

# JUAB COUNTY & SOUTH UTAH COUNTY WATER SUPPLY AND INFRASTRUCTURE PLAN FORMULATION PROJECT PHASE I RESULTS

Objective: Collaborate with entities in Juab and South Utah Counties to estimate water needs and formulate a wholesale regional water supply and facility plan for the next 50 years.

## The Challenge

In 2017, the Kem C. Gardner Policy Institute reported that Utah will double in population by 2065 (*Utah's Long-Term Demographic and Economic Projection Summary*, July 2017). South Utah County will add almost 400,000 people and Juab County approximately 30,000. **South Utah County and Juab County currently do not have the water supply, infrastructure, or water management tools to meet the demand from this increase in population.** Figure 1 shows the 2065 percent population increase by city in south Utah and Juab Counties.

## The Solution

The region must develop additional water supplies, infrastructure, and water management tools to ensure a reliable and resilient water supply for the projected population. CUWCD partnered with Jacobs and Hansen, Allen & Luce, Inc. (Team) to develop and evaluate options, which include increased water supplies, increased conservation, infrastructure, and water management strategies, to ensure south Utah and Juab Counties will be able to reliably and sustainably meet their 2065 water demands. These options will give the region a road map and schedule to develop a reliable and water supply out to the year 2065 (Figure 2).

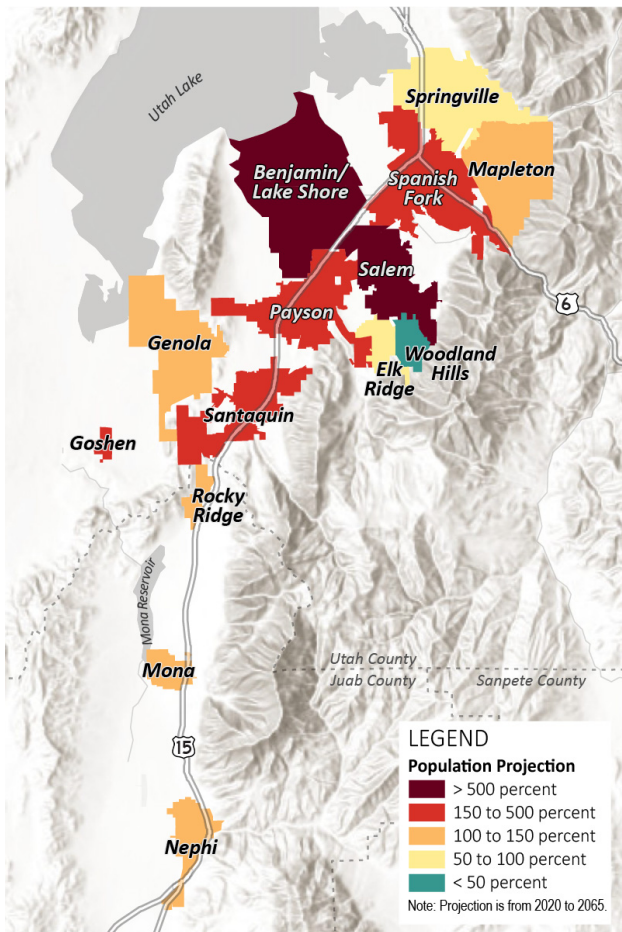


Image Source: ESRI, USGS, Garmin, NASA, HERE, NOAA, CGIAR, NCEAS, NLS, OS, NMA, GSA, Geoland.  
Data Source: Population projections in Utah County are from Mountainland Association of Governments (<https://mountainland.org/population-projections>), population projections in Juab County are from Wasatch Front Regional Council (<https://data.wfrc.org/datasets/population-projections-taz>). Data is through 2050, extrapolated for 2065.

Figure 1. Population projection.

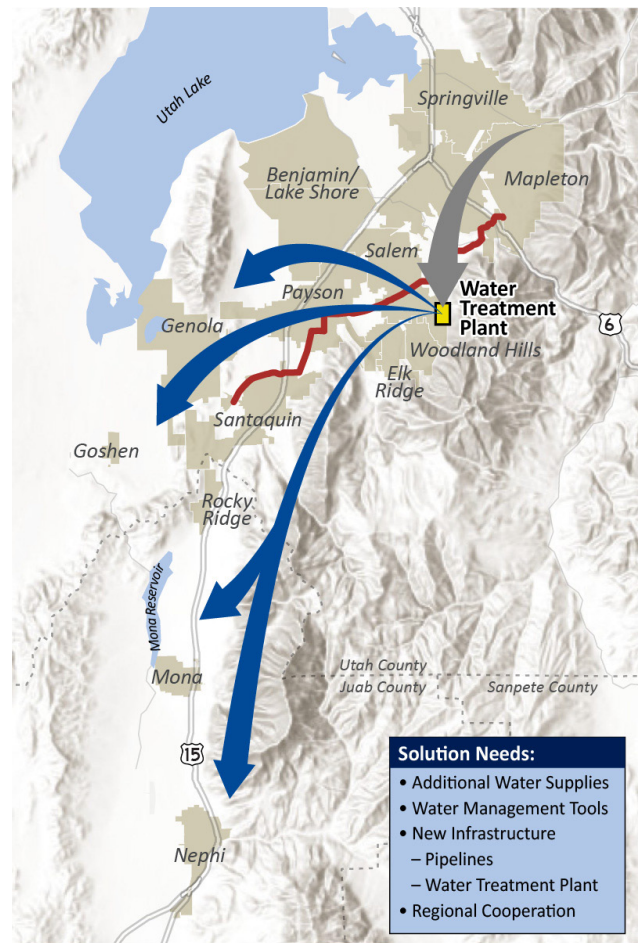


Image Source: ESRI, USGS, Garmin, NASA, HERE, NOAA, CGIAR, NCEAS, NLS, OS, NMA, GSA, Geoland.

Figure 2. Solutions.

## Phase I Process

Objective: Identify water supply shortages, infrastructure needs, and water management options (Figure 3).

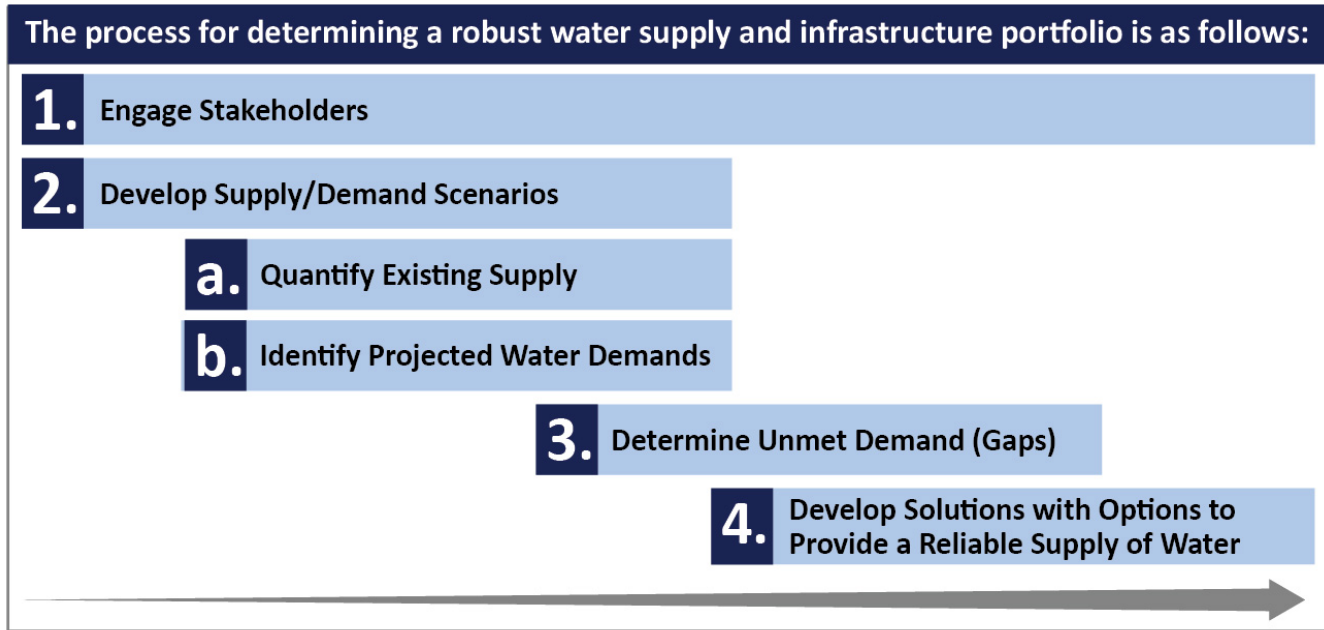


Figure 3. Phase I process

### 1. Engage Stakeholders

The Team met with the cities, counties, and numerous water agencies within the study area to present gathered data, confirm assumptions, and gather additional information from local experts. One outcome of this engagement was the recognition of the need for additional information on groundwater. As a result, CUWCD tasked the Team with updating the United States Geological Survey groundwater models in Utah and Juab Counties. Input from the stakeholders also helped the Team refine the supply/demand scenarios.

### 2. Develop Supply/Demand Scenarios

To help identify future challenges, the Team constructed two scenarios to bracket the likely future outcomes and allow CUWCD to monitor and adapt to actual water supply/demand conditions in real time. These scenarios include the Baseline Supply/Demand Scenario and the Alternative Supply/Demand Scenario, which is based on the Baseline Scenario but with increased demands and decreased water supply.

#### **Baseline Supply/Demand Scenario**

The Baseline supply/demand scenario is based on population, conservation, and climate change assumptions described in section 2b, Identify Projected Water Demand. Under this scenario, agricultural land in south Utah County is assumed to be converted to M&I as land changes to urban uses. Utah Lake System (ULS) water is a component of the Bonneville Unit of the Central Utah Project, and ULS water will be delivered to the cities.

In Juab County, it is assumed that no agricultural land is converted to M&I use. In addition to population growth, Juab County demand is increased by 6,000 acre-feet per year to account for potential future industrial demand.

#### **Alternative Supply/Demand Scenario**

The Alternative Demand Scenario is the Baseline Demand Scenario **plus**:

- Increased industrial demand in Juab County to a total of 12,000 acre-feet per year
- An additional demand of 15,000 acre-feet per year for the Goshen Valley Local District Mega Site

- Reduced surface and groundwater supply due to potential supply variability
- Open space preservation options that could reduce agricultural conversion in south Utah County

The Team anticipates these two supply/demand scenarios will bracket future water demand and supply conditions.

### 2a. Quantify Existing Supply

The components of the existing water supply include groundwater, which is mostly used to meet potable demand, and various components of surface water, including streams, springs, Utah Lake System water, and future conversion of Strawberry Reservoir water from agricultural uses to Municipal & Industrial (M&I) uses.

#### Groundwater

Groundwater supplies potable water and a portion of irrigation water in the study area. CUWCD commissioned a study (Hansen, Allen & Luce, *Remaining Safe Yield Report*, September 2020) to provide an estimate for how much groundwater can be responsibly withdrawn from the aquifer. The Formulation Project study area is characterized by two groundwater models which were obtained from the U.S. Geological Survey: one models southern Utah and Goshen Valleys and the other models Juab Valley.

HAL extended the model through 2039 to ensure the model stabilized and captured any fluctuations from increased withdrawals. Well withdrawals were increased up to the safe yield, which was estimated to be 50 percent of the total recharge. Modeled withdrawals at the safe yield for southern Utah, Goshen, and Juab Valleys can be seen on Figure 4. Mona and Nephi withdrawals include both municipal and agricultural well pumping.

#### Water Supply

To ensure that water systems are sufficiently resilient against the effects of drought, the dependable water supply is based on a critical low flow period. This low flow period is defined by the State of Utah Administrative Code R309-515-5 part 4a as follows:

"The quantity of water from surface sources shall be assumed to be no greater than the low flow of a 25-year recurrence interval or the low flow of record for these sources when 25 years of records are not available."

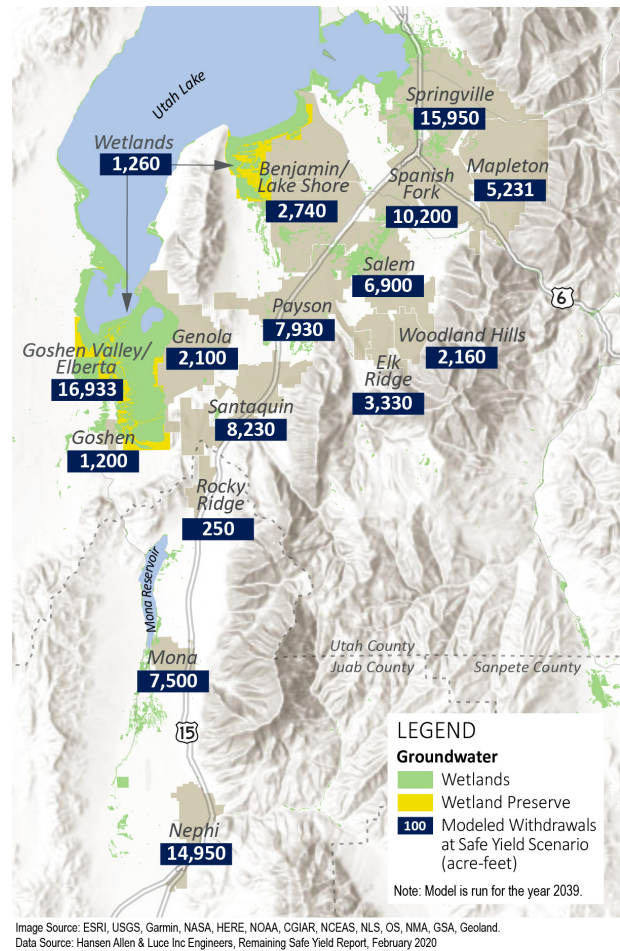


Figure 4. Groundwater withdrawals.

For surface water supplies from streams, the critical dry period is defined as the 25-year low flow based on historical records. For springs and wells, the assumed dependable water supply is based on observed production of wells and springs in similar dry years. The Formulation Project area receives its water supply from six types of sources: springs, wells, stream flows, Strawberry Valley Project water stored in Strawberry Reservoir, Utah Lake System water stored in Strawberry Reservoir, and wastewater reuse. (HAL, *Formulation Project Task 5 & 6 Memorandums*, April 2020.)

Figures 5 and 6 show the available drinking water supply in July for south Utah and Juab Counties out to 2065 under the two supply/demand scenarios. July was chosen because it typically represents the peak demand month.

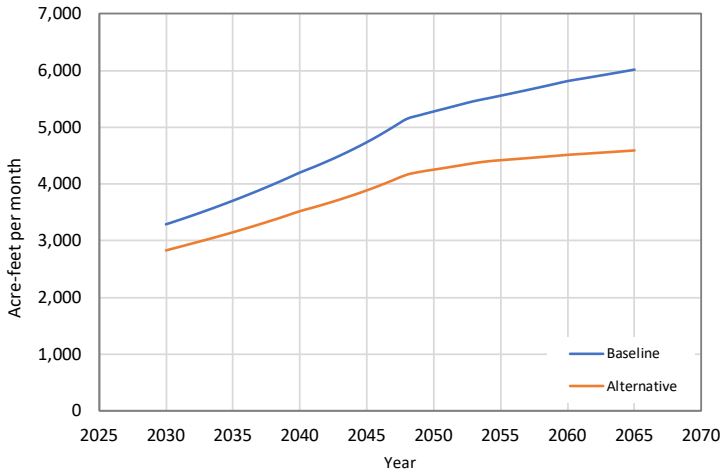


Figure 5. July South Utah County drinking water supply.

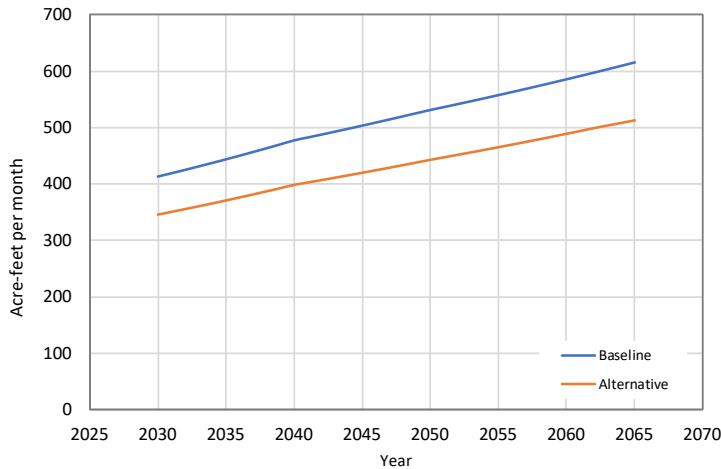


Figure 6. July Juab County drinking water supply.

### 2b. Identify Projected Water Demand

There are a number of key drivers that shape the future demand for water. Key drivers are both somewhat predictable and drive change in the system

The Team held the following three key drivers constant for both the Baseline and Alternative supply/demand scenarios and varied other inputs. The three key constant demand drivers for this analysis are:

- **Population.** Utah County is projected to grow at the highest rate in the state and is expected to have a population of over 1.6 million by year 2065. Juab County's population is projected to increase to over 30,000 by year 2065, an increase of approximately

172 percent (*Utah's Long-Term Demographic and Economic Projection Summary*, July 2017).

- **Conservation.** There are a number of important issues associated with conservation. This analysis assumes, among other things, metering secondary water systems and adjusting water billing rate structures to further encourage conservation. These and other measures will have the effect of reducing consumptive use within the study area.
- **Weather/climate effects.** For the purposes of this analysis, a 10 percent increase in evapotranspiration rates, due to increased temperatures, is assumed to increase linearly between 2015 and 2065. This has the effect of increasing overall demand.

Figures 7 and 8 show the July drinking water demand for south Utah and Juab Counties out to 2065 under the two supply/demand scenarios. July is typically the peak demand month, and comparing peak demands with peak supplies will allow any infrastructure constructed as a result of the Formulation Project study to meet peak demands.

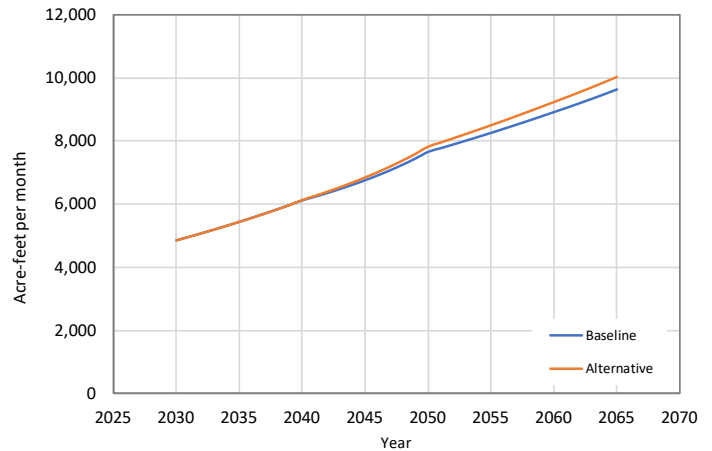


Figure 7. July South Utah County drinking water demand.

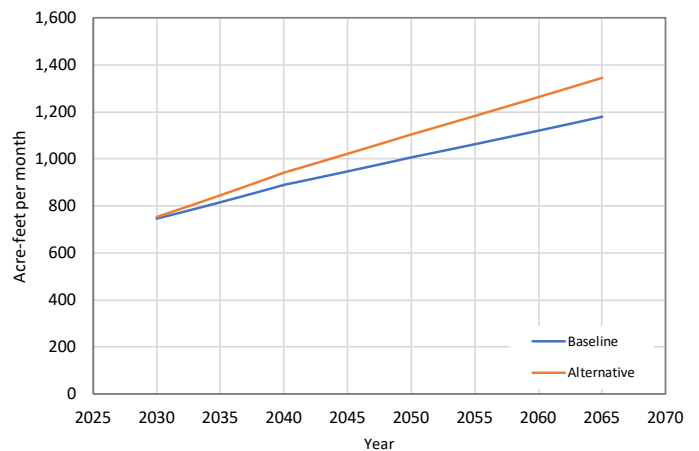


Figure 8. July Juab County drinking water demand.

### 3. Determine Unmet Demand (Gaps)

Figures 9 and 10 show the potential gaps in water supply compared to demand. Each city has a different water supply situation. Some cities show no gaps and may have surpluses, and some have significant gaps. Water supplies suitable for indoor use were assumed to be arranged to meet, and be compared against, the indoor, or drinking water demands. Cities with surplus indoor water supply can use the surplus to meet outdoor demands. However, outdoor water supplies cannot be used for indoor purposes without treatment. It can be seen from the figures that surpluses could be used by other cities in the study area with gaps by treating imported water

and delivering it to areas with a gap. The Team has labeled this “balancing.” Balancing would require regional cooperation and an analysis of legal implications, but the benefits could be significant. Under the Baseline condition for drinking water in 2065, the “balanced” gap for south Utah County is 6,188 acre-feet per year. The “unbalanced” gap is 22,834 acre-feet per year. Under the Alternative condition for drinking water for 2065, the balanced gap would be 18,728 acre-feet per year, and the unbalanced gap would be 38,071 acre-feet per year. There is no opportunity for this type of balancing in Juab County. The effects and benefits of balancing will be further evaluated in Phase II.

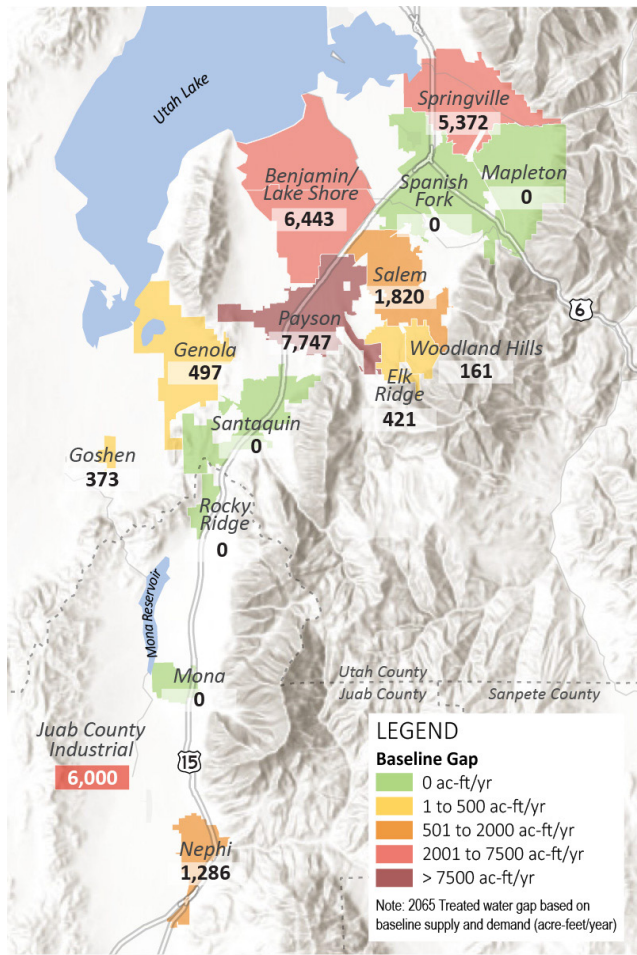


Figure 9. Baseline scenario treated water gap in 2065 (unbalanced).

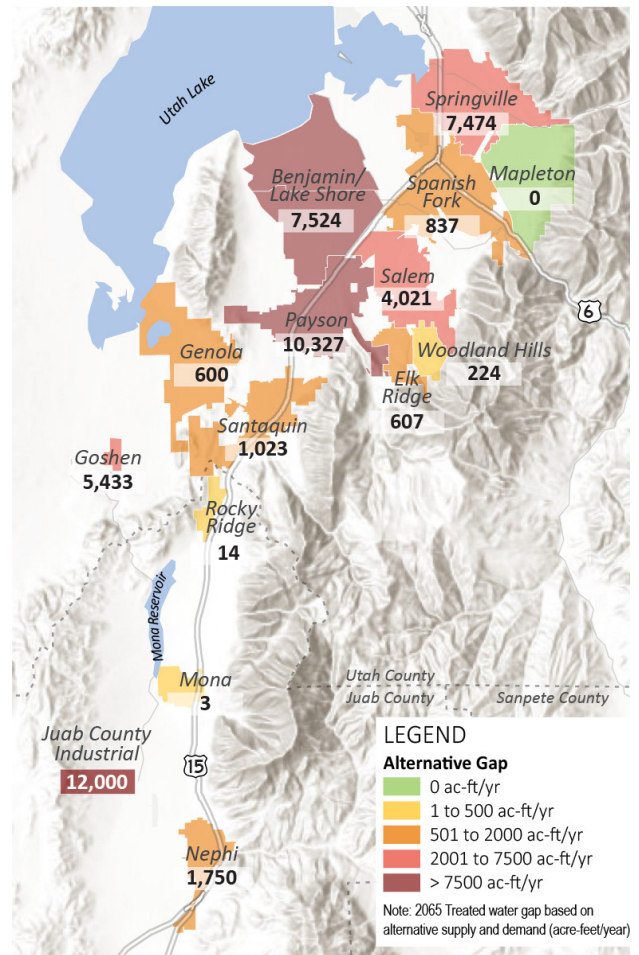


Figure 10. Alternative scenario treated water gap in 2065 (unbalanced).

## 4. Develop Solutions

Analysis of the Baseline and Alternative scenarios revealed a gap in both treated and untreated water. The Formulation Project, and CUWCD, are focused on treated water gaps because irrigation water and conveyance facilities for secondary systems, such as the Highline Canal, are controlled by other entities. Cooperation among the cities and the U.S. Department of the Interior, especially regarding storage in Strawberry Reservoir and the use of the Highline Canal, could have significant benefit for the region. The Team's original analysis assumed that water converted from agricultural uses to M&I uses would be delivered on an agricultural demand basis. There could be additional water supply benefit if storage in Strawberry Reservoir could be used to deliver water on an M&I pattern.

With the water supply and demand gaps defined, the Team began to develop options to fill the water supply deficit, plan potential infrastructure to deliver the water supplies to the geographical areas with gaps, evaluate water management options, and assemble portfolios of options. that represent various actions and methods to address the identified supply/demand gaps.

### Portfolio Development

To develop the water supply portfolios, the Team held a workshop to ensure the CUWCD goals and objectives were clearly defined. CUWCD staff ranked the key functions and objectives in the following order:

- Stakeholder Engagement
- Water Supply Resilience/Reliability
- Schedule/Adaptability
- Infrastructure
- Conservation

CUWCD Staff also developed a list of potential options to resolve the gaps based upon the key objectives. The Team then used this input to develop a number of portfolios for initial analysis. To quickly evaluate various portfolios, Jacobs staff developed a model that pulled data gathered during Formulation Project Tasks 5 and 6 to determine treated and untreated water needs, treated and untreated conveyance and storage needs, and remaining gaps.

The Team then held a series of meetings and workshops with stakeholders to present the initial findings and receive input on the initially developed portfolios. Key input and observations from the stakeholders included:

- Untreated conveyance options into Juab County do not appear viable.
- Treated water delivery into Juab County appears to be the most viable option.
- Juab County is anticipating additional industrial demands as the county grows.

- South Utah County aquifer storage and recovery (ASR) operations appear to have many variables, including water source,
- South Utah County ASR should be evaluated more rigorously in Phase II.
- Secondary systems may not develop in Goshen and Benjamin/Lake Shore. The Team will evaluate options with with treated water only to Goshen and Benjamin/Lake Shore, and options with secondary systems in those areas.

The Team originally evaluated several portfolios, including a no-action portfolio. Using input from the internal workshop and the stakeholder process, the Team revised and renamed the portfolios (6, 6A, 7, and 7A) to be evaluated in Phase II. Figure 11 shows potential infrastructure for the portfolios described below.



Figure 11. Potential Formulation Project Facilities.



Descriptions of these portfolios are included as follows.

For **Portfolio 6**, Baseline and Alternative Supply/Demand Scenarios assume a new regional water treatment plant (WTP) in south Utah County with treated water transmission. Select water supplies are balanced between cities with surplus and cities in deficit, and water from Strawberry Reservoir is delivered on an M&I demand pattern. The Team will also continue to evaluate unbalanced operations. Future Goshen Valley Local District Mega Site and Benjamin/Lake Shore demands are split between treated and secondary demand. In Juab County, all demands are met from the south Utah County WTP delivered through a treated water pipeline terminating at Nephi.

**Portfolio 6A** is the same as Portfolio 6, except it assumes that all Goshen Valley Local District Mega Site and Benjamin/Lake Shore demands are treated water only.

**Portfolios 7 and 7A** are the same as Portfolios 6 and 6A, respectively, except they also include an ASR element. The ASR element of these portfolios will be the focus in Phase II.

#### Findings

The following is a list of the key findings:

- Population will increase significantly in Utah and Juab Counties by 2065.
- A robust and reliable water system is key to establish consumer confidence and meet expectations.
- The Plan Formulation Project direction is to deliver drinking water and (M&I) water and exclude agricultural water due to the high development cost.
- Future M&I demands will not be fully met by relying only on groundwater.
- Additional water resources, water management measures, and infrastructure will need to be developed to meet the increasing population demands for water.
- Additional untreated water will be needed to meet future demands.

- Balancing, which is delivering water from cities with a surplus to cities with a deficit, could be a key water management strategy in south Utah County.
- Balancing will require regional cooperation, and portfolios without balancing should be evaluated.
- Using storage from Strawberry Reservoir to make deliveries on an M&I schedule (instead of on the historical agricultural delivery schedule), could be a key water management strategy in south Utah County.
- Using storage from Strawberry Reservoir will require regional cooperation, and portfolios without this option should be evaluated.
- ASR could be a beneficial water management strategy but needs more study in Phase II.

## Recommended Next Steps

- Initiate Phase II of the Formulation Project.
- Carry Portfolios 6, 6A, 7, and 7A into Phase II.
- Evaluate Portfolios 6, 6A, 7, and 7A with and without balancing and M&I deliveries from Strawberry Reservoir.
- For Phase II, the Team will develop:
  - Strategy for desired outcome
  - Schedule triggers
  - Phasing for implementation
- Bring ASR into Phase II for additional study.
- Create a plan to develop additional water supplies in Phase II.
- Examine National Environmental Policy Act (NEPA) implications, federal constraints, water rights issues, and federal law considerations, such as the Warren Act in Phase II.