

BILLINGS BENCH WATER ASSOCIATION RATTLESNAKE RESERVOIR DIVERSION UPGRADE AND SCADA PROJECT

**Bureau of Reclamation Upper Missouri
WaterSMART Water and Energy Efficiency Grant
Financial Assistance Application
November 2024**

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1 Executive Summary

Date: November 13, 2024

Applicant: Billings Bench Water Association
Billings, Yellowstone County, Montana

Applicant Type: Category A

Project Summary

Billings Bench Water Association (BBWA) proposes to upgrade the existing deteriorating concrete diversion structure on the Main Canal with three Fresno Valves and Castings Inc., Series 8200 Aluminum headgates, or equivalent, and install a Supervisory Control and Data Acquisition (SCADA) system to provide automatic and remote control of the gates. The project will allow BBWA to monitor and adjust water levels in the canal and in Rattlesnake Reservoir remotely and in real-time. Currently, BBWA operators must make manual adjustments every six hours (sometimes more frequently during critical periods), which is time consuming and inefficient. The proposed project will conserve approximately 1,755 acre-feet (AF) per year and allow for optimal water management at the diversion and throughout the entire water delivery system.

Length of Time and Estimated Completion Date

BBWA expects to complete the activities identified under the proposed project within 20 months of the start of work. If activities begin in November 2025, work is anticipated to be completed by June 2027.

Federal Facility Status

The Billings Bench Water Association Rattlesnake Reservoir SCADA project is not located on a Federal facility. The infrastructure is owned and maintained by BBWA.

2 Project Location

The proposed project is located in Yellowstone County, Montana, approximately 8 miles northeast of downtown Billings, Montana. The project is located on the BBWA's Main Canal at Rattlesnake Reservoir. The project is located at latitude 45°53'45"N and longitude 108°25'34"W. See Figure 1 for the project map.

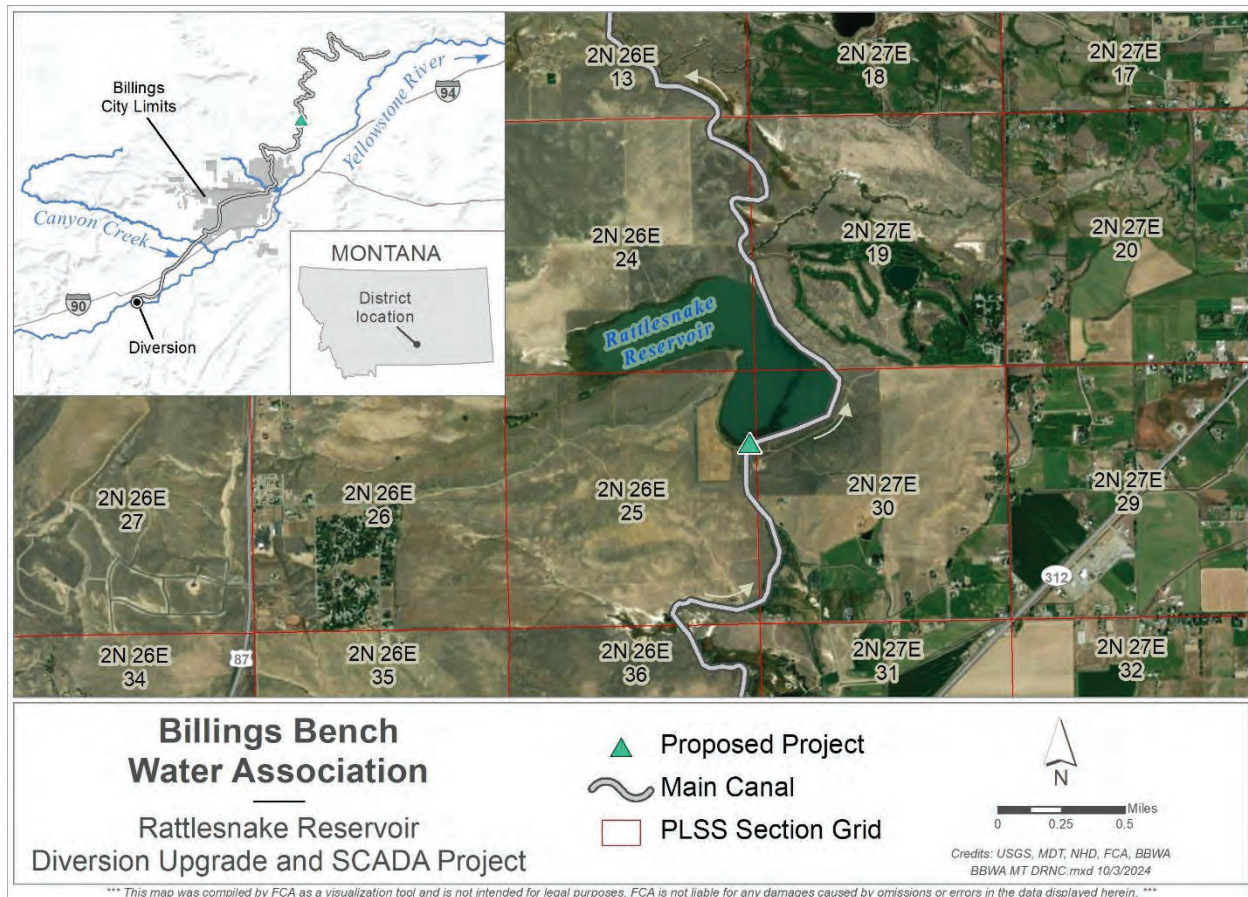


Figure 1. BBWA Rattlesnake Reservoir Diversion Upgrade and SCADA Project Area.

3 Project Description

The BBWA Rattlesnake Reservoir Diversion Upgrade and SCADA Project will complete the final design and construction of a new diversion structure on BBWA's Main Canal at Rattlesnake Reservoir (715 AF capacity). The project includes the removal of the existing deteriorating concrete structure, the installation of a new concrete structure with three motorized headgates, and installation of a new SCADA system that will provide remote control of the headgates. WaterSMART funds will be used for final design, materials, and installation of the system components. Once complete, the project will significantly improve BBWA's capability to manage and optimize surface water storage and delivery for the long-term sustainability of approximately 14,000 acres of the 18,000 acres served by BBWA. The project will save approximately 1,755 acre-feet (AF) per year through improved efficiency and eliminate the time and associated expenses of manually operating the current system.

3.1 Project Overview

SCADA System Integration

The proposed project will install an advanced SCADA system that will allow BBWA staff to monitor and control water flow into and out of Rattlesnake Reservoir remotely. This system is designed to provide real-time data on critical operational parameters, including gate positions, water elevations in the canal and reservoir, and flow rates in the canal, accessible from the BBWA office and through remote devices such as smartphones and tablets. The SCADA interface will enable quick adjustments to monitored water flow, ensuring precise control over water delivery operations.

To achieve comprehensive monitoring, the system will use three water level measuring devices. These devices will be installed upstream of the new diversion structure, downstream, and on the headgate itself (see WWC Engineering 60% design attachment). This configuration will allow operators to continuously monitor water levels on both sides of the structure, providing valuable data on flow rates and ensuring optimal performance. These measurements will be reported on the SCADA platform, helping BBWA operators proactively manage changing conditions.

The SCADA system will use a combination of radio and internet-based telemetry to transmit data to the BBWA control center. A new control station, installed at the BBWA office, will feature dual monitors and touch-screen interfaces, allowing operators to efficiently monitor trends, generate reports, and respond to system alerts. To ensure reliability during power outages, a battery backup will be installed, providing sufficient capacity to operate at least one gate and maintain monitoring functions.

Installation of New Headgates and Actuators

The proposed project will complete the final designs and construction of three new six-foot Fresno Valves and Castings Inc. Series 8200 irrigation headgates, or an approved equivalent, at Rattlesnake Reservoir. These headgates are critical for controlling water flow and will be operated by Rotork IQ Series multi-turn actuators, which provide precise control over gate movements. The actuators are designed to operate smoothly under variable conditions and can be adjusted remotely through the SCADA system.

These motorized headgates will be embedded flush within a newly constructed concrete structure, secured by anchor bolts to ensure stability. Each actuator will feature manual override capabilities in case of equipment failure. This setup will enable both automated and manual control.

Concrete Structures and Walkways

The installation of the new headgates will require the construction of reinforced concrete structures designed to withstand the operational demands of the irrigation system. These structures will house the gates, actuators, and SCADA components, ensuring durability and reliability. Walkways with handrails will be installed to provide safe access for maintenance personnel. These walkways will be constructed using powder-coated grating and anchored securely with W4x13 steel beams.

The construction process will incorporate subgrade stabilization, using crushed base material to prevent settlement and provide a solid foundation for the new structures.

Dewatering and Environmental Management

A dewatering plan will be implemented to ensure dry conditions during excavation and installation of the concrete structures. The contractor will monitor water levels closely and adjust the dewatering system as needed to prevent delays.

To minimize the environmental impact, disturbed areas will be restored through re-seeding with an approved native vegetation mix. The reseeding efforts will prevent erosion and help integrate the new infrastructure into the surrounding landscape. Construction activities will also be scheduled to avoid disruption to local water deliveries, ensuring that irrigation operations resume on schedule for the next growing season.

Power Systems and Backup Capabilities

The new infrastructure will be powered by an electrical connection provided by Yellowstone Valley Electric Cooperative. In addition to the main power source, the project will include battery backup systems designed to keep critical components operational during outages. These batteries will have enough capacity to operate at least one headgate and maintain monitoring functions.

All electrical components, including batteries, chargers, and control panels, will be housed in weatherproof enclosures to protect them from environmental damage.

4 Evaluation Criteria

E.1.1 Evaluation Criterion A – Quantifiable Water Savings

1. **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.

Please include a specific quantifiable water savings estimate; do not include a range of potential water savings.

The proposed project will conserve approximately 1,755 AF per year. Currently, water losses occur from inefficient manual operation, where excess water is often released into the BBWA canal due to delays in adjustments (estimated at 1,517 AF annually). Water losses also occur from leakage from the check boards while filling the reservoir (estimated at 238 AF annually). The 1,755 AF per year of water savings within Rattlesnake Reservoir will be achieved by remote, real-time flow monitoring at the diversion and remote automation of diversion gates to match canal flow to downstream demand. The estimated water savings are based on the premise

that water is over diverted during periods when BBWA operators are only available to adjust flows every 6 hours (four times daily). The SCADA system will prevent overflows into the canal by reacting quickly to changes in demand and releasing a more precise amount of water down the canal. Automated operations will improve water distribution efficiency by eliminating delays in flow adjustments, thus minimizing unnecessary leakage. The new concrete diversion and new headgates will prevent leakage into the canal while filling the reservoir.

2. **Describe current losses.** Please explain where the water that will be conserved is currently going and how it is being used. Consider the following:

- Explain where current losses are going (e.g., back to the stream, spilled at the end of the ditch, seeping into the ground)?

Currently, water losses occur from inefficient manual operation of the diversion structure and check boards, where excess water is often released into the canal due to delays in adjustments (estimated at 1,517 AF annually). BBWA would like to retain this water in the reservoir until needed at a later time. These excess releases into the BBWA canal system are mostly lost due to seepage in the bottom of the earthen canal and evaporation.

Water losses also occur from leakage between the check boards while filling the reservoir (estimated at 238 AF annually). This water also flows into the BBWA canal, where it is lost due to seepage and evaporation as there is not enough water to deliver to water users.

Cumulatively, these two types of water losses from Rattlesnake Reservoir are estimated at 1,755 AF annually.

- If known, please explain how current losses are being used. For example, are current losses returning to the system for use by others? Are current losses entering an impaired groundwater table becoming unsuitable for future use?

The BBWA estimates that the majority of the current water losses are lost to seepage in the canal since the excess water is not enough to push through the canal to be delivered to water users.

- Are there any known benefits associated with where the current losses are going? For example, is seepage water providing additional habitat for fish or animal species?

Current water losses in the project area do not provide any known benefits.

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

Currently, the BBWA cannot remotely measure flows diverted at the Rattlesnake Reservoir diversion. As a result, BBWA must manually adjust flows every 6 hours, resulting in fluctuations of downstream flows instead of maintaining a continuous flow. Each time a check board is removed from the current diversion structure, the downstream flow increases by approximately 10 cfs.

$$\text{Flow Rate Increase (Q)} = \text{Width (W)} \cdot \text{Velocity (V)} \cdot \text{Incremental Depth (\Delta h)}$$

$$Q = W \cdot V \cdot \Delta h = 50\text{ft} \cdot \frac{2\text{ft}}{\text{sec}} \cdot 0.1\text{ft} = 10 \text{ cfs}$$

Over the 6-hour period, the additional flow decreases from 10 cfs back to the baseline as the system stabilizes. Therefore, the average flow increase during this period is 5 cfs.

$$AFI = \text{Average Flow Increase}$$

$$AFI = \frac{\text{Initial Flow Increase} + \text{Final Flow Increase}}{2} = \frac{10 \text{ cfs} + 0 \text{ cfs}}{2} = 5 \text{ cfs}$$

On average, the irrigation season is 165 days, with water flowing past Rattlesnake Reservoir toward water users 13 out of every 14 days and the reservoir filling 1 out of every 14 days.

$$\text{Total Flow Days} = \frac{13}{14} \times 165 \text{ days} = 153 \text{ Days}$$

If the diversion structure could adjust flows instantaneously (eliminating the 6-hour lag between manual adjustments), it would save approximately 1,517 AF currently lost due to the overcompensation during adjustments.

$$\text{Total Volume Lost (AF)} = 153 \text{ days} \times 5 \text{ cfs} \times 3600 \frac{\text{sec}}{\text{hr}} \times 24 \frac{\text{hr}}{\text{day}} \times \frac{1 \text{ AF}}{43,560 \text{ cf}} = 1,517 \text{ AF}$$

During the reservoir filling period (1 day for every 14 days), additional losses occur due to leakage through the check boards and operational inefficiencies. The reservoir fills for a cumulative 12 days over the span of the irrigation season.

$$\text{Total Filling Days} = \frac{1}{14} \times 165 \text{ days} = 12 \text{ days}$$

These flows are not significant enough to overcome seepage losses in the canal. The canal's seepage effectively absorbs the additional 10 cfs during the filling days, meaning approximately 238 AF is lost over the irrigation season from filling the reservoir alone.

$$\text{Total Volume Lost (AF)} = 12 \text{ days} \times 10 \text{ cfs} \times 3600 \frac{\text{sec}}{\text{hr}} \times 24 \frac{\text{hr}}{\text{day}} \times \frac{1 \text{ AF}}{43,560 \text{ cf}} = 238 \text{ AF}$$

During a 165-day irrigation season, approximately 1,755 AF are lost due to operational inefficiencies from manual flow adjustments.

$$\text{Total Volume Lost (AF)} = 1,517 \text{ AF} + 238 \text{ AF} = 1,755 \text{ AF}$$

The estimated water conservation potential of the project is based on the calculations provided above. Addressing these inefficiencies by installing a new structure with SCADA integration would significantly enhance water conservation efforts. Supporting details and additional calculations are provided in subsequent sections of this grant application. Currently BBWA maintains handwritten flow records, highlighting the need for modernized measurement and control systems.

4. **Please address the following questions according to the type of infrastructure improvement you are proposing for funding.** See Appendix A: Benefit Quantification and Performance Measure Guidance for additional guidance on quantifying water savings.

(1) Canal Lining/Piping:

Not applicable

(2) Municipal Metering:

Not applicable.

- (3) Irrigation Flow Measurement:** Irrigation flow measurement improvements can provide water savings when improved measurement accuracy results in reduced spills and over-deliveries to irrigators. Applicants proposing municipal metering projects should address:

- a. How have average annual water savings estimates been determined? Please provide all relevant calculations, assumptions, and supporting data.

Currently, the BBWA cannot remotely measure flows diverted at the Rattlesnake Reservoir Diversion. As a result, the BBWA adjusts flows every 6 hours, resulting in fluctuations of downstream flows instead of maintaining a continuous flow. Each time a check board is removed from the diversion structure, the downstream flow increases by approximately 10 cfs.

$$\text{Flow Rate Increase (Q)} = \text{Width (W)} \cdot \text{Velocity (V)} \cdot \text{Incremental Depth (\Delta h)}$$

$$Q = W \cdot V \cdot \Delta h = 50\text{ft} \cdot \frac{2\text{ft}}{\text{sec}} \cdot 0.1\text{ft} = 10\text{cfs}$$

Over the 6-hour period, the additional flow decreases from 10 cfs back to the baseline as the system stabilizes. Therefore, the average flow increase during this period is 5 cfs.

$$AFI = \text{Average Flow Increase}$$

$$AFI = \frac{\text{Initial Flow Increase} + \text{Final Flow Increase}}{2} = \frac{10 \text{ cfs} + 0 \text{ cfs}}{2} = 5 \text{ cfs}$$

On average, the irrigation season is 165 days, with water flowing past the reservoir 13 out of every 14 days and the lake filling 1 out of every 14 days.

$$Total\ Flow\ Days = \frac{13}{14} \times 165\ days = 153\ Days$$

If the diversion structure could adjust flows instantaneously (eliminating the 6-hour lag between manual adjustments), it would save approximately 1,517 AF currently lost due to the overcompensation during adjustments.

$$Total\ Volume\ Lost\ (AF) = 153\ days \times 5\ cfs \times 3600 \frac{sec}{hr} \times 24 \frac{hr}{day} \times \frac{AF}{43,560\ cf} = 1,517\ AF$$

During the reservoir filling period (1 day for every 14 days), additional losses occur due to seepage and operational inefficiencies. The reservoir fills for 12 days over the span of the irrigation season.

$$Total\ Filling\ Days = \frac{1}{14} \times 165\ days = 12\ days$$

These flows are not significant enough to overcome seepage losses in the canal. The canal's seepage effectively absorbs the additional 10 cfs during the filling days, meaning approximately 238 AF is lost over the irrigation season from filling the reservoir alone.

$$Total\ Volume\ Lost\ (AF) = 12\ days \times 10\ cfs \times 3600 \frac{sec}{hr} \times 24 \frac{hr}{day} \times \frac{1\ AF}{43,560\ cf} = 238\ AF$$

During a 165-day irrigation season, through operational inefficiencies from manual flow adjustments, approximately 1,755 AF are lost.

$$Total\ Volume\ Lost\ (AF) = 1,517\ AF + 238\ AF = 1,755\ AF$$

The estimated annual water savings estimates of the project for the Rattlesnake Reservoir are based on the calculations provided above.

- b. Have current operational losses been determined? If water savings are based on a reduction of spills, please provide support for the amount of water currently being lost to spills.

The estimated water losses of 1,755 AF annually are considered operational losses due to the manual and inefficient operation of the current diversion structure. Water losses are not due to spills in the system.

- c. Are flows currently measured at proposed sites and if so, what is the accuracy of existing devices? How has the existing measurement accuracy been established?

Currently, BBWA uses a staff gauge to measure water levels in Rattlesnake Reservoir and another staff gauge in the Main Canal at the diversion structure. The current gauge in the canal is used strictly for elevation and not for precise flow measurements. The canal gauge reads about 2 feet lower than the actual water level and although these methods have been in place for decades, measurements are only taken four times a day (every 6 hours) during the irrigation season.

- d. Provide detailed descriptions of all proposed flow measurement devices, including accuracy and the basis for the accuracy.

The project would install a MagShaft Shaft Encoder from Microcom on the diversion structure which is a highly accurate flow measurement device specifically designed for precise level monitoring. This encoder has a nominal accuracy of ± 0.36 degrees and a maximum accuracy of ± 0.5 degrees. This level of precision makes the MagShaft ideal for applications requiring exact water level readings. The basis for this accuracy stems from the encoder's advanced magnetic sensing technology, which minimizes drift and maintains consistent output even in fluctuating environmental conditions (Microcom 2024).

- e. Will annual farm delivery volumes be reduced by more efficient and timely deliveries? If so, how has this reduction been estimated?

The annual farm delivery volumes are expected to remain the same, as the project does not aim to reduce the overall water allocated to farms. Instead, the project focuses on enhancing the efficiency and responsiveness of water delivery. By automating water management processes and enabling real-time, remote adjustments, the system will minimize waste and improve delivery timeliness according to fluctuating demand, such as lower usage during cooler weather or rainy periods. These efficiencies aim to ensure the allocated water reaches irrigators more effectively rather than altering the total volume of water delivered annually.

The benefits from the project are thus centered on operational improvements and water efficiency, enhanced reservoir management, and decreased staff demand for manual adjustments. SCADA will significantly reduce the need for 24/7 manual interventions, providing a more reliable and efficient water supply system. This will also bring cost savings in operations and maintenance, alleviating the strain on BBWA resources and potentially improving water reliability for both agricultural users and local residents.

- f. How will actual water savings be verified upon completion of the project?

BBWA will leverage real-time data collection and analysis to measure the project's impact on water conservation and management efficiency. Continuous monitoring of flow rates, gate positions, and water levels in the canal and reservoir will allow BBWA to compare automated data with pre-project manual data, highlighting improvements in water management efficiency and reductions in water loss. The system's automation will streamline operations, reducing the need for manual adjustments and saving time, vehicle mileage, and fuel costs. Real-time tracking of water flows and precise gate control will help prevent over-deliveries, maintain optimal flow rates, and minimize water lost at the canal's end. Automated data logging will also provide detailed records of daily water usage, and flow stability, enabling accurate calculations of water saved.

Over time, this ongoing data collection will support trend analysis, allowing BBWA to report on water conservation achievements and operational savings. This will offer clear, quantifiable evidence of the SCADA system's long-term effectiveness in enhancing water management and efficiency.

(4) Turf Removal:

Not applicable.

(5) Smart Irrigation Controllers, Controllers with Rain Sensor Shutoff, Drip Irrigation, and High-Efficiency Nozzles:

Not applicable.

(6) High-Efficiency Indoor Appliances and Fixtures:

Not applicable.

(7) Commercial Cooling Systems:

Not applicable.

E.1.2 Evaluation Criterion B – Renewable Energy

E.1.2.1 Subcriterion B.1. Implementing Renewable Energy Projects Related to Water Management and Delivery

Describe the amount of energy capacity. For projects that implement renewable energy 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.

Not applicable.

Describe the amount of energy generated. For projects that implement renewable energy 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. Please explain how the power generated as a result of this project will be used, including any existing or planned agreements and infrastructure.

Not applicable.

Describe the status of a mothballed hydropower plant. For projects that are brining mothballed hydropower capacity back online, please describe the following:

Not applicable.

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

Not applicable.

E.1.2.2 Subcriterion B.2. Increasing Energy Efficiency in Water Management

Describe any energy efficiencies that are expected to result from implementation of the water conservation or water efficiency project (e.g., reduced pumping).

- If quantifiable energy savings is expected to result from the project, please provide sufficient details and supporting calculations. If quantifying energy savings, please state the estimated amount in kilowatt hours per year.

Not applicable.

- How will the energy efficiency improvement combat/offset the impacts of climate change, including an expected reduction in greenhouse gas emissions.

The proposed project will reduce greenhouse gas emissions in two ways. First, the project will greatly reduce the number of trips BBWA operators and vehicles must make to the Rattlesnake Reservoir diversion for operations and maintenance. Once the project is installed, BBWA will not have to make as many trips to this remote location to effectively manage water operations. The reduction in trips will reduce the vehicle miles travelled, burn less fuel, and reduce greenhouse gas/carbon dioxide emissions by approximately 5.9 metric tons annually. Additional details and calculations are provided below.

The additional water that is conserved within Rattlesnake Reservoir will be available to augment late-season flows to the system's water users and will allow for increased crop production throughout the BBWA's service area. The additional crop production will improve vegetative cover throughout the irrigated land which will sequester more carbon than currently possible.

If the project will result in reduced pumping, please describe the current pumping requirements and the types of pumps (e.g., size) currently being used. How would the proposed project impact the current pumping requirements and energy usage?

Not applicable.

- Please indicate whether your energy savings estimate originates from the point of diversion, or whether the estimate is based upon an alternate site of origin.

Not applicable.

- Does the calculation include any energy required to treat the water, if applicable?

Not applicable.

- Will the project result in reduced vehicle miles driven, in turn reducing greenhouse gas emissions? Please provide supporting details and calculations.

Currently, BBWA personnel drive the route between the Rattlesnake Reservoir diversion and the BBWA office 4 times per day (every 6 hours) during the irrigation season to adjust gate positions at the diversion. The driving distance between the BBWA office and the reservoir is 16 miles round-trip, which equals 64 miles per day (4 trips x 16 miles). Therefore, BBWA vehicles travel approximately 10,560 miles to and from the reservoir during the 165-day irrigation season (165

days x 64 miles per day). The proposed SCADA improvements would eliminate 95% of these trips and would allow the water measurement and adjustment process to occur remotely and continuously. The project will reduce vehicle miles traveled by approximately 10,032 miles (0.95 x 10,560 miles) during the irrigation season between the office and the reservoir. BBWA's trucks have an average fuel efficiency of 15 miles per gallon, which means the project would save approximately 669 gallons of gasoline per year (10,032 miles / 15 miles per gallon). This will reduce greenhouse gas/carbon dioxide emissions by approximately 5.9 metric tons annually according to the [U.S. EPA Greenhouse Gas Equivalencies Calculator](#). The reduction in vehicle miles will also save significant staff time and money on gasoline and vehicle maintenance for BBWA.

- Describe any renewable energy components that will result in minimal energy savings/production (e.g., installing small-scale solar as part of a SCADA system).
Not applicable.

E.1.3 Evaluation Criterion C – Other Project Benefits

Resilience and Sustainability Benefits. Will the project address a specific water and/or energy sustainability concern? Please address the following:

- Explain and provide detail of the specific issue(s) in the area that is impacting water resilience and sustainability.

Persistent Drought Conditions

The proposed project directly addresses significant water resilience and sustainability concerns in the Billings area which is facing persistent and intensifying drought conditions. The region's semi-arid climate makes it especially susceptible to drought, with recent assessments by Montana's Drought and Water Supply Advisory Committee indicating a Medium-High vulnerability for Yellowstone County (Montana Drought and Water Supply Advisory Committee, 2023). Agricultural demands in this area are increasingly strained due to fluctuating water availability, and as a result, there is a critical need to improve water management to support both current and future demands.

Drought is a recurring feature in central Montana, occurring 20 times in the past 21 years (U.S. Drought Monitor, 2024). Rising temperatures are causing more precipitation to fall as rain rather than snow, reducing snowpack and ultimately diminishing the water available in summer and fall. This shift is creating compounding effects, with drought not only leading to water shortages but also resulting in reduced agricultural yields, increased wildfire risk, and stressed aquatic ecosystems (U.S. Drought Monitor, 2024).

Montana's agricultural regions, including those managed by the BBWA, are currently facing recurring drought conditions, with impacts evident across water supplies and agricultural output. Over recent years, warmer temperatures have caused snow to melt earlier, shifting runoff patterns and reducing water availability during the hotter summer months when it's needed most (Montana Climate Assessment, 2017). This earlier peak in river flows, combined with extended

dry periods, has led to a shorter water supply window for critical summer irrigation, increasing the region's vulnerability to water scarcity.

Projected Increases in Drought Severity and Duration

Projections from climate-informed analyses, such as the 2017 Montana Climate Assessment, indicate that the severity and duration of drought in Montana are expected to worsen (Montana Climate Assessment, 2017). The assessment outlines several concerning trends, including declining snowpack levels at mid and low elevations, earlier spring runoff, and reduced river flows during late summer and fall. This shift toward earlier snowmelt and runoff will likely extend the duration of low-flow conditions in rivers, thereby amplifying drought-related challenges in the BBWA-managed regions. These changes are expected to increase water rationing pressures as river flows diminish earlier than in previous decades, forcing irrigation districts to adapt their water use more aggressively to conserve resources.

Canal Flood Risk

In the event of a structural failure of the diversion, BBWA would lose the ability to manage inflows to the reservoir and regulate the water flow in the Main Canal. Such a failure would have significant consequences, especially if it occurred with a full reservoir. The uncontrolled release of water into the canal would result in extensive flooding east of the diversion. This flooding could lead to substantial erosion along the canal banks, compromising the canal's structural integrity and threatening infrastructure downstream.

- Explain and provide detail of the specific issues(s) in the area that is impacting energy sustainability, such as reliance on fossil fuels, pollution, or interruptions in service.

Currently, BBWA personnel drive between the Rattlesnake Reservoir diversion and the BBWA office four times per day during the irrigation season to adjust gate positions at the diversion. This route is a 16-mile round trip, resulting in 64 miles of travel daily. Over the 165-day irrigation season, BBWA vehicles cover approximately 10,560 miles (165 days x 64 miles per day) which increases BBWA's reliance on fossil fuels to operate and maintain their delivery system.

- Please describe how the project will directly address the concern(s) stated above.

The proposed project offers a strategic solution to the ongoing challenges of drought, water scarcity, and energy inefficiency facing the BBWA. By implementing a SCADA system, BBWA can achieve greater precision and efficiency in managing water resources, reducing the need for excess releases that would otherwise be lost due to fluctuating demands. The ability to make real-time, remote adjustments will enable BBWA to maintain water availability later into the irrigation season, directly supporting the agricultural lands reliant on this water supply.

The shift to remote monitoring at the diversion eliminates the need for most of the daily vehicle trips previously required to adjust gate positions manually. The project would eliminate 95% of vehicle trips to the diversion, allowing remote, continuous water measurement and gate adjustments. This reduction in trips would save approximately 10,032 vehicle miles each

irrigation season, which, with BBWA trucks averaging 15 miles per gallon, equates to an annual savings of around 669 gallons of gasoline. According to the U.S. EPA Greenhouse Gas Equivalencies Calculator, this would reduce greenhouse gas emissions by approximately 5.9 metric tons per year. This change not only reduces fossil fuel use and reduces greenhouse emissions but also cuts down on operational costs associated with travel and vehicle maintenance, contributing to BBWA's energy sustainability goals.

Altogether, the project strengthens BBWA's ability to conserve water and energy, meeting the pressing needs of water sustainability in a drought-prone region while enhancing resilience against future climate variability. By addressing both water and energy sustainability, the project prepares BBWA to manage resources more effectively, supporting both agricultural productivity and environmental conservation.

- Will the project directly result in more efficient management of the water supply? For example, will the project provide greater flexibility to water managers, resulting in a more efficient use of water supplies?

Yes, the proposed project will directly result in more efficient management of the water stored in Rattlesnake Reservoir by providing BBWA with advanced tools for real-time monitoring and precise control of water flows. The SCADA system will allow water managers to remotely monitor and adjust gate positions at the Rattlesnake Reservoir, offering a significant improvement over the current system, which requires manual adjustments multiple times per day. The proposed project will install a MagShaft Shaft Encoder from Microcom, which is a highly accurate flow measurement device specifically designed for precise level monitoring. This increased control will enable BBWA to release only the necessary amount of water to meet downstream demand, reducing waste from excess releases and improving the overall efficiency of water use.

The system also provides greater flexibility for water managers by allowing adjustments to be made in response to real-time changes in water demand, weather conditions, and flow rates. During critical periods—such as late-season droughts—this flexibility will allow BBWA to conserve reservoir water and maximize its availability throughout the irrigation season. By reducing water loss and optimizing the timing of releases, the project will help BBWA sustain agricultural productivity and enhance drought resilience for agricultural producers.

- Please address where any conserved water as a result of the project will go and how it will be used, including whether the conserved water will be used to offset groundwater pumping, used to reduce diversions, used to address shortages that impact diversions or reduce deliveries, made available for transfer, left in the river system, or used to meet another intended use.

The proposed project will conserve approximately 1,755 acre-feet of water each year by enabling remote operation of the Rattlesnake Reservoir diversion, preventing spills into the canal and losses due to seepage. This conserved water will remain in Rattlesnake Reservoir for extended periods throughout the year. Currently, BBWA water users experience reductions in water allocations due to limited water availability in the reservoir, especially during the late summer

months when irrigation demand peaks. By conserving more water in the reservoir, the project will allow BBWA to delay these reductions, providing water users with adequate supply for a longer duration during the irrigation season.

- Will the project assist States and water users in complying with interstate compacts?

Not applicable.

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

Not applicable.

Ecological Benefits. In addition to the separate WaterSMART Environmental Water Resources Projects NOFO, this NOFO places a priority on projects that result in ecological benefits, through this section and other sections above, consistent with the SECURE Water Act. Please provide information regarding how the project will provide ecosystem benefits, including the following:

- 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 or is subject to a recovery plan or conservation plan under the Endangered Species Act (ESA).

Not applicable.

- Will water remain in the system for longer periods of time? If so, provide details on current/future durations and any expected resulting benefits (e.g., maintaining water temperatures or water levels, recreational benefits, etc.).

Not applicable.

- Will the proposed project reduce the likelihood of a species listing or otherwise improve the species status?

Not applicable.

- Please describe any other ecosystem benefits as a direct result of the project.

Not applicable.

Climate Change: E.O. 14008 emphasizes the need to prioritize and take robust actions to reduce climate pollution; increase resilience to the impacts of climate change; protect public health; and conserve our lands, waters, oceans, and biodiversity.

- Describe how the project addresses climate change and increases resiliency. For example, does the project help communities adapt to bolster drought resilience?

The proposed project addresses climate change and enhances resilience by improving BBWA's ability to manage water resources more precisely and efficiently, particularly in response to increasing drought conditions. Climate change in central Montana has led to earlier snowmelt,

reduced snowpack, and extended dry periods, all of which intensify water scarcity during the critical late summer months (Montana Climate Assessment, 2017). The project's implementation of a SCADA system directly supports BBWA's efforts to adapt to these changing conditions by allowing real-time, remote monitoring and control of water releases from Rattlesnake Reservoir. This increased control prevents unnecessary water loss and conserves approximately 1,755 acre-feet of water each irrigation season, extending water availability for BBWA users when they need it most (Montana Drought and Water Supply Advisory Committee, 2023).

- Does the project seek to improve ecological resiliency to climate change?

Not applicable.

- Does the proposed project seek to reduce or mitigate climate pollutions such as air or water pollution?

Yes, the proposed project will mitigate climate pollution, particularly air pollution, by reducing BBWA's reliance on fossil fuels. Currently, BBWA personnel must drive to the Rattlesnake Reservoir diversion four times daily during the irrigation season to adjust gate positions, covering approximately 10,560 miles over the 165-day season. By implementing the SCADA system for remote water measurement and gate adjustments, the project will eliminate 95% of these trips, saving around 10,032 vehicle miles annually. With BBWA trucks averaging 15 miles per gallon, this reduction in travel equates to saving approximately 669 gallons of gasoline each year.

According to the U.S. EPA Greenhouse Gas Equivalencies Calculator, this reduction in fuel use will decrease greenhouse gas emissions by approximately 5.9 metric tons annually. By reducing vehicle miles traveled and fuel consumption, the project minimizes air pollution associated with vehicle emissions, including carbon dioxide, particulate matter, and other pollutants that contribute to climate change and degrade air quality. This shift to remote operations will also support BBWA's energy sustainability goals by reducing operational costs and reliance on fossil fuels, directly addressing climate pollution through decreased emissions.

- Does the proposed project include green or sustainable infrastructure to improve community climate resilience?

Yes, the proposed project includes sustainable infrastructure through the integration of a SCADA system, which supports BBWA's goals of improving water efficiency and climate resilience. By implementing this technology, BBWA can remotely monitor and control water releases from the Rattlesnake Reservoir, reducing water waste and conserving resources during critical drought periods. This digital infrastructure allows for precise, real-time adjustments that align with sustainable water management practices, helping to maintain water availability throughout the irrigation season and supporting the resilience of both agricultural lands and local ecosystems.

- Does the proposed project contribute to climate change resiliency in other ways not described above?

The proposed project is part of a larger planned project by BBWA to modernize their irrigation system and make it more efficient to improve the sustainability of the water supply. The more

water saved within the system will allow the BBWA to reduce and minimize the overall impact of drought conditions throughout the Yellowstone River Basin and Twelve Mile Creek Watershed.

E.1.4 Evaluation Criterion D – Disadvantaged Communities, Insular Areas, and Tribal Benefits

E.1.4.1 Subcriterion D.1. Disadvantaged Communities

- Please use the White House Council on Environmental Quality’s interactive Climate and Economic Justice Screening Tool (CEJST) to identify any disadvantaged communities that will benefit from your project.

The proposed project is located in Yellowstone County, identified as a partially disadvantaged community, specifically due to the high energy costs experienced by its residents (CEJST). While the project focuses on water conservation, improved water management, and emissions reduction, it does not directly address the high energy costs that contribute to the community’s disadvantaged status. The primary goals of this project are to enhance water resilience and sustainability in the face of climate impacts, which indirectly support overall community resilience but do not specifically target energy affordability issues.

- If applicable, describe how the proposed project will serve or benefit a disadvantaged community, identified using the tool. For example, will the project improve public health and safety by addressing water quality, add new water supplies, provide economic growth opportunities, or provide other benefits in a disadvantaged community?

The proposed project will provide economic growth opportunities to Yellowstone County, a partially disadvantaged community identified by the Climate and Economic Justice Screening Tool due to high energy costs (CEJST). The project will support economic resilience by enhancing agricultural productivity and strengthening the local economy.

By conserving 1,755 acre-feet of water annually, the project will increase water available for farms, directly boosting crop yields across 14,000 of the 18,000 acres served by the BBWA. The project will provide more reliable water for crops such as alfalfa, corn, barley, wheat, and sugar beets. These crops generate an average of approximately \$700/acre in revenue, which generates approximately \$9.8 million annually for the local economy. Increased crop production will positively impact the local and state economy by enhancing food supplies, raising farm revenues, and expanding contributions to the state and local tax base.

The proposed project will create short-term economic benefits during its construction phase by generating demand for local labor, trucking, and supplies. These activities will support job creation and economic activity in the area, providing an immediate boost to the community’s economy. Overall, the project’s contribution to agricultural stability and economic growth will strengthen the economic resilience of Yellowstone County, indirectly benefiting disadvantaged residents by promoting sustained regional economic health and enhancing the agricultural backbone of the local economy.

E.1.4.2 Subcriterion D.2. Tribal Benefits

The Department is committed to strengthening tribal sovereignty and the fulfillment of Federal Tribal trust responsibilities. The President's memorandum, *Tribal Consultation and Strengthening Nation-to-Nation Relationships*, asserts the importance of honoring the Federal Government's commitments to Tribal nations. Address the following, if applicable:

- Does the proposed project directly serve and/or benefit a Tribe? Will the project increase water supply sustainability for an Indian Tribe? Will the project provide renewable energy for an Indian Tribe?

Not applicable.

- Does the proposed project support Tribal led conservation and restoration priorities, and/or incorporate or benefit indigenous traditional knowledge and practices?

Not applicable.

- Does the proposed project directly support tribal resilience to climate change and drought impacts or provide other Tribal benefits such as improved public health and safety through water quality improvements, new water supplies, increased renewable energy, or economic growth opportunities? Does the proposed project support Reclamation's Tribal trust responsibilities or a Reclamation activity with a Tribe?

Not applicable.

E.1.5 Evaluation Criterion E – 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.
 - Have the farmers requested technical or financial assistance from NRCS for the on-farm efficiency projects, or do they plan to in the future?

Not applicable.

Not applicable.

- 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.

Not applicable.

- Applicants should provide letters of intent from farmers/ranchers in the affected project areas.

Not applicable.

- 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, installing a pressurized pipe through WaterSMART can help support efficient on-farm irrigation practices, such as drip-irrigation.

Not applicable.

OR

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

Not applicable.

- Describe the on-farm water conservation or water use efficiency benefits that are expected to result from any on-farm work.
 - 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.

Not applicable.

- Please provide a map of your water service area boundaries. If your project is selected for funding under this NOFO, this information will help NRCS identify the irrigated lands that may be approved for NRCS funding and technical assistance to complement funded WaterSMART projects.

Not applicable.

E.1.6 Evaluation Criterion F – Readiness to Proceed

- Identify and provide a summary description of the major tasks necessary to complete the project.

The proposed project will consist of the following tasks:

- Planning – The project will require a planning level effort to coordinate activities for the project up-front following award and contracting with Reclamation.
- Site Survey – The project has had a survey complete for the 60% plans and it is anticipated that the new easement for electrical supply will be provided by the local electrical co-op (Yellowstone Valley Electric Cooperative).
- Design – The proposed project has had 60% design completed and will need finalization of design and bidding documents. A set of plans and specifications will be developed and submitted to BBWA and Reclamation for approval.

- **Permitting** – The necessary permits will need to be obtained to facilitate construction of the project. A copy of the permit documents will be submitted to BBWA and Reclamation. Permitting will include environmental and cultural resource compliance (see below).
- **Construction** – The project will be publicly advertised, and a General Contractor will be hired to perform all construction work. The Contractor will be responsible for securing the materials, equipment, and labor necessary for completing the project according to the plans and specifications.
- **Construction Administration** – An Engineer will be needed to provide construction administration, inspection of the work, and ensure compliance with the plans and specifications. Photos, submittal approvals, daily logs and other construction information will be saved and compiled throughout the project.
 - **As-Built Documentation** – An Engineer will be needed to perform an as-built verification of the new headgate structure. A construction completion report will be submitted to BBWA and Reclamation.
 - **Construction and Grant Close-Out** – The BBWA or consultant will be required to ensure that all the requirements of the construction and WaterSmart grant have been completed and submitted to Reclamation for approval.
- **Describe any permits that will be required, along with the process for obtaining such permits.**

For each of the permits listed below, the BBWA or General Contractor will work with each permitting agency to determine whether a formal permit is needed for the construction of the proposed project. Although it is not anticipated that any permits will be needed except for the Stormwater Pollution Prevention Plan (SWPPP), we have provided the following list of permits that the BBWA will follow up on if the grant is awarded. Additionally, the BBWA will work with a consultant on NEPA and Cultural Resource compliance as required by Reclamation. If needed, the following permits may be obtained with assistance from the engineer during the design process:

SPA 124 Permit – The Montana Department of Fish, Wildlife & Parks requires a permit for any activity that physically alters or modifies the bed or banks of a perennially flowing stream for a legal public entity. Consultation will be performed, but the activities proposed herein are likely exempt from this rule as the construction will take place in existing manmade irrigation canals. A Montana joint application form will need to be filled out and submitted to FWP for review.

404 Permit – The Army Corps of Engineers (USACE) requires a permit for any activity that will result in the discharge or placement of dredged or fill material into waters of the United States, including wetlands. Consultation will be performed, but the activities proposed herein are likely exempt as stated in CRF 323.4(a)3. A Montana joint

application form will need to be filled out and submitted to the USACE for a determination.

318 Authorization – The Short-Term Water Quality Standard for Turbidity requires a permit for any construction activities that will cause temporary violations of state surface water quality standards for turbidity. Since no water will be in the irrigation canals at the time of construction, no turbidity permit will be required.

Storm Water Discharge General Permit – State Storm Water Rules require a storm water discharge permit under the requirements of the 2018 General Permit for any construction project over one acre in total disturbance that discharges into State waters. A Notice of Intent form and Stormwater Pollution Prevention Plan Form along with all attachments and supplements will need to be submitted to the Montana Department of Environmental Quality.

Montana Sage Grouse Habitat Conservation Program - The program's role is to implement Montana's Sage Grouse Conservation Strategy including the conservation, restoration, and mitigation of changes to sage grouse habitat because of development. Montana has a website <https://sagegrouse.mt.gov/ProgramMap> that will need to be consulted prior to construction activities. The project is inside the Executive Order (EO) General Habitat, but it is not a core area. Thus, permitting is not necessary.

- Identify and describe any engineering or design work performed specifically in support of the proposed project.

The proposed project will require the assistance of an engineer for the design of the new structure. A 60% design has been completed including a project manual for bidding. Finalization of the plans and project manual will be required prior to bidding of the project, including completion of the bid form, finalization of reinforcement details, and confirmation with permitting agencies. The 60% design package is included as an attachment.

- Describe any new policies or administrative actions required to implement the project.
Not applicable.
- Describe the current design status of the project. If additional design work is required prior to construction, describe the planned process and timeline for completing the design work.

The current design status of the project is at 60% completion, with preliminary bidding documents already developed. Additional design work is required to bring the project to full readiness for construction. The process involves completing the remaining design phases, which will include finalizing technical specifications, refining cost estimates, and preparing detailed construction plans. This remaining design work is anticipated to proceed on a timeline that will allow for completion in advance of the construction bidding phase. Once the design reaches 100%, the project will be fully prepared to move

forward with the competitive bidding process, ensuring that all elements are ready for efficient and timely construction.

- Please also include an estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates. Milestones may include, but are not limited to, the following: complete environmental and cultural compliance; mobilization; begin construction/installation; construction/installation (50% complete); and construction/installation (100% complete). Was the expected timeline for environmental and cultural compliance discussed with the local Reclamation regional or area office?

BBWA and its partners have discussed the project with the local Reclamation area office (Archie Lind, Civil Engineer, Planning and Project Management, Montana Area Office). The expected timeline for the project, including environmental and cultural compliance, was discussed and the local office agreed the timeline was reasonable given the project. The local Reclamation area office tentatively plans to be involved in the environmental review process pending staffing availability. The costs of environmental compliance will be identified during the process of developing a final project budget for inclusion in the financial assistance agreement.

The table below includes a schedule of activities and milestones:

Activity	Date(s)
WaterSmart Grant Due Date	Nov 13, 2024
Evaluate Grant Applications - Reclamation	Nov 13, 2024 - May 2025
Grant Award	May 2025
Contract Execution	May 2025 - Oct 2025
Project Initiation	Nov 2025
Project Kickoff Meeting	Dec 2025
Project Design	Dec 2025 - April 2026
Environmental/Cultural Resource Compliance	Dec 2025 - April 2026
BBWA and Reclamation Plans Review	April 2026 - June 2026
Final Plans & Specifications	June 2026
General Contractor Advertisement and Contracting	Jun 2026 - Jul 2026
Begin Construction	Oct 2026
Mid-Point Construction (50%)	Dec 2026
End Construction (100%)	Apr 2027
Construction Administration	Oct 2026 - Apr 2027
Construction Closeout	Apr 2027
As-Built Verification	May 2027
Construction Completion Report	May 2027
Grant Closeout and Project Completion	Jun 2027

E.1.7 Evaluation Criterion G – Collaboration

- Is there widespread support for the project? Please provide specific details regarding any support and/or partners involved in the project. What is the extent of their involvement in the process? What is the significance of the collaboration/support?

BBWA is working closely with the City of Billings and Yellowstone County on several projects to better manage water in the canal system which passes through the city. These projects include upgrading the diversion headworks on the Yellowstone River with SCADA and addressing safety concerns along a section of canal that is at risk for flooding due to an aging tunnel and unstable slopes. BBWA and the City of Billings have a Memorandum of Understanding for these projects and work closely with engineers and other partners such as Montana Department of Natural Resources and Conservation and Montana Disaster and Emergency Services. While these projects are distinct from the SCADA project proposed in this application, these efforts by BBWA and the City are interrelated and cumulatively improve water management in the area.

- Will this project increase the possibility/likelihood of future water conservation improvements by other water users?

This project will not necessarily affect the likelihood of water conservation improvements by individual water users, however BBWA is planning to integrate additional SCADA sites at key sites their system, which increase future water conservation.

- Will the project benefit multiple sectors and/or users (e.g., agriculture, municipal and industrial, environmental, recreation, or others)?

The project will benefit water supplies for agriculture users and domestic water users. The project will benefit agricultural water users by saving an estimated 1,755 acre-feet annually that would otherwise be lost to operational inefficiencies. The SCADA project will allow BBWA to save this water in Rattlesnake Reservoir over the course of the season and deliver it to water users for agricultural production.

Rattlesnake Reservoir also supplies raw domestic water for 113 nearby homes in the Hidden Lake subdivision. Improved control of reservoir levels will enhance the reliability of the water supply for these residents.

- Please attach any relevant supporting documents (e.g., letters of support or memorandum of understanding).

BBWA has received letters of support from the following entities:

- Hidden Valley Water District
- Yellowstone Conservation District
- Heidema Farms

BBWA also has a Memorandum of Understanding with the City of Billings for related projects that focus on water conservation and SCADA.

E.1.8 Evaluation Criteria H – Nexus to Reclamation

- Does the applicant have a water service, repayment, or operations and maintenance (O&M) contract with Reclamation?

No, the BBWA does not have a water service, repayment, or O&M contract with Reclamation.

- If the applicant is not a Reclamation contractor, does the applicant receive Reclamation water through a Reclamation contractor or by any other contractual means?

No, the BBWA does not receive Reclamation water through a Reclamation contractor or by any other contractual means.

- Will the proposed work benefit a Reclamation project area or activity?

No, the proposed project would not benefit a Reclamation project or activity.

- Is the applicant a Tribe?

No, the applicant is not a Tribe.

5 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.

All Water and Energy Efficiency Grants applicants are required to propose a “performance measure” (a method of quantifying the actual benefits of their project once it is completed). Actual benefits are defined as water actually conserved or better managed, as a direct result of the project.

5.1 Performance Measure A: Projects with Quantifiable Water Savings

- Performance Measure A.3: SCADA and Geographic Information Systems
 - Pre-project estimations of baseline data:

BBWA’s water management operations rely on manual processes that require personnel to measure flow rates and adjust gate positions multiple times each day. This approach often results in over-deliveries and unintentional water losses due to delays between adjustments and the inherent imprecision of manual control. Without real-time data, operators must estimate water needs based on scheduled checks, typically performed every six hours. These periodic adjustments, while necessary to maintain the system, lead to fluctuations in downstream water availability and inefficiencies, with significant volumes of water inadvertently released due to overcompensation. This baseline data of frequent over-deliveries and approximate flow adjustments highlights the limitations of the current manual system, establishing a quantifiable starting point from which the SCADA system’s impact on water conservation and management efficiency can be measured.

- Post-project methods for quantifying the benefits of SCADA or SCADA/GIS system projects

After the implementation of the SCADA system, BBWA will utilize real-time data collection and analysis to measure the benefits of the project. Continuous monitoring of flow rates, gate positions, and water levels in the canal and reservoir will provide a reliable comparison to pre-project manual data, highlighting improvements in water management efficiency and significant reductions in water loss. The system's automation will streamline operations by minimizing the need for manual adjustments, thereby saving time, reducing vehicle mileage, and lowering fuel costs. In the event of system failures or outages, well-defined response protocols will enable quick troubleshooting and continuity in water management. Over time, this automated data collection will support trend analysis and allow BBWA to report on water conservation achievements and operational savings, offering clear, quantifiable evidence of the SCADA system’s long-term impact on water conservation.

- Performance Measure A.4: Automation
 - Pre-project estimations of baseline data

BBWA's water management makes manual gate adjustments, leading to inefficiencies in water distribution. The existing system requires staff to physically visit the site every six hours to adjust gate positions, a process that often results in over-deliveries and seepage due to the delays between adjustments and the lack of precise, real-time control. This baseline scenario estimates that approximately 1,755 acre-feet of water is lost per irrigation season due to these manual adjustments, with excess water flowing into the canal and being lost to seepage and evaporation. The current limitations of manual adjustments, which lack the accuracy and responsiveness that automation would provide, serve as a benchmark for evaluating the expected improvements in water savings, resource allocation, and operational efficiency once the SCADA-based automation system is implemented.

The pre-project baseline estimations of water loss were calculated based on BBWA's manual adjustment intervals and observed flow patterns. Each manual adjustment increases downstream flow by approximately 10 cfs, which then gradually decreases back to the baseline as the system stabilizes. Over a six-hour period between adjustments, this excess flow averages 5 cfs. Calculations were based on an average 165-day irrigation season, during which flow adjustments are made multiple times daily, and additional losses occur from seepage during reservoir filling. Together, these factors contribute to an estimated 1,755 acre-feet of water lost each season, providing a quantifiable basis to measure the impact of the SCADA system in reducing these inefficiencies.

o Post-project methods for quantifying benefits of spillage reduction projects

BBWA will quantify spillage reduction benefits through continuous monitoring of water flows and precise control of gate adjustments in real time. The system will allow BBWA to track water releases closely and compare actual post-project data against baseline estimates of water loss. By reducing the need for over-deliveries, the automation system will help maintain optimal flow rates, minimizing water lost at the canal's end. Automated data logging will provide a record of daily water usage, flow stability, and any remaining spillage, enabling accurate calculations of water saved. This ongoing data collection will allow BBWA to calculate spillage reductions by measuring actual water conservation against pre-project losses, providing a clear, quantifiable assessment of the SCADA system's effectiveness in enhancing water management and efficiency.

6 Budget Narrative

Please see separate attachment for budget narrative.

7 Environmental and Cultural Resource Considerations

- 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.

The proposed project involves upgrading the entire concrete diversion structure at the Rattlesnake Reservoir. This will require earth-disturbing activities in the existing footprint of the structure, including demolition of the existing structure in the canal, excavation, and installation of the new concrete diversion structure. To minimize environmental impact, BBWA will implement best management practices throughout the construction phase.

The project is not expected to impact the surrounding environment, including soil and dust, air, water quality and quantity, or animal habitat.

- 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?

The project area overlaps with sage grouse and monarch butterfly habitat generally, and thus could have minor, short-term, local, non-recurring effects on habitat during construction activities. A consultation with Montana Sage Grouse Habitat Conservation Program will be completed to determine if any mitigation is needed. Best management practices will be used to mitigate any impacts on endangered species and associated habitat.

- 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.

The project is located on the BBWA Main Canal which diverts water from the Yellowstone River. There are no wetlands in the project area. The project will comply with federal regulations under the Clean Water Act if applicable.

- When was the water delivery system constructed?

The current diversion was originally constructed in 1904 but was restructured in 1925 to accommodate additional irrigator demands downstream in the system.

- 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.

The proposed project will involve modifications to specific features of the BBWA irrigation system, primarily the replacement of the concrete diversion structure at the Rattlesnake Reservoir. The structure, which includes check boards, was originally constructed in 1904, was restructured in 1925 and has undergone concrete repairs over the years to maintain functionality.

The project will replace the entire diversion structure with a new, more resilient concrete structure designed to improve flow control and durability. In addition to this replacement, the project will install a SCADA system for automated monitoring and adjustments.

- 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.

The proposed project will not impact any known listed or eligible for listing on the National Register of Historic Places buildings, structures, or features; however, consultation with the local Reclamation office and the State Historic Preservation Office (SHPO) will occur during the permitting phase.

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

BBWA is not aware of any archeological sites in the proposed project area.

- Will the proposed project have a disproportionate and adverse effect on any communities with environmental justice concerns?

The proposed project is not expected to have a disproportionate or adverse effect on any communities with environmental justice concerns. In fact, it is likely to provide benefits to the local community, including those identified as partially disadvantaged due to high energy costs in Yellowstone County (CEJST). By improving operational efficiency and reducing water loss, the project supports agricultural productivity and local economic stability, which can indirectly benefit disadvantaged communities reliant on the agricultural sector.

The reduction in vehicle travel associated with the SCADA system will also reduce greenhouse gas emissions and improve air quality, which benefits all community members, including those in disadvantaged areas.

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

The proposed project is not near Tribal lands and will not limit access to, and ceremonial use of, Indian sacred sites or cause other effects on Tribal lands.

- 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?

The proposed project is not expected to contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species in the area. During construction activities, BBWA will implement best management practices to prevent the spread of weeds and invasive species.

Following construction, disturbed areas will be reseeded with native vegetation to prevent invasive species establishment. These preventative measures will help ensure that the project does not adversely affect local ecosystems by contributing to the spread of noxious weeds or invasive species.

8 Required Permits and Approvals

A description of potential permits is included in Evaluation Criteria F – Readiness to Proceed.

State Storm Water Rules require a Storm Water Discharge General Permit under the requirements of the 2018 General Permit for any construction project over one acre in total disturbance that discharges into State waters. A Notice of Intent form and Stormwater Pollution Prevention Plan Form along with all attachments and supplements will need to be submitted to the Montana Department of Environmental Quality.

8.1 National Environmental Policy Act

BBWA and its partners have discussed the project with the local Reclamation area office (Archie Lind, Civil Engineer, Planning and Project Management, Montana Area Office). Environmental and cultural compliance was discussed, and the local office agreed the timeline was reasonable given the project. The local Reclamation area office tentatively plans to be involved in the environmental review process pending staffing availability.

8.2 National Historic Preservation Act

To comply with the National Historic Preservation Act, BBWA will conduct necessary consultations with the SHPO and the local Reclamation office to identify any structures or sites eligible for or listed on the National Register of Historic Places. This consultation will occur during the permitting phase to identify and mitigate any potential impacts on historic resources. BBWA will follow all recommended steps from SHPO and Reclamation to maintain compliance with NHPA requirements throughout the project's planning and construction phases.

8.3 Endangered Species Act

To comply with the Endangered Species Act, BBWA will coordinate with relevant agencies to assess any potential impacts of the project on endangered or threatened species and their habitats. Preliminary assessments suggest that the project may have minor, short-term effects on sage grouse and monarch butterfly habitats during construction activities. BBWA will consult with the Montana Sage Grouse Habitat Conservation Program to determine any necessary mitigation measures and implement best management practices to minimize impacts. BBWA is committed to ensuring full compliance with ESA requirements and to protecting sensitive habitats throughout the project.

9 Overlap or Duplication of Effort Statement

There is no overlap between the proposed project and any other active or anticipated proposals or projects in terms of activities, costs, or commitment of key personnel. The proposal for consideration under this program does not in any way duplicate any proposal or project that has been or will be submitted for funding consideration to any other potential funding source, Federal or non-Federal.

10 Conflict of Interest Disclosure Statement

BBWA is not aware of any conflicts of interest at the time of submitting this grant application.

11 Uniform Audit Reporting Statement

BBWA was not required to submit a single audit.

12 References

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Heidema Farms
6003 Yeoman Rd
Shepherd, MT 59079

October 28, 2024

Bureau of Reclamation
Water Resources and Planning Office
WaterSMART Grants: Water and Energy Efficiency Grants FY2025

RE: Billings Bench Water Association Rattlesnake Reservoir Diversion Upgrade and SCADA Project

Dear Grant Coordinator,

This letter indicates Heidema Farm's support for the Billings Bench Water Association's (BBWA) Rattlesnake Reservoir Diversion Upgrade and SCADA Project. Rattlesnake Reservoir is essential to the local agricultural community by providing water storage and delivery flexibility for approximately 75% of the irrigated land BBWA serves in the Yellowstone River Basin that grows alfalfa, hay, corn, barley, and more.

Rattlesnake Reservoir is critical to BBWA's ability to manage water deliveries for downstream irrigators and for residents who rely on the reservoir for drinking water supplies. The diversion structure on the Main Canal that controls water levels in the reservoir and in the canal is severely deteriorating and needs to be upgraded. If the existing structure were to fail, BBWA would be unable to fill the reservoir, the canal could flood, and BBWA could not meet peak demand from water users. Additionally, the existing structure creates maintenance challenges and requires frequent visits 24 hours a day, seven days a week to operate the system.

BBWA is planning to upgrade the concrete structure, install modern gates, and add automation controls to address these challenges and provide a more secure water future for the community. Funding from Reclamation will support final design, permitting, and construction of the project.

We appreciate the Bureau of Reclamation's support for irrigation modernization and hope Reclamation will support BBWA's application for funding. The project will improve water resources management and support the local agricultural community.

Sincerely,



Tim Heidema
President

Hidden Lake Water District
PO Box 51334
Billings, MT 59105



August 22, 2024

Bureau of Reclamation
Water Resources and Planning Office
WaterSMART Grants: Water and Energy Efficiency Grants FY2025

RE: Billings Bench Water Association Rattlesnake Reservoir Diversion Upgrade and SCADA Project

Dear Grant Coordinator,

This letter indicates Hidden Lake Water's support for the Billings Bench Water Association's (BBWA) Rattlesnake Reservoir Diversion Upgrade and SCADA Project. Not only is Rattlesnake Reservoir essential to the local agricultural community by providing water storage and delivery flexibility for approximately 75% of the irrigated land BBWA serves in the Yellowstone River Basin that grows alfalfa, hay, corn, barley, and more, it is essential in helping to keeping the supply of our subdivision's drinking water in high peak.

Rattlesnake Reservoir is critical to BBWA's ability to manage water deliveries for downstream irrigators and for residents who rely on the reservoir for drinking water supplies, such as us. The diversion structure on the Main Canal that controls water levels in the reservoir and in the canal is severely deteriorating and needs to be upgraded. If the existing structure were to fail, BBWA would be unable to fill the reservoir, the canal could flood, and BBWA could not meet peak demand from water users. Additionally, the existing structure creates maintenance challenges and requires frequent visits 24 hours a day, seven days a week to operate the system.

BBWA is planning to upgrade the concrete structure, install modern gates, and add automation controls to address these challenges and provide a more secure water future for the community. Funding from Reclamation will support final design, permitting, and construction of the project.

We appreciate the Bureau of Reclamation's support for irrigation modernization and hope Reclamation will support BBWA's application for funding. The project will improve water resources management and support the local agricultural community.

Sincerely,

Ken Cellmer

President, Hidden Lake Water District



YELLOWSTONE CONSERVATION DISTRICT

PO Box 80088
Billings, MT 59108
Phone: 406.690.9326

November 1, 2024

Montana Department of Natural Resources and Conservation
1539 Eleventh Ave.
Helena, MT 59601

RE: Billings Bench Water Association Rattlesnake Reservoir Diversion Upgrade and SCADA Project

Dear Grant Coordinator,

This letter indicates Yellowstone Conservation District's support for the Billings Bench Water Association's (BBWA) Renewable Resource Grant Application for the Rattlesnake Reservoir Diversion Upgrade and SCADA Project. Rattlesnake Reservoir is essential to the local agricultural community by providing water storage and delivery flexibility for approximately 75% of the irrigated land BBWA serves in the Yellowstone River Basin that grows alfalfa, hay, corn, barley, and more.

Rattlesnake Reservoir is critical to BBWA's ability to manage water deliveries for downstream irrigators and for residents who rely on the reservoir for drinking water supplies. The diversion structure on the Main Canal that controls water levels in the reservoir and in the canal is severely deteriorating and needs to be replaced and upgraded. If the existing structure were to fail, BBWA would be unable to fill the reservoir, the canal could flood, and BBWA could not meet peak demand from water users. Additionally, the existing structure creates maintenance challenges and requires frequent visits 24 hours a day, seven days a week to operate the system.

BBWA is planning to replace the concrete structure, install modern gates, and add automation controls to address these challenges and provide a more secure water future for the community. Funding from the Department will support evaluating alternatives, completing design and permitting, and construction of the project.

We appreciate the Department of Natural Resources and Conservation's support for irrigation modernization and urge the Department to support this application for funding. The project will improve water resources management and support the local agricultural community.

Sincerely,

A handwritten signature in black ink, appearing to read "Brad Kraft", with a long, sweeping underline.

Brad Kraft
Vice-Chairman
Yellowstone Conservation District

Cc: Billings Bench Water Association