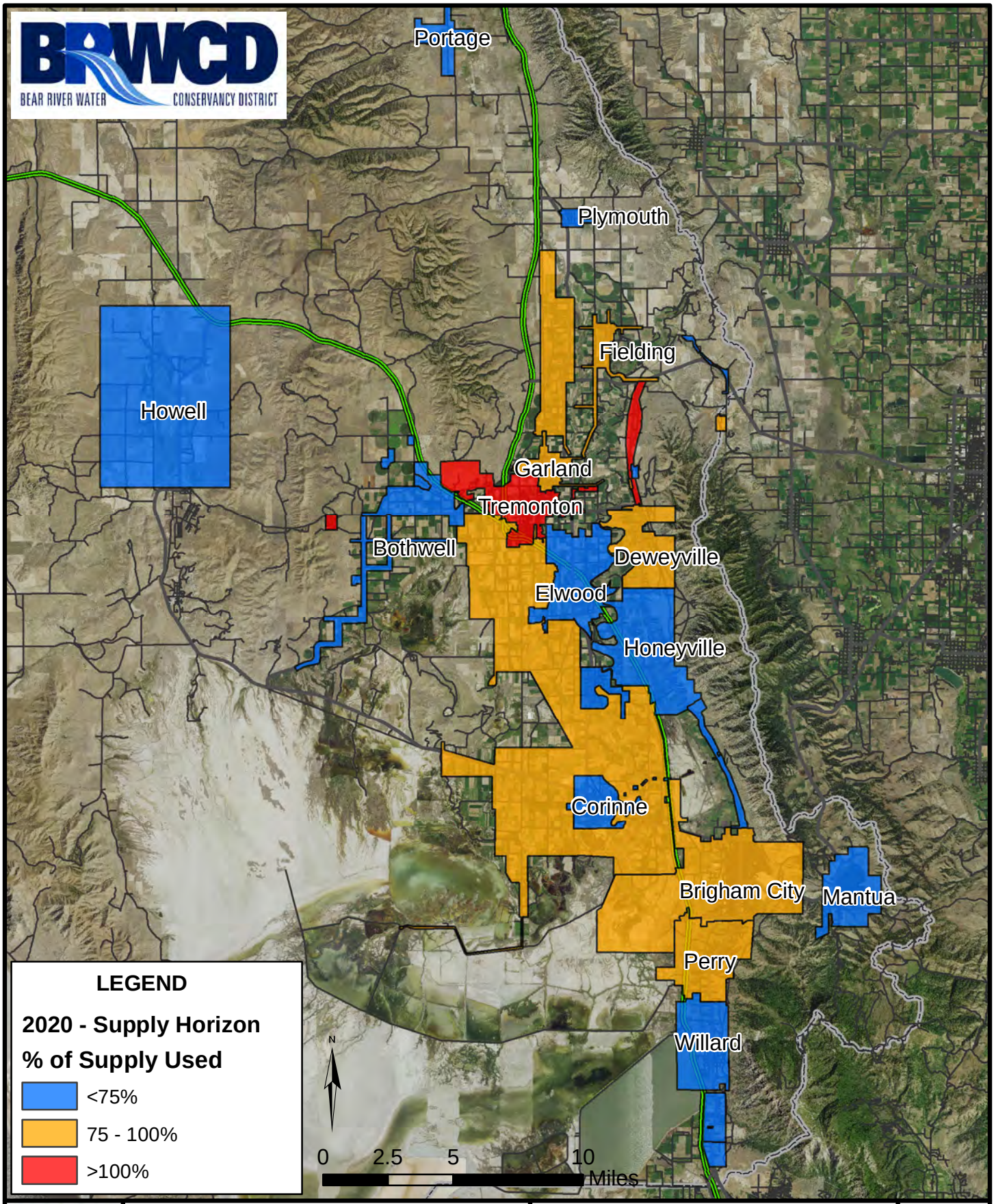
WATER SHORTAGE HORIZON

The available water supply (peak day and annual average) for each public water supplier was compared to the projected water demand throughout the planning period. This was done to better understand when water systems would need additional source of supply and which areas of the county would need additional sources first. It was assumed that water suppliers would begin to seek additional water supply when their demand reached 75% of their source of supply. A series of maps was prepared to demonstrate the water shortage horizon for each decade until 2060 as shown on Figures 4-1 through 4-5. If the projected demand is less than 75% of the supply, the water system area was shown in blue. If the demand is between 75% and 100% of supply, it is shown in yellow. Systems with demands greater than the supply are shown in red. It can be seen from these maps that most water systems will have either exceeded their supply or will be seeking additional water supply by the year 2060. These figures assume that the State's water conservation goal will be achieved for Box Elder County by the year 2025. If conservation goals are not achieved by individual systems, supply may exceed demands sooner than predicted on these figures.

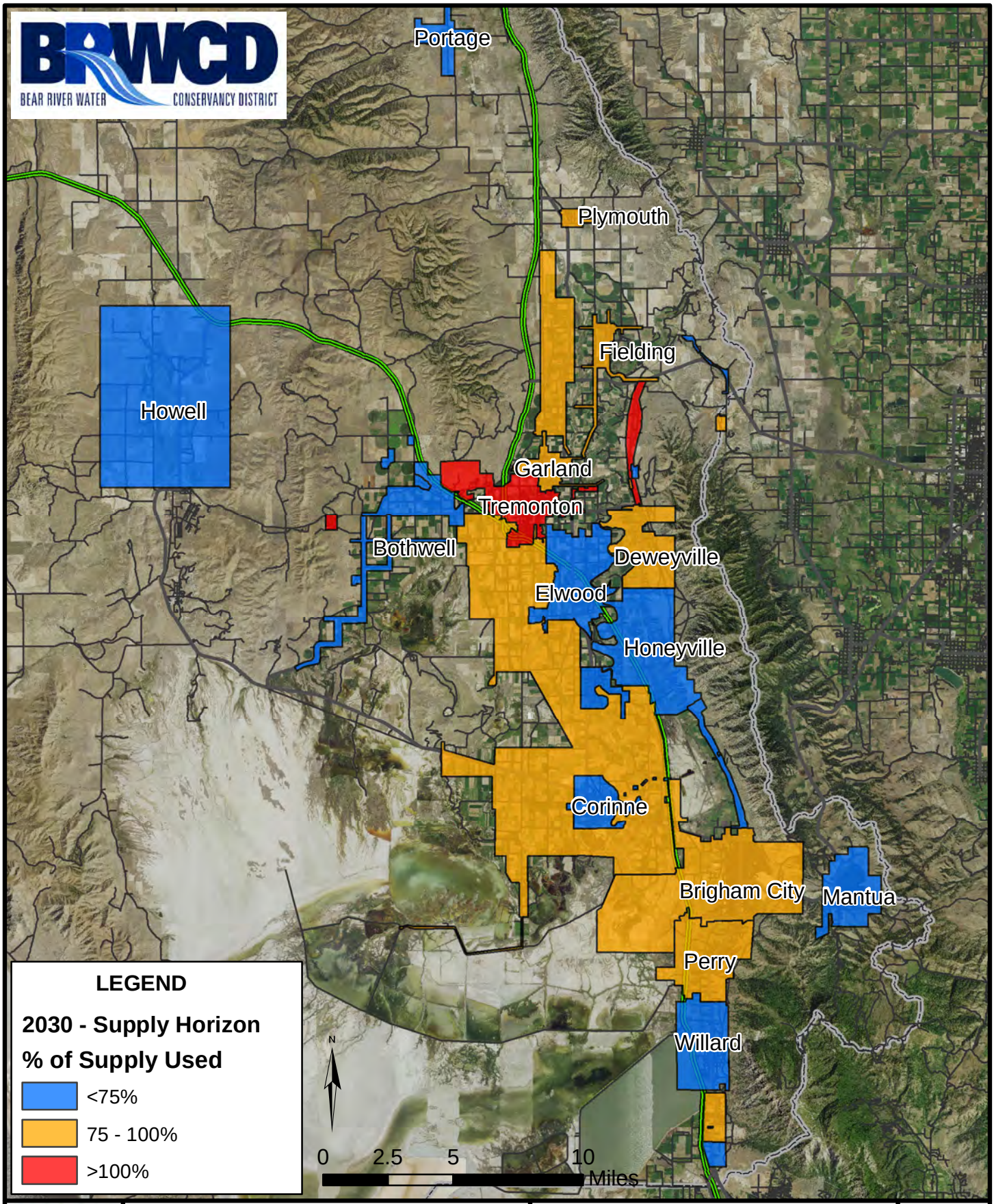
The water shortage horizon maps help show when specific water systems will need water, but do not show when existing overall county water supplies will be exceeded by the projected demand. Figures 4-6 and 4-7 below show the projected water demand using the Gardner Policy Institute (2017) projection, Average Historical Growth Projection, and the Rapid Growth Scenario projection compared to the existing county-wide supply using peak day and annual average volume calculations. Demands were calculated assuming the County meets the conservation goal and assuming current per capita use rates. These figures demonstrate that existing supplies may be exhausted as soon as 2045-2050 if rapid growth is experienced by the County. If future growth follows the pattern developed by GPI, water may not need water until

Figure 4-6
Supply vs. Demand - Peak Day Flow

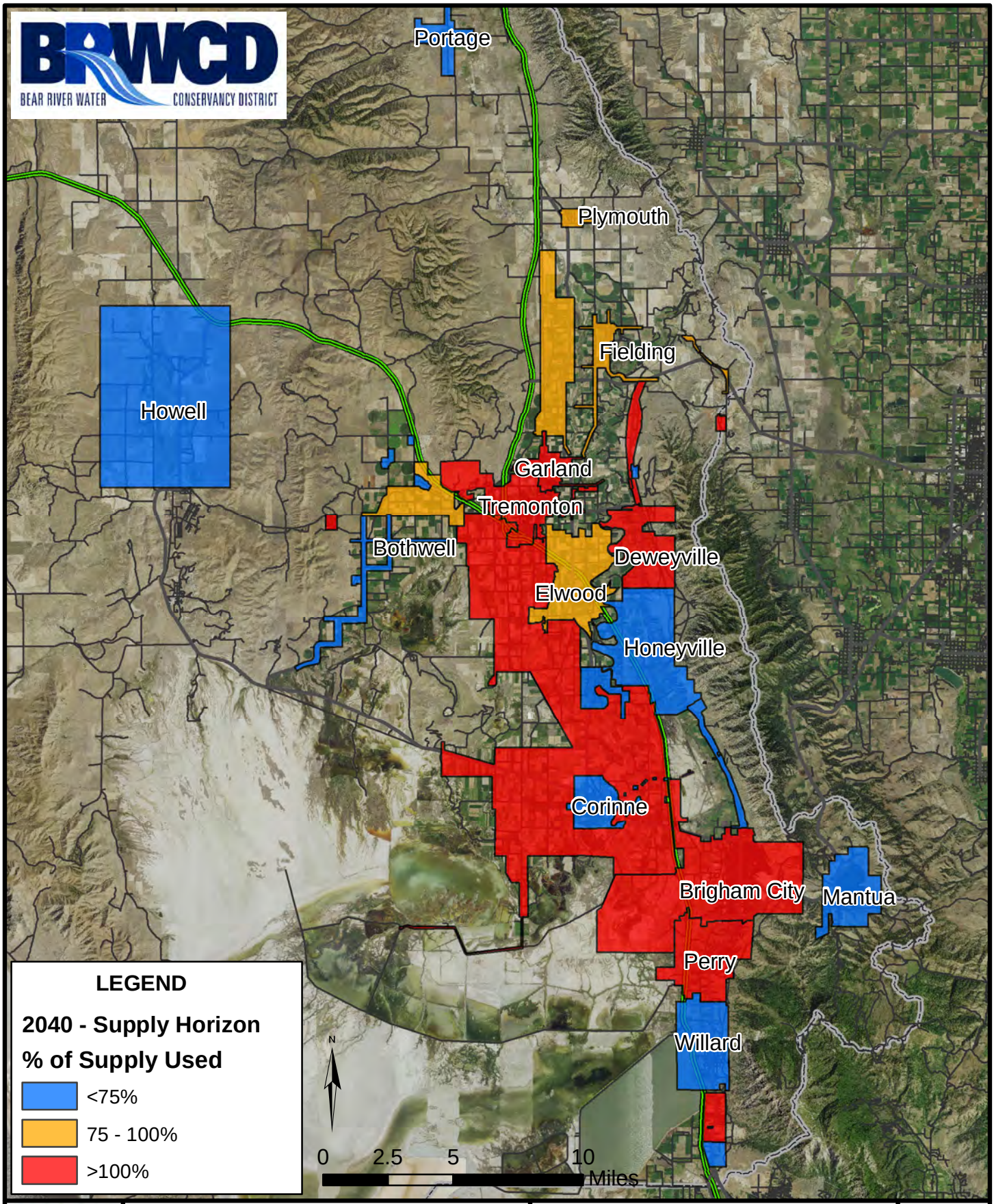




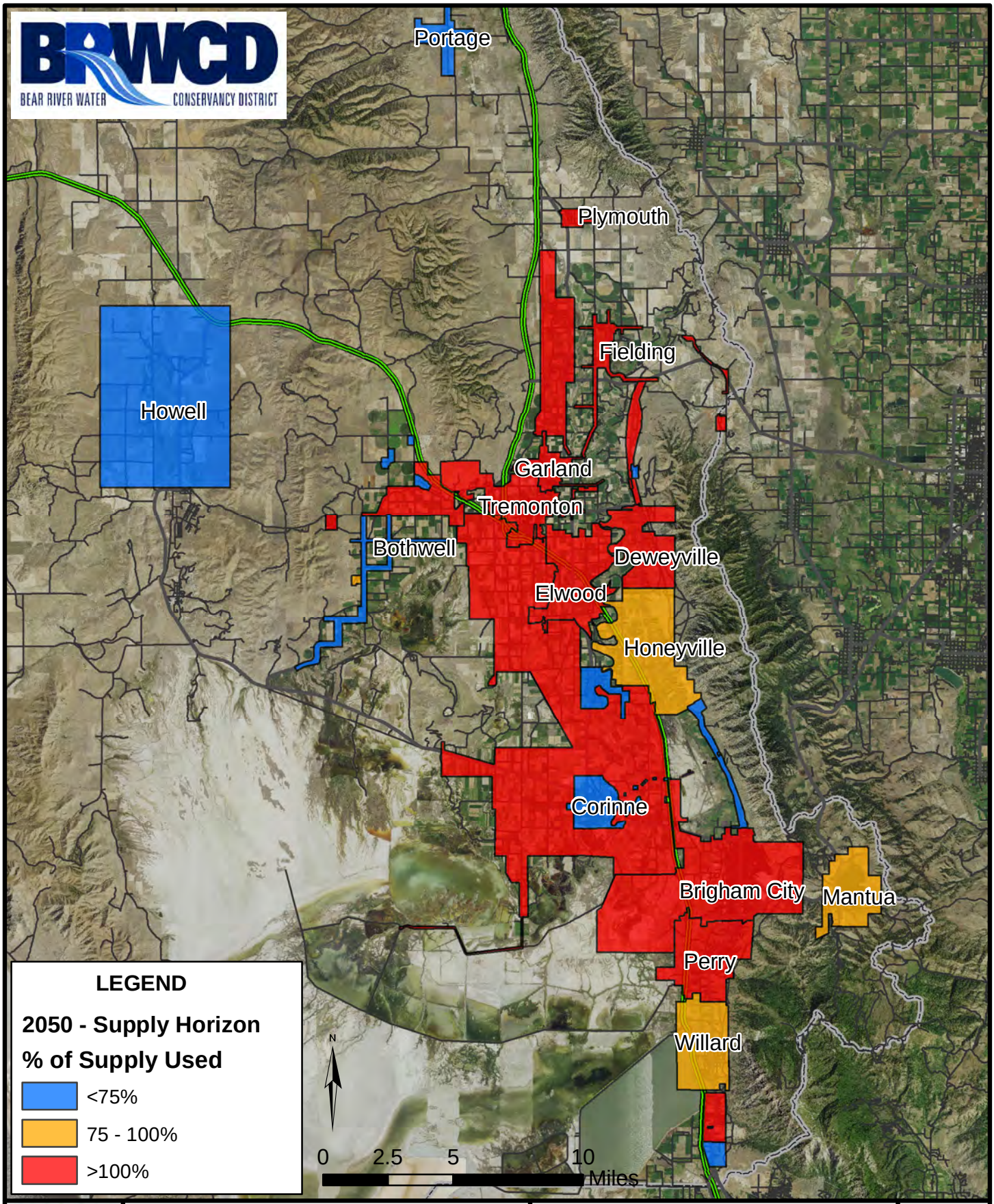
HANSEN ALLEN & LUCE INC ENGINEERS	**Bear River Water Conservancy District 2017 Master Plan**	**Water Shortage Horizon 2020**	**Figure 4-1**



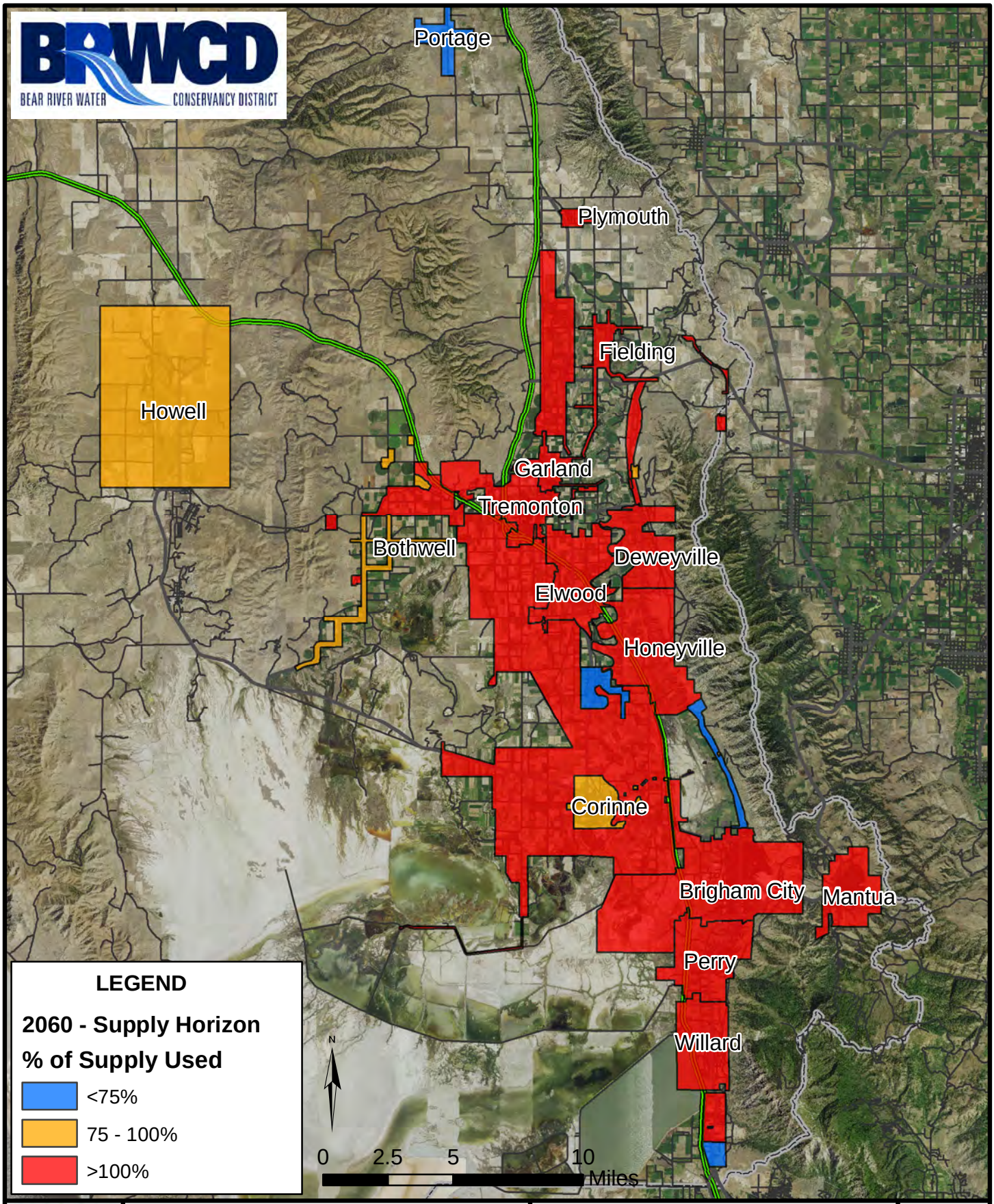
HANSEN ALLEN & LUCE INC ENGINEERS	**Bear River Water Conservancy District 2017 Master Plan**	**Water Shortage Horizon 2030**	**Figure 4-2**



HANSEN ALLEN & LUCE INC ENGINEERS	**Bear River Water Conservancy District 2017 Master Plan**	**Water Shortage Horizon 2040**	**Figure 4-3**

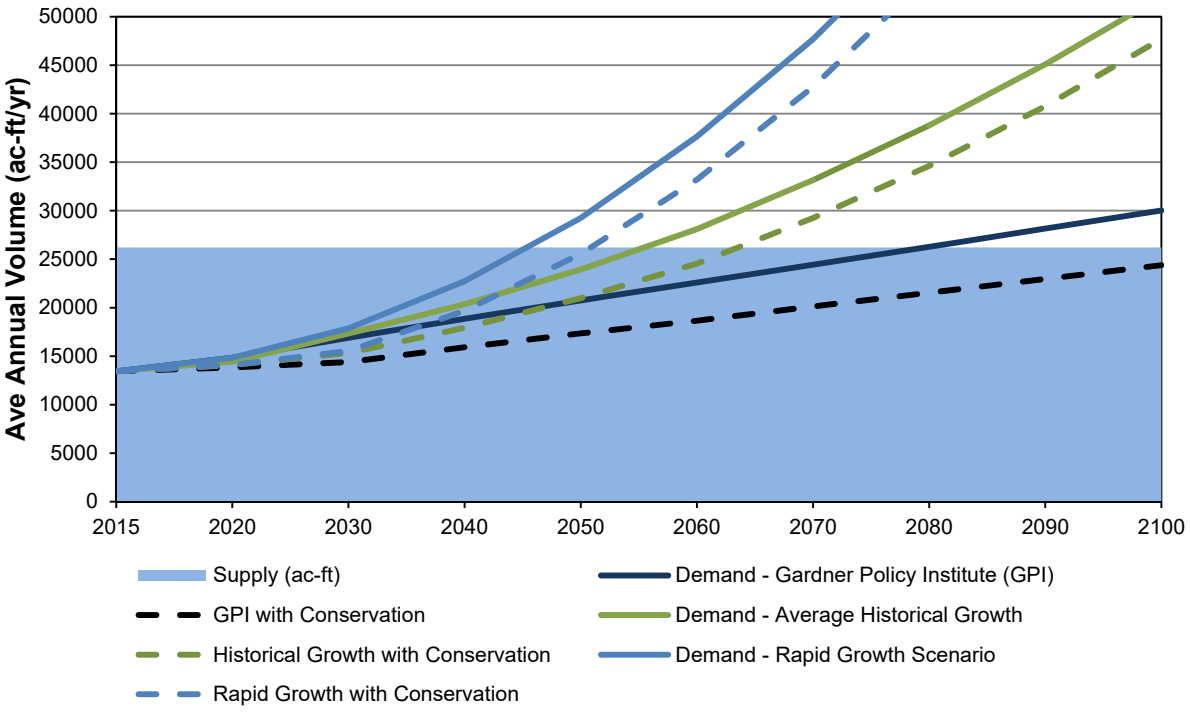


HANSEN ALLEN & LUCE INC ENGINEERS	**Bear River Water Conservancy District 2017 Master Plan**	**Water Shortage Horizon 2050**	**Figure 4-4**



HANSEN ALLEN & LUCE INC ENGINEERS	**Bear River Water Conservancy District 2017 Master Plan**	**Water Shortage Horizon 2060**	**Figure 4-5**

Figure 4-7
Supply vs. Demand - Ave Annual Volume



2080. We believe it is more likely that if rapid growth is not experienced, population growth will follow either historical growth rates or somewhere between historical growth and the rapid growth scenario. In this case water from the Bear River Development project will be need 2055-2060. The Bear River Development project is Box Elder County's future water supply.

Build-Out Projections

In June 2010, BRWCD obtained two independent evaluations of the projected build-out demand for eastern Box Elder County (the Bear River Valley). These evaluations were performed by Hansen, Allen & Luce, Inc. (HAL) and Bowen, Collins & Associates (BC&A). The developable area for both evaluations was very comparable (149,000 to 159,000 acres) and is shown on Figure 5-1. It is interesting to note that the methodology for estimating demands was different for the evaluations. HAL developed a unit demand per equivalent residential connection based on typical water use patterns and projected the total number of connections per acre. BC&A developed a range of unit demands per developable acre based on typical values experienced by large water districts in Salt Lake, Davis, and Weber counties. The HAL unit demands were converted to acre-feet per developable acre for comparison purposes. Table 4-3 summarizes the projected water demand for the HAL and BC&A projections.

Table 4 – 3
Build-Out Projections

	HAL Projection	BC&A Projection
Unit Demand per Developable Acre	2.3 ac-ft/ac	2.0 ac-ft/ac – 2.8 ac-ft/ac (ave = 2.4)
Total Developable Acres	159,000 ac	149,000 ac
Projected Build-Out Demand	361,000 ac-ft	298,000 ac-ft – 417,200 ac-ft (ave = 357,000)

Assuming full development of existing firm water rights held by public water suppliers, the total existing available water supply is estimated to be 32,527 acre-feet. Based on these projections, the Bear River Valley will need more than 300,000 acre-feet of additional water to meet build-out demands. The Bear River Development project allocates 60,000 acre-feet of water to Box Elder County to be administered by BRWCD. This still leaves a deficiency of more than 250,000 acre-feet of water.

The Bear River Canal Company (BRCC) has estimated that the current irrigated acreage in the Bear River Valley is about 66,000 acres and that they currently deliver between 250,000 and 280,000 acre-feet of water for irrigation purposes. However, based on the Bear Lake Compact, these water rights are limited to irrigation only and cannot be converted to municipal use. Therefore, no attempt has been made to estimate any conversion of BRCC water to municipal use. However, BRCC could consider providing pressurized irrigation service to new developments in the future. If this were to occur, and a pressurized irrigation system was constructed throughout most of the study area, a total of approximately 163,000 acre-feet of BRCC water could be used for outdoor watering. This would reduce the projected build-out deficiency to around 100,000 acre-feet.

In order to meet build-out demands, the Bear River Valley will need their full portion of the Bear River Development, BRCC water will need to be used in pressurized irrigation systems, and additional water will need to be developed. BRWCD will move forward in securing additional water rights and water supplies to meet future demands.

CHAPTER 5 - BEAR RIVER DEVELOPMENT

INTRODUCTION

The purpose of this chapter is to provide a general overview of how BRWCD would integrate into the proposed Bear River Project (BRP). It is important to BRWCD to include all future water supply sources in this Master Plan document, including the BRP water. Box Elder County has the potential to grow at normal Wasatch Front growth rates or higher, and it will soon begin to look more like the current Weber/Davis County areas. This potential for increasing demand from growth requires that additional drinking water supply sources be planned for now. The BRP water, as the population grows, will play a key role in the future water supply for Box Elder County.

This BRWCD Master Plan documents and describes the approach and results for estimating population growth within BRWCD boundaries and associated water supply needs (see Chapter 4). BRWCD service area is estimated to begin needing additional water supply between the years 2045 and 2055.

Depending on population growth and long-term availability/reliability of existing water sources, BRWCD's service area could see a need to develop an initial allotment of BRP water prior to the full scale BRP development. Based on this potential need, this chapter also summarizes a conceptual approach to developing the BRP water prior to the initiation of the full project.

It should be noted that the layout of BRWCD's and BRP facilities shown should be considered as very conceptual at this stage of the project. The BRP facilities are shown for the purposes of providing a concept for integration of BRWCD's system.

BEAR RIVER PROJECT BACKGROUND

The purpose of the BRP is to develop Bear River water and deliver it to the four water agencies in Box Elder, Cache, Weber/Davis, and Salt Lake Counties. In 1991, the Utah State Legislature passed the Bear River Development Act. The Act directs the DWRe to develop 220,000 acre-feet (AF) of water right applications held by the Board of Water Resources. The overall Project will consist of reservoir storage and conveyance facilities necessary to deliver water from the Bear River to the four participating water agencies.

The State holds the water rights for the project and will contract with each participating water district to provide the water through the BRP. Box Elder County's set allocation of BRP water is 60,000 AF per year. The cost of the water conveyance and storage aspects of the BRP (minus any public purpose aspects, such as recreation, flood control, etc.) will be equally divided between the four participating water agencies: BRWCD, Cache County Water District, Jordan Valley Water Conservancy District, and Weber Basin Water Conservancy District.

The BRP concept is currently being developed and refined, with reservoir (storage) sites being evaluated. Depending on where those reservoirs are located, the pipeline and pumping facilities may change. Figure 5-1 shows the planned conceptual BRP facilities in the Box Elder County area. Currently the BRP is looking at four reservoirs in the Box Elder County area for storage: Washakie to the north (not shown), Whites Valley to the West, Fielding (on the Bear River near Fielding), and South Willard (south of Willard Bay). These sites are currently being evaluated for

BRWCD Water Treatment Plant Facilities for Full Development of Bear River Project

Legend

- BR Project Facilities
- Potential BR Reservoirs
- Bear River Pipeline (Proposed)
- Whites Valley Pipeline (Proposed)
- Developable Area
- County Boundary

Elevation (feet MSL)

- 4,200 - 4,300
- 4,300 - 4,350
- 4,350 - 4,400
- 4,400 - 4,450
- 4,450 - 4,500
- 4,500 - 4,550
- 4,550 - 4,600
- 4,600 - 4,650
- 4,650 - 4,700
- 4,700 - 9,957

BRWCD Proposed Facilities

- WTP
- Pipeline

NOTES:

BRWCD share of Bear River Project: 180 cfs or 60,000 AF/yr

Colored Elevation Range depicts areas that can be served by gravity, using the pressure in the Bear River Project Pipeline System.

The Bear River Project Facilities shown represent the currently planned concept of the project and may be subject to change depending on storage locations and other factors.

2 1 0 2 Miles

NORTH

Proposed Whites Valley Reservoir

Whites Valley Pumping & Hydro-Power Plants

Bothwell WTP
80 cfs (52 MGD)

Proposed Fielding Reservoir

Fielding Res Pumping Plant

Deweyville WTP
20 cfs (13 MGD)
INITIAL OPTION

Brigham WTP
80 cfs (52 MGD)
MAX: 180 cfs (116 MGD)

Proposed South Willard Reservoir

Clarkston
Plymouth
Fielding
Malad River
Garland
Tremonton
Deweyville
Elwood
Honeyville
Bear River City
Corinne
Brigham City
Mantua
Perry
Willard
Willard Bay
Bear River

BRWCD
BEAR RIVER WATER CONSERVANCY DISTRICT

HANSEN ALLEN & LUCE inc ENGINEERS
Bowen Collins & Associates, Inc. CONSULTING ENGINEERS

Bear River Water Conservancy District Master Plan

BRWCD Facilities for the Bear River Project at Full Development

FIGURE 5-1

P:\State of Utah\Division of Water Resources\Bear River Project-Phase 2-2014\GIS\Projects\BRWCD GIS\BRWCD.mxd tclark 3/23/2017

feasibility and cost. Modifications to the storage size and location may have some impacts on the sizes and locations of BRWCD's facilities shown.

BRWCD FACILITIES AT FULL DEVELOPMENT OF BEAR RIVER PROJECT

The purpose of this section is to outline the future BRWCD facilities needed under the full development of the BRP. BRWCD will have a 60,000 AF allocation from the BRP that generally will be distributed throughout the service area from Fielding to Willard. Figure 5-1 depicts BRWCD's main service area, including the approximate developable area (in red hatching).

The BRP main transmission pipeline (90" to 114" diameter) runs north to south, generally parallel to the Bear River in the north and Willard Bay in the south of the County, as shown in Figure 5-1, stretching the length of BRWCD's service area. The colored areas in Figure 5-1 show the elevation range at which the pressurized BRP Pipelines could deliver water without additional pumping. The main BRP storage facilities, in relation to BRWCD, being evaluated are the Fielding and Whites Valley Reservoirs, located as shown.

The Fielding Reservoir will be located on the Bear River, and has a planned storage capacity from 30,000 AF to 70,000 AF. Delivery flows from the reservoir will have to be pumped either up to Whites Valley or south to the West Haven WTP (not shown) for deliveries to the Weber/Davis and Salt Lake County water entities. The proposed South Willard Reservoir, if implemented, will be mainly for storage capacity for the southern water entities.

The Whites Valley Reservoir has a potential storage capacity of 150,000 AF to 400,000 AF. It sits about 1,000 feet above the Bear River, so it will require significant pumping to supply the reservoir and power recovery hydropower systems for delivery flows. The pipeline (120" to 144" diameter) to and from Whites Valley Reservoir would serve as conveyance of raw water to BRWCD's Bothwell service area.

In this fully developed BRP configuration, BRWCD will take raw water deliveries directly from the BRP pipelines at the proposed locations shown in Figure 6-1. The Bothwell area is adjacent to the alignment of the Whites Valley pipeline, which makes it a candidate for possibly locating a water treatment plant (WTP) on property that BRWCD owns near the Whites Valley Pump and Hydro Plant. The southern service area of BRWCD will be served off the main BRP pipeline near Brigham City, with a possible WTP located near Brigham City. This plant will be able to service the area from Bear River City down to Willard. A smaller WTP could be located in the vicinity of Deweyville to serve water to the northeast side of BRWCD's service area.

BRWCD will be responsible for the metering and controls of their connections on the main BRP pipeline, including their raw water transmission pipeline to the WTP. The proposed WTP capacities listed in the figure represent an approximation of maximum capacities under this fully developed BRP scenario. They are listed only for the purposes of planning and approximation of facility size and cost.

Table 5-1 summarizes the required facilities with associated approximate costs for BRWCD to obtain the full allotment of their BRP water.

Table 5-1
BRWCD Facilities Required at
Full Development of Bear River Project

BRWCD PROPOSED FACILITY *	COST ($ MILLIONS)**
Deweyville WTP (13 MGD) 24" Diameter Pipeline (14,200 LF) 15 MG Finished Water Storage	**$35.0**
Bothwell WTP (52 MGD) 48" Diameter Pipeline (3,900 LF) 55 MG Finished Water Storage	**$123.0**
Brigham City WTP (52 MGD) 48" Diameter Pipeline (8,900 LF) 55 MG Finished Water Storage	**$126.0**
TOTAL	**$249.0**

* Includes metering and valves off of main BRP pipeline
** Represents a conceptual level estimate of 2017 costs

BRWCD EARLY DEVELOPMENT OF BEAR RIVER PROJECT

As described in the introduction to this chapter, it is possible that BRWCD will require development of an initial allotment of their share of the BRP water prior to full scale BRP development. This section provides a conceptual level approach to early development of BRWCD's share of BRP water. Chapter 2 of this Master Plan identifies a need for approximately 10,000 AF by the years 2045-2055 within BRWCD's service area. The communities with the highest future need tend to be north of Honeyville, along the east bench of the valley and extending into the middle of the valley in the greater Tremonton area.

The simplest approach to developing a 10,000 AF share of BRP water would be to locate a small diversion off the Bear River, near Deweyville, and pump up to a treatment facility high on the east bench and then store and distribute treated water from there. It is estimated that approximately 15-20 cfs (up to 13 MGD) would be diverted for this initial development. The Bear River, even at lower flows, generally has adequate flow to supply the needed 15-20 cfs to this diversion. A detailed hydrologic evaluation of available river supply would need to be completed to determine supply reliability and understand the probability and magnitude of shortages (if any) in lower water years.

The Bear River diversion facility for initial development of BRP water would not have any integration into the proposed full development BRP facilities. However, BRWCD's pipeline and treatment facility would continue to be utilized into the future, but with a more reliable source of water supply once BRP storage facilities are fully developed.

It is assumed that the following facilities would be required for this early development of 10,000 AF of BRP water:

1. Diversion on the Bear River
    a. Small Concrete/Earth Diversion Dam Structure

2. Pumping Station (1,000 hp, capacity up to 20 cfs)
    a. Side Channel Intake Bar Racks and Fish Screens
    b. Pump Station Facility

3. Pipeline (24” diameter, 6,650 LF) to WTP

4. Treatment Facility (peak 13 MGD)
    a. Initial Sedimentation Basin
    b. Membrane Treatment Process
    c. Chlorination

5. Finished Water Storage (15 MG)

6. Transmission/Distribution System (not included in cost)

The estimated cost for these initial water supply facilities is approximately $35 million, representing a conceptual level facility sizing and configuration.

As ongoing planning of the BRP facilities continues, BRWCD should continue to modify their approach and plans for initial development of a portion of their share of the BRP. As the BRP is the future water supply for Box Elder County, it is important to encourage and support the State of Utah Division of Water Resources to continue to study all aspects of the BRP as outlined in the Bear River Development Act.

CHAPTER 6 - CONSERVATION

INTRODUCTION

In response to the steady growth occurring throughout the state and a sincere concern for the future availability and cost of the water supply, Utah Division of Water Resources (DWRe) developed *Utah's Municipal & Industrial (M&I) Water Conservation Plan – Planning for the Future* in 2001. In this plan, it is established that the baseline M&I water use in the State of Utah was an average of 295 gallons per capita per day (gpcd) in the year 2000. In order to reduce per capita M&I water use, the State of Utah established a goal "to reduce the 2000 per capita water demand from public community water system by at least 25%" by the year 2050. In 2014, DWRe updated the state goal to accomplish the same 25% reduction by the year 2025 instead of 2050 (see *Utah's Municipal & Industrial Water Conservation Plan – Investing in the Future* by DWRe).

In 2007, the Utah State Legislature passed and amended the "Water Conservation Plan Act" (73-10-32 Utah Code Annotated). This law requires water conservancy districts and retail drinking water providers to prepare a water conservation plan, submit the plan to the Utah Division of Water Resources and to update the plan at least every five years. BRWCD has prepared a water conservation plan and has regularly updated it. The most recent update was completed in 2016.

Conservation is considered as the least costly and most logical method of extending the available water supply to meet the future water demands. BRWCD intends to promote water conservation among its retail and wholesale customers and to meet the State's goal for conservation.

This chapter documents the baseline year 2000 per capita water demand by BRWCD retail and wholesale customers, establishes the target per capita water use goal, explores current per-capita water use throughout the County, and identifies strategies for helping to encourage conservation.

PER CAPITA USAGE

Based on water use records reported to the Utah Division of Water Rights (DWRi) by public water suppliers located within Box Elder County and U.S. Census data, the average per capita M&I water use by BRWCD and public water suppliers potentially served by BRWCD was 264 gpcd. Therefore, in order to meet the State's water conservation goal, Box Elder County would need to reduce their per capita use to about 200 gpcd by the year 2025.

Average M&I per capita water usage for incorporated cities and towns in Box Elder County are shown in Table 6-1, and average M&I per capita usage for unincorporated areas in the county are shown in Table 6-2.

Table 6-1
Incorporated Cities and Towns Residential Per Capita Water Use

Municipality	Number of Residential Connections in 2010 (1)	Estimated Population Served	Total 2010 Usage Kgal	Per Capita Usage GPCD
Perry City	1,406	4,512	185,986	113
Honeyville City	463	1,441	83,995	160
Corinne City	279	685	41,357	165
Bear River City	335	853	58,258	187
Elwood Town	326	1,034	70,721	187
Garland City	756	2,400	211,821	242
Willard City	611	1,772	161,103	249
Brigham City	5,853	17,899	1,654,741	253
Tremonton City	2,060	7,647	29,374	261
Plymouth Town	151	414	40,989	271
Deweyville Town	121	332	33,016	272
Howell Town	84	245	26,312	294
Snowville Town	85	167	23,841	391

1. The 2010 Federal Census is the latest population count for individual communities

BRWCD's service areas also have residential connections as well as commercial and wholesale water delivery connections. Per capita usage from 2010-2015 for BRWCD's service areas are presented in Table 6-3. Note that per capita usage in 2011 was unusually low due to frequent rainy weather during the summer months that year.

Table 6-2
Unincorporated Areas Residential Per Capita Water Use

Water Service Provider	Number of Residential Connections in 2010	Estimated Population Served	Total 2010 Usage Kgal	Per Capita Usage GPCD
South Willard Water Company	400	1,256	44,645	97
Coleman Trailer Court	28	88	4,236	132
Five Cs Trailer Court	26	82	3,941	132
Hot Springs Trailer Court	45	141	6,830	132
Riverside North Garland Water Company	409	1,284	87,062	186
Marble Hills Subdivision	71	223	18,018	221
Sunset Park Subdivision	15	47	3,910	227
UKON Water Company (Fielding)	360	1,130	96,345	234
Grouse Creek	45	141	12,056	234
Bothwell Cemetery and Water Company	128	402	34,603	236

Water Service Provider	Number of Residential Connections in 2010	Estimated Population Served	Total 2010 Usage Kgal	Per Capita Usage GPCD
Thatcher Penrose Service District	243	763	70,770	254
Willow Creek Subdivision	59	185	17,595	260
West Corinne Water Company	564	1,771	170,223	263
Cedar Ridge Subdivision	27	85	11,475	370

Table 6-3
BRWCD Service Areas Per Capita Water Use

Year		Number of Connections	Total Usage Kgal	Per Capita Usage (gpcd)
2010	H,B	123	27,266	187
2011	H,B	121	21,982	153
2012	H,B	123	28,836	198
2013	H,B,BD	151	32,441	181
2014	H,B,BD	157	32,781	176
2015	H,B,BD,C	176	37,230	198

Note: Letters indicate systems included in calculations: H= Harper Ward, B= Bothwell, BD = Beaver Dam, C = Collinston

Based on the information presented in Tables 6-1, 6-2, and 6-3, the average per capita M&I water use in 2010 was about 228 gpcd. This represents a reduction from the 2000 baseline water use of more than 13%, which is more than half of the conservation goal. Additional water conservation will need to occur to reduce per capita water use within the BRWCD service area. It is believed that implementation of the following strategies will help Box Elder County reach the conservation goal.

CONSERVATION STRATEGIES

The following list shows a few of the more common efforts that most water agencies can take to help encourage conservation.

1. **Water Rates** – Many water suppliers in the county are using single tier water rate structures. Redesigning water rates to encourage conservation is a very effective tool for reducing per capita water use. Not only does water usage generally drop after a multi-tiered water rate structure is implemented, but revenue also generally increases to the water utility. The increased revenue provides more resources for water suppliers to make needed water system improvements including conservation measures. Conservation oriented rate structures can also address the need to provide basic water supply for public health needs at a very reasonable cost. BRWCD supports and encourages conservation oriented water rate structures.

2. **Public Outreach** - Some water users may lack information and understanding about efficient water use habits and practices. Many customers' irrigation and indoor practices are based on convenience rather than plant needs and water supply considerations. The benefits could be significant if BRWCD and other water suppliers would provide educational and motivational information to water users to become more informed about ways to water their lawns and gardens more efficiently. Some common ways of providing information to users include:

    a. Bill stuffers can easily be prepared and included with the water bills that are sent out.
    b. Water supplier websites is a common way of providing water saving information to water users.
    c. An annual "Water Week" is sponsored by the Intermountain Section of the American Water Works Association (AWWA) in Utah. AWWA provides educational resources such as newspaper articles, seminars, elementary school class presentations, etc. These resources include conservation and other helpful information.
    d. The Utah Division of Water Resources website is a valuable resource that contains extensive conservation strategies and information.

3. **Meter Replacement Programs** - As water meters age, they become less accurate which leads to loss of revenue due to under reported water usage. This is a two edged sword because the quantity of water being used is underreported, which leads to complacency about water usage, and the revenue to the water supplier is less than it should be which leads to financial difficulties. BRWCD recommends following industry recommendations of replacing meters as soon as they begin to lose efficiency.

4. **Water Audits and Leak Detection and Repair –** Many water supply agencies have found that water audits are an effective method of identifying water losses in their water systems. This in turn makes it much easier to rectify the problems that are causing the losses. A good water audit can easily pay for itself in terms of the water saved and made available for sale to customers.

5. **Outdoor Watering Restrictions** – Because of the loss of water due to evaporation on hot summer days, some water agencies recommend that lawn watering be restricted during daytime hours. The estimated loss from evaporation is 10 to 15 percent of applied water. BRWCD is very supportive of and has adopted the practice for BRWCD facilities as recommended by the State of Utah to refrain from outdoor watering between the hours of 10:00 a.m. and 6:00 p.m.

6. **Landscaping Ordinances -** BRWCD encourages water suppliers to develop and adopt landscaping ordinances that encourage water-efficient landscaping, irrigation efficiency standards and acceptable plant materials for commercial and residential developments in their service areas.

CHAPTER 7 - EXTENDING EXISTING GROUNDWATER SUPPLIES

INTRODUCTION

Box Elder County is currently 100% reliant on groundwater supplies for public drinking water systems. Chapters 2 through 5 of this Master Plan make it abundantly clear that in the not-too-distant future the County's growth will be limited by the existing groundwater supplies. One major option to support future growth is Bear River Development water as discussed in Chapter 5. However, in 2017 this option is at least 20 years into the future prior to implementation, and some communities are already looking for additional water supply.

Several questions warrant consideration:

- Are current groundwater supplies being managed and used to their maximum effectiveness?

- Are there groundwater supplies that are currently unused during periods of low usage that could be captured and put to beneficial use?

OPTIONS TO EXTEND EXISTING GROUNDWATER SUPPLIES

Several approaches (in addition to water conservation) are common throughout the arid western United States and in other parts of the world to extend existing groundwater supplies to meet the growing need for drinking water. Some of these strategies are listed below along with a brief description of the strategies that are available to achieve higher utilization of the available groundwater resources.

It is interesting to note that one or more water suppliers in Box Elder County have already successfully implemented some or all of the strategies listed below [except wastewater reuse].

Renovation of Wells and Springs – Sometimes a well or a spring can decline in production over many years and the water supplier may be unaware that they can often renovate their groundwater source to restore lost yield. Well casings, for example, commonly suffer from corrosion, mineral encrustation or biological growth with a resulting loss of well yield. Wells also sometimes develop a sand production problem that causes problems. There are many strategies for cleaning or relining the affected areas on the well casing without having to drill a new well. Springs that have been constructed without liners, for example, can lose a major amount of the total actual spring flow. Springs like this can be redeveloped to capture essentially 100% of the available spring flows.

Water Treatment of Poor Quality Groundwater – Water treatment systems are available to treat most contaminants that are common in Box Elder County, including high mineral content (total dissolved solids, or TDS), sulfur, arsenic, nitrates, radionuclides and iron & manganese. If a community has a poor quality groundwater source, this option should be included for consideration.

Blending Poor Quality Groundwater with High Quality Groundwater – Sometimes, it is possible to mix two groundwater sources by blending them prior to introduction into the water

system. This can result in acceptable water quality while maintaining and extending the use of an otherwise unacceptable source of supply.

Pressurized Irrigation Water Systems – Box Elder County is fortunate to have an abundance of low cost irrigation water for most of the Eastern portion of the County. Some communities have implemented secondary irrigation systems, thus greatly reducing the summertime demand on the public drinking water system. It is estimated that as much as 65% water savings can result in the public water system by switching the outdoor irrigation to a secondary water system. These dual systems generally do not result in a cost savings to the individual water user, but the reliance on groundwater that otherwise could be used for serving future populations can be decreased significantly, thus extending the groundwater resource.

Aquifer Storage and Recovery – This approach is defined by the Utah Division of Water Resources as follows:

> "Intentionally recharging aquifers when water is available and recovering it when needed"

Brigham City has a functioning ASR project that works as follows: During the winter months several of the City's springs produce flows that are in excess of the City's usage. Rather than let the excess flows go to overflow, the City injects this drinking water into three ASR wells. Then during the following summer months when high water demand is occurring, the City turns on the ASR wells and pumps the recovered spring water back into the water system. This system is even more advantageous to the City because the wells being used originally had poor water quality. The ASR stored water displaces the poor quality water so that only high quality springs water is actually produced for the water system in the summertime.

Water systems that have excess spring flows in the winter could investigate the feasibility of building an ASR project using the same approach that Brigham City is using.

Another approach to ASR projects is to take irrigation return flows or tail water from irrigation ditches and route this water to flow into surface spreading basins. The water can be recovered down gradient by extraction wells. This method artificially recharges the aquifer and provides a "new" source of groundwater for use in the public drinking water systems.

Wastewater Reuse – Utah Division of Water Quality allows the use of reclaimed wastewater for certain uses without further treatment. Where possible, reclaimed wastewater could be used for irrigation needs and possibly industrial needs rather than public drinking water.

CHAPTER 8 - BRWCD SERVICE AREA MASTER PLANNING

INTRODUCTION

The process of analyzing the existing water supply agencies' capacities highlighted the need for future BRWCD projects to add source, storage and distribution facilities. In many locations, new or enlarged BRWCD facilities need to be constructed in order to support anticipated future growth. In other areas, new or enlarged facilities are needed to resolve existing deficiencies. BRWCD's goal in developing capital facilities is to provide water supply while minimizing negative effects on the environment, wildlife, and individual property owners. For this reason, where possible, proposed project facilities are planned to be located within existing rights-of-way.

This chapter covers the recommended BRWCD projects to meet existing or anticipated future water system needs, both for BRWCD service areas as well as for BRWCD customer water supply agencies. Future projects are categorized according to the time period they will be needed: 0 – 10 years, 10 – 20 years, and more than 20 years.

In addition to the capital facilities proposed in this chapter, BRWCD will also pursue securing additional water rights and water supplies for future demands as needed.

Projects to be Implemented Within 0 - 10 Years

Projects needed within the next 10 years are urgent and important. Source development projects typically require at least 5 years to complete, so planning for these projects should be initiated right away. Storage and distribution projects can usually be implemented within a 2-3 year time frame, so these types of projects usually do not need the same degree of advanced planning as the source development projects. Table 8-1 includes the projects that are projected for the 0 – 10 time frame. Figures 8-1 and 8-2 show the locations of master planned projects.

Projects to be Implemented Within 10 – 20 Years

Projects that are planned for implementation between 10 – 20 years from now are important but not urgent. Projects in this category will be needed but for various reasons the timing is not urgent at present. Lack of funding is one common reason for delaying these projects. Table 8-2 includes the projects that are projected for this time frame.

Projects to be Implemented Beyond 20 Years

Projects that are planned for implementation beyond 20 years from now are anticipated but not needed until growth demands result in their need. Table 8-3 includes the projects that are projected for this time frame.

PRECISION OF COST ESTIMATES

When considering cost estimates, there are several levels or degrees of precision, depending on the purpose of the estimate and the percentage of detailed design that has been completed. The following levels of precision are typical:

BEAR RIVER WATER CONSERVANCY DISTRICT

Riverside-North Garland/Plymouth Booster Station

Plymouth

Fielding

Beaver Dam Water System

Beaver Dam Area Supply Line

Beaver Dam

Ukon Meter Station

Riverside

Beaver Dam Supply Line

Storage Reservoir Overflow Pond

Thatcher Penrose Meter Station

Backup Well Enclosure

Riverside-North Garland Meter Station

Willow Creek Area Supply Line and Booster Station

M&I East Water System

Collinston Water System

Willow Creek

Ukon Meter Station

M&I Bothwell Water System

Tremonton Meter Station

Garland

Cedar Ridge Backup Booster Station

Tremonton Meter Station

Garland Meter Station

Bothwell Meter Station

S&K Meter Station

Tremonton Meter Station

Marble Hills

Bothwell

Tremonton

West Corinne Meter Station

Pine Canyon Well

Flat Canyon Well

Thatcher

Elwood

Deweyville

Sunset Park Booster Station

Penrose

Honeyville

Bear River City

Well A

Well B

Bi-directional modification for Honeyville Meter Station

West Corinne Meter Station

Corinne City Meter Station

Harper Ward Water System

Corinne

Brigham City

Legend

Backup Well Enclosure
- 0 - 10 years

Overflow Pond
- 0 -10 years

Water Treatment Plant
- 20+ years

Well
- Existing
- 0 - 10 years
- 10 - 20 years
- 20+ years

Pump Station
- Existing
- 0 - 10 years
- 10 - 20 years
- 20+ years

Meter Station
- Existing
- 0 - 10 years
- 10 - 20 years

Storage Reservoir
- Existing
- 0 - 10 years
- 10 - 20 years
- 20+ years

BRWCD Pipelines
- Existing
- 0 - 10 years
- 10 - 20 years
- 20+ years

N

0 4,500 9,000 18,000 Feet

Date: 3/29/2017
Document Path: H:\Projects\091 - BRWCD\41.200 - Master Plan\GIS\Figure 8-1 - Master Planned Projects Northern Area.mxd

HANSEN ALLEN & LUCE INC ENGINEERS

Bear River Water Consservancy District Master Plan

Master Planned Projects Northern Area

FIGURE 8-1

BEAR RIVER WATER CONSERVANCY DISTRICT

Honeyville

Bear River City

Well A

Well B

Bi-directional modification for Honeyville Meter Station

West Corinne Meter Station

Corinne City Meter Station

Harper Ward Water System

Corinne

Brigham City

Mantua

Perry

Willard

Connection between Willard City and South Willard Water Company

South Willard Water Company Service Area

South Willard Water Company Meter Station

Well #4

Well #3

Coleman Trailer Court and Hot Springs Trailer Court Meter Stations

South Willard Water System

Legend

Well
- Existing
- 0 - 10 years
- 10 - 20 years
- 20+ years

Pump Station
- Existing
- 0 - 10 years
- 10 - 20 years
- 20+ years

Meter Station
- Existing
- 0 - 10 years
- 10 - 20 years

Storage Reservoir
- Existing
- 0 - 10 years
- 20+ years

BRWCD Pipelines
- Existing
- 0 - 10 years
- 10 - 20 years
- 20+ years

N

0 4,500 9,000 18,000 Feet

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HANSEN ALLEN & LUCE INC ENGINEERS

Bear River Water Conservancy District Master Plan

Master Planned Projects Southern Area

FIGURE 8-2

Type of Estimate	Precision
Master Planning	±50%
Preliminary Design	±30%
Final Design or Bid	±10%

For example, at the master planning level (or conceptual or feasibility design level), if a project is estimated to cost $1,000,000, then the precision or reliability of the cost estimate would typically be expected to range between approximately $500,000 and $1,500,000. While this may seem very imprecise, the purpose of master planning is to develop general sizing, location, cost, and scheduling information on a number of individual projects that may be designed and constructed over a period of many years. Master planning also typically includes the selection of common design criteria to help ensure uniformity and compatibility among future individual projects. Details such as the exact capacity of individual projects, the level of redundancy, the location of facilities, the alignment and depth of pipelines, the extent of utility conflicts, the cost of land and easements, the construction methodology, the types of equipment and material to be used, the time of construction, interest and inflation rates, and permitting requirements, are typically developed during the more detailed levels of design and completed in the time frame wherein the project is pending.

At the preliminary or 10% design level, some of the aforementioned details will have been developed. Major design decisions such as the size of facilities, selection of facility sites, pipeline alignments and depths, and the selection of the types of equipment and material to be used during construction will typically have been made. At this level of design the precision of the cost estimate for a $1,000,000 project would typically be expected to range between approximately $700,000 and $1,300,000.

After the project has been completely designed, and is ready to bid, all design plans and technical specifications will have been completed and nearly all of the significant details about the project should be known. At this level of design, the precision of the cost estimate for the same $1,000,000 project would typically be expected to range between approximately $900,000 and $1,100,000.

Table 8-1
Master Planned Projects
0 - 10 Year Time Frame

SYSTEM	PROJECT DESCRIPTION	TOTAL COST
M & I Bothwell	1.5 MG Storage Overflow Pond	$250,000
	12-inch Mainline Extension in 1000 West between 12000 N and 11200 N	$193,000
	Canal Crossing for Mainline Extension at about 12000 N 1000 W	$54,000
	West Corinne Meter Station at 10000 W 11200 N	$41,000
	Sunset Park Booster Station and Piping at 11700 W Sunset Dr.	$92,000
	Enclosure for Newman Backup Well	
Collinston	Pine Canyon Test Well west of Deweyville	$101,000
	Pine Canyon Production Well	$405,000
	Pine Canyon Pump Station and Wellhouse	$540,000
	12-inch Pine Canyon Well Pipeline between well site and HWY 38	$200,000
	12-inch Hwy 38 Pipeline between 10517 N to 11360 N	$420,000
	12-inch Cross Valley Pipeline (Hwy 38 to 12000 N Pump Station)	$778,000
	16-in Bear River Crossing for Cross Valley Pipeline via Horizontal Directional Drilling	$128,000
	Cedar Ridge Backup Pump Station at about 12550 N HWY 38	$101,000
Harper-Ward	Test Well 1	$101,000
	Production Well 1	$405,000
	Pump and Wellhouse for Well 1	$473,000
	12-inch Well 1 Pipeline	$213,000
South Willard	Well Site #4 Backup Generator	$108,000
	Well Site #3 Test Well	$101,000
	South Willard Well Site #3 Production Well	$405,000
	South Willard Well Site #3 Pump and Wellhouse	$473,000
	South Willard Well Site #3 10-inch pipeline	$34,000
	Connection between South Willard Water Company and Willard City and between Perry City and Willard City	$164,000
	TOTAL	$5,781,000

Table 8-2
Master Planned Projects
10 - 20 Year Time Frame

SYSTEM	PROJECT DESCRIPTION	TOTAL COST
M & I Bothwell	Marble Hills Pump Station	$320,000
	Marble Hills Pipeline Phase 1	$936,000
	Marble Hills Pipeline Phase 2	$270,000
	Backup Well Enclosure	$196,000
	Backup Generator	$108,000
	Fire Hydrants	$73,000
	1 MG Storage Reservoir	$1,350,000
M & I East	Plymouth Booster Station	$135,000
Collinston	Garland Meter Station	$41,000
	Flat Canyon Test Well	$101,000
	Flat Canyon Production Well	$405,000
	Pump and Wellhouse for Flat Canyon Well	$473,000
	10-inch Flat Canyon Well Pipeline	$124,000
	12-inch Willow Creek 14400 N Transmission Pipeline	$1,006,000
	Willow Creek Booster Station	$203,000
	Beaver Dam Early Park Road 8" Supply Pipeline	$327,000
Harper-Ward	Harper Ward Well 2 Test Well	$101,000
	Production Well 2	$405,000
	Pump and Wellhouse for Well 2	$473,000
	TOTAL	$7,047,000

Table 8-3
Master Planned Projects
Beyond 20 Year Time Frame

SYSTEM	PROJECT DESCRIPTION	TOTAL COST
M & I Bothwell	Reverse Osmosis Water Treatment Plant (WTP)	$4,311,000
	12-inch Pipeline between WTP and west Tremonton	$2,363,975
	2 Freeway crossings between WTP and west Tremonton	$184,350
	12-inch Pipeline in between 2300 W 1000 N and 12000 N Pump Station	$1,185,550
Collinston	Test Well for Bear River Production Well 1	$101,000
	Bear River Production Well 1	$405,000
	Pump and Wellhouse for Bear River Production Well 1	$473,000
	Test Well for Bear River Production Well 2	$101,000
	Bear River Production Well 2	$405,000
	Pump and Wellhouse for Bear River Production Well 2	$473,000
	Add 3rd Pump for Collinston Booster Stations	$270,000
	8-inch 2400 W Transmission Pipeline	$539,000
	8-inch HWY 38 Pipeline between 12950 N and 14530 N	$473,000
Harper-Ward	Harper Ward Storage Reservoir	$1,031,750
	Harper Ward Well 3 Test Well	$101,000
	Production Well 3	$405,000
	Pump and Wellhouse for Harper-Ward Well 3	$540,000
	12-inch Pipeline between Harper-Ward and Deweyville	$2,568,000
	TOTAL	$15,930,625

SYSTEM IMPROVEMENT PROJECTS

As discussed in previous chapters, source, storage and distribution system projects were identified during the system analysis. Project costs for water system improvements are presented in with the location of each project shown in Figures 8-1 and 8-2. Each recommendation includes a conceptual cost estimate for construction as shown in Tables 8-1, 8-2 & 8-3.

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

1. “Means Heavy Construction Cost Data, 2013"
2. Price quotes from equipment suppliers
3. Recent construction bids for similar work

All costs are presented in 2016 dollars. Recent price and economic trends indicate that future costs are difficult to predict with certainty. Engineering cost estimates provided in this study should be regarded as conceptual level for use as a planning guide. Only during final design can a definitive and more accurate estimate be provided for each project. A cost estimate calculation for each project is provided in the Appendices.

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APPENDIX A

Stakeholders List

Bear River Water Conservancy District
Master Plan Stakeholders List
Stakeholder Agencies

Agency	Contact Person
Bear River Association of Governments	Brian Carver
Bear River Association of Governments	Zac Covington
Box Elder County Economic Development	Mitch Zundel
Box Elder County Planning	Scott Lyons
Bird Refuge	Bob Barrett
Cache County	Bob Fotheringham
Jordan Valley Water Conservancy District	Richard Bay
NRCS	Dave Brown
PacifiCorp	Claudia Conder
PacifiCorp	Conley Baldwin
Rep. Lee Perry	
Rep. Pete Knudson	
Rep. Scott Sandal	
Utah Department of Environmental Quality	Walt Baker
Utah Division of Drinking Water	Marie Owens
Utah Division of Drinking Water	Michael Grange
Utah Division of Water Resources	Eric Millis
Utah Division of Water Resources	Todd Adams
Utah State Dept. of Agriculture	LuAnne Adams
Weber Basin Water Conservancy District	Taige Flint
Weber Basin Water Conservancy District	Mark Anderson
Weber Basin Water Conservancy District	Scott Paxman

Bear River Water Conservancy District
Master Plan Stakeholders List
Water Suppliers

Water Supplier	Contact Person
ACME Water Company	Kendall Morris
Bothwell Cemetery and Water Company	Jay Christensen
Brigham City Public Works	Tyler Pugsley
Cedar Ridge Subdivision	David Thompson
Coleman Trailer Court	Gary Coleman
Corinne City	Kelly Nicholas
Deweyville Town	Nate Spackman
Elwood Town	Steven Woerner
Honeyville City	Mayor Dave Forsgren
Hot Springs Trailer Court	Dan Dimmick
Howell Town	Mayor Craig Hawkes
Mantua Town	Mayor Harper Johnson
Park Valley	Jay Carter
Perry City	Greg Westfall
Plymouth Town	Wes Udy
Portage Town	Grant Smith
Riverside North Garland Water Company	Alan Anderson
South Willard Water Company	Lance Lewis
Sunset Park	Blaine Anderson
Thatcher Penrose Service District	Russ Howe
Tremonton City	Paul Fulgham
UKON Water Company	Larry Hess
West Corinne Water Company	Chad Hardy
Willard City	Jared Profasier
Willow Creek Water Company	Alton Veibell

APPENDIX B

Water Supply Analyses

Technical data for ACME (Bear River City) Water Company

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	344	372	436	512	666	866	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.04	0.04	0.04	0.04	0.04	0.04	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	14.19	15.34	18.00	21.13	27.47	35.71	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	154	167	196	230	298	388	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	27	29	34	40	51	67	ACRE FEET
8	Total Annual Usage	181	195	229	269	350	455	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	275,200	297,510	349,167	409,792	532,730	692,549	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	80,917	87,477	102,665	120,491	156,639	203,630	GAL/DAY
11	Total Peak Day Demand	356,117	384,987	451,832	530,284	689,369	896,179	GAL/DAY
12	(Gallons per Minute)	247.30	267	314	368	479	622	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	137,600	148,755	174,583	204,896	266,365	346,275	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	40,413	43,689	51,275	60,178	78,231	101,701	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	17,801	19,244	22,586	26,507	34,460	44,798	GALLONS
18	Total Storage (Rounded)	210,000	230,000	260,000	310,000	390,000	510,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	454	477	528	585	692	819	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	112	121	143	167	218	283	GPM
22	Total Peak Hour Demand	566	598	671	753	910	1,102	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**							
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	10,000	30,000	60,000	110,000	190,000	310,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Combined Flow From Springs - Low annual flow 2002	61	Gallon/Minute	101	Acre Feet/Year
32	Well #1	435	Gallon/Minute	351	Acre Feet/Year
33	Well #2	450	Gallon/Minute	363	Acre Feet/Year
34					
35	Total Peak Day Sources	946	Gallon/Minute		
36	Safety Factor	1.25			
37	Total Peak Day Sources with Safety Factor	757	Gallon/Minute	814	Acre Feet/Year
38	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
39	Chokecherry and Other Springs	250	Gallon/Minute	452	Acre Feet/Year
40	Well #1 - 29-1857 (a37369)	422	Gallon/Minute	289	Acre Feet/Year
41	Well #2 - 29-4256 (a37370)	476	Gallon/Minute	288	Acre Feet/Year
42					
43	Total Peak Day Sources	1,148	Gallon/Minute		
44	Safety Factor	1.25			
45	Total Peak Day Sources with Safety Factor	918	Gallon/Minute	1,029	Acre Feet/Year
46	**EXISTING STORAGE CAPACITY**				
47	ACME Reservoir	200,000	Gallons		
48					
49	Total Storage	200,000	Gallons		
50	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
51	# based on Peak Day Physical Source Capacity	709	Connections		
52	# based on Annual Physical Source Capacity	1,206	Connections		
53	# based on Peak Day Water Rights Capacity	933	Connections		
54	# based on Annual Water Rights Capacity	1,615	Connections		
55	# based on Storage Capacity	-16	Connections		

Notes:

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for BRWCD Beaver Dam

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	23	25	29	34	44	57	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.01	0.01	0.01	0.01	0.01	0.01	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	0.34	0.37	0.43	0.51	0.66	0.86	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	10	11	13	15	20	26	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	1	1	1	1	1	2	ACRE FEET
8	Total Annual Usage	11	12	14	16	21	27	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	18,400	19,730	23,156	27,176	35,329	45,928	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	1,958	2,099	2,464	2,891	3,759	4,886	GAL/DAY
11	Total Peak Day Demand	20,358	21,829	25,619	30,068	39,088	50,815	GAL/DAY
12	(Gallons per Minute)	14	15	18	21	27	35	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	9,200	9,865	11,578	13,588	17,665	22,964	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	978	1,048	1,230	1,444	1,877	2,440	GALLONS
16	Fire Storage (1000 gpm for 1 hour)	60,000	60,000	60,000	60,000	60,000	60,000	GALLONS
17	Emergency Storage, 10%	1,018	1,091	1,281	1,503	1,954	2,540	GALLONS
18	Total Storage (Rounded)	70,000	70,000	70,000	80,000	80,000	90,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	80	84	93	103	122	144	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	3	3	3	4	5	7	GPM
22	Total Peak Hour Demand	83	87	96	107	127	151	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.640273454	0.686558282	0.805765396	0.945670442	1.229371574	1.598183047	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	5	13	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	0	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Lower East Spring (low flow 2016)	4	Gallon/Minute	6	Acre Feet/Year
32	Lower West Spring (low flow 2016)	12	Gallon/Minute	19	Acre Feet/Year
33	Sleepy Hollow Springs (low flow 2016)	12	Gallon/Minute	19	Acre Feet/Year
34					
35	Total Peak Day Sources	28	Gallon/Minute		
36	Safety Factor	1.25			
37	Total Peak Day Sources with Safety Factor	22	Gallon/Minute	45	Acre Feet/Year
38	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
39	Lower East Spring	224	Gallon/Minute	11	Acre Feet/Year
40	Lower West Spring	incl.	Gallon/Minute	incl.	Acre Feet/Year
41	Sleepy Hollow Springs	69	Gallon/Minute	23	Acre Feet/Year
42					
43	Total Peak Day Sources	294	Gallon/Minute		
44	Safety Factor	1.25			
45	Total Peak Day Sources with Safety Factor	235	Gallon/Minute	35	Acre Feet/Year
46	**EXISTING STORAGE CAPACITY**				
47	Reservoir	200,000	Gallons		
48					
49	Total Storage	200,000	Gallons		
50	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
51	# based on Peak Day Physical Source Capacity	13	Connections		
52	# based on Annual Physical Source Capacity	71	Connections		
53	# based on Peak Day Water Rights Capacity	359	Connections		
54	# based on Annual Water Rights Capacity	49	Connections		
55	# based on Storage Capacity	43	Connections		

Notes:

Line 3: Most users have access to secondary water. Average outdoor use is 650 sq ft per connection, based on 2013 - 2015 usage data.

Lines 5-22: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 30-48: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 30-48: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Bothwell Cemetery & Water Co

		2015	2020	2030	2040	2050	2060	
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Units in Service Area	118	131	154	200	260	338	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.13	0.13	0.13	0.13	0.13	0.13	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	14.75	16.40	19.24	25.02	32.52	42.28	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	53	59	69	90	117	152	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	28	31	36	47	61	79	ACRE FEET
8	Total Annual Usage	80	89	105	136	177	231	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	94,400	104,942	123,164	160,113	208,146	270,590	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	84,110	93,504	109,739	142,660	185,458	241,096	GAL/DAY
11	Total Peak Day Demand	178,510	198,446	232,902	302,773	393,605	511,686	GAL/DAY
12	(Gallons per Minute)	123.97	138	162	210	273	355	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	47,200	52,471	61,582	80,056	104,073	135,295	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	42,008	46,699	54,808	71,250	92,625	120,413	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage 10%	10,421	11,417	13,139	16,631	21,170	27,071	GALLONS
18	Total Storage (Rounded)	110,000	110,000	130,000	170,000	210,000	270,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	229	245	271	321	379	449	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	117	130	152	198	258	335	GPM
22	Total Peak Hour Demand	346	375	424	519	637	784	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.543708577	0.604428745	0.709375708	0.92218842	1.198844947	1.55849843	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	45	127	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	32	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	40	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	40,000	80,000	140,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	West Well	105	Gallon/Minute	85	Acre Feet/Year
32	East Well	110	Gallon/Minute	89	Acre Feet/Year
33	BRWCD Meter Station on Frontage Road	0	Gallon/Minute	0	Acre Feet/Year
34	BRWCD Meter Station on 10000 West	70	Gallon/Minute	25	Acre Feet/Year
35					
36	Total Peak Day Sources	285	Gallon/Minute		
37	Safety Factor	1.25			
38	Total Peak Day Sources with Safety Factor	228	Gallon/Minute	198	Acre Feet/Year
39	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
40	Both Wells #1 & #2 - 29-1138	449	Gallon/Minute	191	Acre Feet/Year
41					
42	Total Peak Day Sources	449	Gallon/Minute		
43	Safety Factor	1.25			
44	Total Peak Day Sources with Safety Factor	359	Gallon/Minute	191	Acre Feet/Year
45	**EXISTING STORAGE CAPACITY**				
46	West Storage Reservoir	100,000	Gallons		
47	East Storage Reservoir	30,000	Gallons		
48					
49	Total Storage	130,000	Gallons		
50	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
51	# based on Peak Day Physical Source Capacity	99	Connections		
52	# based on Annual Physical Source Capacity	173	Connections		
53	# based on Peak Day Water Rights Capacity	224	Connections		
54	# based on Annual Water Rights Capacity	162	Connections		
55	# based on Storage Capacity	21	Connections		

Notes:

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Brigham City

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Residential Units in Service Area	5494	6409	7521	9778	12711	16524	CONNECTIONS
3	# Non-Residential Connections in Service Area	486	521	627	773	966	1207	ACRES/CONN.
4	# Acres of Outside Irrigation per Residential Unit	0.19	0.19	0.19	0.19	0.19	0.19	ACRES/CONN.
5	Total # Acres of Outside Irrigation for the System	1040.00	1213.14	1423.78	1850.91	2406.18	3128.04	ACRES
6	**SOURCE REQUIREMENTS**							
7	Annual Indoor Res. Usage = 146,000 Gal/Year/Connection	2,462	2,872	3,370	4,381	5,696	7,404	ACRE FEET
8	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	1,945	2,269	2,662	3,461	4,500	5,849	ACRE FEET
9	Annual Non-Res Usage = 2.94 Acre Feet/Conn	1,429	1,531	1,843	2,271	2,839	3,549	ACRE FEET
10	Total Annual Usage	5,835	6,671	7,875	10,114	13,035	16,803	ACRE FEET
11	Peak Day Indoor Demand = 800 Gal./Day/Connection	4,395,200	5,126,917	6,017,104	7,822,235	10,168,905	13,219,577	GAL/DAY
12	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	5,930,496	6,917,811	8,118,950	10,554,635	13,721,026	17,837,333	GAL/DAY
13	Peak Day Non-Res Indoor Demand = 1.1 PD/AD PF	1,403,050	1,503,621	1,809,488	2,230,413	2,788,072	3,485,035	GAL/DAY
14	Total Peak Day Demand	11,728,746	13,548,348	15,945,541	20,607,283	26,678,003	34,541,945	GAL/DAY
15	(Gallons per Minute)	8,145	9,409	11,073	14,311	18,526	23,987	GPM
16	**STORAGE REQUIREMENTS**							
17	Indoor Requirement = 400 Gal/Connection	2,197,600	2,563,459	3,008,552	3,911,117	5,084,453	6,609,788	GALLONS
18	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	2,961,920	3,455,023	4,054,919	5,271,395	6,852,813	8,908,657	GALLONS
19	Fire Storage (1000 gpm for 2 hours)	120,000	120,000	120,000	120,000	120,000	120,000	GALLONS
20	Emergency Storage, 10%	515,952	601,848	706,347	918,251	1,193,727	1,551,845	GALLONS
21	Total Storage (Rounded)	5,800,000	6,740,000	7,890,000	10,220,000	13,250,000	17,190,000	GALLONS
22	**DISTRIBUTION SYSTEM REQUIREMENTS**							
23	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	2,822	3,101	3,440	4,058	4,791	5,657	GPM
24	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	8,237	9,608	11,276	14,659	19,057	24,774	GPM
25	Total Peak Hour Demand	11,059	12,709	14,716	18,717	23,848	30,432	GPM
26	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.738853572	0.853479601	1.00449104	1.298157942	1.680583539	2.175973386	
27	Physical Source Capacity on Peak Day Basis	0	0	50	3,287	7,503	12,964	Gallon/Minute
28	Physical Source Capacity on Annual Volume Basis	0	0	0	0	841	4,609	AcreFeet/Year
29	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	4,151	Gallon/Minute
30	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	3,377	AcreFeet/Year
31	**ADDITIONAL STORAGE CAPACITY NEEDED**							
32	Storage Capacity Needed	0	0	0	0	850,000	4,790,000	Gallons

33	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Minimum Year	Annual Volume Capacity	
34	Birch Spring	63	Gallon/Minute	2004	101	Acre Feet/Year
35	East Halling Spring	824	Gallon/Minute	2015	1,329	Acre Feet/Year
36	Flat Bottom Spring	13	Gallon/Minute	2014	21	Acre Feet/Year
37	Knoll Spring	90	Gallon/Minute	2007	145	Acre Feet/Year
37	Olsen Spring	306	Gallon/Minute		493	Acre Feet/Year
38	Peter Jensen Spring	181	Gallon/Minute	2015	291	Acre Feet/Year
39	Rock Spring	295	Gallon/Minute	2004	475	Acre Feet/Year
40	West Halling Spring	1,458	Gallon/Minute		2,352	Acre Feet/Year
41	Total of All Springs:	4,017	Gallon/Minute	2015		
42	Cemetery Well #1	1,000	Gallon/Minute		807	Acre Feet/Year
43	Cemetery Well #2	2,000	Gallon/Minute		1,613	Acre Feet/Year
44	Cooley Well	1,000	Gallon/Minute		807	Acre Feet/Year
45	Intermountain Well #2	700	Gallon/Minute		565	Acre Feet/Year
46	Flat Bottom Canyon Well	750	Gallon/Minute		605	Acre Feet/Year
47	Canyon View Well	3,000	Gallon/Minute		2,420	Acre Feet/Year
48	Mantua East Well	60	Gallon/Minute		48	Acre Feet/Year
49	Mantua West Well	150	Gallon/Minute		121	Acre Feet/Year
50						
51	Total Peak Day Sources	12,677	Gallon/Minute		12,194	Acre Feet/Year
52	Safety Factor	1.15				
53	Total Peak Day Sources with Safety Factor	11,024	Gallon/Minute		12,194	Acre Feet/Year
54	**EXISTING WATER RIGHTS SOURCE CAPACITY**					
55	Springs Total	7,271	Gallon/Minute		405	Acre Feet/Year
56	Wells Total	15,540	Gallon/Minute		13,021	Acre Feet/Year
57						
58	Total Peak Day Sources	22,811	Gallon/Minute			
59	Safety Factor	1.15				
60	Total Peak Day Sources with Safety Factor	19,836	Gallon/Minute		13,426	Acre Feet/Year
61	**EXISTING STORAGE CAPACITY**					
62	Total Storage	12,400,000	Gallons			
63	Storage Reservoir #2		Gallons			
64	Storage Reservoir #3		Gallons			
65	Storage Reservoir #4		Gallons			
66	Storage Reservoir #5		Gallons			
67	Total Storage	12,400,000	Gallons			
68	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**					
69	# based on Peak Day Physical Source Capacity	1,942	Connections			
70	# based on Annual Physical Source Capacity	5,986	Connections			
71	# based on Peak Day Water Rights Capacity	7,886	Connections			
72	# based on Annual Water Rights Capacity	7,147	Connections			
73	# based on Storage Capacity	6,252	Connections			

Notes:

Lines 7-21: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 33-52: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 26-66: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for BRWCD Collinston

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	UNITS
2	# Units in Service Area	21	22	26	31	40	52	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.06	0.06	0.06	0.06	0.06	0.06	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	1.35	1.45	1.70	1.99	2.59	3.37	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	9	10	12	14	18	23	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	3	3	3	4	5	6	ACRE FEET
8	Wholesale Deliveries to UKON	89	118	153	188	223	258	ACRE FEET
9	Total Annual Usage	101	130	167	205	245	287	ACRE FEET
10	Peak Day Indoor Demand = 800 Gal./Day/Connection	16,800	17,984	21,106	24,771	32,202	41,862	GAL/DAY
11	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	7,712	8,255	9,689	11,371	14,782	19,217	GAL/DAY
12	Wholesale Peak Day Demand to UKON	169,920	223,404	289,950	356,495	423,041	489,587	GAL/DAY
13	Total Peak Day Demand	194,432	249,643	320,744	392,637	470,025	550,666	GAL/DAY
14	(Gallons per Minute)	135	173	223	273	326	382	GPM
15	**STORAGE REQUIREMENTS**							
16	Indoor Requirement = 400 Gal/Connection	8,400	8,992	10,553	12,385	16,101	20,931	GALLONS
17	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	3,852	4,123	4,839	5,679	7,383	9,598	GALLONS
18	Wholesale Deliveries Requirement = 1/2 Daily Demand	84,960	111,702	144,975	178,248	211,521	244,794	GALLONS
19	Fire Storage (1,500 gpm for 2 hours)	180,000	180,000	180,000	180,000	180,000	180,000	GALLONS
20	Emergency Storage, 10%	9,721	12,482	16,037	19,631	23,500	27,532	GALLONS
21	Total Storage	287,000	317,000	356,000	396,000	439,000	483,000	GALLONS
22	**DISTRIBUTION SYSTEM REQUIREMENTS**							
23	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	76	79	88	97	115	136	GPM
24	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	11	11	13	16	21	27	GPM
25	Average Daily Demand for Wholesale Deliveries	118	155	201	248	294	340	GPM
26	Total Peak Hour Demand	205	246	303	361	429	503	GPM
27	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.718203035	0.922143239	1.17478192	1.425292322	1.67649281	1.929287421	
28	Physical Source Capacity on Peak Day Basis	0	25	75	125	178	234	Gallon/Minute
29	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
30	Water Rights Source Capacity on Peak Day Basis	0	25	75	125	178	234	Gallon/Minute
31	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
32	**ADDITIONAL STORAGE CAPACITY NEEDED**							
33	Storage Capacity Needed	0	0	0	0	0	0	Gallons

34	**EXISTING PHYSICAL SOURCE PEAK DAY CAPACITY**	Peak Day Capacity		Annual Volume Capacity	
35	Deweyville Surplus Water Contract	185	Gallon/Minute	150	Acre Feet/Year
36	BRWCD Water Rights Temporary Change App.	0	Gallon/Minute	150	Acre Feet/Year
37					
38	Total Peak Day Sources	185	Gallon/Minute	300	Acre Feet/Year
39	Safety Factor	1.25			
40	Total Peak Day Sources with Safety Factor	148	Gallon/Minute	300	Acre Feet/Year
41	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
42	Deweyville Surplus Water Contract	185	Gallon/Minute	150	Acre Feet/Year
43	BRWCD Water Rights Temporary Change App.	0	Gallon/Minute	150	Acre Feet/Year
44					
45	Total Peak Day Sources	185	Gallon/Minute	300	Acre Feet/Year
46	Safety Factor	1.25			
47	Total Peak Day Sources	148	Gallon/Minute	300	Acre Feet/Year
48	**EXISTING STORAGE CAPACITY**				
49	South Tank	500,000	Gallons		
50	North Tank	500,000	Gallons		
51					
52					
53	Total Storage	1,000,000	Gallons		
54	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
55	# based on Peak Day GPM Physical Source Capacity	16	Connections		
56	# based on Annual Volume Physical Source Capacity	349	Connections		
57	# based on Peak Day GPM Water Rights Capacity	16	Connections		
58	# based on Annual Volume Water Rights Capacity	349	Connections		
59	# based on Storage Capacity	1,111	Connections		

Notes:

Line 2: Total of 18 connections served in 2015, the first year of operation. 16 residential connections and 2 - 1" meters having peak demand of 2.5 x standard ERC meter

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Line 21 24: Fire flows not included in calculations

Technical data for BRWCD Harper Ward

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	83	85	100	130	169	220	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.06	0.06	0.06	0.06	0.06	0.06	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	4.76	4.89	5.74	7.47	9.71	12.62	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	37	38	45	58	76	99	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	9	9	11	14	18	24	ACRE FEET
8	Total Annual Usage	46	47	56	72	94	122	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	66,400	68,220	80,065	104,085	135,310	175,903	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	27,164	27,908	32,754	42,580	55,354	71,960	GAL/DAY
11	Total Peak Day Demand	93,564	96,128	112,819	146,665	190,664	247,864	GAL/DAY
12	(Gallons per Minute)	65	67	78	102	132	172	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	33,200	34,110	40,033	52,042	67,655	87,952	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	13,567	13,938	16,359	21,266	27,646	35,940	GALLONS
16	Fire Storage (1000 gpm for 2 hour) (From Honeyville)	120,000	120,000	120,000	120,000	120,000	120,000	GALLONS
17	Emergency Storage, 10%	4,677	4,805	5,639	7,331	9,530	12,389	GALLONS
18	Total Storage (Rounded)	170,000	170,000	180,000	200,000	220,000	260,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	183	186	206	244	288	341	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	38	39	45	59	77	100	GPM
22	Total Peak Hour Demand	220	225	251	303	365	441	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.406092172	0.417223775	0.489666339	0.636566241	0.827536114	1.075796948	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	12	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	120,000	120,000	130,000	150,000	170,000	210,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Brigham City Surplus Contract	200	Gallon/Minute	200	Acre Feet/Year
32	Harper Ward Well (future)		Gallon/Minute		Acre Feet/Year
33					
34	Total Peak Day Sources	200	Gallon/Minute		
35	Safety Factor	1.25			
36	Total Peak Day Sources with Safety Factor	160	Gallon/Minute	200	Acre Feet/Year
37	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
38	Brigham City Surplus Contract	500	Gallon/Minute	200	Acre Feet/Year
39	Harper Ward Well (future)		Gallon/Minute		Acre Feet/Year
40					
41	Total Peak Day Sources	500	Gallon/Minute		
42	Safety Factor	1.25			
43	Total Peak Day Sources with Safety Factor	400	Gallon/Minute	200	Acre Feet/Year
44	**EXISTING STORAGE CAPACITY**				
45	Brigham City Tank (provides water equalization flows)	50,000	Gallons		
46					
47					
48	Total Storage	50,000	Gallons		
49	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
50	# based on Peak Day Physical Source Capacity	121	Connections		
51	# based on Annual Physical Source Capacity	277	Connections		
52	# based on Peak Day Water Rights Capacity	428	Connections		
53	# based on Annual Water Rights Capacity	277	Connections		
54	# based on Storage Capacity	-59	Connections		

Notes:

Line 3: Most users have access to secondary water. Average outdoor use is 2,500 sq ft per connection, based on 2011 - 2014 usage data.

Lines 30-48: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 30-48: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for BRWCD M&I System

		2015	2020	2030	2040	2050	2060	UNITS
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Units in Service Area	44	49	57	75	97	126	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.26	0.26	0.26	0.26	0.26	0.26	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	11.61	12.90	15.14	19.69	25.59	33.27	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	20	22	26	33	43	57	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	22	24	28	37	48	62	ACRE FEET
8	Wholesale Deliveries	365	439	734	1,011	1,289	1,566	ACRE FEET
9	Total Annual Usage	406	486	788	1,081	1,380	1,685	ACRE FEET
10	Peak Day Indoor Demand = 800 Gal./Day/Connection	35,200	39,131	45,925	59,703	77,614	100,898	GAL/DAY
11	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	66,189	73,581	86,357	112,264	145,943	189,725	GAL/DAY
12	Wholesale Peak Day Demand	1,335,899	1,608,532	2,684,736	3,700,028	4,715,955	5,732,579	GAL/DAY
13	Total Peak Day Demand	1,437,288	1,721,244	2,817,018	3,871,995	4,939,511	6,023,202	GAL/DAY
14	(Gallons per Minute)	998	1195	1956	2689	3430	4183	GPM
15	**STORAGE REQUIREMENTS**							
16	Indoor Requirement = 400 Gal/Connection	17,600	19,566	22,963	29,851	38,807	50,449	GALLONS
17	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	33,057	36,749	43,130	56,069	72,889	94,756	GALLONS
18	Wholesale Deliveries Requirement = 1/2 Daily Demand	667,949	804,266	1,342,368	1,850,014	2,357,977	2,866,289	GALLONS
19	Fire Storage (500 gpm for 1/2 hour)	60,000	60,000	60,000	60,000	60,000	60,000	GALLONS
20	Emergcy Storage, 10%	5,066	5,631	6,609	8,592	11,170	14,521	GALLONS
21								
22	Total Storage	784,000	926,000	1,475,000	2,005,000	2,541,000	3,086,000	GALLONS
23	**DISTRIBUTION SYSTEM REQUIREMENTS**							
24	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	122	130	144	171	202	239	GPM
25	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	92	102	120	156	203	264	GPM
26	Peak Day Average Demand for Wholesale Deliveries	839	839	839	839	839	839	GPM
27	Total Peak Hour Demand	1,053	1,071	1,103	1,166	1,244	1,341	GPM
28	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.181476	0.217329	0.355684	0.488888	0.623676	0.760505	
29	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
30	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
31	Water Rights Source Capacity on Peak Day Basis	0	0	0	369	1,111	1,863	Gallon/Minute
32	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	237	AcreFeet/Year
33	**ADDITIONAL STORAGE CAPACITY NEEDED**							
34	Storage Capacity Needed	284,000	426,000	975,000	1,505,000	2,041,000	2,586,000	Gallons

35	**EXISTING PHYSICAL SOURCE PEAK DAY CAPACITY**	Peak Day Capacity		Annual Volume Capacity	
36	Newman Well	3,100	Gallon/Minute	2,500	Acre Feet/Year
37	Backup Well	2,400	Gallon/Minute	1,936	Acre Feet/Year
38					
39	Total Peak Day Sources	5,500	Gallon/Minute	4,436	Acre Feet/Year
40	Safety Factor	1.25			
41	Net Total Peak Day Sources with Safety Factor	4,400	Gallon/Minute	4,436	Acre Feet/Year
42	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
43	Newman Well	2,899	Gallon/Minute	1,448	Acre Feet/Year
44	Backup Well		Gallon/Minute		Acre Feet/Year
45					
46	Total Peak Day Sources	2,899	Gallon/Minute		
47	Safety Factor	1.25			
48	Total Peak Day Sources	2,319	Gallon/Minute	1,448	Acre Feet/Year
49	**EXISTING STORAGE CAPACITY**				
50	M&I Tank	500,000	Gallons		
51					
52	Total Storage	500,000	Gallons		
53	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
54	# based on Peak Day GPM Physical Source Capacity	2,126	Connections		
55	# based on Annual Volume Physical Source Capacity	4,281	Connections		
56	# based on Peak Day GPM Water Rights Capacity	826	Connections		
57	# based on Annual Volume Water Rights Capacity	1,106	Connections		
58	# based on Storage Capacity	-224	Connections		

Notes:

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of

Technical data for BRWCD South Willard

		2015	2020	2030	2040	2050	2060	
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Units in Service Area	96	121	128	138	150	167	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.00	0.00	0.00	0.00	0.00	0.00	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	0.00	0.00	0.00	0.00	0.00	0.00	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	43	54	57	62	67	75	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	0	0	0	0	0	0	ACRE FEET
8	Total Annual Usage	43	54	57	62	67	75	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	76,444	96,444	102,444	110,244	120,384	133,566	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	0	0	0	0	0	0	GAL/DAY
11	Total Peak Day Demand	76,444	96,444	102,444	110,244	120,384	133,566	GAL/DAY
12	(Gallons per Minute)	53	67	71	77	84	93	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	38,222	48,222	51,222	55,122	60,192	66,783	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	0	0	0	0	0	0	GALLONS
16	Fire Storage (1000 gpm for 2 hour)	120,000	120,000	120,000	120,000	120,000	120,000	GALLONS
17	Emergency Storage, 10%	3,822	4,822	5,122	5,512	6,019	6,678	GALLONS
18	Total Storage (Rounded)	160,000	170,000	180,000	180,000	190,000	190,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	200	232	241	253	267	286	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	0	0	0	0	0	0	GPM
22	Total Peak Hour Demand	200	232	241	253	267	286	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.189594356	0.239197531	0.254078483	0.273423721	0.298572531	0.331265983	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	0	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Well #4	350	Gallon/Minute	282	Acre Feet/Year
32					
33	Total Peak Day Sources	350	Gallon/Minute		
34	Safety Factor	1.25			
35	Total Peak Day Sources with Safety Factor	280	Gallon/Minute	282	Acre Feet/Year
36	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
37	Well #4	2,244	Gallon/Minute	1,647	Acre Feet/Year
38					
39	Total Peak Day Sources	2,244	Gallon/Minute		
40	Safety Factor	1.25			
41	Total Peak Day Sources with Safety Factor	1,795	Gallon/Minute	1,647	Acre Feet/Year
42	**EXISTING STORAGE CAPACITY**				
43	Reservoir	1,000,000	Gallons		
44					
45	Total Storage	1,000,000	Gallons		
46	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
47	# based on Peak Day Physical Source Capacity	408	Connections		
48	# based on Annual Physical Source Capacity	534	Connections		
49	# based on Peak Day Water Rights Capacity	3,136	Connections		
50	# based on Annual Water Rights Capacity	3,580	Connections		
51	# based on Storage Capacity	502	Connections		

Notes:

Line 2: # of Units in 2015 is calculated as follows: 25 AF sold to SWWC @ 0.45 af/home = 55.6 ERCs; LDS church = est. 5 ERCs; Hot Springs Mobile home park = 35 ERCs; total = 96 ERCs

Line 3: South Willard water system is designed for indoor use only. Secondary irrigation sources are available to all connections.

Line 37: Water Rights shown are for all future wells; 7 points of diversion are listed

Lines 30-48: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Cedar Ridge

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	33	37	44	51	66	86	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.45	0.45	0.45	0.45	0.45	0.45	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	14.85	16.79	19.64	22.98	29.87	38.83	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	14.7869	17	20	23	30	39	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	28	31	37	43	56	73	ACRE FEET
8	Total Annual Usage	43	48	56	66	86	111	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	26,400	29,840	34,913	40,848	53,102	69,033	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	84,681	95,715	111,986	131,024	170,331	221,431	GAL/DAY
11	Total Peak Day Demand	111,081	125,555	146,899	171,872	223,434	290,464	GAL/DAY
12	(Gallons per Minute)	77	87	102	119	155	202	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	13,200	14,920	17,456	20,424	26,551	34,517	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	42,293	47,804	55,930	65,438	85,070	110,591	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	5,549	6,272	7,339	8,586	11,162	14,511	GALLONS
18	Total Storage (Rounded)	80,000	80,000	100,000	110,000	140,000	170,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	101	109	121	134	158	187	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	118	133	156	182	237	308	GPM
22	Total Peak Hour Demand	219	242	277	316	395	495	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.429697712	0.485688626	0.568255693	0.664859161	0.864316909	1.123611982	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	22	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	22	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	20,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Well (Tremonton Purchased Well)	224	Gallon/Minute	181	Acre Feet/Year
32	Future Well (not drilled yet)	0	Gallon/Minute	0	Acre Feet/Year
33	BRWCD Backup Connection	0	Gallon/Minute	0	Acre Feet/Year
34					
35	Total Peak Day Sources	224	Gallon/Minute		
36	Safety Factor	1.25			
37	Total Peak Day Sources with Safety Factor	180	Gallon/Minute	181	Acre Feet/Year
38	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
39	Well (Tremonton Purchased Well)	224	Gallon/Minute	83	Acre Feet/Year
40	Future Well (not drilled yet)	0	Gallon/Minute	94	Acre Feet/Year
41					
42	Total Peak Day Sources	224	Gallon/Minute		
43	Safety Factor	1.25			
44	Total Peak Day Sources with Safety Factor	180	Gallon/Minute	177	Acre Feet/Year
45	**EXISTING STORAGE CAPACITY**				
46	Reservoir	150,000	Gallons		
47					
48	Total Storage	150,000	Gallons		
49	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
50	# based on Peak Day Physical Source Capacity	44	Connections		
51	# based on Annual Physical Source Capacity	107	Connections		
52	# based on Peak Day Water Rights Capacity	44	Connections		
53	# based on Annual Water Rights Capacity	104	Connections		
54	# based on Storage Capacity	29	Connections		

Notes:

Line 2: # of homes in Cedar Ridge in 2014. Developer wants to plan on an additional 57 lots for phase 2 in the future, but would have to develop additional water supply.

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-12: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 30-44: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Technical data for Coleman Trailer Court

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	28	28	28	28	28	28	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.01	0.01	0.01	0.01	0.01	0.01	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	0.26	0.26	0.26	0.26	0.26	0.26	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	13	13	13	13	13	13	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	0	0	0	0	0	0	ACRE FEET
8	Total Annual Usage	13	13	13	13	13	13	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	22,400	22,400	22,400	22,400	22,400	22,400	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	1,466	1,466	1,466	1,466	1,466	1,466	GAL/DAY
11	Total Peak Day Demand	23,866	23,866	23,866	23,866	23,866	23,866	GAL/DAY
12	(Gallons per Minute)	17	17	17	17	17	17	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	11,200	11,200	11,200	11,200	11,200	11,200	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	732	732	732	732	732	732	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	1,193	1,193	1,193	1,193	1,193	1,193	GALLONS
18	Total Storage (Rounded)	30,000	30,000	30,000	30,000	30,000	30,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	91	91	91	91	91	91	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	2	2	2	2	2	2	GPM
22	Total Peak Hour Demand	93	93	93	93	93	93	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**							
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	1	1	1	1	1	1	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	18,000	18,000	18,000	18,000	18,000	18,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Well	45	Gallon/Minute	36	Acre Feet/Year
32	BRWCD Backup Connection	50	Gallon/Minute	0	Acre Feet/Year
33					
34	Total Peak Day Sources	95	Gallon/Minute		
35	Safety Factor	1.25			
36	Total Peak Day Sources with Safety Factor	76	Gallon/Minute	36	Acre Feet/Year
37	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
38	Well	45	Gallon/Minute	12	Acre Feet/Year
39	BRWCD Backup Connection	0	Gallon/Minute	0	Acre Feet/Year
40					
41	Total Peak Day Sources	45	Gallon/Minute		
42	Safety Factor	1.25			
43	Total Peak Day Sources with Safety Factor	36	Gallon/Minute	12	Acre Feet/Year
44	**EXISTING STORAGE CAPACITY**				
45	Reservoir	12,000	Gallons		
46					
47	Total Storage	12,000	Gallons		
48	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
49	# based on Peak Day Physical Source Capacity	100	Connections		
50	# based on Annual Physical Source Capacity	50	Connections		
51	# based on Peak Day Water Rights Capacity	33	Connections		
52	# based on Annual Water Rights Capacity	-2	Connections		
53	# based on Storage Capacity	-17	Connections		

Notes:

Line 2: Coleman Mobile Home Court currently serves 28 mobile home units and is not expected to increase in the future.

Line 3: Lawn size assumed to be very small (mobile homes) = 20' X 20' average lawn size = 0.00918 acres/connection.

Lines 5-22: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 30-43: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a

Lines 30-47: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Corinne City

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	304	334	392	460	598	777	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.02	0.02	0.02	0.02	0.02	0.02	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	5.24	5.75	6.75	7.92	10.30	13.39	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	136	150	176	206	268	348	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	10	11	13	15	19	25	ACRE FEET
8	Total Annual Usage	146	160	188	221	287	373	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	243,200	266,987	313,344	367,750	478,076	621,498	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	29,869	32,790	38,484	45,165	58,715	76,330	GAL/DAY
11	Total Peak Day Demand	273,069	299,778	351,828	412,916	536,791	697,828	GAL/DAY
12	(Gallons per Minute)	189.63	208	244	287	373	485	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	121,600	133,494	156,672	183,875	239,038	310,749	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	14,918	16,377	19,220	22,557	29,325	38,122	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	13,652	14,987	17,589	20,643	26,836	34,887	GALLONS
18	Total Storage (Rounded)	170,000	180,000	210,000	240,000	310,000	400,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	419	445	493	546	646	764	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	41	46	53	63	82	106	GPM
22	Total Peak Hour Demand	461	491	547	609	728	870	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.432199252	0.474472755	0.556855459	0.653542273	0.849604955	1.104486441	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	46	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	0	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Springs (Low avg. flow from 1990)	47	Gallon/Minute	75	Acre Feet/Year
32	Corinne Well 29-2044	245	Gallon/Minute	198	Acre Feet/Year
33	Corinne Well 29-3702 (Well not drilled yet)	206	Gallon/Minute	167	Acre Feet/Year
34	BRWCD Backup Connection on HWY 38	50	Gallon/Minute	40	Acre Feet/Year
35					
36	Total Peak Day Sources	548	Gallon/Minute		
37	Safety Factor	1.25			
38	Total Peak Day Sources with Safety Factor	439	Gallon/Minute	479	Acre Feet/Year
39	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
40	Springs	178	Gallon/Minute	12	Acre Feet/Year
41	Corinne Well 29-2044	242	Gallon/Minute	195	Acre Feet/Year
42	Corinne Well 29-3702 (Well not drilled yet)	206	Gallon/Minute	167	Acre Feet/Year
43	BRWCD Backup Conn. on HWY 38 (no contract w/BRWCD)	0	Gallon/Minute	0	
44	Total Peak Day Sources	627	Gallon/Minute		
45	Safety Factor	1.25			
46	Total Peak Day Sources with Safety Factor	502	Gallon/Minute	374	Acre Feet/Year
47	**EXISTING STORAGE CAPACITY**				
48	Old South Reservoir	250,000	Gallons		
49	New North Reservoir	1,000,000	Gallons		
50	Total Storage	1,250,000	Gallons		
51	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
52	# based on Peak Day Physical Source Capacity	399	Connections		
53	# based on Annual Physical Source Capacity	694	Connections		
54	# based on Peak Day Water Rights Capacity	500	Connections		
55	# based on Annual Water Rights Capacity	475	Connections		
56	# based on Storage Capacity	1,931	Connections		

Notes:

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Deweyville Town

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	132	146	171	201	261	339	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.16	0.16	0.16	0.16	0.16	0.16	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	21.12	23.33	27.38	32.13	41.77	54.31	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	59	65	77	90	117	152	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	39	44	51	60	78	102	ACRE FEET
8	Wholesale Deliveries to BRWCD Collinston Project	101	130	166	202	238	273	ACRE FEET
9	Total Annual Usage	200	239	294	352	433	527	ACRE FEET
10	Peak Day Indoor Demand = 800 Gal./Day/Connection	105,600	116,647	136,901	160,671	208,872	271,534	GAL/DAY
11	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	120,435	133,034	156,133	183,242	238,215	309,679	GAL/DAY
12	Wholesale Deliveries to BRWCD Collinston Project	266,400	342,582	436,985	530,650	624,554	719,011	GAL/DAY
13	Total Peak Day Demand	492,435	592,263	730,019	874,563	1,071,641	1,300,224	GAL/DAY
14	(Gallons per Minute)	342	411	507	607	744	903	GPM
15	**STORAGE REQUIREMENTS**							
16	Indoor Requirement = 400 Gal/Connection	52,800	58,324	68,450	80,336	104,436	135,767	GALLONS
17	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	60,150	66,442	77,979	91,518	118,974	154,666	GALLONS
18	Wholesale Deliveries Requirement = 1/2 Daily Demand	133,200	171,291	218,492	265,325	312,277	359,506	GALLONS
19	Fire Storage (1,000 gpm for 1/2 hour)	60,000	60,000	60,000	60,000	60,000	60,000	GALLONS
20	Emergency Storage, 10%	24,615	29,606	36,492	43,718	53,569	64,994	GALLONS
21	Total Storage (Rounded)	330,000	390,000	460,000	540,000	650,000	770,000	GALLONS
22	**DISTRIBUTION SYSTEM REQUIREMENTS**							
23	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	246	262	290	322	380	450	GPM
24	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	167	185	217	255	331	430	GPM
25	Average Daily Demand for Wholesale Deliveries	370	238	303	369	434	499	GPM
26	Total Peak Hour Demand	783	685	811	945	1,145	1,379	GPM
27	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.611203813	0.735109992	0.906089969	1.085496746	1.330107799	1.613822361	
28	Physical Source Capacity on Peak Day Basis	0	0	59	160	297	455	Gallon/Minute
29	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
30	Water Rights Source Capacity on Peak Day Basis	0	0	0	15	152	311	Gallon/Minute
31	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	47	AcreFeet/Year
32	**ADDITIONAL STORAGE CAPACITY NEEDED**							
33	Storage Capacity Needed	0	0	0	0	0	0	Gallons

34	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity		
35	Coldwater Springs (based on flow since redevel. in 2016)	30	Gallon/Minute	5	Acre Feet/Year	
36	Willow Spring (based on low flows in July 2011)	10	Gallon/Minute	72	Acre Feet/Year	
37	Old Well	80	Gallon/Minute	65	Acre Feet/Year	
38	New Well	440	Gallon/Minute	355	Acre Feet/Year	
39	BRWCD Deweyville Area Water Rights	0	Gallon/Minute	150	Acre Feet/Year	
40						
41	Total Peak Day Sources	560	Gallon/Minute			
42	Safety Factor	1.25				
43	Total Peak Day Sources with Safety Factor	448	Gallon/Minute	647	Acre Feet/Year	
44	**EXISTING WATER RIGHTS SOURCE CAPACITY**					
45	Coldwater Spring - 29-2144	249	Gallon/Minute	118	Acre Feet/Year	
46	Willow Spring - 29-2643	42	Gallon/Minute	112	Acre Feet/Year	
47	New Well - 29-4140	449	Gallon/Minute	100	Acre Feet/Year	
48	BRWCD Deweyville Area Water Rights	0	Gallon/Minute	150	Acre Feet/Year	
49						
50	Total Peak Day Sources	740	Gallon/Minute			
51	Safety Factor	1.25				
52	Total Peak Day Sources with Safety Factor	592	Gallon/Minute	480	Acre Feet/Year	
53	**EXISTING STORAGE CAPACITY**					
54	Tank 1	150,000	Gallons			
55	Tank 2	150,000	Gallons			
56	Tank 3	500,000	Gallons			
57						
58	Total Storage	800,000	Gallons			
59	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**					
60	# based on Peak Day Physical Source Capacity	89	Connections			
61	# based on Annual Physical Source Capacity	598	Connections			
62	# based on Peak Day Water Rights Capacity	210	Connections			
63	# based on Annual Water Rights Capacity	375	Connections			
64	# based on Storage Capacity	499	Connections			

Notes:

Line 2: The number of connections for 2015 was 132 - see Water Use Metered Sales

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys,

Technical data for Elwood Town

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	364	418	491	638	829	1078	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.05	0.05	0.05	0.05	0.05	0.05	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	19.29	22.16	26.00	33.80	43.94	57.13	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	163	187	220	286	372	483	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	36	41	49	63	82	107	ACRE FEET
8	Total Annual Usage	199	229	268	349	454	590	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	291,200	334,429	392,496	510,245	663,319	862,315	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	110,011	126,342	148,279	192,763	250,591	325,769	GAL/DAY
11	Total Peak Day Demand	401,211	460,771	540,775	703,008	913,910	1,188,083	GAL/DAY
12	(Gallons per Minute)	279	320	376	488	635	825	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	145,600	167,215	196,248	255,123	331,659	431,157	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	54,944	63,100	74,056	96,273	125,155	162,702	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	20,054	23,031	27,030	35,140	45,681	59,386	GALLONS
18	Total Storage (Rounded)	240,000	270,000	310,000	400,000	520,000	670,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	470	514	570	674	797	942	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	153	175	206	268	348	452	GPM
22	Total Peak Hour Demand	623	690	775	941	1,145	1,395	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.442251654	0.507905067	0.596092624	0.774920411	1.007396535	1.309615495	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	131	321	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	57	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	115	306	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	85	221	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	0	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Coldwater Canyon Spring (based on redevelopment in 2016)	30	Gallon/Minute	48	Acre Feet/Year
32	New Well	250	Gallon/Minute	202	Acre Feet/Year
33	Upper Well	350	Gallon/Minute	282	Acre Feet/Year
34					
35	Total Peak Day Sources	630	Gallon/Minute		
36	Safety Factor	1.25			
37	Total Peak Day Sources with Safety Factor	504	Gallon/Minute	532	Acre Feet/Year
38	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
39	Springs	249	Gallon/Minute	46	Acre Feet/Year
40	New Well	350	Gallon/Minute	282	Acre Feet/Year
41	Corinne Well 29-3702	50	Gallon/Minute	40	Acre Feet/Year
42					
43	Total Peak Day Sources	649	Gallon/Minute		
44	Safety Factor	1.25			
45	Total Peak Day Sources with Safety Factor	519	Gallon/Minute	369	Acre Feet/Year
46	**EXISTING STORAGE CAPACITY**				
47	East Tank	200,000	Gallons		
48	West Tank	200,000	Gallons		
49	500,000 gallon Tank	500,000	Gallons		
50					
51	Total Storage	900,000	Gallons		
52	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
53	# based on Peak Day Physical Source Capacity	294	Connections		
54	# based on Annual Physical Source Capacity	609	Connections		
55	# based on Peak Day Water Rights Capacity	314	Connections		
56	# based on Annual Water Rights Capacity	310	Connections		
57	# based on Storage Capacity	1,001	Connections		

Notes:

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Five C's Trailer Court

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	26	26	26	26	26	26	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.01	0.01	0.01	0.01	0.01	0.01	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	0.24	0.24	0.24	0.24	0.24	0.24	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	12	12	12	12	12	12	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	0.45	0.45	0.45	0.45	0.45	0.45	ACRE FEET
8	Total Annual Usage	12	12	12	12	12	12	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	20,800	20,800	20,800	20,800	20,800	20,800	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	1,361	1,361	1,361	1,361	1,361	1,361	GAL/DAY
11	Total Peak Day Demand	22,161	22,161	22,161	22,161	22,161	22,161	GAL/DAY
12	(Gallons per Minute)	15	15	15	15	15	15	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	10,400	10,400	10,400	10,400	10,400	10,400	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	680	680	680	680	680	680	GALLONS
16	Fire Storage - NA	0	0	0	0	0	0	GALLONS
17	Emergency Storage, 10%	1,108	1,108	1,108	1,108	1,108	1,108	GALLONS
18	Total Storage (Rounded)	10,000	10,000	10,000	10,000	10,000	10,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	87	87	87	87	87	87	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	2	2	2	2	2	2	GPM
22	Total Peak Hour Demand	89	89	89	89	89	89	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**							
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	9,700	9,700	9,700	9,700	9,700	9,700	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Well - 29-484	25	Gallon/Minute	20	Acre Feet/Year
32	Well - 29-1217	22	Gallon/Minute	18	Acre Feet/Year
33					
34	Total Peak Day Sources	48	Gallon/Minute		
35	Safety Factor	1.25			
36	Total Peak Day Sources with Safety Factor	38	Gallon/Minute	38	Acre Feet/Year
37	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
38	Well - 29-484	25	Gallon/Minute	6	Acre Feet/Year
39	Well - 29-1217	22	Gallon/Minute	18	Acre Feet/Year
40					
41	Total Peak Day Sources	48	Gallon/Minute		
42	Safety Factor	1.25			
43	Total Peak Day Sources with Safety Factor	38	Gallon/Minute	24	Acre Feet/Year
44	**EXISTING STORAGE CAPACITY**				
45	Hydropneumatic Tank	300	Gallons		
46					
47	Total Storage	300	Gallons		
48	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
49	# based on Peak Day Physical Source Capacity	38	Connections		
50	# based on Annual Physical Source Capacity	56	Connections		
51	# based on Peak Day Water Rights Capacity	38	Connections		
52	# based on Annual Water Rights Capacity	26	Connections		
53	# based on Storage Capacity	-25	Connections		

Notes:

Line 3: Lawn size assumed to be very small (mobile homes) = 20' X 20' average lawn size = 0.00918 acres/connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Garland

		2015	2020	2030	2040	2050	2060	
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Units in Service Area	831	932	1094	1422	1848	2403	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.10	0.10	0.10	0.10	0.10	0.10	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	85.59	95.97	112.63	146.43	190.35	247.46	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	372	418	490	637	828	1,077	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	160	179	211	274	356	463	ACRE FEET
8	Total Annual Usage	532	597	701	911	1,184	1,539	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	664,800	745,407	874,832	1,137,282	1,478,466	1,922,006	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	488,086	547,266	642,288	834,974	1,085,466	1,411,106	GAL/DAY
11	Total Peak Day Demand	1,152,886	1,292,673	1,517,120	1,972,256	2,563,932	3,333,112	GAL/DAY
12	(Gallons per Minute)	801	898	1,054	1,370	1,781	2,315	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	332,400	372,704	437,416	568,641	739,233	961,003	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	243,769	273,326	320,783	417,018	542,124	704,761	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	57,617	64,603	75,820	98,566	128,136	166,576	GALLONS
18	Total Storage (Rounded)	650,000	730,000	850,000	1,100,000	1,420,000	1,850,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	798	859	951	1,125	1,331	1,574	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	678	760	892	1,160	1,508	1,960	GPM
22	Total Peak Hour Demand	1,476	1,619	1,843	2,285	2,838	3,534	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.847390926	0.950137076	1.115109376	1.449642189	1.884534845	2.449895299	
24	Physical Source Capacity on Peak Day Basis	0	0	109	425	836	1,370	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	129	540	1,075	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	50,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Bear River Springs (min flow in 1998)	459	Gallon/Minute	740	Acre Feet/Year
32	Garland & East Side Springs (min flow in 2012)	722	Gallon/Minute	1,165	Acre Feet/Year
33					
34	Total Peak Day Sources	1,181	Gallon/Minute		
35	Safety Factor	1.25			
36	Total Peak Day Sources with Safety Factor	945	Gallon/Minute	1,905	Acre Feet/Year
37	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
38	Bear River Springs - 29-1371, 1015	700	Gallon/Minute	1,129	Acre Feet/Year
39	Garland & Bear River Springs - 29-1147, 532	850	Gallon/Minute	1,371	Acre Feet/Year
40					
41	Total Peak Day Sources	1,550	Gallon/Minute		
42	Safety Factor	1.25			
43	Total Peak Day Sources with Safety Factor	1,240	Gallon/Minute	2,501	Acre Feet/Year
44	**EXISTING STORAGE CAPACITY**				
45	Tank 1	300,000	Gallons		
46	Tank 2	1,000,000	Gallons		
47	Tank 3	500,000	Gallons		
48					
49	Total Storage	1,800,000	Gallons		
50	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
51	# based on Peak Day Physical Source Capacity	150	Connections		
52	# based on Annual Physical Source Capacity	2,143	Connections		
53	# based on Peak Day Water Rights Capacity	456	Connections		
54	# based on Annual Water Rights Capacity	3,072	Connections		
55	# based on Storage Capacity	1,470	Connections		

Notes:

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division

Technical data for Grouse Creek

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	45	47	52	57	63	70	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.20	0.20	0.20	0.20	0.20	0.20	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	9.00	9.46	10.41	11.47	12.63	13.91	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	20	21	23	26	28	31	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	17	18	19	21	24	26	ACRE FEET
8	Total Annual Usage	37	39	43	47	52	57	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	36,000	37,824	41,655	45,876	50,523	55,642	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	51,322	53,921	59,384	65,400	72,026	79,323	GAL/DAY
11	Total Peak Day Demand	87,322	91,745	101,040	111,276	122,549	134,965	GAL/DAY
12	(Gallons per Minute)	60.64	64	70	77	85	94	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	18,000	18,912	20,828	22,938	25,262	27,821	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	25,632	26,930	29,659	32,663	35,973	39,617	GALLONS
16	Fire Storage	0	0	0	0	0	0	GALLONS
17	Emergency Storage, 10%	4,363	4,584	5,049	5,560	6,123	6,744	GALLONS
18	Total Storage (Rounded)	50,000	50,000	60,000	60,000	70,000	70,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	123	127	136	144	153	163	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	71	75	82	91	100	110	GPM
22	Total Peak Hour Demand	195	202	218	235	253	273	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.562982769	0.591500661	0.651425593	0.71742152	0.790103494	0.870148879	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	10,000	10,000	20,000	20,000	30,000	30,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Buckskin Springs	112	Gallon/Minute	77	Acre Feet/Year
32	Well	22	Gallon/Minute	24	Acre Feet/Year
33					
34	Total Peak Day Sources	135	Gallon/Minute		
35	Safety Factor	1.25			
36	Total Peak Day Sources with Safety Factor	108	Gallon/Minute	101	Acre Feet/Year
37	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
38	Buckskin Springs	112	Gallon/Minute	77	Acre Feet/Year
39	Well	22	Gallon/Minute	24	Acre Feet/Year
40					
41	Total Peak Day Sources	135	Gallon/Minute		
42	Safety Factor	1.25			
43	Total Peak Day Sources with Safety Factor	108	Gallon/Minute	101	Acre Feet/Year
44	**EXISTING STORAGE CAPACITY**				
45	Reservoir	40,000	Gallons		
46					
47	Total Storage	40,000	Gallons		
48	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
49	# based on Peak Day Physical Source Capacity	35	Connections		
50	# based on Annual Physical Source Capacity	78	Connections		
51	# based on Peak Day Water Rights Capacity	35	Connections		
52	# based on Annual Water Rights Capacity	78	Connections		
53	# based on Storage Capacity	-9	Connections		

Notes:

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division

Technical data for Honeyville

		2015	2020	2030	2040	2050	2060	
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Units in Service Area	489	502	590	767	996	1295	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.29	0.29	0.29	0.29	0.29	0.29	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	142	146	171	222	289	376	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	219	225	264	343	447	580	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	265	272	320	416	540	703	ACRE FEET
8	Total Annual Usage	484	498	584	759	987	1,283	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	391,200	401,923	471,709	613,222	797,189	1,036,345	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	808,657	830,824	975,080	1,267,604	1,647,885	2,142,250	GAL/DAY
11	Total Peak Day Demand	1,199,857	1,232,747	1,446,789	1,880,826	2,445,074	3,178,596	GAL/DAY
12	(Gallons per Minute)	833	856	1,005	1,306	1,698	2,207	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	195,600	200,962	235,855	306,611	398,594	518,173	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	403,875	414,946	486,993	633,091	823,018	1,069,923	GALLONS
16	Fire Storage (1,000 gpm for 1 hour)	60,000	60,000	60,000	60,000	60,000	60,000	GALLONS
17	Emergency Storage, 10%	59,947	61,591	72,285	93,970	122,161	158,810	GALLONS
18	Total Storage (Rounded)	720,000	740,000	860,000	1,090,000	1,400,000	1,810,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	568	578	641	758	896	1,060	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	1,123	1,154	1,354	1,761	2,289	2,975	GPM
22	Total Peak Hour Demand	1,691	1,732	1,995	2,518	3,185	4,036	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.548180439	0.563206898	0.660996511	0.859295464	1.117084104	1.452209335	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	178	687	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	53	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	150,000	560,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Springs (min July flow in 1992)	150	Gallon/Minute	201	Acre Feet/Year
32	North Well	650	Gallon/Minute	524	Acre Feet/Year
33	South Well	1,100	Gallon/Minute	887	Acre Feet/Year
34	BRWCD Backup Connection on HWY 38	0	Gallon/Minute	0	Acre Feet/Year
35					
36	Total Peak Day Sources	1,900	Gallon/Minute		
37	Safety Factor	1.25			
38	Total Peak Day Sources with Safety Factor	1,520	Gallon/Minute	1,612	Acre Feet/Year
39	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
40	Springs - 29-857	898	Gallon/Minute	1,448	Acre Feet/Year
41	Well 9 - 29-1259	1,346	Gallon/Minute	1,086	Acre Feet/Year
42	Well 10 - 29-3715 (a26165)	449	Gallon/Minute	362	Acre Feet/Year
43					
44	Total Peak Day Sources	2,693	Gallon/Minute		
45	Safety Factor	1.25			
46	Total Peak Day Sources with Safety Factor	2,154	Gallon/Minute	2,896	Acre Feet/Year
47	**EXISTING STORAGE CAPACITY**				
48	North Tank	250,000	Gallons		
49	South Tank	1,000,000	Gallons		
50					
51	Total Storage	1,250,000	Gallons		
52	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
53	# based on Peak Day Physical Source Capacity	403	Connections		
54	# based on Annual Physical Source Capacity	1,139	Connections		
55	# based on Peak Day Water Rights Capacity	775	Connections		
56	# based on Annual Water Rights Capacity	2,435	Connections		
57	# based on Storage Capacity	360	Connections		

Notes:

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Hot Springs Trailer Court

		2015	2020	2030	2040	2050	2060	
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Units in Service Area	45	45	45	45	45	45	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.01	0.01	0.01	0.01	0.01	0.01	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	0.41	0.41	0.41	0.41	0.41	0.41	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	20	20	20	20	20	20	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	0.77	0.77	0.77	0.77	0.77	0.77	ACRE FEET
8	Total Annual Usage	21	21	21	21	21	21	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	36,000	36,000	36,000	36,000	36,000	36,000	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	2,356	2,356	2,356	2,356	2,356	2,356	GAL/DAY
11	Total Peak Day Demand	38,356	38,356	38,356	38,356	38,356	38,356	GAL/DAY
12	(Gallons per Minute)	27	27	27	27	27	27	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	18,000	18,000	18,000	18,000	18,000	18,000	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	1,177	1,177	1,177	1,177	1,177	1,177	GALLONS
16	Fire Storage - NA	0	0	0	0	0	0	GALLONS
17	Emergency Storage, 10%	1,918	1,918	1,918	1,918	1,918	1,918	GALLONS
18	Total Storage (Rounded)	20,000	20,000	20,000	20,000	20,000	20,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	123	123	123	123	123	123	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	3	3	3	3	3	3	GPM
22	Total Peak Hour Demand	127	127	127	127	127	127	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.416185563	0.416185563	0.416185563	0.416185563	0.416185563	0.416185563	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	2	2	2	2	2	2	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	2	2	2	2	2	2	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	19,782	19,782	19,782	19,782	19,782	19,782	Gallons

		Instantaneous Capacity		Annual Volume Capacity	
30	**EXISTING PHYSICAL SOURCE CAPACITY**				
31	Well	30	Gallon/Minute	24	Acre Feet/Year
32	BRWCD Connection	50	Gallon/Minute	81	Acre Feet/Year
33					
34	Total Peak Day Sources	80	Gallon/Minute		
35	Safety Factor	1.25			
36	Total Peak Day Sources with Safety Factor	64	Gallon/Minute	105	Acre Feet/Year
37	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
38	Well	31	Gallon/Minute	19	Acre Feet/Year
39	BRWCD Connection	0	Gallon/Minute	0	Acre Feet/Year
40					
41	Total Peak Day Sources	31	Gallon/Minute		
42	Safety Factor	1.25			
43	Total Peak Day Sources with Safety Factor	25	Gallon/Minute	19	Acre Feet/Year
44	**EXISTING STORAGE CAPACITY**				
45	2 - Hydropneumatic Tanks	218	Gallons		
46					
47	Total Storage	218	Gallons		
48	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
49	# based on Peak Day Physical Source Capacity	63	Connections		
50	# based on Annual Physical Source Capacity	180	Connections		
51	# based on Peak Day Water Rights Capacity	-3	Connections		
52	# based on Annual Water Rights Capacity	-4	Connections		
53	# based on Storage Capacity	-45	Connections		

Notes:

Line 2: Hot Springs Trailer Court currently serves 45 mobile home units, which is the maximum number of units.

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-32: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-47: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Howell Town

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	109	109	128	150	176	220	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.18	0.18	0.18	0.18	0.18	0.18	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	20.06	20.06	23.55	27.64	32.43	40.54	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	49	49	57	67	79	99	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	38	38	44	52	61	76	ACRE FEET
8	Total Annual Usage	86	86	101	119	140	175	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	87,200	87,200	102,341	120,110	140,965	176,206	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	114,409	114,409	134,274	157,588	184,950	231,187	GAL/DAY
11	Total Peak Day Demand	201,609	201,609	236,614	277,698	325,914	407,393	GAL/DAY
12	(Gallons per Minute)	140.01	140	164	193	226	283	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	43,600	43,600	51,170	60,055	70,482	88,103	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	57,140	57,140	67,062	78,705	92,371	115,464	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	10,074	10,074	11,823	13,876	16,285	20,357	GALLONS
18	Total Storage (Rounded)	130,000	130,000	150,000	170,000	190,000	240,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	217	217	241	267	296	341	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	159	159	186	219	257	321	GPM
22	Total Peak Hour Demand	376	376	427	486	553	662	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.519016723	0.519016723	0.609133597	0.714897463	0.839025109	1.048781387	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	13	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	40,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Hillside Spring (min flow in 2015)	7	Gallon/Minute	12	Acre Feet/Year
32	77 Well	100	Gallon/Minute	81	Acre Feet/Year
33	Kotter Well	230	Gallon/Minute	186	Acre Feet/Year
34					
35	Total Peak Day Sources	337	Gallon/Minute		
36	Safety Factor	1.25			
37	Total Peak Day Sources with Safety Factor	270	Gallon/Minute	278	Acre Feet/Year
38	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
39	Hillside Spring	20	Gallon/Minute	32	Acre Feet/Year
40	77 Well	108	Gallon/Minute	174	Acre Feet/Year
41	Kotter Well	444	Gallon/Minute	250	Acre Feet/Year
42					
43	Total Peak Day Sources	572	Gallon/Minute		
44	Safety Factor	1.25			
45	Total Peak Day Sources with Safety Factor	457	Gallon/Minute	456	Acre Feet/Year
46	**EXISTING STORAGE CAPACITY**				
47	North Tank	100,000	Gallons		
48	South Tank	100,000	Gallons		
49					
50	Total Storage	200,000	Gallons		
51	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
52	# based on Peak Day Physical Source Capacity	101	Connections		
53	# based on Annual Physical Source Capacity	242	Connections		
54	# based on Peak Day Water Rights Capacity	247	Connections		
55	# based on Annual Water Rights Capacity	466	Connections		
56	# based on Storage Capacity	59	Connections		

Notes:

Lines 3 - 10: Number of acres of landscaped area was calibrated to match 2015 reported total usage.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Mantua

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	246	250	293	344	448	582	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.24	0.24	0.24	0.24	0.24	0.24	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	59.08	60.01	70.43	82.66	107.46	139.70	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	110	112	132	154	201	261	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	110	112	132	155	201	261	ACRE FEET
8	Total Annual Usage	221	224	263	309	402	522	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	196,924	200,047	234,781	275,546	358,210	465,673	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	336,882	342,224	401,644	471,382	612,797	796,635	GAL/DAY
11	Total Peak Day Demand	533,805	542,271	636,425	746,928	971,006	1,262,308	GAL/DAY
12	(Gallons per Minute)	370.70	377	442	519	674	877	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	98,462	100,023	117,390	137,773	179,105	232,836	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	168,252	170,920	200,597	235,426	306,054	397,871	GALLONS
16	Fire Storage (1,000 gpm for 1 hour)	60,000	60,000	60,000	60,000	60,000	60,000	GALLONS
17	Emergency Storage, 10%	26,671	27,094	31,799	37,320	48,516	63,071	GALLONS
18	Total Storage (Rounded)	350,000	360,000	410,000	470,000	590,000	750,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	366	370	410	454	537	635	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	468	475	558	655	851	1,106	GPM
22	Total Peak Hour Demand	834	845	968	1,109	1,388	1,742	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.528361158	0.536740275	0.629934489	0.739310014	0.961103018	1.249433923	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	175	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	66	268	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	100,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Springs Low Flow in July 2006	27	Gallon/Minute	59	Acre Feet/Year
32	Well #1	325	Gallon/Minute	262	Acre Feet/Year
33	Well #2	525	Gallon/Minute	423	Acre Feet/Year
34	Total Peak Day Sources	877	Gallon/Minute		
35	Safety Factor	1.25			
36	Total Peak Day Sources with Safety Factor	702	Gallon/Minute	744	Acre Feet/Year
37	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
38	Springs and 2 Wells all combined in 1 WR	761	Gallon/Minute	1,227	Acre Feet/Year
39	Well #1		Gallon/Minute		Acre Feet/Year
40	Well #2		Gallon/Minute		Acre Feet/Year
41	Total Peak Day Sources	761	Gallon/Minute		
42	Safety Factor	1.25			
43	Total Peak Day Sources with Safety Factor	609	Gallon/Minute	1,227	Acre Feet/Year
44	**EXISTING STORAGE CAPACITY**				
45	Tank 1	150,000	Gallons		
46	Tank 2	500,000	Gallons		
47					
48	Total Storage	650,000	Gallons		
49	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
50	# based on Peak Day Physical Source Capacity	220	Connections		
51	# based on Annual Physical Source Capacity	584	Connections		
52	# based on Peak Day Water Rights Capacity	158	Connections		
53	# based on Annual Water Rights Capacity	1,122	Connections		
54	# based on Storage Capacity	211	Connections		

Notes:

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Marble Hills Subdivision

		2015	2020	2030	2040	2050	2060	
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Units in Service Area	75	80	94	111	130	169	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.22	0.22	0.22	0.22	0.22	0.22	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	16.27	17.43	20.46	24.01	28.18	36.64	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	34	36	42	50	58	76	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	30	33	38	45	53	69	ACRE FEET
8	Total Annual Usage	64	69	81	95	111	144	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	60,000	64,301	75,465	88,568	103,947	135,130	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	92,764	99,413	116,674	136,932	160,708	208,920	GAL/DAY
11	Total Peak Day Demand	152,764	163,714	192,140	225,501	264,654	344,051	GAL/DAY
12	(Gallons per Minute)	106	114	133	157	184	239	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	30,000	32,150	37,733	44,284	51,973	67,565	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	46,330	49,651	58,272	68,389	80,264	104,343	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	7,633	8,180	9,600	11,267	13,224	17,191	GALLONS
18	Total Storage (Rounded)	100,000	100,000	120,000	140,000	160,000	200,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	171	179	198	220	243	288	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	129	138	162	190	223	290	GPM
22	Total Peak Hour Demand	300	317	360	410	467	578	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	1.473416204	1.579030651	1.853197743	2.174968467	2.552608242	3.318390714	
24	Physical Source Capacity on Peak Day Basis	34	42	61	85	112	167	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	8	22	38	72	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	0	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Well	90	Gallon/Minute	73	Acre Feet/Year
32	New Undrilled Well	0	Gallon/Minute	0	Acre Feet/Year
33					
34	Total Peak Day Sources	90	Gallon/Minute		
35	Safety Factor	1.25			
36	Total Peak Day Sources with Safety Factor	72	Gallon/Minute	73	Acre Feet/Year
37	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
38	Well	251	Gallon/Minute	270	Acre Feet/Year
39	New Undrilled Well	646	Gallon/Minute	254	Acre Feet/Year
40					
41	Total Peak Day Sources	898	Gallon/Minute		
42	Safety Factor	1.25			
43	Total Peak Day Sources with Safety Factor	718	Gallon/Minute	524	Acre Feet/Year
44	**EXISTING STORAGE CAPACITY**				
45	Tank 1	150,000	Gallons		
46	Tank 2	150,000	Gallons		
47	Tank 3	150,000	Gallons		
48					
49	Total Storage	450,000	Gallons		
50	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
51	# based on Peak Day Physical Source Capacity	-24	Connections		
52	# based on Annual Physical Source Capacity	10	Connections		
53	# based on Peak Day Water Rights Capacity	433	Connections		
54	# based on Annual Water Rights Capacity	538	Connections		
55	# based on Storage Capacity	263	Connections		

Notes:

Line 2: Buildout is estimated to be about 186 - 1/2 acre lots.

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Park Valley Elementary School

		2015	2020	2030	2040	2050	2060	
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Persons in School Building when in session	60	60	60	60	60	60	PERSONS
3	# Acres of Outside Irrigation	0.33	0.33	0.33	0.33	0.33	0.33	ACRES
4	Total # Acres of Outside Irrigation	0.33	0.33	0.33	0.33	0.33	0.33	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage for School = 25 Gal/Day/Per. x 180 days	0.83	0.83	0.83	0.83	0.83	0.83	ACRE FEET
7	Annual Indoor Usage for UDOT Shed = 0.45 af	0.45	0.45	0.45	0.45	0.45	0.45	ACRE FEET
8	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	0.62	0.62	0.62	0.62	0.62	0.62	ACRE FEET
9	Total Annual Usage	1.45	1.45	1.45	1.45	1.45	1.45	ACRE FEET
10	Peak Day Indoor Demand = 25 Gal./Day/Person	1,500	1,500	1,500	1,500	1,500	1,500	GAL/DAY
11	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	1,882	1,882	1,882	1,882	1,882	1,882	GAL/DAY
12								
13	Total Peak Day Demand	3,382	3,382	3,382	3,382	3,382	3,382	GAL/DAY
14	(Gallons per Minute)	2.3	2.3	2.3	2.3	2.3	2.3	GPM
15	**STORAGE REQUIREMENTS**							
16	School Indoor Requirement = Equalization 1/2 day Volume	3,000	3,000	3,000	3,000	3,000	3,000	GALLONS
17	UDOT Shed Indoor Req. = Equalization 1/2 day Volume	940	940	940	940	940	940	GALLONS
18	Outdoor Irrigation = 2,848 Gal./Irrigated Acre	940	940	940	940	940	940	
19	Fire Storage	0	0	0	0	0	0	GALLONS
20	Emergency Storage, 10%	394	394	394	394	394	394	GALLONS
21	Total Storage (Rounded)	5,274	5,274	5,274	5,274	5,274	5,274	GALLONS
22	**DISTRIBUTION SYSTEM REQUIREMENTS**							
23	Peak Hour Indoor Demand = Avg. daily demand/8 hrs x 2	6.3	6.3	6.3	6.3	6.3	6.3	GPM
24	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	2.6	2.6	2.6	2.6	2.6	2.6	GPM
25	Total Peak Hour Demand	8.9	8.9	8.9	8.9	8.9	8.9	GPM
26	**ADDITIONAL SOURCE CAPACITY NEEDED**							
27	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
28	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
29	Water Rights Source Capacity on Peak Day Basis	2	2	2	2	2	2	Gallon/Minute
30	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
31	**ADDITIONAL STORAGE CAPACITY NEEDED**							
32	Storage Capacity Needed	0	0	0	0	0	0	Gallons

33	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
34	New Well	5	Gallon/Minute	8	Acre Feet/Year
35	Old Well	2	Gallon/Minute	2	Acre Feet/Year
36					
37	Total Peak Day Sources	7	Gallon/Minute		
38	Safety Factor	1.25			
39	Total Peak Day Sources with Safety Factor	6	Gallon/Minute	10	Acre Feet/Year
40	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
41	New Well		Gallon/Minute	8	Acre Feet/Year
42	Old Well		Gallon/Minute	incl.	Acre Feet/Year
43					
44	Total Peak Day Sources	0	Gallon/Minute		
45	Safety Factor	1.25			
46	Total Peak Day Sources with Safety Factor	0	Gallon/Minute	8	Acre Feet/Year
47	**EXISTING STORAGE CAPACITY**				
48	Storage Tank	7,500	Gallons		
49					
50	Total Storage	7,500	Gallons		
51	**ADDITIONAL PERSONS SERVICEABLE WITH EXISTING CAPACITY**				
52	# based on Peak Day Physical Source Capacity	83	Persons		
53	# based on Annual Physical Source Capacity	342	Persons		
54	# based on Peak Day Water Rights Capacity	-60	Persons		
55	# based on Annual Water Rights Capacity	271	Persons		
56	# based on Storage Capacity	25	Persons		

Notes:

Line 2: Elementary School with students, staff and faculty maximum estimate = 60 persons. School in session about 180 days per year.

Line 3: School grounds include about 1/3 acre of lawns.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Perry

		2015	2020	2030	2040	2050	2060	
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Units in Service Area	1570	1587	2063	2682	3487	4533	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.00	0.00	0.00	0.00	0.00	0.00	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	0.00	0.00	0.00	0.00	0.00	0.00	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	704	711	925	1,202	1,562	2,031	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	0	0	0	0	0	0	ACRE FEET
8	Total Annual Usage	704	711	925	1,202	1,562	2,031	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	1,256,206	1,269,718	1,650,633	2,145,823	2,789,569	3,626,440	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	0	0	0	0	0	0	GAL/DAY
11	Total Peak Day Demand	1,256,206	1,269,718	1,650,633	2,145,823	2,789,569	3,626,440	GAL/DAY
12	(Gallons per Minute)	872.37	882	1,146	1,490	1,937	2,518	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	628,103	634,859	825,316	1,072,911	1,394,785	1,813,220	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	0	0	0	0	0	0	GALLONS
16	Fire Storage (1,000 gpm for 1 hour)	60,000	60,000	60,000	60,000	60,000	60,000	GALLONS
17	Emergency Storage, 10%	62,810	63,486	82,532	107,291	139,478	181,322	GALLONS
18	Total Storage (Rounded)	750,000	760,000	970,000	1,240,000	1,590,000	2,050,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	1,199	1,207	1,428	1,689	1,998	2,363	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	0	0	0	0	0	0	GPM
22	Total Peak Hour Demand	1,199	1,207	1,428	1,689	1,998	2,363	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.809242567	0.817946379	1.063330293	1.382329381	1.797028195	2.336136654	
24	Physical Source Capacity on Peak Day Basis	0	0	68	412	859	1,440	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	101	462	930	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	75	656	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	400,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Stokes (Walker) Springs July Low Flow Estimate	18	Gallon/Minute	28	Acre Feet/Year
32	Allen St Well #1	0	Gallon/Minute	0	Acre Feet/Year
33	Allen St Well #2	220	Gallon/Minute	177	Acre Feet/Year
34	Anderson Well #3	360	Gallon/Minute	290	Acre Feet/Year
35	East Bench Well #4	750	Gallon/Minute	605	Acre Feet/Year
36	Basin Springs		Gallon/Minute	0	Acre Feet/Year
37					
38	Total Peak Day Sources	1,348	Gallon/Minute		
39	Safety Factor	1.25			
40	Total Peak Day Sources with Safety Factor	1,078	Gallon/Minute	1,101	Acre Feet/Year
41	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
42	Stokes (Walker) Springs	130	Gallon/Minute	210	Acre Feet/Year
43	Allen St Well #1	247	Gallon/Minute	199	Acre Feet/Year
44	Allen St Well #2	430	Gallon/Minute	346	Acre Feet/Year
45	Anderson Well #3	399	Gallon/Minute	322	Acre Feet/Year
46	East Bench Well #4	898	Gallon/Minute	724	Acre Feet/Year
47	Basin Springs	224	Gallon/Minute	362	Acre Feet/Year
48					
49	Total Peak Day Sources	2,328	Gallon/Minute		
50	Safety Factor	1.25			
51	Total Peak Day Sources with Safety Factor	1,862	Gallon/Minute	2,164	Acre Feet/Year
52	**EXISTING STORAGE CAPACITY**				
53	Tank 1	300,000	Gallons		
54	Tank 2	350,000	Gallons		
55	Tank 3	1,000,000	Gallons		
56					
57	Total Storage	1,650,000	Gallons		
58	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
59	# based on Peak Day Physical Source Capacity	370	Connections		
60	# based on Annual Physical Source Capacity	887	Connections		
61	# based on Peak Day Water Rights Capacity	1,782	Connections		
62	# based on Annual Water Rights Capacity	3,258	Connections		
63	# based on Storage Capacity	1,884	Connections		

Notes:

Line 3: Perry has a secondary water system that serves essentially all of its customers

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Plymouth

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	168	181	212	249	324	421	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.24	0.24	0.24	0.24	0.24	0.24	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	40.32	43.43	50.97	59.82	77.76	101.09	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	75	81	95	112	145	189	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	75	81	95	112	145	189	ACRE FEET
8	Total Annual Usage	151	162	190	224	291	378	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	134,400	144,756	169,890	199,388	259,204	336,966	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	229,921	247,637	290,634	341,097	443,426	576,454	GAL/DAY
11	Total Peak Day Demand	364,321	392,393	460,524	540,485	702,630	913,419	GAL/DAY
12	(Gallons per Minute)	253.00	272	320	375	488	634	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	67,200	72,378	84,945	99,694	129,602	168,483	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	114,831	123,679	145,154	170,357	221,464	287,903	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	18,203	19,606	23,010	27,005	35,107	45,639	GALLONS
18	Total Storage (Rounded)	220,000	230,000	270,000	310,000	400,000	520,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	287	301	333	369	437	517	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	319	344	404	474	616	801	GPM
22	Total Peak Hour Demand	606	645	737	843	1,053	1,317	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.733316174	0.789820498	0.926957031	1.08790458	1.414275954	1.83855874	
24	Physical Source Capacity on Peak Day Basis	0	0	0	30	143	289	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	25	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	40	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	0	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Water Canyon & Bishop's Springs	6	Gallon/Minute	10	Acre Feet/Year
32	New Well	425	Gallon/Minute	343	Acre Feet/Year
33			Gallon/Minute		Acre Feet/Year
34					
35	Total Peak Day Sources	431	Gallon/Minute		
36	Safety Factor	1.25			
37	Total Peak Day Sources with Safety Factor	345	Gallon/Minute	353	Acre Feet/Year
38	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
39	Water Canyon & Bishop's Springs	177	Gallon/Minute	105	Acre Feet/Year
40	Wells	565	Gallon/Minute	353	Acre Feet/Year
41			Gallon/Minute		Acre Feet/Year
42					
43	Total Peak Day Sources	743	Gallon/Minute		
44	Safety Factor	1.25			
45	Total Peak Day Sources with Safety Factor	594	Gallon/Minute	458	Acre Feet/Year
46	**EXISTING STORAGE CAPACITY**				
47	3 Tanks	250,000	Gallons		
48	New Tank	500,000	Gallons		
49					
50	Total Storage	750,000	Gallons		
51	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
52	# based on Peak Day Physical Source Capacity	61	Connections		
53	# based on Annual Physical Source Capacity	225	Connections		
54	# based on Peak Day Water Rights Capacity	227	Connections		
55	# based on Annual Water Rights Capacity	343	Connections		
56	# based on Storage Capacity	405	Connections		

Notes:

Line 3: Based on average water use in 2014-2015 with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Portage

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	108	118	139	163	191	248	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.24	0.24	0.24	0.24	0.24	0.24	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	25.82	28.24	33.15	38.90	45.66	59.36	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	48	53	62	73	86	111	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	48	53	62	73	85	111	ACRE FEET
8	Total Annual Usage	97	106	124	146	171	222	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	86,400	94,501	110,909	130,167	152,767	198,598	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	147,252	161,059	189,023	221,843	260,362	338,471	GAL/DAY
11	Total Peak Day Demand	233,652	255,560	299,933	352,010	413,129	537,068	GAL/DAY
12	(Gallons per Minute)	162.26	177	208	244	287	373	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	43,200	47,251	55,455	65,083	76,384	99,299	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	73,543	80,439	94,406	110,797	130,035	169,045	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	11,674	12,769	14,986	17,588	20,642	26,834	GALLONS
18	Total Storage (Rounded)	140,000	160,000	180,000	210,000	240,000	310,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	216	229	254	281	311	368	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	205	224	263	308	362	470	GPM
22	Total Peak Hour Demand	421	453	516	589	673	838	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.359175583	0.39285295	0.461064008	0.541118551	0.635072965	0.825594855	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	11	26	57	93	135	221	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	21	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	0	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Upper Well	350	Gallon/Minute	282	Acre Feet/Year
32	Upper Springs	200	Gallon/Minute	323	Acre Feet/Year
33	Lower Springs (minimum year = 2003 & 2004)	15	Gallon/Minute	24	Acre Feet/Year
34					
35	Total Peak Day Sources	565	Gallon/Minute		
36	Safety Factor	1.25			
37	Total Peak Day Sources with Safety Factor	452	Gallon/Minute	629	Acre Feet/Year
38	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
39	Well	130	Gallon/Minute	105	Acre Feet/Year
40	Upper Springs	10	Gallon/Minute	16	Acre Feet/Year
41	South Canyon Spring	49	Gallon/Minute	80	Acre Feet/Year
42					
43	Total Peak Day Sources	190	Gallon/Minute		
44	Safety Factor	1.25			
45	Total Peak Day Sources with Safety Factor	152	Gallon/Minute	201	Acre Feet/Year
46	**EXISTING STORAGE CAPACITY**				
47	Tank 1	100,000	Gallons		
48	Tank 2	500,000	Gallons		
49					
50	Total Storage	600,000	Gallons		
51	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
52	# based on Peak Day Physical Source Capacity	193	Connections		
53	# based on Annual Physical Source Capacity	594	Connections		
54	# based on Peak Day Water Rights Capacity	-7	Connections		
55	# based on Annual Water Rights Capacity	116	Connections		
56	# based on Storage Capacity	355	Connections		

Notes:

Line 3: Based on average water use in dry years where springs overflow was unlikely, with average lawn size calculated to match total water use per residential connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Riverside-North Garland

		2015	2020	2030	2040	2050	2060	
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Units in Service Area	634	648	761	893	1160	1508	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.01	0.01	0.01	0.01	0.01	0.01	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	8.24	8.42	9.89	11.60	15.08	19.61	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	284	290	341	400	520	676	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	15	16	18	22	28	37	ACRE FEET
8	Total Annual Usage	300	306	359	422	548	713	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	507,200	518,400	608,410	714,048	928,262	1,206,741	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	46,999	48,037	56,378	66,167	86,017	111,821	GAL/DAY
11	Total Peak Day Demand	554,199	566,437	664,787	780,215	1,014,279	1,318,563	GAL/DAY
12	(Gallons per Minute)	385	393	462	542	704	916	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	253,600	259,200	304,205	357,024	464,131	603,371	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	23,473	23,992	28,157	33,046	42,960	55,848	GALLONS
16	Fire Storage (1,000 gpm for 1 hour)	60,000	60,000	60,000	60,000	60,000	60,000	GALLONS
17	Emergency Storage, 10%	27,707	28,319	33,236	39,007	50,709	65,922	GALLONS
18	Total Storage (Rounded)	360,000	370,000	430,000	490,000	620,000	790,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	671	681	754	835	988	1,169	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	65	67	78	92	119	155	GPM
22	Total Peak Hour Demand	736	747	832	927	1,107	1,324	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.783510876	0.800812378	0.939857431	1.103044877	1.43395834	1.864145842	
24	Physical Source Capacity on Peak Day Basis	0	0	0	51	213	424	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	23	188	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	79	290	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	135,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Well #1	228	Gallon/Minute	184	Acre Feet/Year
32	Well #2	336	Gallon/Minute	271	Acre Feet/Year
33	BRWCD Connection on 14400 North	50	Gallon/Minute	70	Acre Feet/Year
34					
35	Total Peak Day Sources	614	Gallon/Minute		
36	Safety Factor	1.25			
37	Total Peak Day Sources with Safety Factor	491	Gallon/Minute	525	Acre Feet/Year
38	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
39	Well #1	283	Gallon/Minute	228	Acre Feet/Year
40	Well #2	449	Gallon/Minute	609	Acre Feet/Year
41	BRWCD Connection on 14400 North	50	Gallon/Minute	36	Acre Feet/Year
42					
43	Total Peak Day Sources	782	Gallon/Minute		
44	Safety Factor	1.25			
45	Total Peak Day Sources with Safety Factor	625	Gallon/Minute	873	Acre Feet/Year
46	**EXISTING STORAGE CAPACITY**				
47	North Tank	200,000	Gallons		
48	Old South Tank	125,000	Gallons		
49	New South Tank	330,000	Gallons		
50					
51	Total Storage	655,000	Gallons		
52	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
53	# based on Peak Day Physical Source Capacity	175	Connections		
54	# based on Annual Physical Source Capacity	477	Connections		
55	# based on Peak Day Water Rights Capacity	396	Connections		
56	# based on Annual Water Rights Capacity	1,214	Connections		
57	# based on Storage Capacity	520	Connections		

Notes:

Line 2 & 3: # of Units in 2015 is based on average water use in 2014, 390 active connections and estimated 244 ERCs for large users. Average lawn size calculated to be about 0.013 ac/connection based on actual water usage in 2014.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Snowville

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	130	129	151	177	208	270	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.05	0.05	0.05	0.05	0.05	0.05	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	6.50	6.43	7.55	8.86	10.40	13.52	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	58	58	68	79	93	121	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	12	12	14	17	19	25	ACRE FEET
8	Total Annual Usage	70	70	82	96	113	146	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	103,975	102,944	120,818	141,795	166,415	216,340	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	37,057	36,689	43,059	50,536	59,310	77,103	GAL/DAY
11	Total Peak Day Demand	141,032	139,633	163,877	192,331	225,725	293,443	GAL/DAY
12	(Gallons per Minute)	97.94	97	114	134	157	204	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	51,987	51,472	60,409	70,898	83,208	108,170	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	18,508	18,324	21,506	25,240	29,622	38,508	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	7,049	6,980	8,191	9,614	11,283	14,668	GALLONS
18	Total Storage (Rounded)	90,000	90,000	110,000	120,000	140,000	180,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	243	242	268	297	329	389	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	51	51	60	70	82	107	GPM
22	Total Peak Hour Demand	295	293	328	367	411	496	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.54410324	0.538706055	0.632241587	0.742017694	0.870854226	1.132110494	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	24	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	0	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Spring		Gallon/Minute		Acre Feet/Year
32	Well #1, 2006 data	225	Gallon/Minute	181	Acre Feet/Year
33			Gallon/Minute		Acre Feet/Year
34					
35	Total Peak Day Sources	225	Gallon/Minute		
36	Safety Factor	1.25			
37	Total Peak Day Sources with Safety Factor	180	Gallon/Minute	181	Acre Feet/Year
38	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
39	Spring	20	Gallon/Minute	33	Acre Feet/Year
40	Well #1	898	Gallon/Minute	474	Acre Feet/Year
41			Gallon/Minute		Acre Feet/Year
42					
43	Total Peak Day Sources	918	Gallon/Minute		
44	Safety Factor	1.25			
45	Total Peak Day Sources with Safety Factor	734	Gallon/Minute	506	Acre Feet/Year
46	**EXISTING STORAGE CAPACITY**				
47	Tank 1	200,000	Gallons		
48	Tank 2	220,000			
49					
50	Total Storage	420,000	Gallons		
51	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
52	# based on Peak Day Physical Source Capacity	109	Connections		
53	# based on Annual Physical Source Capacity	205	Connections		
54	# based on Peak Day Water Rights Capacity	844	Connections		
55	# based on Annual Water Rights Capacity	805	Connections		
56	# based on Storage Capacity	477	Connections		

Notes:

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for South Willard Water Company

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	450	472	614	798	1037	1348	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.00	0.00	0.00	0.00	0.00	0.00	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	0.00	0.00	0.00	0.00	0.00	0.00	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	202	211	275	357	465	604	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	0	0	0	0	0	0	ACRE FEET
8	Total Annual Usage	202	211	275	357	465	604	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	360,000	377,573	490,845	638,099	829,529	1,078,387	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	0	0	0	0	0	0	GAL/DAY
11	Total Peak Day Demand	360,000	377,573	490,845	638,099	829,529	1,078,387	GAL/DAY
12	(Gallons per Minute)	250	262	341	443	576	749	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	180,000	188,787	245,423	319,049	414,764	539,194	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	0	0	0	0	0	0	GALLONS
16	Fire Storage (1,000 gpm for 1 hour)	60,000	60,000	60,000	60,000	60,000	60,000	GALLONS
17	Emergency Storage, 10%	18,000	18,879	24,542	31,905	41,476	53,919	GALLONS
18	Total Storage (Rounded)	260,000	270,000	330,000	410,000	520,000	650,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	539	556	657	777	919	1,087	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	0	0	0	0	0	0	GPM
22	Total Peak Hour Demand	539	556	657	777	919	1,087	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.673491379	0.706367793	0.91827813	1.193761569	1.55189004	2.017457052	
24	Physical Source Capacity on Peak Day Basis	0	0	0	72	205	378	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	34	141	281	AcreFeet/Year
26		0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	46	129	236	375	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	0	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Maple Grove Springs (min flow in 1996)	14	Gallon/Minute	16	Acre Feet/Year
32	Well Next to 700,000 Gallon Tank	350	Gallon/Minute	282	Acre Feet/Year
33	Undeveloped Well		Gallon/Minute		Acre Feet/Year
34	Old Well on HWY 89		Gallon/Minute		Acre Feet/Year
35	BRWCD Backup Connection on HWY 38	100	Gallon/Minute	25	Acre Feet/Year
36					
37	Total Peak Day Sources	464	Gallon/Minute		
38	Safety Factor	1.25			
39	Total Peak Day Sources with Safety Factor	371	Gallon/Minute	323	Acre Feet/Year
40	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
41	Maple Grove Springs	990	Gallon/Minute	306	Acre Feet/Year
42	Well Next to 700,000 Gallon Tank	incl.	Gallon/Minute	incl.	Acre Feet/Year
43	Undeveloped Well	incl.	Gallon/Minute	incl.	Acre Feet/Year
44	Old Well on HWY 89	incl.	Gallon/Minute	incl.	Acre Feet/Year
45	BRWCD Backup Connection on HWY 38	100	Gallon/Minute	25	Acre Feet/Year
46					
47	Total Peak Day Sources	1,090	Gallon/Minute		
48	Safety Factor	1.25			
49	Total Peak Day Sources with Safety Factor	792	Gallon/Minute	229	Acre Feet/Year
50	**EXISTING STORAGE CAPACITY**				
51	Tank 1	700,000	Gallons		
52	Tank 2	550,000	Gallons		
53					
54	Total Storage	1,250,000	Gallons		
55	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
56	# based on Peak Day Physical Source Capacity	218	Connections		
57	# based on Annual Physical Source Capacity	272	Connections		
58	# based on Peak Day Water Rights Capacity	976	Connections		
59	# based on Annual Water Rights Capacity	60	Connections		
60	# based on Storage Capacity	1,713	Connections		

Notes:

Lines 3-18: South Willard has a secondary water system, so no public water supply is used for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Sunset Park

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	15	16	19	22	26	34	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.20	0.20	0.20	0.20	0.20	0.20	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	3.00	3.26	3.83	4.49	5.27	6.85	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	7	7	9	10	12	15	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	6	6	7	8	10	13	ACRE FEET
8	Total Annual Usage	12	13	16	18	22	28	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	12,000	13,042	15,306	17,964	21,083	27,408	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	17,107	18,592	21,821	25,609	30,056	39,073	GAL/DAY
11	Total Peak Day Demand	29,107	31,634	37,127	43,573	51,139	66,480	GAL/DAY
12	(Gallons per Minute)	20.21	22	26	30	36	46	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	6,000	6,521	7,653	8,982	10,541	13,704	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	8,544	9,286	10,898	12,790	15,011	19,514	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	1,454	1,581	1,855	2,177	2,555	3,322	GALLONS
18	Total Storage (Rounded)	30,000	30,000	40,000	40,000	40,000	50,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	61	64	71	79	88	104	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	24	26	30	36	42	54	GPM
22	Total Peak Hour Demand	85	90	102	115	129	158	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.505333333	0.549203847	0.644562111	0.75647743	0.887824606	1.154171988	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	6	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	10	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	6	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	0	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Well	50	Gallon/Minute	40	Acre Feet/Year
32					
33	Total Peak Day Sources	50	Gallon/Minute		
34	Safety Factor	1.25			
35	Total Peak Day Sources with Safety Factor	40	Gallon/Minute	40	Acre Feet/Year
36	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
37	Well	45	Gallon/Minute	23	Acre Feet/Year
38					
39	Total Peak Day Sources	45	Gallon/Minute		
40	Safety Factor	1.25			
41	Total Peak Day Sources with Safety Factor	36	Gallon/Minute	23	Acre Feet/Year
42	**EXISTING STORAGE CAPACITY**				
43	Tank	100,000	Gallons		
44					
45	Total Storage	100,000	Gallons		
46	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
47	# based on Peak Day Physical Source Capacity	15	Connections		
48	# based on Annual Physical Source Capacity	34	Connections		
49	# based on Peak Day Water Rights Capacity	12	Connections		
50	# based on Annual Water Rights Capacity	13	Connections		
51	# based on Storage Capacity	35	Connections		

Notes:

Lines 5-18: No data available for outside watering acreage. Estimated 0.20 acres of irrigated area average per home based on aerial photos.
Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Thatcher-Penrose

		2015	2020	2030	2040	2050	2060	
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Units in Service Area	259	277	325	381	448	582	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.17	0.17	0.17	0.17	0.17	0.17	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	43.96	47.08	55.26	64.85	76.11	98.94	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	116	124	146	171	201	261	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	82	88	103	121	142	185	ACRE FEET
8	Total Annual Usage	198	212	249	292	343	446	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	206,892	221,556	260,024	305,173	358,160	465,608	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	250,703	268,472	315,087	369,796	434,004	564,205	GAL/DAY
11	Total Peak Day Demand	457,595	490,028	575,112	674,968	792,163	1,029,812	GAL/DAY
12	(Gallons per Minute)	317.77	340	399	469	550	715	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	103,446	110,778	130,012	152,586	179,080	232,804	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	125,211	134,086	157,367	184,690	216,758	281,786	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	22,866	24,486	28,738	33,728	39,584	51,459	GALLONS
18	Total Storage (Rounded)	270,000	280,000	330,000	390,000	450,000	580,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	378	395	438	485	537	635	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	348	373	438	514	603	784	GPM
22	Total Peak Hour Demand	726	768	875	998	1,140	1,419	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.453963303	0.486139072	0.570547399	0.669611544	0.785876197	1.021639056	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	0	15	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	99	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	0	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	North Well (new well)	550	Gallon/Minute	444	Acre Feet/Year
32	South Well	250	Gallon/Minute	202	Acre Feet/Year
33	BRWCD Backup Connection	75	Gallon/Minute	10	Acre Feet/Year
34					
35	Total Peak Day Sources	875	Gallon/Minute		
36	Safety Factor	1.25			
37	Total Peak Day Sources with Safety Factor	700	Gallon/Minute	655	Acre Feet/Year
38	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
39	North Well	898	Gallon/Minute	315	Acre Feet/Year
40	South Well	250	Gallon/Minute	22	Acre Feet/Year
41	BRWCD Backup Connection	75	Gallon/Minute	10	Acre Feet/Year
42					
43	Total Peak Day Sources	1,223	Gallon/Minute		
44	Safety Factor	1.25			
45	Total Peak Day Sources with Safety Factor	978	Gallon/Minute	346	Acre Feet/Year
46	**EXISTING STORAGE CAPACITY**				
47	Tank - Upper	500,000	Gallons		
48	Tank - Lower	250,000	Gallons		
49					
50	Total Storage	750,000	Gallons		
51	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
52	# based on Peak Day Physical Source Capacity	311	Connections		
53	# based on Annual Physical Source Capacity	597	Connections		
54	# based on Peak Day Water Rights Capacity	537	Connections		
55	# based on Annual Water Rights Capacity	194	Connections		
56	# based on Storage Capacity	460	Connections		

Notes:

Lines 3 - 22: Outdoor irrigation was estimated to match total water use in 2014 by 255 connections.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division

Technical data for Tremonton City

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Residential Units in Service Area	2506	2684	3150	4094	5323	6920	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.15	0.15	0.15	0.15	0.15	0.15	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	375.90	402.54	472.44	614.17	798.42	1037.94	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	1,123	1,202	1,411	1,835	2,385	3,101	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	703	753	883	1,148	1,493	1,941	ACRE FEET
8	Total Annual Usage	1,826	1,955	2,295	2,983	3,878	5,042	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	2,004,800	2,146,895	2,519,661	3,275,559	4,258,226	5,535,694	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	2,143,532	2,295,460	2,694,021	3,502,227	4,552,896	5,918,764	GAL/DAY
11	Total Peak Day Demand	4,148,332	4,442,355	5,213,682	6,777,786	8,811,122	11,454,459	GAL/DAY
12	(Gallons per Minute)	2880.79	3,085	3,621	4,707	6,119	7,954	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	1,002,400	1,073,448	1,259,830	1,637,779	2,129,113	2,767,847	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	1,070,563	1,146,442	1,345,499	1,749,148	2,273,893	2,956,061	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	207,296	221,989	260,533	338,693	440,301	572,391	GALLONS
18	Total Storage (Rounded)	2,300,000	2,460,000	2,880,000	3,740,000	4,860,000	6,310,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	1,617	1,690	1,872	2,214	2,619	3,098	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	2,977	3,188	3,742	4,864	6,323	8,221	GPM
22	Total Peak Hour Demand	4,594	4,878	5,614	7,078	8,943	11,318	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	1.051715605	1.126258544	1.321810815	1.71835406	2.233860278	2.904018362	
24	Physical Source Capacity on Peak Day Basis	2,881	3,085	3,621	4,707	6,119	7,954	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	1,676	1,805	2,145	2,833	3,728	4,892	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	845	2,680	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	2,300,000	2,460,000	2,880,000	3,740,000	4,860,000	6,310,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	West Spring	60	Gallon/Minute	97	Acre Feet/Year
32	East Spring	80	Gallon/Minute	129	Acre Feet/Year
33	Fish Spring	330	Gallon/Minute	532	Acre Feet/Year
34	Garland Overflow	135	Gallon/Minute	218	Acre Feet/Year
35	North Spring	275	Gallon/Minute	150	Acre Feet/Year
36	North Flowing Wells	1,670	Gallon/Minute	150	Acre Feet/Year
37	Gardner Spring	0	Gallon/Minute	150	Acre Feet/Year
38	BRWCD UDOT Connection	600	Gallon/Minute	150	Acre Feet/Year
39	BRWCD Bypass #2 Connection	0	Gallon/Minute	0	Acre Feet/Year
40					
41	Total Peak Day Sources	3,150	Gallon/Minute		
42	Safety Factor	1.15			
43	Total Peak Day Sources with Safety Factor	2,739	Gallon/Minute	1,576	Acre Feet/Year
44	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
45	Fish & Gardner Spgs - 29-1107, 2956	5,274	Gallon/Minute	8,508	Acre Feet/Year
46	Garland Overflow - 29-1370	incl.	Gallon/Minute	incl.	Acre Feet/Year
47	North Springs - 29-1141, 2520	incl.	Gallon/Minute	incl.	Acre Feet/Year
48	East, South, & West Spgs - 29-1022, 1104, 1289	incl.	Gallon/Minute	incl.	Acre Feet/Year
49	BRWCD UDOT Connection	600	Gallon/Minute	150	Acre Feet/Year
50	BRWCD Bypass #2 Connection	0	Gallon/Minute	0	Acre Feet/Year
51					
52					
53	Total Peak Day Sources	5,874	Gallon/Minute		
54	Safety Factor	1.15			
55	Total Peak Day Sources with Safety Factor	5,108	Gallon/Minute	8,658	Acre Feet/Year
56	**EXISTING STORAGE CAPACITY**				
57	7 Tanks	5,190,000	Gallons		
58					
59	Total Storage	5,190,000	Gallons		
60	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
61	# based on Peak Day Physical Source Capacity	-123	Connections		
62	# based on Annual Physical Source Capacity	-343	Connections		
63	# based on Peak Day Water Rights Capacity	1,938	Connections		
64	# based on Annual Water Rights Capacity	9,377	Connections		
65	# based on Storage Capacity	3,149	Connections		

Notes:

Line 3: Adjusted to match annual average water use in 2005

Lines 6-21: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 33-46: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 26-53: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for Ukon

		2015	2020	2030	2040	2050	2060	
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Units in Service Area	384	388	455	534	694	902	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.00	0.00	0.00	0.00	0.00	0.00	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	0.00	0.00	0.00	0.00	0.00	0.00	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	172	174	204	239	311	404	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	0	0	0	0	0	0	ACRE FEET
8	Total Annual Usage	172	174	204	239	311	404	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	307,200	310,080	363,919	427,106	555,238	721,810	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	0	0	0	0	0	0	GAL/DAY
11	Total Peak Day Demand	307,200	310,080	363,919	427,106	555,238	721,810	GAL/DAY
12	(Gallons per Minute)	213	215	253	297	386	501	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	153,600	155,040	181,960	213,553	277,619	360,905	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	0	0	0	0	0	0	GALLONS
16	Fire Storage (500 gpm for 1/2 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	15,360	15,504	18,196	21,355	27,762	36,090	GALLONS
18	Total Storage (Rounded)	180,000	190,000	220,000	250,000	320,000	410,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	487	490	543	601	711	841	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	0	0	0	0	0	0	GPM
22	Total Peak Hour Demand	487	490	543	601	711	841	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.818221799	0.825892629	0.969292366	1.137590599	1.478867779	1.922528113	
24	Physical Source Capacity on Peak Day Basis	0	0	0	36	125	241	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	61	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	55	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	40,000	130,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Upper Springs (min July flow, 2015)	76	Gallon/Minute	122	Acre Feet/Year
32	Old Ukon Springs (min flow, 2015 & 2016)	15	Gallon/Minute	24	Acre Feet/Year
33	Ukon Well (combined discharge pipeline w/ Ukon Springs)	35	Gallon/Minute	56	Acre Feet/Year
34	BRWCD Collinston Wholesale Connection	150	Gallon/Minute	100	Acre Feet/Year
35	BRWCD M&I Wholesale Connection from Booster Station	50	Gallon/Minute	40	Acre Feet/Year
36					
37	Total Peak Day Sources	326	Gallon/Minute		
38	Safety Factor	1.25			
39	Total Peak Day Sources with Safety Factor	261	Gallon/Minute	343	Acre Feet/Year
40	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
41	Upper Springs (min flow, 2015)	515	Gallon/Minute	171	Acre Feet/Year
42	Old Ukon Springs (min flow, 2015 & 2016)	(incl.)	Gallon/Minute	(incl.)	Acre Feet/Year
43	Ukon Well (combined discharge pipeline w/ Ukon Springs)	63	Gallon/Minute	94	Acre Feet/Year
44	BRWCD Collinston Wholesale Connection	150	Gallon/Minute	85	Acre Feet/Year
45	BRWCD M&I Wholesale Connection from Booster Station	50	Gallon/Minute	0	Acre Feet/Year
46					
47	Total Peak Day Sources	778	Gallon/Minute		
48	Safety Factor	1.25			
49	Total Peak Day Sources with Safety Factor	622	Gallon/Minute	349	Acre Feet/Year
50	**EXISTING STORAGE CAPACITY**				
51	New Storage Tank	200,000	Gallons		
52	Old Storage Tank	80,000	Gallons		
53					
54	Total Storage	280,000	Gallons		
55	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
56	# based on Peak Day Physical Source Capacity	85	Connections		
57	# based on Annual Physical Source Capacity	382	Connections		
58	# based on Peak Day Water Rights Capacity	736	Connections		
59	# based on Annual Water Rights Capacity	395	Connections		
60	# based on Storage Capacity	213	Connections		

Notes:

Line 2: Data available from 1980-2015.

Line 3-4: Metered water sales from 2012 to 2014 indicate average water use per connection is about 0.34 af/yr. Most homes have access to secondary water sources. Since this value is below Utah DDW standards, it is assumed that essentially zero outside irrigation is occuring. Estimated annual use per connection is assumed to be DDW standard.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Line 33: The UKON Well flow capacity is 60 gpm, however, when combined with the springs flowing the 2016 flow limit for the well is only 35 gpm due to restriction in the flow pipeline.

Line 34: UKON took a peak flow of about 77 gpm in July 2016 through the blending station meter. For 2016 through 2020 a total of 100 gpm will be available.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

Technical data for West Corinne Water Company

		2015	2020	2030	2040	2050	2060	
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Units in Service Area	619	662	777	912	1186	1542	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.14	0.14	0.14	0.14	0.14	0.14	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	86.66	92.71	108.81	127.70	166.01	215.81	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	277	297	348	409	531	691	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	162	173	203	239	310	404	ACRE FEET
8	Total Annual Usage	439	470	552	648	842	1,094	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	495,200	529,771	621,755	729,711	948,624	1,233,211	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	494,170	528,669	620,462	728,193	946,651	1,230,646	GAL/DAY
11	Total Peak Day Demand	989,370	1,058,440	1,242,217	1,457,903	1,895,274	2,463,857	GAL/DAY
12	(Gallons per Minute)	687.06	735	863	1,012	1,316	1,711	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	247,600	264,886	310,878	364,855	474,312	616,605	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	246,808	264,038	309,883	363,688	472,794	614,632	GALLONS
16	Fire Storage (500 gpm for 1 hour)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	49,441	52,892	62,076	72,854	94,711	123,124	GALLONS
18	Total Storage (Rounded)	560,000	600,000	700,000	820,000	1,060,000	1,370,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	661	690	764	847	1,002	1,185	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	686	734	862	1,011	1,315	1,709	GPM
22	Total Peak Hour Demand	1,347	1,424	1,626	1,858	2,317	2,894	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.792137135	0.847438138	0.994578821	1.167267542	1.517447805	1.972682146	
24	Physical Source Capacity on Peak Day Basis	0	0	0	145	449	844	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	112	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	0	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Baker Springs (min flow in 1992)	134	Gallon/Minute	216	Acre Feet/Year
32	Anderson Well	900	Gallon/Minute	726	Acre Feet/Year
33	BRWCD Backup Connection	50	Gallon/Minute	40	Acre Feet/Year
34					
35	Total Peak Day Sources	1,084	Gallon/Minute		
36	Safety Factor	1.25			
37	Total Peak Day Sources with Safety Factor	867	Gallon/Minute	982	Acre Feet/Year
38	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
39	Baker Springs	583	Gallon/Minute	463	Acre Feet/Year
40	Anderson Well	1,571	Gallon/Minute	2,534	Acre Feet/Year
41	BRWCD Backup Connection	0	Gallon/Minute	0	Acre Feet/Year
42					
43	Total Peak Day Sources	2,154	Gallon/Minute		
44	Safety Factor	1.25			
45	Total Peak Day Sources with Safety Factor	1,723	Gallon/Minute	2,997	Acre Feet/Year
46	**EXISTING STORAGE CAPACITY**				
47	Tank 1 - Baker Canyon	125,000	Gallons		
48	Tank 2 - Little Mountain	200,000	Gallons		
49	Tank 3 - Anderson Well Tank	500,000	Gallons		
50	Tank 4 - New Tank in Bothwell Pocket	1,000,000	Gallons		
51					
52	Total Storage	1,825,000	Gallons		
53	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
54	# based on Peak Day Physical Source Capacity	162	Connections		
55	# based on Annual Physical Source Capacity	765	Connections		
56	# based on Peak Day Water Rights Capacity	934	Connections		
57	# based on Annual Water Rights Capacity	3,602	Connections		
58	# based on Storage Capacity	1,398	Connections		

Notes:

Lines 3 - 22: Outdoor irrigation was estimated to match total water use in 2015 by 619 connections.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division

Technical data for Willard City

1	**POPULATION AND IRRIGATED ACREAGE DATA:**	2015	2020	2030	2040	2050	2060	
2	# Units in Service Area	652	684	889	1156	1502	1953	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.13	0.13	0.13	0.13	0.13	0.13	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	86.72	90.94	118.22	153.69	199.80	259.74	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	292	306	398	518	673	875	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	162	170	221	287	374	486	ACRE FEET
8	Total Annual Usage	454	476	619	805	1,047	1,361	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	521,600	547,019	711,125	924,462	1,201,800	1,562,341	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	494,489	518,587	674,163	876,412	1,139,336	1,481,136	GAL/DAY
11	Total Peak Day Demand	1,016,089	1,065,606	1,385,288	1,800,874	2,341,136	3,043,477	GAL/DAY
12	(Gallons per Minute)	705.62	740	962	1,251	1,626	2,114	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	260,800	273,509	355,562	462,231	600,900	781,170	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	246,967	259,002	336,703	437,714	569,028	739,737	GALLONS
16	Fire Storage (1,000 gpm for 1 hour)	60,000	60,000	60,000	60,000	60,000	60,000	GALLONS
17	Emergency Storage, 10%	50,777	53,251	69,227	89,995	116,993	152,091	GALLONS
18	Total Storage (Rounded)	620,000	650,000	820,000	1,050,000	1,350,000	1,730,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	683	704	833	985	1,166	1,379	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	687	720	936	1,217	1,582	2,057	GPM
22	Total Peak Hour Demand	1,370	1,425	1,769	2,203	2,748	3,436	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.488925708	0.512752282	0.666577966	0.866551356	1.126516763	1.464471792	
24	Physical Source Capacity on Peak Day Basis	0	0	0	0	183	670	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	0	0	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	250,000	630,000	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Springs (low flow in 2014)	4	Gallon/Minute	7	Acre Feet/Year
32	Well - 10" (1936) (used for secondary supply in parks)	0	Gallon/Minute	0	Acre Feet/Year
33	Well - 16" (1962) (not in service)	0	Gallon/Minute	0	Acre Feet/Year
34	North Well (2002) & New Well (1995)	1,800	Gallon/Minute	1,452	Acre Feet/Year
35					
36	Total Peak Day Sources	1,804	Gallon/Minute		
37	Safety Factor	1.25			
38	Total Peak Day Sources with Safety Factor	1,443	Gallon/Minute	1,458	Acre Feet/Year
39	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
40	Springs	1,346	Gallon/Minute	2,172	Acre Feet/Year
41	Well - 10" (1936) (used for secondary supply in parks)	0	Gallon/Minute	0	Acre Feet/Year
42	Well - 16" (1962) (not in service)	0	Gallon/Minute	0	Acre Feet/Year
43	North Well (2002) & New Well (1995)	1,773	Gallon/Minute	1,400	Acre Feet/Year
44					
45	Total Peak Day Sources	3,119	Gallon/Minute		
46	Safety Factor	1.25			
47	Total Peak Day Sources with Safety Factor	2,495	Gallon/Minute	3,572	Acre Feet/Year
48	**EXISTING STORAGE CAPACITY**				
49	West Tank 1	300,000	Gallons		
50	West Tank 2	300,000	Gallons		
51	East Tank	500,000	Gallons		
52					
53	Total Storage	1,100,000	Gallons		
54	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
55	# based on Peak Day Physical Source Capacity	682	Connections		
56	# based on Annual Physical Source Capacity	1,441	Connections		
57	# based on Peak Day Water Rights Capacity	1,654	Connections		
58	# based on Annual Water Rights Capacity	4,474	Connections		
59	# based on Storage Capacity	505	Connections		

Notes:

Line 3: Discuss presence of secondary water, average outdoor irrigation per connection

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was obtained by a straight units conversion.

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division

Technical data for Willow Creek Water Company

		2015	2020	2030	2040	2050	2060	
1	**POPULATION AND IRRIGATED ACREAGE DATA:**							
2	# Units in Service Area	59	60	70	82	107	139	CONNECTIONS
3	# Acres of Outside Irrigation per Unit	0.25	0.25	0.25	0.25	0.25	0.25	ACRES/CONN.
4	Total # Acres of Outside Irrigation for the System	14.75	14.94	17.54	20.58	26.76	34.78	ACRES
5	**SOURCE REQUIREMENTS**							
6	Annual Indoor Usage = 146,000 Gal/Year/Connection	26	27	31	37	48	62	ACRE FEET
7	Annual Outdoor Usage = 1.87 Acre Feet/Irrigated Acre	28	28	33	38	50	65	ACRE FEET
8	Total Annual Usage	54	55	64	75	98	127	ACRE FEET
9	Peak Day Indoor Demand = 800 Gal./Day/Connection	47,200	47,816	56,119	65,862	85,621	111,307	GAL/DAY
10	Peak Day Outdoor Demand = 3.96 Gpm/Irrigated Acre	84,110	85,209	100,003	117,367	152,577	198,350	GAL/DAY
11	Total Peak Day Demand	131,310	133,025	156,122	183,229	238,198	309,657	GAL/DAY
12	(Gallons per Minute)	91	92	108	127	165	215	GPM
13	**STORAGE REQUIREMENTS**							
14	Indoor Requirement = 400 Gal/Connection	23,600	23,908	28,059	32,931	42,811	55,654	GALLONS
15	Outside Irrigation Requirement = 2,848 Gal/Irrigated Acre	42,008	42,556	49,946	58,618	76,203	99,064	GALLONS
16	Fire Storage (500 gpm for 30 minutes)	15,000	15,000	15,000	15,000	15,000	15,000	GALLONS
17	Emergency Storage, 10%	6,561	6,646	7,800	9,155	11,901	15,472	GALLONS
18	Total Storage (Rounded)	90,000	90,000	100,000	120,000	150,000	190,000	GALLONS
19	**DISTRIBUTION SYSTEM REQUIREMENTS**							
20	Peak Hour Indoor Demand = 10.8(N^.64); N = # Connections	147	148	164	182	215	254	GPM
21	Peak Hour Outside Demand = 7.92 Gpm/Irrigated Acre	117	118	139	163	212	275	GPM
22	Total Peak Hour Demand	264	266	303	345	427	530	GPM
23	**ADDITIONAL SOURCE CAPACITY NEEDED**	0.9119	0.9238	1.0842	1.2724	1.6542	2.1504	
24	Physical Source Capacity on Peak Day Basis	0	0	8	27	65	115	Gallon/Minute
25	Physical Source Capacity on Annual Volume Basis	0	0	0	0	0	27	AcreFeet/Year
26	Water Rights Source Capacity on Peak Day Basis	0	0	0	0	28	77	Gallon/Minute
27	Water Rights Source Capacity on Annual Volume Basis	0	0	0	0	0	0	AcreFeet/Year
28	**ADDITIONAL STORAGE CAPACITY NEEDED**							
29	Storage Capacity Needed	0	0	0	0	0	0	Gallons

30	**EXISTING PHYSICAL SOURCE CAPACITY**	Instantaneous Capacity		Annual Volume Capacity	
31	Well #1	85	Gallon/Minute	69	Acre Feet/Year
32	Well #2	40	Gallon/Minute	32	Acre Feet/Year
33					
34	Total Peak Day Sources	125	Gallon/Minute		
35	Safety Factor	1.25			
36	Total Peak Day Sources with Safety Factor	100	Gallon/Minute	101	Acre Feet/Year
37	**EXISTING WATER RIGHTS SOURCE CAPACITY**				
38	Well #1 (29-1334)	172	Gallon/Minute	144	Acre Feet/Year
39	Well #2 (29-2081)	Incl.	Gallon/Minute	Incl.	Acre Feet/Year
40					
41	Total Peak Day Sources	172	Gallon/Minute		
42	Safety Factor	1.25			
43	Total Peak Day Sources with Safety Factor	138	Gallon/Minute	144	Acre Feet/Year
44	**EXISTING STORAGE CAPACITY**				
45	Tank 1	250,000	Gallons		
46	Tank 2	Incl.	Gallons		
47					
48	Total Storage	250,000	Gallons		
49	**ADDITIONAL CONNECTIONS SERVICEABLE WITH EXISTING CAPACITY**				
50	# based on Peak Day Physical Source Capacity	6	Connections		
51	# based on Annual Physical Source Capacity	51	Connections		
52	# based on Peak Day Water Rights Capacity	30	Connections		
53	# based on Annual Water Rights Capacity	99	Connections		
54	# based on Storage Capacity	105	Connections		

Notes:

Line 2: 59 units in 2016. Future growth based on typical BE county projections for a similar residential community.

Line 3: Based on assumed data from 2005 Master Plan, average lawn size estimated to be about 0.25 ac/connection.

Lines 5-18: Water Demands calculated based on Utah Division of Drinking Water Standards assuming Zone 4 for outside watering requirements.

Lines 24-35: When data was not available for either the annual limit (ac-ft/yr) or the maximum flow rate (cfs or gpm), the other value was

Lines 24-41: Existing source and storage data has been gathered from the following sources of information: interviews with the water agency, sanitary surveys, water rights information and Division of Drinking Water records.

APPENDIX C

Cost Estimate Calculations

BRWCD Master Plan Capital Cost Estimates
Updated: 02/10/2017

SYSTEM	PROJECT DESCRIPTION	UNIT	UNIT TYPE	UNIT COST	COST	CONTINGENCY (20%) AND ENGINERING + ADMIN (15%)	TOTAL COST	ASSUMPTIONS
0 - 10 year projects								
M & I Bothwell	1.5 MG Storage Overflow Pond at about 14800 N 11000 W	1	ea.	$184,976	$185,000	$65,000	$250,000	Added 5.1% to account for inflation between 2013 and 2016
	12-inch Mainline Extension in 1000 West between 12000 N and 11200 N	2,800	ft.	$51	$143,000	$50,000	$193,000	12-in PVC pipeline, out of road
	Canal Crossing for Mainline Extension at about 12000 N 1000 W	1	ea.	$40,000	$40,000	$14,000	$54,000	
	West Corinne Meter Station at 10000 W 11200 N	1	ea.	$30,000	$30,000	$11,000	$41,000	
	Sunset Park Booster Station and Piping at 11700 W Sunset Dr	1	ea.	$67,700	$68,000	$24,000	$92,000	
	Enclosure for Newman Backup Well							
Collinston	Pine Canyon Test Well west of Deweyville at about 10500 N	1	ea.	$75,000	$75,000	$26,000	$101,000	
	Pine Canyon Production Well	1	ea.	$300,000	$300,000	$105,000	$405,000	$50 per inch-foot for well cost, 12" casing, 500 feet
	Pine Canyon Pump Station and Wellhouse	1	ea.	$400,000	$400,000	$140,000	$540,000	
	12-inch Pine Canyon Well Pipeline between well site and HWY 38	2,900	ft.	$51	$148,000	$52,000	$200,000	12-in PVC pipeline, out of road
	12-inch Hwy 38 Pipeline between 10517 N to 11360 N	6,100	ft.	$51	$311,000	$109,000	$420,000	12-in PVC pipeline, out of road
	12-inch Cross Valley Pipeline (Hwy 38 to 12000 N Pump Station)	11,300	ft.	$51	$576,000	$202,000	$778,000	12-in PVC pipeline, out of road
	16-in Bear River Crossing for Cross Valley Pipeline via Horizontal Directional Drilling	300	ft.	$318	$95,000	$33,000	$128,000	Assumed 300 feet, 16-inch DIPS DR 9 HDPE, assumed $1/lb material cost for pipe
	Cedar Ridge Backup Pump Station at about 12550 N HWY 38	1	ea.	$75,000	$75,000	$26,000	$101,000	
Harper-Ward	Test Well A	1	ea.	$75,000	$75,000	$26,000	$101,000	
	Production Well A	1	ea.	$300,000	$300,000	$105,000	$405,000	$50 per inch-foot for well cost, 12" casing, 500 feet
	Pump and Wellhouse for Well A	1	ea.	$350,000	$350,000	$123,000	$473,000	
	12-inch Well A Pipeline	3,100	ft.	$51	$158,000	$55,000	$213,000	
South Willard	Well #4 Backup Generator	1	ea.	$80,000	$80,000	$28,000	$108,000	
	Well #3 Test Well	1	ea.	$75,000	$75,000	$26,000	$101,000	
	South Willard Well #3 Production Well	1	ea.	$300,000	$300,000	$105,000	$405,000	$50 per inch-foot for well cost, 12" casing, 500 feet
	South Willard Well #3 Pump and Wellhouse	1	ea.	$350,000	$350,000	$123,000	$473,000	
	South Willard Well #3 10-inch pipeline	1	ea.	$25,000	$25,000	$9,000	$34,000	375*44=16500
	Connection between South Willard Water Company and Willard City; Connection between Perry City and Willard	2	ea.	$61,000	$122,000	$43,000	$165,000	Meter station and 950 feet of 8-inch pipe
					Subtotal		$5,781,000	
10 - 20 year projects								
M & I Bothwell	Marble Hills Pump Station	1	ea.	$237,000	$237,000	$83,000	$320,000	
	Marble Hills Pipeline Phase 1	1	ea.	$693,000	$693,000	$243,000	$936,000	
	Marble Hills Pipeline Phase 2	1	ea.	$200,000	$200,000	$70,000	$270,000	
	Backup Well Enclosure	1	ea.	$145,000	$145,000	$51,000	$196,000	
	Backup Generator	1	ea.	$80,000	$80,000	$28,000	$108,000	
	Fire Hydrants	1	l.s.	$54,000	$54,000	$19,000	$73,000	get number of fire hydrants
	1 MG Storage Reservoir	1	ea.	$1,000,000	$1,000,000	$350,000	$1,350,000	
M & I East	Plymouth Booster Station	1	ea.	$100,000	$100,000	$35,000	$135,000	assumed 200 gpm
Collinston	Garland Meter Station	1	ea.	$30,000	$30,000	$11,000	$41,000	
	Flat Canyon Test Well	1	ea.	$75,000	$75,000	$26,000	$101,000	
	Flat Canyon Production Well	1	ea.	$300,000	$300,000	$105,000	$405,000	$50 per inch-foot for well cost, 12" casing, 500 feet
	Pump and Wellhouse for Flat Canyon Well	1	ea.	$350,000	$350,000	$123,000	$473,000	
	10-inch Flat Canyon Well Pipeline	2,100	ft.	$44	$92,000	$32,000	$124,000	
	12-inch Willow Creek 14400 N Transmission Pipeline	14,600	ft.	$51	$745,000	$261,000	$1,006,000	
	Willow Creek Booster Station	1	ea.	$150,000	$150,000	$53,000	$203,000	
	Beaver Dam Early Park Road 8" Supply Pipeline	6,900	ft.	$35	$242,000	$85,000	$327,000	
Harper-Ward	Harper Ward Well B Test Well	1	ea.	$75,000	$75,000	$26,000	$101,000	
	Production Well B	1	ea.	$300,000	$300,000	$105,000	$405,000	$50 per inch-foot for well cost, 12" casing, 500 feet
	Pump and Wellhouse for Well B	1	ea.	$350,000	$350,000	$123,000	$473,000	
					Subtotal		$7,047,000	
20 + year projects								
M & I Bothwell	Reverse Osmosis Water Treatment Plant	1	ea.	$3,134,917	$3,135,000	$1,176,000	$4,311,000	Includes additional 2.5% in contingency for admin and legal costs
	12-inch Pipline between WTP and west Tremonton	33,700	ft.	$51	$1,719,000	$602,000	$2,363,975	
	2 Freeway crossings between WTP and west Tremonton	500	ft.	$269	$134,000	$47,000	$184,350	Assume 500 total feet of crossings, 14-inch DIPS DR 11 pipeline
	12-inch Pipeline in between 2300 W 1000 N and 12000 N Pump Station	16,900	ft.	$51	$862,000	$302,000	$1,185,550	
Collinston	Test Well for Bear River Production Well A	1	ea.	$75,000	$75,000	$26,000	$101,000	
	Bear River Production Well A	1	ea.	$300,000	$300,000	$105,000	$405,000	$50 per inch-foot for well cost, 12" casing, 500 feet
	Pump and Wellhouse for Bear River Production Well A	1	ea.	$350,000	$350,000	$123,000	$473,000	
	Test Well for Bear River Production Well B	1	ea.	$75,000	$75,000	$26,000	$101,000	
	Bear River Production Well B	1	ea.	$300,000	$300,000	$105,000	$405,000	$50 per inch-foot for well cost, 12" casing, 500 feet
	Pump and Wellhouse for Bear River Production Well B	1	ea.	$350,000	$350,000	$123,000	$473,000	
	Add 3rd Pump for Collinston Booster Stations	2	ea.	$100,000	$200,000	$70,000	$270,000	
	8-inch 2400 W Transmission Pipeline	11,400	ft.	$35	$399,000	$140,000	$539,000	assumed 8-inch
	8-inch HWY 38 Pipeline between 12950 N and 14530 N	10,000	ft.	$35	$350,000	$123,000	$473,000	assumed 8-inch
Harper-Ward	Harper Ward Storage Reservoir	1	ea.	$750,000	$750,000	$263,000	$1,031,750	750,000 gallon storage reservoir
	Harper Ward Well C Test Well	1	ea.	$75,000	$75,000	$26,000	$101,000	
	Production Well C	1	ea.	$300,000	$300,000	$105,000	$405,000	$50 per inch-foot for well cost, 12" casing, 500 feet
	Pump and Wellhouse for Harper-Ward Well C	1	ea.	$400,000	$400,000	$140,000	$540,000	
	12-inch Pipeline between Harper-Ward and Deweyville	37,300	ea.	$51	$1,902,000	$666,000	$2,568,000	
					Subtotal		$15,930,625	
					Total:		$28,758,625	

Notes:
1. Projects Costs in 2016 dollars