

GREATER WENATCHEE IRRIGATION DISTRICT
3300 SOUTH EAST 8TH STREET, EAST WENATCHEE, WA 98802-9130
509-884-4042

FLOW METER CONVERSION AND UPGRADE

Replace Propeller Meters Having Analog Readouts with Electromagnetic Meters Having Automated Meter Reading Readouts

***Eligible Project Category: Irrigation Flow Measurement
(per Funding Opportunity Announcement No. BOR-DO-17-F011 Section
C.3.1)***

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TABLE OF CONTENTS

SF-424 Application for Federal Assistance.....	Preface
SF-LLL Disclosure of Lobbying Activities.....	Preface
SF-424C Budget Information – Construction Programs.....	Preface
SF-424D Assurances – Construction Programs	Preface
Title Page	1
Table of Contents.....	2
Executive Summary	3
Background Data.....	3
Project Description	4
Technical Proposal Evaluation Criteria.....	7
Environmental and Cultural Resource Compliance	10
Required Permits or Approvals	12
Project Budget	12
Funding Plan and Letters of Commitment.....	12
Budget Proposal	13
Budget Narrative	13
Unique Entity Identifier and System for Award Management	13
Vicinity Map	14
Official Resolution	15

EXECUTIVE SUMMARY

January 9, 2017

Greater Wenatchee Irrigation District

Chelan and Douglas Counties

330 Southeast 8th Street

East Wenatchee, WA 98802-9130

The Greater Wenatchee Irrigation District (District) is submitting this WaterSMART grant application to seek financial assistance for its plan to replace approximately 40 existing propeller-style water meters with electromagnetic (mag)-style water meters. These mag meters will be equipped with digital encoders and transmitters that will radio meter data to a data collector. An employee using the data collector will be able to gather data from all meters at only two or three locations. This Automatic Meter Reading System (AMR) mag meter replacement and upgrade project will result in improved water management through increased water measurement accuracy and efficiency; the reduction of the District's use of federal reserved power by eliminating metering head losses; saved labor and reduced fuel costs by eliminating the need to visit each meter location; and the reduction of meter maintenance costs since mag meters have no moving parts. The granted funds would be used to purchase mag meters and pay labor costs for the installation. The replacement of the District's approximately 750 meters is identified in Section 6.1.1 of the District's *2015 Water and Energy Conservation Plan* as a primary opportunity for improvement to conserve energy. The District plans to implement the project over approximately 6 to 9 months during the second half of 2017. The estimated completion date is December 2017.

The District is a federal reclamation project within the Chief Joseph Project of the United States Bureau of Reclamation's (Reclamation) Pacific Northwest Region. This grant application is submitted pursuant to Funding Opportunity Announcement No. BOR-DO-17-F011, Section C.3.1: Irrigation Flow Measurement.

BACKGROUND DATA

Description of the District

General Information

The District is located in Douglas and Chelan Counties, Washington. The District is part of the Chief Joseph Dam Project and serves approximately 9,745 acres of irrigable lands through closed-pipe distribution systems. Chief Joseph Dam, constructed by the Corps of Engineers, is on the Columbia River in north central Washington. The District was originally built by Reclamation in the years 1960 to 1965. Approximately 93 percent of the water use is agricultural, used primarily to irrigate apple orchards. The District is composed of three units: East Unit, Brays Landing, and Howard Flats. Each unit is comprised of an independent irrigation system with unique source and conveyance facilities, which are described in the following section. (**Vicinity Map** attached)

East Unit

The East Unit serves approximately 5,575 acres in the East Wenatchee area of Douglas County. The water demand in the East Unit has averaged 2.83 acre-feet (af) per acre in the last 10 years. Water rights for the East Unit include Washington State water rights numbers S3-00800C, S4-26127P, S4-28566P, and S4-29269P, totaling 27,012 af of annual withdrawal volume. Water rights are held in the name of the United States acting through the Regional Director, Pacific Northwest Region, Reclamation. The water is supplied for this unit via a two-stage pump station located on the Columbia River, approximately 3 miles southeast of East Wenatchee. There are a total of 44.36 miles of District-owned steel, PVC, asbestos-cement, and concrete pipeline in the East Unit. There are four reservoirs with a combined storage capacity of 129.55 af. There are six pump stations with a combined rated capacity of 184.9 cubic feet per second (cfs).

Brays Landing Unit

The Brays Landing Unit is located approximately 8 miles north of Orondo, in Douglas County. The water supply for this unit is pumped from wells located adjacent to the Columbia River. The service area of this unit is approximately 2,818 acres in size. The water demand in the Brays Landing Unit has averaged 3.08 af per acre in the last 10 years. Water rights for the Brays Landing Unit include Washington State water rights numbers 7150, G4-26878P, and G4-26128P, totaling 11,272 af of annual withdrawal volume. Water rights are held in the name of the United States acting through the Regional Director, Pacific Northwest Region, Reclamation.

There are a total of 22.1 miles of District-owned steel, PVC, and asbestos-cement pipeline in the Brays Landing Unit. The unit contains eleven pressure reducing valves (PRV) in laterals. There are five reservoirs with a combined storage capacity of 4.08 af. There are ten pump stations with a combined rated capacity of 157.08 cfs.

Howard Flats Unit

The Howard Flats Unit is located east of Chelan in Chelan County. The water supply for this unit is pumped from wells located adjacent to the Columbia River. The service area of this unit is approximately 1,240 acres and the water demand has averaged 3.04 af per acre in the last 10 years. Water rights for the Howard Flats Unit include Washington State water rights numbers 6592-A (Cert. Rec. 14 Pg. No. 6592-A), G4-26879P, and G4-26129P totaling 5,068 af of annual withdrawal volume. Water rights are held in the name of the United States acting through the Regional Director, Pacific Northwest Region, Reclamation.

There are a total of 8.2 miles of District-owned concrete, asbestos cement, and PVC pipeline in the Howard Flats Unit. There are also 18 PRVs. There are three reservoirs with a combined storage capacity of 3.9 af. There are six pump stations with a combined rated capacity of 67.58 cfs.

PROJECT DESCRIPTION

Flow Meter Conversion and Upgrades

The District adopted its current *Water and Energy Conservation Plan* (WECP) in April 2015. The following are excerpts from Chapter 6 of the WECP describing the District's recent history and long-range plans regarding flow meters:

“6.1 Improvements Implemented Since the 1999 Water Conservation Plan

6.1.1 Meters

Greater Wenatchee Irrigation District (District) has approximately 750 flow meters in use. The meters installed as part of the original construction, were propeller-type flow meters. The District has replaced approximately 500 of the original meters with Sparling brand propeller meters.

Since 1999 replacement meters have been electromagnetic meters (mag meters) rather than propeller meters. Propeller meters measure the velocity of water flowing in a pipeline using a propeller inserted within the pipe parallel to the direction of the flow. The propeller creates a head loss due to the energy required to rotate it and creates a potential collection point for solids entrained in the water. The revolutions of the propeller are counted by a rotating cable which is read by a speedometer head that calculates and displays instantaneous flow rate (in gpm or cfs) and cumulative flow volume (in gallons or ac-ft). The head loss, obstruction and moving parts make propeller meters more prone to maintenance, breakdown and calibration problems. Mag meters have no mechanism within the pipe itself and thus create no head loss or obstruction. Electrodes contained within the cylindrical body of the meter create an electromagnetic field within the pipeline. Based on Faraday’s Law of Electromagnetic Induction, the flow through this electromagnetic field creates an electrical voltage that is proportional to the velocity of flow. This is sensed electronically, eliminating the need for moving parts.

Replacing propeller meters with mag meters eliminates metering head losses, eliminates pipeline obstructions and reduces maintenance labor and expenses associated with metering. The District is using Siemens brand electromagnetic meters. These meters have a digital readout head that displays instantaneous flow in gallons per minute and totalized volume in acre-feet. These meters have the capability to be converted for remote reading at a later date. Utilizing one brand of meter simplifies overall meter maintenance needs, simplifies water delivery record keeping, and simplifies SCADA hardware and software requirements. Meter replacement costs are currently averaging about \$2,500 each. Approximately 150 Siemens mag meters have been installed since 1999. Approximately 568 additional meters still need to be replaced.

6.5 District – Wide Opportunities for Improvements

6.5.1 Continuation of Meter Replacement

*The District’s progress in replacing flow meters is reported in **Section 6.1.1**. This work is ongoing and the District intends to continue. Approximately 568 more meters will be replaced with Siemens electromagnetic meters having digital readouts. These meters have the capability to be converted for remote reading at a later date.”*

The District successfully replaced approximately 34 propeller-style meters in 2015 and 2016, partially using federal funds granted under two separate WaterSMART Water and Energy Efficiency grants. The District is determined to continue its programmatic meter replacement efforts using mag meters with AMR readouts. Approximately 700 meters remain to be replaced to achieve the goals outlined in the 2015 WECP. The program will be ongoing until all meters are replaced, which is expected to take several years. The AMR mag meters transmit meter data by radio where it can be read by an employee using a data collector at a few strategic points in each of the District’s three units. This

system will provide the future opportunity to add radio relay sites that can relay the meter data from the data collection points to the District's supervisory control and data acquisition (SCADA) system.

Since mag meters have no obstructions in the conduit and no head loss as do propeller meters, it will often be possible to replace a propeller meter with a smaller diameter mag meter. This will help minimize hardware costs. The decision regarding sizing mag meters will need to be made on a meter-by-meter basis. The instantaneous flow and velocity at each meter will need to be checked to ensure that the downsized meter is appropriate for the flow and velocity at that metering location. This sizing decision will be made at the time the AMR mag meters are ordered.

During the initial phases of this AMR mag meter program, the District selected and acquired the software and hardware necessary to read and record the meter data. Meter readings are collected in the field using a Trimble Ranger 3 Handheld Computer. This portable device receives the meter readings that are encoded in radio signals. The District determined that all the meters' radio signals can be accessed from two or three locations in each unit. This will provide an immense labor savings compared to the current situation where an employee must visit each meter location every month. After program completion, this data collection task may be performed by a single employee (requiring less than a day to visit all the data collection sites) or it may be assigned to a couple of employees who can visit the data collection sites located within their work area as they go about their normal duties. Either method will provide a significant increase in labor efficiency and will also eliminate most of the 800 miles of driving now required each month to visit each meter location.

The District also purchased an ORION Mobile Reading System laptop and software. Meter data collected with the Trimble Ranger is downloaded to this laptop and the integral software then processes the meter information for input to the District's water records and billing processes.

Each propeller meter will be replaced with a Badger Meter M-Series Model M-5000 Electromagnetic Flow Meter. These will totalize in af with the instantaneous flow reading in cfs or gallons per minute (gpm). The meter and its amplifier do not require an external alternating current (AC) power source and are battery powered. This capability is necessary because very few of the meters currently have AC power. The District has selected the Badger Model M-5000 meters because they are field programmable and battery powered.

Each M-5000 meter will be equipped with a Badger Meter Absolute Digital Encoder. This device encodes the meter data into a format compatible for the Trimble Ranger Data Collector and the ORION AMR Laptop.

Each M-5000 meter will be equipped with a Badger Meter ORION transmitter. This radio transmitter broadcasts the meter data that has been encoded by the Absolute Digital Encoder to the Trimble Ranger Data Collector. This transmitter is battery powered and operates in a band width that does not require a Federal Communications Commission (FCC) radio license.

Replacing propeller meters with mag meters will result in water better managed through increased efficiency and measuring accuracy, eliminate metering head losses, and lower meter maintenance costs. While the head loss in a single modern propeller meter is small, the total energy lost due to head loss in propeller meters throughout the District's large enclosed pressurized system is significant (enough to power 29 homes for a year).

TECHNICAL PROPOSAL EVALUATION CRITERIA

E.1.1. Evaluation Criterion A — Planning Efforts Supporting the Project (35 points)

Up to 35 points may be awarded based on the extent to which the proposed on-the-ground project is supported by an applicant's existing water management plan, water conservation plan, System Optimization Review (SOR), or identified as part of another planning effort led by the applicant.

Describe how your project is supported by an existing planning effort.

- *Does the proposed project implement a goal or address a need or problem identified in the existing planning effort?*

The District completed and adopted its updated WECP in April 2015. Sections 6.1.1 and 6.5.1 identify the need for and the goal of replacing all existing propeller meters with mag meters with AMR and SCADA capabilities. Those sections of the WECP are reprinted in the opening pages of the PROJECT DESCRIPTION section. This AMR mag meter replacement and upgrade project will directly implement the goals of Sections 6.1.1 and 6.5.1 of the District's 2015 WECP.

- *Explain how the proposed project has been determined as a priority in the existing planning effort as opposed to other potential projects/measures.*

The WECP identified various other opportunities for improvements in addition to the District-wide programmatic meter replacement effort, but they consist of significant infrastructure upgrades to consolidate/replace/upgrade aging pump stations or reservoirs. The programmatic meter replacement effort reflects an easily achievable, but relatively high-payoff project that can readily be implemented and that will immediately result in benefits to the District. Upfront effort is relatively low compared to the more significant infrastructure upgrades also included in the WECP, as engineering and design efforts are minimal and the meters can be replaced with in-house labor.

E.1.2. Evaluation Criterion B — Project Benefits (35 points)

Up to 35 points may be awarded upon evaluation of the benefits that are expected to result from implementing the proposed project. This criterion considers a variety of project benefits, including improving the management of water supplies, the significance of the anticipated water management benefits, the public benefits of the project, and any expected environmental benefits.

- *Describe the expected benefits and outcomes of implementing the proposed project.*
 - *What are the benefits to the applicant's water supply delivery system?*

This AMR mag meter replacement and upgrade project will result in water better managed through increased measurement accuracy and operational efficiency; reduce the Districts' use of federal reserved power by eliminating metering head losses; save labor and reduce fuel costs by eliminating the need to visit each meter location; and reduce meter maintenance costs since mag meters have no moving parts. The primary benefit to the

District is improved water management. The upgraded metering system with improved accuracy and automatic reading capabilities will allow the District to better quantify leakage and over-deliveries. Propeller meters typically have an accuracy of +/- 2 percent (source: McCrometer, Inc.). The Badger M5000 mag meters that will be installed to replace the existing propeller meters have an accuracy of 0.40 percent to 0.50 percent (source: Badger Meter), which will be a four- to five-fold increase in measurement efficiency. In addition, the ability to frequently review up-to-date metering data will allow the District to identify inefficiencies or other issues quickly so the District can respond appropriately. A significant secondary benefit is energy savings for the District. While the head loss in a modern propeller meter is small, the total energy lost due to head loss in propeller meters throughout the District's large enclosed pressurized system is significant. The District and RH2 Engineering, Inc., (RH2) have estimated the energy that would be saved by replacing all the existing propeller meters with mag meters is 330,000 kilowatt-hours (kw-hr) per year of the District's reserved power. 330,000 kw-hr is a meaningful amount of electricity; enough to power 29 homes for a year.

- *If other benefits are expected explain those as well. Consider the following:*
 - *Extent to which the proposed project improves overall water supply reliability*
 - *The expected scope of positive impact from the proposed project (e.g., local, sub-basin, basin)*
 - *Extent to which the proposed project will increase collaboration and information sharing among water managers in the region*
 - *Any anticipated positive impacts/benefits to local sectors and economies (e.g., agriculture, environment, recreation, tourism)*

Aside from improved water management and reduced energy requirements, benefits of the AMR mag meter replacement and upgrade project include reduced labor and vehicle mileage. These benefits will impact the entire District. Once the AMR mag meters are in place District-wide, stationary data collectors at radio relay sites can be added in each of the three units to radio meter data directly to the District's SCADA server. This will be a final phase of this project and is not within the scope of this grant application. Prior to the meter conversion program, the District's meter reader drove about 200 miles per week reading meters. That works out to about 800 miles per month or 4,800 miles during the 6-month irrigation season. At a cost of \$0.56 per mile, this vehicle expense equates to about \$2,700 per irrigation season. This driving time and vehicle expense will be nearly eliminated once the entire AMR mag meter replacement and upgrade project is completed. The project does have the potential to increase collaboration and information sharing among water managers in the region. Many of the District's orchardists use irrigation water management (IWM) techniques to accurately schedule crop irrigation needs based on meteorological conditions, soil moisture content, and agronomic need. This AMR mag meter system will have the capability to interface directly to the District's SCADA system, which could then provide real-time metering data to water users that would further enhance IWM irrigation scheduling. However, the District does not plan to make this interface to SCADA until after all meters have been replaced. This project will have only minor effects on water supply reliability and the local sectors/economies.

E.1.3. Evaluation Criterion C — Project Implementation (15 points)

Up to 15 points may be awarded based upon the extent to which the applicant is capable of proceeding with the proposed project upon entering into a financial assistance agreement. Applicants that describe a detailed plan (e.g., estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates) will receive the most points under this criterion.

- Describe the implementation plan for the proposed project. Please include an estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates.

The District is currently capable and prepared to immediately continue replacing meters. The District has included \$75,000 in its 2017 Budget intended to be a 50 percent cost share for implementation. These funds are intended to enable the following implementation schedule:

- March 2017 – Notice of award (assumed)
- July 2017 – Funds awarded (assumed)
- *August 2017 – Purchase meters
- *September-December 2017 – Install meters
- December 2017 – Project completion
- 2017 and Beyond – Continue phased installation of AMR mag meters in the remainder of the District.

*These dates can be accelerated if funds are awarded earlier.

- Describe any permits that will be required, along with the process for obtaining such permits.

No permits are required. This project changes out existing plumbing components within existing facilities, all within existing facility footprints. Therefore, no environmental permits, local planning department permits, or building permits are anticipated.

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

The District will likely require minor technical support from RH2 periodically during implementation. The range of velocities likely at each meter location will need to be determined so that the appropriate size meter is installed.

- Describe any new policies or administrative actions required to implement the project.

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

E.1.4. Evaluation Criterion D — Nexus to Reclamation (15 points)

Up to 15 points may be awarded based on the extent that the proposal demonstrates a nexus between the proposed project and a Reclamation project or activity. Describe the nexus between the proposed project and a Reclamation project or activity, including:

- *How is the proposed project connected to a Reclamation project or activity?*
- *Will the project help Reclamation meet trust responsibilities to any tribe(s)?*
- *Does the applicant receive Reclamation project water?*
- *Is the project on Reclamation project lands or involving Reclamation facilities?*
- *Is the project in the same basin as a Reclamation project or activity?*
- *Will the proposed work contribute water to a basin where a Reclamation project is located?*

The District is part of Reclamation’s Chief Joseph Project and was authorized by Congress on May 5, 1958, pursuant to Public Law 85-393. The District is within Reclamation’s Pacific Northwest Region, Columbia-Cascades Area Office, Ephrata Field Office. The District’s water supply is provided by 10 separate Washington State water rights certificates and permits held by Reclamation. The District’s facilities were planned, designed, and constructed by Reclamation, and title to those facilities is held by the United States. The District and its water supply are within the Columbia River basin. The project is not expected to affect Reclamation’s trust responsibilities to any Tribe(s).

ENVIRONMENTAL AND CULTURAL RESOURCE COMPLIANCE

This AMR mag meter replacement and upgrade project will be changing out meters in existing facilities. This project scope is limited to changing plumbing components. All work will be within the existing footprints of existing facilities. No excavations or other site disturbances are anticipated. No local planning department or building permits will be required. As will be covered in the responses to the following questions, there will be no applicability of the National Environmental Policy Act (NEPA), National Historic Preservation Act (NHPA), Endangered Species Act (ESA), or other federal or state environmental laws.

• *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.*

No. This project will be changing meters within existing pipe systems. Some are above ground and some are in existing shallow vaults. There will be no excavation or other site disturbance.

• *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?*

There are species of salmon and steelhead in the Columbia River within the District’s area that are listed as “threatened” under ESA. The District’s operations are covered under an ESA Section 7 consultation known as the Federal Columbia River Power System Biological Assessment. The District’s ESA coverage thereunder is pursuant to Reclamation’s coverage.

This AMR mag meter project will take place away from the Columbia River and will not affect any endangered species.

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

No. The District operates an enclosed pressurized conveyance system.

• When was the water delivery system constructed?

1960 through 1965, and in 1985.

• 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.

No. This AMR mag meter project will be changing meters within existing pipe systems.

• 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.

None will be affected since this project will be changing meters within existing pipe systems.

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

Yes. However, none will be affected since this project will be changing meters within existing pipe systems.

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

There will be no effect since this project will be changing meters within existing pipe systems.

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

None will be affected since this project will be changing meters within existing pipe systems.

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

No. There will be no excavation or other soil disturbance since this project will be changing meters within existing pipe systems.

REQUIRED PERMITS OR APPROVALS

This AMR mag meter replacement and upgrade project scope is limited to changing out meters in existing facilities. This project is simply changing plumbing components. All work will be within the existing footprints of existing facilities. No excavation or other site disturbances are anticipated. No local planning department or building permits will be required.

PROJECT BUDGET

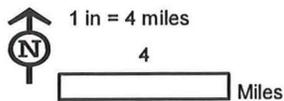
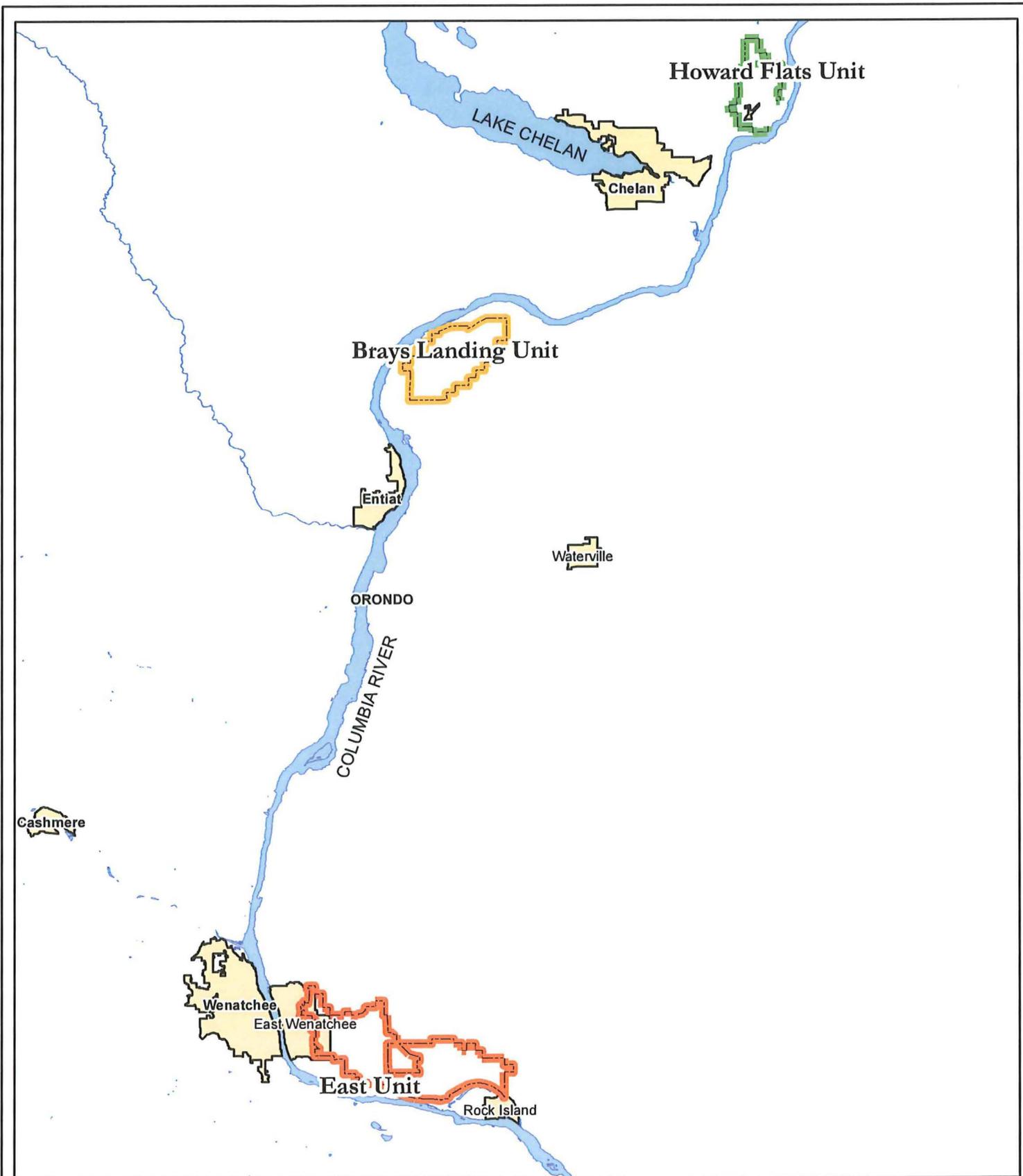
Funding Plan and Letters of Commitment

The District will fully fund the non-federal share of project costs through \$75,000 included in its 2017 Operations and Maintenance (O&M) Budget as a monetary contribution to the cost-share requirements. The District is fully capable of supporting these costs within its existing budget. No third-party funding sources or letters of commitment are required. No costs incurred before the project start date are sought to be included as project costs. No other Federal funding will be utilized and no other pending funding requests exist for this project.

The District has included \$75,000 in its 2017 O&M Budget to provide approximately 50 percent of the funding for this phase of the AMR mag meter replacement and upgrade project.

Table 1 – Summary of Non-federal and Federal Funding Sources

FUNDING SOURCES	AMOUNT
Non-federal Entities	
1. Greater Wenatchee Irrigation District	\$ 75,000.00
Non-federal Subtotal	\$ 75,000.00
Other Federal Entities	
1. None	0
Other Federal Subtotal	\$ -
REQUESTED RECLAMATION FUNDING	\$ 75,000.00



Vicinity Map

Greater Wenatchee Irrigation District

FIGURE 1

Legend	
	Howard Flats Unit Boundary
	East Unit Boundary
	Brays Landing Unit Boundary
	Waterbodies
	Cities



GREATER WENATCHEE IRRIGATION DISTRICT
3300 SOUTH EAST 8TH STREET EAST WENATCHEE WA 98802-9130
509-884-4042

Resolution 01.10.17.01:

RE: Funding Opportunity Announcement No. BOR-DO-17-F011

The Board of Directors of the Greater Wenatchee Irrigation District, by resolution, hereby authorizes Mike Miller, Secretary/Manager to pursue WaterSMART (Sustaining and Manage America's Resources) Grant BOR-DO-17-F011. By adopting this resolution, the Board of Directors has designated Mike Miller as the appropriate official to pursue this grant.

The Board also confirms there will be matching funds available upon acceptance of this Grant. Upon adoption, GWID agrees to work with Reclamation to meet all established deadlines for entering into a cooperative agreement.

Signed:

President, Michael Brownfield: Michael Brownfield Date: 1/10/17

Vice President, Michael Clayton: Michael Clayton Date: 1-10-17

Robert Koenig: _____ Date: _____

John Lawrence: John Lawrence Date: 1/10/17

Douglas Bromiley: D. Bromiley Date: 1/10/17

Current Manager, Michael Miller: Michael Miller Date: 1/10/17