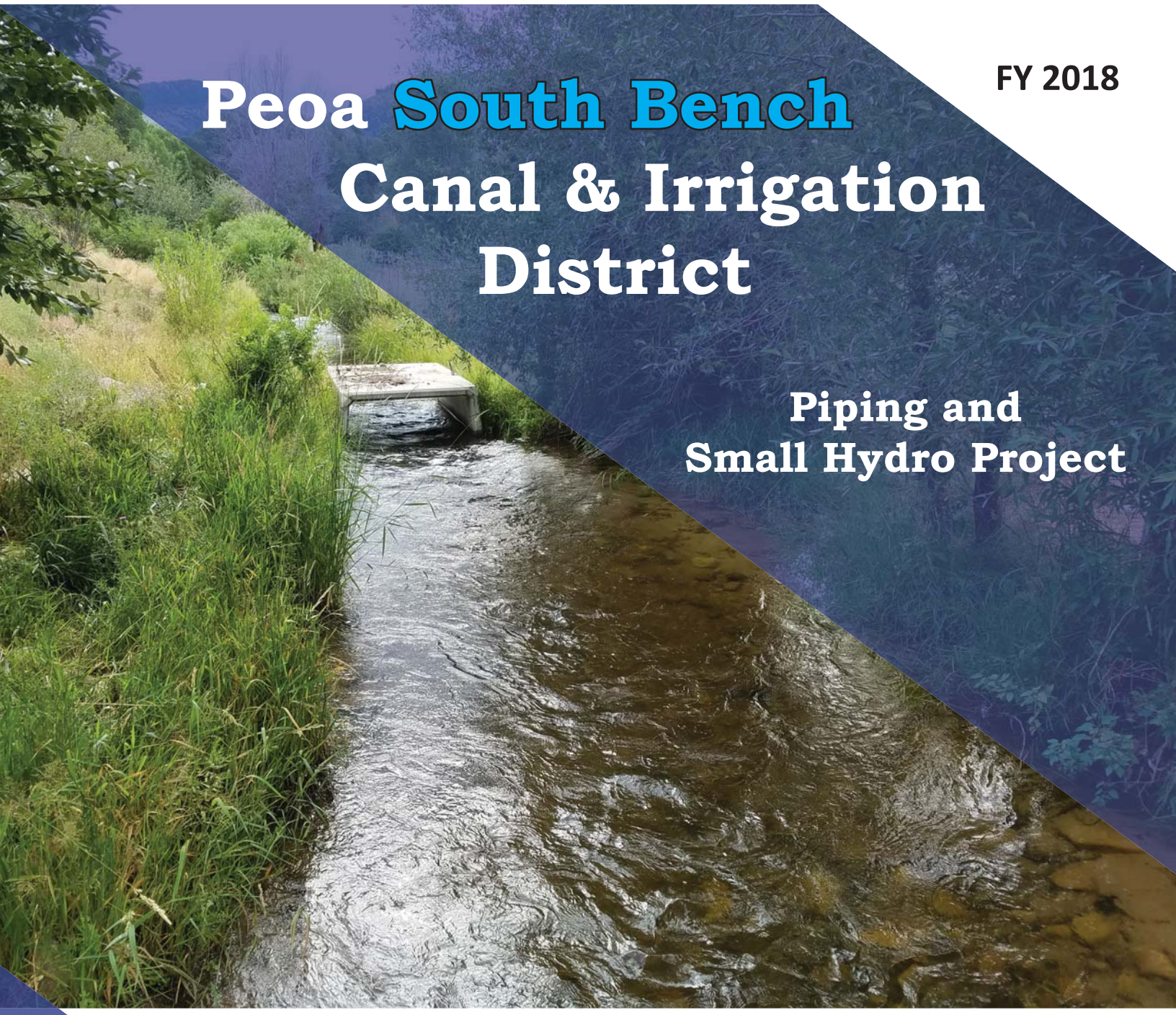
WaterSMART Grants: Water and Energy Efficiency Grants
FOA# BOR-DO-18-F006

FY 2018

Peoa South Bench Canal & Irrigation District

Piping and Small Hydro Project



Applicant

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Executive Summary

Applicant Info

Date: May 10, 2018

Applicant Name: Peoa South Bench Canal and Irrigation Company (South Bench)

City, County, State: Oakley City, Summit County, Utah

Project Manager:

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Project Manager/Engineer
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Project Funding Request: Funding Group II $1,000,000; Total Project Cost $2,145,730

Project Summary

Specify the work proposed, including how funds will be used to accomplish specific project activities and briefly identifies how the proposed project contributes to accomplishing the goals of this FOA.

The proposed Peoa South Bench Canal and Irrigation Company (South Bench) Piping and Small Hydro Project will replace the entire South Bench canal system with 19,760 feet of 27-inch PIP PVC Pipe and 32-inch HDPE pipe. The existing diversion will remain unchanged, but the project will follow a modified and more efficient alignment than the existing canal. A new fish-friendly screening structure and metering station will be constructed along with an underwater micro hydro turbine station that will produce 588 kWh of energy per year. The new alignment will follow existing property lines, fences, and existing access roads, creating a smaller impact on farmable ground – requiring less pipe and a more centralized location relative to the irrigated acreages.

The proposed project will contribute to the goals of this FOA in the following ways:

- The project will seek to conserve and use water more efficiently by producing a quantifiable water savings of 2,629 acre-feet and by better managing 5,477 acre-feet of water. The project will also conserve water in the Weber River and the upper lakes of the Uintah Mountains.
- The project will increase the production of hydropower by constructing an underwater micro hydro turbine station that will produce 588 kWh of energy per year.
- By pressurizing the canal system, farmers and ranchers will be able to work with NRCS to implement sprinkler irrigation, expand their growing season, and increase their yield. Further water savings is expected as farmers and ranchers change from flood irrigation to sprinkler irrigation – a 25 percent increase in water use efficiency. An additional 570 acre-feet of water savings can be anticipated as changes are made.
- The project will work to mitigate conflict risk in an area at high risk of future (even current) water conflict. South Bench's substantial water losses have flooded basements,

infiltrated the sewer system, increased nutrient loading in the Weber River, and impacted water reliability; all of which have amplified water conflicts. The proposed project and future on-farm improvements will work together to create the quantifiable water savings and water reliability benefits that will work to resolve this issue. Conserving water in the Weber River and the upper lakes of the Uintah Mountains will also benefit endangered species and their habitats and reduce conflicts between irrigation and recreational water users.

Length of Time and Estimated Completion Date

State the length of time and estimated completion date for the proposed project.

This project is ready to move forward as soon as it is awarded. South Bench has been and will continue to work with the Utah Division of Water Resources (DWRe) to secure a loan for a portion of their matching funds. DWRe requires that final design is completed before their final award contract can be signed. Therefore, the final design and the environmental report will coincide and are estimated to take six to ten months to complete. The project will follow a modified alignment, which will require obtaining a small amount of right-of-way. Otherwise, the new alignment will follow existing shareholder property and fence lines and within existing road right-of-ways. It is anticipated that the actual construction of the piping portion of the project will start in the Sept/Oct 2019 – April 2020 timeframe. The project will be accomplished within the three-year allowance; Oct 2018 - Sept 2021.

Year 1 Oct 2018 - Sept 2019	Year 2 Oct 2019 - Sept 2020	Year 3 Oct 2020 - Sept 2021
• Contracts • Complete environmental process • Complete final design and bid the project • ($300,000)	• Start the piping project ($500,000)	• Continue the project • Close out the project ($200,000)

Federal Facility

Whether or not the project is located on a Federal facility.

The project is not directly located on a federal facility. However, South Bench is in the same basin as the Rockport, Echo, and Smith and Morehouse Reservoirs. The water South Bench will conserve will contribute to the Weber River, which feeds the Rockport and Echo Reservoirs. The proposed project will also help – according to the TMDL Implementation Plan for the Rockport and Echo Reservoirs – reduce nutrient loading in the lower Weber River and Rockport Reservoir.

Background Data

The South Bench service area has a rich agricultural history in Oakley, Utah. Water rights date back to 1879 out of the Weber River. These are composed of 28 shareholders and 425 shares. The system is comprised of main canal and open ditches that deliver water to farms, most of which use flood irrigation. Because of drought years and the age and condition of the system, farmers require a more efficient irrigation method for conserving available water, while also maintaining productive crop yields. Seepage losses have not only impacted the ability to water fields, but have impacted the nutrient levels of the Weber River, caused high infiltration within Oakley City's sewer system, seeped into local residential basements, and caused conflict with recreational water users; all of which cost money, cause conflict, impact the environment, and reduce the ability for farmers to grow crops.

Photo 1 Weber River Diversion for South Bench

Because of the area's elevated location, it has a very short growing and irrigation season. The typical irrigation season is from May 20th to the end of August during a good water year. If the irrigation season is anything like it has been over the past few years, South Bench will only have water until the end of June, and in July, will have to go on to what is known as "low water." Low water does not allow enough flow volume to be used to flood irrigate in the South Bench service area. The development of the proposed project will allow South Bench to ensure that they can irrigate through July, even on low water.

Water Supply

Source of water supply and water rights involved.

The source of South Bench's water supply is a small reservoir called Fish Lake, high up in the Uintah Mountains above the Smith and Morehouse Reservoir. Their water right comes down through the Weber River. Their existing diversion is located on the Weber River, approximately 1.5 miles upstream of the Highway 32 crossing of the Weber River. The headwall and gates were constructed in 2012 following flood damage to the diversion.

South Bench takes their water rights from the Weber River, and they include:

- 33.04 cfs for flood
- 18.36 cfs for high flow stages
- 10.32 cfs for low flow stages

Currently, the system operates on turns, and at any given time, five irrigators are each using 1/5 of the total ditch flow. The number of shares that each irrigator owns determines the length of

time they are allowed to use the water. In 2017, South Bench diverted 5,477 acre-feet of water over the course of the irrigation season.

Current water uses and number of water users served.

South Bench's water supply is primarily used for irrigation. Only 25.2 acres out of the 807.2 acres served is for urban use. South Bench has 425 shares and 28 shareholders.

Current and projected water demand/potential shortfalls in water supply

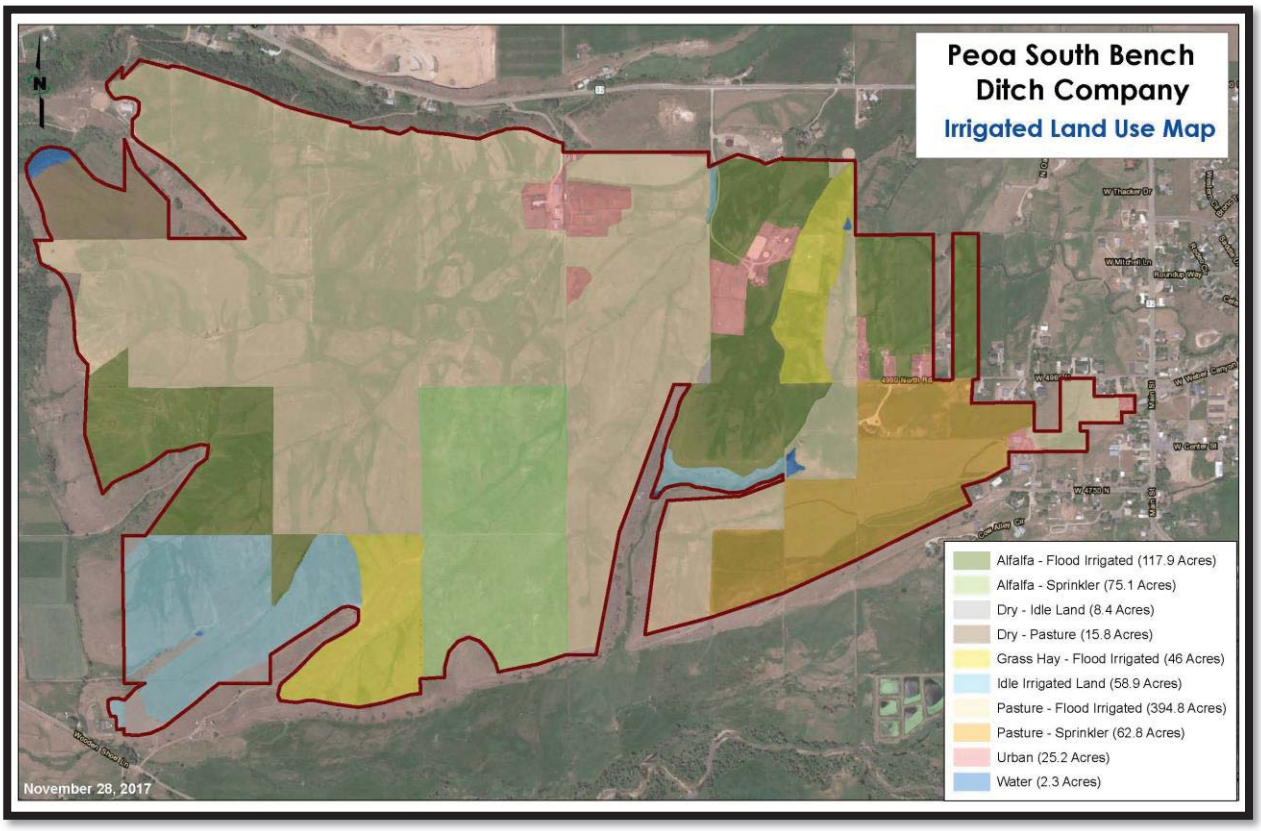
Current & Projected Water Demands

South Bench diverts and attempts to deliver their full water right as described above on an annual basis. Because of the large seepage losses, the water diverted is not delivered in full. This reduces the ability for users to take advantage of their full shares and to put it to beneficial use on their crops.

There are approximately 780 acres of agricultural land within the South Bench service area.

All this ground should be irrigated if the water can be delivered. Figure 1 Irrigated Land Use represents the current land use within the South Bench service area. For a larger map, please see Attachment 1 Irrigated Land Use Map

Figure 1 Irrigated Land Use



The following summarizes current and projected water demand based on current and future land use and irrigation practices:

Table 1 Current and Projected Water Demands

CURRENT WATER DEMANDS				
Crop/Irrigation	**Efficiency**	**Acres**	**Volume (AF)**	
Alfalfa/Sprinkled	75%	75	178	
Alfalfa/Flood	50%	118	421	
Grass/Sprinkled	75%	63	112	
Grass/Flood	50%	441	1175	
Dry or Idle	NA	83	0	
TOTAL		**780**	**1887**	
PROJECTED WATER DEMANDS				
Crop/Irrigation	**Efficiency**	**Acres**	**Volume (AF)**	
Alfalfa/Sprinkled	75%	75	178	
Alfalfa/Flood	50%	705	2516	
TOTAL		**780**	**2694**	
Alfalfa Annual Net Consumptive Use			21.41	inches
Pasture Annual Net Consumptive Use			15.99	inches
From USU Research Report 145 "Consumptive Use of Irrigated Crops in Utah"				

Shortfalls in the Water Supply

South Bench faces potential water supply shortfalls in the following areas:

Seepage: In July 2017, the NRCS performed a water loss study of the upper 1.5 miles of the South Bench canal. The section studied was between the river diversion and the Weber Canyon Road crossing. The report found that the canal was losing 2.62 cfs per mile in this upper section of canal. Although a study was not performed for the lower 2.4 miles, NRCS surmises that a loss of 1.48 cfs/mile for the lower section is a reasonable assumption. The total calculated flow loss in the entire canal was 7.5 cfs at the time of the study. The average flow rate at the head of the ditch at the time the seepage loss study was performed was 15.7 cfs, so the calculated flow loss for the entire canal was 48 percent. The total diversion for 2017 was 5,477 acre-feet. A 48 percent loss of the 5,477 acre-feet for 2017 would be 2,629 acre-feet. For a more detailed look at this study, see Attachment 2 NRCS Peoa South Bench Canal Water Loss Study. The Table 2 below summarizes the conclusions of the NRCS study.

Table 2 NRCS 2017 Water Loss Summary

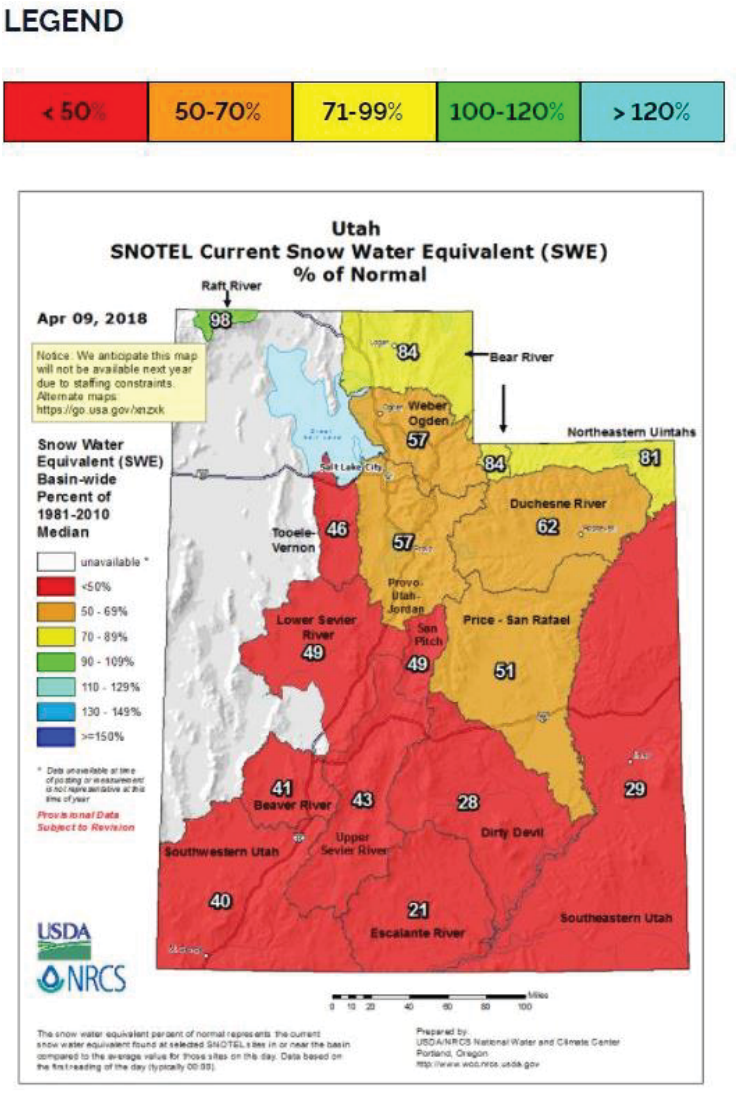
Location	Flow (cfs)	Loss (cfs)	Loss (% cfs)	Distance (Miles)	Loss (Flow/Mile)
NRCS Site 1 (Weber River Flume)	15.7				
NRCS Site 2	11.8	3.9	24.9%	1.49	2.62
End of the canal	8.2	3.6	30.3%	2.41	1.48
TOTAL		**7.5**		**3.9**	**1.91**
Percentage Loss		**48%**			

Drought: Over the past six years, Summit County has had some of the driest summers, accompanied by scorching temperatures and wildfires. Local farmers and ranchers are beginning to struggle to make ends meet. With a reduction in hay harvest, they have had to purchase more

hay to feed their cattle or sell off more cattle. The continued years of drought have reduced watering times during the most critical irrigation month of June, reducing the ability for farmers to get just one good cutting of hay.

This winter's snowpack in the South Bench service area and within Summit County has been documented as one of the lowest in 30 years. In an article written by Emma Penrod on the abnormally dry and warm conditions of the 2018 winter, published in the Salt Lake Tribune on February 9, 2018, she quotes Jim Steenburgh, a professor of atmospheric sciences at the University of Utah, who said: *"Since November, Utah has experienced the hottest winter in recorded history…To make water prospects worse, warm weather has already started melting snow at lower elevations. There have been drier winters…but this is close to as bad as it gets."* The temperatures measured at the Salt Lake City International Airport averaged nearly ten degrees above normal in January 2018.

Figure 2 NRCS 2018 Drought Map



The hot winter weather and no snow has irrigators on their guard all across Utah, but for South Bench, it is more alarming. They do not have a full reservoir to rely on to get them through their irrigation season, and with the type of water losses occurring within the canal, they may be out of water before the irrigation season even begins this year. If Fish Lake, the high Uinta Lake they depend on for their water, does not have sufficient snowmelt, South Bench will not have a reliable water supply to flood irrigate their crops. This year, it is expected that they will begin the irrigation season on low water. For South Bench irrigators, this means no crops will be flood irrigated this year. As a result, many of the farmers that depend on producing one hay or alfalfa cutting each growing season will not be yielding any this year. Figure 2 NRCS 2018 **Drought Map** indicates the severity of the drought and the current water equivalent of normal for Utah. The South Bench Service area is 57 percent of normal as of April 9, 2018.

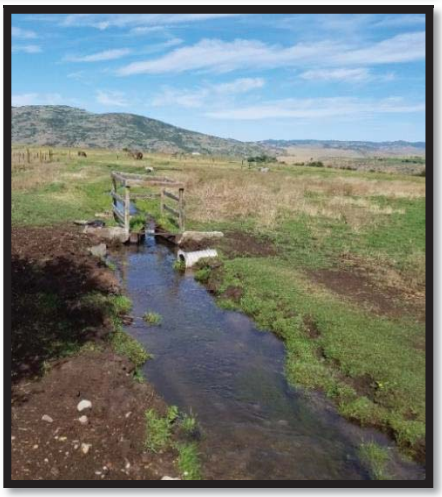
Condition of the Existing System: Areas of the canal are over 60 plus years old, with portions of the canal having been constructed in the late 1800s. Most of the canal is unlined and experiences persistent seepage along its entire length. The middle section of the canal is elevated above the Weber Canyon

Road as it parallels the road through Oakley. This section leaks and overtops when the canal is full, causing water to run along the side and into the highway.

Major Crops and Total Acres Served.

The major crops are alfalfa and grass hay. The majority of the irrigated land is for pasture and livestock use. South Bench serves a total of 780 acres.

Photo 2 Water seeping into the Highway and Crossing Private Property



Water Delivery System

South Bench's water delivery system is comprised of the main canal and open ditches. As previously stated, most of the canal is unlined and experiences constant leakage along its entire length. With the middle section of the canal being elevated above the Weber Canyon Road, it leaks and overtops when the canal is full, causing water to run alongside and within the highway. The existing canal is approximately 4 miles in length and meanders through easements on private residential property primarily located within the rural areas of Oakley City. It crosses under several county roads and one state highway. The upper 2 miles of the canal is wide with a rocky bottom, and the banks of this section of the canal are densely vegetated with grasses and cottonwood trees. The first turnout is approximately 2 miles downstream from the river diversion. The lower 2 miles of the canal is where all the irrigation use occurs, and through this section, the canal is narrower and less vegetated. Each turnout relies on a Parshall flume for flow measurement. The lower section of the canal is mainly used to water livestock and open pasture.

Photo 3 Canal with water and without water

Energy Efficiency

If the application includes hydropower or energy efficiency elements, describe existing energy sources and current energy uses.

Hydropower – Produces 588 kWh per year

The project will increase the production of hydropower by constructing an underwater micro hydro turbine station that will produce 588 kWh of energy per year. The power will be used at the diversion and measuring station on the canal to meet the power needs of the system at that remote location.

Energy Efficiency – Saves 151,000 kWh and $1,800 per year

The proposed project will also have a great impact on reducing the cost and use of pumps for those who are currently sprinkling their lands. Presently, 138 acres of the South Bench service area are being sprinkled using pumps. The proposed project will eliminate those pumps. The 138 acres represent an average annual flow rate of 1,504 gpm. The current electrical load on these pumps is 60.7 kWh. This project will save 151,000 kWh per year, as represented in the following calculations:

$$(1504 \text{ gpm} \times 150 \text{ ft})/(3960 \times 70\%) * .746 = 61 \text{ kW}$$

$$61 \text{ kW} \times 2{,}476 \text{ hrs/season} = 151{,}000 \text{ kWh}$$

This Project will have reduced the carbon footprint of those few irrigator's sprinkler pumps by offsetting approximately 247,748lbs of CO2 per year when compared with coal power plant generation. This offset does not include the hydro South Bench will be producing to run its screen and meter. Over a twenty-year span, the saving of not running pumps for sprinkling is a reduction in the carbon footprint that is equivalent to:

The carbon footprint equivalent information above was provided by the United States Environmental Protection Agency Greenhouse Gas Equivalencies Calculator by entering the kilowatt-hours reduced and then multiplying the equivalent results of the reduced carbon dioxide emission by twenty years.

The project will not only save energy, but will also save the irrigator $1,800 per year in energy cost that is paid to run the pumps.

The proposed piped system will be a pressurized system and will not require the use of pumps or alternative sources of power.

Relationship with Reclamation

Identify any past working relationships with Reclamation. This should include the date(s), description of prior relationships with Reclamation, and a description of the project(s).

South Bench has participated with the Weber Basin Water Conservancy District as they have developed their most recent Drought Plan, and over the years, has worked on small projects in the Weber River. This is the first time South Bench has applied for funding for a project from Reclamation.

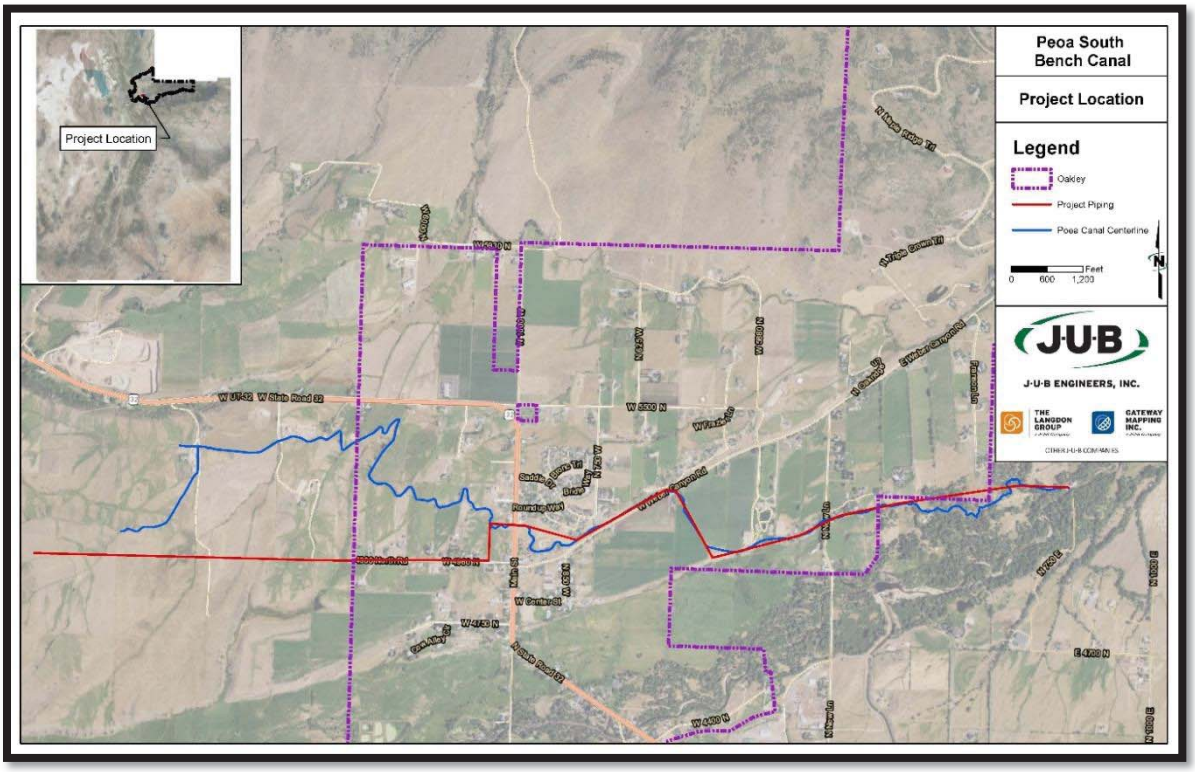
Project Location

Provide specific information on the proposed project location or project area including a map showing the geographic location.

Geographic Location

The South Bench Canal is approximately 4 miles long and extends from the Weber River through the town of Oakley, Summit County, Utah. See Attachment 3A South Bench Project Location Map for a larger view and Attachment 3B Project Detail Map.

Figure 3 Project Location Map



Technical Project Description

Describe the work in detail, including specific activities that will be accomplished. This description shall have sufficient detail to permit a comprehensive evaluation of the proposal.

Purpose: The purpose of the proposed project is to address three main issues that currently exist within the South Bench irrigation canal system by:

- Significantly reducing water loss in the existing canal, primarily caused by seepage throughout the entire length of the system
- Providing sufficient pressure that will qualify farmers to seek NRCS funding for installing sprinklers on their irrigated land
- Extending the watering season for irrigators, even when they are on "low water"

Project: The proposed project will:

- Replace the entire South Bench canal system with 19,760 feet of 27-inch PIP PVC Pipe and 32-inch HDPE pipe, use the existing diversion, and start piping at the location of the existing Parshall Flume. The current diversion will remain unchanged, but the project will follow a modified and more efficient alignment than the existing canal. The proposed project will construct an underwater micro hydro turbine station that will produce 588 kWh of energy per year. A new screening structure and system meter will also be constructed, and the Parshall Flume will be removed. Specific pipe diameters, ratings, and lengths are as follows:

27" PIP PVC 100 psi	14,850	LF
32" HDPE DR 41 PIPE	4,910	LF

The new alignment will be straighter and more efficient, requiring less pipe. It will also deliver the water to a more centralized location relative to the irrigated acreages. The alignment will follow existing property lines, fences, and existing access roads, creating a smaller impact on the farmable ground.

Benefits of the Project: The proposed project will provide significant benefits for the South Bench canal system and its service area, as well as for the environment and surrounding water bodies. These benefits include:

– *Water Savings:* The water loss study performed on this canal indicates that the water loss in 2017 was 2,629 acre-feet (48 percent). This project replaces the entire open system with a piped and pressurized system. With such a system, water loss can reasonably be assumed to be at 0 percent, resulting in saving the entire 2,629 acre-feet of seepage.

  Also, higher water savings will be realized when irrigation practices are changed from flood irrigation to sprinkler irrigation, as farmers and ranchers take advantage of the newly piped and pressurized delivery system. Application efficiency for flood irrigation is approximately 50 percent, while sprinkler irrigation application efficiency is approximately 75 percent. The following table summarizes water loss associated with irrigation application inefficiencies.

Table 3 Irrigation Inefficiencies

2017 IRRIGATION INEFFICIENCIES		
Annual Volume Diverted	5477	AF
Annual Volume Lost (5477 x 48%)	2629	AF
Annual Volume Delivered	2848	AF
Assumed Flood Irrigation Efficiency	50%	
Assumed Sprinkler Irrigation Efficiency	75%	
Flood vs. Sprinkler Efficiency Difference	25%	
Total Acres Irrigated	697	
Total Acres Flooded	559	
% Acres Flooded	80%	
Water Lost to Inefficient Application (2848 x 80% x 25%)	**570**	**AF**

- *Water quality benefits from a reduction in return flow to the Weber River and Rockport Reservoir:* Flood irrigation requires runoff water at the end of an irrigated field in order to thoroughly wet the crop root zone. This method flushes soil, biomass, manure, and fertilizer off the field and into the tailwater ditch and eventually into streams, rivers, and other waterbodies. Tailwater from flood irrigation on the South Bench system eventually ends up in the Weber River and Rockport Reservoir. Within the Rockport Reservoir and Echo Reservoir TMDL Implementation Plan (TMDL Plan), it states that "Sprinkler systems apply less water at rates that allow water to infiltrate the soil, thereby reducing irrigation return flow generated from surface runoff." Piping and pressurizing the ditch will allow irrigators to implement sprinkler irrigation and eliminate tailwater. This reduction in tailwater from fields will positively affect the Lower Weber River and Rockport Reservoir by reducing the amount of return flow carrying large amounts of fertilizer, sediment, and other debris to the river.
- *Extending the Irrigation Season:* With the development of the proposed project, irrigators will now have the ability to use their water for longer in the season. In the past, when the water was moved to low flow stage, typically in mid-July, irrigators were left with 10.32 cfs of flow (this year, 2018, they are expected to start on low flows). With that amount of water loss in the system, it was not enough flow for any water user who irrigates to move the water into their fields. The one irrigator who has a sprinkling system was able to extend his watering season by pumping and using other shareholder's shares. A closed, pressurized system will provide all water users with the opportunity to use sprinklers to better utilize their shares of water and extend their watering season.
- *Reduce Impact on Oakley City Sewer System:* The substantial seepage losses have impacted the Oakley City sewer treatment system by infiltrating large amounts of water every year as the irrigation season starts. The treatment facility continually sees the large infiltration of water in the areas where the canal is located. The treatment process uses energy to treat the wastewater. Although difficult to quantify, this project will reduce energy requirements at the Oakley City sewer treatment plant by reducing the volume being treated.

– *Stop Flooding Residential Basements:* Over the years, residential basements located near the canal have been flooded with the seepage losses. Sub-pumps have been installed in many of the basements to alleviate the impacts. By piping the canal and ditch system, this will reduce the need for these pumps to run 24 hours a day throughout the irrigation season.

E.1. Technical Proposal: Evaluation Criteria

E.1.1. Evaluation Criterion A – Quantifiable Water Savings

Quantifiable Water Savings

Describe the amount of estimated water savings. *For projects that conserve water, please state the estimated amount of water expected to be conserved (in acre-feet per year) as a direct result of this project.*

The estimated amount of water expected to be conserved by replacing the entire open system with a piped and pressurized system is the 2,629 acre-feet per year from seepage losses. Also, it is anticipated that an additional 570 acre-feet of savings will come as farmers and ranchers change from flood irrigation to sprinkler irrigation – a 25 percent increase in water use efficiency, resulting in an additional 570 acre-feet of water savings. Therefore, the total anticipated water savings would result in 3,199 acre-feet per year.

Describe current losses. *Explain where the water that will be conserved is currently going (e.g., back to the stream, spilled at the end of the ditch, seeping into the ground)?*

The seepage losses are lost to deep percolation, infiltration into the sewer system and basements, overtopping the canal and running along the side of the highway. All of this water will eventually make its way back to the Weber River. Water associated with inefficient irrigation practices (flood irrigation) that will be conserved by changing to sprinklers is currently being applied to the fields. Seepage losses are lost to deep percolation as the water saturates soils beneath the plant roots, or lost as tailwater out of the end of irrigation furrows. This tailwater will eventually make its way back to the Weber River.

Describe the support/documentation of estimated water savings. *Provide sufficient detail supporting how the estimate was determined, including all supporting calculations.*

As previously stated through a study completed by NRCS, the estimated water savings of 2,629 acre-feet per year was determined based on a water loss study done in early part of July 2017. This study showed that the water loss in 2017 was approximately 48 percent. Because the proposed project will pipe the entire length of the ditch, it is expected that the total amount of water loss (2,629 acre-feet per year) will be saved. The NRCS report can be found in Attachment 2 NRCS Peoa South Bench Canal Water Loss Study.

The sections of the canal that were studied are between the river diversion and the Weber Canyon Road crossing. The report confirms that the canal was losing 2.62 cfs per mile in the upper section of the canal. While a study was not fully performed in the lower 2.4 miles, the NRCS report surmises that a loss of 1.48 cfs/mile for the lower section is a reasonable assumption. The total calculated flow loss in the entire canal was 7.5 cfs at the time of the study.

The average flow rate at the head of the ditch at the time the seepage loss study was performed was 15.7 cfs, so the calculated flow for the entire canal was 48 percent. The total diversion for 2017 was 5,477 acre-feet. Therefore, a 48 percent loss of 5,477 acre-feet for 2017 would be 2,629 acre-feet. An independent water loss study was performed in August 2017 for the entire canal. This study found water loss to be at 45 percent, which substantiates the study done by the NRCS. It is anticipated that further water savings can be expected as farmers and ranchers change from flood irrigation to sprinkler irrigation – a 25 percent increase in water use efficiency, resulting in an additional 570 acre-feet of water savings and a potential water savings of 3,199 acre-feet.

Canal Lining/Piping

a. *How has the estimated average annual water savings that will result from the project been determined? Please provide all relevant calculations, assumptions, and supporting data.*

The estimated average annual water savings (2,629 acre-feet per year) that will result from the proposed project was determined based on measurements taken at two locations using an Acoustic Doppler Current Profiler (ADCP) – Streampro. There were no user diversions between the two locations, so any reduction in flow was because of seepage. In addition, a known seep location downstream was measured using a 5-gallon bucket and a stopwatch. According to the NRCS water loss study done on this canal, the upper section of the canal was losing 2.62 cfs per mile, and the total calculated flow loss in the entire canal was 7.5 cfs at the time of the study. The average flow rate at the head of the ditch at the time the seepage loss study was performed was 15.7 cfs, so the calculated flow for the entire canal was 48 percent. The estimated average annual water savings of 2,629 acre-feet per year was then determined by taking the total diversion for 2017, which was 5,477 acre-feet, and multiplying it by the 48 percent calculated flow for the entire canal.

The table indicated in Table 4 is from the NRCS South Bench Water Loss Study. This table illustrates canal discharges, location, and losses per mile from the two measurement locations chosen for the study (Site 1, upstream/Site 2, downstream). This data and other ADCP readings that will be discussed in the following question were used to determine water loss.

Table 4 NRCS Table 1 from Water Loss Report

Table 1. Reaches with individual sites, with discharges, location, and losses per mile.

SECTION REFERENCE	AVERAGE DISCHARGE (CFS)	CFS Δ	DISTANCE BTW Δ	CFS/MILE LOSS(-) GAIN(+)	LONGITUDE	LATITUDE
SITE 1 UPSTREAM	15.68				-111.2681	40.7206
SITE 2 DOWNSTREAM	11.78	-3.9	7867	-2.62	-111.291	40.7201

b. *How have average annual canal seepage losses been determined? Have ponding and/or inflow/outflow tests been conducted to determine seepage rates under varying conditions? If so, please provide detailed descriptions of testing methods and all results. If not, please provide an explanation of the method(s) used to calculate seepage losses. All estimates should be supported with multiple sets of data/measurements from representative sections of canals.*

As previously stated, the average annual canal seepage losses were determined as part of the NRCS Peoa South Bench Water Loss Study. The first step involved using an Acoustic Doppler Current Profiler (ADCP) – Streampro to measure canal flows at two different reach

locations. A seep was observed along a terrace that ran parallel to the canal and adjacent to the highway. Measurements were taken at the seepage using a 5-gallon bucket and timer to estimate losses.

Table 4 above shows the average measurement reading from the ADCP as well as the differences, distance, and latitude and longitude from two measurement locations. Site 1, the upper section at a flume below the diversion from the Weber River, was the most upstream measurement. Site 2, the next downstream measurement location, is approximately 1.49 miles downstream of Site 1. Site 2 is the last measurement site of the 4.3-mile canal system. The remaining reach was not measured, but a seep was measured just 1,188 feet downstream of Site 2. Two measurements from the seep were taken. The first seep measured 3 gallons in 2 minutes and the second measured 1.25 gallons in 2 minutes, totaling approximately 2.75 gpm or 0.006 cfs. Other seeps were estimated in the immediate vicinity, and using the two measurement sites as surrogates, an estimate of 4.5 to 6 gpm was noted for all seep losses. This seep seemed to be the only seep identified, but due to the high vegetation in the area, other seeps may be present. This seep is present due to the short distance between the canal and the higher elevation difference between the canal and floodplain – where the canal is transitioning between the floodplain to a terrace.

Figure 6 Photo of Site 1 NRCS Measurement Location

Figure 5 Photo of NRCS Seep Measurement

Figure 4 Photo of Site 2 NRCS Measurement Location

Table 5 below is the NRCS table taken from their report that illustrates the ADCP measurement information with selected datasets that include measured and interpolated discharges.

Based on this water loss study, including a look into geology, topography, and hydrologic factors, it is evident that there are losses happening along most portions of the irrigation canal where it is higher than the

surrounding topography. The major contributor to volumetric losses is the location of the canal on an elevated terrace, above an existing floodplain, and constructed in highly permeable, unconsolidated surficial deposits. For a more detailed overview of South Bench canal water loss, see Attachment 2 NRCS Peoa South Bench Canal Water Loss Study.

Table 5 NRCS Report Table 2 and 3

Table 2. ADCP reading from WinRiver II selected output for Site 1.

TRANSECT	TOTAL Q	TOP Q	MEAS. Q	BOTTOM Q	LEFT Q	RIGHT Q	WIDTH	TOTAL AREA
	ft³/s	ft³/s	ft³/s	ft³/s	ft³/s	ft³/s	ft	ft²
MEASUREMENT 10	16.33	7.52	4.42	3.50	0.54	0.35	7.57	6.86
MEASUREMENT 11	15.01	6.88	4.25	3.04	0.54	0.30	7.05	6.28
MEASUREMENT 12	15.59	7.09	4.78	3.01	0.49	0.21	7.11	6.50
MEASUREMENT 13	16.05	7.41	4.35	3.39	0.51	0.39	7.54	6.75
MEASUREMENT 14	15.42	6.96	4.34	3.40	0.46	0.26	7.36	6.74
AVERAGE	15.68	7.17	4.43	3.27	0.51	0.30	7.33	6.63
STD DEV.	0.52	0.28	0.21	0.23	0.03	0.07	0.24	0.23
STD./| AVG.|	0.03	0.04	0.05	0.07	0.07	0.23	0.03	0.04

Table 3. ADCP reading from WinRiver II selected output for Site 2.

TRANSECT	TOTAL Q	TOP Q	MEAS. Q	BOTTOM Q	LEFT Q	RIGHT Q	WIDTH	TOTAL AREA
	ft³/s	ft³/s	ft³/s	ft³/s	ft³/s	ft³/s	ft	ft²
MEASUREMENT 18	10.96	3.33	5.76	2.04	-0.37	0.20	6.11	8.69
MEASUREMENT 19	12.38	3.81	6.44	2.25	-0.36	0.25	5.92	8.29
MEASUREMENT 20	11.81	3.62	6.23	2.13	-0.34	0.17	6.21	8.70
MEASUREMENT 21	11.96	3.75	6.12	2.25	-0.34	0.18	6.13	8.47
AVERAGE	11.78	3.63	6.14	2.17	-0.35	0.20	6.09	8.54
STD DEV.	0.60	0.21	0.28	0.10	0.02	0.04	0.12	0.20
STD./| AVG.|	0.05	0.06	0.05	0.05	0.04	0.18	0.02	0.02

c. *What are the expected post-project seepage/leakage losses and how were these estimates determined (e.g., can data specific to the type of material being used in the project be provided)?*

The expected post-project seepage/leakage losses can reasonably be assumed to be 0 percent, as the project involves replacing the entire open system with HDPE and PVC pipe that will allow for a piped and pressurized system. With this, it is expected that by piping and pressurizing the whole system, South Bench will realize the savings of the entire 2,629 acre-feet of water.

d. *What are the anticipated annual transit loss reductions in terms of acre-feet per mile for the overall project and for each section of canal included in the project?*

Records from the State of Utah database show that the average flow for the 2017 irrigation season was 19.14 cfs and the total number of irrigation days was 144 days. Using the water

loss data provided by the NRCS study, Table 6 below summarizes the estimated transit losses for the 2017 season.

Table 6 Summary of 2017 Estimated Transit Losses

Location	Flow (cfs)	Loss (% cfs)	Loss (cfs)	Distance (Miles)	Loss (Flow/Mile)	*Loss (AF/Mile)
NRCS Site 1 (Weber River Flume)	19.14					
NRCS Site 2	14.37	24.9%	4.8	1.49	3.20	914
End of the canal	10.02	30.3%	4.4	2.41	1.81	516

*144 Irrigation Days in 2017

1. *How will actual canal loss seepage reductions be verified?*

Although system water losses have not been measured and recorded outside of the verification provided by the NRCS report conducted in 2017, flow records for the South Bench canal river diversion exist all the way back to 1957. It is anticipated that once the canal is piped and most farms have converted to sprinkler irrigation, the South Bench river diversion volumes will significantly decrease as all seepage losses and irrigation inefficiencies are eliminated.

A new system meter will be installed to continue recording system flows. The on-farm systems to be funded through NRCS EQIP will include turnout metering for each user so that it will be a simple exercise to determine system losses. No losses are expected, as it will be a piped, pressurized system.

2. *Include a detailed description of the materials being used.*

The project will consist of the following primary components:

- **27" Plastic Irrigation Pipe (PIP) PVC 80 psi & fittings** – This is a common PVC specifically designed for agricultural irrigation practices. It will be produced in accordance with the Natural Resources Conservation Service NRCS 430-DD specification and dimensionally complies with Annex A1 of ASTM D2241.
- **32" High-Density Polyethylene (HDPE) DR 41 PIPE & fittings** – This is a common pipe material frequently used in water conveyance. It will be produced in accordance with ANSI/AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings.
- **Concrete Screening Structure** – The screen will be a Coanda style screen as commonly specified on the Bureau of Reclamation's Technical Service Center site. Construction will be of stainless steel wedge-wire. The screen will be housed in a reinforced concrete structure.
- **System Meter** – There will be a system meter located on the mainline pipe just downstream of the screening structure. The style will be a Doppler/Transit-Time/Ultrasonic Flow Meter. The meter station will include SCADA and the ability to upload real-time data to the internet.

- **Seamap Ampair UW100 Underwater Micro Hydro Turbine –** This is an underwater generator unit that will provide power to the Ultrasonic Flow Meter and associate SCADA equipment at the remote metering location.

E.1.2. Evaluation Criterion B – Water Supply Reliability

Address how the project will increase water supply reliability. Provide sufficient explanation of the project benefits and their significance. These benefits may include, but are not limited to, the following:

- *Does the project promote and encourage collaboration among parties in a way that helps increase the reliability of the water supply?*

  Yes, the users located in this project area want the project to happen, and so does Oakley City and others within Summit County. They know that they must do something to secure their water rights, reduce infiltration in the sewer system, and allow for water to stay up in the high Uinta lakes for recreation and fishing, and to help reduce sediment and nutrients that are flowing into the Weber River.

  - *Is there widespread support for the project?*

    There was a stockholder meeting held on March 6, 2018. The proposed project and anticipated costs were presented. Over 90 percent of the stockholders were present at the meeting. Voting was nearly unanimous in favor of the project.

  - *What is the significance of the collaboration/support?*

    Oakley City, Trout Unlimited, Kamas Valley Conservation District, NRCS, shareholder, residents, and others are in support of this long overdue project. The impact that this project will have on the rural community of Oakley City and the irrigators is significant for two fundamental reasons: 1 - reduction in the volume of water that is flowing into the Oakley City treatment plant and sewer collection system and 2- the amount of water that is being lost from the system that could be used to water crops and produces hay and feed for livestock of the farmers and ranchers of South Bench.

    These two reason along with others have brought planning, conversation, and change that has been far too long in coming. The benefits of this support have moved far beyond South Bench Irrigators and Oakley City. It has now become part of an effort to improve fish passage and protect habitats for the Bonneville cutthroat trout and bluehead sucker though water efficiency projects. It also has also developed a relationship with water quality groups to help reduce sediment within the Weber River and Rockport Reservoir. There was a time this would have never been a conversation that could have been undertaken but drought, growth, water needs, and partnerships have developed a team of people working towards common goals.

  - *Is the possibility of future water conservation improvements by other water users enhanced by completion of this project?*

    Yes, Oakley City has expressed interest in the implementation of this project. The city will be conducting a feasibility study to consider pressurized irrigation throughout the city. The pressurization of the South Bench system, which runs

through the city, presents an excellent opportunity for the city to implement a secondary water system.

- *Will the project make water available to address a specific water reliability concern? Please address:*
  - *Explain and provide detail of the specific issue(s) in the area that is impacting water reliability, such as shortages due to drought, increased demand, or reduced deliveries.*
    The main water reliability concerns that the project will address are seepage, drought, and the age and condition of the existing irrigation canal system.

    Seepage – Because the system is comprised of open ditches, and a portion of the system located on an elevated terrace, above an existing floodplain, and constructed in highly permeable, unconsolidated surficial deposits, seepage occurs alongside the highway, causing an estimated 2,820 acre-feet out of the 5,874 diverted over the course of the irrigation season to be lost – a 48 percent water loss.

    Drought – Over the past six years, Summit County has had some of the driest summers, accompanied by scorching temperatures and wildfires. Local farmers and ranchers are beginning to struggle to make ends meet, and hay harvest has been down over the past six years due to the drought. South Bench has had to reduce watering times during the most critical irrigation months of the season, which is having a real impact on the area farmers and ranchers.

    Age and condition of existing irrigation canal system – The canal is unlined with constant seepage, especially where the canal is elevated and paralleled with the road. This section leaks and can overtop when the canal is full, causing water to run alongside the highway. The lower two miles of the canal, where all the irrigation occurs, is narrow and relies on a partial flume for flow measurement to the user.

  - *Describe where the conserved water will go/how it will be used. Will the project directly address a heightened competition for finite water supplies and over-allocation (e.g., population growth)? Will it be left in the river system?*
    It is anticipated that much of the conserved water will still be used by irrigation users located within the South Bench service area. In addition to water rights to the natural flow of the Weber River, South Bench owns shares of storage water in the Fish Lake system. Because of the repeated water losses and drought, South Bench has often had to start using their storage water as early as July when the river flow starts to drop. Once the storage water is gone, the irrigation season can come to an end. This can happen during the most critical irrigation months of the season and is having a real impact on the area farmers and ranchers. By eliminating seepage losses, it is expected that the storage water may not need to begin being used until August. This will allow South Bench to continue irrigating throughout the entire growing season. Greater water reliability, by way of a newly piped and pressurized system, will afford users increased watering times to maintain crops, pastures, and livestock better.

As an immediate result of this project, it is anticipated that the water will be left in Fish Lake storage and within the river system for an extended period of time, especially during the river's flood and high-water stages.

- *Describe how the project will address the water reliability concern?*

South Bench's water reliability concerns, previously addressed, include drought and seepage losses. Drought is not something they can do much about, but seepage loss is a concern that can be addressed and corrected. Piping and pressurizing the entire canal system will eliminate the water losses and will allow for the application of sprinkler irrigation systems on the farms within the service area. Upon completion of the proposed project, opportunities for storage water to be used later in the season can extend the irrigation season and lessen many of the conflicts currently happening with recreational water users on Fish Lake.

- *Will the project help to prevent a water-related crisis or conflict? Is there frequently tension or litigation over water in the basin?*

Yes, just last year (2017), eight reports of waterbodies plagued by algal blooms were documented. According to the Division of Water Quality, Rockport Reservoir was one of those documented water bodies. This project will create a pressurized system that will allow irrigators to implement sprinklers in place of flood irrigation to reduce the amount of nutrients and sediment that end up in the river and associated reservoirs. The reduction of the amount of sediment that reaches the Weber River and Rockport Reservoir is an issue that South Bench is willing to help address by finding a solution to reduce nitrogen and phosphorus pollutants that come from erosion and agricultural runoff, and from fields that still use flood irrigation. The piping and pressurization of the South Bench canal system is a significant step in realizing this goal and preventing the algal blooms that have been plaguing multiple waterbodies.

As indicated earlier, South Bench receives its storage water from Fish Lake, a favorite summertime fishing lake high in the Uinta Mountains. This Lake demands sufficient and reliable water storage capacity to keep the fish habitats viable all summer long. In the past, fisherman have damaged headgates in order to reduce the amount of water being released from Fish Lake. This happens every time South Bench starts to use their storage water from the Lake. Over the past several years, the tension has heated up between recreational water users and irrigators. Water shortages due to drought, seepage losses, and inefficient water systems have all contributed to the tension that exists over the levels of water available during irrigation season for both irrigation and recreational water uses. South Bench's efforts to provide and implement solutions to water loss that affect Fish Lake will work to reduce the multiple conflicts that have caused tension over Utah's high-demand water resources over the past few years.

- *Provide a description of the mechanism that will be used, if necessary, to put the conserved water to the intended use.*

  The water conserved through the elimination of seepage, spillage, and evaporation will be delivered to the irrigated land through the new piped, pressurized system. In other words, the same mechanism that conserves the water will also deliver the conserved water to the crops.

  The water conserved through increased irrigation application efficiencies will be delivered to the crops through the same piped system and applied to the crops through the new on-farm sprinkler systems. Again, the same mechanism that provides the means for conservation by increasing application efficiency will deliver the conserved water to its ultimate destination, and be used for irrigating crops.

- *Describe the roles of any partners in the process. Please attach any relevant supporting documents.*

  Oakley City will expedite any permits needed for construction within city limits as indicated in their letter of support. Trout Unlimited has made application to help provide funding for fish passage through WRI as stated within the budget area. The funding is pending notification.

- *Indicate the quantity of conserved water that will be used for the intended purpose.*

  The quantity of conserved water that will be used for irrigating land within the South Bench service area is expected to be the full 2,629 acre-feet saved by piping and pressurizing the full length of the South Bench canal system. Water users have already had to cut back on water times due to seepage and drought. However, once farmers and ranchers implement sprinkler irrigation, more water will be conserved and left in the Weber River.

- *Will the project benefit Indian tribes?*

  No, the project will not directly benefit any tribes. However, all water conservation in the Weber River Basin will have some sort of benefit, primarily through the drought years.

- *Will the project benefit rural or economically disadvantaged communities?*

  Yes, the project will benefit rural communities served by the South Bench canal system, which includes rural areas in the unincorporated county just outside Oakley City limits.

- *Will the project benefit species (e.g., federally threatened or endangered, a federally recognized candidate species, a state listed species, or a species of particular recreational, or economic importance). Please describe the relationship of the species to the water supply, and whether the species is adversely affected by a Reclamation project.*

  The project does not have any anticipated adverse effects on any threatened and endangered species, state sensitive species, wetlands and other jurisdictional waterways. From past environmental reviews done in the area we are aware of the Yellow-billed cuckoo and Canada lynx. Both species require dense vegetation and undisturbed habitat. The proposed project actions are unlikely to take place in and/or disturb habitat for either species. A number of migratory birds exist in the general vicinity and nests may be located in or adjacent to project disturbance areas. Mitigation measures, such as timing

vegetation clearing to take place outside of the migratory birds' nesting season and preconstruction nest surveys, will be conducted to minimize any potential impacts to nesting birds.

- *Will the project address water supply reliability in other ways not described above?*
  No

E.1.3. Evaluation Criterion C – Implementing Hydropower

If the proposed project includes construction or installation of a hydropower system, please address the following:

***Describe the amount of energy capacity**. For projects that implement hydropower systems, state the estimated amount of capacity (in kilowatts) of the system. Please provide sufficient detail supporting the stated estimate, including all calculations in support of the estimate.*

The project will increase the production of hydropower by constructing an underwater micro-hydro turbine station that will produce 100 W of energy. The power will be used at the diversion and measuring station on the canal to meet the power needs of the system at that remote location.

***Describe the amount of energy generated.** For projects that implement hydropower systems, state the estimated amount of energy that the system will generate (in kilowatt hours per year). Please provide sufficient detail supporting the stated estimate, including all calculations in support of the estimate.*

The underwater micro-hydro turbine station that will produce 2.4 kWh of energy per day. The small hydro turbine will be installed in the channel just upstream of the screening structure where the flows will be the highest in the system prior to spilling diverted river water back to the river before the screening structure. This will maximize the energy production. The channel will be narrowed at that point to ensure a velocity of at least 13.5 feet per second. This velocity will produce 2.4kWh of energy per day. South Bench has a water right for 245 days.

$$2.4kWh\ x\ 245\ days\ = 588\ kWh/year$$

***Describe any other benefits of the hydropower project.** Please describe and provide sufficient detail on any additional benefits expected to result from the hydropower project, including:*

- *Any expected reduction in the use of energy currently supplied through a Reclamation project*
  No expected reduction is known of at this time.

- *Anticipated benefits to other sectors/entities.*
  Reduction in the expense to run power from the local power grid to the meter that would be required for this system.

- *Expected water needs, if any, of the system*
  There won't be any additional water needed beyond the required flow through the system for irrigation.

E.1.4. Evaluation Criterion D – Complementing On-Farm Irrigation Improvements

If the proposed project will complement an on-farm improvement eligible for NRCS assistance, please address the following:

- *Describe any planned or ongoing projects by farmers/ranchers that receive water from the applicant to improve on-farm efficiencies.*
    - *Provide a detailed description of the on-farm efficiency improvements.*
      Planned on-farm efficiency improvements include eliminating flood irrigation and implementing sprinkler irrigation. This is directly supported by the proposed project, which will pipe and pressurize the entire South Bench canal system, the first step to realizing this on-farm irrigation improvement.
    - *Have the farmers requested technical or financial assistance from NRCS for the on-farm efficiency projects, or do they plan to in the future?*
      Upon completion of the proposed WaterSMART project, farmers will then be eligible to request technical or financial assistance from NRCS for implementing sprinkler irrigation. Many farmers have already contacted NRCS regarding eligibility for EQIP funding for the construction of laterals and on-farm sprinkler systems.
    - *If available, provide documentation that the on-farm projects are eligible for NRCS assistance, that such assistance has or will be requested, and the number or percentage of farms that plan to participate in available NRCS programs.*
      A number of farmers have already contacted NRCS. Please see Attachment 4 Signature Page of Interest in NRCS EQUIP for the signatures and acreage. The farmers that have signed include 50+ percent of the shareholders.
    - *Applicants should provide letters of intent from farmers/ ranchers in the affected project areas.*
      See Attachment 4 for the signatures and acreage.
- *Describe how the proposed WaterSMART project would complement any ongoing or planned on-farm improvement.*
    - *Will the proposed WaterSMART project directly facilitate the on-farm improvement? If so, how? For example, installation of a pressurized pipe through WaterSMART can help support efficient on-farm irrigation practices, such as drip-irrigation.*
      The proposed WaterSMART project will directly facilitate the on-farm improvements. Sprinkler irrigation will be made possible by the piping and pressurization of the South Bench canal system. The new alignment is different from the alignment of the existing canal system. It brings the pressurized line closer to many of the farms making easier and less expensive to construct the laterals required to bring the water to the farms. The irrigators will be responsible for seeking NRCS funding to implement this on-farm irrigation practice.

OR

- *Will the proposed WaterSMART project complement the on-farm project by maximizing efficiency in the area? If so, how?*

  Yes. There are only a two irrigators that are sprinkling now and all of the land owners have seen the success and yields that have come from sprinkling the ground. After just two years of seeing the number of hay cuts that these two farmers were able to get the other farmers were sold on investing in sprinkling systems themselves. But the cost to pump was a big drawback to coming on board. However, with the development of this project the system will be fully pressurized and will allow all the water users to install sprinkling systems that is run by a gravity fed pressurized pipe without any required pumping equipment or expenses.

- *Describe the on-farm water conservation or water use efficiency benefits that would result from the on-farm component of this project.*
  - *Estimate the potential on-farm water savings that could result in acre-feet per year. Include support or backup documentation for any calculations or assumptions.*

    Greater water savings will be realized when irrigation practices are changed from flood irrigation to sprinkler irrigation, as farmers and ranchers take advantage of the newly piped and pressurized delivery system. Application efficiency for flood irrigation is approximately 50 percent, while sprinkler irrigation application efficiency is around 75 percent. The following table summarizes water loss associated with irrigation application inefficiencies.

2017 IRRIGATION INEFFICIENCIES

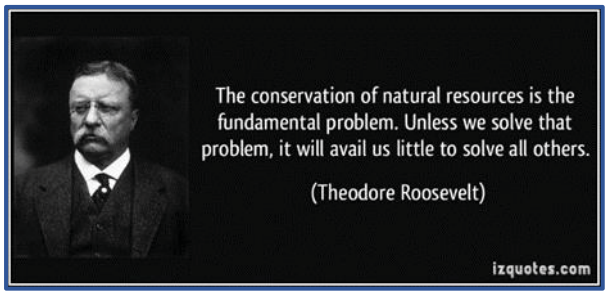
Annual Volume Diverted	5477	AF
Annual Volume Lost (5477 x 48%)	2629	AF
Annual Volume Delivered	2848	AF
Assumed Flood Irrigation Efficiency	50%	
Assumed Sprinkler Irrigation Efficiency	75%	
Flood vs Sprinkler Efficiency Difference	25%	
Total Acres Irrigated	697	
Total Acres Flooded	559	
% Acres Flooded	80%	
Water Lost to Inefficient Application (2848 x 80% x 25%)	**570**	**AF**

E.1.5. Evaluation Criterion E – Department of the Interior Priorities

Address those priorities that are applicable to your project. Points will be allocated based on the degree to which the project supports one or more of the priorities listed, and whether the connection to the Priority (is) is well supported in the proposal.

Creating a conservation stewardship legacy second only to Teddy Roosevelt

Theodore Roosevelt, in a speech in Memphis, Tennessee in 1907 said, *"The conservation of natural resources is the fundamental problem. Unless we solve that problem, it will avail us little to solve all others."* This statement of conservation is so vital when it comes to the limited water resources in Utah. With Utah being the second driest state in the nation, drought and growth are quickly teaching this state that you have to work towards conservation constantly. The proposed project will add to Teddy Roosevelt's conservation stewardship legacy by not only identifying opportunities but by helping to implement DOI strategies. The project will help expand water capacity and resolve conflicts that affect South Bench water delivery efficiency, waterbodies supplying the South Bench delivery system, Reclamation Projects, and recreational water users.



Expand Capacity

Piping and pressurizing the South Bench canal system is expected to produce a quantifiable water savings of 2,629 acre-feet of water. An additional 570 acre-feet of water savings is anticipated as farmers and ranchers change from flood irrigation to sprinkler irrigation. These combined water savings are expected to leave water in the Weber River, and by extension, the Echo, Rockport, and Smith and Morehouse reservoirs, and the upper lakes of the Uintah Mountains, including Fish Lake, for longer during the irrigation season; thereby expanding capacity for better water savings and resolving the following water conflicts:

Resolve conflicts that affect South Bench water delivery efficiency

The conflict specifically associated with the South Bench irrigation system is water loss due to seepage, drought, and the age and condition of the system. This has caused worry among many farmers and ranchers who rely on this valuable water resource for crop and livestock production. The proposed project will work to overcome this worry by piping the entire South Bench canal system. Doing so will rid the system of its old, unreliable delivery system, and enclose ditches to prevent the seepage and evaporation of valuable water resources. Further, pressurizing the system will allow those same farmers and ranchers to implement on-farm improvements, such as sprinkler irrigation, to further save on water and produce even better crops and livestock.

Resolve conflicts that affect waterbodies supplying the South Bench delivery system

However, South Bench's canal issues affect water reliability far beyond that of South Bench's delivery system. Water losses have flooded the basements of residential homes, infiltrated the

sewer system, and increased nutrient loading in the Weber River – caused by flood irrigation. The piping and the pressurization of South Bench's irrigation system, combined with farmer efforts to implement sprinkler irrigation, will significantly reduce the water conflicts that threaten the South Bench service area, and by extension, the Weber River, the Echo, Rockport, and Smith and Morehouse reservoirs, and the upper lakes of the Uintah Mountains, including Fish Lake.

Resolve conflicts that affect Reclamation Projects

Within the Rockport Reservoir and Echo Reservoir TMDL Implementation Plan (TMDL Plan), it states that "Sprinkler systems apply less water at rates that allow water to infiltrate the soil, thereby reducing irrigation return flow generated from surface runoff." The proposed South Bench project will pipe and pressurize the ditch, which will allow irrigators to implement sprinkler irrigation to more efficiently apply water to their crops. This will significantly reduce water loss and positively affect the Lower Weber River and Rockport Reservoir by decreasing the amount of return flow carrying large amounts of fertilizer, sediment, and other debris to the river. The fertilizer, sediment, and other debris carried in the river and deposited in the Reservoir are the sores of many conflicts between water quality advocates, Reclamation, local cities, recreational water users, and others. As algae bloom become the norm and TMDL levels sore, it creates a systematical breakdown of communication between the groups as blame is directed towards the local agricultural groups. These are often the groups with the least amount of resources to make the changes necessary, and this type of tension could have a significant impact. This project can reduce such tension and help implement the changes necessary to start on a road that will reduce the contribution made to the TMDL levels by South Bench irrigators.

Resolve conflicts that affect recreational water users

The Echo, Rockport, Smith and Morehouse Reservoirs, and Fish Lake are all popular fishing and watersports grounds. These types of recreational activities demand sufficient and reliable water storage capacity. Fish Lake is a popular summertime fishing lake high in the Uinta Mountains and requires adequate and reliable water storage capacity to keep the fish habitats viable all summer long. Water shortages due to drought, seepage, old inefficient water systems, and flood irrigation have all contributed to the tension that exists over the levels of water available during irrigation season for both irrigation and recreational water uses. South Bench's efforts to provide and implement solutions to the water loss that affects Fish Lake and many reservoirs will expand capacity and reduce multiple conflicts that have caused tension over Utah's high-demand water resources over the past few years.

Utilizing our natural resources

The underwater micro-hydro turbine station that will be constructed will use natural stream flow in the canal to produce power for the meter and SCADA that would otherwise require the construction of a power line and the consumption of energy from the power grid.

Restoring trust with local communities

Previously, each year when water was delivered through the canal, water losses have had a significant impact on local communities, residential basements, water quality, and recreation. This project will begin to restore trust and reduce conflict by alleviating burdens placed upon

others due to water losses in the South Bench canal system. The development of the South Bench Water Conservation and Management Plan and the development of this proposal sparked a dialogue between South Bench irrigators, Oakley City, Trout Unlimited, Utah Water Quality, the NRCS, and others that would not have transpired under any other circumstance. The groups have come together in trust and to work toward common goals, including:

- Water conservation
- Implementing greater watering efficiency methods
- Developing fish screening
- Holding water in the upper lakes longer for recreation expansion
- Working toward better water quality in the river and reservoir

Modernizing our infrastructure

The proposed project extends a public/private partnership between South Bench, Reclamation, Trout Unlimited, and DWRe. This partnership will allow South Bench to modernize their system and bring them into the twenty-first century. The development of this project will:

- Cut maintenance times and solve issues related to weeds, debris, and sediment
- Allow real-time water tracking and metering
- Reduce water losses and conflicts with recreational water users, local residents, and Oakley City
- Provide opportunities to sprinkle farmland and increase irrigation season and yields
- Facilitate power generation to run meters and possibly sell excess power to local farmers
- Reduce the need for pumps to run existing sprinkler systems
- Enhance water quality efforts

E.1.6. Evaluation Criterion F – Implementation and Results

E.1.6.1. Subcriterion No. F.1 – Project Planning

Does the applicant have a Water Conservation Plan and/or System Optimization Review (SOR) in place?

Please self-certify, or provide copies of these plans where appropriate to verify that such a plan is in place.

South Bench has prepared a Water Conservation and Management Plan to help guide them into the future. This plan was partially funded through a grant from the Utah Division of Water Resources. The Plan concluded with a recommendation to the pipe and pressurized the ditch. Piping the ditch will eliminate the enormous seepage losses currently experienced, and it will allow irrigators to implement sprinkling systems, and thereby apply water more efficiently and realize higher crop yields. The preliminary cost estimate for this work is $2.13M. The Plan includes a funding plan to seek federal grants and state loans to construct the project. For a draft of this plan, see Attachment 5 Water Conservation and Management Plan

Provide the following information regarding project planning:

1) *Identify any district-wide, or system-wide, planning that provides support for the proposed project. This could include a Water Conservation Plan, SOR, or other planning efforts done to determine the priority of this project in relation to other potential projects.*

   The initial planning for the South Bench canal system began with a water loss study performed by the NRCS. This water loss study provided all the calculations and

documentation necessary to understand the system better, identify priorities, and to come up with alternative scenarios for dealing with issues (water losses due to seepage, drought, age and condition of canal system) facing the South Bench system.

Under the working Water Conservation and Management Plan, South Bench outlines two alternatives for piping and pressurizing the system. To determine which alternative would be most beneficial, South Bench ranked the selected alternative on the following criteria:

a. The chosen alternative must be economical
b. It must supply the water at the most beneficial location relative to the land being irrigated
c. It must have the smallest impact on existing farms
d. It must include water and energy savings

The proposed WaterSMART project conforms to each of these criteria, as described below.

2) *Describe how the project conforms to and meets the goals of any applicable planning efforts, and identify any aspect of the project that implements a feature of an existing water plan(s).*

The proposed alternative to piping and pressurizing the South Bench system is less expensive than the other alternatives and includes a new alignment that will be straighter and more efficient, requiring less pipe. The new alignment will also deliver the water to a more centralized location relative to the acreages being irrigated. It will follow existing property lines, fences and existing access roads, creating a smaller impact on the farmable ground. It will include an estimated water savings of 3,199 acre-feet from seepage losses, the implementation of sprinkler systems, and will conserve energy by eliminated pumps used for sprinkling 138 acres. All aspects of the proposed WaterSMART project utilize features of South Bench's working Water Conservation and Management Plan.

E.1.6.2. Subcriterion No. F.2 – Performance Measures

Provide a brief summary describing the performance measure that will be used to quantify actual benefits upon completion of the project (e.g., water saved or better managed, energy generated or saved). For more information calculating performance measure, see Appendix A: Benefit Quantification and Performance Measure Guidance.

This project has meters within the system that will be used to measure water use within the main diversion system. An inflow/outflow test over the irrigation season will be done to determine water what enters the system and what water leaves the system. The water will be metered to account for the volume/flow rates. These will be compared with the historical volumes and flow rates diverted from the river and will give a comparison by which to verify water savings. After the pipe is installed, it will be filled with water and all of the turnouts closed. The system meter will be checked to verify that it is reading zero and that there are no losses in the closed system.

An assessment of the estimated power from the hydro turbine will be developed with a projected timeline (May-August) in which the turbine would be in operation to calculate the amount of kWh that will be generated. The performance measures will be based on calculations that make a comparison of the actual number of kWh that will be recorded on the meter. A reading of the

meter will be made monthly and recorded. Then, a calculation and comparison will be established to show the performance measures. These monthly reports will be summarized annually in October and reported to the South Bench Board. An evaluation of the energy being sold to the local farmers will be reported on and evaluated.

E.1.7. Evaluation Criterion G – Nexus to Reclamation Project Activities

Is the proposed project connected to Reclamation project activities? If so, how? Please consider the following:

- *Does the applicant receive Reclamation project water?*
  No.
- *Is the project on Reclamation project lands or involving Reclamation facilities?*
  No, not directly. However, the water that is conserved can maintain instream flows through the Weber River and facilitate the augmentation of water that is stored in Rockport Reservoir and eventually Echo Reservoir.
- *Is the project in the same basin as a Reclamation project or activity?*
  Yes, the project is located in the Weber River Basin where a number of Reclamation projects are located.
- *Will the proposed work contribute water to a basin where a Reclamation project is located?*
  Yes, as the project conserves water and reduces losses, South Bench can maintain instream flows within Weber River, which will help contribute to the storage and potential flows in the Rockport, Echo, and Smith and Morehouse Reservoirs. It will also allow for and enhance habitats and recreational opportunities in the high Uinta lakes and within the Weber River Basin. Conserved water will be delivered through the Weber River to Rockport Reservoir, which is a Reclamation project.
- *Will the project benefit any tribe(s)?*
  No, the project will not directly benefit any tribes. However, all water conservation in the Weber River Basin will have some sort of benefit, primarily through the drought years.

E.1.8. Evaluation Criterion H – Additional Non-Federal Funding

State the percentage of non-federal funding provided using the following calculation: Non-Federal Funding divided by Total Project Cost.

$$\frac{1{,}145{,}730}{2{,}145{,}730} = \mathbf{53\%}$$

Project Budget

Funding Plan and Letters of Commitment

Describe how the non-Federal share of project costs will be obtained.

1. *How you will make your contribution to the cost-share requirement, such as monetary and/or in-kind contributions and source funds contributed by the applicant*

   South Bench has committed $140,360 from their cash reserve account and will request a loan from the Utah Division of Water Resources (DWRe) in May 2018 for $795,370. South Bench has a pending grant application with the Utah Department of Water Quality for $150,000 from their Non-point Source fund. If that grant is not awarded, the loan amount will be increased to cover the amount needed. A grant was awarded for our project by Trout Unlimited for $60,000 from the Watershed Restoration Initiative (WRI) program.

2. *Describe any donations or in-kind costs incurred before the anticipated Project start date that you seek to include as project costs. For each cost, identify:*

   There are no incurred in-kind project costs included in this project.

3. *Describe any funding requested or received from other Federal partners. Note: other sources of Federal funding may not be counted towards the required cost share unless otherwise allowed by statute.*

   N/A

4. *Describe any pending funding requests that have not yet been approved, and explain how the project will be affected if such funding is denied.*

   As stated above, a loan application will be submitted to DWRe within the next month. South Bench has been in communication with Water Resources, who funds more than 90 percent of submitted loan requests. For a project with such significant water and energy savings, South Bench feels confident that they will receive the loan from DWRe. If the funding were to be denied, they would look to the open market.

   South Bench has a pending grant application with the Utah Department of Water Quality for $150,000 from their Non-point Source fund. If that grant is not awarded, the loan amount requested from DWRe will be increased to cover that amount.

Summary of Non-Federal and Federal Funding Sources

FUNDING SOURCES	***AMOUNT***
Non-Federal Entities	
Trout Unlimited/WRI Grant	$60,000.00
Utah Water Quality/Non-point Source Grant (Pending if not awarded will request additional loan funds)	$150,000.00
Utah Division of Water Resource Loan (Working on it)	$795,370.00
Recipient Funding	$140,360.00
Non-Federal Subtotal	**$1,145,730.00**
Other Federal Entities	
Other Federal Subtotal	**$0.00**
Requested Reclamation Funding	**$1,000,000.00**
Total Project Funding	**$2,145,730.00**

Budget Proposal

Budget Proposal

Budget Item Description	Computation		Quantity Type	Total Cost
	$/Unit	Quantity		
Salaries & Wages				**$0.00**
Fringe Benefits				**$0.00**
Travel				**$0.00**
Equipment				**$0.00**
Supplies and materials				**$0.00**
Contractual /Construction				**$2,135,730**
Engineering				
Engineering & Design 8%	$143,000	1	EA	$143,000
Construction Management 8%	$143,000	1	EA	$143,000
Environmental Compliance	$62,000	1	EA	$62,000
Construction				
Mobilization	$100,000	1	EA	$100,000
27 inch Pipe PVC 80 psi	$58.50	14,850	LF	$868,700
32 inch HDPE DR 41 Pipe	$80.50	4,910	LF	$395,300
Fittings	$90,000	1	LS	$90,000
Screening Structure	$130,000	1	EA	$130,000
Hydro Turbine	$5,500	1	EA	$5,500
Meter Station	$4,000	1	EA	$4,000
Clear & Grub	$3.50	19,760	LF	$69,160
Fill ditch through fields	$3.00	12,000	LF	$36,000
Highway Crossing	$71.00	120	EA	$8,520
Imported Fill	$16.50	4,500	TON	$74,250
Furnish Foundation Type A5	$21.00	300	TON	$6,300
Other				**$10,000**
Reclamation Review Environmental	$10,000	1	EA	$10,000
Total Direct Costs				**$2,145,730**
Indirect Costs				
Type of rate	Percentage	$base		**$0.00**
Total Estimated Project Costs				**$2,145,730**

Budget Narrative

Salaries and Wages

No separate salaries or wages outside of contractual costs will be included.

Fringe Benefits

No separate fringe benefits will be included.

Travel

No separate travel costs will be included.

Equipment

No separate equipment costs will be included. All of these costs are included in the contractual contracts.

Materials and Supplies

No separate materials and supplies costs will be included. All of these costs are included in the contractual contracts.

Contractual

In order to determine unit costs, which were included in the cost estimate for this project, South Bench relied upon contract unit prices from similar projects recently completed for other similar projects. South Bench follows the State of Utah procurement process for procuring a contractor for this project. They will bid the construction portion of the project to several prequalified construction companies. The contractual costs shown are estimates for each of the components to furnish and install all the pipe and equipment. Generally, the low bidder will be selected based on a determination of acceptable qualifications.

J-U-B Engineers, Inc. has been working with South Bench for over two years as they help them prepare their Water Conservation and Management Plan. They have been contracted to prepare the design and NEPA documents for this project. The contractual for the proposed project will include design, construction engineering, NEPA, mobilization, and installing the pipe, hydro, meter station, screening structure, fittings, and other miscellaneous items listed within the budget.

The Engineering fees have been evaluated to ensure that they are fair and reasonable based on the Bureau of Labor Statistics wage rates for engineers.

Environmental and Regulatory Compliance Costs

For the environmental document for this project, $10,000 in funds will be set aside for Reclamation to review the EA report. This is based on past set-asides that have been holding out on other similar contracts. It is expected that it will take $62,000 to evaluate the required information, prepare the report, and to update any changes required from reclamation after their review. The total ER cost is included as 4 percent of the project at $72,000. (The $10,000 for review is only an estimate. It is anticipated that it could take less based on past experience).

Other Expenses

The other expense that is expected for South Bench is the setting aside of $10,000 in funds for Reclamation to review the EA report.

Indirect Costs

No indirect costs will be part of the proposed project.

Total Costs

South Bench Portion: $1,145,730 Fed Portion: $1,000,000 Total: $2,145,730

Environmental and Cultural Resources Compliance

Will the proposed project impact the surrounding environment (e.g., soil [dust], air, water [quality and quantity], animal habitat)? Please briefly describe all earth-disturbing work and any work that will affect the air, water, or animal habitat in the project area. Please also explain the impacts of such work on the surrounding environment and any steps that could be taken to minimize the impacts.

Impacts will be those associated with piping and pressurizing the South Bench system. In the past, similar projects have had minimal impacts. The surface vegetation will be restored upon completion of the project.

Are you aware of any species listed or proposed to be listed as a Federal threatened or endangered species, or designated critical habitat in the project area? If so, would they be affected by any activities associated with the proposed project?

South Bench is not aware of any impacts concerning threatened or endangered species in this area.

Are there wetlands or other surface waters inside the project boundaries that potentially fall under CWA jurisdiction as "Waters of the United States?" If so, please describe and estimate any impacts the proposed project may have.

South Bench is not aware of any impacts to wetlands in this area.

When was the water delivery system constructed?

Many improvements have been made over the years. As part of the completed environmental document, the required historical documentation for the project willl be completed.

Will the proposed project result in any modification of or effects to, individual features of an irrigation system (e.g., headgates, canals, or flumes)? If so, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features completed previously.

In addition to the piping and pressurizing of the South Bench irrigation system, a new screening structure and system meter will be constructed, and the Parshall Flume will be removed. The existing diversion will remain unchanged, but the project will follow a modified and more efficient alignment than the existing canal, after crossing Highway 32.

Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places? A cultural resources specialist at your local Reclamation office or the State Historic Preservation Office can assist in answering this question.

A cultural resource inventory will be completed as part of the submitted environmental document.

Are there any known archeological sites in the proposed project area?

South Bench is not aware of any impacts to or locations of archeological sites.

Will the proposed project have a disproportionately high and adverse effect on low income or minority populations?

No, the project will not require a right-of-way or relocations from adjacent properties and will have no impact on residential uses within the study area.

Will the proposed project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands?

No.

Will the proposed project contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area?

No.

Required Permits or Approvals

Applicants must state in the application whether any permits or approvals are required and explain the plan for obtaining such permits or approvals.

Summit County Conditional Use Permit – The County requires a conditional use permit for any pipe over 16 inches. This will require meeting with the planning commission to request the permit. This is a standard permit granted by the county for the installation of larger diameter piping within the county.

Summit County Excavation Permit – Summit County Engineering requires this permit for any construction within the county. This will require a review of the design plans by the county's engineering department. This is a typical permit for any construction activity.

Oakley City Excavation Permit – Oakley City Public Works requires this permit for any construction within the city. This is a typical permit for any construction activity. The city has committed to expedite this permit and wave the fee.

Letters of Support

Include letters of support from interested stakeholders supporting the proposed project.

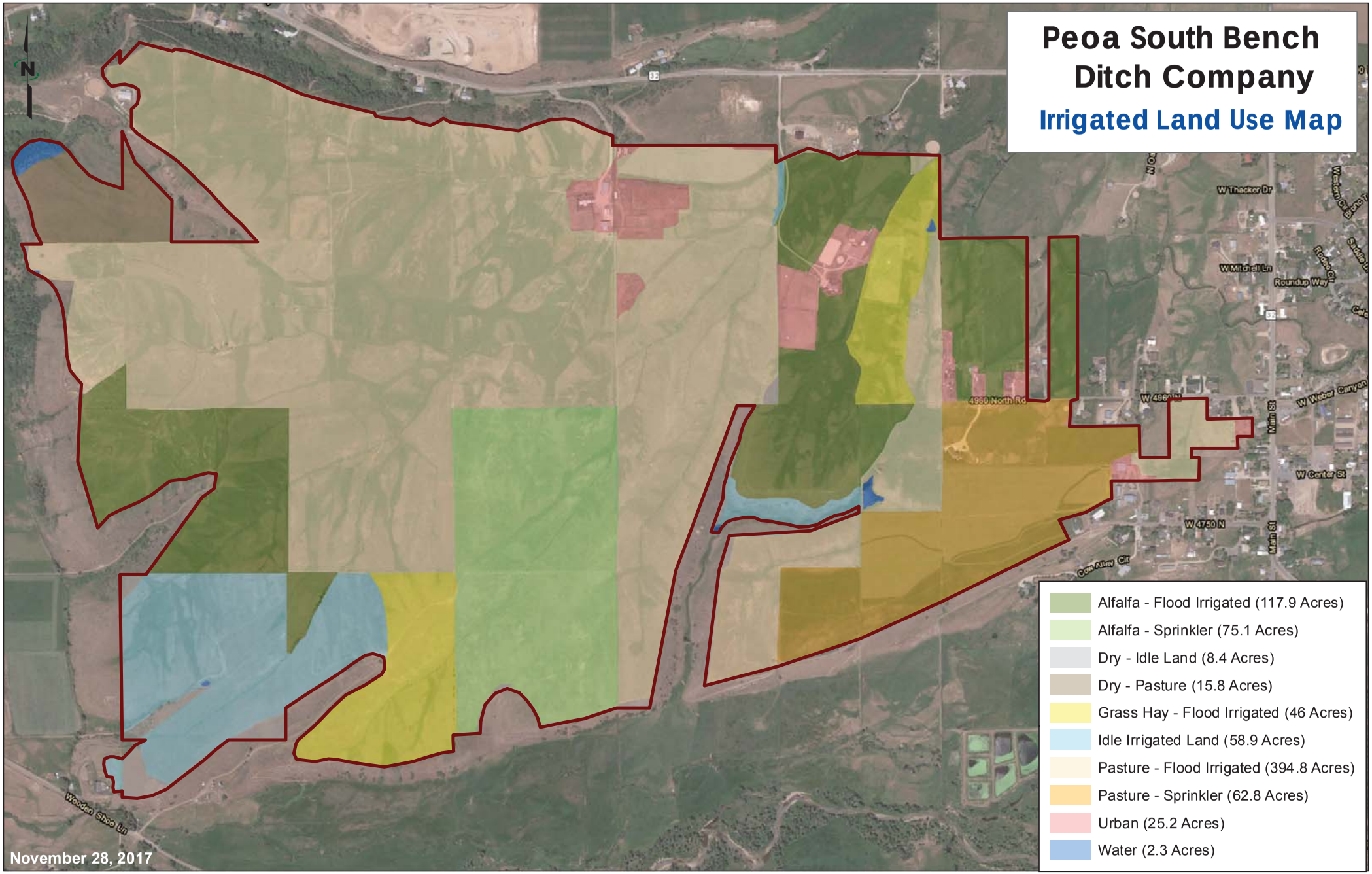
Letters of support have been included from the following, found in Attachment 6 Letters of Support:

Trout Unlimited
Oakley City
Kamas Valley Conservation District
Natural Resource Conservation Service NRCS

Official Resolution

Include an official resolution adopted by the applicant's board of directors or governing body. The official resolution may be submitted up to 30 days after the application deadline.

The Official Resolution for the Peoa South Bench Canal and Irrigation Company (South Bench) Piping and Small Hydro Project will be submitted within 30 days after the application deadline.


Peoa South Bench Ditch Company
Irrigated Land Use Map
N
W Thacker Dr
W Mitchell Ln
Roundup Way
W Weber Canyon
W Center St
W 4750 N
Main St
4980 North Rd
Wooden Shoe Ln
Alfalfa - Flood Irrigated (117.9 Acres)
Alfalfa - Sprinkler (75.1 Acres)
Dry - Idle Land (8.4 Acres)
Dry - Pasture (15.8 Acres)
Grass Hay - Flood Irrigated (46 Acres)
Idle Irrigated Land (58.9 Acres)
Pasture - Flood Irrigated (394.8 Acres)
Pasture - Sprinkler (62.8 Acres)
Urban (25.2 Acres)
Water (2.3 Acres)
November 28, 2017

November 7, 2017

Mr. Dave Lake
President
Peoa South Bench Canal
P.O. Box 32
Oakley, Utah 84055

Dear Mr. Lake:

As requested, following is the South Peoa Bench Canal Water Loss Study.

If you have any questions or if you see any corrections that need to be made, please contact me at 801-524-4573 (work), 801-419-9661 (cell) or email nathaniel.todea@ut.usda.gov.

Sincerely,

NATHANIEL TODEA

Digitally signed by NATHANIEL TODEA
Date: 2017.11.07 13:34:32 -07'00'

NATHANIEL TODEA
State Hydraulic Engineer

cc:
Bronson Smart, State Conservation Engineer, NRCS, Salt Lake City, Utah
Don Ashby, Area North Conservationist, NRCS, Ogden, Utah
Craig McKnight, District Conservationist, NRCS, Coalville, Utah
Jonathan Bingham, Area North Engineer, NRCS, Ogden, Utah

South Peoa Bench Canal Water Loss Study

Nathaniel Todea, USDA NRCS Utah Hydraulic Engineer
September 28, 2017

A water loss study was conducted on the South Peoa Bench Canal, which extends from the Weber River through the town of Oakley, Summit County, Utah. The canal receives water from the Weber River. See Figure 1 for location map. On July 27, 2017 Nathaniel Todea (Utah NRCS State Hydraulic Engineer), Ryan Pierce (Utah NRCS GIS Specialist), and Dee Cummings (Utah NRCS Administrative Assistant) met with Brian Deeter, JUB Engineer, and Dave Lake with the South Peoa Bench Canal to determine measurement locations and the extent of the canal.

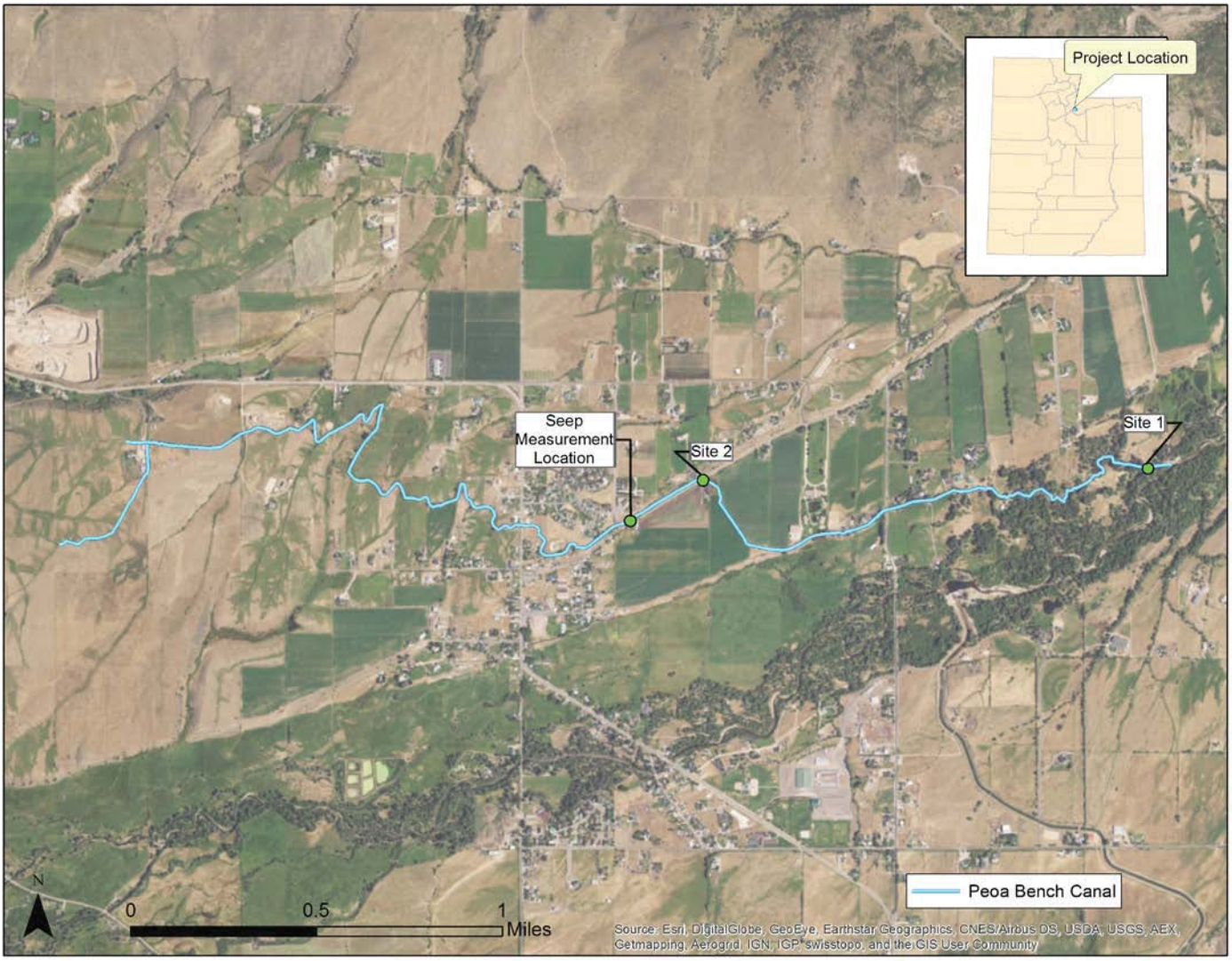


Figure 1. General location and vicinity map of South Peoa Bench Canal with measurement locations.

As part of this study an Acoustic Doppler Current Profiler (ADCP) – Streampro was used to measure canal flows at two different reach locations. It should be noted that the ADCP has a limits error range of 4%. Measurements are outside the range of error. The estimated flows from the ADCP seem to be accurate through observation and experience of users. A seep was observed along a terrace that ran parallel to the canal and adjacent to the highway. . Measurements were taken at the seepage using a bucket and timer to estimate losses.

Located in Table 1 is the average measurement reading from the ADCP as well as the differences, distance, and latitude and longitude from two measurement locations. Site 1, the upper section at a flume below the diversion from the Weber River, was the most upstream measurement. Site 2, the next downstream measurement location, is approximately 1.49 miles downstream of Site 2. Site 2 is the last measurement site of the 4.3 mile canal system.

The remaining reach was not measured, but a seep was measured just downstream of Site 2, 1188 feet downstream. A 5-gallon bucket was used to capture discharge and recorded with time. Two measurements from the seep were taken. The first seep measured 3 gallons in 2 minutes and the second measured 1.25 gallons in 2 minutes. This totals approximately 2.75 gpm or 0.006 cfs. Other seeps were estimated in the immediate vicinity and using the two measurement sites as surrogates, an estimate of 4.5 to 6 gpm was noted for all seep losses. This seep seemed to be the only seep identified, but due to the high vegetation in the area other seeps may be present. Note the seep that was observed could be a result of piping by the root system of the riparian foliage (which is a concern.) This could escalate and a repair is recommended. This seep is present due to the short distance between the canal and the higher elevation difference between the canal and floodplain - where the canal is transitioning between the floodplain to a terrace.

Located in Table 2 and 3 are the ADCP measurement information with selected datasets that include measured and interpolated discharges.

Photo of site locations of Site 1 is located in Figure 2, Site 2 is located in Figure 3, and Seep Measurement location is located in Figure 4.

Table 1. Reaches with individual sites, with discharges, location, and losses per mile.

SECTION REFERENCE	AVERAGE DISCHARGE (CFS)	CFS Δ	DISTANCE BTW Δ	CFS/MILE LOSS(-) GAIN(+)	LONGITUDE	LATITUDE
SITE 1 UPSTREAM	15.68				-111.2681	40.7206
SITE 2 DOWNSTREAM	11.78	-3.9	7867	-2.62	-111.291	40.7201

Table 2. ADCP reading from WinRiver II selected output for Site 1.

TRANSECT	TOTAL Q	TOP Q	MEAS. Q	BOTTOM Q	LEFT Q	RIGHT Q	WIDTH	TOTAL AREA
	ft^3/s	ft^3/s	ft^3/s	ft^3/s	ft^3/s	ft^3/s	ft	ft^2
MEASUREMENT 10	16.33	7.52	4.42	3.50	0.54	0.35	7.57	6.86
MEASUREMENT 11	15.01	6.88	4.25	3.04	0.54	0.30	7.05	6.28
MEASUREMENT 12	15.59	7.09	4.78	3.01	0.49	0.21	7.11	6.50
MEASUREMENT 13	16.05	7.41	4.35	3.39	0.51	0.39	7.54	6.75
MEASUREMENT 14	15.42	6.96	4.34	3.40	0.46	0.26	7.36	6.74
AVERAGE	15.68	7.17	4.43	3.27	0.51	0.30	7.33	6.63
STD DEV.	0.52	0.28	0.21	0.23	0.03	0.07	0.24	0.23
STD./| AVG.|	0.03	0.04	0.05	0.07	0.07	0.23	0.03	0.04

Table 3. ADCP reading from WinRiver II selected output for Site 2.

TRANSECT	TOTAL Q	TOP Q	MEAS. Q	BOTTOM Q	LEFT Q	RIGHT Q	WIDTH	TOTAL AREA
	ft^3/s	ft^3/s	ft^3/s	ft^3/s	ft^3/s	ft^3/s	ft	ft^2
MEASUREMENT 18	10.96	3.33	5.76	2.04	-0.37	0.20	6.11	8.69
MEASUREMENT 19	12.38	3.81	6.44	2.25	-0.36	0.25	5.92	8.29
MEASUREMENT 20	11.81	3.62	6.23	2.13	-0.34	0.17	6.21	8.70
MEASUREMENT 21	11.96	3.75	6.12	2.25	-0.34	0.18	6.13	8.47
AVERAGE	11.78	3.63	6.14	2.17	-0.35	0.20	6.09	8.54
STD DEV.	0.60	0.21	0.28	0.10	0.02	0.04	0.12	0.20
STD./| AVG.|	0.05	0.06	0.05	0.05	0.04	0.18	0.02	0.02

Figure 2. Photo of Site 1 measurement location.

Figure 3. Photo of Site 2 measurement location (Ryan Pierce in the background).

Figure 4. Photo of seep measurement location (Ryan Pierce in the background).

Soils

Located in the next section of this report is a copy of the *Soils review for Peoa Water Loss Study* written up by Meredith Albers, Utah NRCS Resource Soil Scientist. In brief most losses should occur in the Weber River floodplain. It is questionable whether the map unit closes to the Weber River can be gaining or losing reach. The next section identified as terrace was identified as an area that had less losses then the floodplain area.

A previous study across the Weber River in the same valley another water loss study was completed in 2014, called the Marion Ditch Losses (Todea, 2014). The flow in the ditch was similar in size. A large portion of the ditch covered Map Unit Symbols (MUSYM) 106 and 109, approximately 16100 feet. When reviewing the saturated hydraulic conductivity of maps units in the area, MUSYM in the Marion study 106 and 139 match MUSYM located on the terrace for this study, MUSYM 154, 181 and 182, see Table 4.

Table 4. Saturated Hydraulic Conductivity of selected soils.

Tables — Saturated Hydraulic Conductivity (Ksat), Standard Classes — Summary By Map Unit

Summary by Map Unit — Summit Area, Utah, Parts of Summit, Salt Lake and Wasatch Counties (UT613)

Summary by Map Unit — Summit Area, Utah, Parts of Summit, Salt Lake and Wasatch Counties (UT613)

Map unit symbol	Map unit name	Rating (micrometers per second)
106	Ayoub cobbly loam, 2 to 15 percent slopes	3.0459
126	Echocreek loam, 2 to 10 percent slopes	9.1700
139	Harter gravelly loam, 2 to 15 percent slopes	3.6818
146	Horrocks-Hades complex, 30 to 60 percent slopes	5.8326
154	Manila-Ant Flat loams, 2 to 8 percent slopes	3.6033
174	Snyderville cobbly loam, 1 to 5 percent slopes	194.2017
179	Wanship-Kovich loams, 0 to 3 percent slopes	66.2405
181	Yeates Hollow-Henefer complex, 15 to 30 percent slopes	3.3294
182	Yeates Hollow-Henefer complex, 30 to 60 percent slopes	3.3294

Table 5. Reaches with individual sites, with discharges, location, and losses per mile, Marion Loss Study (Todea, 2014).

SITE LOCATION	SECTION REFERENCE	AVERAGE DISCHARGE (CFS)	CFS Δ	DISTANCE BTW Δ	CFS/MILE LOSS(-) GAIN(+)
MARION	Middle	12			
MARION	Lower	7.5	-4.5	16100	-1.48

It is reasonable and logical to use the Marion Ditch Losses Study to interpolate water losses. To summarize the upper reach of the South Peoa Bench Canal within MUSYM 179 and 126 the water loss is -2.62 cfs/mile and using the Marion Loss Study a loss of -1.48 cfs/mile can be surmised for the ditch covering MUSYM 154, 181, 182, the lower section.

Geology

Located in the last section of this report is a copy of the *South Peoa Bench Canal Geological Prognosis/Evaluation* written up by Todd Sieber, Utah NRCS State Geologist. In brief most the canal could be a gaining or losing reach depending on the season. Furthermore, during low precipitation, snowmelt, or low runoff the system would be losing reach.

USDA

October 3, 2017

To: Nathaniel Todea

Re: Soils review for Peoa Water Loss Study

Hello Nathanial,

The Peoa Canal travels through five different soil map units, in order of high to low elevation:

179--Wanship-Kovich loams, 0 to 3 percent slopes
146--Horrocks-Hades complex, 30 to 60 percent slopes
126--Echocreek loam, 2 to 10 percent slopes
182--Yeates Hollow-Henefer complex, 30 to 60 percent slopes
154--Manila-Ant Flat loams, 2 to 8 percent slopes
174--Snyderville cobbly loam, 1 to 5 percent slopes

A map is included in this report with general properties of each soil map unit.

In summary, I recommend:

1. Investigating hydrologic properties in soil map unit 179 to determine if it is a gaining or losing reach.
2. Evaluating canal condition (porosity, permeability) along soil map unit 126.
3. Investigate structural condition of section traveling through map unit 182.
4. If none of the above appear to be contributing to water loss from the canal, apply improvements to the reach flowing through map unit 146.

Justification:
Soil map units contain multiple soil components. Each soil component has multiple horizons. Each horizon has its own soil properties. A general interpretation from Web Soil Survey or Soil Data Viewer will distill this information into a single value for the soil map unit, but some of the diversity of soil properties is lost. Below is a table of representative saturated hydraulic conductivity (Ksat) values for the area of interest. For each soil map unit, a weighted percent value was determined for each Ksat value that occurs in a soil map unit. To interpret this table, look under each soil map unit and use the Ksat values with the higher percent occurrence. For example, map unit 126 has an estimated Ksat value of 9.17 micrometers/sec over 92 percent of its components. Map unit 179 however has a spread of values.

Natural Resources Conservation Service 125 South State Street, Room 4010, Salt Lake City, UT 84138
www.ut.nrcs.usda.gov 801-524-4550 Fax 844-715-4928

Table 1: Percent Occurrence of Standard Ksat values per Soil Map Unit.

Ksat (micrometers/sec)	Soil Map Unit Symbol				
	126	146	154	179	182
0.005	0	2	0	0	0
0.91	0	2	29	0	32
2.82	2	51	46	12	43
7.76	0	0	0	0	2
9.17	92	45	24	29	22
28.23	1	0	0	22	0
91.72	3	0	0	35	0
432.01	1	0	0	2	0

Given the Ksat values, map unit 179 has the highest Ksat values and stands out as having the greatest ability to allow water to flow through the soil and away from the canal. However, this map unit is also predominantly somewhat poor and poorly drained, which indicates it has a high water table during the growing season, which may be contributing water to the canal. Investigating the properties of the site are recommended to determine if this is a gaining or losing stretch of the canal.

The soil map unit with the next greatest Ksat value is map unit 126. This stretch would be the next likely to have losses due to flow of water through the soil and away from the canal. However, loam soils would compact better than soils with high rock contents. If construction of the original canal compacted these soils well, this reach may not have the greatest losses.

Soil map unit 146 also has a similar Ksat to 126, though it is less than half the total map unit. It would be the next likely to have losses.

Map units 154 and 182 have similar Ksat values and would be the least likely to be a major source of water loss for the canal. However, 182 contains significantly more rock content than 154. Map unit 182 may be more difficult to compact and with additional surface and subsurface flow through the landscape drainages, could experience other problems from cross-canal hydraulic gradients.

Please contact me with any further questions you may have.

Thank you,

Meredith Albers, Resource Soil Scientist, CPSS

9/1/2017

Peoa Water Loss Soils Map

Meredith Albers, Resource Soil Scientist

0 1,400 2,800 5,600 Feet

N

Flow direction

Legend

Peoa Canal

- Peoa Canal Centerline
- Segment 1
- Segment 2
- Segment 3

Soil Map Units (symbol--name)

- 126--Echocreek loam, 2 to 10 percent slopes
- 146--Horrocks-Hades complex, 30 to 60 percent slopes
- 154--Manila-Ant Flat loams, 2 to 8 percent slopes
- 174--Snyderville cobbly loam, 1 to 5 percent slopes
- 179--Wanship-Kovich loams, 0 to 3 percent slopes
- 181--Yeates Hollow-Henefer complex, 15 to 30 percent slopes
- 182--Yeates Hollow-Henefer complex, 30 to 60 percent slopes

Map Unit Symbol	154		182		126	146		179	
Component	Manila (50%)	Ant Flat (35%)	Yeats Hollow (55%)	Henefer (30%)	Echocreek	Horrocks (60%)	Hades (20%)	Wanship (55%)	Kovich (30%)
Saturated Hydraulic Conductivity Class	Moderately low	Moderately low	Moderately low	Moderately low	Moderately high	Very low	Moderately high	High	Moderately high
Hydrologic Soils Group	C	C	C	C	B	C	C	B	C/D
Runoff Class	high	High	Very high	Very high	Low	-	Very high	Very low	Low
Drainage Class	Well drained	Well drained	Well drained	Well drained	Well drained	Well drained	Well drained	Somewhat poorly drained	Poorly drained
Top Soil Profile	Loam, clay loam	Loam, clay loam	Very stony loam, very cobbly clay	Gravelly loam, cobbly clay	Loam	Very cobbly loam and clay loam	Loam	Loam	Loam, clay loam
Lower Profile	Clay, gravelly clay	Clay, clay loam	Extremely cobbly clay loam, bedrock at 43 in.	Very gravelly clay loam, very cobbly sandy clay loam	Loam	Very gravelly loam, bedrock at 59 inches	Clay loam	Extremely cobbly loamy sand	Fine sandy loam, very gravelly loamy fine sand
Ecological Site	Mountain Loam (Mountain Big Sagebrush)	Mountain Loam (Mountain Big Sagebrush)	Mountain Stony Loam (Mountain Big Sagebrush)	Mountain loam (Oak)	Upland Loam (Basin Wildrye)	Mountain Stony Loam (Mountain Big Sagebrush)	Mountain Loam (oak)	Interzonal Semiwet Fresh Meadow (Meadow sedge/ Tufted hairgrass)	Interzonal Wet Fresh Meadow (Sedge)

USDA

SUBJECT:	South Peoa Bench Canal Geological Prognosis/Evaluation	DATE:	10/16/2016
TO:	Nathaniel Todea	File Code:	047-03-2017

A geologic prognosis/evaluation was requested by Nathaniel Todea (NRCS Hydraulic Engineer) for the purpose of determining the cause and scope of water loss in the South Peoa Bench Canal. The Canal is located at the northwestern tip of the Kamas Valley between the towns of Peoa and Oakley, Summit County, Utah.

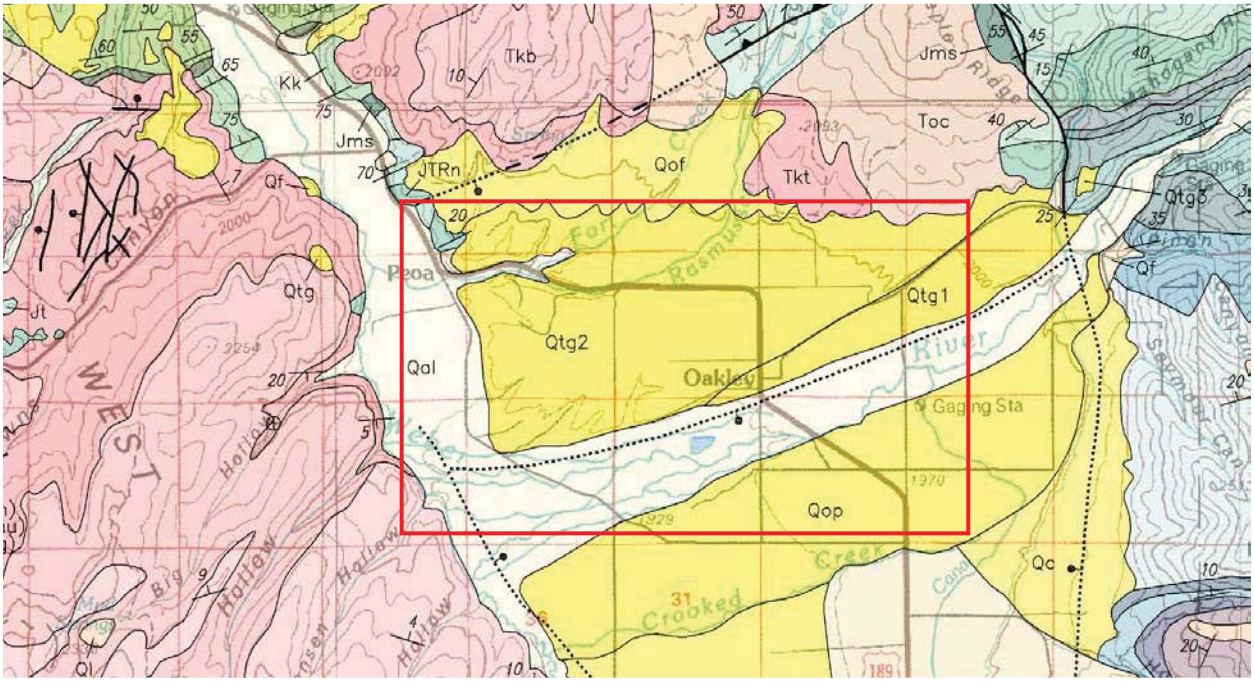


Figure 1 – Geologic Map of Project area (red rectangle)

This portion of the Kamas Valley is composed of alluvium, alluvial fans, terrace gravels and outwash deposits of tertiary age. The Weber River corridor (Qal) is derived of clay, silt, sand, gravel cobbles and boulders, which are deposited in channels and flood plains of streams. To the north of the Weber River corridor are terrace gravels (Qtg1, Qtg2) comprised of silt, sand, and gravels. These terraces are situated anywhere from a few to several tens of meters above the modern flood plains. Further north, overlaying the terrace gravels, and situated at the base of the northern foothills are alluvial fan deposits (Qaf) consisting of poorly sorted gravel, sand and silt. South of the Weber River corridor are outwash deposits of poorly sorted gravel and sands.

Natural Resources Conservation Service
125 South State St., Room 4010, Salt Lake City, UT 84138
Voice 801 524-4550 Fax 1-844-715-4928

The Kamas Valley is surrounded to the north and west by volcanic tuffs, flow rock (volcanic rock) and breccia. To the east it is contained early Triassic and late Paleozoic sandstone, siltstone, mudstone and limestone deposits.

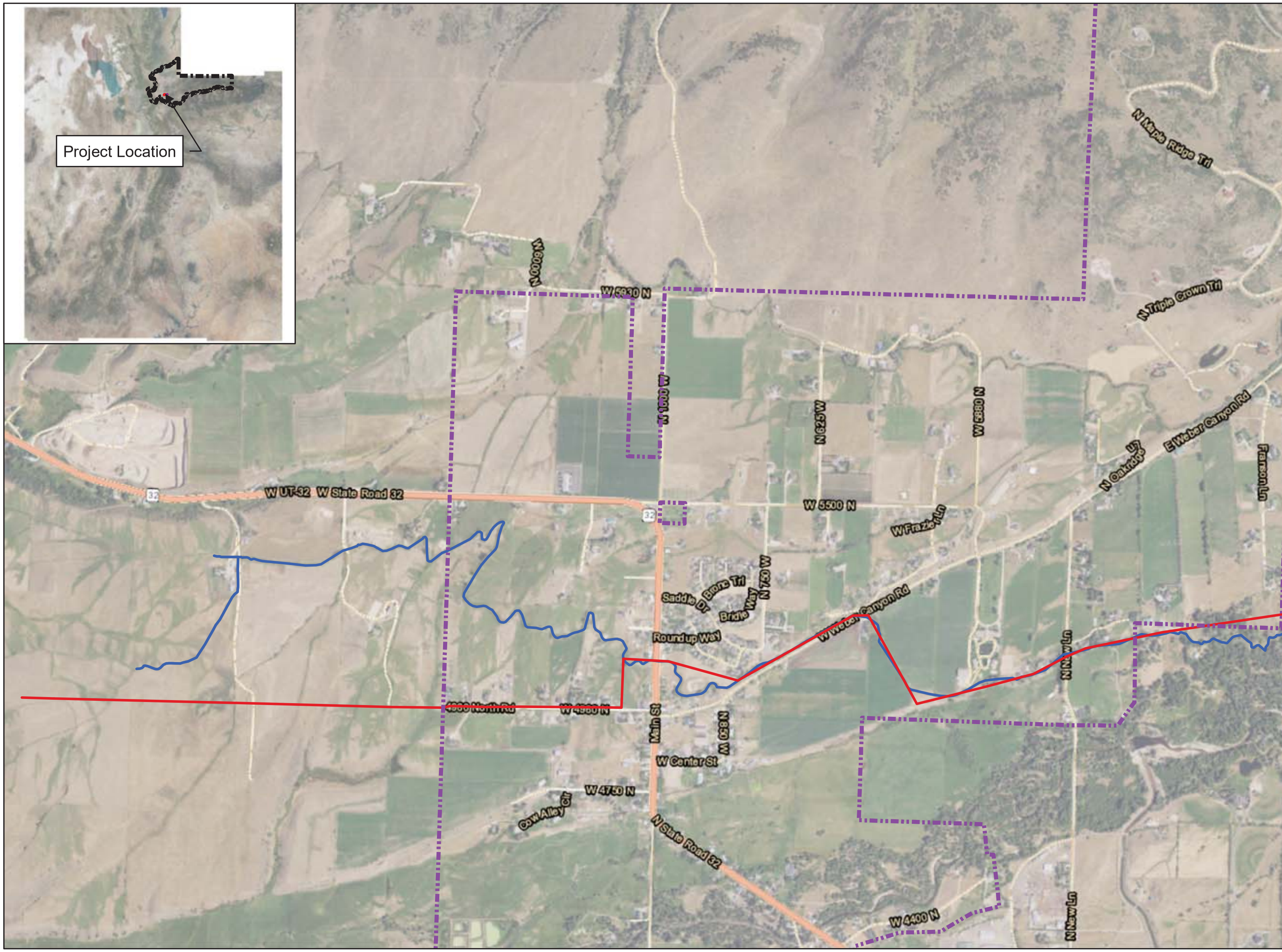
The main recharge area to groundwater systems in the northern Kamas Valley are the foothills to the north and east. Due to the well graded nature of the terrace gavels and alluvial fans, water easily infiltrates into the subsurface system and flows down gradient to the Weber River. While this can add additional water to the canal, it also enables water to seep out of the canal due to gravity flow.

Because of the influx of ground water from the surrounding hills it is assumed that during times of high precipitation and seasonal changes (snow melt), water in the South Peoa Canal will tend to raise and give the impression of it being a gaining system. However, due to the nature of the depositional fans and the terrace gravels in which the system is built, ground water readily seeps into the subsurface and flows into the river corridor below. This is of note, because during times of low precipitation the canal is likely to become a losing system, because its flow is no longer being augmented from groundwater influx. The portion of the system delineated as Qal is relatively in balance (gaining and losing) due to the high water table.

Conclusions

Based on geology, topography and hydrologic factors it is evident that there are losses happening along most portions of the irrigation canal (where it is higher than the surrounding topography.) Seasonal variations can give the impression of greater flow due to groundwater gains, but without groundwater recharge, the system can lose flow to subsurface geologic conditions. The location of the canal on an elevated terrace, above an existing flood plain, and constructed in highly permeable, unconsolidated surficial deposits are the major contributor to volumetric losses.

Anthony T. Sieber
State Geologist
NRCS, UT



Peoa South Bench Canal

Project Location

Legend

- Oakley
- Project Piping
- Poea Canal Centerline

0 600 1,200 Feet

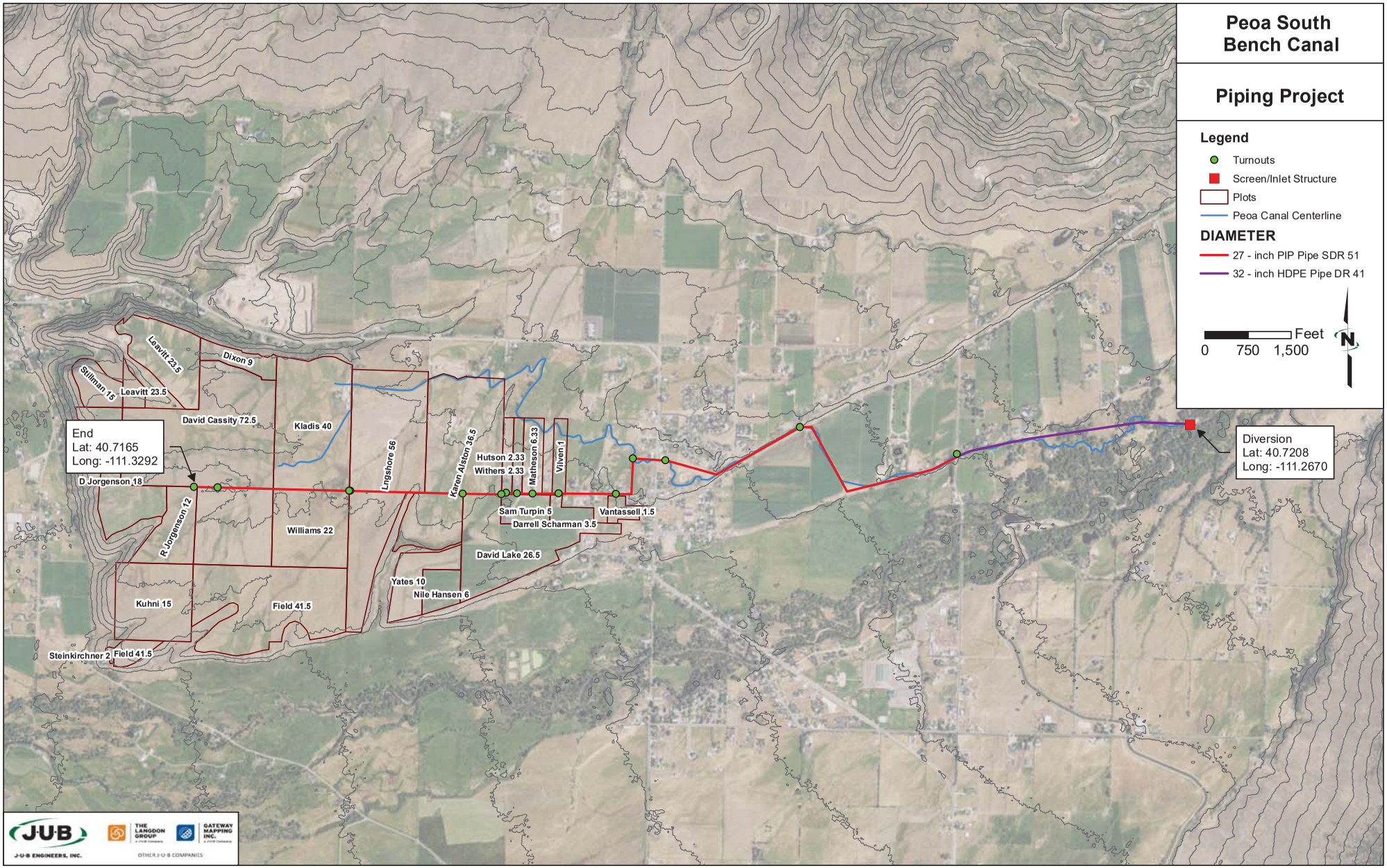
N

J·U·B ENGINEERS, INC.

THE LANGDON GROUP *a J·U·B Company*

GATEWAY MAPPING INC. *a J·U·B Company*

OTHER J-U-B COMPANIES


Peoa South
Bench Canal
Piping Project
Legend
Turnouts
Screen/Inlet Structure
Plots
Peoa Canal Centerline
DIAMETER
27 - inch PIP Pipe SDR 51
32 - inch HDPE Pipe DR 41
Feet
0 750 1,500
N
End
Lat: 40.7165
Long: -111.3292
Diversion
Lat: 40.7208
Long: -111.2670
Leavitt 23.5
Dixon 9
Stillman 15
Leavitt 23.5
David Cassity 72.5
Kladis 40
D Jorgenson 18
R Jorgenson 12
Williams 22
Kuhni 15
Field 41.5
Steinkirchner 2
Field 41.5
Lngshore 56
Karen Alston 36.5
Hutson 2.33
Withers 2.33
Matheson 6.33
Vilven 1
Sam Turpin 5
Darrell Scharman 3.5
Vantassell 1.5
David Lake 26.5
Yates 10
Nile Hansen 6
J-U-B ENGINEERS, INC.
THE LANGDON GROUP
GATEWAY MAPPING INC.
OTHER J-U-B COMPANIES

Peoa South Bench Canal and Irrigation Company
On-farm Intent Signatures - Piping and Pressurization Project
FOA# BOR-DO-18-F006

Landowner Name	Claimable Acreage	Landowner Signature I have an interest to install a high-efficiency irrigation system when sufficient water quantity, quality, and application requirements are met.
Natalie Hutson	5.15	
Brad King / Norene Vantassel	4-5	
FRANK MATHESON	11	
Karen Alston	88	
Dale & Lorie Leavitt	56	
Mont Williams	40	
LeRoy Withers	5½	
Sam Turpin	10	
Darrell Brenda Scharman	7	
STEPHEN KLAUS	75	
John Feild	80	
Mike Hansen	40	
[illegible]	17	
DAVID LAKE	92	
David Cassity	140	

Attachment 5 - Water Conservation and Management Plan

PEOA SOUTH BENCH CANAL COMPANY

Master Plan & Funding Plan

January 2018

Prepared by:

J·U·B ENGINEERS, INC.

466 North 900 West
Kaysville, Utah 84037
801 547 0393

Table of Contents

PEOA SOUTH BENCH CANAL COMPANY

WATER MASTER PLAN AND FUNDING PLAN

January 2018

1 - INTRODUCTION

Peoa South Bench Canal & Irrigation Company (South Bench) has a long history of agriculture in the Oakley, Utah area. Water rights date back to 1879 out of the Weber River. They are a small irrigation company with only 28 shareholders and 425 shares. There are approximately 756 acres that are currently irrigated. In 2017, South Bench diverted 5,874 acre-feet of water over the irrigation season. The system is comprised of open ditches with significant water loss, due to seepage. It is difficult to understand the real water loss in the system because there are no meters to measure the losses. In the past, the agricultural lands of this area have always been productive and have yielded good crops, but without water, that may not be the case. The drought years and age and condition of the system are leaving farmers wondering what they can grow. South Bench needs to prepare a Water Use Efficiency Plan to help guide them into the future.

Over the past six years, Summit County has had some of the driest summers, accompanied by scorching temperatures and wildfires. Local farmers and ranchers are beginning to struggle to make ends meet, and due to drought, the hay harvest has been down over the past six years. South Bench has had to reduce watering times during the most critical irrigation months of the season, having a real impact on the area ranchers.

The purpose of this study is to assess the condition of the existing delivery system and provide a plan to modernize and improve the system. A pressurized delivery system will permit farmers to install on-farm sprinkler systems that will allow irrigators to implement sprinkling systems and apply water more efficiently. Elements of this Master Plan include project identification and funding options.

2 - SYSTEM EVALUATION

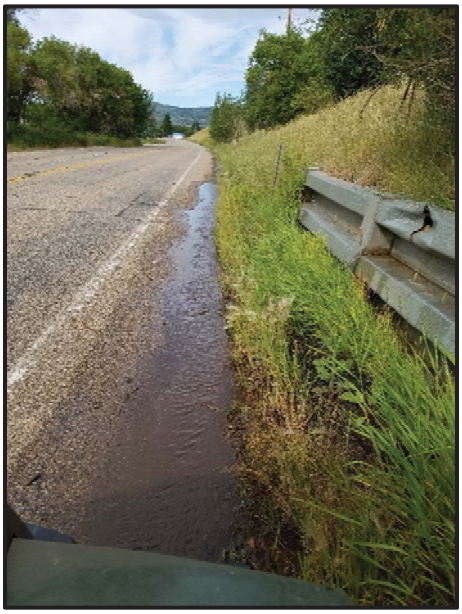
2-1 Existing Diversion

The existing diversion is located on the Weber River approximately 1.5 miles upstream of the Highway 32 crossing of the Weber River. The diversion consists of a concrete headwall on the North side of the river and two 48" aluminum sluice gates to regulate flow into the canal. The headwall and gates were constructed in 2012 following flood damage to the diversion. The water level at the diversion is regulated using ten 48" independent checks. Each check is made of steel beams with wooden stop logs between each steel beam. The steel beams each have a steel prop on the downstream side to keep them in a tilted position when water is being checked. Adjustments to this system of water checking can be dangerous, depending on the flow in the river at the time.

Approximately 350 feet down the canal from its point of diversion from the river is a 5 foot concrete parshall flume for flow measurement. Just upstream of the flume is a gate used to regulate flow into the flume. Water not flowing into the flume can spill into a side channel where it can make its way back to the Weber River. The flume is equipped with telemetry so that flow can be monitored remotely. Also, the regulating gate upstream of the flume is automated so that the flow rate into the canal can be set and maintained.

2-2 Existing Canal

The canal was originally constructed in the late 1800s. Most of the canal is unlined and experiences constant leakage along its entire length. The middle section of the canal is elevated above the Weber Canyon Road as it parallels the road through Oakley. This section leaks and can overtop when the canal is full, causing water to run along the side of the highway.



The existing canal is approximately 4 miles in length. While the canal winds through private residential property and is located within Oakley City limits, for the most part, it is located within rural areas. It crosses under several county roads and one state highway. The upper 2 miles of canal is wide with a rocky bottom. The banks of this section of canal are heavily vegetated with natural vegetation and cottonwood trees.

The first turnout isn't until after the highway 32 crossing, approximately 2 miles downstream from the river diversion. The lower 2 miles of canal is where all the irrigation use occurs. The canal through this section is narrower and less vegetated. Each turnout relies on a parshall flume for flow measurement to the user. Most of the lower section is open pasture, and livestock use the canal for drinking.

2-3 Existing Water Turns & Water Rights

South Bench has a water right for 33.04, 18.36 and 10.32 cfs for flood, high and low flow stages respectively from the Weber River. Currently the system operates on turns, where at any given time, 5 irrigators are each using 1/5 of the total ditch flow. The number of shares that they own determines the length of time they are allowed to use the water.

2-4 Water Loss Study

In July 2017, the NRCS performed a water loss study of the upper 1.5 miles of the South Bench Canal (A copy of the NRCS report is located in Appendix A). The section studied was between the river diversion and the Weber Canyon Road crossing. The report found that the canal was losing 2.62 cfs per mile in this upper section of canal. Although a study wasn't performed for the lower 2.4 miles, the NRCS surmises that a loss of 1.48 cfs/mile for the lower section is a reasonable assumption. The total calculated flow loss in the entire canal was 7.5 cfs at the time of the study. The average flow rate at the head of the ditch at the time the seepage loss study was performed was 15.7 cfs, so the calculated flow loss for the entire canal was 48%. The total diversion for 2017 was 5,874 acre-feet. A 48% loss of the 5,874 acre-feet for 2017 would be 2,820 acre-feet.

J-U-B Engineers, Inc. performed an independent water loss study in August 2017 of the entire canal and found the canal loss to be 45%, which substantiates the study done by the NRCS.

3 – PROJECT IDENTIFICATION

3-1 Generation of Improvement Alternatives

Any project considered needed to address the two main issues that currently exist within the South Bench system, and the benefits associated with that project. The two main issues and the desired project benefits are as follows:

1. Water loss from seepage: The ideal project will significantly reduce water loss in the existing canal caused by seepage.
2. Flood irrigation: The ideal project will provide pressure sufficient to allow for sprinkled irrigation.

Using the flow and elevation data gathered, the system was evaluated in a hydraulic model. The modeling software used was Innovyze's InfoWater, running in ArcGIS. The improvement initially considered was to replace the existing pipe within the existing alignment.

In addition to piping improvements, a screening was also considered. Natural Resource Conservation Service (NRCS) Design Standards were considered in the evaluation of improvement alternatives.

Alternatives generated were evaluated internally by J-U-B Engineers, Inc., as well as with South Bench. This evaluation looked at these initial alternatives to consider how they might be modified to be more efficient and still serve the needs of the irrigators. Alternatives considered were all piping alternatives and generally differed only in alignment and pipe material.

As more efficient alternatives emerged, it became necessary to generate preliminary cost estimates to continue with the evaluation of and comparison between alternatives. These cost estimates were based on pricing data from recent projects, material suppliers and local contractors. Cost estimates within this report are presented in present-day dollars.

A project map is located in Appendix B, and cost estimates of the different project alternatives are included in Appendix C.

3-2 Improvement Project Descriptions

3-2-1 Alignment Alternatives

All project alternatives considered were piping alternatives. All alternatives had the following features in common:

- The existing diversion was unchanged and the piping begins at the location of the existing Parshall Flume.
- A new screening structure and system meter will be constructed and the Parshall Flume will be removed.
- None of the alternatives include user meters or running laterals to individual users.

3-2-1-1 Alternative 1 - Existing Canal Alignment

This alternative would follow the existing ditch alignment for the entire length of the project. From the screening structure to the crossing of New Lane Road, the alignment strictly follows the canal. The original canal alignment followed the contours of the terrain and the result is a meandering alignment above the highway crossing. After the road crossing, the existing canal alignment is followed, but there is significant straightening of the alignment.

High-density polyethylene (HDPE) pipe is well suited to installations that follow this meandering section of the alignment, as it can be deflected without requiring fabricated joints. Also, HDPE has heat-fused joints which are at least as strong as the pipe wall itself and can withstand some ground movement and the resulting deflection without any damage to the joint. Installation requires specialized equipment to perform the joint fusion and connect fittings or services.

Where the alignment is straightened, Plastic Irrigation Pipe (PIP) will be used. PIP is more economically priced and is more easily repaired and maintained by farmers.

This alternative included the installation of 21,500 feet of 32" HDPE pipe and 27" PIP. Specific pipe diameters, ratings and lengths are listed here.

27" PIP PVC 100 psi	**16590**	**LF**
32" HDPE DR 41 PIPE	4910	LF

The estimated cost for this alternative is $2,279,100.

3-2-1-2 Alternative 2 - Modified Alignment after Highway 32

This alternative follows the existing alignment for the first 1.6 miles. After crossing Highway 32, the pipeline will follow a new alignment. The new alignment will run on a straight alignment down Stevens Lane and will require less pipe. It will also deliver the water to a more centralized location relative to the acreages being irrigated. The alignment will follow existing property lines, fences and existing access roads, thus creating a smaller impact on farmable ground.

This alternative includes the installation of 17,040 feet 32" HDPE pipe and 27" PIP. Specific pipe diameters, ratings and lengths are listed here.

27" PIP PVC 100 psi	**14850**	**LF**
32" HDPE DR 41 PIPE	4910	LF

The estimated cost for this alternative is $2,130,400.

3-2-1-3 Alternative 3 - Piping Ends after Highway 32

This alternative follows the existing alignment for the first 1.6 miles. After crossing Highway 32, the pipeline will end and the water will be discharged back into the existing canal prior to the first user outlet. The pipe will be under pressure and an energy dissipater will be required.

This alternative includes the installation of 11,530 feet 32" HDPE pipe and 27" PIP. Specific pipe diameters, ratings and lengths are listed here.

27" PIP PVC 100 psi	**3160**	**LF**
32" HDPE DR 41 PIPE	8370	LF

The estimated cost for this alternative is $1,593,100.

3-2-2 Selected Alternative

Alternative 2, which includes piping the entire canal and following an altered alignment after crossing Highway 32, is the recommended alternative. This alternative is recommended for the following reasons:

- It is the most economical.
- It supplies the water at the most beneficial location relative to the land being irrigated.
- It has the smallest impact on existing farms.

- It provides pressurized water to farmers, allowing conversion from flood to sprinkle, or allowing the elimination or reduction in pumping costs.

3-3-3 Project Benefits

The selected project alternative provides significant benefits, which are detailed in this section.

3-3-3-1 Water Savings

The water loss study done on this canal, as previously described, indicates that the water loss in 2017 was 2,820 acre-feet. This project involves replacing the entire open system with a piped and pressurized system. The water loss with such a system can reasonably be assumed to be 0%, resulting in saving the entire 2,820 acre-feet.

More efficient use of the water being saved and delivered to the crops will result when irrigation practices are changed from flood irrigation to sprinkle irrigation as a result of providing pressurized water to the fields. Of the 756 acres that are currently irrigated, only 138 acres are sprinkle irrigated. Irrigation application efficiency is the amount of water delivered that can be used by the plants being irrigated. Application efficiency for flood irrigation application is approximately 50%, while sprinkler application efficiencies are approximately 75%. Of the 5,874 acre-feet diverted in 2017, only an estimated 3054 acre-feet were delivered to the fields. The conversion of the existing flood irrigated acres to sprinkler application will result in 626 acre-feet of water savings as calculated in the following table.

2017 IRRIGATION INEFFICIENCIES

Annual Volume Diverted	5874	AF
Annual Volume Lost	2820	AF
Annual Volume Delivered	3054	AF
Assumed Flood Irrigation Efficiency	50%	
Assumed Sprinkler Irrigation Efficiency	75%	
Total Acres Irrigated	756	
Total Acres Flooded	618	
% Acres Flooded	82%	
Water Lost to Inefficient Application (3054 x 82% x 50%)	1252	AF
Post Project Increased Irrigation Efficiency	25%	
Post Project Water Loss (3054 x 82% x 25%)	626	AF
Post Project Water Savings	**626**	**AF**

3-3-3-2 Energy Savings

There are currently 138 acres being sprinkled using pumps. This project will eliminate those pumps. The 138 acres represent an average annual flow rate of 1,504 gpm. The current electrical load on these pumps is 60.7 kW. This project will save 151,000 kWh per year. This 151,000 kWh per year is shown in the following calculations:

(1504 gpm x 150 ft)/(3960 x 70%) *.746 = 61 kW
61 kW x 2,476 hrs/season = 151,000 kWh

4 – IDENTIFY ENVIRONMENTAL CONCERNS

4-1 Potential Concerns

Environmental resources of concern in the general project area may include: Threatened and Endangered Species, State Sensitive Species, wetlands and other jurisdictional waterways, protected farmland and cultural/historic resources. According to the U.S. Fish and Wildlife Services Information and Planning Conservation (IPaC) website, two threatened species have the potential to exist in the general vicinity. These species are the Yellow-billed cuckoo and Canada lynx. Both species require dense vegetation and undisturbed habitat. The proposed project actions are unlikely to take place in and/or disturb habitat for either species.

A number of migratory birds exist in the general vicinity and nests may be located in or adjacent to project disturbance areas. Mitigation measures such as timing vegetation clearing to take place outside of the migratory birds' nesting season and preconstruction nest surveys would be conducted to minimize any potential impacts to nesting birds.

Water resources in the general area include the Weber River, Rasmussen Creek, canal laterals, irrigation ditches and fringe wetlands. Potential impacts to these resources would be mitigated through best management practices and refinement of project alternatives to avoid or minimize disturbance to the natural water features.

Farmland resources are critical to the agricultural activities within the general project area. Information obtained from the Natural Resources Conservation Service's Web Soil Survey indicates that there are soils in the general area that are classified as prime farmland if irrigated. The proposed project actions would not convert any existing farmland to nonagricultural uses and are likely to provide an overall benefit to existing agricultural lands in the area.

Portions of the irrigation system, including canals, diversion structures and other facilities may be considered historic resources. A cultural resource survey would be performed to identify all potentially eligible cultural resources that may exist in the project area. Coordination with regulatory agencies and other officials with jurisdiction would be completed prior to the implementation of the proposed project actions.

All required NEPA documentation, including an in-depth environmental resource evaluation and coordination with regulatory agencies would be performed to meet regulatory requirements, assess the potential impacts to critical resources and determine necessary mitigation measures.

Trout Unlimited
1777 N Kent Street, Suite 100
Arlington, VA 22209
(703) 522-0200

April 16, 2018

Dave Lake
President
Peoa South Bench Canal and Irrigation Company
P.O. Box 32
Oakley, UT 84055

Dear Dave:

Over the past several years, Trout Unlimited has had the great opportunity and privilege to be involved in a positive effort within the Weber River Watershed, known as the Weber River Partnership, which represents a broad and diverse array of interests within the basin. The Weber River Partnership has made great progress in the Weber River by providing a platform for communication, coordination and collaboration among the diverse stakeholders and we believe this diversity has brought considerable value to developing a cohesive vision that includes water security, agricultural interests, community development and natural resources values.

Trout Unlimited has been working on the ground with a number of partners throughout the Weber River Basin, including the Utah Division of Wildlife Resources, agricultural producers and water users to protect and restore populations of Bonneville cutthroat trout and bluehead sucker though habitat restoration, fish passage and water efficiency projects. The bluehead sucker and Bonneville cutthroat trout populations have declined and are considered to be in jeopardy and petitions for listing under the Endangered Species Act are possible.

Understandably, all partners in the watershed benefit by preventing the listing of imperiled species, but beyond that, we believe that many watershed partners also greatly value the fact that these species still persist in the Weber River, a sign of the great resilience of these native species and a reflection of the rich economic vitality they bring to our communities. Nevertheless, these species need our help and a cohesive strategy through the Weber River Partnership broadens the scope of our actions on the ground to provide broad benefits to all stakeholders in the Basin.

Trout Unlimited is supportive of your proposed project through WaterSMART funding to improve the water conveyance of your irrigation system. We are encouraged by your consideration of the ecological values of the native fisheries within this reach of the Weber

River. We support your proposal and are committed to working with you on as the project develops.

With Kind Regards.

Paul Burnett - Weber River Project Coordinator
5279 South 150 East
Ogden, UT 84405
801-436-4062
pburnett@tu.org

April 17, 2018

Dave Lake, President
Peoa South Bench Canal & Irrigation Company
P.O. Box 32
Oakley, UT 84405

Dear Mr. Lake,

Oakley City is pleased to write in support of your grant application being submitted to the Bureau of Reclamation Water and Energy Efficiency Grants Program. Oakley is very interested because of the impact the seepage water from the canal has on our wastewater system. The water from the canal seeps into the groundwater and infiltrates our collection lines. This impacts not only the capacity of the collection system but greatly increases the volume of wastewater that must be treated by our treatment plant.

We will expedite the excavation permit required by Oakley City and wave the fee.

We strongly support your grant application and appreciate the advancements it will make in improving efficiency for the South Bench Canal.

Sincerely,

Chad Kramer

Chad Kramer
Public Works Director
Oakley City

Kamas Valley Conservation District

April 3, 2018

To whom this may concern:

The quality and quantity of water in Summit County, Utah is of great concern to all parties living and working in the county. As one of the organizations with stewardship over the natural resources of the area, we, the Kamas Valley Conservation District are particularly concerned with those water resources within and those that contribute to the Conservation District's boundaries.

We recognize that currently no local organization exists to coordinate water resource protection and enhancement related efforts at a watershed scale. We also recognize the need and benefits that come from piping a canal and encourage the implementation of practices that achieve goals to conserve water and irrigate efficiently.

Therefore, we, the Kamas Valley Conservation District express our support for the piping of Peoa South Bench Canal. We support a Peoa South Bench Canal that shares our concern for the water resources of the area and are committed to positively affecting these resources. We also express our support for the grant request for funding. We are committed to supporting this ditch company in any way deemed feasible by the district.

Sincerely,

Lloyd Marchant

Lloyd Marchant

Kamas Valley Conservation District Chair

United States Department of Agriculture

Natural Resources
Conservation Service

Ogden Field Office

2871 S Commerce Way
Ogden, UT
84401-3277

Voice: 382-405-7259
Fax: 844-715-4940

April 25, 2018

To: Brian Deeter, P.E.
Area Manager
J-U-B Engineers, Inc.

From: Donald Ashby
ASTC-FO
Natural Resources Conservation Service (NRCS)

Subject: Letter of support for Peoa South Bench Canal Reclamation WaterSMART Grant

The NRCS fully supports your application for a Reclamation WaterSMART grant for piping of the Peoa South Bench Canal. Replacing this canal with pipe will reduce water loss thru leakage and evaporation, improve water quality and quantity, and provide on-farm operations with opportunity to improve their irrigation efficiencies, crop yields and reduce labor costs.

NRCS is currently in contact with landowners who can be affected by this new system, offering technical assistance and potential cost-share opportunities to improve their on-farm operations. As you move forward with your application please keep me informed of opportunities in which NRCS can provide assistance.

Sincerely,

Donald Ashby
ASTC-FO
USDA-NRCS
2871 S. Commerce Way
Ogden, UT 84401
Phone: 385-405-7247