BUREAU OF RECLAMATION

STOCKTON EAST WATER DISTRICT
PROVIDING SERVICE SINCE 1948

Stockton East Water District

Upper Farmington Flow Measuring Flume

Applicant Contact:

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Acronyms and Abbreviations

AF	acre-feet
AF/yr	acre-foot per year
District	Stockton East Water District
DWR	California Department of Water Resources
GPM	gallons per minute
MGD	million gallons per day
OID	Oakdale Irrigation District
Project	Upper Farmington Flow Measuring Flume
SCADA	Supervisory Control and Data Acquisition
SSJID	South San Joaquin Irrigation District

Technical Proposal and Evaluation Criteria

Executive Summary

Date: July 28, 2022

Applicant: Stockton East Water District

City: Stockton

County: San Joaquin

State: California

Stockton East Water District (District) is a Special District and Category A applicant.

The District, located on the floor of the San Joaquin Valley just east of the city of Stockton, will construct a new flow measurement structure at a tunnel outlet located at the start of the District's Upper Farmington Canal. The Upper Farmington Flow Measuring Flume (Project) is intended to provide accurate flow measurement from the New Melones Reservoir to the District's Upper Farmington Canal via Goodwin Dam and the Tunnel. The project will improve water reliability and efficiency. The Project alleviates the risk of future water conflict by providing accurate flow measurement. The Project sets up the water distribution system by eliminating the unreliable and unknown flow measurement at the head of the system. With accurate flow measurement, water supply operators operate the water deliveries more accurately to ag users which minimizes losses and saves water. In addition to the flume, the first part of the canal will be lined with an impermeable liner to minimize seepage losses.

Project Location

The Project is located in Stanislaus, California, approximately 2 miles north of the town of Knights Ferry. The Project latitude is 37.84846° and longitude is - 120.6865°. See Figure 1 below for site map and vicinity map.

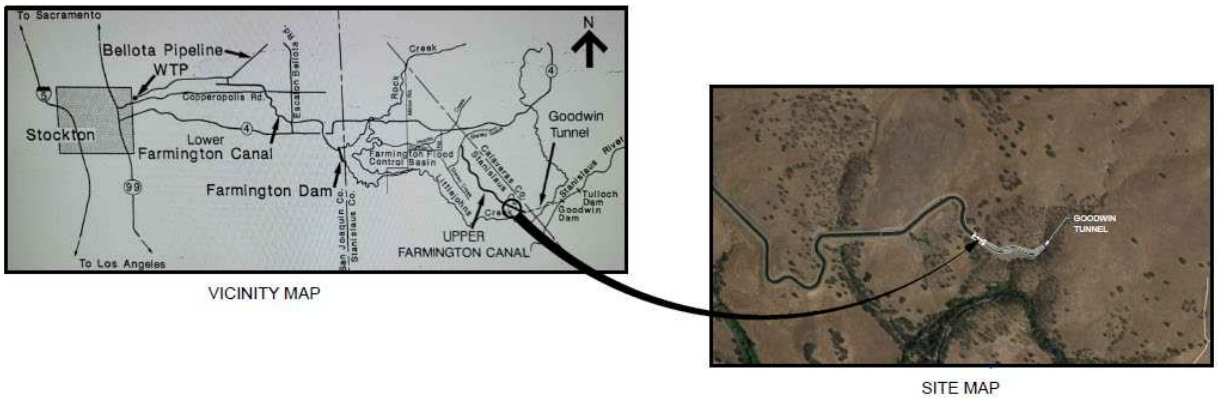


Figure 1: Location Maps

Technical Project Description

The existing Upper Farmington Canal (Canal) is owned and operated by the District and provides water to urban (municipal and industrial) and agricultural users. The purpose of the Canal is to divert New Melones water for municipal and agricultural use. There are gates located at Goodwin dam that release water to the tunnel. The tunnel outlet is at the head of the Upper Farmington Canal. The existing facilities at the Upper Farmington Canal use a Sontek IQ flow measurement device to measure flow. Unfortunately, the extreme aquatic plant life and backwatering from the plant life cause the Sontek IQ to malfunction often and be inaccurate. The Sontek IQ device stops working at least three or four times throughout the irrigation season from April to October. When the Sontek IQ stops working, there is no way to get an accurate flow measurement. It may take days or weeks to get the Sontek IQ to work again. During that time, it becomes difficult for water supply operators to manage the surface water effectively and efficiently.

The proposed project consists of two major parts; lining of the canal from the tunnel outlet to the entrance of the flume, and the construction of the flow measurement flume. The canal lining will mitigate the aquatic vegetation and reduce water losses. The flume will provide reliable accurate flow measurement. Both parts of the project will result in water savings and reduced greenhouse gas emissions. Table 1 shows the necessary materials and estimated quantities to complete the Flume and Canal Lining.

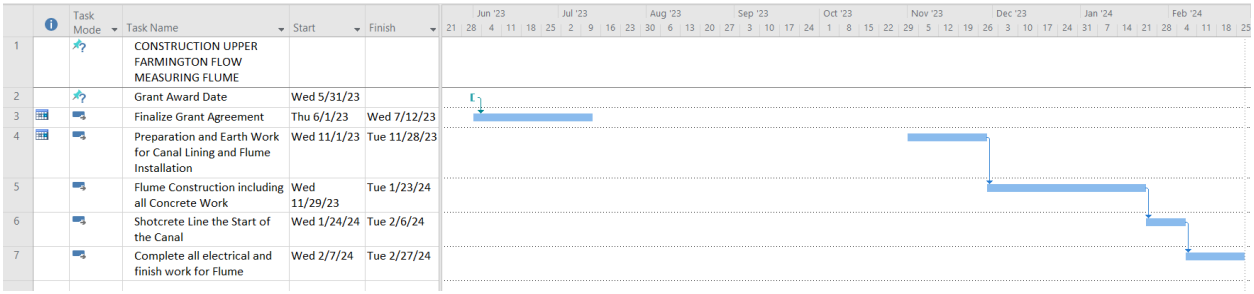
Table 1: Materials Needed

Item No.	Description	Estimated Quantity
1.	Flume Earthwork Excavate to appropriate elevations. Prepare for cast in place concrete and shotcrete.	390 CY
2.	24" Bypass Pipeline for Flume 100 PSI PIP PVC pipe, ADS N-12, or equal.	226 FT
3.	24" Slide Gate C-10 Waterman or Equal	Lump Sum
4.	Rock Excavation The site may have no rock or minimal rock.	CY
5.	Two-Foot Curb on South Side One foot above ground and one foot of footing.	777 FT
6.	Flume Stilling Well Including the 36" RCP Stand Pipe, Riser, Cover, and 10" pipe 100 PSI PIP PVC, ADS N-12, or equal pipe.	Lump Sum
7.	Catwalk This includes W8x21 or W14x34 Main Beams, grating, and handrail.	Lump Sum
8.	Shotcrete from Flume to Tunnel Outlet	520 CY
9.	Canal Earthwork for Shotcrete Prep	520 CY

Additional to the materials, the necessary equipment needed to complete the project are:

- D6T CAB/AIR LGP Dozer
- 325F CAB/AIR Excavator
- 325 CAB/AIR Thumb Excavator
- 140 M CAB/AIR Laser Ready Motor Grader

- 950 CAB/AIR Wheel Loader
- 84” Pad Drum Roller CP56 OROPS w/ Blade
- 84” Smooth Drum Roller CS54 OROPS
- Articulated Dump Truck 735
- Water Truck



	Task Mode	Task Name	Start	Finish
1		CONSTRUCTION UPPER FARMINGTON FLOW MEASURING FLUME		
2		Grant Award Date	Wed 5/31/23	
3		Finalize Grant Agreement	Thu 6/1/23	Wed 7/12/23
4		Preparation and Earth Work for Canal Lining and Flume Installation	Wed 11/1/23	Tue 11/28/23
5		Flume Construction including all Concrete Work	Wed 11/29/23	Tue 1/23/24
6		Shotcrete Line the Start of the Canal	Wed 1/24/24	Tue 2/6/24
7		Complete all electrical and finish work for Flume	Wed 2/7/24	Tue 2/27/24

Figure 2: Canal Lining and Flume Timeline

Figure 2 shows the construction schedule for the Project. After the grant award and all agreements are finalized the construction will commence in November 2023. The construction is expected to be a four-month long period ending by March 2024.

Evaluation Criteria

Criterion A – Quantified Water Savings

All applicants should be sure to:

1) Describe the amount of estimated water savings. *For projects that conserve water, please state the estimated amount of water expected to be conserved (in acre-feet per year) as a direct result of this project.*

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

Installing an accurate flow measurement and lining part of the canal will provide water savings. The estimated water savings from the proposed project is **10,865 AF/yr**. The majority of the water savings (10,565 AF/yr) comes from the installation of the flow measuring Replogle flume. The second part of the water savings (300 AF/yr) is from minimizing the seepage losses with shotcrete lining from the tunnel outlet to the inlet of the flume.

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

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

The current losses are due to multiple reasons. The first cause of the existing losses is the lack of accuracy and dependency on the existing flow measurement Sontek IQ. The existing flow measurement was on average -20% accurate in 2021. Unfortunately, due to the site's extensive aquatic life the Sontek IQ frequently malfunctions and stops working. As stated a minimum of three to four times throughout the irrigation season the Sontek IQ stops working. During this time, it becomes very difficult for water supply operators to efficiently deliver water to ag users and to the water treatment plant for municipal services without losses. Since, the flow is unknown when the Sontek IQ is broken the operators typically over deliver to ensure there is enough water for ag and municipal. Unfortunately, this means a significant amount of spilling at the end of the distribution system.

The second cause of losses is the seepage in the canal. The Upper Farmington Canal is a man-made unlined canal. Water seeps into the soil. The soil type along the Upper Farmington Canal is a sandy loam which has a large seepage constant.

The third cause of losses is the aquatic vegetation in the water and the plant life that borders the canal. Depending on the size and type of plant life they can use a significant amount of the water to stay alive. Additionally, the plant life can cause major hydraulic issues limiting the capacity of the canal.

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

The losses from over requesting water from the New Melones Reservoir end up going to one of the spill sites. The spill sites spill the excess water in the canals and creeks. The water then gets into the Stockton Diverting canal that goes to the delta and then to the ocean.

The losses from canal seepage and leaks can be seen on the south side of the canal where green vegetation grows year-round. That water is lost to the vegetation.

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

The Upper Farmington Canal is a manmade canal where there are no known fish species. There are no known benefits for animal species associated with where the current losses are going.

3) Describe the support/documentation of estimated water savings: *Please provide sufficient detail supporting how the estimate was determined, including all supporting calculations. Note: projects that do not provide sufficient supporting detail/calculations may not receive credit under this section. Please be sure to consider the questions associated with your project type (listed below) when determining the estimated water savings, along with the necessary support needed for a full review of your proposal.*

In addition, please note that the use of visual observations alone to calculate water savings, without additional documentation/data, are ***not*** *sufficient to receive credit under this section. Further, the water savings must be the result of reducing or eliminating a current, ongoing loss, not the result of an expected future loss.*

The estimated average annual water savings from the inaccurate flow measurements from the Sontek IQ were calculated from comparing Sierra Hydrographics monthly flow measurements to the flow measurements recorded from the existing Sontek IQ. Once the value of water losses was calculated it was then compared to the future loss to find an estimated water savings for the implementation of this project. Figure 3 shows the monthly data recorded in 2021, the percent error of the Sontek IQ, and the average losses in AF per month.

The total losses for 2021 from inaccurate flow measurement were approximately 12,355 AF. Then the approximate losses were calculated for 2021 if the percent accuracy of the flow measuring device was -2%. The accuracy of the proposed flume installation is +/- 2%. The approximate losses for a measurement device with -2% accuracy for the 2021 flow values was 1,790 AF/yr. The difference between the values is the approximate water savings for the proposed project from the more accurate flow measurement device. The approximate water savings from the new flow measuring flume is **10,565 AF/yr.**

Date Data Recorded	Sierra Hydrographics Measurement (CFS, Actual)	Sontek IQ (CFS)	Percent Error Sontek IQ	Differnce in Flowrate	Average Losses in AF per Mon
1/7/2021	47.2	36.51	-23%	10.69	644.96
2/4/2021	58.37	40.31	-31%	18.064	1089.86
4/13/2021	153.66	104.012	-32%	49.648	2995.41
5/24/2021	215.39	178.99	-17%	36.4	2196.12
6/21/2021	279.99	204.871	-27%	75.119	4532.15
7/26/2021	308.92	IQ not working			0.00
8/17/2021	282.67	278.87	-1%	3.8	229.27
9/28/2021	137.72	126.657	-8%	11.063	667.46
		Average Error	-20%		
		Total Losses for 2021	12355.23	AF	

Figure 3: Water Losses from Inaccurate Flow Measurement

The estimated average annual water savings from the canal lining was determined using the average typical flow and associated water depth in the Upper Farmington canal with data from two permanent flow measurement sites and an additional site that is checked monthly by a consultant. The typical flow rate of 300 CFS produced a water depth of 9’ in the canal. This depth as well as the typical canal cross section was used to determine wetted perimeter. The wetted perimeter was multiplied by the length of proposed lining to find surface area. A seepage rate of 7.48 gal/ft^2/day was used for the Amador Sandy Loam soil type at the site of lining. The seepage rate of the soil was then compared to the rate for shotcrete to obtain the volume of water saved. The values used for both calculations are shown in Figure 4 and Figure 5.

Canal Seepage Losses before Canal Lining

Soil Type	Sandy Loam	
Seepage rate based on Soil Type	7.48	gal/ft^2/day
Width	14	ft
Length	777	ft
Height	9	ft
SS	1.5	hz ft/vt ft
Days in Use	365	days
Wetted Perimeter	46.45	ft
Surface Area	36092	ft^2
Seepage Volume	302	ac-ft/yr

Figure 4: Calculations for Existing Canal Seepage

Canal Seepage Losses after Canal Lining

Soil Type	Shotcrete	
Seepage rate based on Soil Type	0.06	gal/ft^2/day
Width	14	ft
Length	777	ft
Height	9	ft
SS	1.5	hz ft/vt ft
Days in Use	365	days
Wetted Perimeter	46.45	ft
Surface Area	36092	ft^2
Seepage Volume	2	ac-ft/yr
Volume Saved	300	ac-ft/yr

Figure 5: Calculations for Future Canal Seepage after Shotcrete Lining

The total volume saved from lining the canal was solved for by subtracting the seepage volume unlined canal from the seepage volume lined canal. The estimated water savings from lining the start of the Upper Farmington Canal is **300 AF/yr**.

The total estimated water savings is the water savings from the canal lining plus the water savings from the new flow measurement. The total water savings is **10,865 AF/yr**.

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

1. ***Canal Lining/Piping:*** *Canal lining/piping projects can provide water savings when irrigation delivery systems experience significant losses due to canal seepage. Applicants proposing lining/piping projects should address:*

a. How has the estimated average annual water savings that will result from the project been determined? Please provide all relevant calculations, assumptions, and supporting data.

The estimated average annual water savings from the canal lining was determined using the average typical flow and associated water depth in the Upper Farmington canal with data from two permanent flow measurement sites and an additional site that is checked monthly by a consultant. The typical flow rate of 300 CFS produced a water depth of 9’ in the canal. This depth as well as the typical canal cross section was used to determine wetted perimeter. The wetted perimeter was multiplied by the length of proposed lining to find surface area. A seepage rate of 7.48 gal/ft^2/day was used for the Amador Sandy Loam soil type at the site of lining. The seepage rate of the soil was then compared to the rate for shotcrete to obtain the volume of water saved. In addition, there are two leaks along the proposed lining path whose leakage rate was not estimated due to a lack of testing. The effects are quite visible by the large amounts of vegetative growth downslope of the canal throughout the year which normally would not survive year-round.

b. How have average annual canal seepage losses been determined? Have ponding and/or inflow/outflow tests been conducted to determine seepage rates under varying conditions? If so, please provide detailed descriptions of testing methods and all results. If not, please provide an explanation of the method(s) used to calculate seepage losses. All estimates should be supported with multiple sets of data/measurements from representative sections of canals.

Ponding and inflow/outflow tests have not been conducted at this site. Estimates have been made from the soil type at the site of the project using seepage rates for representative soils and canals and have been calculated based on the canal cross section.

c. What are the expected post-project seepage/leakage losses and how were these estimates determined (e.g., can data specific to the type of material being used in the project be provided)?

The expected post-project seepage losses are estimated at 2 ac-ft/yr based on an estimated seepage rate through shotcrete lining of 0.06 gal/ft^2/day.

d. What are the anticipated annual transit loss reductions in terms of acre-feet per mile for the overall project and for each section of canal included in the project?

The anticipated annual transit loss reduction for the lining is 300 ac-ft/yr for the 777-foot section of canal lining which equates to 2038 ac-ft/yr/mile.

e. How will actual canal loss seepage reductions be verified?

Actual canal seepage loss reductions will be verified using the existing flow measurement and the flow measurement at the proposed Replogle flume. The reduction of seepage/leakage will also be visible from the lack of vegetative growth on the downslope of the canal in the locations of canal leakage along the lined section.

f. Include a detailed description of the materials being used.

The materials which will be used for the canal lining for this project will be reinforced concrete and shotcrete.

*2. **Municipal Metering:** Municipal metering projects can provide water savings when individual user meters are installed where none exist to allow for unit or tiered pricing and when existing individual user meters are replaced with advanced metering infrastructure (AMI) meters. To receive credit for water savings for a municipal metering project, an applicant must provide a detailed description of the method used to estimate savings, including references to documented savings from similar previously implemented projects. Applicants proposing municipal metering projects should address the following:*

This project does not include municipal metering.

*3. **Irrigation Flow Measurement:** Irrigation flow measurement improvements can provide water savings when improved measurement accuracy results in*

reduced spills and over-deliveries to irrigators. Applicants proposing municipal metering projects should address:

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

Annual average water savings were determined by comparing the flow rate measured monthly by a consultant to the flow rate measured at the same time by the existing flow measurement structure in the canal. Average errors of the existing flow measurement at the site was found to be -20% and consistently an underestimate of flow through the canal. This difference between the consultant measurement and the existing flow measurement was taken and added over the full year to determine the total amount of over-delivery to the districts system.

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

Operational losses are determined by the amount of spill from the districts system caused by consistent over delivery. The district spills in multiple sites out of the system from existing check structures.

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

Flows are currently measured at the site using a Sontek IQ upward facing acoustic meter. This device needs to be cleaned of sediment and debris and the accuracy is checked monthly versus measurements taken by a consultant at the site. The meter consistently over estimates the flow at the site with an average error of -20%.

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

The proposed flow measurement to be installed at the site is a Replogle flume. The flume is sized to measure flows up to 450 CFS. The head of the Replogle flume will be measured with a pressure transducer. The accuracy of this structure ranges from +/-1.91% to +/-2.22% at low flows. This accuracy is based off of the design criteria for the proposed flume. After construction as-built dimensions will be taken and a new rating equation will be generated providing a

high level of accuracy for flow measurement. The basis for the accuracy of this type of flow measurement structure is derived from hydraulic theory and empirical relationships created by laboratory testing of Replogle flume which creates the most accurate estimate of discharge possible.

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

No, the annual farm delivery volumes will remain the same.

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

Upon completion of the project the new flow measurements from the flume will be compared to the Shirley Gulch measurements at the end of the Upper Farmington Canal to verify water savings.

*4. **Turf Removal:** Applicants proposing turf removal projects should address:*

The proposed project does not include turf removal.

*5. **Smart Irrigation Controllers, Controllers with Rain Sensor Shutoff, Drip Irrigation, and High-Efficiency Nozzles:** Applicants proposing smart irrigation controllers, controllers with rain sensor shutoff, drip irrigation, or high-efficiency nozzle projects should address:*

The proposed project does not include smart irrigation controllers, controllers with rain sensor shutoff, drip irrigation nor high efficiency nozzles.

*6. **High-Efficiency Indoor Appliances and Fixtures:** Installing high- efficiency indoor appliances and fixtures can provide water savings for municipal water entities where there is significant potential for replacing existing non-efficient indoor appliances and fixtures. Applicants proposing high-efficiency indoor appliance and fixtures projects should address:*

The proposed project does not include high efficiency indoor appliances and fixtures.

*7. **Commercial Cooling Systems:** Cooling towers are components of many refrigeration systems with many applications. They dissipate heat to the atmosphere through the evaporative process and are common in manufacturing processes where cooling is required. They are also used for cooling large*

commercial buildings. Cooling tower structures vary in size, design, and efficiency. Regardless, all cooling towers consume large volumes of water and energy.

Open-circuit or direct contact are the most common types of cooling towers. Water is supplied to the tower after gathering heat and then released in the upper tower levels. A fan near the base of the tower creates upward airflow. Closed-circuit towers are more efficient and closed-circuit towers with adiabatic cooling are more efficient yet.

Water and energy savings can be achieved by replacing or retrofitting older low efficiency cooling towers. Applicants proposing cooling system projects should address:

The proposed project does not include commercial cooling systems.

Evaluation Criterion B—Renewable Energy

The proposed project does not include renewable energy. Evaluation Criterion B will be addressed as B.2 below.

B.2: Increasing Energy Efficiency in Water Management

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

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

The proposed Project does not have quantifiable energy savings.

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

Since, the new flume will have SCADA that reports back to mobile devices and the water treatment plant's SCADA system. Once the project is complete, the trips to read the flow measurement at the Canal inlet will significantly reduce. This is significant, because the inlet to the canal is approximately 37 miles from the District's main office. This is a 50-minute drive each way. This will greatly decrease the release of gas emissions. For every mile driven approximately 441 grams of CO2 are emitted to atmosphere from the exhaust pipe.

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

The project does not result in reduced pumping.

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

Not applicable.

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

No.

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

Yes. The Project reduces vehicle miles driven. It is 37 miles from the District's office to the Project site one way. During the times when the existing flow measurement is not working (approximately 3-4 times a year) the water supply operator has to go check water levels and the electricians have to drive out to try to fix the existing device. That is a minimum of 148 miles per day that the existing flow measurement device is not working. That means a minimum of 444 miles and a maximum of 1,776 miles would be saved per year with the implementation of the proposed project.

For every mile driven approximately 441 grams of CO2 are released in to the atmosphere. By implementing this Project, a minimum of 783,216 grams of CO2 are not being released in to the atmosphere.

Additionally, since the Sontek is unreliable Sierra Hydrographics must visit the site monthly to verify the accuracy of the flow measurement. With the existing flow measurement Sierra Hydraulics has been hired to read the flow monthly. Once the new flow measuring flume is constructed Sierra Hydraulics would at most be hired to visit the site once a year to verify the continued accuracy of the flume. This would save 11 additional driving trips to the site.

•Describe any renewable energy components that will result in minimal energy savings/production (e.g., installing small-scale solar as part of a SCADA system).

Because this is such a remote site, solar power will be utilized to operate the flow meter and electronic equipment for measurements to send to the SCADA system.

Evaluation Criterion C—Sustainability Benefits

Up to 20 points may be awarded under this criterion. This criterion prioritizes projects that address a specific water and/or energy sustainability concern(s), including enhancing drought resilience, addressing the current and future impacts of climate change, and resolving water related conflicts in the region. In addition, this criterion is focused on the benefits associated with the project, including benefits to tribes, ecosystem benefits, and other benefits to water and/or energy supply sustainability.

Enhancing drought resiliency.

In addition to the separate WaterSMART Environmental Water Resources Projects NOFO, this NOFO places a priority on projects that enhance drought resiliency, through this section and other sections above, consistent with the SECURE Water Act. Please provide information regarding how the project will enhance drought resilience by benefitting the water supply and ecosystem, including the following:

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

Yes, by minimizing greenhouse emissions through fewer miles driven to the site.

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

No.

- ***Will the project benefit species (e.g., federally threatened or endangered, a federally recognized candidate species, a state listed species, or a species of particular recreational, or economic importance)? Please describe the relationship of the species to the water supply, and whether the species is adversely affected by a Reclamation project or is subject to a recovery plan or conservation plan under the Endangered Species Act (ESA).***

No.

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

Not applicable.

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

Yes. The existing Sontek IQ flow meter had an average accuracy of -20% in 2021. Based on the data collected from Sierra Hydraulics a total of 12,355 AF of water was over delivered to the Upper Farmington Canal. The Replogle flume has an accuracy of +/- 2%. With the installation of the flume approximately 10,654 AF of water will be saved annually. The accurate flow measurement allows the water supply operators to more precisely request water. Since there is minimal error in the flow rate at the head of the distribution system precise deliveries to the ag users and the treatment plant can be planned.

Addressing a specific water and/or energy sustainability concern(s). Will the project address a specific sustainability concern?

Yes. The District has a contract with an allocated USBR allocating the District 75,000 AF of water from the New Melones Reservoir. This allocation is dependent on the total storage at the end of winter from the rainfall and snowmelt. During drought years the allocation is reduced or zero. During 2022 the District did not receive an allocation. This Project will save approximately 11,000 AF per year of water with the installation of the shotcrete lining and flume. This specifically improves water sustainability.

Please address the following:

•Explain and provide detail of the specific issue(s) in the area that is impacting water sustainability, such as shortages due to drought and/or climate change, increased demand, or reduced deliveries.

Climate change, drought, and the addition of more permanent crops are the major threats to water sustainability in Stanislaus and San Joaquin County. With climate change increasing the average temperature within the central valley drought has become a major issue year to year. With the current drought there is significantly less surface water available to farmers. The increased farming of permanent crops, such as almonds and walnuts, increase the demand for surface and ground water.

On a typical year the District receives an allocation of 75,000 AF of water from the New Melones Reservoir. Due to the severe drought the District did not receive an allocation from New Melones reservoir this year.

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

The site location is very remote. This makes it difficult to reduce fossil fuels and pollution unless reliable equipment is installed.

•Please describe how the project will directly address the concern(s) stated above. For example, if experiencing shortages due to drought or climate change, how will the project directly address and confront the shortages?

Keeping more accurate flow measurement saves water, reducing the impacts of a drought by allowing more water to be stored in the New Melones Reservoir. Based on the data from 2021 approximately 11,000 AF of water will be saved from lining the canal and installing the flume. This increases the water stored in the New Melones reservoir. Additionally, installing reliable equipment will minimize the pollution and greenhouse gas emissions associated with making frequent trips to this remote site.

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

The conserved water will be stored in the New Melones Reservoir and later used to address shortages that impact diversions and reduce agricultural deliveries in future drought years.

• Provide a description of the mechanism that will be used, if necessary, to put the conserved water to the intended use.

Not applicable.

•Indicate the quantity of conserved water that will be used for the intended purpose(s).

Approximately 11,000 AF of water will be saved annually and stored in the New Melones Reservoir as a result of this Project.

Other project benefits.

Please provide a detailed explanation of the Project benefits and their significance. These benefits may include, but are not limited to, the following:

- **Please provide specific details and examples on how the project will address the impacts of climate change and help combat the climate crisis.**

The Project will help combat the climate crisis. The Project reduces vehicle miles driven. It is 37 miles from the District's office to the Project site one way. During the times when the existing flow measurement is not working (approximately 3-4 times a year) the water supply operator has to go check water levels and the electricians have to drive out to try to fix the existing device. That is a minimum of 148 miles per day that the existing flow measurement device is not working. That means a minimum of 444 miles and a maximum of 1,776 miles would be saved per year with the implementation of the proposed Project.

For every mile driven approximately 441 grams of CO2 are released in to the atmosphere. By implementing this Project, a minimum of *783,216 grams of CO2* are NOT being released in to the atmosphere.

Additionally, since the Sontek is unreliable Sierra Hydrographics must visit the site monthly to verify the accuracy of the flow measurement. With the existing flow measurement Sierra Hydraulics has been hired to read the flow monthly. Once the new flow measuring flume is constructed Sierra Hydraulics would at most be hired to visit the site once a year to verify the continued accuracy of the flume. This would save 11 additional driving trips to the site.

- **Does this proposed project strengthen water supply sustainability to increase resilience to climate change?**

Yes, the proposed Project strengthens water supply sustainability to increase resilience to climate change. The annual saved water from the completion of this Project will allow more water to be stored in the New Melones reservoir. The saved water can be used in later years when there is minimal rain fall from drought.

- ***Will the proposed project establish and utilize a renewable energy source?***

Yes. This Project will utilize a solar panel to take flow measurements and report the flow data to the SCADA system.

- ***Will the project result in lower greenhouse gas emissions?***

. For every mile driven approximately 441 grams of CO2 are released in to the atmosphere. By implementing this Project, a minimum of *783,216 grams of CO2* are NOT being released in to the atmosphere, lowering greenhouse gas emissions.

(2) Disadvantaged or Underserved Communities:

a. Does the proposed project directly serve and/or benefit a disadvantaged or historically underserved community? Benefits can include, but are not limited to: public health and safety through water quality improvements, new water supplies, new renewable energy sources, or economic growth opportunities.

The water received from the New Melones Reservoir is eventually treated and sold as municipal water to the City of Stockton. This supplies municipal water to disadvantaged communities.

b. If the proposed project is providing benefits to a disadvantaged community, provide sufficient information to demonstrate that the community meets the disadvantaged community definition in Section 1015 of the Cooperative Watershed Act, which is defined as a community with an annual median household income that is less than100 percent of the statewide annual median household income for the State, or the applicable state criteria for determining disadvantaged status.

Figure 6 shows the disadvantaged community locations assessed by the California Office of Environmental Health Hazard Assessment. The District serves municipal water to the south side of Stockton. Figure 6 shows that the majority of Stockton is disadvantaged.

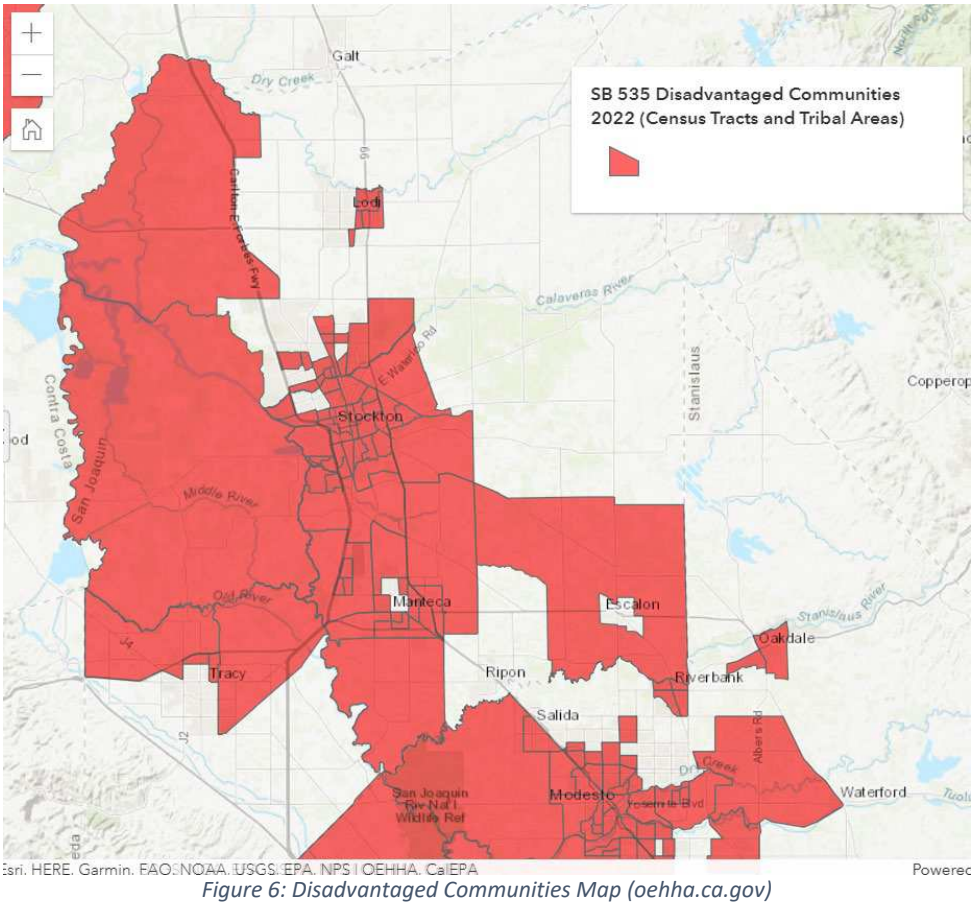


Figure 6: Disadvantaged Communities Map (oehha.ca.gov)

c. If the proposed project is providing benefits to an underserved community, provide sufficient information to demonstrate that the community meets the underserved definition in E.O. 13985, which includes populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life.

Not applicable.

(3) ***Tribal Benefits:***

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

No.

b. Does the proposed project directly support tribal resilience to climate change and drought impacts or provide other Tribal benefits such as improved public health and safety through water quality improvements, new water supplies, or economic growth opportunities?

No.

(4) Other Benefits: *Will the project address water and/or energy sustainability in other ways not described above? For example:*

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

No.

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

Yes, the project will benefit municipal and agricultural users.

c. Will the project benefit a larger initiative to address sustainability?

Yes, the project addresses water sustainability by saving water through accurate flow measurement.

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

Yes, the project will help prevent water related crisis and conflict by saving water. The saved water will be stored in the New Melones reservoir to be used in times of drought.

Evaluation Criterion D—Complementing On-Farm Irrigation Improvements

If the proposed project will complement an on-farm improvement eligible for NRCS assistance, please address the following:

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

The proposed Project will complement the on-farm project by maximizing efficiency throughout the Upper and Lower Farmington Canal distribution system. The proposed project allows for better water management by the district. More efficient and accurate water management allows the District to be more reliable and accurate in their deliveries to the on-farm users.

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

By having reliable surface water, the on-farm water can be managed based on a reliable source of surface water. If the surface water is unreliable then the on-farm irrigation has to utilize ground water wells. This can happen if the District doesn't manage the surface water efficiently and does not have enough water for the on-farm costumer.

- ***Estimate the potential on-farm water savings that could result in acre-feet per year. Include support or backup documentation for any calculations or assumptions.***

This cannot be properly estimated because it is a farm to farm evaluation.

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

  Figure 7 shows District boundaries.

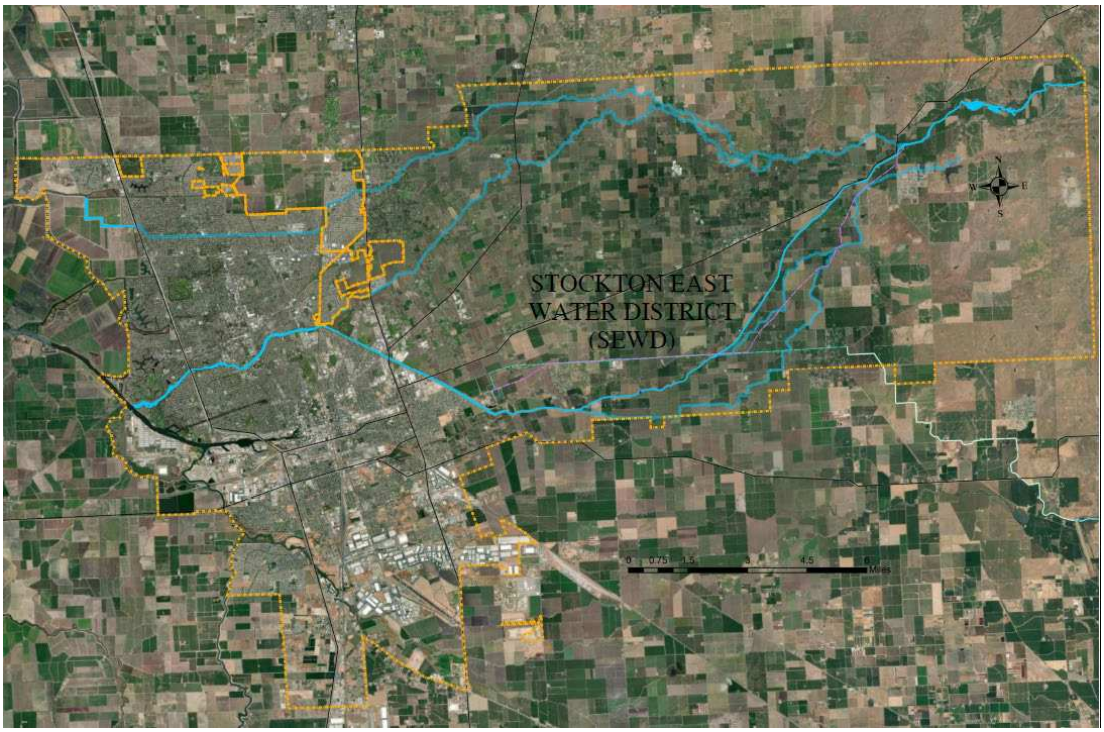


Figure 7: Stockton East Water District Boundary

Evaluation Criterion E—Planning and Implementation

Subcriterion E.1— Project Planning

Provide the following information regarding project planning:

(1) Identify any district-wide, or system-wide, planning that provides support for the proposed project. This could include a Water Conservation Plan, SOR, Drought Contingency Plan or other planning efforts done to determine the priority of this project in relation to other potential projects.

The District has an Urban Water Shortage Contingency Plan that outlines the severity of water shortages, response actions, and preventative measures. As a part of the water shortage response action, the District promotes education on conserving water. The proposed project is supported by the Urban Water Shortage Contingency Plan.

(2) Describe how the project conforms to and meets the goals of any applicable planning efforts and identify any aspect of the project that implements a feature of an existing water plan(s).

The project meets the goal of conserving surface water to use during water shortages. The Urban Water Shortage Plan promotes water conservation and improving the groundwater table. This project is projected to conserve 10,565 AF/yr.

(3) If applicable, provide a detailed description of how a project is addressing an adaptation strategy specifically identified in a completed WaterSMART Basin Study or Water Management Options Pilot (e.g., a strategy to mitigate the impacts of water shortages resulting from climate change, drought, increased demands, or other causes)

The project mitigates the impacts of water shortages resulting from climate change, drought, and increased demands. The project will result in approximately 10,565 AF/yr of water savings. The saved water will remain in the New Melones Reservoir and be stored for later use. This additional storage will mitigate the impacts of water shortages because there will be a larger amount of surface water available in storage.

Subcriterion E.2— Readiness to Proceed

•Identify and provide a summary description of the major tasks necessary to complete the project. Note: please do not repeat the more detailed technical project description provided in Section D.2.2.2. Application Content. This section should focus on a summary of the major tasks to be accomplished as part of the project.

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

Since the project is located in the District's manmade Upper Farmington Canal there are no permits that are required for commencement of this project.

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

All engineering design work was completed during fiscal year 21-22. The drawings are finalized for the start of construction. The final set of drawings can be found in the Attachments of this document.

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

The District Board of Directors approved a budget of $364,000 for this project for fiscal year 22-23.

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

There are no environmental or cultural compliance concerns associated with this project. Please see Figure 2 in the executive summary portion of this application for the project's schedule and milestones.

Evaluation Criterion F—Collaboration

Please describe how the project promotes and encourages collaboration. Consider the following:

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

Oakdale Irrigation District and South San Joaquin Irrigation District both have reclamation contracts for allocations from the New Melones Reservoir. Both districts are in support of this project because it helps all parties receiving water from the New Melones Reservoir. The project conserves water and keeps the storage volume in the New Melones reservoir high which is good for all districts.

•What is the significance of the collaboration/support?

The collaboration and support are important to maintain a positive environment where all water districts can work together to conserve water and continue to use the surface water stored in the New Melones Reservoir.

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

This project is a step in the right direction. The proposed flume is a large project, but is extremely reliable, so once complete it may encourage other districts to install a flume or a better flow measuring device.

Evaluation Criterion G— Additional Non-Federal Funding

State the percentage of non-Federal funding provided using the following calculation:

The percentage of non-Federal funding id 50%.

Evaluation Criterion H— Nexus to Reclamation

Describe the nexus between the proposed project and a Reclamation project or Reclamation activity. Please consider:

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

  Yes, the District receives Reclamation water from two contracts. All water delivered by the District is Reclamation water. All water saved by this project will be Reclamation water.

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

  Yes, the District receives Reclamation water from two contracts. All water delivered by the District is Reclamation water. All water saved by this project will be Reclamation water.

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

  The proposed project will save approximately 11,000 AF of reclamation water per year.

- ***Is the applicant a Tribe?***

  The applicant is not a Tribe.

Performance Measures

Provide a brief summary describing the performance measure that will be used to quantify actual benefits upon completion of the project (e.g., water saved or better managed, energy generated or

saved). For more information calculating performance measure, see Appendix A: Benefit Quantification and Performance Measure Guidance.

*All Water and Energy Efficiency Grants applicants are **required** to propose a "performance measure" (a method of quantifying the actual benefits of their project once it is completed). A provision will be included in all assistance agreements with Water and Energy Efficiency Grants recipients describing the performance measure and requiring the recipient to quantify the actual project benefits in their final report to Reclamation upon completion of the project. If information regarding project benefits is not available immediately upon completion of the project, the financial assistance agreement may be modified to remain open until such information is available and until a Final Report is submitted. Quantifying project benefits is an important means to determine the relative effectiveness of various water management efforts, as well as the overall effectiveness of Water and Energy Efficiency Grants.*

Note: program funding may be used to install necessary equipment to monitor progress. However, program funding may not be used to measure performance after project construction is complete (these costs are considered normal operation and maintenance costs and are the responsibility of the applicant).

Upon completion of the project specific performance measures will be implemented to show the actual volume of water savings and reduced gas emissions. For the first year after implementation of the project the District will have Sierra Hydraulics continue to take monthly measurements to validate the accuracy of the flume. Using the monthly data from Sierra Hydraulics calculations can be made to see how much water the District is losing due to inaccuracy of the flow measurement. This data can then be compared to previous years. The 2021 accuracy of the existing Sontek IQ flow measurement is approximately -20%. The project's Replogle flume is estimated to have an accuracy of +/-2%. The new accuracy of the project's flow measuring device will save approximately **10,865 AF/yr**. This volume of water savings will be confirmed by comparing the data from Sierra Hydraulics from 2021 to the new data after project completion.

In order to evaluate the reduced gas emissions, the number of visits to the project site after the completion of the project will be reported. This will allow the District to compare the number of times the site was visited to previous years and verify the quantifiable reduced CO2 emissions.

Project Budget

Budget Proposal

The total cost of the project is estimated to be $727,000 dollars, as shown in Table 1. The project funding sources are $363,500 from the District and $363,500 from Reclamation, as show in in Table 2. Please note that the grant reimbursable project costs are $727,000 of which Reclamation's share is $363,500 (50%) and the District's share is $363,000 (50%), as shown in

Table 3 Total Project Cost Summary. The funding source is shown in Table 2 Non-Federal and Federal Funding Sources Summary.

Table 1. Total Project Cost Summary

SOURCE	AMOUNT
Costs to be reimbursed with the requested Federal Funding	$363,500
Costs to be paid by the applicant	$363,500
Value of third-party contributions	$0
Total Project Cost	**$727,000**

Table 2. Non-Federal and Federal Funding Sources Summary

FUNDING SOURCES	AMOUNT
Non-Federal Entities	
1. Stockton East Water District	$363,500
Non-Federal Subtotal	$363,500
REQUESTED RECLAMATION FUNDING	**$363,500**

The project costs include project materials and equipment.

Budget Narrative

Salaries and Wages

No salary and wages are included in the project budget.

Fringe Benefits

No fringe benefits are included in the project budget.

Travel

No travel expenses are included in the project budget.

Equipment

Equipment Description	Amount
D6T CAB/AIR LGP DOZER	$12,200
325F CAB/AIR EXCAVATOR	$ 7,695
325F CAB/AIR THUMB EXCAVATOR	$ 78,100
140M CAB/AIR LASER READY MOTOR GRADER	$ 11,350
950 CAB/AIR WHEEL LOADER	$ 7,290
84" PAD DRUM ROLLER CP56 OROPS W/ BLADE	$ 5,850

84" SMOOTH DRUM ROLLER ROLLER CS54 OROPS	$ 5,715
ARTICULATED DUMP TRUCK 735	$ 14,550
WATER TRUCK	$ 5,000
Total	$ 147,750

Materials and Supplies

Materials Description	Amount
Wall Drains	$ 50,000
24" Waterman C-10 Slide Gate	$ 3,000
24" Bypass Pipeline 100 PSI PIP PVC	$ 33,900
Flume Stilling Well - 36" RCP Stand Pipe	$ 1,460
Catwalk W8x21 or W14x34 Main Beams, grating, and handrail	$ 9,710
Reinforced Pour in Place Concrete	$ 197,500
Shotcrete Lining	$ 115,404
Total	$ 410, 974

Contractual

There are no contracts involved in this project.

Third-Party In-Kind Contributions

No Third-Party In-Kind Contributions are included in the project budget.

Environmental and Regulatory Compliance Costs

There are no environmental and regulatory compliance costs for this project.

Indirect Costs

Indirect costs are not included in the project budget.

Funding Plan

The proposed project will be funded by the District's FY23-24 Budget. The budget for this fund for Fiscal Year 2023-2024 is $363,500. The District has enough funding in Fiscal Year 23-24 budget for the proposed project and will make the available funding as part of the cost-share contribution. There will be no in-kind contribution by other parties.

Official Resolution

The District's Board Members, Figure 4.

Resolution No. 15-16-07
A RESOLUTION OF THE BOARD OF DIRECTORS OF
STOCKTON EAST WATER DISTRICT

AUTHORIZATION TO FILE A GRANT APPLICATION WITH THE
DEPARTMENT OF INTERIOR UNITED STATES BUREAU OF RECLAMATION
FOR THE WATERSMART: Water and Energy Efficiency Grants (Funding No. R23AS00008) 2023
FOR FISCAL YEAR 2023, EXECUTE ANY REQUIRED DOCUMENTS AND PROVIDE
DELEGATION OF AUTHORITY

WHEREAS, the Board of Directors of the Stockton East Water District (District) desires to file a grant application with the Department of the Interior United States Bureau of Reclamation for the WaterSMART: Water and Energy Efficiency Projects (Funding No. RR23AS00008) for the FY 22-23, $364,000 budgeted Upper Farmington Flow Measuring Flume Project;

WHEREAS, the District will budget $727,000 for FY 23-24 for the Upper Farmington Flow Measuring Flume Project;

WHEREAS, the WaterSMART: Water and Energy Efficiency Project grant (Funding No. RR23AS00008) requires a 50% cost share, of which the District is obligated to pay $363,500 towards said project;

WHEREAS, the General Manager, Justin M. Hopkins of the District is hereby authorized and directed to prepare the necessary data, conduct investigations, file such application, and execute a grant agreement with Department of the Interior United States Bureau of Reclamation; and

WHEREAS, the General Manager, Justin M. Hopkins of the District and his designee of the District are hereby authorized and delegated to submit reports, request for cost reimbursement, and conduct day-to-day business with Department of the Interior United States Bureau of Reclamation;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Stockton East Water District that the grant application be made to the Department of the Interior United States Bureau of Reclamation to obtain a WaterSMART: Water and Energy Efficiency grant (Funding No. R23AS00008), and to enter into an agreement to receive the grant.

PASSED AND ADOPTED at a regular meeting by the Board of Directors of the Stockton East Water District on the 2nd day of August 2022 by the following vote of the members thereof:

AYES:
NAYES:
ABSENT:
ABSTAIN:

Andrew Watkins, President

ATTEST:

Justin M. Hopkins
Secretary of the Board

Figure 8: Resolution of the Board of Stockton East Water District