WaterSMART Grants:
Small-Scale Water Efficiency Projects for Fiscal Year 2019

Tuolumne Utilities District Ditch Meters Small-Scale Water Efficiency Project

Tracking Consumption and Improving Delivery of Raw Water

April 24, 2019

Applicant: Tuolumne Utilities District
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1.0 TECHNICAL PROPOSAL AND EVALUATION CRITERIA

1.1 Executive Summary

Date: April 24, 2019
Applicant Name: Tuolumne Utilities District
City/ County/ State Sonora, Tuolumne, CA

1.1.1 Project Summary

Tuolumne Utilities District (TUD) is seeking U.S. Bureau of Reclamation (Reclamation) WaterSMART cost share funding in the amount of $75,000 to help fund its Ditch Meter Small-Scale Water Efficiency Project (Project). Currently, TUD serves water to 587 untreated or raw water accounts. These accounts are largely unmetered, with many customers still taking and paying for water based on a miner's inch. The Project will upgrade 150 of these customer service turnouts along TUD's open ditch system. Each turnout upgrade would consist of: installation of an electromagnetic flow meter to monitor water usage, meter box, suction screens, piping through the ditch berm (as needed), and isolation gate valves for service laterals. The service lateral gate valves will allow customers to turn off the service when water is not being used.

The Project would:

1) improve the accuracy of TUD's tracking and monitoring of raw water use, and thus enable TUD to better evaluate water use patterns, identify water losses in the ditch, and forecast water supplies;
2) provide TUD with equipment to track water consumption and the opportunity to adjust its water rate structure to include a consumptive rate for raw water, as opposed to the current flat rate based on flow rate; and
3) enable raw water customers to turn on and off their water service at will, saving TUD staff time and travel costs (including vehicle miles traveled and fuel costs) to perform this service at each turnout.

TUD estimates that converting raw water services from a flat rate based on flow rate to a consumptive rate based on metered use could save up to 3,250 gallons of water per day, per customer. This equates to approximately 488,000 gallons (1.5 acre-feet) of water saving annually per meter installed, a total annual water savings of 225 acre-feet per year with installation of all 150 meters.

1.1.2 Length of Time and Estimated Completion Date for the Project

The Project is ready for implementation following purchase of proposed metering equipment. Installation would be completed by TUD staff on a continuous basis beginning in 2020 with conclusion anticipated before the end of 2022.

1.1.3 Federal Facility Information

The Project is not located on a federal facility. All ditches within which meters would be installed are owned and operated by TUD.

1.2 Background Data

TUD's raw water conveyance system, consisting of 71 miles of ditch, flume, pipe and tunnel infrastructure (some of which was constructed in the 1850s), supplies water to all 14 of TUD's surface water treatment plants and serves a variety of customer types and uses, including agricultural/irrigation water, ditch domestic use, commercial and industrial, resale, and raw water supply to other treated water agencies such as the Twain Harte Community Services District. Among TUD raw water customers are 587 customer accounts that receive raw water via service turnouts along TUD's ditch system. These customers withdraw water directly from a TUD ditch for irrigation, landscaping and other purposes. Water withdrawn is frequently roughly allocated based on a miner's inch. A miner's inch is a simple system of water allocation in which water is measured as a unit of flow in terms of volume per unit time. The miner's inch was derived from the amount of water that would flow through the hole of a given area at a given pressure (for example, 4-6 inches of water, or 1-1.5 kPa). The word 'inch' refers to the area of the hole in 'square inches'. One miner's inch is equivalent to 11.22 gallons per minute. Many customers take delivery of this flow of water on a continuous basis and pay a flat rate for the service over the course of an irrigation season (150 days).

Approximately 96% of the water TUD distributes is surface water from the South Fork Stanislaus River, a river fed by Sierra Nevada mountain rainfall and snowmelt. South Fork Stanislaus River water is impounded in Pinecrest Lake and Lyons Reservoir and delivered to TUD via the Tuolumne Main Canal by agreement with Pacific Gas & Electric (PG&E). PG&E owns and operates Pinecrest Lake, Lyons Reservoir and the Tuolumne Main Canal. TUD serves nearly 44,000 residents with 11 water systems, 14,105 water connections, 14 surface water treatment plants, 78 treated water storage tanks, 330 miles of treated water pipeline, 12 active wells, and 71 miles of raw water conveyance infrastructure that diverts water from the Tuolumne Main Canal at various locations.

The topography of Tuolumne County varies greatly from gently rolling terrain at the lower elevations, to steep hilly uplands deeply traversed by streams and tributaries that drain south to the Tuolumne River or north to the Stanislaus River. The majority of TUD customers reside in or near the City of Sonora which is at about elevation 2,000 feet. TUD also serves customers in several communities east of Sonora, up to about elevation 6,000 feet, and west of Jamestown down to an elevation of less than 1,500 feet. Through its history, the water system, which is now operated by TUD, has changed from a utility serving mainly gold rush mining operations to one that serves the 21st century vibrant and diverse residential, commercial and industrial sectors of Tuolumne County.

TUD has existing contracts and active agreements for Reclamation.

1.3 Project Location

Tuolumne County is located in the Sierra Nevada foothills and mountain range of Central California. The County seat is the City of Sonora, where TUD headquarters are located. The Project is located in and along TUD's ditch system in Tuolumne County, California. There is no exact location for this Project as the 150 meters will be dispersed among existing customer service turnouts along TUD's ditches where there are no meters currently. Figure 1 shows the location of TUD's existing raw water system. Figure 2 shows the location of Tuolumne County in the State of California.

Figure 1: TUD Raw Water System

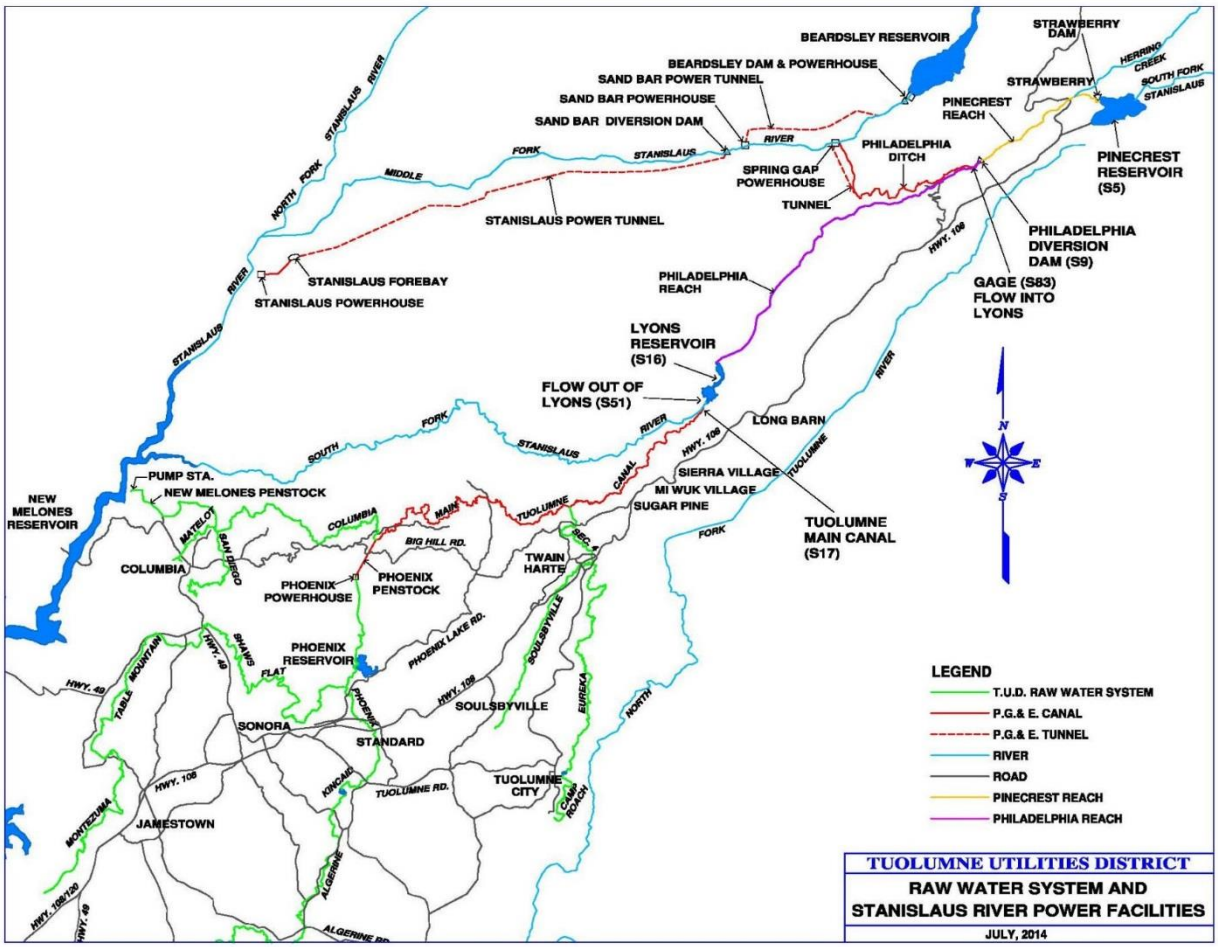

Figure 2: Tuolumne County in the State of California

1.4 Technical Project Description and Milestones

TUD recognizes the current system of raw water allocation to individual customer accounts as problematic from a conservation and efficiency perspective. A miner's inch of water is a rough calculation that does not provide TUD or the customer with a means for accurately measuring water use. In addition, the infrastructure to support these diversions is rudimentary. Customers are not able to turn flows on and off without TUD staff support,so TUD ditch tenders are constantly responding to customer service requests to turn raw water service on and off. Without a financial incentive to conserve or reduce their raw water use, a means for accurately measuring use, or, even, a means to turn off their flow when desired, these raw water users consume substantial amounts of water that could otherwise be conserved or used elsewhere. Likewise, TUD is limited in its ability to measure water use, evaluate water use patterns, identify use anomalies, or charge customers according to consumption.

TUD is seeking Reclamation WaterSMART cost share funding in the amount of $75,000 to help fund its Ditch Meter Small-Scale Water Efficiency Project, a project to install meters on a substantial percentage of unmetered raw water customer turnouts. Through this Project, TUD would be enabled with a better method of determining actual water use, and customers would be provided the opportunity to turn on and off their water allocation from the ditch. TUD estimates that converting raw water services from a flat rate based on flow rate to a consumptive rate based on metered use could save up to 3,250 gallons of water per day, per customer. This equates to approximately 488,000 gallons (1.5 acre-feet) of water saving annually per meter installed, a total annual water savings of 225 acre-feet per year with installation of all 150 meters.

The Project would upgrade 150 existing customer service turnouts along TUD's open ditch system. Each turnout upgrade would consist of: installation of an electromagnetic flow meter to monitor water usage, meter box, suction screens, piping through the ditch berm (as needed), and isolation gate valves for service laterals. The service lateral gate valves will allow customers to turn off the service when water is not being used. TUD would prioritize installation of meters based on the size and format of the customer accounts, seeking to install meters on those accounts with highest value opportunity to improve water use efficiency via tracking and monitoring.

A magnetic flow meter is a transducer that measures flow rate by measuring the voltage across the liquid by the use of a magnetic field. Electromagnetic flow meters work by applying a magnetic field to a metering tube and works by the physical principle of electromagnetic induction. The magnetic flow meter requires a conducting fluid, such as water that contains ions, an electrical insulating pipe surface, and a rubber-lined steel tube. The main advantages of electromagnetic flow meters are their obstruction-less design, linear signal output, corrosion-resistant wetted parts, and high accuracy. Because the liquid flowing through the meter meets no obstructions, the pressure drop through the meter is virtually zero. Electromagnetic flow meters have no moving parts to wear. The only wetted parts are the electrodes, insulating liner, and a grounding ring. TUD has initiated research into meter purchase and bases its cost estimate for this Project on the MACH 10® ultrasonic water meter.

All ditches within which meters would be installed are owned by TUD. The Project is ready for implementation following purchase of proposed metering equipment. Installation would be completed by TUD staff on a continuous basis beginning in 2020 with conclusion anticipated prior to the winter of 2022. The workplan for the Project would involve the following steps:

Phase I: Preparation – winter 2020

1. Confirm and map locations where each meter would be installed
2. Purchase equipment

Phase II: Installation – spring 2020 through end of 2022

3. Complete outreach to landowners
4. Install meters
5. Follow-up inspection

Each step during the installation phase would be completed on a continuous cycle throughout the three-year period with landowner outreach an ongoing effort and prioritized according to the chronology of planned installation. Inspection of installed meters would be initiated within the month following install.

1.5 Evaluation Criteria

1.5.1 Evaluation Criterion A – Project Benefits

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

The Project would provide TUD with data and equipment to improve water management, measure customer water use, and reduce overall operational costs. TUD looks forward to relying on the high flow rate accuracy of the meters to:

- Evaluate water use patterns.
- Identify water losses associated with leaks in and around turnouts.
- Improve and refine water forecasting.
- Track overuse/abuse and non-beneficial use of water.
- Save staff time and travel costs by enabling individual customers the ability to turn on and off their water flow at will.
- Establish consumption rates of water use to, eventually, establish a consumptive rate for raw water. Adjusting water rates from a flat rate based on flow rate to a consumptive rate based on metered use could reduce as much as 225 acre-feet of water lost annually, incentivize water use efficiency and subsequently reduce water demands, and enable TUD to recover costs associated with maintenance and operations of its raw water infrastructure.

These direct benefits all result in long term water and operational savings, increasing the region's resilience and improving TUD's ability to better respond and manage future water shortages associated with drought.

1.5.2 Evaluation Criterion B – Planning Efforts Supporting the Project

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

This Project has been identified as a priority by multiple TUD planning and strategy documents including:

- TUD's November 2015 Final Draft Rate Study for Fiscal Year 2016-Fiscal Year 2020.
- TUD's November 2015 Capital Improvement Plan for Fiscal Year 2016-Fiscal Year 2020.
- TUD's February 2012 report: Ditch System Sustainability Project Operation And Maintenance Strategies For Reducing Non-Consumptive Use Water

The November 2015 Rate Study describes the raw water metering project multiple times referring to TUD's proposal to initiate a meter installation program for a substantial percentage of unmetered raw water customers as a means for reducing operational costs for TUD and providing a better method of determining actual water use (Section 4-7, *Untreated (Raw) Water*). The Rate Study also identifies the installation of a meter and a customer side valve as an incentive for customer to turn off their water flow when it is not needed, and discusses improved metering and transitioning to consumptive based rates as an opportunity to recover costs associated with providing raw water service, costs for which TUD currently experiences an annual revenue shortfall compared to annual operations and maintenance expenses (Section 4-12, *Raw (Untreated) Water*).

The November 2015 Capital Improvement Plan describes and budgets for the Project and highlights the Project as a means of addressing and modernizing gold rush era infrastructure that can both save water and mitigate vulnerabilities in the ditch system by providing information that

will allow TUD to determine inefficiencies related to evaporation, seepage and flow regulation (Section 5, *Water Projects*). The Capital Project Worksheet for the Project includes a description of the Project's impact on TUD's operating budget, highlighting multiple benefits including: increasing accuracy of water flow measurement, reducing TUD staff time associated with responding to requests to turn on and off water service, and creating the opportunity for TUD to transition to a consumptive based rate, rather than a flow based rate, for water, use.

The February 2012 Ditch System Sustainability Report suggests TUD use new flow metering stations to better quantify the non-consumptive use component of water to determine the appropriate balance of municipal, industrial and agricultural uses, compared to the ecosystem benefits derived as a result of the non-consumptive component that leaves the system (Section 3.0, *Fate of Non-Consumptive Use Water*).

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

Yes, this Project will directly addresses problems TUD has identified regarding insufficient data related to raw water use and consumption, poor incentives for raw water conservation, and the need to modernize gold rush era infrastructure – infrastructure that does not serve TUD's need to track and monitor water use as a means of ensuring a sustainable water supply over time.

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

The proposed Project is identified as a priority project in the TUD Capital Improvement Plan for Fiscal Year 2016-Fiscal Year 2020, and is included in the budget for water supply improvements.

1.5.3 Evaluation Criterion C – Project Implementation

- *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 Project is ready for implementation following purchase of proposed metering equipment. Installation would be completed by TUD staff on a continuous basis beginning in 2020 with conclusion anticipated before the end of 2022. The workplan for the Project would involve the following steps:

Phase I: Preparation – winter 2020

1. Confirm and map locations where each meter would be installed – winter 2020
2. Purchase equipment

Phase II: Installation – spring 2020 through end of 2022

3. Complete outreach to landowners
4. Install meters

5. Follow-up inspection

Each step during Phase II: Installation would be completed on a continuous cycle throughout the three-year period with landowner outreach an ongoing effort and prioritized according to the chronology of planned installation. Inspection of installed meters would be initiated within the month following install. TUD also recognizes reporting guidelines associated with this grant award. Interim and Financial Reports would be submitted at least annually followed by a Final Project Report at Project completion. Figure 3 illustrates the timeline of Phase I and Phase II and the ongoing expectations regarding reporting requirements.

Figure 3: Project Timeline

Ditch Meters Small-Scale Water Efficiency Project		2020				2021				2022			
Phase	Description	winter	spring	summer	fall	winter	spring	summer	fall	winter	spring	summer	fall
Phase I	Confirm and map meter locations												
	Purchase equipment												
Phase II	Complete outreach to landowners												
	Install meters												
	Follow-up inspection												
Ongoing	Interim Performance and Financial Reports												
	Final Performance Reports												

- *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.*

No engineering or design work is required to implement the Project. The Project will be ready to implement with identification of prioritized meter placement locations and purchase of the meters.

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

The Project is supported by TUD staff and board and is in compliance with existing local ordinances and regulations.

- *Describe how the environmental compliance estimate was developed. Have the compliance costs been discussed with the local Reclamation office?*

No environmental compliance is anticipated as meter installation is planned within the existing footprint of existing TUD ditches and TUD berms with little or no ground disturbance at each meter installation location.

1.5.4 Evaluation Criterion D – Nexus with Reclamation

TUD's water system is primarily fed by water in the Stanislaus River, which also feeds into New Melones Lake, a water collection and transfer unit of Reclamation's Central Valley Project. Any water conservation achieved through this Project has potential positive downstream effects as conserved water could enter New Melones Lake.

1.5.5 Evaluation Criterion E – Department of Interior Priorities

- ***Modernizing our infrastructure***
    - *Support the White House Public/Private Partnership Initiative to modernize U.S. infrastructure;*
    - *Remove impediments to infrastructure development and facilitate private sector efforts to construct infrastructure projects serving American needs;*
    - *Prioritize DOI infrastructure needs to highlight:*
        - *Construction of infrastructure;*
        - *Cyclical maintenance;*
        - *Deferred maintenance.*

The Project is directly aligned with the White House Public/Private Partnership Initiative to modernize U.S. infrastructure with direct benefits related to reduced maintenance and operational costs, and overall improved management leading to more efficient use of water. The modern electromagnetic flow meters proposed for the Project would be a dramatic improvement over the gold rush era miner's inch infrastructure currently in use. Their installation offers TUD a relatively low-cost opportunity to dramatically improve tracking, monitoring and evaluation of water flow and delivery, to respond to changes as they occur, and to reduce unrecoverable water losses.

2.0 PROJECT BUDGET

2.1 Funding Plan and Letters of Commitment

The total costs for the Project are estimated at $184,306.15, covering equipment purchase, installation and management. The majority of funding for the Project is budgeted in the TUD Board approved Capital Improvement Plan (CIP) for 2016-2021. The funding sources for the Project will be derived from the following primary sources:

1) $75,000 WaterSMART Grants: Small-Scale Water Efficiency Projects for Fiscal Year 2019
2) $60,306.15 of TUD in-kind contributions, $45,000 of TUD cash contributions

No third-party funding sources or letters of commitment are required. The Project does not involve funding from any other Federal partners and there are no Project costs that have already been incurred.

2.2 Budget Proposal

Table 1. Summary of Non-Federal and Federal Funding Sources

FUNDING SOURCES	AMOUNT
Costs to be reimbursed with the requested Federal funding	$75,000
Costs to be paid by the applicant	$109,306
Value of third party contributions	NA
TOTAL PROJECT COST	**$184,306.15**

The budget proposal summary is provided in the table below and is described in a narrative format below.

Table 2. Budget Proposal

BUDGET ITEM DESCRIPTION	COMPUTATION		QUANTITY TYPE	TOTAL COST
	$/Unit	Quantity		
Salaries and Wages				
Water Master, Eric Hall	51.29	25	Per hour	$ 1,282.25
Management Analyst	34.62	25	Per hour	$ 865.50
Associate Engineer II	53.91	10	Per hour	$ 539.10
Ditch Tender	28.38	1200	Per hour	$ 34,056.00
Fringe Benefits - 75% of Employee Salary				

Water Master, Eric Hall	38.47	25	Per hour	$ 961.75
Management Analyst	25.97	25	Per hour	$ 649.25
Associate Engineer II	40.43	10	Per hour	$ 404.30
Ditch Tender	21.29	1200	Per hour	$ 25,548.00
Equipment				
Electromagnetic Flow Meters	380	$ 150.00	Per unit	$ 57,000.00
Screen	200	$ 150.00	Per unit	$ 30,000.00
Plumbing	120	$ 150.00	Per unit	$ 18,000.00
Meter Box	100	$ 150.00	Per unit	$ 15,000.00
Supplies and Materials				
NA				
NA				
Contractual/Construction				
NA				
NA				
Third-Party In-Kind Contribution				
NA				
NA				
TOTAL DIRECT COSTS				**$ 184,306.15**

2.3 Budget Narrative

2.3.1 Salaries and Wages

Salaries and wages for TUD staff are based on anticipated staff hours required to manage the Project including to confirm and map locations for installation, to conduct outreach with landowners, to install the meters, and to complete follow-up inspections. Hours also account for time associated with Reclamation reporting requirements including: submission of financial reports (once per year), interim performance reports (once per year) and a final performance report. Eric Hall, Water Master at TUD, would serve as the director for the Project.

2.3.2 Fringe Benefits

TUD's fringe benefit rate is calculated at the end of each year using a number of financial elements. The fringe rate for this Project is estimated as 75% each position's salary. As the total data and methods for this rate value are quite complicated, further data and information is available upon request.

2.3.3 Travel

There will be no travel expenses as the Project is within TUD Service Boundary. No travel expenses are expected, nor will any travel expenses be included with this Project.

2.3.4 Equipment

Equipment for the Project exceeding $5,000 in total value is listed below and discussed in terms of need and how the equipment is priced.

The MACH 10® ultrasonic water meter features solid state metrology with no degradation of accuracy over time. They are priced $380 per meter, at 150 units, for a total meter cost of $57,000. Combined with a corrosion-resistant, lead-free, high-copper alloy maincase, the MACH 10 is built to withstand demanding service conditions and deliver sustained accuracy over the life of the meter. The technology uses a magnetic sensing format that measures flow in the meter but does not obstruct the flow with a pitot tube, propeller, or other physical sensing device residing in the flow of water.

Other equipment includes: screen, plumbing and meter box. This equipment would provide the needed infrastructure to complete each installation. Estimates for equipment is based on previous purchases made by TUD staff.

2.3.5 Materials and Supplies

No materials and supplies are required for this Project.

2.3.6 Contractual

No contractual services are required for this Project. Management and installation of meters will be completed by TUD staff.

2.3.7 Third-Party In-Kind Contributions

No third-party contributions are required for this Project.

2.3.8 Environmental and Regulatory Compliance Costs

Though no environmental or regulatory compliance costs are expected with the Project, any that may occur will be considered in-kind costs. All work performed will be consistent with industry

"best practices" for construction activities in or near the ditch system. Further, the Water Master, will consider existing cultural resources based on the 2012 Ditch Sustainability Project Historic Resource Evaluation Report when confirming locations for meter replacement and will evaluate each work location with appropriate personnel if there is the possibility for any resource disturbance, and to determine if any additional measures are to be taken to comply with any environmental or regulatory rules or regulations, and file any required documentation with the respective regulatory agency prior to work being performed.

2.3.9 Other Expenses

No other expenses are expected with this Project. If such expenses occur, they will be documented, but not included with any reimbursement requests.

2.3.10 Indirect Costs

There are no indirect expenses associated with this Project.

2.3.11 Total Costs

The total design, construction, and administrative cost for the Project are estimated at $184,306.15, inclusive of Federal and non-federal cost share dollars and in-kind contributions.

3.0 ENVIRONMENTAL AND CULTURAL RESOURCES COMPLIANCE

No environmental compliance is anticipated as meter installation is planned within the existing footprint of existing TUD ditches and TUD berms with little or no ground disturbance at each meter installation location. The only resource issue that may arise during meter installation is potential disturbance of cultural resources associated with some of the existing infrastructure. In instances where any existing infrastructure is older than 50 years or, for other reasons, triggers cultural review, TUD would work with their in-house cultural resource specialist and/or contract with local cultural resource consultants before proceeding with meter installation. TUD completed a comprehensive Ditch Sustainability Project Historic Resource Evaluation Report in 2012 that investigated and identified any sites/features over 45 years along TUD's ditches; TUD would reference the report with regards to any potential cultural resource sites near planned locations of meter installation. Overall, TUD's strategy with respect to potential cultural resources is to avoid disturbance.

4.0 REQUIRED PERMITS OR APPROVALS

Permits and approvals are not expected to be needed for this Project as all activities are within the ditch, ditch berm, and TUD operated facilities. No work is expected to be performed within a State or County, or railroad right-of-way, negating the need for encroachment permits. If the need for a permit is identified during the process, all rules and procedures to obtain the permit will be followed prior to any work commencing.

5.0 OFFICIAL RESOLUTION

TUD will adopt an official Resolution at its Board of Directors meeting scheduled for May 14, 2019. A draft of the Resolution is included in Attachment A. An original and copy of the signed Resolution will be submitted to Reclamation upon its approval by the TUD Board of Directors.