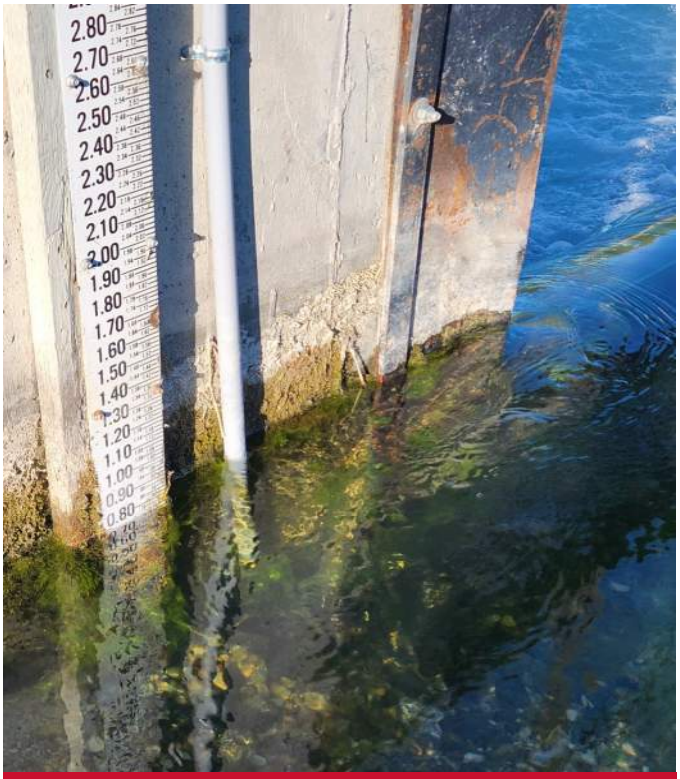

Flow Measurement of Irrigation Canal Turnouts for Jefferson Irrigation Co, Limited

WaterSMART Small-Scale Water Efficiency Projects Grants for Fiscal Year 2024

Funding Opportunity Number R24AS00059

July 8, 2024

Terreton, Idaho

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Terreton, Idaho

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Prepared for:
U.S. Department of the Interior
Bureau of Reclamation

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Applicant Information

Date: July 8, 2024
Applicant Name: Jefferson Irrigation Co. Limited
City, County, State: Terreton, Jefferson County, Idaho
Applicant Category: A
Grant Funding Request: $99,715
Non-Federal Matching Funds: $99,715
Total Project Costs: $199,429
Federal Facility Denotation: This project is not located on a federal facility.

Jefferson Irrigation Company, LTD (JIC), located in eastern Idaho, is a Category A applicant. JIC is installing water measurement devices on 23 canal turnouts to measure deliveries to shareholders more accurately. Proposed devices are intended to meet Idaho Department of Water Resources' (IDWR) minimum acceptable standards and include magnetic flowmeters for piped diversions and weirs, flumes, or other equivalent devices for open-channel turnouts. The total project estimated budget is $199,429. JIC is requesting one third of the project cost funding ($63,311) through the Idaho Water Resource Board's (IWRB) Aging Infrastructure Grant Program. JIC is requesting up to half of the funding through U.S. Bureau of Reclamation WaterSMART Grant programs ($99,715). JIC will self-fund the remaining portion ($36,404) thorough cash, assessments, in-kind services, and loans if necessary.

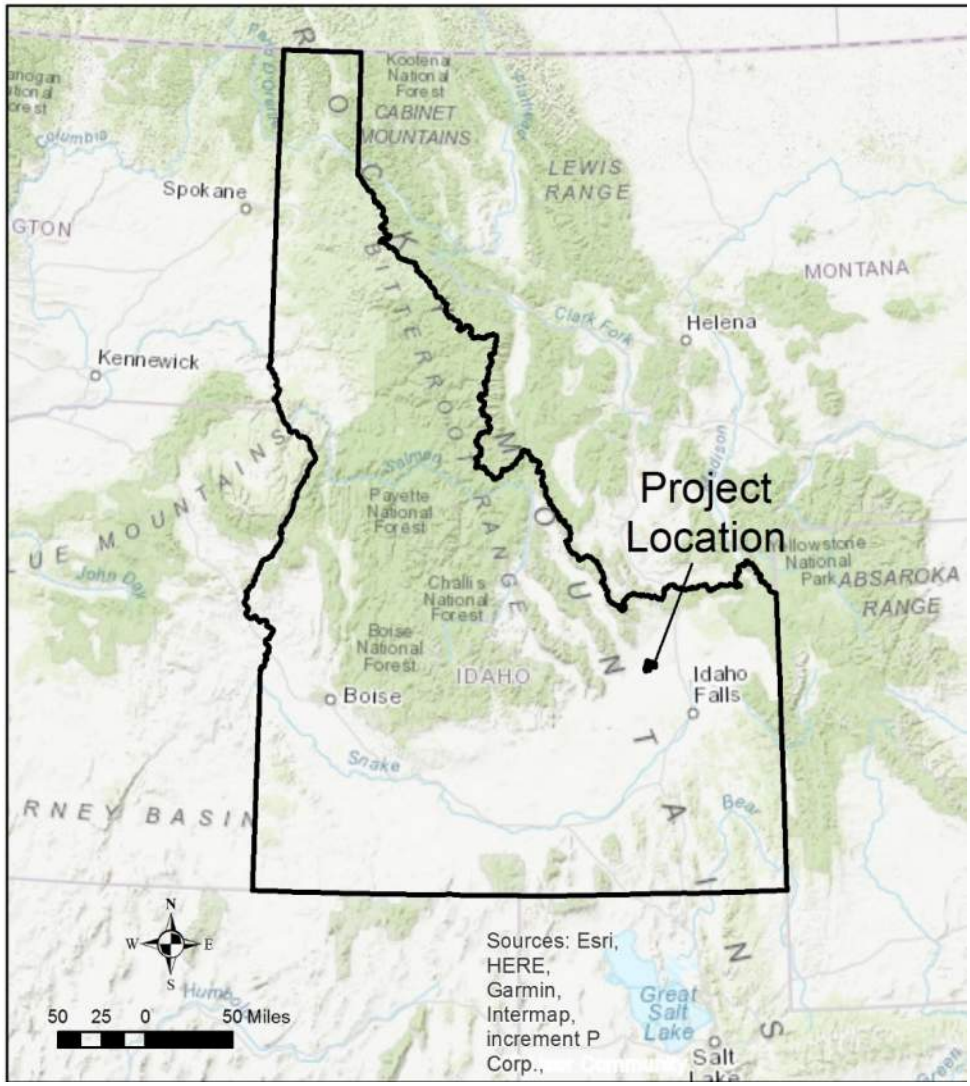
Improvements in measurement accuracy will enhance the equitable distribution of water to shareholders, quantify annual volumetric deliveries to shareholders, quantify conveyance losses through the canal and lateral distribution system, and promote groundwater diversion reduction obligations required by the Jefferson Clark Groundwater District and Idaho Ground Water Association (IGWA)/Surface Water Coalition (SWC) Settlement Agreement.

Projected start date is April 2025, unless required to be extended due to USBR WaterSMART grant award conditions, and length of time for completion is estimated at 18 months.

Project Location

Jefferson Irrigation Company is in eastern Idaho, Jefferson County, approximately five miles northwest from Terreton, Idaho. The project latitude is 43°54' North and longitude is -112°32' East.

Figure 1. Proximity map for Jefferson Irrigation Company.



Technical Project Description

JIC diverts groundwater from multiple wells into a canal system and subsequently delivers water from the canals to company shareholders. Groundwater diversions are measured with a single main weir at the upper end of the main canal.

Downstream of the main weir, water is delivered from the main canal to four laterals identified in downstream order as East, South, North, and West. A pumping lift station raises water for delivery to the North and West laterals.

JIC's canal system has 47 active headgates for water delivery to stockholders. Approximately 32 turnouts are open-channel deliveries to laterals or ditches, 13 turnouts are equipped with one or more pumps, 1 turnout is a combination of pumped and open-channel delivery, and 1 turnout is a piped siphon.

Three of 32 open-channel deliveries are equipped with functional weirs, but the remaining are not equipped with measuring devices. Approximately half of the open-channel turnouts are infrequently used "flood" deliveries. The flood irrigated areas are smaller, irregularly-shaped fields, usually pivot corners, where the fields are flood-irrigated two to four times per year.

One or two of the pumped systems are equipped with a newer magnetic flowmeter, but the remaining are unmeasured.

The objective of this measurement project is to equip high priority, high use turnouts with accurate water measurement equipment. Weirs, flumes, or other devices will be installed on open-channel turnouts. Weirs will be constructed of steel with concrete abutments. Flumes will be pre-fabricated galvanized steel. Some sites may require Acoustic Doppler Velocimeters (ADVs) to be installed in concrete control sections.

Site preparation will range depending on the site conditions and installed equipment. Minimal site preparation will be needed for weir plates attached to existing concrete turnout structures and for magnetic flowmeters installed in existing pipelines. Flumes, ADVs, and some weirs will require localized excavation in existing ditches to place measuring equipment. Excavated soils will be used as backfill, spread locally, or applied to ditch embankments.

Motorized equipment used for device installation includes excavators, soil tampers, equipment delivery trucks, pickups, concrete trucks and/or portable concrete mixers. Pickups and portable generator/welder sets will be used for magnetic flowmeter installations.

Site laydown and mobilization will vary and will be coordinated with the landowners through JIC. Equipment and materials will be stored at existing company member's private shop yards pending installation.

Areas impacted by construction will be distributed among the sites where devices are to be installed. These sites have all been previously disturbed. Open channel flow measuring devices will be installed on existing concrete structures or placed in existing

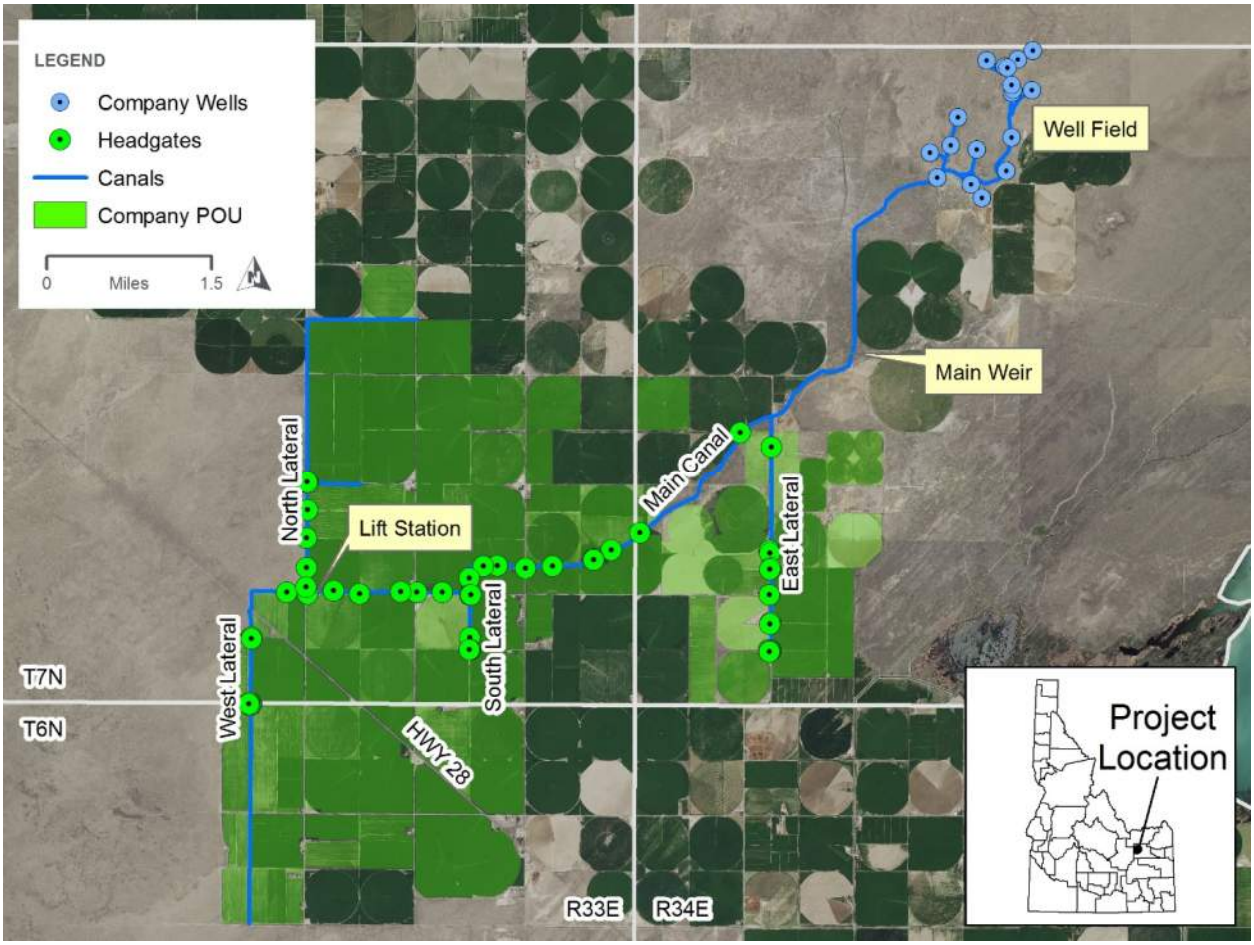
ditches. Magnetic flowmeters will be installed on existing pipelines at existing pumping stations.

The frequently used open-channel turnouts will be equipped with stilling wells, level sensors, data loggers, and telemetry equipment, allowing JIC to track water use and determine annual delivery volume.

Stilling wells, level sensors, loggers, and telemetry equipment are not proposed for the infrequently-used “flood” turnouts. Instead, JIC’s watermaster will record staff gage readings, delivery flow rates, and operating time. This is a reasonable approach as these turnouts are typically operated at high flow rates for 8-to-12-hour periods, and only two to four times per irrigation season.

Full profile totalizing magnetic flowmeters will be installed on pumped turnouts. JIC’s watermaster will regularly check meter operation and record diversion rates and volumes.

Figure 2. Jefferson Irrigation Company Facilities and Headgate Turnouts.



Evaluation Criteria

E.1.1. Evaluation Criterion A. Project Benefits (35 points)

Benefits to the Category A Applicant's Water Delivery System: *Describe the expected benefits to the Category A applicant's water delivery system. Address the following:*

This project will result in more efficient management of the water supply. JIC, as with other groundwater users diverting from Idaho's Eastern Snake Plain Aquifer (ESPA), are committed to improving the overall health of the aquifer system.

> The ESPA is a key element of southern Idaho's economy and covers approximately 10,800 square miles of Idaho. The ESPA region produces approximately 21% of all goods and services within the State of Idaho—resulting in an estimated annual value of $10 billion. Water is the critical element for this productivity.
>
> For a variety of reasons, groundwater levels in parts of the ESPA declined, leading to a cumulative decrease in aquifer storage, decreased spring flows, and changing Snake River flows that resulted in insufficient water supplies to satisfy existing beneficial uses. IWRB , at the request of the Idaho State Legislature, prepared and submitted a Comprehensive Aquifer Management Plan to address the water supply-and-demand imbalance.[1]

JIC is committed to efforts of the Jefferson Clark Groundwater District to meet aquifer enhancement goals through recharge efforts, diversion reductions, and other endeavors to meet Surface Water Coalition / Idaho Ground Water Users (SWC/IGWA) Settlement Agreement obligations[2]. This project is an important step toward meeting JIC's obligations as part of their commitments to the stewardship of the ESPA through the SWC/IGWA Settlement Agreement. Improving measurement accuracy of water delivered to shareholders will provide the following benefits:

- More equitable distribution of water to company shareholders, which in turn yields water supply stability, sustainability, and drought resiliency.

[1] Eastern Snake River Plain Aquifer CAMP | Idaho Department of Water Resources

[2] Settlement Agreement Entered Into June 30, 2015 Between Participating Members of the Surface Water Coalition and Participating Members of the Idaho Ground Water Appropriators, Inc. | idwr.idaho.gov

- Limit excessive shareholder deliveries which will result in decreased groundwater diversions.
- Provide transparency in water usage among company shareholders.
- Provide mechanisms for quantifying conveyance losses in JIC's delivery system.
- Provide mechanisms for quantifying conveyance losses in private laterals and ditches beyond JIC's system. This is likely to result in ditch lining, piping, and/or installation of pressurized sprinkler systems resulting in additional water savings.
- Improved overall health of the ESPA.

Water conserved because of this project will either be available to other company shareholders for irrigation use through equitable distribution improvements or will remain undiverted in the ESPA. Water left undiverted and remaining in the ESPA will improve aquifer conditions by increasing aquifer water levels, which in turn yields higher flows in the Snake River to be available for aquatic habitat, irrigation diversions, etc.

Explain the significance of the anticipated water management benefits for the Category A applicant's water delivery system and customers. Consider:

The project will result in more efficient management of the water supply. As described above, the ESPA is a critical groundwater resource suffering from declining water levels. Increasing delivery efficiency through improved measurement of irrigation deliveries is expected to yield potential reductions in groundwater pumping with resultant improvement in groundwater levels.

JIC's shareholders are concerned that they do not receive their full water right during peak summertime demand periods. Some shareholders have threatened lawsuits against JIC for failure to measure and account for shareholder deliveries. This project will address these potential lawsuits. The consequences of not making improvements include:

- Potential lawsuits against JIC
- Continuation of potentially inequitable water distribution
- Continued excessive shareholder deliveries
- Decreased incentives for efficiency improvements such as ditch lining or piping

JIC shareholder water restrictions are currently required and will be required in the future. Peak season irrigation demand exceeds well field production capacity. Implementing this project will greatly improve the equitable distribution of the limited supply.

Broader Benefits:

Will the project improve broader water supply reliability at sub-basin or basin scale?

Monitoring will increase transparency among water managers in the JIC service area and region. Through this transparency, information sharing will improve.

The project is in an area that experiences water scarcity. JIC pumps groundwater from the ESPA. The ESPA is experiencing chronic long-term aquifer water level declines. JIC, as a member of the Jefferson Clark Ground Water District, along with other Ground Water Districts, are committed to reversing groundwater level declines through multiple efforts including pumping reductions, aquifer recharge, and efficiency improvements. This project will help address drought conditions through equitable distribution of shareholder water and meeting groundwater pumping reduction targets.

The project will positively impact agricultural economies and environmental conditions. Improving the equitable distribution of water will help shareholders crop yields. Measurement of turnouts is expected to identify seepage losses of shareholder ditches and encourage shareholders to line or pipe long earthen ditches conveying water past turnouts, with associated reductions in seepage and evaporative losses. If this project is successful in leaving more water in the ESPA, higher river return flows and spring flows will contribute to higher flows in the Snake River, benefitting federally threatened and/or endangered species including salmon.

Higher volumes of water discharging from the ESPA would result in:

- More water available for downstream users.
- More water available for hydroelectric generation.
- Improved recreational opportunities in rivers and reservoirs.
- Improved scenic experiences at Shoshone Falls and other spring complexes in the Thousand Springs reach.
- Reduced water temperatures in the mid-Snake reach, which benefits aquatic habitat.
- Higher probability that downstream Snake River minimum stream flows will be met.
- Higher probability that downstream domestic, municipal, and irrigation wells will continue to function at their current depth.

• *Will the project complement work being done in coordination with NRCS in the area (e.g., the area with a direct connection to the districts water supply)? Please explain.*

JIC is submitting a funding request with the NRCS to replace the Jefferson Canal earthen north lateral with a pipeline. This project would have several benefits, including seepage and evaporative loss reduction, energy savings by avoiding lift station pumping, and simplifying flow measurement requirements.

E.1.2. Evaluation Criterion B. Planning Efforts Supporting the Project (25 points)

Plan Description and Objectives:

JIC engaged SPF Water Engineering to complete a canal efficiency investigation for the Jefferson Canal System in 2015. SPF conducted on-site investigation of the well field, main weir, primary canal, and user turnouts, pumps, and ditches. SPF's report provided recommendations for improving operations, addressing water rights, aquifer conditions, wells and pumps, main canal, and user ditches and pumps. Since this plan was developed, JIC has engaged HDR to implement the plan. Following the 2015 plan, HDR conducted a seepage run of the canal system during 2023 and checked accuracy of the canal's main weir. Also, HDR investigated the individual turnouts and provided a plan for installing measuring devices with specified type and size at shareholder turnouts. This grant application seeks funding to continue plan implementation with flowmeter installations.

Plan Development:

As stated above SPF Water Engineering and HDR developed the plan specifically for JIC and the geographic scope is within the JIC system. However, benefits from plan implementation extend beyond the JIC area to the ESPA aquifer.

Support for the Project:

This project is specifically identified within the planning effort. SPF's 2015 report included measuring device installation as a specific recommendation. The project addresses a need identified in the existing planning effort. The goal is to accurately account for water delivered to company shareholders. The objective is measuring device installation to meet the goal of measuring and accounting for water deliveries.

E.1.3. Evaluation Criterion C. Implementation and Results (20 points)

Project Schedule

JIC engaged HDR to provide engineering guidance with implementing this project. HDR's engineers visited the Jefferson canal system in late 2022 to gain an understanding of project needs and on-site conditions of canal turnouts. HDR subsequently provided a plan for turnout measurement including recommendations for individual devices, cost estimates, and installation priority ranking. The priority ranking for individual device installations fits a phased installation approach.

JIC plans to initiate measuring device installation after the SWEG funding award announcement, with equipment installation proceeding in phases from the fall of 2024 with completion planned prior to start of the 2026 irrigation season.

Project phase 1 is expected to begin as the 2024 irrigation season is closing, and continuing, weather permitting, through the initiation of the 2025 irrigation season. Phase 2 will continue through the 2025 irrigation season while open-channel turnouts are shut off during harvest periods. Phase 3 will complete device installation from late summer of 2025 through spring of 2026. If SWEG funding is not available in the fall of 2024, project initiation will begin in 2025 after funding becomes available. Alternately, JIC may self-fund Phase 1 and utilize SWEG funding for Phase 2.

Table 1. Proposed installation schedule.

Phase	Period
Phase 1	October 2024 through April 2025
Phase 2	April 2025 through September 2025
Phase 3	September 2025 through April 2026

HDR toured the canal system and identified the measurement device types anticipated for installation, as documented in the *Turnout Measurement Plan*. HDR subsequently provided a "Measurement Cost Estimate" memorandum in 2023. These reports provide specific measurement recommendations and estimated costs. Standard sharp-crested rectangular or Cipolletti weirs are appropriate for turnouts that have sufficient water surface elevation, or head, available for accurate weir operation. Turnouts with insufficient available head will be equipped with flumes, likely of the cutthroat or Parshall design. A few turnouts may not have sufficient head even for flume operation and may be equipped with a concrete section and ADV instrumentation.

Budget Narrative

Fourteen turnouts are equipped with pumps to pressurized sprinkler irrigation systems. Three turnouts have two or more pumps with plumbing layouts requiring two meters. This budget estimate assumes the watermaster will read magnetic flowmeters, as needed, and that telemetry is not required for these systems. The cost estimate for 8-, 10-, and 12-inch diameter magnetic flowmeter equipment acquisition is $61,700 (see Table 2). Installation costs are estimated at $22,000 (see Table 3).

Table 2. Equipment cost estimates for closed-conduit magnetic flowmeters.

Size	Count	Cost Each	Total Cost
8	7	$ 3,150	$ 22,050
10	4	$ 3,850	$ 15,400
12	5	$ 4,850	$ 24,250
Totals	16		$ 61,700

Table 3. Installation cost estimates for closed-conduit magnetic flowmeters.

Installation Complexity	Count	Cost Each	Total Cost
Little to no plumbing modification	9	$ 1,000	$ 9,000
Moderate plumbing modification	2	$ 1,500	$ 3,000
Substantial plumbing modification	5	$ 2,000	$10,000
Totals	16		$22,000

Weirs are recommended whenever possible for cost efficiency, simplicity of installation and operation, and flexibility in adjusting weir crest height, if required. Cipolletti style weirs are recommended for most installations, with rectangular weirs recommended when they can be installed at existing concrete box structures.

Cutthroat style flumes are recommended for sites where sufficient head is not available for weir operation. Flumes are more expensive and are more difficult to adjust when set too low or high, but their operating head requirements can be up to one third to one half that of a comparable weir. This budget includes costs for galvanized steel flume material.

ADV sensors are recommended for turnouts with little available head. These systems are more expensive and complex and are recommended for use only when weirs or flumes are not appropriate due to limited head.

The budget includes stilling tubes with level sensing equipment, data logging, and telemetry for weirs and flumes. Budgeted equipment includes OTT-CBS bubbler-type level sensors, Sutron loggers, and cellular telemetry.

One turnouts with existing weir and high use (M01 Sauer) is budged for water-level sensing equipment, logger, and telemetry.

The size, type, number, equipment cost, and installation cost for open channel measuring equipment is provided in Table 4. This table also includes costs for 8 turnouts to be equipped with level sensors, loggers, and telemetry with 7 designated for new installations and 1 destined for an existing weir.

Table 4. Equipment and installation cost estimates for open-channel measuring and telemetry devices.

Size & Type	Count	Cost Each	Installation Cost Each	Total
3' Cipolletti	1	$ 2,500	$ 1,250	$ 3,750
4' Cipolletti	1	$ 3,000	$ 1,500	$ 4,500
6' Cipolletti	1	$ 4,500	$ 2,250	$ 6,750
4' Rectangular Weir	1	$ 3,000	$ 1,500	$ 4,500
54x12 Cutthroat	1	$ 6,465	$ 3,233	$ 9,698
54x24 Cutthroat	1	$ 8,690	$ 4,345	$ 13,035
ADV	1	$ 10,000	$ 5,000	$ 15,000
Sensor, Logger, Telemetry	8	$ 5,000		$ 40,000
Total			$ 19,078	$ 97,233

Table 5 provides the total cost budget. In addition to this WaterSMART proposal, JIC submitted a funding proposal to Idaho Water Resource Board (IWRB). IWRB's Aging Infrastructure grant program may fund up to 1/3 of project costs. IWRB has announced this project is selected for funding, but the funding amount is not confirmed. If required, JIC is prepared to self-fund all or some of the IWRB portion of the project.

Table 5. Total cost budget.

Item	Cost	IWRB Aging Infrustructure		USBR WaterSMART		JIC	
		Share (%)	Amount	Share (%)	Amount	Share (%)	Amount
Mag Meters and Installation	$ 83,700	33%	$ 27,900	50%	$ 41,850	17%	$ 13,950
Weirs, Flumes, ADCP, and Installation	$ 57,233	33%	$ 19,078	50%	$ 28,616	17%	$ 9,539
Sensors, Loggers, Telemetry	$ 40,000	33%	$ 13,333	50%	$ 20,000	17%	$ 6,667
Engineering	$ 9,000	33%	$ 3,000	50%	$ 4,500	17%	$ 1,500
Administration & Legal (5%)	$ 9,497	0%	$ -	50%	$ 4,748	50%	$ 4,748
Total	$ 199,429		$ 63,311		$ 99,715		$ 36,404

Contractors may need to secure state and/or county electrical permits when installing certain equipment, such as magnetic flowmeters. No other permitting is anticipated.

HDR has reviewed individual turnouts and specified size and type of measuring equipment at each site, along with cost estimates for equipment and installation. HDR will work with JIC and contractors during the equipment acquisition and installation process to verify the appropriate equipment is secured and installed properly.

JIC has access to land where measuring equipment will be installed. No additional easements or permissions are required to complete this project.

E.1.4. Evaluation Criterion D. Nexus to Reclamation (5 Points)

The applicant does not have a water service, repayment, or O&M contract with Reclamation.

The applicant is not a Reclamation contractor.

The work will benefit a Reclamation Project area or activity. The project's water measurement initiative is expected to yield reduced pumping from the ESPA and improved compliance with Jefferson Clark Groundwater District's pumping reduction requirements. Improved aquifer conditions will have a positive benefit to flows in the Snake River. Reclamation has projects on the Snake River that will benefit from increased river flows.

E.1.5. Evaluation Criteria E. Presidential and Department of the Interior Priorities (15 points)

E.1.5.1. Sub-criterion No. E1. Climate Change

Installing measuring devices on irrigation turnouts provides JIC with greater control over the quantity of water delivered to shareholders and reduces a shareholders' ability use more than their allotment. This in turn is expected to yield reductions in groundwater pumping, which improves aquifer conditions and helps combat the climate crisis.

E.1.5.2. Sub-criterion No. E2. Disadvantaged or Underserved Communities

This project is located in Jefferson County, Idaho (Tract Number 16051960100). This tract is identified as disadvantaged as it meets multiple burden thresholds and the associates socioeconomic threshold. The burdens identifie on the Climate and Economic Justice screening tool include expected agricultural loss rate (91st percentile) and energy costs (90th percentile), both of which would benefit from this project. In making better use of water and associated pumping costs, this project could improve drought resiliency and improve energy efficiency for JIC.

E.1.5.3. Sub-criterion No. E3. Tribal Benefits

In 2004, the State of Idaho agreed to settle the Nez Perce Tribe's water rights claims by supplying 427,000 acre-feet per year to the tribe as salmon flow augmentation. As described above, in 2022, this water was unknowingly delivered to meet irrigation demands. By improving flow water measurement, monitoring, and conservation this project will reduce the risk of water scarcity for the Nez Perce Tribe.