MADERA IRRIGATION DISTRICT

APPLICATION

FOR

U.S. BUREAU OF RECLAMATION

2016 WATER AND ENERGY EFFICIENCY GRANT

Funding Group I

JANUARY 20, 2016

IRRIGATION WATER CONSERVATION AND CANAL AUTOMATIONIMPROVEMENT PROJECT

EST. 1920

MADERA
IRRIGATION DISTRICT

MADERA IRRIGATION DISTRICT
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i) Executive Summary

The following is the pertinent information regarding the Applicant:

Date of Application:	January 15, 2016
Name of Applicant:	Madera Irrigation District
City/County:	Madera, Madera County
State:	California

Address and Contact Information:

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The proposed work to be accomplished with the combined resources of District and the WaterSMART Grant funding is to replace the numerous manual control gates within the Districts extensive canal system with an automated precise metered control gate operation along with remote sensing capability to provide system wide management and monitoring for flow control. The project goal is to achieve sustainable water savings, improved management of resources through conveyance improvements (compliance with Section III Eligible Projects - **Irrigation Flow Measurement** and **SCADA and Automation**) that will:

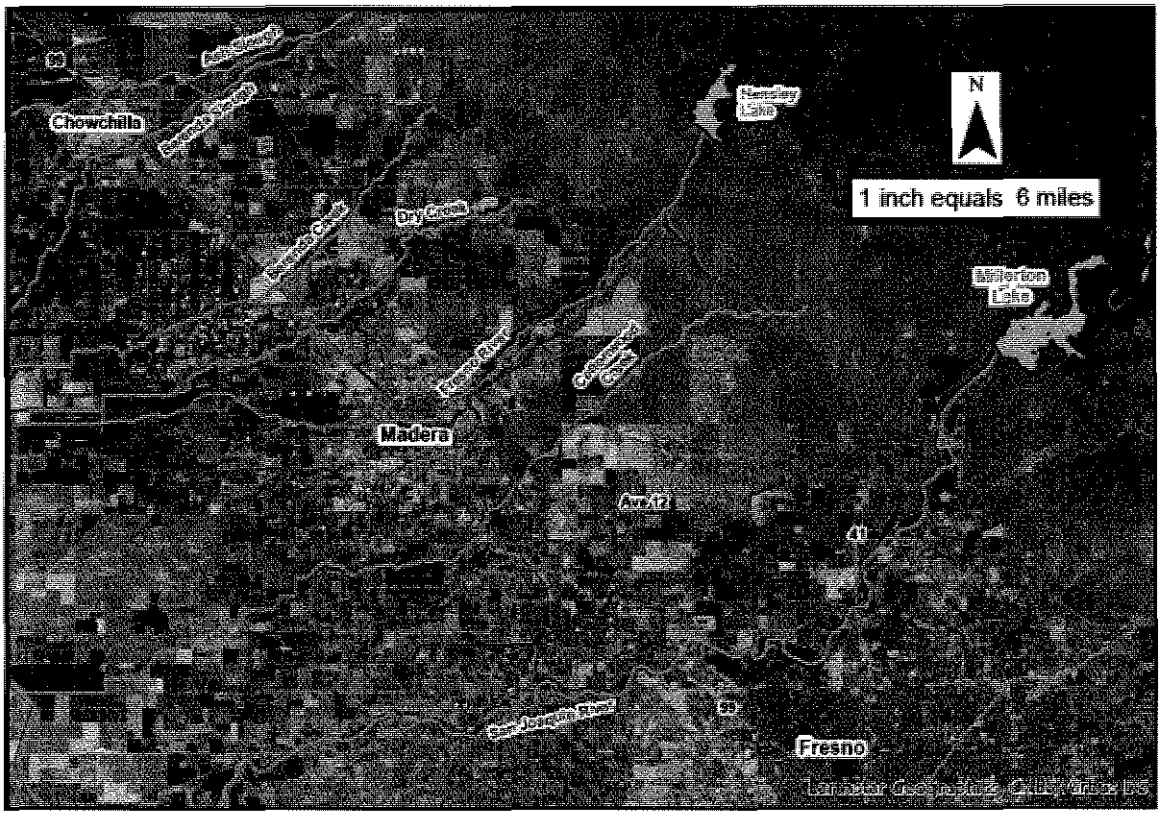
- Meter flows to maintain constant levels in each canal segment and reduce the need to release excess waters from reservoirs.
- Install automated gates to maintain constant volume canal levels and reduce losses through current manual surcharging of channel segments to compensate for high/low imbalance.
- Install Supervisory Control And Data Acquisition (SCADA) system to provide remote sensing of all gate/channel operations to eliminate losses from overflows, over-deliveries at turnouts and to provide early detection of breaching of canals.
- When excess waters are available, direct water savings to groundwater water bank and recharge facilities.
- Install solar power to operate gates and SCADA system (renewable energy) to eliminate extension of electrical service and demands on electrical system (carbon neutral installation).

Project will be complete in two years with an estimated completion date of September 2018. The project site locations on Reclamation facilities are designated by "Lateral", refer to priority list in Appendix B.

ii) Background Data

Map of District and Location of Proposed Improvements.

Vicinity Map: Madera Irrigation District, Madera County, Central California



A more detailed Project Location map is included in Appendix A.

Location - The map above shows the location of the District boundaries (shown in blue) in relation to its geographic location within the Central portion of the State of California. The District is located 18 miles north of the City of Fresno and is bisected by State Highway 99 and State Highway 145. The City of Madera is located within the District boundaries.

Formation - The Madera Irrigation District was formed in 1920 by popular vote of the people residing within the then proposed Madera Irrigation District and comprised 350,000 acres. The Madera Irrigation District operates under rules as set forth by the California Water Code. Under Section Code 20571, irrigation districts are given the right to assess land within their district boundaries. The District sells irrigation water for a fee above and beyond assessments levied on land within the District. Over the 90-year history of the District, portions where removed or transferred for the formation of other Districts and the District is currently 130,400 acres in size.

Distribution System - The District utilizes 315 miles of canals (225 miles of clay lined and 90 miles of unlined canals) to deliver water to agricultural users. In addition, the District also distributes irrigation waters through 118 miles of pipeline.

Source of Water - Water Supply Contracts – MID has three sources of water; the San Joaquin

River, the Fresno River, and pre-1914 rights to Big Creek and Soquel Creek. This water is then stored at either Millerton Lake (Friant Dam) or Hensley Lake (Hidden Dam). MID water is distributed via the Madera Canal and the Fresno River (below Hidden Dam).

From the Hidden Dam of Hensley Lake, the water flows into the district along the Fresno River to deliver other federal and non-federal water rights. The Bureau of Reclamation has recently agreed to store and convey up to 36,000 acre-feet of Madera Irrigation District (MID) non-federal water from 2010 through February 2015. The storage provides greater water management flexibility as compared to operating Hensley Lake for flood control alone which tends to make water available too early in the growing season.

The district calls water off the Madera Canal and Hidden Dam, USBR-owned facilities. On three locations of the Madera Canal, USBR sets the daily flows at the head gates of three conveyances: Lateral 6.2, Dry Creek, and Lateral 32.2. USBR controls the flow into the district from the Fresno River through its operations on the Hidden Dam of Hensley Lake. From the two laterals and two natural channels, the total seasonal surface water volume into the district is roughly broken up evenly in four paths or 25% per channel. Table 1 summarizes Madera Irrigation Districts' annual entitlements.

Table 1. The District receives water for its customers from several sources as follows:

	AF	Source	Contract #	Contract / Restriction	Expiration
USBR Agricultural Class I	85,000	Federal	175R2891-IRd	Firm as available	None
USBR Agricultural Class II	186,000	Federal	175R2891-IRd	As available subject to obligation	None
Hensley Lake	24,000+	Federal	14-06-200-4020-IRd	Fluctuating annual yield	None
Other Pre-1914	Varies	Prior historic rights		Fluctuation annual yield	None

Land Information

- Area - The District is 129,180 acres (of which 15,000 acres were annexed as a part of the Hidden Dam contract with the Bureau of Reclamation in 1975) and irrigated land totals 102,178 acres.

- Topography - gently sloping plain, ranging in elevation from about 370 to 470 feet above sea level along the eastern boundary to 180 to 200 feet along the western boundary.

- Depth to groundwater in the District is, in the extreme range, anywhere from 10 feet to 350 feet below the ground surface. Ninety percent of Bureau wells and private agricultural wells within the District fall within the depth range of 100 to 225 depending on geographic location. The historical trend of the Ground Water Table shows it is dropping 5 feet per year.

Water Use - Water use has ranged from a low of 21,250 acre feet in 1977 to a high of 173,979 in 2011. Unused District irrigation water is usually disposed of through discharge into the water bank lands, sold to other districts either in direct transfer or through indirect transfer from waters allocated to the District in the San Luis Reservoir or released into natural creeks and rivers. It should be noted that such sales or disposal are usually a direct result of storm waters or excess availability during periods of low demand for agricultural uses within the District. In addition, drought years yielding below average rainfall and mountain runoff to reservoirs yields reduce availability of water from federal contracts.

Crop Data - District waters are primarily used for crop irrigation purposes. The cropping pattern in the District has changed from row crops in 1968 to one of principally permanent crops at present. High water costs have been one of the factors contributing to the present cropping pattern.

Listed below are the District crops grown in 2014 :

Madera Irrigation District 2014 Crop Survey

Crop Type	Crop Name	Acres	Crop Type	Crop Name	Acres
Cereal	Oat	65	Fruit	Pomegranate	259
Cereal	Oat For/Fodder	537	Fruit	Prune	915
Cereal	Sorghum Milo	19	Fruit	Stone Fruit	3
Cereal	Wheat	427	Fruit	Tangerine	9
Cereal	Wheat For/Fodder	891	Fruit	Tangerine Seedless	1,131
Forage	Forage Hay/Silage	313	Fruit	Tomato	601
Forage	Rangeland	248	Fruit	Watermelon	26
Forage	Pastureland	287	Misc. Field Crop	Bean Dried	273
Fruit	Apple	76	Misc. Field Crop	Cotton	41
Fruit	Apricot	20	Nut	Almond	38,937
Fruit	Blueberry	64	Nut	Pecan	26
Fruit	Cherry	551	Nut	Pistachio	8,788
Fruit	Citrus	15	Nut	Walnut	1,136
Fruit	Fig	791	Other Crops	N-Outdoor Transplant	82
Fruit	Grape	4,278	Other Crops	Ot-Palm	88
Fruit	Grape, Raisin	18,897	Other Crops	Research Commodity	93
Fruit	Grape, Wine	17,662	Seed Crop	Alfalfa	839
Fruit	Kiwi	18	Seed Crop	Sudangrass	24
Fruit	Nectarine	149	Vegetable	Carrot	437
Fruit	Olive	298	Vegetable	Corn For/Fodder	1,038
Fruit	Orange	532	Vegetable	Corn, Human Consumption	10
Fruit	Orange, Tangelo	40	Vegetable	Garlic	69
Fruit	Peach	577	Vegetable	Onion	340
Fruit	Pear	44	Vegetable	Potato	18
Fruit	Persimmon	73	Vegetable	Vegetable (Various)	54
Fruit	Plum	71			
				TOTAL:	**102,178**

Irrigation System Types (estimated 2012)

- Drip / Microspray Irrigation – 75,822 acres (75.2%)
- Sprinkler - 137 acres (0.1%)
- Surface – 24,849 acres (24.6)

Past Working Relationship with the Bureau of Reclamation – The District has a long history of participation with Reclamation and works with the agency on many levels as follows:

- In 1951 the District entered into a contract for a loan from Reclamation for funding of the distribution system that served approximately ½ of the District lands.
- In 1959 the District entered into second contract for a loan from Reclamation for to construct the remainder of the distribution system. This financing of District improvements was recently paid off and the District is waiting for formal title transfer of the improvements from Reclamation.
- The District receives Class 1 and Class 2 Irrigation waters from Reclamation owned or administered water storage facilities.
- The District is working with Reclamation of Warren Act Contracts, Fresno River Riparian Plan and the Madera Ranch Water Bank.
- The District has received Field Service Grants from Reclamation for GIS and District Mapping including sensors and handheld equipment.
- Reclamation has also funded Meter Replacement grants in 2009, 2010, and 2011 including 2013 WaterSMART for SCADA Improvements.

iii) Technical Project Description

Refer to Project Location Map in Appendix A and Site Priority List in Appendix B. The proposed project will retrofit/replace the following:

- Replace the current manually operated canal gates at various canal heads with 13 new automated slip meters connected to the District's SCADA system.
- Replace the current manually operated sluice gate on Dry Creek weir with new automated flume gate connected to the District's SCADA system.

To accomplish the work, District staff will unbolt the 13 existing manually operated canal gates and install new precision motorized slip meter operated via a site specific solar panel power system to existing concrete headwalls and control structures. The solar system will also provide power to the SCADA and communication system that will allow remote monitoring, control and constant measurement to balance water flows throughout each canal segment to ensure accurate flows and delivery to meet grower needs.

Similarly, the proposed new flume gate in Reclamation's weir at Dry Creek (Abbey's Hole) will provide the same water savings, flow measurement, SCADA, and operational benefits as the slip meters. The District will greatly benefit from this automated flume gate because it will balance the fluctuating Dry Creek flows and store excess waters in Abbey's Hole, which is a large ponding area within the Creek channel above the weir and the existing Lateral 24.2 Head flume gate (installed under Reclamation's 2011 Field Services grant). The District's operations staff and engineers have determined that the flume gate installation can be accomplished "in place" within the existing concrete weir abutments being retained with only minor modification to the concrete

weir slab. This type of installation will save on the cost of complete reconstruction of concrete weirs and abutments.

By using 85 watt solar panels for powering equipment to operate the motorized gates and the SCADA control system, the District also avoids the expense and time of requiring Pacific Gas & Electric to extend poles and overhead transmission wires to provide electricity to the motorized gates and monitoring devices at each canal segment location.

iv) Evaluation Criteria

See Section V for a detailed description of each criterion and subcriterion and points associated with each.

IV.D.5 Performance Measures

See Section VIII.A for a detailed description.

IV.D.6 Environmental and Cultural Resources Compliance

(1) Will the 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.

Air Quality – Mitigation Measure - Installation of new automated gates and SCADA systems will require truck transport along canal access roads, potential access through adjacent farmlands access roads along with equipment to lift and place components and minor concrete work may require concrete trucks. Any equipment that will generate dust will be mitigated by water sprayed on access roads prior to and during truck movement to reduce dust generation and impacts to air quality.

Water Quality – No impact. Work will be completed during the non-irrigation season between when the District stops transporting water and prior to the rain season when significant storm waters are diverted into the canal system.

Animal Habitat – No impact. Construction activity is consistent with normal maintenance work and will be confined to existing access roads and turnouts at gate locations and therefore no impact is foreseen to any existing animal habitat. The majority of the access roads are also used by farm equipment for adjacent lands developed for agricultural uses.

(2) 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?

Yes, the project is within the Madera County region where there are a number of endangered species, such as the Blunt Nosed Leopard Lizard, Tiger Salamander, San Joaquin Kit Fox, Fresno Kangaroo Rat and the perimeter of the territory for the Swainson Hawk. However, lands adjacent to the project are in active agricultural use and therefore: i) not considered as habitat, ii) the retrofit project will not result in the disturbance of soils or breeding areas and is in line with normal maintenance operations performed throughout the year and will not introduce a new element of

activity not currently present. Since no wetlands are within the project area, it is not anticipated that the Blunt Nosed Leopard Lizard or Tiger Salamander would be present.

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

Yes. Dry Creek is listed as waters of the United States. The proposed automated flume gate on the Dry Creek weir at Abbey's Hole is Reclamation owned. The existing weir structure is reinforced concrete and has sheet metal panels with a single undershot sluicegate in the center bay (pictures are included in Appendix C). The impacts to the channel will be very minimal because the single sluicegate will be replaced with an automated flume gate. The concrete improvements necessary to support the proposed flume gate frame will be anchored to or cut into the existing concrete weir slab. There will be no other construction activity outside of the existing concrete weir slab. The flume gate will be placed into the frame by a crane operating from the top of the bank. No impacts to habitat are foreseen.

(4) When was the water delivery system constructed?

The canal system originates back in the late 1800s but the modern delivery system was constructed with Reclamation assistance in 1951 and 1955.

(5) Will the 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.

The project involves replacement of 14 manual monitoring stations with new motorized gate or meter systems. The 13 of the new installations can be retrofitted within existing gates and concrete abutments without any significant modification. One of the existing weir structures will require minor modification to accept the prefabricated gates and frames.

The project will replace existing monitoring stations constructed in the 1950's with minor modifications to the gates in the 1970's and 1980's. No modifications have been completed to the canal gate systems since the aforementioned time.

(6) 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.

A number of historical structures listed on the National Register of Historic Places with are present within the District Boundaries; however, all of these are within the Madera City limits and far removed from the location of the proposed project.

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

Although the project area is within the historical boundaries of the Mono Tribe, no known archaeological sites or features are present in the project area or adjacent vicinity.

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

No. Low income or minority populations will not be affected by this proposed project.

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

No. The proposed project will not limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands.

(10) Will the project contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area? Note, if mitigation is required to lessen environmental impacts, the applicant may, at Reclamation's discretion, be required to report on progress and completion of these commitments. Reclamation will coordinate with the applicant to establish reporting requirements and intervals accordingly.

No, the proposed project will not contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area.

IV.D.7 Required Permits or Approvals

Applicants must state in the application whether any permits or approvals are required and explain the plan for obtaining such permits or approvals. To complete a renewable energy project within the time frame required of this FOA, it is recommended that an applicant has commenced the necessary permitting process prior to applying.

The project is in the process of transfer of ownership from Reclamation to the District after completion of debt repayment for improvements made within the District with funding provided by Reclamation. It is possible since this transaction has not been completed that the District may be required to procure MP-620 permits.

The proposed project will not require any permits or approvals from any other regulatory agencies have jurisdiction within the District or project area boundaries. This is a retrofit project within existing weirs and concrete abutments to replace manual check gates with precise measurement automated gates and control systems.

IV.D.8 Official Resolution

Include an official resolution adopted by the applicant's board of directors or governing body, or for state government entities, an official authorized to commit the applicant to the financial and legal obligations associated with receipt of WaterSMART Grant financial assistance, verifying:

Attached is the official resolution by the Board of Directors of the Madera Irrigation District complying with the funding announcement requirements.

IV.D.9 Project Budget

The project budget includes: (1) Funding Plan and Letters of Commitment, Budget Proposal, (3) Budget Narrative and (4) Budget Form.

i) Funding Plan and Letters of Commitment

Describe how the non-Reclamation share of project costs will be obtained. Reclamation will use this information in making a determination of financial capability.

The proposed project non-Reclamation cost share shall be funded by Madera Irrigation District capital project (cash) reserves. No third party funding agency or other source is intended to be used for this project.

It is anticipated that this project will require two Fiscal calendar years to complete and the District will allocate appropriations within its annual budget for 50% of the cost of its share per Fiscal calendar year.

Project funding provided by a source other than the applicant shall be supported with letters of commitment from these additional sources. This is a ***mandatory requirement****. Letters of commitment shall identify the following elements:*

There are no other funding sources.

The funding plan must include all project costs, as follows:

(1) How you will make your contribution to the cost share requirement, such as monetary and/or in-kind contributions and source funds contributed by the applicant (e.g., reserve account, tax revenue, and/or assessments).

The District contribution shall be accounted for using in kind costs for District's share of salaries and wages and monetary for District's share of equipment purchases, training costs and grant management expenses. The source of the District's funds is from designated capital project reserves.

(2) Describe any in-kind costs incurred before the anticipated project start date that you seek to include as project costs. Include:

There are **no** prior costs to be included as "in-kind" for which the District would seek reimbursement before the anticipated project start date.

(3) Provide the identity and amount of funding to be provided by funding partners, as well as the required letters of commitment.

These are no participating outside funding sources beyond the District's match commitment.

(4) Describe any funding requested or received from other Federal partners. Note: other sources of Federal funding may not be counted towards your 50 percent cost share unless otherwise allowed by statute.

V.A.1 Evaluation Criterion A: Water Conservation

Subcriterion No. A.1: Quantifiable Water Savings

> ***Describe the amount of water saved.*** *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 provide sufficient detail supporting how the estimate was determined, including all supporting calculations. 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 (please note, the following is* ***not*** *an exclusive list of eligible project types. If your proposed project does not align with any of the projects listed below, please be sure to provide support for the estimated project benefits, including all supporting calculations and assumptions made).*

In January 2011, Rubicon Water prepared a Total Channel Control (TCC) Assessment Report to determine losses, water balance and corrective measures to capture same.

It is estimated that the District's water losses are approximately 59,000 to 63,000 acre feet in above average rainfall seasons and 6,000 to 12,000 acre feet in below average rainfall seasons. These losses are attributed to: i) imbalances in channel flows, ii) unanticipated high flows from storm waters that are channeled or piped into the system from the City of Madera requiring "dumping" of excess into the Madera Ranch Water Bank lands (partially completed at this time) or through overflows into creeks and rivers, iii) canal seepage, and iv) unforeseen canal breaching caused by ground squirrels burrowing into embankments. In situations where water is lost during irrigation season, it may require upstream releases to compensate for lost volumes from stored allocations behind federal dams. This then, especially in a drier than normal rainfall season and Federal allocations are reduced, releases limited resources earlier than intended by the District.

The report states that:

- Based on the information available for the water balance, it appears that during above average rainfall years, through implementation of TCC, it is estimated that about 14,700 to 30,000 acre feet of this could be conserved.

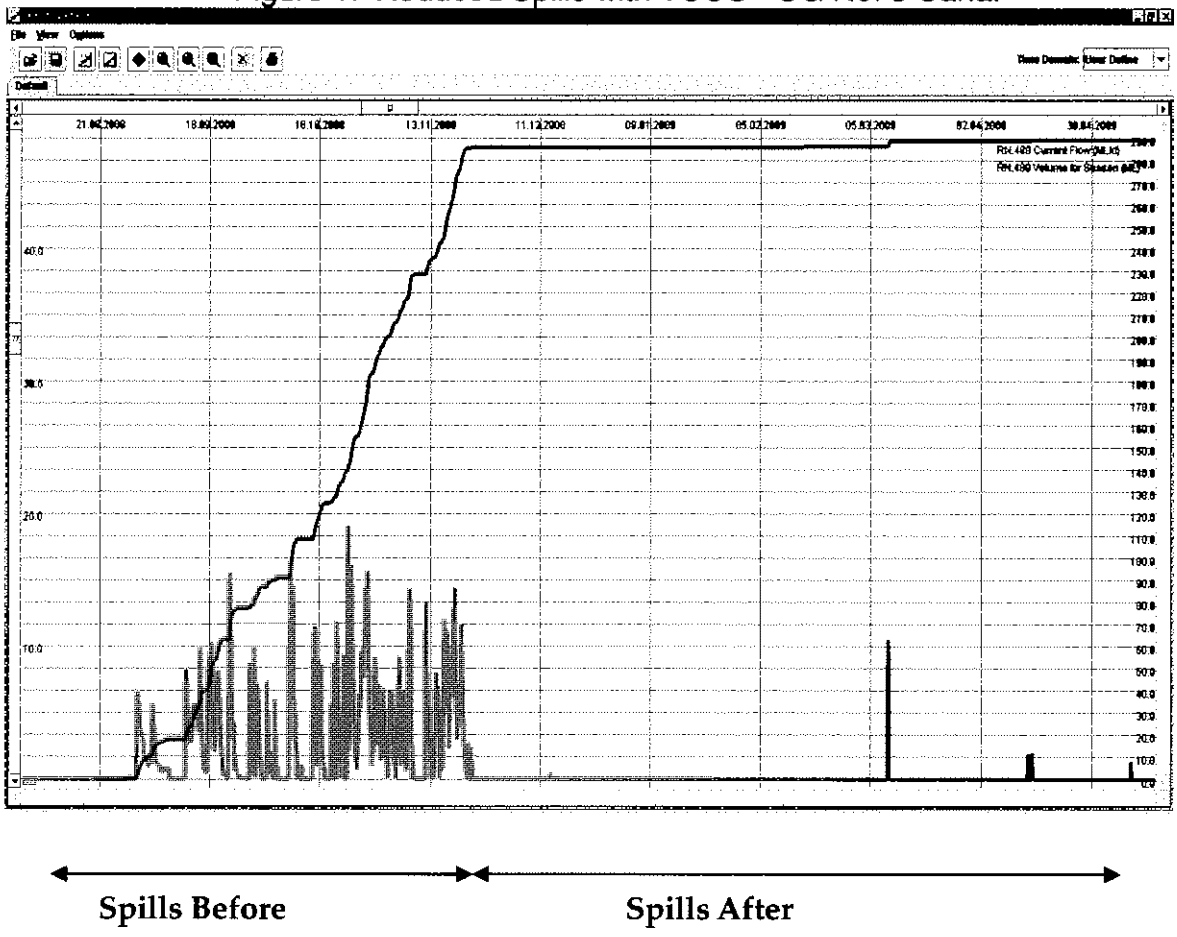
- Below average rainfall year savings would be proportionate in that 1,440 to 2,880 acre feet of irrigation waters could be conserved.

The installation of a precise slip meters and flume gate metered flow system will allow the District to maintain constant water levels in each channel segments using an acoustic level monitoring system at each channel head gate. The combination of automated meters/gates, flow monitoring and centralized reporting system (SCADA) will allow the District to implement a network management system that provides management of flow control, demand management (faster response to meet grower demands in multiple channel segments), customer order management (from multiple days to a day and in some instances, down to hours), distribution efficiency and system wide operational controls that are lacking at this time due to the required individual manual gate operations that impact accuracy of water deliveries.

As an example of achievable savings:

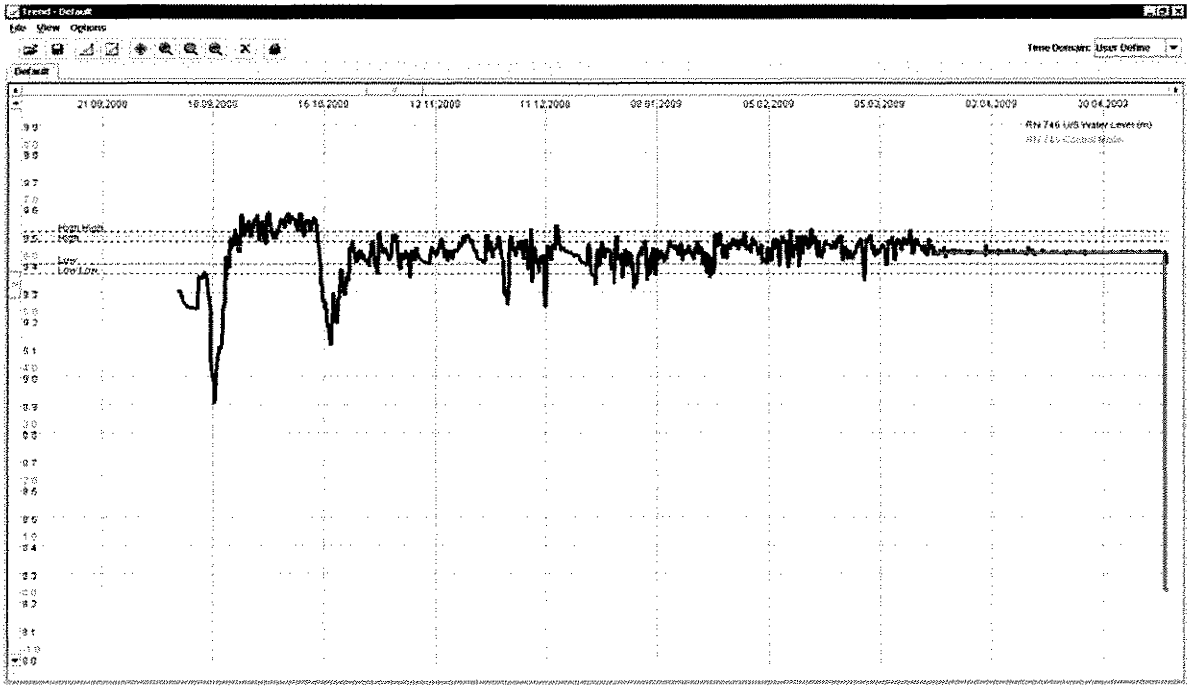
System generated data (fig 1) shows just how well demand is matched to capacity in a canal operating under Total Channel Control. The graph is a screenshot of management information data showing a typical canal spill. Instantaneous and cumulative spill volumes from the CG No. 5 canal - 100 cfs off-take capacity and 11.2 miles in length are shown for the 2008-2009 irrigation season. The canal was modernized in July 2008 with FlumeGates™ and operated manually until mid- November 2008, when full TCC was initiated. Cumulative outfalls up until TCC implementation were 230 AF (286ML). Spills for the remainder of the 2008-2009 season (to end April 2009) under TCC were just 2.4 AF (3ML).

Figure 1. Reduced Spills with TCC® - CG No. 5 Canal



In addition, automation within the canal system minimizes fluctuating supply levels caused by manual operation of the gates. The ability to remotely monitor motorized gates and match supply to demand equalizes water levels. In Figure 2 below, the graph shows the upstream water levels in the manual vs. automated mode.

Figure 2. Canal Levels Stabilization



Water Level – Manual Operations **After Automation**

- *What is the applicant's average annual acre-feet of water supply?*

The District's annual water is approximately 122,500 acre feet.

- *Where is the water that will be conserved currently going (e.g., back to the stream, spilled at the end of the ditch, seeping into the ground, etc.)?*

Since the District does not have the ability to pump and recirculate surplus waters back to the headworks or to the reservoir and keep these waters "in system". Waters not consumed for irrigation purposes are lost to the following:

- Lost through seepage in either in unlined canals or clay lined canals whose clay barrier has been breached or through leakage (point source).
- Channeled through the canal system and, i) flow through to the Madera Ranch Water Bank lands; ii) are diverted to natural channels, or iii) captured and sold to neighboring irrigation districts.
- Lost through unauthorized use or theft via bypassed or altered meters at turnouts.
- Lost to system filling at the beginning of the irrigation season.
- Lost to evaporation.
- Meter error.

- Lost through spills.

- *Where will the conserved water go?*

Depending on the time of year and related factors (IE: storm water runoff waters), conserved waters will be: i) better utilized within the District; ii) channeled to the water bank lands, or iii) remain behind the dam at the Hidden or Friant Dams until needed.

(1) 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 the following:*

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

The current management system using manually operated gates and scattered monitoring sites of various types is labor intensive and provides questionable and inaccurate data. The ability to implement a system wide management plan using remote sensing will result in achievable savings as shown in Figures 1 and 2 on the previous pages. These examples show the current installation of a flume gate and the performance characteristics demonstrated from the before and after conditions and calculation of the savings achieved which can be applied across the entire system.

As noted in the TCC report:

"Monitoring of the old manual systems relies on a large field staff presence for visual inspections and manual non-continuous monitoring. Delays in the collection, transmission and analysis of data result in delayed decision making when responding to changing circumstances."

"By contrast, automation provides the opportunity to monitor remotely in real time, collect appropriate amounts of data. In addition, automatic alarming allows operators to respond to irregular or emergency operational problems that require immediate attention or intervention. A modern district can establish a central 24 hour a day water operations and monitoring center to ensure proper management, including timely action on problems to minimize service disruption. The wealth of performance data generated is used to monitor and routinely fine- tune canal operating parameters to improve system performance."

Also as noted in the next section, current measurement of system performance is based upon a "best estimate" scenario as measurement current device accuracy is questionable.

(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

Yes. Over years of data in the District's USBR Water Management Plans, system seepage represents 33% and evaporation represents 1% of inflows. The volume of spills varies each year between canal segments for the following reasons: 1) channel flows, 2) ditch tender

practices, 3) active growers receiving water, 4) seasonal timing constraints, 5) climate change, and 6) geographical limitations. During the recent drought years, there has been 0 AF allocation and 0 AF spill. However, in very wet past years, the District spills exceeded 15,000 AF. The spills within the project channels represent approximately 30% of the District's spills, or 3,800 AF in an average year. The proposed slip meters and flume gate will reduce spills by as much 95% by delivering exact volumes of water and eliminating flow imbalances within the system, which yields 3,610 AF.

(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 72 stations throughout the District using the following methods:

Type of Measurement Device	***Interval Frequency***	***Accuracy***
Rubicon FlumeGate	15 mins, Continuous	±2%
Rubicon FlumeMeter	15 mins, Continuous	±2%
Rubicon SlipMeter	15 mins, Continuous	±2%
Parshall Flume	Single	±3-5% (free flow)
Radial Gate	Single	±10%
Recorder	Continuous	±5-10%
Staff Gauge	Single	water depth only
Weir & Stick Measurement	Single	±10%
Weir & Staff Gauge	Single	±10%
Weir, Recorder, & Staff Gauge	Continuous	±10%
Sensor	15 mins, Continuous	±5%
Macemeter	5 mins, Continuous	±5%
Propeller Meter	Single	±10%
In-line Meter	Single	±10%

Accurate calculations are not possible as several canal and check gate systems have only staff gauges and channel level floats. Predominantly, canal segment flows are mostly estimates only with relative changes made after the system is primed. Site gauges provide depth of water measurement only. Where measurement is possible on the headwater side of a gate, the downstream segment may only have a staff gauge or stick measurement therefore losses between measurement points is not possible. Therefore, there is no "real time" ability to monitor flows.

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

The automated gated system calculates flow using measurements of upstream water levels, downstream water levels, and gate position and must have an accuracy of +/- 2%. The use of stilling wells for the acoustic sensors creates a constant controlled environment unaffected by debris, surrounding objects, foam or silts or other contaminants. The sensors are self-calibrating on each reading to eliminate drift in speed of sound variations.

The gate positioning is controlled by a wire rope and drum mechanism that provide precise gate position accuracy in both raising and lowering operations to within +/-0.02 inches. The modular gate system is factory checked before installation and field checked after installation.

The installation will be a combination of 13 slip meters and 1 flume gate with an accuracy of +/-2% with continuous measurement over 15 minute intervals.

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

Yes. Though this grant will not be replacing the meters to individual farm delivery turnouts, the system wide water usage trends over time should show more efficient deliveries and that water is being better managed because the proposed automated gates and meters on the main channels will maintain a constant water surface and provide a steady head to each farm delivery turnout. Steady head pressure at each farm gate benefits both the District and the growers. The District benefits because the meters at each turnout will be operating when the pipe is flowing full, which yields the most accurate measurements. The growers benefit because their pumps can operate at a constant speed without fluctuations. When the canal levels are in a constant state of fluctuation due to the changing flows of the creek and river, the grower pumps can draw more water than they need, or run short of water which can cause pump cavitation, internal damage, and additional energy consumption.

During times when the canal levels drop, the length of the grower delivery increases and causes scheduling delays to the next grower in line. In addition, District staff react to low levels in the canal by increasing pump rates on the water supply to meet the grower's needs, which can lead to oversupply and spills as the supply wave passes through the system. The proposed project will eliminate the current system of increasing flows from the pumps and basin to achieve downstream deliveries to multiple growers by visually measuring and constantly monitoring each canal segment and making delayed (due to travel time by the ditch tender) manual gate adjustments to maintain flow rates through the entire system. On an automated and remote metered system, less water is required to flow through the system and the grower gets exactly what he needs, when he needs it.

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

Given that the District can only accurately measure headwaters into the system and tail waters exiting the system, with a few scattered flow meters, accurate historical data is variable and imprecise. The new measurement system will compile a historic database that, over time, will provide annual use and user (grower) information to show flows and grower deliveries both in each individual canal segment and system-wide.

The level of accuracy attained by a system wide management program, individual canal segment volumes and flows, and both instantaneous and historical data for same will provide the District with an accurate performance tool. Limited measurement stations that require manual data downloads, channel site gauges and level sensors that is at best guesswork based solely on limited water measurements, and estimates from gate tenders and their logs. Before the 2013 WaterSMART grant when 20 automated meters and gates were installed, there were only 52 monitoring stations using everything from a few Mace meters to channel staff gauges in the more than 315 miles of canal.

Once the system is operational and water balance is achieved through the automated gate and measurement system and subsequent grower demand controls are in place, the measurement of flows will be compared to water release rates at the headwaters from the reservoir in the before and after condition to determine actual savings.

Water will be measured accurately through each gate for both free over-fall and submerged flow conditions integrated into the design of each gate. The high level of measurement accuracy at each structure, leakage, seepage and theft losses can be identified, pinpointing these losses to individual canal pools.

(2) SCADA and Automation: *SCADA and Automation components can provide water savings when irrigation delivery system operational efficiency is improved to reduce spills, over-deliveries, and seepage. Applicants proposing municipal metering projects should address the following:*

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

See (1) (a) above.

(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.

See (1) (b) above.

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

See (1) (e) above.

(d) Will canal seepage be reduced through improved system management? If so, what is the estimated amount and how was it calculated?

Somewhat as the ability to measure flows between check gate structures will allow the District to monitor volumes which will provide a level of accuracy to determine losses from cracks in the clay lined canals. Deviations of measured flows into and out of each segment allows for more precise calculation of losses from leakage. However, older clay lined or unlined canal segments will experience some measure of seepage and in a positive sense, this contributes to groundwater recharge and since there is not a system wide canal segment measurement system in place at each check gate, determining actual loss is not possible.

(e) How will actual water savings be verified upon completion of the project?

See (1) (f) above.

***(3) Groundwater Recharge**: Groundwater recharge can provide savings when surface water storage evaporation is reduced and/or surface runoff is intercepted for recharge. Applicants proposing groundwater recharge projects should address the following:*

No groundwater recharge facility is proposed beyond the current diversion to the Madera Ranch Water Bank lands and a few small ground water recharge basins. However, better management of water resources will allow the District to divert surplus waters to the Water bank which is located in a low area within the District identified as water deficient.

Subcriterion No. A.2: Percentage of Total Supply

*Up to **4 additional points** may be allocated based on the percentage of the applicant's total average water supply (i.e., including all facilities managed by the applicant) that will be conserved directly as a result of the project.*

***Provide the percentage of total water supply conserved:** State the applicant's total average annual water supply in acre-feet. Please use the following formula:*

$$\frac{\text{Estimated Amount of Water Conserved}}{\text{Average Annual Water Supply}}$$

Based on the information available for the water balance, it is estimated that through the implementation of the proposed 14 meters/gate connected to SCADA, more than 3,610 AF could be conserved.

The following assumptions are based on the low end of savings with the provision that some breaching of canal banks will occur resulting in spills that will be significantly reduced using the automated system, but still in reality cannot be avoided.

$$\frac{\text{Estimated Amount of Water Better Managed}}{\text{Average Annual Water Supply}} = \frac{3{,}610 \text{ AF}}{122{,}500 \text{ AF}} = 3\%$$

V.A.2 Evaluation Criterion B: Energy-Water Nexus

*Up to **16 points** may be awarded based on the extent to which the project increases the use of renewable energy or otherwise results in increased energy efficiency.*

Subcriterion No. B.2: Increasing Energy Efficiency in Water Management

*If the project is not implementing a renewable energy component, as described in Subcriterion No. B.1 above, up to **4 points** may be awarded for projects that address energy demands by retrofitting equipment to increase energy efficiency and/or through water conservation improvements that result in reduced pumping or diversions.*

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

- *Please provide sufficient detail supporting the calculation of any energy savings expected to result from water conservation improvements. If quantifiable energy savings are expected to result from water conservation improvements, please provide sufficient details and supporting calculations. If quantifying energy savings, please state the estimated amount in kilowatt hours per year.*

Better water management will lead to surpluses stored at the reservoir and therefore, an extended irrigation season or resulting in less demand by agricultural operations to use private wells to pump ground water. This would be especially true during water shortage years resulting in lower Federal water allocations to the District.

The number, size and power consumption of private wells within the District on lands supplied with District waters is not known. However, as an example, the water needs to irrigate the 75,000 acres within the District that are irrigated by drip and spray/micro-spray irrigation systems would be considerable and any extension of water deliveries derived from a better managed delivery system would be a substantial savings in utility costs to each grower who must pump water after the irrigation deliveries are terminated for the season. This project will install 85W solar panels on 13 automated slip meters and 1 automated flume gate:

14 solar panels x 0.085kW x 6 sun hours/day x 265 Madera sun days/year = 1,892 kWh/yr

- *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?*

The exact number and size of pumps on private property used by the growers within the District is not known at this time. When surface water deliveries are terminated by the District, growers pump an average additional 215,000 acre feet of well water. The estimated savings in acre feet of conserved water from this project would result in a potential reduction of 5% up to 15% in annual pumping volume depending on whether it is an above average or below average rainfall season.

- *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.*

The energy savings originate from the various private wells within the District. The combination of solar powered automated check gates, flow monitoring and reporting system (SCADA) will allow the District to implement a network management system that provides management of flow control, distribution efficiency and operational controls.

Site specific solar power generation to supply the demand for gate operations and monitor/metering equipment will eliminate the need for extension of utility grid power sources which in some cases are not in the immediate vicinity of the improvements.

- *Does the calculation include the energy required to treat the water?*

N/A

- *Will the project result in reduced vehicle miles driven, in turn reducing carbon emissions? Please provide supporting details and calculations.*

The installation of a remotely managed system results in the reduced employee trips to monitor, manually open and close gates. Currently, ditch tenders must make from 3-4 trips per day to perform these operations and with the new system travel will be reduced to one trip per day for observation and maintenance work. On average, 3 fewer trips per day would result in approximately 50 miles per day, multiplied by a 180 day season and 5 ditch tender vehicles results in 45,000 vehicle miles saved per year.

V.A.3 Evaluation Criterion C: Benefits to Endangered Species

*Up to **12 points** may be awarded for projects that will benefit federally- recognized candidate species or up to **12 points** may be awarded for projects expected to accelerate the recovery of threatened or endangered species, or addressing designated critical habitat. Note: proposals for water efficiency projects that simply state that a species in the basin will benefit from water savings (i.e., without a commitment to dedicate water savings for instream flows) shall receive minimal consideration under this criterion.*

N/A. This is a retrofit project and no benefit can be attributed to an endangered species.

V.A.4 Evaluation Criterion D: Water Marketing

*Up to **12 points** may be awarded for projects that propose developing a new water market. Note: Water marketing does **not** include an entity selling conserved water to an existing customer. This criterion is intended for the situation where an entity that is conserving water uses water marketing to make the conserved water available to meet other existing water supply needs or uses outside of the entity's geographic service area.*

***Briefly describe any water marketing elements included in the proposed project.** Include the following elements:*

- *Estimated amount of water to be marketed*

Based upon the type of season experienced by the District, either an above average rainfall or below average rainfall season will determine how much water the District has to market. Given that the high range of 30,000 acre feet to low range of 1,440 acre feet of projected surplus allows the District to make decisions as to how to best use its reserves.

A high range season allows the District to place waters in the Madera Ranch Water Bank, sell waters to other irrigation districts and to supply smaller agricultural operations referred to as "subordinate growers" within the current District boundaries that are not holders of immediate rights to water deliveries and are classified as secondary water users.

It is assumed that in low annual rainfall event years, any savings would be best served to extend service to existing primary agricultural operations and prolong the irrigation season as much as possible to reduce the need by individual farms to pump their own irrigation water.

The water marketing therefore depends on the weather as much as how many acre feet can be conserved by this proposed project.

Over the past 15 years, the District has transferred out an average of 9,400 AF per year.

- *A detailed description of the mechanism through which water will be marketed (e.g., individual sale, contribution to an existing market, the creation of a new water market, or construction of a recharge facility)*

The mechanism for marketing of District waters is through:

  - Existing agreements Districts based on acre feet of water delivered / received (contribution to an existing market) with adjacent or regional districts such as:

    Gravelly Ford Water District
    Chowchilla Water District
    Lower Tule River Irrigation District
    North Kern Water Storage District
    Tulare irrigation District
    Westlands Water District
    Wheeler Ridge – Maricopa Water Storage District

  - Metered flow to Subordinate Growers (secondary users not entitled to District water – individual sale).
  - Diversion to the Madera Ranch Water bank (for future pumped withdrawal and sale)

- *Number of users, types of water use, etc. in the water market*

The number of users varies and is dependent on availability of a surplus (weather dependent). 10% of the waters marketed or reserved for future sale from the Water Bank are agricultural users.

- *A description of any legal issues pertaining to water marketing (e.g., restrictions under Reclamation law or contracts, individual project authorities, or State water laws)*

The marketing of surplus waters must take into account any existing agreements for purchase of same, commitments to deposit waters in the Water Bank and potentially any changes to the San Joaquin River restoration agreements that in the future may alter delivery allocations.

- *Estimated duration of the water market*

April through October with some flows during the rainy season between November through March.

V.A.5 Evaluation Criterion E: Other Contributions to Water Supply Sustainability

*Up to **14 points** may be awarded for projects expected to contribute to a more sustainable water supply. This criterion is intended to provide an opportunity for the applicant to explain 1) how the project relates to a completed **WaterSMART Basin Study**; 2) how the project could expedite future **on-farm improvements**; and/or 3) how the project will provide **other benefits to water supply sustainability** within the basin. An applicant may receive the **maximum 14 points** under this criterion based on discussion of one or more of these subcriteria.*

Subcriterion E.1: Addressing Adaptation Strategies in a WaterSMART Basin Study

*Up to **14 points** may be awarded for projects that address an adaptation strategy identified **in a completed WaterSMART Basin Study.***

- *Identify the specific WaterSMART Basin Study where this adaptation strategy was developed. Describe in detail the adaptation strategy that will be implemented through this WaterSMART Grant project and how the proposed WaterSMART Grant project would help implement the adaptation strategy.*

Although not tied to Reclamation funded WaterSMART Basin Study, the District is implementing a water storage program as a participant with a consortium of members in the Madera Ranch Water Bank project. A recently completed Rapid Appraisal Process by California Polytechnic State University in San Luis Obispo, California illustrates the need for this type of action within the San Joaquin /Fresno River Water Basin.

The adaptation strategy is to provide available surface waters in the Madera Groundwater basin for use in recharging unconfined aquifers. The Madera Ranch project located at a natural low point / depression within the basin is ideal for this purpose. Agricultural operations that have a history of over pumping for agricultural uses are drawing groundwater into the depression from the west which has salinity content not conducive for irrigation waters. In addition, this overuse of the aquifer has caused degradation of groundwater levels throughout the Madera and Chowchilla Subbasins in Madera County.

The full RAP report is available for review at the Madera Irrigation District website: http://www.madera-id.org/index.php/services/engineering-department

- *Describe how the adaptation strategy and proposed WaterSMART Grant project will address the imbalance between water supply and demand identified by the Basin Study.*

The one issue that will contribute to the success of the Water Bank project is the ability of the District to generate surplus flows during both above average and below average rainfall seasons. The RAP report notes that even a 100 acre foot contribution to the Water bank has beneficial values to rebuilding the unconfined aquifer. The WaterSMART Grant will allow the District to achieve steady flows throughout its canal system, manage flows to reduce spill over, lessen severity of canal breaching and surcharging of the system due to manual operation of the Districts gates. The installation of flow measurement devices and SCADA management system will

contribute to maximizing conservation efforts. The surplus created from these endeavors will create an allocation for deposit in the Water Bank project.

- *Identify the applicant's level of involvement in the Basin Study (e.g., cost- share partner, participating stakeholder, etc.).*

The implementation of the WaterSMART grant project will contribute to efforts set forth in the Madera Integrated Water Management Plan (IRWMP). This State of California required planning document requires cooperation between all water uses including agricultural, urban and environmental entities to achieve basin wide conservation and management programs. This is especially true in areas that have a depleted aquifer system due to historic over-drafting. The IRWMP sets forth goals and policies to achieve performance based results. This project is in line with those goals and policies through the Districts efforts to implement conservation efforts and contributions to restore the ground water levels.

- *Describe whether the project will result in further collaboration among Basin Study partners.*

The implementation of the WaterSMART grant project will further collaboration amongst the participating agencies of Madera Regional Water Management Group. The Group meets monthly to discuss current projects, grant funding opportunities, and regional projects that promote affordable surface water and groundwater supplies. As neighboring Districts have done, the successful water conservation projects are shared with the Group to promote awareness and further collaboration on regional projects.

Subcriterion E.2: Expediting Future On-Farm Irrigation Improvements

*Up to **14 points** may be awarded for projects that describe in detail how they will directly expedite future **on-farm irrigation improvements**, including future on- farm improvements that may be eligible for NRCS funding.*

If the proposed projects will help expedite future on-farm improvements, please address the following:

- *Include a detailed listing of the fields and acreage that may be improved in the future.*

There are 99,203 irrigated acres within the District. The proposed project would benefit all farms within the District because of the water savings and improved operational supply benefits. All District growers will be able to review and learn from the District's water saving benefits of undergrounding sandy ditches into pipelines.

- *Describe in detail the on-farm improvements that can be made as a result of this project. Include discussion of any planned or ongoing efforts by farmers/ranchers that receive water from the applicant.*

The automation of canal head gates together with the SCADA system provides the base platform for future expansion of automated farm delivery gates. Though the existing turnouts are currently metered, future automated farm delivery gates would allow remote control, alarms, online ordering, automatic rescheduling, and improved on-farm management with precise irrigation

flows. Growers are always seeking new technologies and researched methodologies to improve the crop yield per acre-foot of water.

- *Provide a detailed explanation of how the proposed WaterSMART Grant project would help to expedite such on-farm efficiency improvements.*

The proposed project would expedite on-farm efficiency improvements by providing the necessary canal automation and SCADA system management infrastructure.

- *Fully describe the on-farm water conservation or water use efficiency benefits that would result from the enabled on-farm component of this project. 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.*

Irrigation pilot studies are being conducted around the world to improve on-farm irrigation efficiency. The largely agricultural Southeastern Australia has suffered severe droughts and benefited from the technologic advancements Rubicon Water has developed. Case studies have shown that precise automated on-farm irrigation methods, particularly in flood applications, have increased crop yield by as much as 20% per acre-foot. These test farms incorporated the use of on-farm soil moisture sensors to determine the exact amount of water necessary to penetrate the crop root zone and then automatically shut the delivery headgate. Because the farmers would typically overestimate the necessary water supply for each pasture and shut the headgate when it was convenient for their schedules, there was excess standing water in each pasture that would take 24-48 hours to percolate. Because excess flood water on the crop stops crop growth, the incorporation of on-farm improvements improved crop growth by 1-2 days per week. Though this project does notdirectly provide on-farm improvements, it starts the journey towards on-farm automation, precise irrigation deliveries necessary for maximum crop growth, and increased water savings.

- *Projects that include significant on-farm irrigation improvements should demonstrate the eligibility, commitment, and number or percentage of farmers/ranchers who plan to participate in any available NRCS funding programs. Applicants should provide letters of intent from farmers/ ranchers in the affected project areas.*

There are no known NRCS funding applications at this time.

- *Describe the extent to which this project complements an existing NRCS- funded project or a project that either has been submitted or will be submitted to NRCS for funding.*

There are no known NRCS funding applications at this time.

Subcriterion E.3: Other Water Supply Sustainability Benefits

*Up **14 points** may be awarded for projects that include **other benefits** to water supply sustainability.*

Projects may receive up to 14 points under this sub-criterion by thoroughly explaining additional project benefits, not already described above. Please provide sufficient explanation of the additional expected project benefits and their significance. Additional project benefits may include, but are not limited to, the following:

- *Will the project make water available to alleviate water supply shortages resulting from drought?* Yes.

  - *Explain in detail the existing or recent drought conditions in the project area. Describe the impacts that are occurring now or are expected to occur as a result of drought conditions.*

The Governor's 2015 proclamation regarding the statewide drought brought a heightened awareness to the groundwater depletion and aquifer overdraft in Madera County. The Madera and Chowchilla Subbasins were designated as critically overdrafted high priority basins. Local groundwater elevations have fallen approximately four feet per year for the last five years. Hundreds of residential wells have run dry and west side communities have been without water for extended periods of time requiring FEMA relief.

- Describe the severity and duration of drought conditions in the project area.

The drought conditions have persisted for more than four years. This is best seen in the drastic decline of the District's available water supply in recent years.

2011	396,517 AF
2012	103,551 AF
2013	104,416 AF
2014	15,978 AF
2015	9,764 AF

- Describe how the water source that is the focus of this project (river, aquifer, or other source of supply) is impacted by drought.

The District's Class I water supply from Friant has been 0% allocation since 2014. Because of the statewide drought, Exchange Contractors senior rights and river restoration programs on the San Joaquin River, there has been very limited water supply in recent years. The drought has also depleted District's supply reservoirs.

- Provide a detailed explanation of how the proposed WaterSMART Grant project will improve the reliability of water supplies during times of drought.

During the drought years, growers must rely on groundwater pumping to sustain their current crops and farming operations. The proposed WaterSMART grant project will conserve the precious water supplies and replenish the groundwater aquifer with the excess water supplies that occur during the irrigation and flood seasons.

- *Will the project make water available to address a specific concern? For example:*

  - *Will the project directly address a heightened competition for finite water*

supplies and over-allocation (e.g., population growth)?

Yes. Water resources in the Central San Joaquin valley are a finite supply. The construction of the pipeline and installation of the automated slip meter connected to the District's SCADA system will result in water savings to the Madera Irrigation District growers, which in turn creates more water availability to downstream users. If the individual growers or District determines an excess from their allocations and opts to market the savings, the availability of irrigation waters is extended to others within the State suffering from population growth, aquifer overdraft, etc. This project will allow for better utilization of these limited water resources.

- *Describe how the water source that is the focus of this project (river, aquifer, or other source of supply) is impacted by climate variation.*

The Hidden Dam at Hensley Lake and Friant Dam at Millerton lake are mainly served by snowmelt and therefore, have different and more frequent peaks, thus reducing the District's supply and increasing the need for water conservation efforts like this project.

- *Will the project help to address an issue that could potentially result in an interruption to the water supply if unresolved?*

The San Joaquin River Restoration Settlement which implements the San Joaquin River Restoration project reduced allocations to all water users. All users of Friant Dam waters have had to adjust to this reallocation. As stated above, this project will allow for better utilization of these limited water resources.

- *Will the project make additional water available for Indian tribes?*

No. Tribal lands are not present in the vicinity of the District.

- *Will the project make water available for rural or economically disadvantaged communities?*

Yes. Better management of water resources equates to meeting demand for water that is in short supply and increasingly reduced by allocations to different interests not only in the water basin, but in the San Joaquin Valley. Better management also means meeting grower needs without excessive waste in doing so, such as over-supplying growers in an unbalanced water distribution system. What is not wasted here is used elsewhere.

The installation of the automated gates and SCADA management system may result in a net water savings to the Madera Irrigation District growers which in turn creates more water availability to the disadvantage City and County of Madera.

- *Does the project promote and encourage collaboration among parties?*

Yes. Through the District's media channels (i.e., newsletter, website, Facebook, Twitter, annual Growers' meeting, etc.), the project will gain attention, promote and encourage collaboration among local water districts, cities, and counties.

- *Is there widespread support for the project?*

Yes. This project implements the goals and policies of the Integrated Water Management Plan adopted by the water districts, City and County of Madera. Each participant in the Plan must implement conservation measures and this project addresses the District's role in the IRWMP. Adjacent Water Districts (i.e., Chowchilla, Gravelly Ford, etc.) will monitor the installation and operation and are very interested in exploring similar projects. Letters of support are located in Appendix F.

- *What is the significance of the collaboration/support?*

Water loss is a critical issue in the adjacent districts and a project that results in savings and better management is widely supported. A drought year is devastating to all districts and their member agricultural users. The ability to maintain a resource during droughts and to bank waters during abundance is beneficial to everyone.

- *Will the project help to prevent a water-related crisis or conflict?*

The majority of the discussion in the previous sections has dealt with water limitations within the Madera Water Basin. Of equal importance are operation issues that lead to extensive losses of irrigation water. Breaching of dikes and overtopping can contribute to significant loses, especially if the discovery is delayed due to time of day or other factors.

The ability to have a system that can "sense" a change in flow characteristics such as breaching, or that levels out deliveries within the system thereby removing the probability of overtopping, will contribute greatly to water savings, especially in drought years.

- *Is there frequently tension or litigation over water in the basin?*

Yes. As evidenced over the last decade with the San Joaquin River Restoration Settlement, competing interests, be it environmental or agricultural, continue to litigate over a finite resource.

- *Is the possibility of future water conservation improvements by other water users enhanced by completion of this project?*

Yes. This project will demonstrate the viability of installing automation and replacement of antiquated manual gate systems with retrofit equipment that minimizes water losses.

- *Will the project increase awareness of water and/or energy conservation and efficiency efforts?* Yes.

  - *Will the project serve as an example of water and/or energy conservation and efficiency within a community?*

Yes, but within the agricultural community. This project will demonstrate the viability of installing automation and replacement of antiquated manual gate systems with retrofit equipment that minimizes water losses.

The installation of solar powered motorized gates and SCADA controls saves on utility provided energy supplies and the cost of installing and extending electrical service, especially when the sites do not have such infrastructure immediately adjacent.

- *Will the project increase the capability of future water conservation or energy efficiency efforts for use by others?*

Yes. Adjacent Water Districts will monitor the installation and operation and are very interested in exploring similar projects.

- *Does the project integrate water and energy components?*

Yes. The project incorporates physical improvements to the water delivery system and incorporates 14 small scale solar installations to power these devices and the SCADA control systems that manage them.

V.A.6 Evaluation Criterion F: Implementation and Results

Up to 10 points may be awarded for these subcriteria.

Subcriterion No. F.1: Project Planning

Points may be awarded for proposals with planning efforts that provide support for the proposed project.

Does the project have a Water Conservation Plan, System Optimization Review (SOR), and/or district or geographic area drought contingency plans in place? Does the project relate/have a nexus to an adaptation strategy developed as part of a WaterSMART Basin Study)? *Please self-certify, or provide copies of these plans where appropriate to verify that such a plan is in place.*

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, Basin Study, drought contingency plan, or other planning efforts done to determine the priority of this project in relation to other potential projects.

As required by the State of California, Madera County has adopted a county-wide Integrated Regional Water Management Plan (IRWMP) which was approved by the State of California on June 6, 2011. This document sets forth the goals and policies for water management and conservation between all consumers whether urban or agricultural.

The goals and policies include increased use of reclaimed waters, implementation of advanced water management and delivery methods, reduction of irrigation water needs, and water basin recharge.

The Madera Irrigation District certifies that it is a member of the Regional Water Management Group. The document can be viewed at http://www.madera-county.com/index.php/forms-and-documents/category/167-the-integrated-regional-water-management-plan-irwmp

(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 proposed project achieves or implements several goals of the IRWMP as follows:

- Sustainable management plan for water resources.
- Reduction in District water needs.
- Ability of the growers to implement alternative irrigation methods due to efficient and accurate water supply on demand.
- Water savings can be used for water recharge.

Subcriterion No. F.2: Readiness to Proceed

Points may be awarded based upon the extent to which the proposed project is capable of proceeding upon entering into a financial assistance agreement.

Describe the implementation plan of 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. ***(Please note, under no circumstances may an applicant begin any ground-disturbing activities—including grading, clearing, and other preliminary activities—on a project before environmental compliance is complete and Reclamation explicitly authorizes work to proceed).***

This proposed project involves: i) removing existing check gates and retrofitting modular check gate systems into existing concrete weirs and abutments, and ii) installation of flow metering devices and monitoring equipment modifications by District staff. Permits will be required for NEPA, NHPA, and MP-620. The SCADA and solar power installation is also modular and either mounts to the gate frames and adjacent concrete abutments or pole mounted adjacent to the installation along access roads. The project will require minor earthwork a three of the sites where concrete retrofits require slightly more modification to accommodate the new devices. Work can proceed as soon as the irrigation "off-season" arrives.

The following schedule shows the sequence and timing of the proposed work.

Item	Start Date	End Date
MID Administer Grant	10/1/2016	9/30/2018
Task 1: NEPA, NHPA, and MP-620 Permitting	10/1/2016	1/31/2017
MID Construction of Civil Works	2/1/2017	3/31/2018
Task 2: Rubicon Slip Meters and Flume Gate	2/1/2017	3/31/2018
Task 3: Sierra Controls	10/1/2017	9/30/2018

Please explain any permits that will be required, along with the process for obtaining such permits. Identify and describe any engineering or design work performed specifically in support of the proposed project.

The project is in the process of transfer of ownership from Reclamation to the District after completion of debt repayment. It is possible since this transaction has not been completed that the District may be required to procure MP-620 permits. District staff will work with their designated representatives from Reclamation to secure the permits if such action is required.

Subcriterion No. F.3: Performance Measures

Points may be awarded based on the description and development of performance measures to quantify actual project benefits upon completion of the project.

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, marketed, or better managed, or energy saved). For more information calculating performance measure, see Section VIII.A.1. FY2016 WaterSMART Water and Energy Efficiency Grants: Performance Measures.

The performance measures for the project will include the following:

- Improved operational control throughout the district – provide graphs of the before and after conditions. The District will more accurately be able to quantify losses through seepage between the new gates and metering devices, compare historic flows into and out of the system against the new SCADA management system. The latter issue will help quantify actual water conservation efforts.

  The post project SCADA system will allow the District to measure performance in a real time environment and allow decision makers to make adjusts with immediate impact to flow management.

- Reduced staffing and trip costs along with energy generation savings from small scale solar installations – analysis of time cards and trip logs. How much time was spent on water operations vs. maintenance that would have been deferred? The completion of the SCADA installation for system wide management will involve training of staff to use the software systems to manage water flows, thereby shifting some staff effort from an operational role to part supervisory. A contract with the system provider will require a training component for District employees to facilitate this change in operations.

  There is also a secondary benefit to real time monitoring of the system by the District staff. Spills and canal breaches will register as flow loss in the system and allow staff to become more alert via an alarm and therefore able to react quicker and more responsive to solving the problem before it results in significant losses. Remote operation of gates would allow isolation of a canal segment to confine the loss.

- Water savings from reduced spills – actual vs. previously estimated and reaction time by staff to resolve the issues based on an automated alarm system as opposed to visual inspection or farmer notification. This measure also allows the District to quantify spills that will continue to occur until a water balance within canal segments is achieved at completion of the improvements and to measure spills in a before and after state.

- Increased deliveries of MID water as a substitute for groundwater pumping – was it

possible to extend the delivery season? By how long based upon how much was measured and therefore stored behind the dam or in other District basins/canals.

- Increased service levels to farmers – responding to on demand delivery and maintaining channel levels for same. Graphing of flow measurements through each segment which cannot be done currently. The implementation of accurate flow management will allow the District to measure distribution of irrigation waters throughout its 315 miles of canals through remote sensing as opposed to manual adjustments and field observations.

- Accurate accounting of water stored at MID's future water bank – allocations of surplus waters can be broken down to individual commitments as opposed to gross measurement and accounted for from a better managed system including such items as reductions in spills discussed in item c). (spillage without project – spillage with project)

- Accurate measurement of water sold – allocations for market water can be measured. Retention within a water balanced system will show exactly what is available for transfer as opposed to the current pass through, especially for storm water flow excess.

Subcriterion No. F.4: Reasonableness of Costs

Points may be awarded based on the reasonableness of the cost for the benefits gained.

Please include information related to the total project cost, annual acre-feet conserved, energy capacity, or other project benefits and the expected life of the improvement(s).

For all projects involving physical improvements, specify the expected life of the improvement in number of years and provide support for the expectation (e.g., manufacturer's guarantee, industry accepted life-expectancy, description of corrosion mitigation for ferrous pipe and fittings, etc.). Failure to provide this information may result in a reduced score for this section.

The total project cost is $591,721 for estimated average annual water savings of 3,610 AF and energy savings 1,892 kWh. The industry accepted life-expectancy of reinforced concrete is 50+ years. Rubicon Water developed the following life expectancy for each component:

Component	Expected Lifespan
Gate panels and frames	30 years
Radio	15 years
Ultrasonic Level Sensors	15 years
Batteries	5 years
Gearboxes	25 years
Motors	25 years
SDB's	15 years

Moscad-M RTU	15 years
Solar Panel	15 years
LCD Screen	15 years
Keypad	15 years

Over the 30 year lifespan, the cost of 1AF conserved is $5.46. This is money well invested considering a typical irrigation water sale price of $100/AF. Manufacturer data sheets are provided in the appendices.

V.A.7 Evaluation Criterion G: Additional Non-Federal Funding

*Up to **4 points** may be awarded to proposals that provide non-Federal funding in excess of 50 percent of the project costs. State the percentage of non-Federal funding provided.*

$$\frac{\textit{Non-Federal Funding}}{\textit{Total Project Cost}} = \frac{\text{MID Contribution \$299,460}}{\text{Total Project Cost \$591,721}} = 50.6\%$$

No additional Non-Federal funding beyond the District's match funds are provided to this project.

V.A.8 Evaluation Criterion H: Connection to Reclamation Project Activities

*Up to **4 points** may be awarded if the proposed project is in a basin with connections to Reclamation project activities. No points will be awarded for proposals without connection to a Reclamation project or Reclamation activity.*

(1) How is the proposed project connected to Reclamation project activities?

The District has participated with Reclamation on the following projects and activities:

- The primary connection to Reclamation activities is through contracted water deliveries. In 1939, the District contracted with Reclamation for water deliveries in exchange for certain properties and interests in water filings. This agreement was modified in 1950 and in 1959.
- In 1975, the District contracted with Reclamation for the Hidden Dam project where Reclamation required the District to acquire 15,000 additional acres in exchange for water from this dam.
- The District is a participant in the San Joaquin River Restoration Settlement wherein Reclamation must provide waters from the Friant Dam to the San Joaquin River to restore historic fisheries.

(2) Does the applicant receive Reclamation project water?

Yes, under the following contracts with deliveries from the Friant and Hidden Dams:

	AF	Source	Contract #	Contract / Restriction	Expiration
USBR Agricultural Class I	85,000	Federal	175R2891-IRd	Firm as available	None
USBR Agricultural Class II	186,000	Federal	175R2891-IRd	As available subject to obligation	None
Hensley Lake	24,000 +	Federal	14-06-200-4020-IRd	Fluctuating annual yield	None

(3) Is the project on Reclamation project lands or involving Reclamation facilities?

The project involves Reclamation facilities. The District is in the process of transfer of ownership from Reclamation to the District after completion of debt repayment for improvements made within the District with funding provided by Reclamation. Technically, Reclamation owns these historic improvements until the transfer of ownership is completed.

(4) Is the project in the same basin as a Reclamation project or activity?

The Madera Water Basin, in which the District and the Project are located, includes the San Joaquin and Fresno Rivers which are under the jurisdiction of Reclamation.

(5) Will the proposed work contribute water to a basin where a Reclamation project is located?

Yes. The development of the Madera Ranch Water Bank is an effort by the District and its partners to restore the ground water to a basin that has historically been over drafted by agricultural and urban uses. Portions of the surface waters provided through the Reclamation water delivery contracts and conserved under the Project will be used to replenish ground water.

(6) *Will the project help Reclamation meet trust responsibilities to Tribes?*

No known direct impacts to Tribes.

APPENDICES

Appendix A — Project Location Map

Appendix B — Priority List of Proposed Improvements

Appendix C — Representative Photos of Proposed Improvements

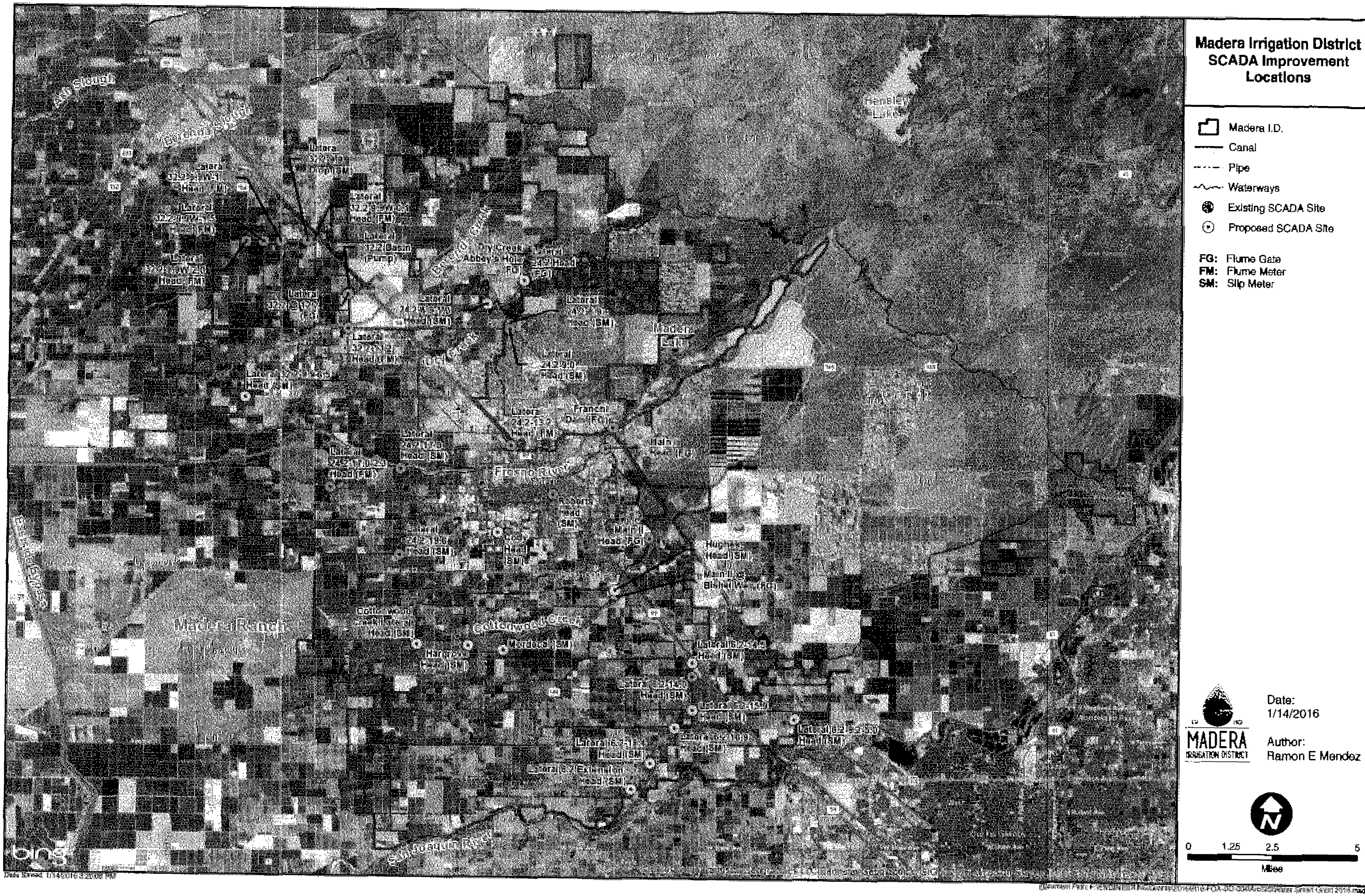
Appendix D — Consultant Proposals

Appendix E — Rubicon Water Slipmeter Data Sheet

Appendix F — Letters of Support for the Project

Appendix G — Board Resolutions

Appendix A — Project Location Map


Madera Irrigation District
SCADA Improvement
Locations
Madera I.D.
Canal
Pipe
Waterways
Existing SCADA Site
Proposed SCADA Site
FG: Flume Gate
FM: Flume Meter
SM: Slip Meter
MADERA
IRRIGATION DISTRICT
Date:
1/14/2016
Author:
Ramon E Mendez
N
0 1.25 2.5 5
Miles
Madera Ranch
Fresno River
Cottonwood Creek
San Joaquin River
Madera Lake
bing

Appendix B — Priority List of Proposed Improvements

Appendix C — Representative Photos of Proposed Improvements

Existing manually controlled canal gates to be upgraded

Example of new Slip Meter

Existing Reclamation's Dry Creek weir at Abbey's Hole. Proposed Flume Gate site.

Example of proposed retrofit automated Flume Gate.

Appendix D — Consultant Proposals

People and space over time
CULTURESCAPE

Client: Madera Irrigation District
Contact: Sean M. Smith, PE, MBA Associate Engineer
Address: 12152 Road 28 1/4, Madera, CA 93637
Telephone Number: (559) 673-3514) Mobile: (559) 715-2550
Fax: (559) 673-0564

Purpose: Cultural Resources Survey and Report for Maintenance and Service of 20 locations

Service Provider: Culturescape: Cultural Resource Management
Address 6182 Carter Rd. Mariposa, California, 95338
Telephone Number: 209 966-3327
E-mail Address: mck@sierratel.com
Nature: Private Consulting

Sean,

Thank you for your consideration of Culturescape for your cultural management needs on your upcoming proposal

1.0 Culturescape (the Company) proposes to provide services consisting of:

1.1) an archaeological records search, to determine if sites have been located within the project area or in close proximity (.50 miles) to proposed facilities, a review and report of findings for an estimated 20 locations.

1.2) Implement a methodology that considers the historical context of elements within the APE and introduce research questions for archaeological, historical, and ethnographic themes. This will include the methodology to identify and record surface and sub-surface features and the criteria for evaluation of discovered resources with regard to the eligibility of discovered resources for inclusion into the National Register. This will include acquisition of any necessary permits to conduct the work.

1.3) Survey for historic and prehistoric sites at 31 locations within the Madera Irrigation System in Madera County, California. We assume that any landowner permission, gate keys or combinations that may be necessary to enter the project areas will be provided.

1.4) Record sites within the project area with the basic recordation to meet the Secretary of the Interior \ Standards and Guidelines for Archaeology and Historic Preservation. Archaeological Resource Management Reports (ARMR): Recommended Contents and Format. Any sites located will be given a fixed location using a Trimble JUNO Global Positioning System (GPS) unit for accurate plotting and digital camera for photo documentation. Documentation for sites will be completed on forms compatible to the Department of Parks and Recreation DPR523 and will include securing Primary number and Trinomial as appropriate through the Southern San Joaquin Valley Information Center.

1.5) Documentation and delivery of such to client. These reports will include Primary Record forms, photographs, maps, reports and recommendation for mitigation of Cultural resources that may be affected, including negative archaeological findings.

1.51) The submission of documentation to the client will include:

A. two hard copies and one CD or DVD.

B. Digital data including GIS shape files, photos and maps on a CD or DVD.

C. Revised and Final Inventory Report that includes revision of draft comments and submission of three hard copies and one electronic version to Reclamation.

D. Submission of final report draft to the Southern San Joaquin Valley Information Center.

With all archaeological survey, the possibility of discovery of sites may exist, or that are more complex; occupation sites, such as village sites, would require additional labor to document and would require a modification to the contract to record the sites, describe them in the technical document, and provide recommendations. It is assumed that the work will be completed under a cost plus percentage fee type of contract. Alternatively, if fewer resources are identified, or if the survey proceeds at a faster rate than anticipated, a cost savings will be realized. Based on the assumptions listed above, we estimate the cost of the study to be approximately $6,500.00

Turnout Flow Meters

In the above pricing, the following items/features are included with every SlipMeter™:

- The SlipMeter is a precision flow meter that measures partial-full flow and mounts directly to a headwall or in a channel with no straight pipe requirements.
- The SlipMeter comes equipped with an internal and external frame c/w stainless steel anchors, Hilti capsules and SIKA sealant.
- Each meter comes equipped with a separate standalone control pedestal which includes a display and keypad, solar panel power system and a 16 ft mast for mounting of communication antenna; RTUs, radio and antenna by others;
- The SlipMeter comes complete with an integrated power supply comprising an 85W solar panel, a solar regulator, and a 48Ah 12 volt deep cycling battery pack. Note, the batteries must be removed from the meter and charged if the gates are not installed within four weeks of delivery;

Services during meter commissioning include:

- Visits by a Rubicon certified Field Technician will involve installation of external frame and will involve supervision of meter installation, field wiring of control pedestal to meter, commissioning and training in the operation and maintenance of the meter.

Exclusions:

- Civil works structures to fit above items.
- Supply and operation of crane for install of meter.
- RTU, Radio and antenna.

Check Structures

In the above pricing, the following items/features are included with every FlumeGate™:

- One (1) only aluminum and stainless steel FlumeGate™. Each gate comes equipped with a control pedestal which includes a standard processor and keypad for automation, solar panel power system and a 16 ft mast for mounting of communication antenna; RTUs, radio and antenna by others;
- One (1) only aluminum external mounting frame, c/w stainless steel anchors, Hilti capsules and SIKA sealant;
- One (1) only 12 volt DC deep cycling battery packs. Each pack consists of two (2) batteries. Note, the batteries must be removed from the meter and charged if the gates are not installed within four weeks of delivery;
- One (1) set of primary ultrasonic water level sensors (long range), both upstream and downstream.

Services during gate commissioning include:

- Visits by a Rubicon certified Field Technician will involve installation of external frame and will involve supervision of gate installation, field wiring of control pedestal to meter, commissioning and training in the operation and maintenance of the meter.

Exclusions:

- Civil works structures to fit above items.
- Supply and operation of crane for install of meter.
- RTU, Radio and antenna.

Payment Terms

Payments are to be made as follows:

- Net 30 days.
- Spare parts will be invoiced 100% when shipped.
- In the event that frames and meter/gate hardware are shipped separately, payment is to be made as follows:
  - 30% of the total price within 30 days of shipment of frames.
  - 70% of the total price within 30 days of the delivery of the meter/gate hardware.

All payments are to be made by check to Rubicon Systems America Inc.

Warranty

Rubicon Water warrants the hardware offered in this quotation to be free of defects in material and workmanship for a period of twelve months from the date of commissioning.

Warranty on spare parts is twelve months from delivery.

Rubicon Water Standard Terms of Sale applies to this Quotation and is appended to the end of this quotation.

Delivery

All hardware will be delivered by road transport to customer worksite, whereupon immediate unloading will be the responsibility of customer. Rubicon will not be responsible for any damage that may occur at customer worksite

Primary Frames will be delivered to customer worksite within 6-8 weeks of receipt of a Purchase Order.

It is anticipated that the Meters/Gates and associated hardware will be delivered to customer within 16-18 weeks of receipt of a Purchase Order but will be confirmed by email once the order has been received.

The Next Step:

To accept this quotation and begin the procurement process, please sign here and return:

Customer:

Authorized Signature

Date

Authorized By:

General Manager

Appendix E — Rubicon Water Slipmeter Data Sheet

SlipMeter™

RUBICON™

Data Sheet

Overview

The SlipMeter is a combined flow meter and control gate designed to automate irrigator service points. Accurate flow measurement, precise flow control, power supply and radio telecommunications are fully integrated in a single device.

Rubicon's unique acoustic array flow measurement technology provides an accurate 3D representation of the velocity profile in the meter box. The SlipMeter accurately measures flows even in turbulent conditions. Instantaneous flow rate and total volume passed are recorded, providing a precise account of water usage.

It features a local LCD display which provides irrigators with the ability to control the service point and view instantaneous flow rate, volume of current delivery, and total flow volume for the season.

The SlipMeter can be managed and monitored on-site or operated remotely when connected to a SCADA network such as Rubicon's SCADAConnect® system.

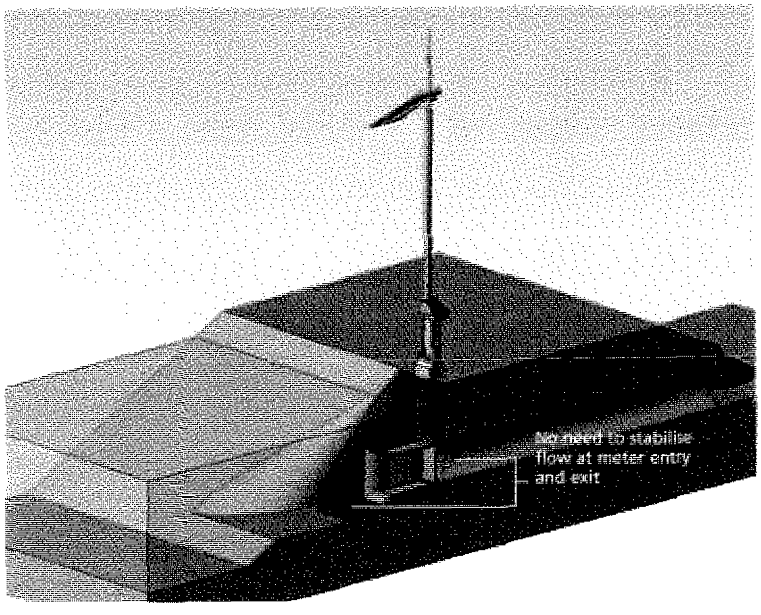
The SlipMeter automatically controls the flow of water by varying the gate position based on a desired set-point or on irrigation demand as shown in the table.

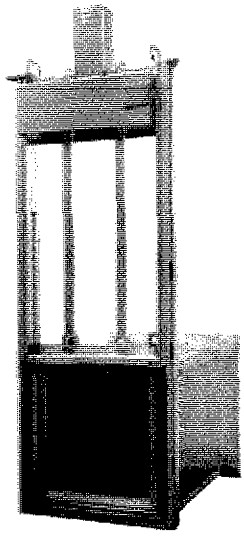
Control objective		Gate action
Local	Position	Moves to a desired set-point and stays there
	Flow	Maintains a constant flow regardless of channel levels

A TCC® product

The SlipMeter is one of the products making up a modular family of precision hardware and software called TCC (Total Channel Control®). TCC is an advanced technology set designed to improve the management and productivity of water in open channel distribution. Unlike traditional infrastructure, TCC products can interact and work together to help managers improve:

- the availability of water
- service and equity to users
- management and control
- health and safety for channel operators



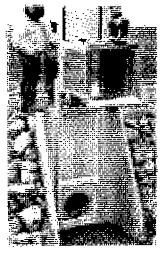


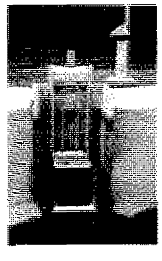
Features

- Acoustic array flow measurement technology provides proven measurement accuracy in real-world open channel flow conditions
- Ultrasonic water level measurement
- Local display software in multiple languages
- Solar-charged battery system or mains power
- SCADA ready communication system – can be integrated to many SCADA platforms
- Robust high duty cycle operation and long life
- Flow measurement accuracy is not affected by obstructions, turbulence or silt
- Independently verified flow measurement accuracy of ±2.5%*
- Standard sizes include 600, 750, 900 and 1200mm
- Very low power consumption compared to magnetic flow measurement

Ideal solution for...

- Measuring and controlling flow in farm service points
- Channel-to-pipe applications especially when large conduits are used
- Applications affected by turbulence
- Lowering civil costs because there is no need to stabilise flow at entry and exit
- Service points requiring very low head loss and/or high accuracy





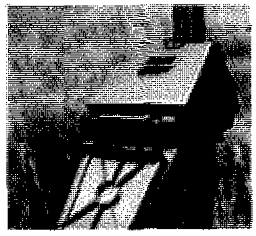
SlipMeter™

Data Sheet

Local control pedestal

Each SlipMeter installation includes a robust pedestal that provides power and control to the gate and is a secure, weather proof housing for electronic components and batteries.

The pedestal also serves as a local user interface. A keypad and LCD display are located under the lockable pedestal lid, allowing farmers to monitor, or operators to control and troubleshoot on-site.

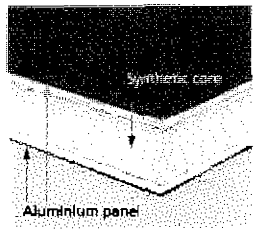


Local user interface

High strength construction

FormiPanel™ is Rubicon's high strength construction method that uses techniques adopted from the aerospace and marine industries.

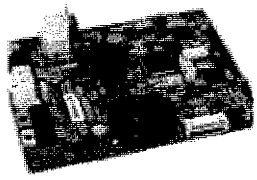
The gate panel and meter assembly is made from a laminate construction that utilises high strength industrial adhesives to bond structural grade aluminium extrusions and skin plates to a synthetic core material. The result is strong, lightweight, and corrosion resistant.



FormiPanel construction

Gate control technology

CableDrive™ is Rubicon's actuation system designed to provide precision gate position accuracy and repeatability in harsh environments. The drive is a wire-rope (cable) and drum mechanism that provides positive drive in both the raise and lower directions. It is designed for high duty cycle operation and provides precise gate positioning to within ±0.5mm. The drive is managed by Rubicon's SolarDrive® technology – a purpose built integrated circuit board that manages gate positioning, solar power regulation, battery charge, fusing and the pedestal user interface.



SolarDrive electronics

Low maintenance

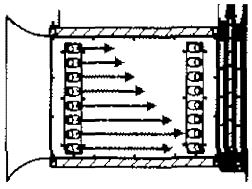
The SlipMeter's modular design allows it to be maintained in the field with minimal tools, training, and easily replaceable parts.

- Level sensors are easily removed during in-field servicing
- Seals can be replaced
- On-site diagnostics built into the software
- Service can be done by local Rubicon field technicians or authorised/trained independent local integrators

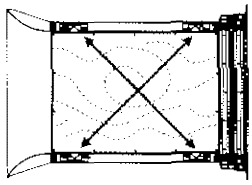
Sonaray® flow measurement technology

Rubicon's SlipMeter employs Sonaray acoustic array technology. The acoustic array principle maps the velocity profile by using multiple transecting paths to provide an accurate 3D representation of the velocity distribution within the meter box.

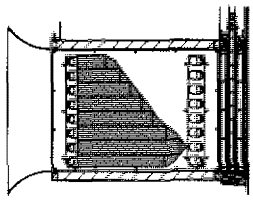
This technique measures across the entire velocity field within the meter box and is unaffected by swirl, or other non-uniform velocity distributions caused by garbage or other debris.



Eight horizontal planes sample the velocity distribution passing through the meter (side view)



Each measurement plane implements crossed-path transit time acoustics to sample the entire velocity field in that plane (plan view of measurement plane)



The horizontal velocity distributions are then integrated vertically to construct the three dimensional flow velocity distribution (side view)

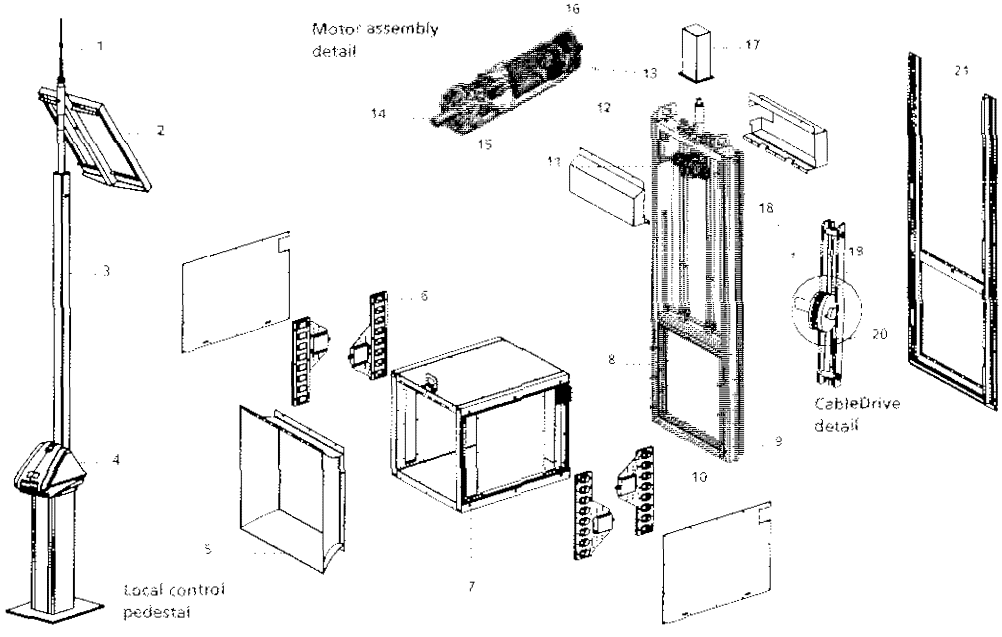
SlipMeter™ components

Control pedestal

1 Antenna
2 Solar panel
3 Hinged mast
4 Secure controller housing with LCD display

Meter/control unit

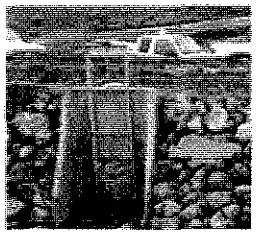
5 Entry flare
6 Sonaray sensors
7 Meter box
8 Gate seals
9 Internal frame (one side houses the ultrasonic level sensors)
10 Gate panel
11 Output drive assembly (gear box)
12 Lifting hooks
13 Motor and encoder
14 Motor drive shaft
15 Planetary gear box
16 Encoder
17 Motor cover
18 CableDrive assembly
19 Cable drum
20 Cable guide
21 External frame



Easy to install

Rubicon's SlipMeters are designed to mount to existing headwall structures as well as purpose built emplacements significantly reducing costs associated with civil work.

- Installed and operational in two days during irrigation or off-season
- Factory calibrated and pre-configured



Remove existing manual gate and...

replace with face mounted SlipMeter™

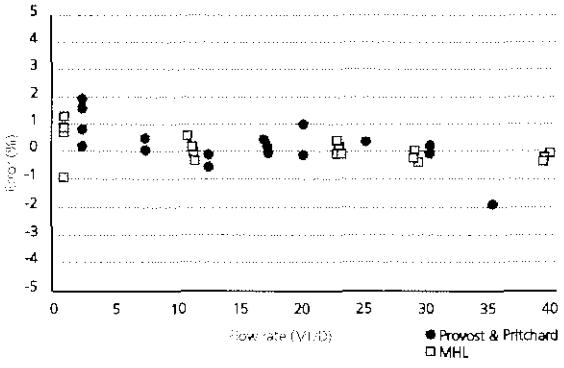
Independently tested flow measurement accuracy

The SlipMeter's flow measurement accuracy has been independently verified under a wide range of conditions in the laboratory and in the field.

- Provost & Pritchard engineers in California conducted in-situ testing in a customer service point configuration under calm, turbulent, and extreme turbulent conditions
- Manly Hydraulics Laboratory in Sydney, Australia conducted laboratory tests under wave disturbance, upstream disturbance and submerged conditions
- Testing has demonstrated compliance with AS4747

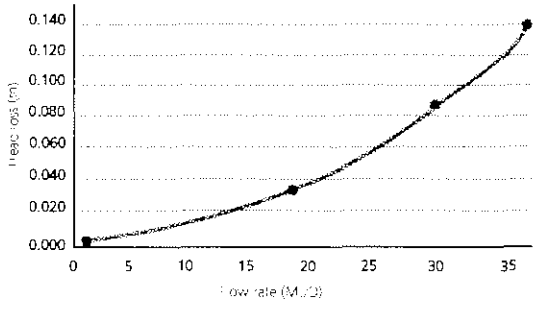
SlipMeter measurement accuracy

(600mm SlipMeter measured under normal operating conditions relative to ABB Magmaster)



SlipMeter head loss

(600mm SlipMeter measured at Manly Hydraulics Laboratory)



SlipMeter™ specifications

General	
Minimum flow rate	600mm wide gate: 1ML/d; 750mm wide gate: 1.56ML/d; 900mm wide gate: 2.25ML/d; 1200mm wide gate: 4ML/d
Data interface	Local display (4 line LCD with keypad), Modbus serial, data radio
Unit of measure	User definable (metric/imperial (US))
Data tags	140+ available for integration into SCADA systems
Data storage	All volumetric usage is accumulated and backed up internally in nonvolatile memory. Historical data can be uploaded through the Modbus interface, a local data logger or from the SCADA host database.
Not full alarm	Alarm indicates when meter box is not full
Control	Local or remote via SCADA
Electronics	SolarDrive® power management and control technology housed in the local control pedestal. Each unit passes a 12hr heat pre-stress and 100% functional test.
Typical weight	600mm wide gate ≈ 195kg; 750mm wide gate ≈ 215kg; 900mm wide gate ≈ 290kg; 1200mm wide gate ≈ 340kg
Motor	12V DC
Gate position	256 count magnetic encoder
Seal performance	<0.02 litres/min per lineal metre of seal (better than the American and European standards AWWA C513 & DIN 19569)
Actuation options	12V DC powered (solar); AC powered; Manual with hand-crank or car battery
Flow measurement	
Technique	Cross-path acoustic transit-time
Transit time measurement resolution	100 picoseconds
Measurement frequency	100 milliseconds (configurable)
Accuracy	±2.5% *Accuracy of 600mm SlipMeter verified by Manly Hydraulics Laboratory, April 2011 and Provost & Pritchard, November 2011
Velocity measurement range	Accuracy listed above is achieved at flow velocities greater than 25mm per second
Sensor quantity	32 individual acoustic sensors, arranged in four cartridges, across 8 planes of measurement
Calibration method	Factory pre-calibrated. Ultrasonic level sensors are also internally self-calibrated
Material	
Frames	Extruded marine grade aluminium (6351-T5)
Gate panels	Composite laminate construction using marine grade 5083-H321 aluminium sheet bonded to RTM Styrofoam on 6351-T5 aluminium extrusion
Hardware	304, 316 stainless steel
Shafts	304, 316, 431 stainless steel
Seals	EDPM rubber (Durometer 70 (Shore A))
Wear strip	PVC
Pressure rating	Refer to the Dimensions and Maximum Water Level table on page 4
Water level sensor	Anodized 6063-T6 grade aluminium and copolymer acetyl plastic with 316 grade stainless-steel fittings and gold-plated connectors
Power	
Power supply	12V DC self-contained battery charged from solar panel or AC mains power
Solar panel	85W monocrystalline
Batteries	(2) or (3) 12V 28 ampere-hour sealed gel led acid with temperature sensor (~5yr life, ~5 day operation)
Communications	
Protocols	Modbus, analog/digital outputs
Data communications	DNP3, MDLC, Modbus
Environmental	
Operating temp	14°F to 140°F (-10°C to 60°C)
Operating humidity	0% to 100%
Water temperature	33.8°F to 122°F (1°C to 50°C)

Specifications subject to change

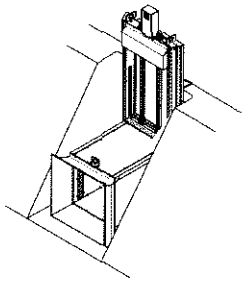
Dimensions and maximum water levels

	A	B	C	D	E	F
	mm	mm	mm	mm	mm	
SM-F.600.600.1500.4	600	1500	862	2088	971	5
SM-F.600.600.1800.4	600	1800	862	2415	971	6
SM-F.600.600.2400.4	600	2400	862	3015	971	8
SM-F.600.600.3000.4	600	3000	862	3615	971	9
SM-F.750.750.1800.4	750	1800	1012	2465	1151	6
SM-F.750.750.2400.4	750	2400	1012	3065	1151	8
SM-F.750.750.3000.4	750	3000	1012	3665	1151	10
SM-F.900.900.1800.4	900	1800	1162	2565	1301	6
SM-F.900.900.2400.4	900	2400	1162	3065	1301	8
SM-F.900.900.3000.4	900	3000	1162	3665	1301	9
SM-F.1200.1200.2400.4	1200	2400	1462	3165	1601	8
SM-F.1200.1200.3000.4	1200	3000	1462	3665	1601	10

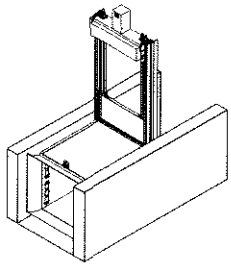
Contact Rubicon for complete mechanical dimensions or additional gate sizes. Consultation with a Rubicon engineer or agent is recommended prior to gate sizing.

A Gate size
B Maximum check height (upstream water depth); also referred to as pressure rating
C Frame width
D Overall gate height
E Box length
F Minimum number of anchors per side

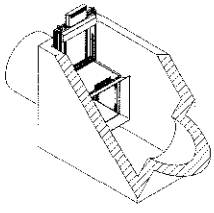
Mounting options



Headwall

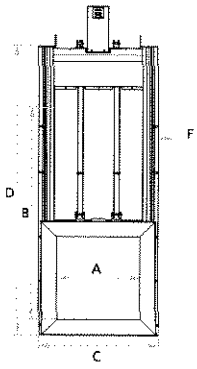


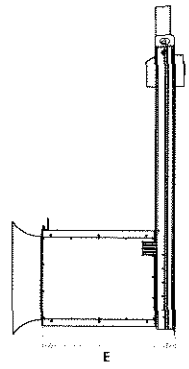
Sidewalls

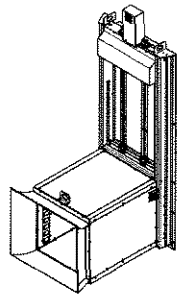


Control box

Front and side views







About Rubicon Water

Rubicon Water delivers advanced technology that optimises gravity-fed irrigation, providing unprecedented levels of operational efficiency and control, increasing water availability and improving farmers' lives.

Founded in 1995, Rubicon have more than 15,000 gates installed in TCC systems in 10 countries.

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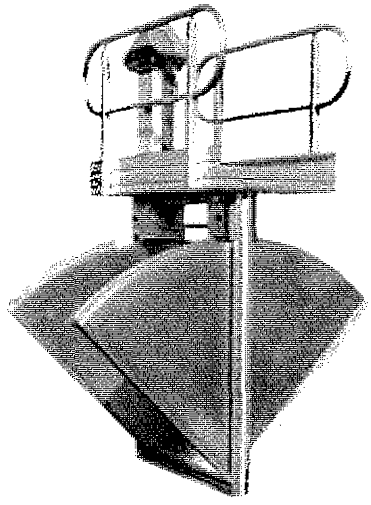
FlumeGate™

RUBICON™

Data Sheet



Overview

The FlumeGate is a combined flow measurement and control gate designed for open channel applications. Accurate flow measurement, precise motor control, power supply and radio telecommunications are fully integrated in a single device.

In free-flow or submerged conditions, flow is calculated from the gate's own measurements of upstream water level, downstream water level and gate position.

The FlumeGate can be operated as a stand-alone unit, or can coordinate with other gates along the channel to optimise the whole network's flow. It can be managed and monitored on-site or operated remotely when connected to a SCADA network.

The FlumeGate automatically controls the flow of water by varying the gate position based on a desired set-point or on irrigation demand as shown in the table.

Control objective		Gate action
Local	Position	Moves to a desired set-point and stays there
	Flow	Maintains a constant flow regardless of upstream or downstream levels
	Upstream level	Maintains a desired level in the pool immediately upstream
	Downstream level	Maintains a desired level in the pool immediately downstream
Network*	Demand	Changes the flow to match measured outflow from the network below the pool while maintaining a stable downstream water level
	Supply	Changes the flow to match the flow supplied from the network above the gate while maintaining a stable upstream water level

* Network control is only available when used with other Rubicon gates and Rubicon's NeuroFlo® network control software.

A TCC® product

The FlumeGate is one of the products making up a modular family of precision hardware and software called TCC (Total Channel Control®). TCC is an advanced technology set designed to improve the management and productivity of water in open channel distribution. Unlike traditional infrastructure, TCC products can interact and work together to help managers improve:

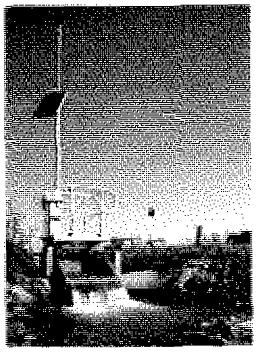
- the availability of water
- service and equity to users
- management and control
- health and safety for channel operators

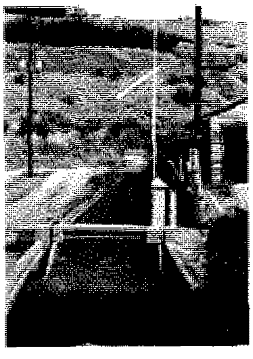
Features

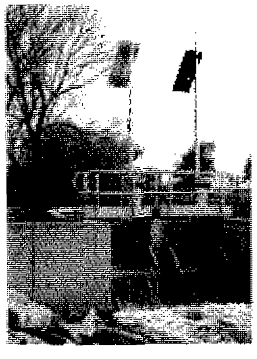
- Ultrasonic water level measurement
- Integrated flow calculation and control software
- Solar-charged or 110-240V AC charged battery system
- SCADA ready communication system
- Robust high duty cycle operation
- Overshot design for better water level control
- Not affected by sand, silt or other contaminants
- Standard sizes from 0.6m to 3m
- Optional walkways with handrails for staff safety

Ideal solution for...

- Regulating structures or service points requiring low headloss and high accuracy
- Gate modernisation projects (more cost-effective than automating an existing gate)
- Remote locations without AC power
- Highly corrosive environments including salt water
- Maintaining channel diversions or upstream water levels







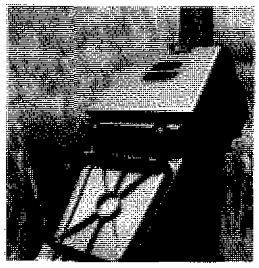
FlumeGate™

Data Sheet

Local control pedestal

Each FlumeGate installation includes a robust pedestal that provides power and control to the gate and is a secure, weather proof housing for electronic components and batteries.

The pedestal also serves as a local user interface. A keypad and LCD display are located under the pedestal lid, allowing farmers to monitor, or operators to control and troubleshoot on-site.

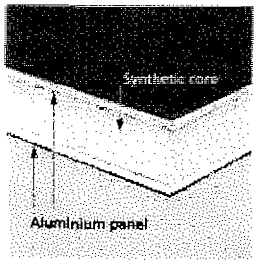


Local user interface

High strength construction

FormiPanel™ is Rubicon's high strength gate leaf construction that uses techniques adopted from the aerospace and marine industries.

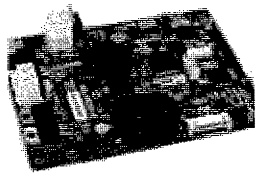
The gate panel assembly is a laminate construction that utilises high strength industrial adhesives to bond structural grade aluminium extrusions and skin plates to a synthetic core material. The result is strong, lightweight, and corrosion resistant.



FormiPanel construction

Flow measurement

The FlumeGate calculates flow using measurements of upstream water level, downstream water level and gate position, achieving independently verified measurement accuracy of ±2.5%†. This accuracy is attributed to its unique design and precision manufacture.



SolarDrive electronics

Rubicon's MicronLevel™ water level measurement sensors are housed within the internal frame. A water-tight seal separates the upstream and downstream sensors.

- Unique, integrated stilling wells unaffected by surrounding objects, debris, foam, silt or other contaminants
- Self-calibrates on every reading to eliminate drift in speed of sound variations due to changes in temperature or humidity
- Specifically designed for use in harsh irrigation channel environments

Gate control technology

CableDrive™ is Rubicon's actuation system designed to provide precision gate position accuracy and repeatability in harsh environments. The drive is a wire-rope (cable) and drum mechanism that provides positive drive in both the raise and lower directions. It is designed for high duty cycle operation and provides precise gate positioning to within ±0.5mm.

The drive is managed by Rubicon's SolarDrive® technology – a purpose built integrated circuit board that manages gate positioning, solar power regulation, battery charge and the pedestal user interface.

Low maintenance

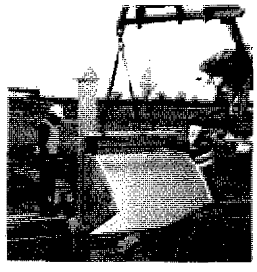
The FlumeGate's modular design allows it to be maintained in the field with minimal tools, training, and easily replaceable parts.

- Retractable level sensors allow for easy in-field servicing
- Seals can be replaced
- On-site diagnostics
- Service can be done by local Rubicon field technicians or authorised/trained independent local integrators

Easy to install

Rubicon's FlumeGate products are designed to retrofit to existing in-line regulating structures as well as purpose built emplacements significantly reducing costs associated with civil work.

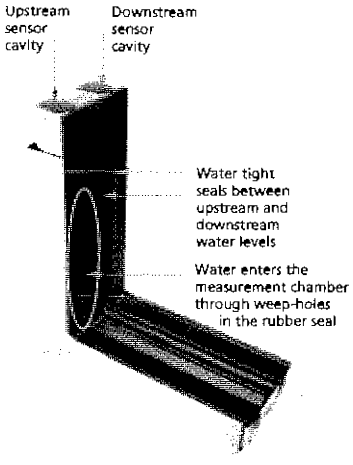
- Installed and operational in two days during irrigation or off-season
- Factory calibrated and pre-commissioned



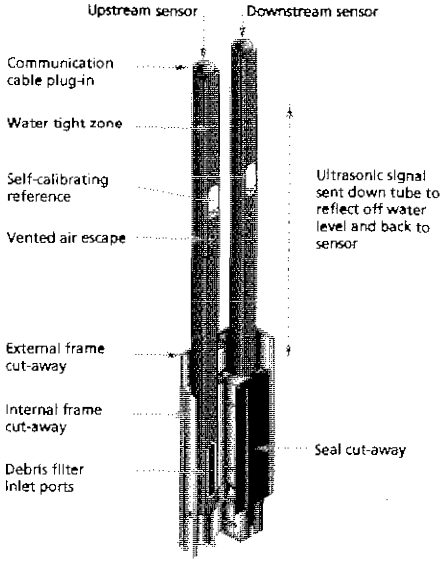
Dry install

Wet install

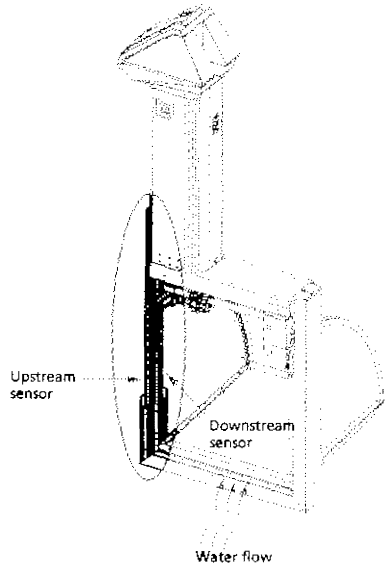
FlumeGate™ frame corner section



FlumeGate™ sensor detail



FlumeGate™ sensor location

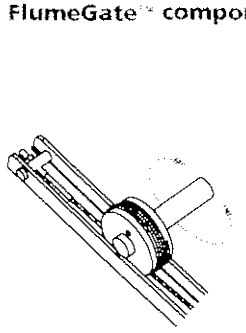


FlumeGate™ specifications

General	
Maximum flow rate	Varies by gate size, refer to flow rating table
Data interface	Local display (4 line LCD with keypad), Modbus serial, data radio
Data tags	140+ available for integration into SCADA systems
Control	Local or remote via SCADA
Drive mechanism	CableDrive™ stainless steel wire rope and cable drum assembly for precision positioning and long life
Electronics	SolarDrive® power management and control technology housed in the local control pedestal. Each unit passes a 12hr heat soak pre-stress and 100% functional test.
Typical weight	0.8m range: 100-185kg, 0.9m range: 120-195kg, 1.2m range: 115-350kg, 1.3m range: 165-325kg, 1.5m range: 145-375kg, 1.6m range: 130-385kg, 1.8m range: 160-1300kg, 1.9m range: 240-740kg, 2.4m range: 400-2000kg
Motor	12V DC
Gate position	256 count magnetic encoder
Seal performance	<0.02 litres/min per lineal metre of seal (better than the American and European standards AWWA C513 & DIN 19569)
Actuation options	12V DC powered (solar); 110-240V AC powered; manual with hand-crank or car battery
Flow measurement	
Accuracy	±2.5% †Accuracy of FG-1050-674 and FG-M-626-620 models verified by Manly Hydraulics Laboratory, January and August 2005
Sensor quantity	2 or 4 (dual redundancy)
Measurement frequency	10 seconds
Calibration method	Factory pre-calibrated and internal self-calibrating sensors
Material	
Frames	Extruded marine grade aluminium (6351-T5)
Gate panels	Composite laminate construction using marine grade 5083-H321 aluminium sheet bonded to RTM Styrofoam on 6351-T5 aluminium extrusion
Hardware	304, 316 stainless steel
Shafts	304, 316, 431 stainless steel
Seals	EDPM rubber (Durometer 70 (Shore A))
Hinge	2205 duplex stainless steel
Water level sensors	Anodized 6063-T6 grade aluminium and copolymer acetyl plastic with 316 grade stainless steel fittings and gold-plated connectors
Standards	AS/NZS 1664: Aluminium Structures, AS/NZS 1665: Welding of Aluminium Structures, AS/NZS 1170.1: Structural Design Actions – Part 1: Permanent (dead loads), Imposed (live loads) and Other Actions, AS/NZS 1170.2: Structural Design Actions – Part 2: Wind Actions
Power	
Power supply	12V DC self-contained battery charged from solar panel or AC line power
Solar panel	85W monocrystalline
Batteries	(2) or (3) 12V 28 Ampere-hour sealed gel lead acid with temperature sensor (~5yr life, provides ~5 days of operation without solar or AC line power)
Communications	
Protocols	Modbus, analog/digital outputs
Data communications	DNP3, MDLC, Modbus
Environmental	
Operating temp	-10°C to +60°C
Operating humidity	0% to 100%
Water temperature	+1°C to +50°C

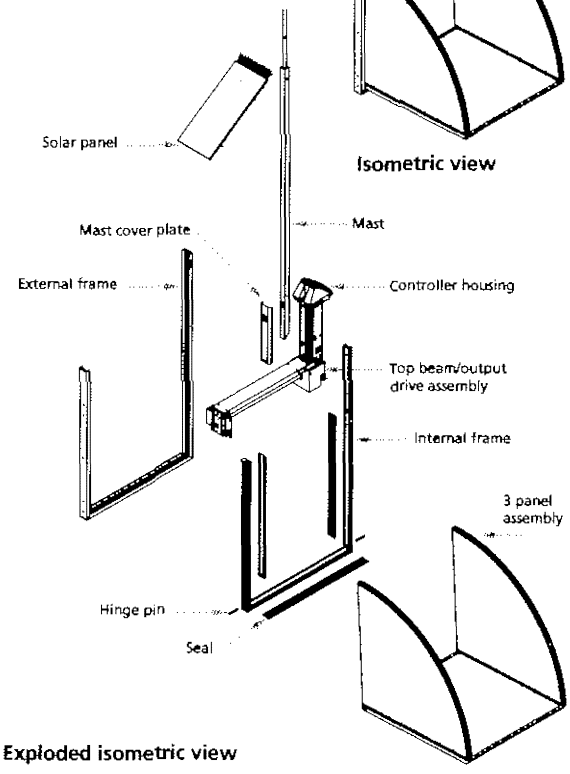
Specifications subject to change

FlumeGate™ components



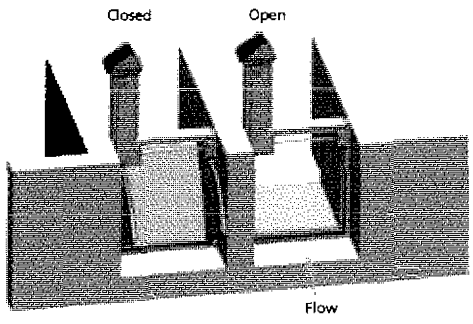
CableDrive™ mechanism

Isometric view



Exploded isometric view

Typical installation

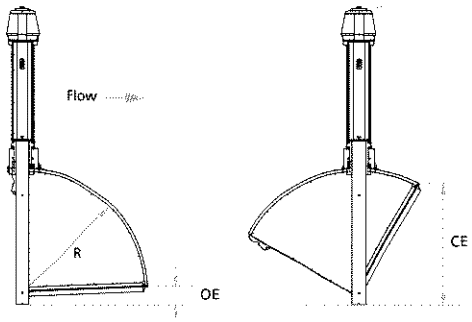


FlumeGate™ dimensions and maximum flow rates

Model	Structure width	OE	CE	HUmax	HDmax	Q_F	Q_S
	m	mm	mm	mm	mm	ML/d	ML/d
FGB-0626-0674	0.8 (2.5ft)	125	715	700	600	46	36
FGB-0626-0866		135	880	800	700	57	43
FGB-0626-1077		160	1035	1000	900	75	55
FGB-0626-1273		165	1230	1200	1100	103	72
FGB-0760-0866	0.9 (3ft)	135	880	800	700	70	53
FGB-0760-1077		160	1035	1000	900	94	68
FGB-0760-1273		165	1230	1200	1100	129	90
FGB-1050-0674	1.2 (4ft)	125	715	700	600	80	62
FGB-1050-0866		135	880	800	700	95	72
FGB-1050-1077		160	1035	1000	900	135	98
FGB-1050-1273		165	1230	1200	1100	185	129
FGB-1050-1437		190	1385	1300	1200	205	142
FGB-1050-1587		200	1535	1500	1400	255	171
FGB-1050-1804		195	1720	1700	1600	317	208
FGB-1180-0866	1.3 (4.4ft)	135	880	800	700	108	87
FGB-1180-1077		160	1035	1000	900	153	112
FGB-1180-1273		165	1230	1200	1100	210	147
FGB-1180-1437		190	1385	1300	1200	233	161
FGB-1180-1587		200	1535	1500	1400	290	195
FGB-1370-0674	1.5 (5ft)	125	715	700	600	102	79
FGB-1370-0866		135	880	800	700	127	96
FGB-1370-1077		160	1035	1000	900	180	131
FGB-1370-1273		165	1230	1200	1100	247	173
FGB-1370-1437		190	1385	1300	1200	274	190
FGB-1370-1587		200	1535	1500	1400	342	230
FGB-1370-1804		195	1720	1700	1600	426	279
FGB-1485-0620	1.6 (5.4ft)	105	615	600	500	91	73
FGB-1485-1077		160	1035	1000	900	197	143
FGB-1485-1273		165	1230	1200	1100	269	188
FGB-1485-1437		190	1385	1300	1200	294	204
FGB-1485-1587		200	1535	1500	1400	373	251
FGB-1485-1804		195	1720	1700	1600	464	305
FGB-1675-0674	1.8 (6ft)	125	715	700	600	126	98
FGB-1675-0866		135	880	800	700	157	119
FGB-1675-1077		160	1035	1000	900	223	162
FGB-1675-1273		165	1230	1200	1100	305	214
FGB-1675-1437		190	1385	1300	1200	335	232
FGB-1675-1587		200	1535	1500	1400	425	286
FGB-1675-1804		195	1720	1700	1600	529	347
FGB-1675-2186		413	2200	2200	2100	658	418
FGA-1675-3038		475	2912	2900	2800	957	576
FGB-1790-1077	1.9 (6.4ft)	160	1035	1000	900	240	174
FGB-1790-1587		200	1535	1500	1400	456	307
FGB-1790-2186		413	2200	2200	2100	708	450
FGB-2268-1587	2.4 (8ft)	200	1535	1500	1400	586	394
FGB-2268-2186		413	2200	2200	2100	918	583
FGA-2268-3038		475	2912	2900	2800	1368	823

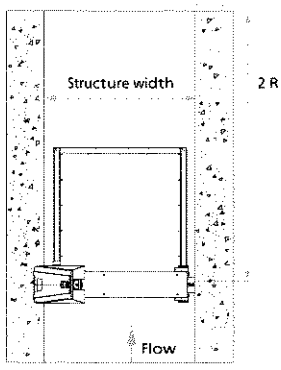
Contact Rubicon for complete dimensions and flow rating tables.
Consultation with a Rubicon engineer or agent is recommended prior to gate sizing.

OE	Fully open gate elevation
CE	Fully closed gate elevation (checking height)
Structure width	Compatible structure width
HUmax	Maximum upstream water level (CE – freeboard)
HDmax	Maximum downstream water level
Q_F	Maximum flow at freefall condition (HU=HUmax, HD=0)
Q_S	Maximum flow at fully submerged condition (HD=HDmax)
R	Gate radius

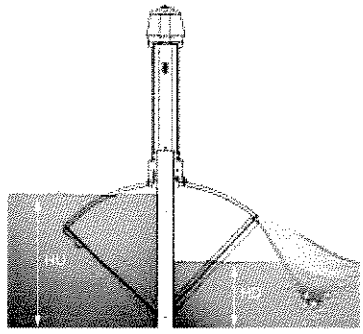


Side view – fully open

Fully closed



Plan view – fully open



Upstream and downstream water levels

About Rubicon Water

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Email: enquiry@rubiconwater.com

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www.rubiconwater.com

DS-FG-06/13-AU

Appendix F — Letters of Support for the Project

December 16, 2015

Madera Irrigation District
Attn: Thomas Greci, General Manager
12152 Road 28 ¼
Madera, CA 93637

Re: 2016 WaterSMART Grant Application R16-FOA-DO-004

The City has a history of supporting worthwhile efforts such as this that seek to conserve one of our most precious natural resources. To that end, I support the Madera Irrigation District's application to obtain the WaterSMART: Water and Efficiency Grant from the U.S. Department of the Interior Bureau of Reclamation. It represents a noteworthy and effective example of MID's commitment to water conservation.

The District's efforts to conserve our limited water resources and improve our local agriculture are commendable. I would encourage the Bureau of Reclamation to consider this funding request and provide financial support. Recent drought years have been hard on local farms and families. Anything that can be done to conserve irrigation water is a high priority.

Sincerely,

Keith Helmuth, P.E.
City Engineer

Engineering
205 W. Fourth Street • Madera, CA 93637 • TEL (559) 661-5418 • FAX (559) 675-6605
www.madera-ca.gov

COUNTY OF MADERA
PUBLIC WORKS DEPARTMENT

AHMAD M. ALKHAYYAT
INTERIM DIRECTOR

200 West 4th Street
Madera, CA 93637
Main Line - (559) 675-7811
Special Districts - (559) 675-7820
Fairmead Landfill - (559) 665-1310

January 13, 2016

Madera Irrigation District
Attn: Thomas Greci, General Manager
12152 Road 28 ¼
Madera, CA 93637

Re: 2016 WaterSMART Grant Application R16-FOA-DO-004

Madera County supports the Madera Irrigation District's (MID) application to obtain the 2016 WaterSMART: Water and Efficiency Grant from the U.S. Department of the Interior – Policy and Administration, Bureau of Reclamation.

The drought has been very detrimental to agencies, farmers, and residents throughout Madera County. MID's efforts to conserve the County's limited water resources and improve our local agriculture are highly regarded. We encourage the Bureau of Reclamation to consider this funding request and provide financial support for such an important project for the Madera groundwater subbasin.

Sincerely,

Ahmad Alkhayyat, P.E.
Interim Public Works Director

GRAVELLY FORD WATER DISTRICT

18811 Road 27· Madera, CA 93638 (559)·474·1000 Fax: (559) 673· 1086

December 14, 2015

Madera Irrigation District
Attn: Thomas Greci, General Manager
12152 Road 28 ¼
Madera, CA 93637

Re: 2016 WaterSMART Grant Application R16-FOA-DO-004

The Gravelly Ford Water District supports the Madera Irrigation District's application to obtain the 2016 WaterSMART: Water and Efficiency Grant from the U.S. Department of the Interior - Policy and Administration, Bureau of Reclamation.

Madera's efforts to conserve our basins limited water resources is critical to the overall wellbeing of the entire urban and agricultural area of Madera. We encourage the Bureau of Reclamation to consider this funding request and provide financial support for such an important and necessary project for the Madera ground water basin. Recent drought years have had a significant impact on local farms and families, as well as the City of Madera. Anything that can be done to assist in the conservation of irrigation water is of high priority and will be of benefit to the entire Madera Irrigation District area, as well as adjacent neighbors. We urge you to give the utmost consideration to Madera's request for such a worthwhile grant application.

Sincerely,

Don Roberts, P.E.
Manager
Gravelly Ford Water District

TULARE IRRIGATION DISTRICT

6826 Avenue 240 ◆ Tulare, California 93274 ◆ Telephone (559) 686-3425

December 10, 2015

Thomas Greci, General Manager
Madera Irrigation District
12152 Road 28 1/4
Madera, California 93637

Subject: Madera Irrigation District – USBR WaterSMART Grant Application

Dear Mr. Greci:

The Tulare Irrigation District (TID) supports the efforts of the Madera Irrigation District (MID) in their pursuit of a WaterSMART grant application from the United States Department of the Interior, Bureau of Reclamation (Bureau). This grant application involves the development of increased water management efficiency, by installing automated control structures and Supervisory Control and Data Acquisition (SCADA) equipment. TID, through its experience with similar projects, believes strongly that this project will be an effective tool for efficient water management. TID began its SCADA and automation program approximately 10 years ago and has continued to expand each year, also with the assistance of Bureau grant funding. The benefits that TID has experienced include water savings and an increased flexibility in managing water to meet grower demands.

TID recognizes the importance of sound water management and conservation projects, and the significant role they play in stabilizing the local water supply. TID and MID have a long history of coordinating water management projects and programs aimed at managing water supplies in our respective regions to efficiently meet local demands. The SCADA and automation project being proposed by MID is a project that will support current and future efficient water management practices. TID strongly encourages the Bureau to consider funding MID in their pursuit of this grant application.

Sincerely,

J. Paul Hendrix

J. Paul Hendrix
General Manager

Appendix G — Board Resolutions

JANUARY 12, 2016
RESOLUTION NO. 2016-04

RESOLUTION OF THE BOARD OF DIRECTORS,
MADERA IRRIGATION DISTRICT
IN SUPPORT OF ITS PROPOSAL FOR FUNDING UNDER THE
WATERSMART: WATER & EFFICIENCY GRANTS
FOR THE INSTALLATION OF AUTOMATED CONTROL GATES CONNECTED
TO THE DISTRICT'S SCADA SYSTEM

RESOLVED by the Board of Directors ("Directors") of the Madera Irrigation District ("District"), at a special meeting duly called and held on January 12, 2016, at the business office of the District, 12152 Road 28 1/4, Madera, California 93637 as follows:

WHEREAS, the U.S. Department of the Interior Bureau of Reclamation ("Reclamation") is requesting proposals for water use efficiency activities from the WaterSMART: Water Efficiency Grants for FY 2016; and

WHEREAS, the District is submitting a grant proposal to Reclamation under Funding Opportunity No. R16-FOA-DO-004 WaterSMART: Water and Efficiency Grant for the installation of automated control gates connected to the District's SCADA system; and

NOW, THEREFORE, BE IT RESOLVED, that the Board of Directors of the Madera Irrigation District supports the grant proposal for the installation of automated control gates connected to the District's SCADA system.

BE IT FURTHER RESOLVED, that the Board of Directors hereby delegates the legal authority to General Manager Thomas Greci to negotiate with Reclamation, and enter into a final agreement with Reclamation, subject to the approval of General Counsel, to allow the District to receive the requested WaterSMART grant.

BE IT FURTHER RESOLVED, that the Board of Directors finds the District is capable of providing the amount of funding and/or in-kind contributions specified in the funding plan, and agreeable to providing such funding and in-kind contributions as a condition of receiving the requested WaterSMART grant.

BE IT FURTHER RESOLVED, that if selected for funding, the Board of Directors declares that the District will work with Reclamation to meet established grant deadlines.

THE FOREGOING RESOLUTION WAS DULY AND REGULARLY ADOPTED by the Madera Irrigation District Board of Directors, at a special meeting of the Board held on the 12th day of January, 2016, by the following vote:

AYES:	Directors Davis, Erickson, Loquaci, Cosyns, and Janzen
NOES:	None
ABSENT:	None
ABSTAIN:	None

Carl Janzen, President

ATTEST:
Richard Cosyns, Vice President

CERTIFICATE OF SECRETARY

The undersigned Secretary of the Board of the Madera Irrigation District hereby certifies that the foregoing is a full, true and correct copy of Resolution No. 2016-04 adopted January 12, 2016.

Andrea Kwock Sandoval, Secretary

MADERA IRRIGATION DISTRICT
ORGANIZED
JAN. 12 1920