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APPLICATION

WaterSMART Small-Scale Water Efficiency Projects
Dept. of Interior, Bureau of Reclamation
Funding Opportunity R22AS00195

PROJECT TITLE

River Diversion SCADA Gate Automation & Flow Measurement

APPLICANT

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Technical Proposal and Evaluation Criteria

Executive Summary

April 28, 2022

Arnold Irrigation District (AID)
Bend, Deschutes County, Oregon
Category A Applicant

Project - River Diversion SCADA Gate Automation & Flow Measurement

The proposed works are for the modernization of the AID's Deschutes River main headworks to automate the existing radial gate and improve diversion flow measurement via SCADA. The river diversion is located south of the Bend, Oregon city limits along the east bank of the Deschutes River and feeds the District's main canal and all distribution laterals downstream serving 4,364 acres.

The project will automate the operation of a manually operated radial gate with the installation of an electrical motor drive, a down channel stilling basin with an ultrasonic level sensor connecting through a programmable logic controller (PLC) that is all accessible through a secure cellular remote access router and firewall with a SCADA system to remotely monitor and control the radial gate. The Project is utilizing the existing diversion radial gate infrastructure, on-site power distribution, and power vault. This project will allow the District to annually conserve 1,800 AF (6% of annual average supply) by better managing and measuring highly fluctuating river flows that currently require daily manual adjustments. This project meets the goals of the District's 2014 and 2022 Water Management and Conservation Plan and contributes to conservation measures requiring conservation of water for threatened species habitat (Oregon Spotted Frog) in the Habitat Conservation Plan signed with US Fish & Wildlife Service in December 2020.

Commencement and completion of the project will occur in the month of April 2023.

Proposed project is not located on a Federal facility.

Technical Project Description

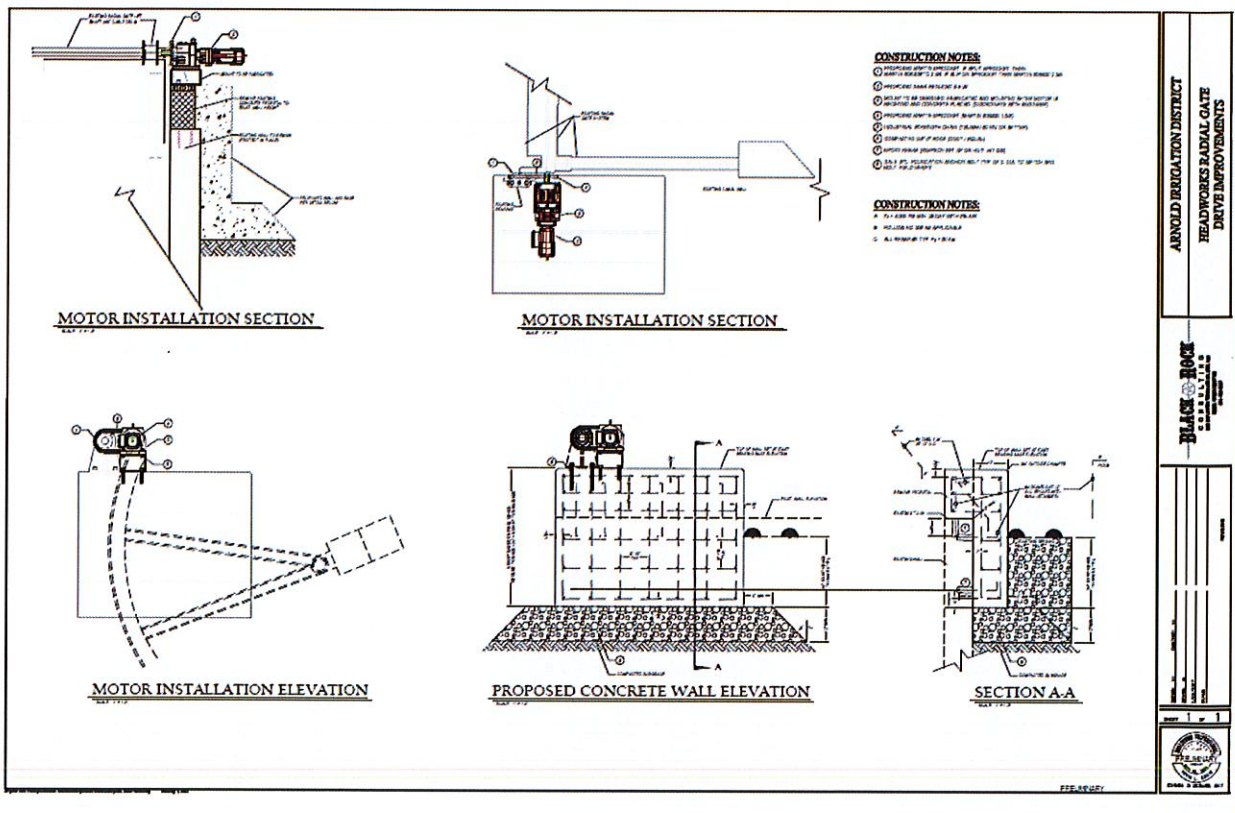
Automation and remote monitoring and control of the existing river diversion radial gate and diversion flows will be accomplished by the assembly and connectivity of four primary components:

- Installation of electric motor drive assembly to radial gate
- Installation of down channel stilling basin for flow measurement
- Integration of electronic components through a programmable logic controller (PLC)
- Installation of SCADA system for remote monitoring and control

The project is utilizing the existing radial gate infrastructure, on-site power distribution, power vault and fish screen control cabinet.

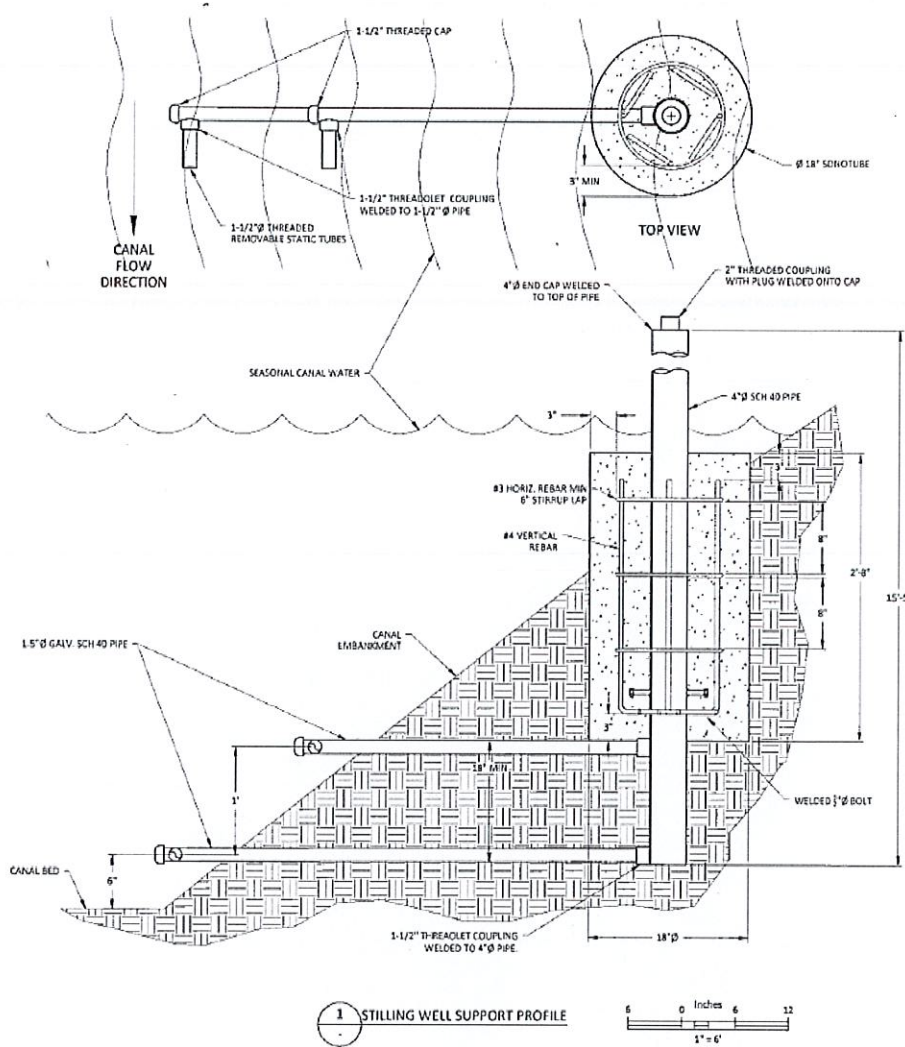
Installation of the electric motor drive assembly to the radial gate

A ¼ horsepower Eurodrive electric motor mounted on a constructed concrete pad connecting to the radial gate shaft through a geared sprocket set driving a Tsubaki chain assembly. Existing manual control wheel and chain to be disassembled and removed. A motor controller and gate position sensor shall be installed to connect with the PLC.

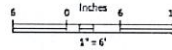


Installation of down channel stilling basin for flow measurement

Stilling basin to be constructed with a standard vertical pipe and two horizontal channel pipes connecting to water levels thru the existing concrete-controlled channel. Stilling basin will utilize an ultrasonic level sensor and connect through an existing power vault to a control cabinet housing fish screen controls.



1 STILLING WELL SUPPORT PROFILE



Integration of electronic components through a programmable logic controller (PLC)

Modification of the code in the existing onsite programmable logic controller (PLC) to incorporate downstream level (or flow) control of the radial gate. Automatic and manual modes will be provided.

ID	Item	Manufacturer	Description	Qty
1	SCE-1210EUJ	Saginaw	12"H x 10"W x6"D Enclosure	1
2	SCE-12P10	Saginaw	11"H x 9"W Subpanel	1
3	AF16-30-10-13	ABB	30 General Purpose Amp, 5HP @ 240V, 3ph, 3-Pole, 600V Rated, 100-250 VAC/VDC Coil, 1 NO Aux Contact	2
4	TF42-20	ABB	16.0 - 20.0 Amp, IEC, Overload Relay, Type: Thermal Bi-Metallic, Trip Class 10. Selectable Manual or Automatic Reset.	1
5	E49M11XM1	Eaton	E49 Full Size IEC Limit Switch, Wobble Stick, Cat Whisker, Die Cast Aluminum enclosure, 10A max AC, 1.5A max DC, 1NO-1NC, 10A at 600Vac, 1.5A at 24Vdc, Screw Terminals	2
6	ES-SSP-231006	IDEM	emergency stop control station, 316 stainless steel, single pushbutton, mushroom, red, twist-to-release, guarded and padlockable, (1) N.O./ (2) N.C. contact(s).	1
7	JX-P420-60-N13-10R-N22	UniMeasure	Linear Position Transducer	1
8	TBL650US	Tosibox	Lock 650 VPN, Router, Firewall	1
9	TBK2	Tosibox	Key w/ 1 mobile client	3
10	JC390F541XA19	Industrial Computers, Inc	Industrial PC w/ Windows 10 LTSC Embedded, 8GB RAM, 500GB SSD, Quad Core, Intel Celeron, LAN, HDMI, VGA, Audio, Keyboard & Mouse	1
11	Ignition	Inductive Automation	Base platform, Alarm Notification (SMS), Perspective (3 clients), Tag Historian	1
12	Misc		Conduit, cable, supports, terminations	AS

Installation of SCADA system for remote monitoring and control

Connectivity will be established with a secure cellular remote access router and firewall, and SCADA system through an industrial PC installed at the District's facilities. SCADA will remotely monitor and control the radial gate. The SCADA platform will utilize a software license for Inductive Automation's Ignition SCADA platform. This includes alarming for conditions determined by the District, and remote access will be provided via the secure Tosibox Lock & Key system. This system will provide complete connectivity and SCADA functionality for additional monitoring and/or control nodes in the future on additional locations through the District's distribution system. Listing of all Hardware and software below.

Evaluation Criterion

Criterion A – Project Benefits

This project will allow the District to annually conserve 1,600 AF (6% of annual average supply) by better managing and measuring highly fluctuating river flows that currently require frequent manual adjustments. This will utilize the available natural water supply to its maximum efficiency and extend the duration of operational flows from the District's storage water from two to three weeks thereby providing additional stability of water delivery to the patrons.

Continued severe drought has required AID to shorten its irrigation seasons the past two years, and is expected to occur again in 2022. Conserving the available water supply will provide an additional two to three weeks of water deliveries for growing crops that may otherwise fail. Climate change effects are demonstrable and failure to adjust and continue to make water usage and management efficiency gains should be ongoing.

Automating the AID river diversion will be critical as the District moves forward with its NRCS co-sponsored 11.9 mile main canal piping project pending final approval in the fall of 2022. While this project is entirely separate from the main canal project, it will serve a critical function with piping and safety of operation. The SCADA system installed with the river diversion gate will serve as a base system to easily connect additional nodes of water measurement and monitoring as the pipeline is completed in phases and inlet structures are moved upstream with each phase. Automating flows will enhance the water management as demand fluctuates during the day or at night insuring efficient water use. In addition, if water levels are too high when entering the pipe inlet, the SCADA will automatically be able to throttle the river diversion flows to adjust and thereby prevent overtopping of the infrastructure with its subsequent flooding and damage to the surrounding homeowners and property.

Incremental benefits to lower water usage from the Deschutes River also provides longer and higher river flows that benefit the habitat of the Oregon Spotted Frog, an ESA Threatened species. AID is a member of the eight-irrigation district Deschutes Basin Board of Control (DBBC) and was a signatory to the Habitat Conservation Plan (HCP) with the US Fish & Wildlife Service in 2020. Deschutes River flows from May to September are to maintain minimum flows for Oregon Spotted Frog habitat benefit. Reducing water diversions through conserving water reduces demand on the Basin's reservoirs and enhances the capability to provide minimum flows for the entire required period. This benefits the other seven members of the DBBC and particularly the North Unit Irrigation District (Reclamation Project) which must utilize its storage water to maintain the HCP required flows.

B – Planning Efforts Supporting the Project

The District began its planning to automate the river diversion in the early 2010's after upgrading the diversion to incorporate up to standard automated fish screens. Investment was made in power supply to the rather remote location and limited telemetry for monitoring of

high flows and fish screen malfunctions. This project was formally incorporated into the District's goals with its 2014 Water Management and Conservation Plan. This was subsequently reinforced with the System Improvement Plan in 2017 funded by the Energy Trust of Oregon and the Farmers Conservation Alliance and conducted by BlackRock Consulting. This project is also listed in the District's recently updated 2022 Water Management and Conservation Plan.

While funding was not readily available for the entire diversion structure modernization and radial gate automation, the District did contract with BlackRock Consulting to prepare plans for the installation of a electric motor assembly and identify additional components that could be incrementally accomplished on a limited capital budget and over time. A stilling basin area was excavated with conduit pipe laid back to the fish screen power vault for future connectivity, and PLC boards and controls were upgraded to insure expansion capability. This preliminary work has enabled this Project to more easily utilize existing infrastructure and be accomplished with less capital outlay.

Timing is now for moving this Project forward with the oncoming NRCS co-sponsored main canal piping project, meeting the goals of the 2014 and 2022 Water Management and Conservation Plan, and the specter of climate change and continued severe drought.

C – Implementation and Results

This project is planned to commence April 1, 2023 and requires less than 30 days to construct and implement and has no in water construction. The challenge is to coordinate the procurement of long lead items with Reclamation award dates and authority to purchase to meet the desired project timeline. Procurement lead times are somewhat unpredictable due to the pandemic but ordering a few key components including the electrical motor drive and supporting gears will be necessary. The implementation plan dates below are based on a completion date of April 30.

The project does not require any permits and is located on AID owned property.

Engineering plans have already been completed for the minor amount of construction needed, and specific software and hardware has already been identified for the electronics.

No new policies or administrative actions are required to implement the project.

Environmental and cultural compliance requirements were discussed with the local Reclamation office. Due to the minor amount of excavation for the motor mount (2'x1'x2') the likelihood of a categorical exclusion is high, but the time to evaluate and process is still needed. As the radial gate and diversion structure itself is over 50 years old, consultation with the Oregon State Historical Preservation Office will also need to be evaluated and processed. It is believed that the changed visual profile of the gate is of minimal impact but the primary consideration is of time to be spent going thru the process.

Project Timeline

2022

Summer - Identify critical long lead items and order if necessary
-Environmental and cultural compliance undertaken with local Reclamation

2023

April 1-7 - Construct concrete mounting pad for Eurodrive motor
-Construct stilling basin with ultrasonic sensor and connect to power vault
-Begin assembly and coding of instrumentation, power assembly and PLCs in circuit panel

April 8-21 - Mount Eurodrive motor and gear assembly to radial gate shaft
-Install motor controls and connect to PLC
- Attach power to Eurodrive
- Install SCADA industrial PC at AID office

April 22-29 -Testing, configuring and commissioning PLCs, gate limits and alarm settings
-AID staff trained on SCADA and controls

April 30 -Go live with SCADA enabled radial gate

D – Nexus to Reclamation

This Project diverts natural water flow from the Deschutes River and storage water from Crane Prairie, a Reclamation Project. AID has a partial share of Crane Prairie water and paid off its debt obligations to Reclamation several decades ago. Wickiup Reservoir and the North Unit Irrigation District (NUID) were constructed at the same time with Crane Prairie and are both Reclamation Projects. Any conserved water from this Project will flow to NUID as the next senior right of priority.

E – Presidential and Department of the Interior Priorities

No additional benefits than as already mentioned in this application.

E – Sub-criterion E1- Climate Change

This Project strengthens water supply sustainability by conserving water and increasing resiliency to climate change.

E – Sub-criterion E2 – Disadvantaged or Underserved Communities

No additional benefits than as already mentioned in this application.

E – Sub-criterion E3 – Tribal Benefits

No additional benefits than as already mentioned in this application.

Project Budget

Funding Plan

The estimated \$32,167.10 of Non-Federal share of project costs will be provided from AID's readily available financial resources. There are no time constraints or contingencies on the funds availability.

Budget Proposal

Table 1.—Summary of Non-Federal and Federal Funding Sources	
FUNDING SOURCES	AMOUNT
Non-Federal Entities	
1. Arnold Irrigation District	\$32,167.10
2.	
3.	
Non-Federal Subtotal	\$32,167.10
REQUESTED RECLAMATION FUNDING	\$28,667.10

Table 2. —Total Project Cost Table	
SOURCE	AMOUNT
Costs to be reimbursed with the requested Federal funding	\$ 28,667.10
Costs to be paid by the applicant	\$ 31,167.10
Value of third-party contributions	\$
TOTAL PROJECT COST	\$ 60,834.20

Table 3. —Budget Proposal Format			
BUDGET ITEM DESCRIPTION	COMPUTATION	Quantity Type	TOTAL COST
\$/Unit		Quantity	
Salaries and Wages			
Chris Webb, Field Supervisor	\$32.20/hr 20 hrs		\$ 644.00
Jaiden Giffin, Ditchrider	\$32.20/hr 20 hrs		\$ 644.00
Employee 3			\$
Fringe Benefits			

Full-Time Employees \$31.05/hr 40 hours	\$ 1,242.00
Part-Time Employees	\$
Equipment	
Eurodrive Motor, parts & drive chain	\$ 3,065.92
Item B	\$
Item C	\$
Supplies and Materials	
Concrete, rebar, plywood & misc	\$ 1,943.28
Item B	\$

BUDGET ITEM DESCRIPTION	COMPUTATION	Quantity Type	TOTAL COST
\$/Unit		Quantity	
Contractual/Construction			
OS Engineering		\$ 49,975.00	
Contractor B			
Third-Party In-Kind Contributions			
Contributor A		\$	
Contributor B		\$	
Other			
Environmental & Cultural Compliance		\$ 3,500.00	
TOTAL DIRECT COSTS		\$ 60,834.20	
Indirect Costs			
Type of rate	percentage	\$base	\$
TOTAL ESTIMATED PROJECT COSTS		\$ 60,834.20	

Budget Narrative

There are five primary activities with associated costs totaling \$60,834.20

- Installation of electric motor drive mount and assembly to radial gate
 - AID Labor – 30 hours - \$32.20/hr - \$966.00
 - AID Fringe – 30 hours – \$31.05/hr - \$322.00
 - Fringe includes all benefits paid for full-time employees including vacation time, health - dental - vision benefits, AD&D insurance
 - Equipment – Eurodrive motor, gear assembly and chain - \$3,065.92
 - Supplies – concrete, rebar, plywood and misc - \$777.91
- Installation of down channel stilling basin for flow measurement
 - AID Labor – 10 hours - \$32.20/hr – \$322.00
 - AID Fringe – 10 hours - \$31.05/hr - \$310.50
 - Supplies – pipe and fittings, concrete - \$1,165.38
- Integration and coding of electronic components through a programmable logic controller (PLC), including software and hardware and ultrasonic transducer
- Installation of SCADA system for remote monitoring and control, programming, testing
 - Contracted costs - \$49,795.00 (combined PLC and SCADA activities)
- Coordination with Reclamation on Cultural and Environmental compliance
 - \$3,500 to Reclamation

There have been no costs added for AID Project Manager or administrative functions and project oversight. This is an internal cost to AID and is not being declared as in-kind. Only direct labor is by AID Field Supervisor and Ditchrider is included in the labor and fringe costs above.

AID personnel involved with the Project include the following:

- Program Manger – Steve Johnson, District Manager
- Field Supervisor – Chris Webb
- Ditchrider – Jaiden Giffin

Environmental and Cultural Resources Compliance

Will the proposed project impact the surrounding environment?

- There is a minimal amount of excavation associated with the Project. A 2'x1'x2' trench needs to be dug along side the existing radial gate mount to extend the mounting area to mount the electric motor drive. The Stilling Basin area was cleared two years ago and does not require any excavation.
- Visually the profile of the existing structure does not change, excepting for the 2'x1' concrete mount expansion.

Are you aware of any species listed as Federal threatened in the project area?

- The Oregon Spotted Frog is a Federal threatened species in the aquatic habitat of the Deschutes River that is adjacent to the Project. As there is no in-water construction or disturbance this is seen as having no impact.

Are there wetlands or surface waters inside the project boundaries that fall under CWA "Waters of the United States"?

- No

When was the delivery system constructed?

- 1905 and completely reworked in the 1950s

Will the proposed project result in any modification of or effects to individual features of an irrigation system?

- There are no extensive modifications or alterations to the existing irrigation infrastructure

Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places?

- Cultural Resources Survey was completed in July 2021 and identified the Arnold Irrigation Canal as eligible for the National Register under Criteria A and B.

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

- Cultural Resources Survey completed in July 2021 did not identify any archeological sites in the project area.

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

- No

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

- Cultural Resources Survey completed in July 2021 did not identify any Indian sacred site or impacts to tribal lands in the project area.

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 project area site is maintained and controlled for noxious and non-native invasive species. There are no known occurrences of either at the project site.

Required Permits or Approvals

There are no known permits or approvals required for this Project.

Official Resolution

AID Procurement Policy provides approval for the District Manager to expend District monies up to \$50,000 for capital projects. As the expected District fund expenditure is \$32,167.10, which the District has "in hand" a Board Resolution is not required and the District Manager has the authority to meet established deadlines and enter into a grant or cooperative agreement.

Conflict of Interest Disclosure

There are no known conflicts of interest by AID personnel or Board Members with this Project.

Uniform Audit Reporting Statement

AID will not be expending \$750,000 or more of Federal award funds with this Project.

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