

McMullin Area Groundwater Sustainability Agency

Optimizing Water and Energy Efficiency by the Addition
of Precision Metering with Real-Time Remote Telemetry

(You Can't Accurately Manage What You Can't Accurately Measure)

WaterSMART Water and Energy Efficiency Grant

Grant Application FOA# R23AS00008

Funding Group III



McMullin Area
Groundwater Sustainability Agency

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TECHNICAL PROPOSAL AND EVALUATION CRITERIA

EXECUTIVE SUMMARY

Estimates and Educated Guesses are the tools of fools when attempting to hone the efficient consumption of either water or energy in a limited supply regime. A variation in data reliability of even five percent (5%) can skew results by a wide margin. In irrigation groundwater pumping, management and field application, precise, reliable, and temporally relevant data provide the only effective means to achieve the optimal efficiency for either resource. In this applicant's case, the efficient consumption (or savings) of water yields an equally efficient consumption (or savings) of energy. A win-win! With this application, the McMullin Area Groundwater Sustainability Agency (MAGSA) proposes to deploy a comprehensive groundwater well measurement and monitoring array with a telemetrically supported data collection system for the purpose of providing the most accurate, real-time data inputs available to its algorithm assisted water and energy management optimization software for all high capacity agricultural groundwater extraction wells within the boundary of its Groundwater Sustainability Agency (GSA) near Fresno, California. When installed and fully operational, will facilitate the reduction of existing groundwater overdraft (saving both water and energy) and secondarily support and enhance other groundwater sustainability features identified in the GSA's Groundwater Sustainability Plan (GSP).

MAGSA, located in central California and covering 120,635 acres (or approximately 190 square miles), was formed in response to the Sustainable Groundwater Management Act (SGMA) passed into law in California in 2014, which, unless additional water resources become available, will ultimately serve to involuntarily limit groundwater withdrawals in the area. The MAGSA Groundwater Sustainability Plan (GSP) was submitted to the State of California on January 28, 2020 (with a follow on newly revised version currently being submitted in July 2022) outlining its plan to achieve groundwater sustainability by no later than 2040, as required by the Act. One identified goal, as discussed below, is to reduce total groundwater extraction and application by approximately 9 inches per acre (91,100 acre-feet annually across the entire area) in pursuit of sustainability for the groundwater supply. Unfortunately, because the MAGSA area has been reliant historically on groundwater only, and no overlying agency existed (prior to the formation of MAGSA) to assist, no measurement or monitoring regime was ever established. MAGSA has identified several proven methods to provide the outputs for enhanced irrigation efficiencies and to inform the pumping reduction and optimal application function, but the continuing lack of reliable, accurate and timely inputs for the supply part of the equation has left MAGSA with rough estimates (or guesstimates) with which to attempt to manage toward the achievement of its goals.

Again, the intent of this application will be to gain Bureau of Reclamation assistance as we acquire the best available measurement and monitoring hardware and work aggressively toward physically equipping each and every irrigation well within the GSA boundary with a telemetry-enabled and connected electromagnetic flow meter for real-time data collection and transmission to groundwater managers for subsequent inclusion in MAGSA's currently available solution methodologies to perfect the achievement of optimal field application, resulting in both precision water and energy saving irrigation scheduling at the individual parcel level.

Important additional background on MAGSA is that it has significant historical and continuing water supply issues including loss of groundwater storage resulting from basin-wide groundwater

overdraft, declining local groundwater levels, potential for declining water quality, lack of permanent surface water supply and potential land subsidence. Included within the GSP are a number of proposed actions and projects aimed at incrementally reducing the negative impacts associated with each of these “Undesirable Results.” In addition to the project described above, one such action MAGSA is considering is the implementation of a water marketing or trading platform and associated strategy for groundwater users within the GSA. MAGSA was previously successful in obtaining a WaterSMART water marketing grant from the Bureau of Reclamation in 2018 to assess the best methodologies for achieving that type of system. The resulting report from that study concluded that a marketing platform also will be a key component to more efficiently and accurately manage groundwater use reductions to meet goals set forth in the MAGSA GSP. The report cited the critical nature of accurate metering of groundwater withdrawals, establishment of a verifiable, data-supported allocation system, and the ability to transmit real-time pumping data electronically with telemetry as a base requirement in implementing this system. This proposal, while providing for the acquisition of the electromagnetic meters and associated telemetry identified in the preceding paragraph as benefit #1, will also allow for the ability to utilize the same hardware as a key component of this innovative water marketing program, resulting in a multi-benefit enhancement to MAGSA’s efforts.

BACKGROUND DATA

MAGSA was formed in 2017 pursuant to the 2014 Sustainable Groundwater Management Act (SGMA) of the State of California. SGMA requires governments and water agencies of high- and medium priority basins to halt overdraft and bring groundwater basins into balanced levels of pumping and recharge. For critically over-drafted basins, including the Kings Sub-basin where MAGSA is located, the deadline for achieving sustainability is 2040.

MAGSA was formed as a Joint Powers Authority (JPA) that is comprised of the County of Fresno, the Raisin City Water District, and the Mid-Valley Water District (MVWD). The County of Fresno has land use authority over the portion of the basin that MAGSA intends to manage. The Mid-Valley and Raisin City Water Districts are California Water Districts formed under the provisions of Water Code §§34000-38500 with the ability to acquire, plan, construct, maintain, improve, operate, and keep in repair the necessary works for production, storage, transmission, and distribution of water for irrigation, domestic, industrial, and municipal purposes.

The JPA gives MAGSA the authority to fulfill the role of a GSA for the McMullin area and to develop, adopt and implement a Groundwater Sustainability Plan (GSP). Mid Valley Water District and Raisin City Water District are both local public agencies.

The MAGSA Joint Powers Authority provided notice to DWR as required by Water Code section 10723.8, establishing MAGSA as the **exclusive** GSA pursuant to Water Code §§10723.8(c) for purposes of managing groundwater under Water Code §§10720 et seq. (the Sustainable Groundwater Management Act of 2014 or SGMA) for the portion of the Kings Sub-basin that lies within the boundaries of the GSA, as seen in **Figure 1**, “Groundwater Sustainability Agencies in the Kings Sub-basin.” The JPA, through reference to and incorporation of SGMA, empowers MAGSA to develop and implement a GSP to achieve sustainable groundwater management within its boundaries, in compliance with the mandates and timelines contained in SGMA. Accordingly, through the SGMA notification process, MAGSA has been deemed the exclusive GSA within the

designated territory empowered to sustainably manage the McMullin area of the Kings Sub-basin in compliance with SGMA.

On January 28, 2020, MAGSA and the six other GSAs in the Kings Sub-basin jointly submitted their Groundwater Sustainability Plans (GSP) to the Department of Water Resources for initial review. Pursuant to SGMA legislation, completion of this action immediately and fully vested all the oversight and enforcement powers of a GSA with the MAGSA. Included within that GSP is an obligation for MAGSA, as its part of the Sub-basin reduction and elimination of overdraft, to reduce, within its boundary, the groundwater overdraft by an annual average of 91,100 acre-feet per year (either through acquisition of additional surface water resources or reduction in groundwater pumping demand).

The MAGSA Board has adopted a phased approach to sustainability, allowing a landowner maximum flexibility to adjust and continue to survive and thrive over the 20-year implementation period. The goal of reducing groundwater overdraft by 91,100 AF/yr. has been divided into phases. The Phase 1 target amount is a 10% reduction or 9,110 AF/yr. by 2025. Each 5-year period thereafter, the target will increase (i.e. 30% by 2030, 60% by 2035 and 100% by 2040). To provide for verification of achievement of these goals, the MAGSA Board of Directors passed on October 6, 2021 the Rules and Regulations related to groundwater well metering and measurement which requires all groundwater wells designed to produce more than two (2) AF/year within MAGSA to be outfitted with compliant electromagnetic flow metering devices on or before January 31, 2025.

The MAGSA Board and Staff have begun development of additional plans to accelerate work toward achieving these targets through implementation of management actions and projects and programs identified in the GSP, such as implementation of enhanced irrigation efficiency conservation practices, a robust groundwater extraction data gathering and management system for water marketing, establishment of a groundwater bank, and accurate groundwater level observation for evaluating change in storage in the local aquifer, among others. The Board continues to strongly encourage involvement and input by landowners and stakeholders in fleshing out the most effective groundwater sustainability programs that can immediately be implemented.

During FY'22 MAGSA was selected as one of fifteen (15) new WaterSMART Initiative (WSI) areas targeted for the NRCS Environmental Quality Incentive Program (EQIP) funding to complement Bureau of Reclamation WaterSMART Projects. With the additional NRCS assistance, individual farmers in the MAGSA area will be able to improve soil moisture management through addition of soil moisture probes, cover cropping, reduction of evapotranspiration losses by conversion from flood irrigation to low pressure sprinkler systems, and reduction of groundwater withdrawals allowing for conserved water to be available for use during droughts. In addition to the water savings and drought resilience benefits, EQIP funding will also help them improve crop productivity and health.

Permanently installed totalizing electromagnetic flow meters with remote telemetry capabilities are the common lynchpin and indisputable foundation for all MAGSA water (and associated energy) conservation. Meters with telemetry will not only accurately quantify the volume of water pumped and applied to crops, but also will be central in providing the data necessary to identify the optimal timing related to crop water needs. MAGSA, as a partner with irrigation software specialists, Irrigation for the Future (IFF), with over 40 years in university level academic modeling, analysis and field testing, is also a participant in a FY'21 Conservation

Innovation Grant (CIG) through the USDA-NRCS to pilot, in conjunction with a group of MAGSA farmer landowners, the implementation of a program known as Irrigation Management Optimization (IMO) on their fields. IFF is an advanced irrigation management consulting services and software development company specializing in research, tools and training for economic optimization (water, energy and production) of irrigated agriculture. This service will facilitate actual water savings through an advanced water management tool, absolutely reliant upon the real-time inputs received from the metering and telemetry which are the subject of this grant request, to produce directive outputs targeted toward reduction of water and energy overuse and to optimize scarce groundwater resources within MAGSA.

MAGSA has a successful history of working cooperatively with the Bureau of Reclamation. In 2018, MAGSA was awarded a WaterSMART Water Marketing grant from the Bureau to assess conditions and provide planning information to prepare for future groundwater marketing (trading) within the district. In 2020, MAGSA was awarded a WaterSMART Small-Scale Water Efficiency grant to deploy remote telemetry equipment on 23 Indicators wells for gathering groundwater observation data in the district. Unfortunately, the State of California has not prioritized funding for permanently installed irrigation flow meters for groundwater sustainability. **The funds associated with this grant opportunity are critical for the successful implementation of a metering and monitoring program that (with telemetry-enabled water meters) will enhance irrigation efficiency for water savings, energy savings and improved overall groundwater management in MAGSA.**

PROJECT LOCATION

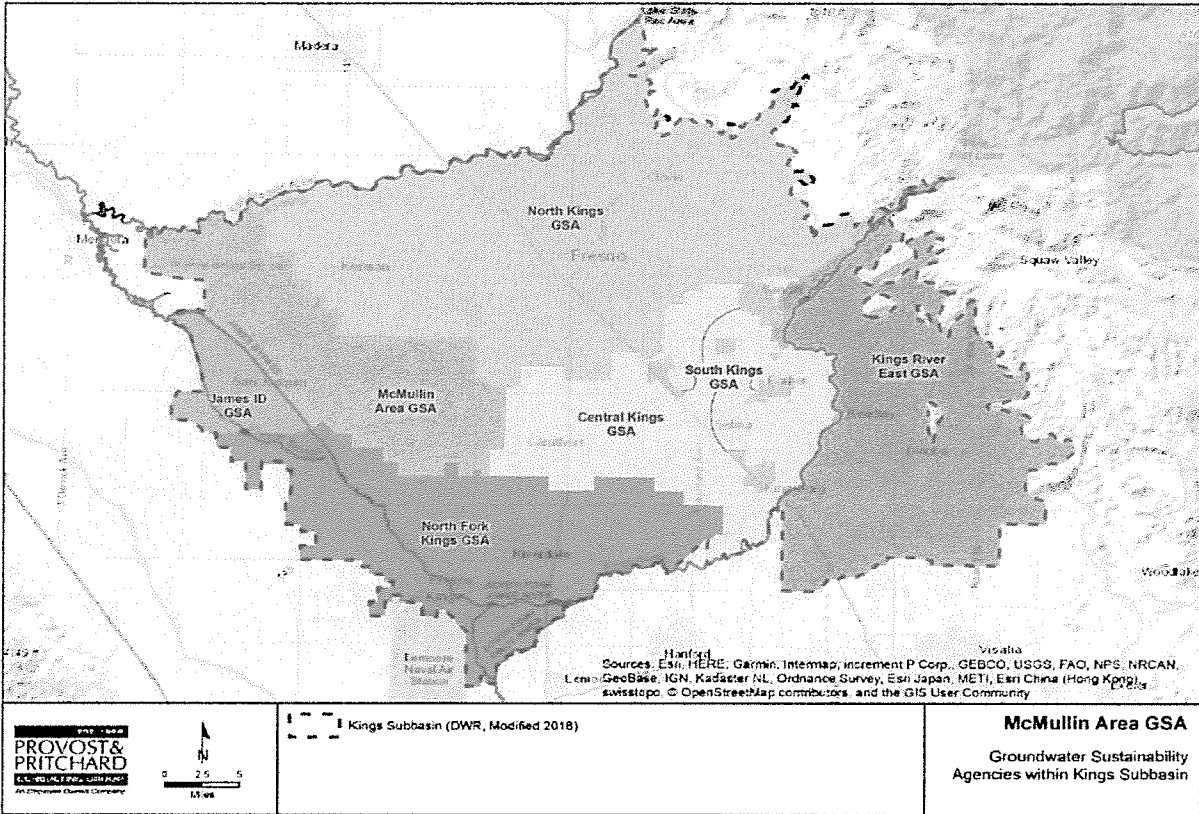
The Kings Sub-basin is located within the southern part of the San Joaquin Valley Basin in the Central Valley of California. It is bordered by five groundwater sub-basins which include the Madera, Kaweah, Tulare Lake, Westside, and Delta-Mendota Sub-basins. MAGSA is located near Kerman, CA in western Fresno County bordered on the west by the James Bypass (Kings River) and on the north by the San Joaquin River. MAGSA administers the Groundwater Sustainability Plan (GSP) for wells in a portion of Fresno County. MAGSA is one of seven GSAs within the Kings Sub-basin as shown in **Figure 1: Groundwater Sustainability Areas in the Kings Sub-basin.**

The district covers around 120,635 acres in Fresno County. District boundaries include three other public entities including the Mid-Valley Water District (MVWD), Raisin City Water District (RCWD) and Fresno County.

The area consists of a combination of large and small farming operations that host permanent crops and annual row crops. Farmed agricultural land represents a large majority of the total area. Farm operations within the area include vineyards, almonds, alfalfa, dairy farms, poultry farms, and various row crops. Agricultural lands represent the vast majority of the district with 92% of the land use area. Residential areas (single-family rural dwellings) occupy only about 1 percent of the total area. A few industrial units which comprise manufacturing assembly processing units and storage and distribution units reside in the district.

Figure 1

Groundwater Sustainability Areas in the Kings Sub-basin

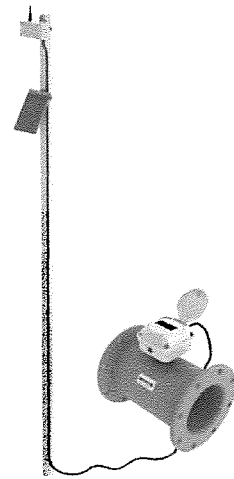


TECHNICAL PROJECT DESCRIPTION

A successful grant award will allow MAGSA to acquire hardware consisting of permanently installed electromagnetic flow meters with telemetry hardware providing remote access and automated data acquisition capabilities capable of providing water use and environmental data in near real-time to agricultural water users for optimal field level irrigation water management (and appurtenant water and energy savings through optimization) as well as to district water managers to assist in quantifying overall extractions in compliance with the SGMA requirements and in implementation of an innovative water marketing and trading program. Water savings will be realized on the farm level as well as on a watershed/basin level for groundwater uses in MAGSA. In addition, water use will be accurately measured with permanently installed totalizing flow meters rather than broadly “guesstimated” by other methods. Intuitively, use of sweeping generalities and widely varying data (i.e., satellite data, crop ET data, etc.) cannot provide the critical precision that is associated with the capital equipment proposed in this application.... once again, “you can’t accurately manage what you don’t accurately measure.” Water conservation and overuse reduction are so critical to MAGSA that it cannot afford to operate in a realm of educated guesses.

MAGSA will require flowmeters with telemetry on all wells, but more specifically as a prerequisite for those wells that will participate in the water marketing program, with sooner rather than later being the objective. Following the successful completion of a recent well registration program within the district, it is estimated that 1,075 **active** irrigation wells currently exist within the district. This project will deploy totalizing electromagnetic flow meters with telemetry on approximately **925** of the groundwater wells representing the vast majority of actively pumping large capacity wells in MAGSA. The remote telemetry units (RTUs) also have the capability of accepting other water management sensors such as rain gages and other weather-related data inputs for enhanced local irrigation water management. Weather stations are also part of the capital hardware being requested hereunder.

Weather stations for local crop water use will be placed throughout the district for spatial representation of local evapotranspiration (ET). All water use data (meter totalizer data), crop water use (ET), and data from any other water management sensors will be forwarded to farmers through a web-based server on a single website accessible via personal computer or smartphone for on-farm irrigation water conservation.



Real-time telemetry connected to these additional water management sensors will aid producers in their on-farm water management decisions. The application of telemetry to irrigation flow meters and other water management sensors will provide valuable tools to farmers for irrigation management by allowing them to schedule irrigation events based on real-time local measurements of crop water use gathered by local weather stations deployed under this proposal.

Water measurement tools and methods to be utilized under the project are proven, including the Water Balance or Checkbook Method that is a proven tool for irrigation scheduling. The premise of the tool is to balance water being extracted from the soil (via evaporation and plant transpiration) with water being added to the soil (via irrigation and rainfall). Typically, automated weather stations are used to measure specific environmental conditions and then specific formulas are used calculate reference ET and/or estimate effective rainfall. Crop specific coefficients will be applied to ET values to fine-tune water use. When used consistently with reliable field data, the water balance index can show growers how closely their irrigation practices are meeting the current plant water use demand.



The initial analysis of the MAGSA Water Marketing program was funded through a 2018 WaterSMART grant awarded by the US Bureau of Reclamation. The water marketing program, with respect to groundwater, will focus on a credit system to allocate groundwater resources among landowners within the GSA. Under a groundwater credit system, landowners would be given a groundwater allocation to either keep, trade, or sell to other landowners within the GSA.

The analysis indicates an absolute prerequisite of permanently installed meters providing accurate measurements of groundwater extractions with real-time telemetry. This will be essential for transactions in the marketing program and allocations in MAGSA. Telemetry-enabled electromagnetic meters will be installed on all production wells in the marketing program as a requirement. In addition to improving on-farm water management, real-time telemetry will also enable MAGSA to facilitate water credits traded among users. To make this possible, the MAGSA Board of Directors passed measurement rules and regulations on October 6, 2021 requiring the installation of district-approved meters on high-capacity wells by January 31, 2025.

A well-designed marketing program will improve water use efficiency and provide flexibility for MAGSA landowners. Once the marketing program has been fully developed, coordination with other agencies that could potentially market water to MAGSA will be initiated. The water marketing program will include outreach, coordination, and studies with several water agencies to facilitate potential water transfers into MAGSA. MAGSA will be prevented from implementing its water marketing program until enough meters are installed on large capacity wells. The next step is to equip all large capacity production wells in the GSA with the equipment necessary to allocate water and trade water credits to maintain groundwater pumping under sustainable levels.

Since the NRCS WSI program will tend to fund larger contracts with large-scale irrigation practices, the number of meters funded through that program will be limited. MAGSA staff and Board of Directors estimate that only **150** meters (approximately 15% of landowners) with telemetry will be funded by the NRCS EQIP program through the WaterSMART Initiative (WSI) Project. This program will implement water savings practices such as Irrigation Flow Meters with Telemetry, Soil Moisture Sensors, Micro-drip irrigation, Underground Pipelines, and Integrated Evapotranspiration. These farms will also have the opportunity to implement Irrigation Management Optimization (**IMO**) on their farms for additional water savings through advanced irrigation scheduling with an organization called Irrigation for the Future (IFF). IFF is an advanced irrigation management consulting services and software company specializing in research, tools and training for economic optimization of irrigated agriculture.

Unfortunately, this will leave the vast majority of the district unmetered. Through one of the first successful well registration programs in the State of California, MAGSA staff has registered **978** high-capacity irrigation wells within the GSA. MAGSA Staff estimate that approximately another 8-10% of irrigation wells may remain unregistered for a total of **1,075** wells that will need to be metered. This proposal will provide funding to equip the remaining **925 wells** with meters and telemetry and will affect most of the water pumped in the GSA for groundwater conservation.

EVALUATION CRITERIA

Evaluation Criterion A—Quantifiable Water Savings: *Up to 28 points may be awarded for this criterion.*

This criterion prioritizes projects that will conserve water and improve water use efficiency, supporting the goals of E.O. 14008. Points will be allocated based on the quantifiable water savings expected as a result of the project. Points will be allocated to give greater consideration to projects that are expected to result in more significant water savings.

All applicants should be sure to address the following:

Describe the amount of estimated water savings. For projects that conserve water, please state the estimated amount of water expected to be conserved (in acre-feet per year) as a direct result of this project. Please include a specific quantifiable water savings estimate; do not include a range of potential water savings.

Average annual water consumptive use in MAGSA is estimated at **303,800 AF/yr.** as stated in the MAGSA GSP. This estimate is based upon the best information available including urban water demands for wet and dry years, agricultural water demands based on 2014 DWR land use mapping, surface water supplies, and other variables assumed to be consistent with the historical water budget. Additionally, the annual groundwater recharge to the local aquifer is estimated at 240,000 AF/yr. creating an average annual deficit in aquifer storage. The current acreage within MAGSA is **120,635 acres.** The projected calculated water use in the district would be approximately **2.52 AF/ac/year** (please refer to calculations in subsection C of this Criterion).

Water measurement tools and methods to be utilized under the project are proven, including the Water Balance or Checkbook Method that is a well-known tool for irrigation scheduling. The premise of the tool is to balance water being extracted from the soil (via evaporation and plant transpiration) with water being added to the soil (via irrigation and rainfall). Typically, automated weather stations are used to measure specific environmental conditions and then specific formulas are used to calculate reference ET and/or estimate effective rainfall. Crop specific coefficients will be applied to ET values to fine tune water use. When used consistently with reliable field data, the water balance index can show growers how closely their irrigation practices are meeting the current plant water use demand. The routine use of irrigation

scheduling, which will be made easier and more effective by supplying crop water demand information available under the proposed project, was shown to reduce water applications by 11 percent in Nebraska (Kranz et al., 1992).

Once the large capacity wells in MAGSA are metered with permanently installed totalizing flowmeters, a much more accurate characterization of the local groundwater use will be achieved. The MAGSA Board of Directors and Staff estimate that once electromagnetic flow metering with telemetry is deployed across the district, minimum groundwater savings of **6.35%** will be achieved through improved irrigation water management. This percentage of actual water savings was achieved by a groundwater management district in Nebraska, Middle Republican Natural Resources District, where real-time data (utilizing identical technology as proposed herein) on water use was delivered directly to irrigators in a USBR funded project for on-farm irrigation water management. (MRNRD, 2021)

In addition, irrigators in MAGSA will also have access to implement **Irrigation Management Optimization (IMO)** in cooperation with Irrigation for the Future (IFF) thanks to a CIG grant from the USDA-NRCS. IMO is an advanced irrigation software management and modeling tool for irrigation scheduling where water is expensive or limited. Utilizing inputs from fully calibrated electromagnetic meter inputs through remote telemetry delivery, IMO calculates the marginal productivity of water for a field and then produces irrigation strategies for the most efficient use of water. Irrigators will use IMO to define and target different irrigation amounts and timing strategies for individual fields, plan and manage a season, and determine the best use of limited available water considering economic productivity. IFF has experienced water savings of 10-15% when consulting irrigators in deficit irrigation situations. The installation of permanently installed totalizing flow meters with telemetry will not only quantify water pumped and its timing of application but will also facilitate water savings through implementation of Irrigation Management Optimization, saving water from over-application. A conservative estimate of water savings of the lower of the projected range, or ten percent (10%) has been utilized herein for savings calculations. **See Appendix F.**

In the first 10 years of implementation of its GSP, MAGSA has chosen to focus on efficiencies achieved in MAGSA through better water management and water resource development as a near term solution. Utilizing averaging between the very conservative 6.35% and 10% estimates associated with each of the proposed management technologies expected to utilize the precision data inputs generated by the electromagnetic meters and associated remote telemetry, water savings (and associated groundwater energy costs associated with groundwater pumping) for this proposal is expected to yield at least **8.12%** water savings or a reduction in groundwater use of **0.20 AF/ac/yr.** This is reasonable since water optimization practices learned through the IMO program are expected to be extrapolated across MAGSA upon the conclusion of this grant project.

$$(2.52 \text{ AF/ac/yr.}) (8.12\%) = \mathbf{0.20 \text{ AF/ac/yr.}}$$

This project is expected to affect **102,540** acres or **85%** of the acreage in the district which would then conserve **20,508 AF/yr.**

$$(0.2 \text{ AF/ac/yr.}) (102,540 \text{ ac}) = \mathbf{20,508 \text{ AF/yr.}}$$

One Hundred Fifty (**150**) farms are expected to participate in the WaterSMART Initiative through the USDA-NRCS and implement water savings practices such as Irrigation Flow Meters

with Telemetry, Soil Moisture Sensors, Micro-drip irrigation, Underground Pipelines, and Integrated Evapotranspiration. These farms also could implement Irrigation Management Optimization (IMO) on their farms for additional water savings through advanced irrigation scheduling. These 150 farms are expected to represent 18,095 acres or 15% of the acres in MAGSA. 10% water savings is projected on these 18,095 acres due to the increased level of management for an estimated **4,559.94 AF/yr**. An additional benefit of this program is that these practices may be replicated on other farms by cooperators not in IMO sponsored by the USDA-NRCS CIG program.

$$(18,095 \text{ ac}) (2.52\text{AF/ac}) (10\%) = \mathbf{4,559.95 \text{ AF/yr}}$$

A summary of the annual water savings from each of these separate, but connected programs is expressed in the chart below:

Water Savings (AF/yr)	Water Conservation Program
20,508	FY'23 WaterSMART Grant
4,559.95	USDA-NRCS WSI/CIG

Intuitively, appropriate funding from the Bureau’s Water and Energy Efficiency Grant program is essential for expedited accomplishment of the installation of totalizing flow meters with telemetry and other water management sensors to facilitate and quantify the groundwater management and conservation in MAGSA for the above-mentioned programs. Without the ability to measure the inputs to the water and energy saving methodologies MAGSA already has, MAGSA remains unable to adequately provide the savings anticipated. A (meter inputs) + B (available methodologies already in hand and available to MAGSA) = C (water and energy savings conservatively estimated at 8.12%)

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

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

The MAGSA GSP has identified over-draft as the principal loss to the aquifer system. Excess groundwater pumped (above estimated sustainable yield) as irrigation water is currently lost to local transpiration and to runoff which can result in off-site transpiration and/or evaporation. Deep percolation from the crop root zone is also considered a loss. Deep percolation can result in water that is held in an unusable state in the unsaturated zone until it reaches the water table as recharge. Depth to groundwater ranges from 150 – 350 feet in the MAGSA district. Groundwater measurements from predevelopment to present time represent declines on the average of 140 feet in the local aquifer. The time necessary for the overused water to re-enter the aquifer properly, is excessive, leaving MAGSA with no ability to use it.

Annual water consumption in MAGSA is estimated to be approximately **303,800 AF/year**. This volume represents total groundwater application on all irrigated acres and average application efficiency of all irrigation types is considered to be at least 70%. It would be reasonable to estimate current operational losses to be equal to the remaining 30% or **91,110 AF/yr**. Operational losses would be due to deep percolation, runoff, evaporation, and off-site transpiration due to current inefficiencies. If estimated water conservation of **20,508 AF** due to

Improved Application Efficiency were achieved, this would represent a **22.5%** reduction in operational losses in the Project Area.

$$(303,800 \text{ AF/yr.}) (70\%) = 91,110 \text{ AF/yr. of Operational Losses}$$

$$(20,508 \text{ AF/yr.}) / (91,110 \text{ AF/yr.}) = \mathbf{22.5\% \text{ Reduction in Operational Losses}}$$

The deployment of real-time telemetry devices on irrigation flow meters, weather stations, and other water management sensors will aid in reducing and limiting these water losses by improving the seasonal timing of irrigation water applications closer to the needs of the crops, improving the application efficiency of irrigation events, and improved tracking of pumping allocations. Groundwater that is conserved will remain in the local aquifer to maintain groundwater levels for future irrigation events and other water uses.

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

Current losses are not being used by other water users. Current losses are to non-beneficial uses including runoff and deep percolation.

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

No. The current losses to the system are non-beneficial. Current losses include deep percolation which results in an economic loss to the irrigator and immobilization of water in the local vadose zone and runoff which is another loss to the irrigator and may result in off-site (non-beneficial) transpiration. A feature of the local aquifer is a confining layer that creates a perched aquifer and results in higher salinity which is another reason to limit losses. This project will improve the efficiency of irrigation in MAGSA and limit these losses to the local groundwater aquifer.

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

Annual water consumption in MAGSA is estimated to be approximately **303,800 AF/year**. (MAGSA GSP. Table 3-6. Section 3.3.9). Annual Water Savings of 6.35% (MRNRD, 2021) and/or 10% (IFF IMO 2022), **averaged to 8.12%**, is expected from the implementation of improved irrigation water use efficiency, water resource development, and the implementation of the MAGSA Water Marketing Program. This percentage of water savings has been achieved in the Middle Republican NRD where similar technology has been deployed. The land area in MAGSA is **120,635 acres**. This project is expected to affect **85%** or **102,540 acres** in the district. The current water use in the district is approximately **2.52 AF/ac** per year. Once the expected groundwater savings of **8.12%** is achieved through improved irrigation water management of groundwater and the implementation of the MAGSA Groundwater Marketing Program, the groundwater use in MAGSA will be reduced by **0.20 AF/ac/year** or **20,508 AF/year** within MAGSA.

Annual Consumptive Water Use: 303,800 AF/yr.

303,800 AF / 120,635 acres = **2.52AF/acre/year**

Projected Water Savings (AF/ac/yr.): **8.12% (2.52 AF/ac/year) = 0.20 AF/ac/year**

Total Annual Estimated Water Savings = (0.20 AF/ac/yr.) (102,540 ac) = **20,508 AF/year**

Deploying irrigation flow meters and other water management sensors with remote telemetry puts all of the missing support tools for water management at the fingertips of water managers on the district level as well as on the farm. Irrigation flow meters with telemetry are one of the absolute pre-requisite set-up requirements for inclusion in the **Irrigation Management Optimization (IMO)** program to be implemented in MAGSA for advanced water irrigation water management with assistance through the NRCS CIG program. Irrigation flow meters with telemetry are base requirements for design and implementation of irrigation management strategies, formulating irrigation management plans, and facilitating an operational schedule to take advantage of utility incentives for energy load shifting.

Kings Basin Current Water Budget

Table 3-6 shows a current water budget (2016-2017) for the Kings Subbasin as a whole along with the equivalent individual water budgets for the seven GSAs within the Kings Subbasin.

Table 3-6 Kings Basin Current Water Budget (2016-2017)

(all units in acre-feet)

Description	TOTAL	McMullin GSA	NFKings GSA	North Kings GSA	Central/South	Kings River East	James ID
Total Supply	3,490,400	389,400	621,300	1,110,300	604,900	671,500	83,000
Consumptive Use Subtotal	2,043,000	303,800	493,200	493,600	350,300	424,600	67,500
GW Recharge Subtotal	1,352,000	241,900	203,300	448,400	215,700	208,400	33,300
Nonrecoverable Subtotal	635,400	31,900	65,500	330,400	188,200	76,300	22,100
Method 1							
Estimated Annual Change in Groundwater Storage	-119,400	-69,400	-63,100	39,200	-1,100	-19,500	-5,500
GW Recharge	1,352,000	241,900	203,300	449,400	215,700	208,400	33,300
GW Pumping	-1,285,000	-292,800	-282,700	-288,200	-181,400	-223,200	-16,700
GW Outflow	-200,400	0	-16,200	-122,000	-35,400	-4,700	-22,100
Other Change in GW Storage	14,000	-18,500	32,500	0	0	0	0

Please address the following questions according to the type of infrastructure improvement you are proposing for funding:

***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.

Conservative estimates of **0.20 AF/ac** in water savings are projected on **102,540** acres per year in the project area from improved irrigation water management, efficiencies in production, and the implementation of the water marketing program in MAGSA. Weather stations with telemetry will be installed as a component of this project which will provide accurate and local evapotranspiration (ET) data to agricultural producers for irrigation scheduling. The MAGSA GSP outlines a path to groundwater sustainability by 2040 through a combination of voluntary

and mandatory actions. The water conservation in the first 10 years will be achieved through voluntary actions described herein to reach sustainability before advancing to any mandatory controls in 2030.

The following water conservation calculations are based on saving 0.146 AF/acre on 102,540 acres within MAGSA for a total of **20,508 AF/yr.**

$$(102,540 \text{ ac}) (0.20 \text{ AF/acre/yr.}) = \mathbf{20,508 \text{ AF/yr. Annual Water Conservation}}$$

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, A water budget has been prepared in Chapter 3 of the MAGSA GSP which has determined losses to groundwater storage. Annual water consumption in MAGSA is estimated to be approximately **303,800 AF/year**. Assuming an application efficiency of **70%**, losses to groundwater storage have been estimated to be approximately **91,100 AF/yr.** due to excess pumping demand. This represents an overall storage deficit for the local aquifer. These losses were taken into account within the other GSAs in the Kings River Basin and the amount of mitigation for groundwater extraction assigned to MAGSA was determined to be **91,100 AF/yr.** to reverse overdraft on the aquifer. Real-time telemetry for meter readings and other water management sensors will limit unnecessary pumping that will increase the overdraft on the aquifer.

$$(303,800 \text{ AF/yr.}) (70\%) = \mathbf{91,110 \text{ AF/yr. of Operational Losses}}$$

Water consumption in MAGSA is currently based on estimated water consumption for various uses. Many of these estimates may be high since they have not been measured to date. Agriculture is the largest used in MAGSA and once metering with telemetry is implemented in the district, a more accurate quantification of water use in MAGSA will be derived for management of water resources.

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?

No. Most individual wells have historically not been metered and currently are not metered in MAGSA. Some individual fields or irrigation systems are metered, but do not measure all water pumped by a given well or series of wells. This project will meter all groundwater pumped in MAGSA and all water that is traded in the MAGSA allowing for greater precision in irrigation water application and water traded in the Marketing Program. Accurate groundwater measurement and clear and enforced allocation program is necessary for a successful groundwater marketing program. All meters deployed under this program will have an accuracy of +/- 1% to +/- 2% of total flow. Studies have shown that the error of crop water use from remote sensing can range from 7% - 22% based on the highest reported performing remote sensing products (Bretreger, 2019). The MAGSA Board feels that current methods of estimating groundwater use from remote sensing are inadequate for equitable management of an allocation program or a groundwater trading system for groundwater sustainability.

The proposed water trading program within MAGSA would be next to impossible without permanently installed totalizing flow meters equipped with remote telemetry. This WaterSMART proposal will initiate installation of meters and telemetry in MAGSA to facilitate the Marketing Program. MAGSA is in the process of implementing a “smart market” or electronic clearinghouse for trading water within MAGSA. **For a water market to work, clear rules and regulations with**

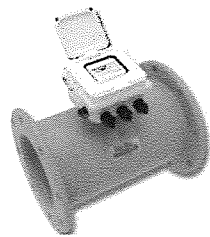
respect to an allocation are necessary for the trading program to work. In addition, accurate measurement of water pumped is necessary to ensure compliance with pumping allocations and to facilitate trading water credits among users. Capturing real-time water use by remote telemetry from flow meters is the most efficient method of implementing water allocations and facilitating a water trading system in a district such as MAGSA. These criteria will be met by this WaterSMART Project.

To make this possible, the MAGSA Board of Directors passed measurement rules and regulations on October 6, 2021 requiring the installation of district-approved meters on high-capacity wells by January 31, 2025.

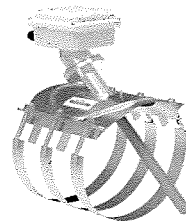
d. Provide detailed descriptions of all proposed flow measurement devices, including accuracy and the basis for the accuracy.

Upon the successful award of this proposal, all wells will be metered utilizing electromagnetic flow meters manufactured for the agricultural industry. Meter accuracies will be +/- 1% to +/- 2% of total flow and do not degrade over time compared to mechanical meters. All meters will be wet tested by an NIST Traceability testing facility which renews its NIST standards annually. Meters will be either the flanged (DuraMag™) or saddle-insertion style (McMag3000™) battery-powered electromagnetic totalizing flow meters manufactured by McCrometer, Inc. of Hemet, CA. Each of these meters feature no moving parts and therefore will be limited maintenance for district staff. General maintenance will involve changing the batteries after five years of use. These meters are manufactured for the agricultural industry.

McCrometer DuraMag™



McCrometer McMag3000™



All meters will transmit flow data automatically through a cellular remote telemetry unit (RTU) to a centralized database accessible by the internet. Real-time water use data will be used to assure implementation of best management practices for irrigation water management efficiencies, basin-wide groundwater management, and performing water marketing trades. Remote telemetry will facilitate trading of water credits among irrigators in the district to maintain aggregate pumping within the district to a level at or below sustainability.

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

Yes. The water savings goals in the first ten years of the MAGSA GSP's action plan toward sustainability are to be achieved through water conservation and improved water use efficiencies. The MAGSA GSP outlines a path to groundwater sustainability by 2040 through a combination of voluntary and mandatory actions. The water conservation in the first 10 years will be achieved through voluntary actions described herein to reach sustainability before advancing to any mandatory controls in 2030.

Weather stations with telemetry will be installed as a component to this project which will provide accurate and local evapotranspiration (ET) data to agricultural producers for irrigation scheduling. The availability of real-time data for ET or crop water use as well as irrigation water use from meters will enable farmers to match water applications to local weather conditions and reduce water consumption. Real-time water use data from water management sensors is an indispensable element to water savings and will be integral to **Irrigation Management Optimization (IMO)** Program made available by the NRCS CIG Grant that will benefit approximately 15% of farms in MAGSA.

IMO is an advanced irrigation management tool for managing irrigated crops where water is expensive or limited. IMO calculates the marginal productivity of water on a field-by-field basis then plans irrigation strategies accordingly. Irrigators use IMO to define, pre-test and target different irrigation amounts and timing strategies for each field, plan and manage a season, and determine how the marginal productivity of water for a field will be profitable.

MAGSA irrigators that participate in the IMO program will be trained to identify how different irrigation timing strategies will influence soil moisture depths at different points of the season, evaluate how different levels of applied water will impact yield and net returns, and aid the irrigator in determining if the last few inches of water would be better applied on one field, or to be sold on the MAGSA Water Market.

The set-up requirements for MAGSA producers to cooperate in the IMO program include a permanently installed totalizing flow meter with telemetry and local ET readings – both of which can be provided by this Bureau grant. The set-up procedure also includes farmer interviews to evaluate knowledge, attitudes and interest for deficit irrigation, defining producer's current management methodology, and starting field measurements. Soil moisture monitoring and interpretation will also be provided by IFF as part of the IMO program for irrigation management and scheduling which will further water savings. Field parameter data must also be gathered for the farmer's pressurized irrigation system.

IMO Project Deliverables for Irrigators

- **Field Calibration:** Detailed field assessment (evaluation of irrigation system performance and disposition of crop available water). Develop field-specific predictive analytics for soil moisture and crop stress.
- **Field Instrumentation:** Volumetric soil moisture measurements, irrigation flow monitoring, crop stress measurements.
- **Water Production Function:** Define how water affects yield, calibrated for specific field conditions.
- **Field-Specific Assessment:** Assess the value of water bought or sold through a local water market.
- **Planning and Management Tool:**
 - Align seasonal irrigation schedules with critical stages of crop development
 - Evaluate profitability of land use (acreage) for limited water
 - Schedule full season to optimize energy costs to capture load shifting incentives

Once the irrigator has enrolled in IMO and gone through the initial setup, then the farmer decides how much water to apply, selects the desired seasonal soil moisture pattern, and determines the Managed Allowable Depletion (MAD) for the field or how dry the soil can get. The producer

decides the desired levels of crop stress during each growth stage according to his or her own comfort level. As a result, the operational losses due to deep percolation, runoff, and off-site evapotranspiration will be significantly reduced.

The implementation of the IMO Program allows for the estimates of **0.20 AF/ac** in water savings (8.12% of current water use) projected on **102,540** acres per year in the project area from improved irrigation water management, efficiencies in production, and the implementation of the water marketing program in MAGSA. Real-time telemetry of irrigation water applications will be delivered electronically to irrigators as a result of the deployment of metered telemetry stations on irrigation wells within MAGSA. This data will be used not only for irrigation water management on the farm, but also for trading water credits in the MAGSA Water Marketing Program. The Water Marketing Program will inevitably introduce lower water use crops in order to trade water credits and consequently reduce water consumption in MAGSA.

The MAGSA Board and Staff estimate that water conservation of 0.20 AF/acre on 102,540 acres within MAGSA is reasonable where just metering with telemetry is deployed. Resulting annual water conservation would be 20,508 AF/yr.

$$(102,540 \text{ ac}) (0.20 \text{ AF/acre/yr.}) = \mathbf{20,508 \text{ AF/yr. Total Annual Water Conservation}}$$

For the 150 farms or 18,095 acres (15%) of the acres in MAGSA expected to enroll in IMO, an additional 50% or 9.525% of water savings is projected on these 18,095 acres for an estimated 3,964.20 AF/yr. An additional benefit of this program is that these practices may be replicated on other farms by cooperators not in IMO sponsored by the USDA-NRCS CIG program.

$$(18,095 \text{ ac}) (2.52\text{AF/ac}) (10\%) = \mathbf{4,559.95 \text{ AF/yr.}}$$

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

Rather than using estimates of crop water use based on satellite imagery and associated acreage for individual crops, MAGSA will deploy permanently installed flowmeters with telemetry which will provide accurate measurement of groundwater extraction rather than estimates. Permanently installed totalizing flow meters will provide accurate documentation of not only water use, but also water savings. The MAGSA Board and Staff feel strongly that accurate water measurement is critical to the sound management of groundwater. Measuring groundwater use with permanently installed totalizing flow meters and delivering this data directly to water users as well as MAGSA district managers will facilitate on-farm conservation of groundwater through improved irrigation water management as well as water savings achieved through the MAGSA Water Marketing Program estimated to be **20,508 AF/yr.** from the implementation of this project.

Groundwater extraction data from permanently installed flow meters is the best method to measure and evaluate groundwater use. Accurate measurement of groundwater extraction will verify the achievement of water conservation goals set forth in the MAGSA GSP.

Evaluation Criterion B—Renewable Energy (20 points) *Up to 20 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 and reduced greenhouse gas emissions.*

Since this project addresses increased irrigation efficiency through irrigation management by the installation of permanently installed totalizing flow meters with telemetry, Subcriterion B.2 will be completed and address the savings in power consumption in MAGSA as a result of this project.

Subcriterion No. B.2: Increasing Energy Efficiency in Water Management: Up to 10 points may be awarded for projects that address energy demands and reduce greenhouse gas emissions 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 efficiency project (e.g., reduced pumping).

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

Current and accurate pump plant efficiency tests were conducted on local irrigation pumps for proposed upgrades to high efficiency pumps within the district. Existing pumps were consuming electricity at the following rates:

50hp: 752 kWh/AF

75hp: 1,212 kWh/AF

Assuming that equal numbers of pumps in MAGSA are 50 and 75 hp pumps (and that existing pumps have the same efficiency), the average acre-foot of irrigation water pumped would require **982 kWh** of electricity to deliver irrigation water to farm fields in MAGSA. As stated under Criteria A, annual water consumption in MAGSA is estimated to be **303,800 AF/year**. Consequently, a reasonable estimate for the annual power consumption in MAGSA to pump irrigation water is **298,331,600 kWh/yr**. The projected groundwater savings derived on-farm conservation and the MAGSA Water Marketing Program is estimated to be **8.12%** from this project. This would equate to **24,224,526 kWh/yr** in power savings as demonstrated in the following equations:

$$(982\text{kWh/AF}) (303,800 \text{ AF/yr.}) = 298,331,600 \text{ kWh/yr.} = \text{Annual Estimated Electrical Consumption}$$

$$(298,331,600 \text{ kWh/yr.}) (8.12\%/yr. \text{ water savings}) = \mathbf{24,224,526 \text{ kWh/yr. Estimated Power Savings from Water Conservation.}}$$

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

Since much of the electricity used in the project area is still generated by fossil fuels, any reduction in electrical consumption will reduce greenhouse gas emissions. In this case, a **8.12%** reduction in irrigation pumping will have a significant effect on electrical savings estimated at over **24,000,000 kWh/yr**. reducing the reliance on fossil fuels used to generate electricity in the region. With less reliance on fossil fuels for generation of electricity, a greater portion of the electricity used will come from renewable sources such as solar and hydropower.

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

Most irrigation wells in MAGSA are vertical turbine pumps powered by either 50 or 75 horsepower electric motors. Of the irrigators surveyed, electrical usage ranged from 752 to 1,212 kWh/AF of irrigation water produced.

Water savings through on-farm water conservation and participation in the MAGSA Water Marketing Program is expected to reduce pumping by **8.12%** annually in MAGSA which will have a commensurate reduction on energy usage in the district. An **8.12%** reduction in pumping is estimated to result in energy savings of **24,224,526 kWh/yr.**

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.

All energy savings calculations are based on the use of power at the point of diversion which is the irrigation well that extracts groundwater from the local aquifer. No alternate site of diversion will be implemented in this project.

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

No. This project does not involve water treatment, only the improved management of irrigation water in MAGSA. No power requirements are needed for water treatment.

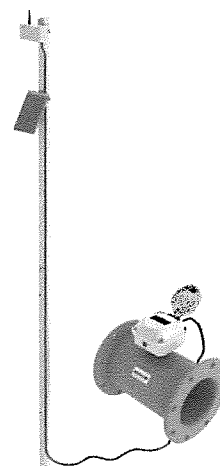
Will the project result in reduced vehicle miles driven, in turn reducing greenhouse gas emissions? Please provide supporting details and calculations.

Yes. Being a relatively new agency, MAGSA does not currently employ a large number of field staff. However, achieving the goals of this project would not be possible without the deployment of real-time telemetry. Without real-time telemetry, MAGSA would need to employ several field staff with a fleet of vehicles that would drive thousands of miles each year to obtain the same amount of data and yet would not achieve the same data frequency. Approval of this proposal will prevent thousands of miles driven and in turn the production of greenhouse gases by future MAGSA employees.

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

The remote telemetry units (RTUs) proposed to be deployed under this program are **solar powered** as seen in the image at the right. Each RTU utilizes cellular telemetry communications which will be powered by a 540 mA solar panel **eliminating** the need for commercial power sources to power the telemetry system.

Since each system will be a cellular node, the communications system will be independent of a capital-intensive system of towers that would be necessary for a traditional radio telemetry system.



Evaluation Criterion C—Sustainability Benefits (20 points): *Up to 20 points may be awarded under this criterion. This criterion prioritizes projects that address a specific water and/or energy sustainability concern(s), including enhancing drought resilience, addressing the current and future impacts of climate change, and resolving water related conflicts in the region. In addition, this*

critterion is focused on the benefits associated with the project, including benefits to Tribes, ecosystem benefits, and other benefits to water and/or energy supply sustainability.

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

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

Yes. MAGSA has a close relationship with the California Department of Fish and Wildlife (CDFW). CDFW manages two ecological reserves in MAGSA. CDFW has a representative on the MAGSA Stakeholder Advisory Committee. MAGSA seeks to benefit all stakeholders through the collaborative process for groundwater management. MAGSA has encouraged CDFW to participation in the Water Marketing and Banking Program which will benefit wildlife and their habitat in the GSA which will improve ecological resiliency to climate change. For example, where agricultural production may be idled, wildlife experts have been consulted on the establishment of pollinator habitat which will not only benefit wildlife, but also provide for the pollination of permanent crops such as almonds without commercial pollination services.

The Kings Groundwater Sub-basin (which is part of the San Joaquin Groundwater Basin) is the main source of water for MAGSA. The aquifer below MAGSA is used for irrigation, municipal, and minor industrial purposes. Groundwater pumping for municipal use occurs in the community of Raisin City. Other private domestic and industrial wells are scattered throughout MAGSA. Agriculture accounts for the largest groundwater demand.

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

Yes. Over 2 million AF of groundwater has been extracted and not replenished in the aquifer below MAGSA, resulting in an average annual groundwater overdraft of approximately 91,100 AF. Overdraft will be reduced by 20,508 AF/yr. or 22.5% of annual overdraft. Conserved groundwater will remain in the aquifer for future uses. Sustainable groundwater levels will be maintained for domestic, municipal, industrial, and agricultural users. These practices will achieve groundwater sustainability in MAGSA by 2040 if not sooner. The aquifer is subject to falling groundwater levels due to a semi-arid climate, limited recharge, and overdraft pumping. Annual rainfall varies considerably from year to year and averages about 10 inches, of which approximately 80% occurs from November through April. This results in a prolonged dry season with heavy reliance on irrigation with groundwater pumping to meet water demands.

As a critically over-drafted basin for groundwater resources, groundwater levels have declined roughly 140 feet in the Kings River Basin. The permanently installed flowmeters and telemetry equipment deployed under this program will not only aid in improved irrigation efficiencies promoted by the GSA but will also facilitate the Water Marketing program currently being initiated by the MAGSA that will maintain extraction of groundwater at sustainable levels.

Will the project benefit species (e.g., federally threatened or endangered, a federally recognized candidate species, a state listed species, or a species of particular recreational, or economic importance)?

Please describe the relationship of the species to the water supply, and whether the species is adversely affected by a Reclamation project or is subject to a recovery plan or conservation plan under the Endangered Species Act (ESA).

Threatened or endangered species such as the Swainson's Hawk and Giant Garter Snake exist in the project area. However, neither the species nor their habitat will be harmed as a result of this project. Many practices will have wildlife habitat benefits as land transitions from irrigated ag production to wildlife habitat with incentives. All permanently installed totalizing flow meters and other water management sensors will be installed onto existing pump discharge pipes. Environmental impacts will be minimal since all wells for metered telemetry stations are existing and minimal ground disturbance will be required.

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

MAGSA enjoys an active relationship with the CDFW, who manages the Kerman Ecological Reserve and Alkali Sink Ecological Reserve in MAGSA. The goal is to engage them in the Water Marketing Program as well as MAGSA's Groundwater Sustainability Plan. CDFW already has a member on the MAGSA Stakeholder Committee. The Ecological Reserves could benefit from surface water to develop pond, wetland, and vernal pool habitat, or could sell groundwater credits and generate funds for habitat improvements.

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

Yes. Acquiring irrigation water application data and crop water use in real-time will aid farmers in making irrigation scheduling decisions. Data that was once missing will now be at the fingertips of farm irrigation managers. Real-time water application data will have the potential to make individual irrigation applications more efficient and precise while real-time crop water use data has the potential to improve timing of application or seasonal irrigation efficiency. This information will alert the irrigators to current environmental factors that may delay or make an irrigation event unnecessary, thus conserving groundwater for future use and support the life of the local aquifer.

Projects that are intended to improve streamflows or aquatic habit, and that are requesting \$500,000 or more in Federal funding, must include information about plans to monitor the benefits of the project. Please describe the plan to monitor improved streamflows or aquatic habit benefits over a five-year period once the project has been completed. Provide detail on the steps to be taken to carry out the plan.

Not Applicable.

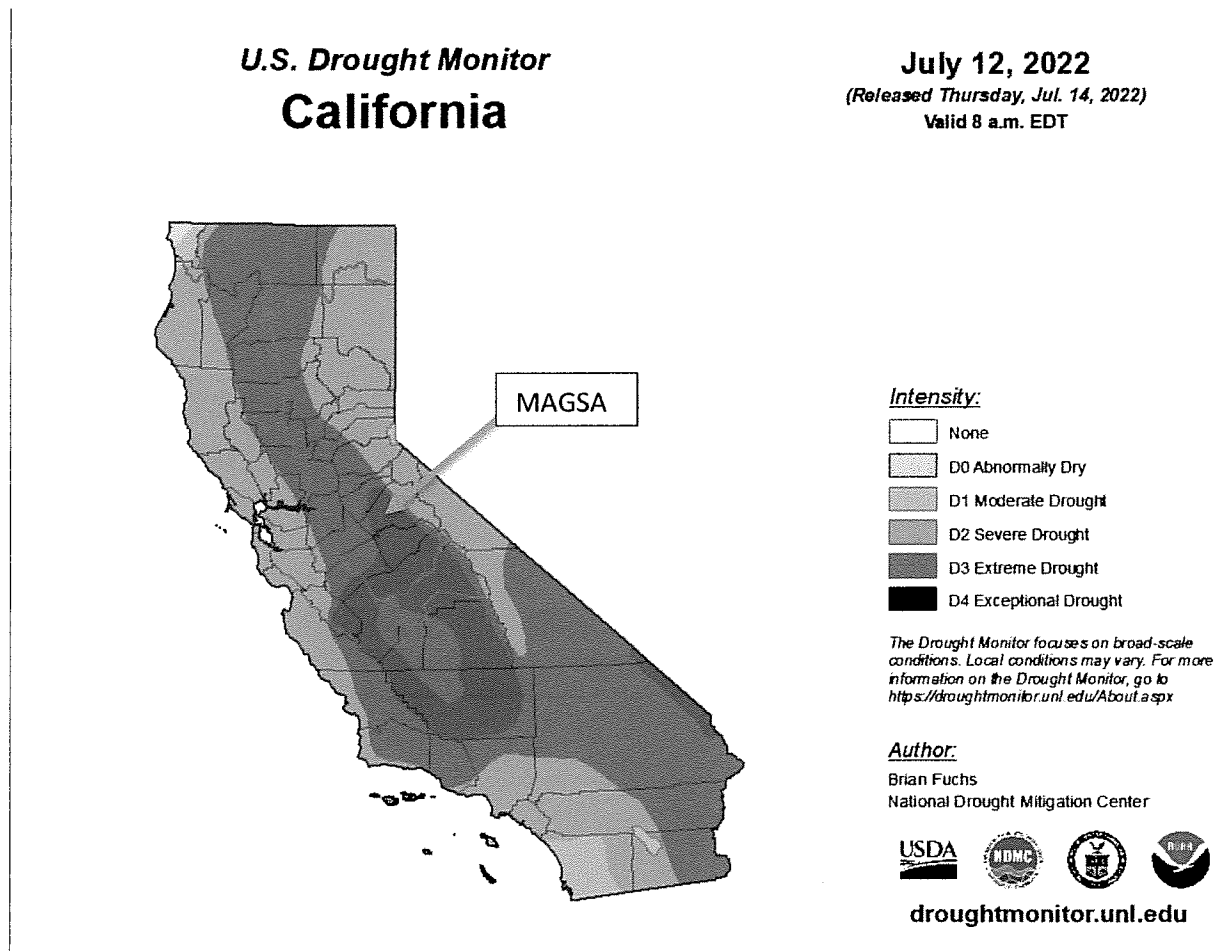
Addressing a specific water and/or energy sustainability concern(s). Will the project address a specific sustainability concern? Please address the following:

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

Over 2 million AF of groundwater has been extracted and not replenished in the aquifer below MAGSA, resulting in an average annual groundwater overdraft of approximately **91,100 AF**. The aquifer is subject to falling groundwater levels due to a semi-arid climate, limited recharge, and overdraft pumping. Annual rainfall varies considerably from year to year and averages about

10 inches, of which approximately 80% occurs from November through April. This results in a prolonged dry season with heavy reliance on irrigation with groundwater pumping to meet water demands.

In addition, this area has been significantly impacted by drought for the past four years consecutively and for many more years prior to the current drought streak. MAGSA is currently in the area designated as either **extreme** or **exceptional** drought by the Drought Monitor published by the National Drought Mitigation Center at the University of Nebraska-Lincoln.



The Kings Groundwater Sub-basin (which is part of the San Joaquin Groundwater Basin) is the main source of water for MAGSA. The aquifer below MAGSA is used for irrigation, municipal, and minor industrial purposes. Groundwater pumping for municipal use occurs in the community of Raisin City. Other private domestic and industrial wells are scattered throughout MAGSA. Agriculture accounts for the largest groundwater demand.

As a critically over-drafted basin for groundwater resources, groundwater levels have declined roughly 140 feet in the Kings River Basin. Permanently installed flowmeters and telemetry equipment deployed under this program will not only aid in improved irrigation efficiencies promoted by the GSA, but will also facilitate the Water Marketing program currently being initiated by MAGSA. Conserved groundwater will remain in the aquifer for future uses. Sustainable groundwater levels will be maintained for domestic, municipal, industrial, and

agricultural users. These practices will achieve groundwater sustainability in MAGSA by 2040 if not sooner.

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

Irrigated agriculture is the main focus of this proposal which will conserve water through improved irrigation efficiencies as well as implementing the MAGSA Water Marketing Program. Irrigation wells are powered by either electricity or internal combustion engines to extract groundwater from the local aquifer. Improving the irrigation efficiency of farms in MAGSA through the IMO Program as well as the function of the Water Marketing Program will reduce the volume of groundwater pumped and consequently the amount of energy consumed either in the form of electricity or fossil fuels which will have positive effects on energy sustainability in California. In this case, an **8.12%** reduction in irrigation pumping will have a significant effect on electrical savings estimated at over **24,000,000 kWh/yr.**

Improved groundwater management through irrigation efficiency and water marketing will reduce the electricity demand in the Kings River Basin where shortages of electricity have plagued the region in recent years. Rolling blackouts have been an issue in California for several years due to supply and demand issues. Conserving groundwater as proposed in this application will improve the supply of power to this area of the State of California.

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

Water conservation through voluntary methods of irrigation efficiency and water marketing are the primary methods of achieving groundwater sustainability in MAGSA in the first ten years of the MAGSA GSP. Irrigation efficiencies will be achieved through providing real-time water use as well as local ET to irrigators on a daily basis for improved on-farm irrigation management. Water marketing will inevitably reduce pumping by the growth of lower water use plants or fallowing land which will not only reduce power demands, but also store more water in the local aquifer. Water marketing activities aided by telemetry-enabled water management sensors will be an indispensable factor for water savings in MAGSA. Improving data availability to farmers will improve the ability of water users in the area to better meet water demands during times of drought or water shortage due to climate change.

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

Water conserved due to reduced groundwater pumping through allocations, groundwater marketing, and improved irrigation efficiency will remain in the local aquifer to achieve sustainable groundwater levels by 2040. Improved water management made possible through telemetry-enabled water management sensors deployed under this project will save an estimated **20,508 AF/yr.** in MAGSA.

Multiple water users will benefit in the future including agriculture, municipal, domestic, and industrial. Conservation will maintain groundwater supplies for all of the above-mentioned beneficial uses.

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

The development of the MAGSA Water Marketing program was funded through a 2018 WaterSMART grant awarded by the US Bureau of Reclamation. The water marketing program, with respect to groundwater, will focus on a credit system to allocate groundwater resources among landowners within the GSA. Under a groundwater credit system, landowners would be given a groundwater allocation to either keep, trade, or sell to other landowners within the GSA.

The Water Marketing program within MAGSA would be **virtually impossible** without permanently installed totalizing flow meters equipped with remote telemetry. For a water market to work, clear rules and regulations with respect to an allocation are necessary for the trading program. **In addition, accurate measurement of water pumped is necessary to ensure compliance with pumping allocations and to facilitate credits to be traded among water users.** Automated data transmission of groundwater extraction will be delivered to MAGSA water managers as well as individual water users. The delivery of water use data through real-time telemetry is the most efficient method of accessing large amounts of data from numerous points on a frequent basis.

Water conserved under the Water Marketing program will remain in the local aquifer for future sustainable uses to the benefit of all water users.

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

Conservative estimates of **0.20 AF/ac** in water savings are projected on **102,540 acres** per year in the project area from improved irrigation water management, efficiencies in production, and the implementation of the water marketing program in MAGSA. Weather stations with telemetry will be installed as a component of this project which will provide accurate and local evapotranspiration (ET) data to agricultural producers for irrigation scheduling. The MAGSA GSP outlines a path to groundwater sustainability by 2040 through a combination of voluntary and mandatory actions. The water conservation in the first 10 years will be achieved through voluntary actions described herein to reach sustainability before advancing to any mandatory controls in 2030.

The following water conservation calculations are based on saving **0.20 AF/acre** on **102,541 acres** within MAGSA for a total of **20,508AF/yr.**

$(102,540 \text{ ac}) (0.20 \text{ AF/acre/yr.}) = \mathbf{20,508 \text{ AF/yr. Total Annual Water Conservation}}$

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

(1) Combating the Climate Crisis: Presidential Executive Order 14008: Tackling the Climate Crisis at Home and Abroad, focuses on increasing resilience to climate change and supporting climate-resilient development. For additional information on the impacts of climate change throughout the western United States, see: <https://www.usbr.gov/climate/secure/docs/2021secure/2021SECUREReport.pdf>. Please describe how the project will address climate change, including the following:

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

Permanently installed totalizing flow meters with real-time telemetry will gather continuous data that will ensure the highest accuracy of (and greatest confidence in) groundwater extractions within the GSA. Daily water meter records gathered in real-time will provide water users and district water managers with **crucial information** for on-farm water management as well as basin-wide water management. Real-time data access to water extraction from meters as well as water management sensors such as weather stations for local crop water use (ET) will increase efficiency of on-farm water use and therefore conserve water stored in the local aquifer for times of water shortage due to climate change.

Remote telemetry units (RTUs) will regularly supply groundwater extraction data from irrigation wells in real-time without the need for MAGSA staff to drive to the well sites enhancing the environment by conserving staff time and resources including reduced vehicle emissions, mileage, and wear and tear. Frequent water use data available to district water managers will improve water management on the basin level enabling practices such as the Water Marketing Program to benefit districtwide groundwater management with minimal labor expense, energy consumption, and wear and tear to equipment for MAGSA.

b. Does this proposed project strengthen water supply sustainability to increase resilience to climate change?

Yes. Improved management of groundwater will conserve water in storage in the aquifer for all uses at times of drought or other environmental conditions related to climate change. Improved data on extraction of groundwater will also improve groundwater modeling in MAGSA since until now it has consisted of Hydro-geologic Conceptual Models. Real-time data from groundwater monitoring wells is already being supplied thanks to a FY'20 Small-Scale Water Efficiency Grant which equipped indicator wells with RTUs. Real-time flow data coupled with groundwater elevation data will represent a significant asset to improved groundwater modeling and sustainability of water resources in the district. Permanently installed totalizing flow meters will provide real data on groundwater extraction which will improve management of the aquifer and allow MAGSA to reach sustainability.

c. Will the proposed project establish and use a renewable energy source?

Yes. The remote telemetry units (RTUs) proposed for this project are **solar powered** therefore **no** commercial power is required for real-time telemetry. Each RTU will utilize cellular telemetry communications which will be powered by a 540 mA solar panel eliminating the need for commercial power sources to power the telemetry system. Since each metered telemetry station will be a cellular node, the communications system will be independent of a capital-intensive system of towers that would be necessary for a traditional radio telemetry system.

d. Will the project result in lower greenhouse gas emissions?

Yes. Reduced pumping of groundwater will result in reduced production of greenhouse gases regardless of the energy source to pump the water. Since the energy source of the irrigation pumps is either electricity or internal combustion engines and most electricity is generated from fossil fuels, reduced pumping for irrigation will have a positive effect of lowering greenhouse gases in the atmosphere due to decreased use of electricity or direct use of fossil fuels.

(2) Disadvantaged or Underserved Communities: E.O. 14008 and E.O. 13985 support environmental and economic justice by investing in **underserved and disadvantaged communities** and addressing the climate-related impacts to these communities, including impacts to public health, safety, and economic opportunities. Please describe how the project supports these Executive Orders, including the following:

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

Yes, all of the communities located in the MAGSA project area are designated as disadvantaged communities and have been negatively affected by the downturns in the agricultural economy associated with groundwater declines. This project will support agricultural production as well as the businesses and economic growth supported by irrigated agriculture. Benefits of this project include groundwater sustainability for all users and beneficial uses including agriculture, industry, municipal, and domestic water uses.

The data management organization that will house the water extraction data acquired from totalizing flow meters on large capacity wells in MAGSA and serve this data to water users and facilitate digital water transactions for the Water Market in MAGSA is a company called Aegis Technologies Group (Aegis). Aegis is a Service-Disabled Veteran-Owned (SDVO) Corporation of Washington State that will do business in California for this project. See Attached letter in **Appendix C**.

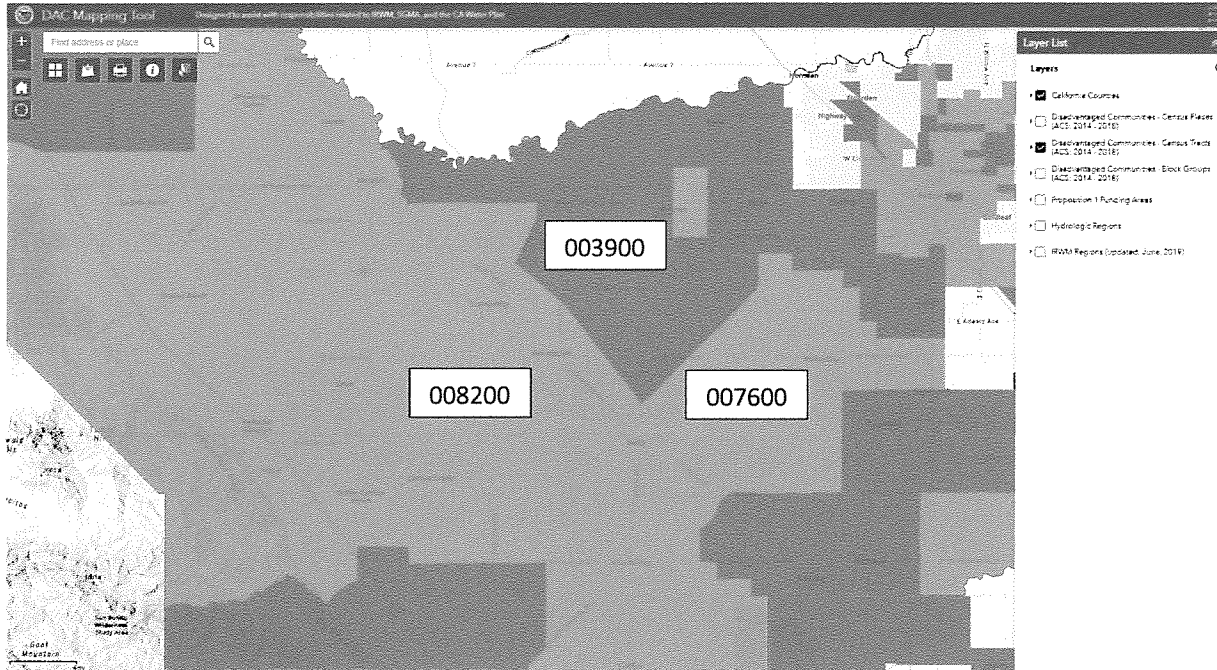
b. If the proposed project is providing benefits to a disadvantaged community, provide sufficient information to demonstrate that the community meets the disadvantaged community definition in Section 1015 of the Cooperative Watershed Act (defined as a community with an annual median household income that is less than 100 percent of the statewide annual median household income for the State), or the applicable state criteria for determining disadvantaged status.

Yes. 2019 data from the U.S. Census Bureau state that the annual median household income for the State of California is **\$75,235**. The median annual income for Fresno County, CA is **\$53,969** which is less than the statewide annual median household level for California. **Consequently, the project area meets the criteria for a disadvantaged community.** (<https://data.census.gov>)

Further clarifying the disadvantaged community status of the MAGSA communities, please refer to the following **Figure 2** which displays Census data from the DAC Mapping Tool provided by California Department of Water Resources (<https://water.ca.gov/Work-With-Us/Grants-And-Loans/Mapping-Tools>). The shaded areas represent census tracts that have been designated by the State of California as Disadvantaged. **The median household income for each of the census tracts within MAGSA is even lower than the average for Fresno County, CA of \$53,969.** The labeled census tracts coincide with the MAGSA district and the Median Household Income for these tracts is as follows:

Census Tract	Median Household Income
003900	\$ 47,125
007600	\$ 42,714
008200	\$ 35,368

Figure 2



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

In addition, the Commissioner of the California Department of Insurance Data Analytics and Reporting drafted a report in 2015 on underserved communities for the purpose of addressing the issue of availability of insurance in such communities and of promoting anti-discrimination so that all have equal access to insurance in California. Two zip codes within the project area; **93660** and **93706**, in Fresno County, California were included as Underserved and are referenced in **Appendix D**. MAGSA is located entirely within the Disadvantaged and Underserved Community Area in Fresno County.

(3) Tribal Benefits: The Department of the Interior is committed to strengthening tribal sovereignty and the fulfillment of Federal tribal trust responsibilities. The President's memorandum "Tribal Consultation and Strengthening Nation-to Nation Relationships" asserts the importance of honoring the Federal government's commitments to Tribal Nations. Please address the following, if applicable:

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

No tribes or federal lands are located within the MAGSA Plan area.

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

No tribes or federal lands are located within the MAGSA Plan area.

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

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

No interstate compacts exist in the MAGSA Plan area.

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

Yes. The Kings River Basin has been designated as a **critically over-drafted basin** for water resources by the California Department of Water Resources (CA DWR). Irrigated Agriculture is the major water user in the basin. Water savings facilitated through allocations, trading water credits through the groundwater marketing program, and improved irrigation efficiency will improve water availability for all users including groundwater irrigators, municipalities, and industries. Water saved from reduced irrigation water application will remain in the aquifer and slow declining groundwater levels and reduce interference between water wells. This will improve water conservation for groundwater users in the Kings River Sub-basin.

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

Yes. This project will benefit the entire Kings River Basin as the McMullin Area GSA is one of seven GSAs in the basin working cooperatively toward groundwater sustainability under separate Groundwater Sustainability Plans (GSPs). The sustainability goal of the Kings Sub-basin and this GSA is to ensure that by 2040 the basin is being managed to maintain a reliable water supply for current and future beneficial uses without experiencing undesirable results. This goal will be met by balancing water demand with available water supply to stabilize declining groundwater levels without significantly and unreasonably impacting water quality, land subsidence or interconnected surface water.

The goal of the Basin is to correct and end the long-term trend of a declining water table understanding that water levels will fluctuate based on the season, hydrologic cycle and changing groundwater demands within the basin and its proximity. Improved groundwater storage and management will decrease the demand for surface supplies in the Kings Basin therefore supporting the habitat for aquatic and waterfowl species that depend on water resources for their existence. Meters with real-time telemetry will document actual water use and will quantify water savings.

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

Yes, The Kings River Sub-basin has been designated as critically over-drafted basin for water resources by the California Department of Water Resources (CA DWR). The GSAs within the Kings Basin have defined the **Undesirable Result** for groundwater levels to be significant and unreasonable when either the water level has declined to a depth that a new productive well cannot be constructed, or when the water level has declined to a depth that water quality cannot be treated for beneficial use. The McMullin Area GSA contains approximately 1,075 large capacity groundwater production wells which are mainly irrigation wells, but also include some municipal and industrial wells. The MAGSA GSP contains the sustainable management criteria

that will maintain groundwater levels at a level above the undesirable levels that will result in wells being drilled deeper or becoming untreatable for beneficial uses. If the undesirable result were achieved for a significant number of groundwater wells in MAGSA, this would be devastating for agricultural, municipal, domestic, and industrial users in the district.

Evaluation Criterion D—Complementing On-Farm Irrigation Improvements (10 points)

Up to 10 points may be awarded for projects that describe in detail how they will complement on-farm irrigation improvements eligible for Natural Resources Conservation Service (NRCS) financial or technical assistance.

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

Describe any planned or ongoing projects by farmers/ranchers that receive water from the applicant to improve on-farm efficiencies.

WaterSMART Initiative (WSI)/NRCS CIG

During FY'22 MAGSA was selected as one of 15 new WaterSMART Initiative (WSI) areas targeted for Environmental Quality Initiative Program (EQIP) funding to complement Bureau of Reclamation WaterSMART Projects. This is estimated to benefit 15% of landowners in MAGSA or 18,095 acres and save approximately **4,559.95 AF/yr.** through improved irrigation water management. With the additional NRCS assistance, farmers in the priority area will be able to improve soil moisture management through cover cropping, reduce evapotranspiration losses by converting from flood irrigation to low pressure sprinkler systems, and reduce groundwater withdrawals allowing for conserved water to be available for use during droughts. In addition to the water savings and drought resilience benefits, EQIP funding will also help them improve crop productivity and health.

Provide a detailed description of the on-farm efficiency improvements.

WaterSMART Initiative (WSI)/NRCS CIG

NRCS Environmental Quality Incentive Program (EQIP) Practices from the **449 Irrigation Water Management - Advanced Technologies and 587 Flow Meter with Electronic Index and Telemetry** practice codes will be deployed on irrigated farms in the project area by the NRCS. Specific practices that will be applied on irrigated land in the MAGSA project area will include Irrigation Flow Meters with Telemetry, Soil Moisture Sensors, Micro-drip irrigation, Underground Pipelines, and Integrated Evapotranspiration. However, the EQIP project is expected to fund only **150** meters with telemetry leaving the vast majority of the district unmetered. Additional funding is needed to equip all high-capacity wells in the district with meters and remote telemetry for irrigation water management.

Have the farmers requested technical or financial assistance from NRCS for the on-farm efficiency projects, or do they plan to in the future?

WaterSMART Initiative (WSI)/NRCS CIG

Yes. MAGSA Staff have begun conversations with the NRCS Area Engineer, the local NRCS District Conservationist, and the NRCS California State Irrigation Engineer to carry out the

WaterSMART Initiative (WSI) and prioritize these practices within MAGSA. These practices will be encouraged and incentivized to landowners and operators in the project area as part of this program.

If available, provide documentation that the on-farm projects are eligible for NRCS assistance, that such assistance has or will be requested, and the number or percentage of farms that plan to participate in available NRCS programs.

WaterSMART Initiative (WSI)/NRCS CIG

Practices including irrigation flow meters, soil moisture monitoring, micro-drip irrigation, underground pipelines, and other practices are available to farmers in the State of California through the USDA Natural Resources Conservation Service. Funding for these practices will be pursued through this agency to further improve the water application efficiency and therefore reduce the groundwater extraction in MAGSA to improve the probability of achieving sustainability goals set forth in the MAGSA GSP. Approximately **15%** of the MAGSA farms will be able to participate in the NRCS programs. As a result, this would have an effect on **18,095 acres** in MAGSA.

Applicants should provide letters of intent from farmers/ranchers in the affected project areas.

The Resolution from the MAGSA Board of Directors on **page 55** codifies the intent and support of several local landowners for this project. **Letters of Support** from local landowners and future participants can be found in a section with the same name at the end of this document. See attached **Letters of Participation** from OTT Hydromet and McCrometer for irrigation equipment and remote technology for this project. Irrigation for the Future (IFF) will participate in this project by providing advanced irrigation consulting. The data management company for this project, Aegis Group, has also submitted a letter of participation attached in the same section.

Describe how the proposed WaterSMART project would complement any ongoing or planned on-farm improvement.

Discussions have taken place among the MAGSA Board members to implement an allocation program that, once enforced, will limit groundwater extraction to sustainable levels. This would not happen until after 2030 in the second phase of the GSP to achieve groundwater sustainability by 2040. Real-time data from irrigation flow meters will be relayed to irrigators to provide them with water use information that will enable them to maintain pumping within their allocation. Groundwater levels have been measured in the 23 Indicator Wells by a patchwork of agencies over several decades. This project will take the real-time data gathered from these wells and relate the water pumped to actual recharge or the rebound of groundwater levels realized in the local aquifer within the MAGSA boundaries.

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

WaterSMART Initiative (WSI)/NRCS CIG

Yes. This WaterSMART proposal will complement the on-farm water conservation programs because many of the irrigation water management technologies will utilize the signal output capabilities of the new flow meters to integrate flow measurement for improved application efficiency of the irrigation system. The EQIP funds utilized through the WaterSMART Initiative (WSI) will facilitate water conserving irrigation practices such as Irrigation Flow Meters with

Telemetry, Soil Moisture Sensors, Micro-drip irrigation, Underground Pipelines, and Integrated Evapotranspiration.

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

WaterSMART Initiative (WSI)/NRCS CIG

Advanced Irrigation Water Management Technologies deployed through the USDA-NRCS programs include Irrigation Flow Meters with Telemetry, Soil Moisture Sensors, Micro-drip irrigation, Underground Pipelines, and Integrated Evapotranspiration. Groundwater savings will be realized with these features that will improve seasonal and application efficiency and reduce irrigation water losses on the farm to non-beneficial uses.

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.

WaterSMART Initiative (WSI)/NRCS CIG

MAGSA estimates that **10%** water savings would be realized from the implementation of these advanced irrigation water management technologies on the **18,095 acres** where these practices are applied. Since water use in the MAGSA project area is measured at **2.52 AF/ac**, additional water savings would be estimated at **4,559.95 AF/yr.** as a result of these practices. This quantity of savings is reasonable since IMO has experienced 10-15% water savings in other geographies with managed allowable depletion (MAD) methodologies for irrigation scheduling and management.

$$(18,095 \text{ ac}) (2.52\text{AF/ac}) (10\%) = 4,559.95 \text{ AF/yr.}$$

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

Figure 3: MAGSA Boundaries

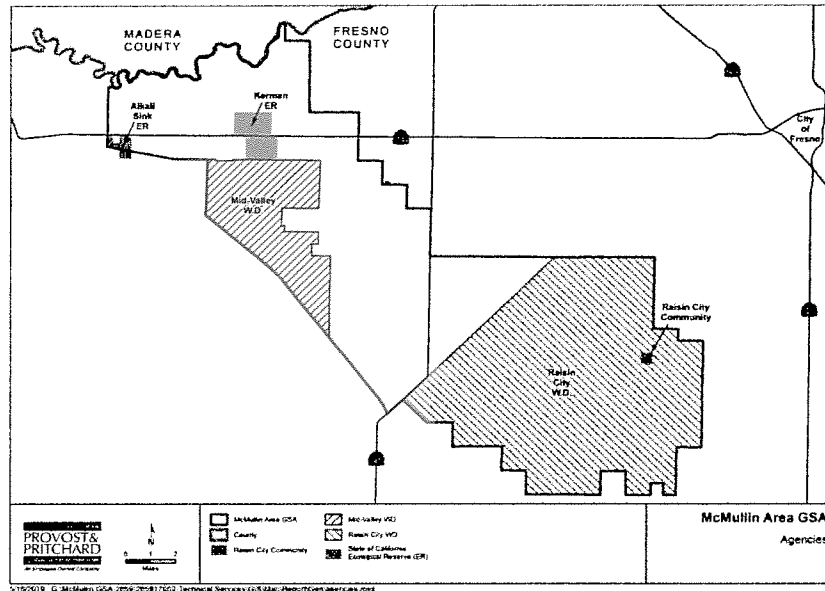


Figure ES-3 Participants in MAGSA Groundwater Sustainability Plan

Note: On-farm water conservation improvements that complement the water delivery improvement projects selected through this funding opportunity may be considered for NRCS funding and technical assistance to the extent that such assistance is available. For more information, including application deadlines and a description of available funding, please contact your local NRCS office. See the NRCS website for office contact information, www.nrcs.usda.gov/wps/portal/nrcs/main/national/contact/states/.

Evaluation Criterion E—Planning and Implementation (8 points): *Up to 8 points may be awarded for these subcriteria.*

Subcriterion E.1— Project Planning: *Points may be awarded for proposals with planning efforts that provide support for the proposed project.*

Does the applicant have a Water Conservation Plan and/or System Optimization Review (SOR) in place? Does the project address an adaptation strategy identified in a completed WaterSMART Basin Study? Please self-certify or provide copies of these plans where appropriate to verify that such a plan is in place. Including a specific excerpt or a link to the planning document may also be considered where appropriate. Provide the following information regarding project planning:

Yes. In response to the 2014 Sustainable Groundwater Management Act (SGMA) of the State of California, MAGSA was formed in 2017 and published its **Groundwater Sustainability Plan (GSP)** in 2020. Please find the attached excerpts of the MAGSA GSP in the following Appendices:

Appendix A: MAGSA GSP §§ 6.3.1.1 - Notification of Groundwater Use

Appendix B: MAGSA GSP §§ 6.3.2.1 - Well Metering and Sampling Requirements

The full text of the MAGSA GSP can be found at <https://www.mcmullinarea.org/gspdownload/>

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

Yes, this project relates directly to the MAGSA Groundwater Sustainability Plan (GSP) drafted and submitted to the State of California on **January 28, 2020**. According to SGMA legislation, this action fully vests all oversight and enforcement powers of groundwater management with MAGSA. This project enables MAGSA to implement groundwater sustainability goals described in Chapters 4 of the MAGSA GSP as follows:

Section 4.1 of the MAGSA GSP establishes the Sustainability Goal for the McMullin Area GSA. The coordination efforts between the GSAs have resulted in initial quantities for each GSA to mitigate in order to correct current and future conditions. For MAGSA, this is **91,100 AF** per year. These quantities and each GSA’s respective obligation will continue to be measured and evaluated as additional information is gathered.

The basin has agreed to a phased approach of increasing mitigation of groundwater extractions to achieve sustainability. The proposed mitigation schedule is shown in **Table 4-2** from Chapter 4 of the MAGSA GSP.

Table 4-2 Overdraft Mitigation Schedule

Period	Percent of Overdraft Mitigated	Cumulative Mitigation
2020-2025	10%	10%
2025-2030	20%	30%
2030-2035	30%	60%
2035-2040	40%	100%

This phased approach will incrementally mitigate groundwater extraction over the next twenty years with five-year milestones. Annual reductions in groundwater extractions increase every five years until the full goal of **91,110 AF/year** is achieved by 2040 utilizing various mitigation strategies.

(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 identifies technology that will improve the management of groundwater resources on the farm as well as on the basin-wide level. These project tasks are consistent with the goals of the plan to evaluate existing and potential new management actions to conserve storage of water in the aquifer during a drought. **Chapter 6** of the MAGSA GSP establishes a variety of tools that California GSAs have which can be used to achieve sustainable groundwater management. Management actions can be taken which primarily focus on the reduction of groundwater demand. These could be accomplished through increasing data collection, education and outreach, regulatory policies, incentive-based programs, and enforcement actions.

Section 6.3 discusses a suite of management action options that MAGSA may consider during the GSP implementation. The GSA will develop and craft projects and management actions in response to stakeholder input on parallel timelines and will adapt the estimated schedules according to the best available information and best available science at any given time in accordance with §354,44(c) California Revised Statutes. Section 6.3.2 established the authority for Wellhead requirements that include registration of extraction facilities (groundwater wells), the installation of permanently installed totalizing flowmeters, sounding tubes for groundwater observation, and the reporting of groundwater extraction, levels, and quality. This proposal is related to the implementation of this section of the MAGSA GSP and will be necessary before the GSA proceeds with regulations for groundwater allocations or a Water Marketing Program.

Each GSA in the Kings Sub-basin is responsible for implementing projects and management actions intended to enhance its ability to reach sustainability and meet its initial mitigation requirements for overdraft. Examples of the types of measures that may be implemented to ensure the basin will be operated within the sustainable yield are identified in detail in **Chapter 6 – Projects and Management Actions to Achieve Sustainability** of the GSP for each GSA in the basin. Collectively, these projects and programs have been identified to ensure the basin reaches sustainability by 2040. The projects and programs include technical data and estimates of project benefit. The sum of these benefits within the basin meet is believed to support the initial estimates for successfully achieving sustainability within the basin.

The Sub-basin GSAs have agreed to a phased approach of increasing mitigation to achieve sustainability. Each of four (4) phases has set incremental targets and time periods for correcting the overdraft of 10% by 2025, 30% by 2030, 60% by 2035 and 100% by 2040 respectively. Each GSA in the Basin is planning to implement projects and management actions in accordance with the agreed mitigation targets. The GSAs will continue to confer regularly to review data to ensure all GSAs are meeting their milestones and progress is being made toward overall basin sustainability, in accordance with the Coordination Agreement.

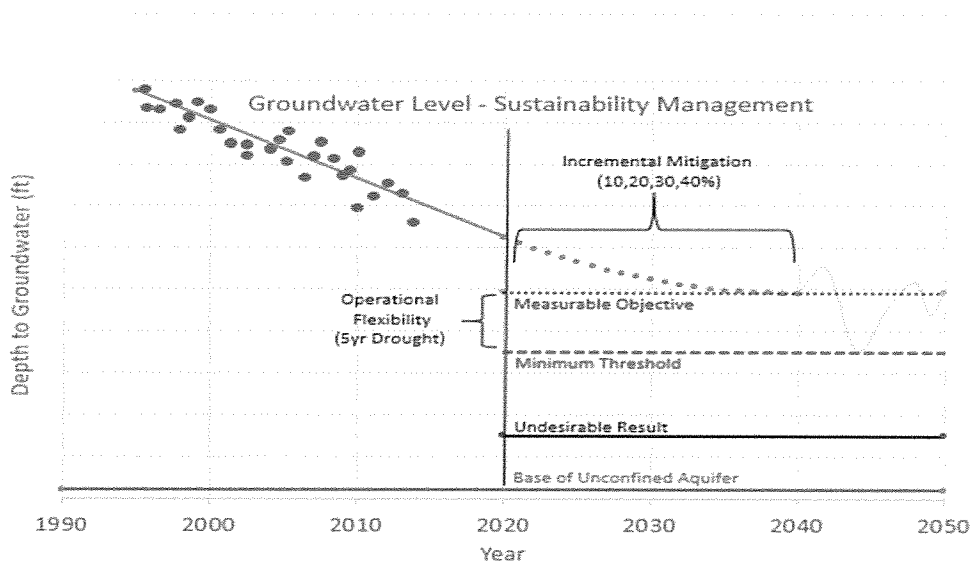
Chapter 6 of the MAGSA GSP *Projects and Management Actions to Achieve Sustainability* include a list of site-specific construction projects beneficial to groundwater aquifer recovery including groundwater recharge structures and water banking, among others. These have been prioritized based on a cost-benefit matrix, however, the Board will consider environmental benefits in the assessment and prioritization of such projects.

The GSA Board has determined that projects related to management actions designed to curtail groundwater extraction will be prioritized as funding becomes available based on a cost per acre benefit to the district. At the **July 6, 2022** Board Meeting of the MAGSA GSA, the board moved to proceed with the application to the Bureau to acquire funds for the purchase and deployment of metered telemetry stations in the GSA. This project will run along parallel timelines to any other projects that may be pursued in the district due to its importance.

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

In addition to all groundwater pumping being accurately measured by permanently installed totalizing flow meters, groundwater level observation will be the primary measurement of aquifer sustainability in MAGSA. **Figure 4** contains a graph that represents the **sustainable management criteria** based on measured groundwater levels in the twenty-three Indicator Wells in MAGSA. Each Indicator Well in MAGSA will have such a graph. In addition, The GSAs within the Kings Basin have defined the **Undesirable Result** for groundwater levels to be significant and unreasonable when either the water level has declined to a depth that a new productive well cannot be constructed, or when the water level has declined to a depth that water quality cannot be treated for beneficial use.

Figure 4



The **Minimum Threshold** was set at an elevation to allow operational flexibility of an anticipated groundwater level decline during a 5-year drought. The actual decline during the historic 2012-2016 drought was determined and the **Minimum Thresholds** were set by adding that distance below the **Measurable Objective** for each Indicator Well in the network. MAGSA's groundwater management objective will be to maintain groundwater levels as close to the **Measurable Objective** as possible to preserve storage in the aquifer above the **Minimum Threshold** and prevent excessive groundwater declines. Accurate measurement will be critical to the successful implementation of management actions assuring compliance.

The primary effect of the chronic lowering of the groundwater table has caused wells to be drilled deeper and deeper to maintain productivity. Without correcting the basin to groundwater sustainability and stabilizing the water table, the decades long trend of drilling deeper and deeper wells would continue causing increased financial burden on stakeholders. In some areas of the basin, bedrock is shallow and the availability of supply above the bedrock could be diminished such that productive wells could not be constructed if water levels are not stabilized above these levels. In some portions of the basin, as water levels decline, the water quality changes are significant enough to require additional treatment. Stabilizing the water table will reduce the changing conditions and provide for more sustainable long-term conditions within the basin.

Subcriterion E.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. Please note, if your project is selected, responses provided in this section will be used to develop the scope of work that will be included in the financial assistance agreement.

Applications that include a detailed project implementation plan (e.g., estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates) will receive the most points under this criterion.

- **Identify and provide a summary description of the major tasks necessary to complete the project. Note: please do not repeat the more detailed technical project description provided in Section D.2.2.4.; this section should be focused on a summary of the major tasks to be accomplished as part of the project.**

In order to achieve groundwater sustainability goals, MAGSA plans to have all wells metered by 2025. A significant amount of this plan will be achieved by the proposed project.

Upon the successful award of this proposal, MAGSA will proceed with procuring the equipment necessary for this project. Totalizing flow meters will be sized according to measurements of well discharge pipes and models will be selected and purchased that will best accommodate proper installation for accurate readings. Solar-powered remote telemetry units (RTUs) will be purchased that will be capable of accepting electronic signals from the flow meters.

Totalizing flow meters and remote telemetry units will be purchased, and installation will begin in the Fall of 2023. Subsequent installations will be conducted in the fall and winters of 2024, 2025, and 2026. Following the deployment, a final report will be prepared for the Bureau by May, 2026.

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

No permits are required for the tasks performed under this project.

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

No structural engineering or design work is necessary for this project. Installation contractors will conduct site surveys of individual meter installation sites to ensure proper meter installation and accuracy. No excavation or construction is necessary for this project.

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

No new policies, rules & regulations, or other administrative action is necessary for this project. The MAGSA Board of Directors adopted well registration and meter regulations (**See Appendix E**) at the October, 2021 regular board meeting so all necessary policies are in place. A copy of these regulations can be found at: <https://www.mcmullinarea.org/policies/>

- **Please also include an estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates. Milestones may include, but are not limited to, the following: complete environmental and cultural compliance; mobilization; begin construction/installation; construction/installation (50% complete); and construction/installation (100% complete)**

January, 2023: Successful notification of award from the Bureau

July, 2023: Sign contract with the Bureau

September, 2023: Achieve Environmental and cultural compliance from the Bureau

October, 2023 - March, 2024: Install 325 telemetry-equipped flowmeters

April, 2024: Installation of weather stations for local crop water use

October, 2024 - March, 2025: Install 300 telemetry-equipped flowmeters

October, 2025 - March, 2026: Install 300 telemetry-equipped flowmeters

May, 2026: Prepare Final Project Report for Bureau

Evaluation Criterion F—Collaboration (6 points): *Up to 6 points may be awarded for projects that promote and encourage collaboration among parties in a way that helps increase the sustainability of the water supply. Please describe how the project promotes and encourages collaboration. Consider the following:*

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

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

Yes, the MAGSA 5-member Board approved the resolution attached at their board meeting on **July 6, 2022**.

Concurrently, the seven GSAs within the Kings Basin have been coordinating within the basin for several years on how to reach and maintain sustainability within the Basin. All GSAs in the Kings Basin submitted GSPs on January 30, 2020. The Kings Basin includes significantly varied geologic conditions, water supplies and land uses that lead to different conditions and obligations within each GSA.

The basin setting describes the trend of declining groundwater levels within the basin and this GSA. The degree of decline varies by location based primarily on land use and available surface water supplies. The Basin setting information, including historic groundwater conditions, surface supplies, groundwater flows, land use and other information were used to establish the water budget, estimates of overdraft within each GSA and sustainable yield. The coordination efforts between the GSAs have resulted in agreed to initial quantities for each GSA to correct in order to correct current and future conditions.

Partnerships are being explored with other entities including the Kings River Conservation District (KRCD) and local Natural Resources Conservation Service (NRCS) and Resource Conservation Districts (RCD) offices to facilitate acceptance of irrigation water management practices to improve water use efficiency in the GSA.

MAGSA also has a close relationship with the California Department of Fish and Wildlife (CDFW). CDFW manages two ecological reserves in MAGSA. CDFW has a representative on the MAGSA Stakeholder Advisory Committee. MAGSA seeks to benefit to all stakeholders through the collaborative process for groundwater management. MAGSA has encouraged

CDFW to participation in the Water Marketing and Banking Program which will benefit wildlife and their habitat in the GSA and provide groundwater recharge benefits.

This project also represents a cooperative effort between the MAGSA, McCrometer Corporation and OTT HydroMet with assistance from the Bureau of Reclamation to deploy permanently installed flowmeters and water management sensors with real-time telemetry. This collaboration will represent one of the first regional data networks for water management in the country.

The data management company that will house the water extraction data acquired from totalizing flow meters on large capacity wells in MAGSA, serve this data to water users, and facilitate digital water transactions for the Water Market in MAGSA is a company called Aegis Technologies Group (Aegis). Aegis is a **Service-Disabled Veteran-Owned Small Business (SDVOSB)** of Washington State that will do business in California for this project. See attached participation letter in Appendix C.

Irrigation for the Future (IFF) will also be a partner in the project by providing irrigation consulting services to local irrigators to improve irrigation management. IFF is an advanced irrigation management consulting services and software company specializing in research, tools and training for economic optimization of irrigated agriculture. This service will facilitate water savings through an advanced water management tool to optimize scarce water resources in MAGSA.

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

The proposed project includes significant outreach with landowners, residents, and local water and natural resource management agencies. The project will benefit a multi-jurisdictional area with 12 major stakeholders representing agricultural, municipal, domestic, industrial, and environmental water users. The project is in Reclamation's Central Valley Project Service Area and could potentially involve water transfers from the Friant Division (San Joaquin River) of the Central Valley Project. The expected project benefits include an increase in water supplies, improved water reliability, reduction in land subsidence, incentives to conserve groundwater, improved coordination with other agencies, and creation of a sustainable water supply.

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

Yes. Once this project is complete, it will be replicated in other portions of this GSA until all large capacity wells in the GSA are equipped with meters on real-time telemetry. These activities also have the potential to be replicated in other GSAs in the Kings River Basin and other portions of the State of California.

- *Please attach any relevant supporting documents (e.g., letters of support or memorandum of understanding).*

Please see attached Letters of **Support** and **Participation** in the Sections with the same name at the end of this document.

Evaluation Criterion G— Additional Non-Federal Funding (4 points): *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 using the following calculation:*

Non-Federal Funding	\$4,085,260	59%
Total Project Cost	\$6,885,260	

Evaluation Criterion H— Nexus to Reclamation (4 Points): *Up to 4 points may be awarded if the proposed project is connected to a Reclamation project or Reclamation activity. No points will be awarded for proposals without connection to a Reclamation project or Reclamation activity.*

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

- *Does the applicant have a water service, repayment, or O&M contract with Reclamation?*

No. However, MAGSA is adjacent to several USBR projects listed below. In addition, MAGSA is in the same basin as the Friant Dam, the San Joaquin River Restoration Project and the Central Valley Project.

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

MVWD, one of the participating agencies in MAGSA, may receive USBR 215 water when available.

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

Yes. The Central Valley Project delivers water through the San Joaquin River system and the Delta Mendota Canal to the southern-most contractors in the San Luis and Delta Mendota Water Authority, namely the Tranquility Irrigation District and the James Irrigation District. Both of these districts are directly adjacent to MAGSA. Tranquility ID is within the Delta Mendota Sub-basin and the James ID is within the Kings Sub-basin. Accurate measurement of the well extractions will assist in area water management, assuring that Federal deliveries will be given their most effective use in a conjunctive use groundwater-surface water regime, resulting, ideally, in greater groundwater retention within each sub-basin.

In addition, The McMullin Area Groundwater Sustainability Agency (MAGSA) is a Joint Powers Authority comprised of the County of Fresno (County), Mid-Valley Water District (MVWD), and Raisin City Water District (RCWD). Reclamation nexus with MAGSA members, and several potential water trading partners include:

- On several occasions, MVWD has obtained temporary contracts from USBR to divert Section 215 floodwater from the CVP Friant Division
- The County of Fresno Water Works District 18 has a contract for Class 1 surface water from the CVP Friant Division
- Fresno Irrigation District, located immediately east of MAGSA, has a contract with Reclamation for 75,000 acre-feet (AF) of Class 2 water from the CVP Friant Division
- James Irrigation District, located immediately west of MAGSA, has a contract for 9,700 AF of Schedule 2 CVP water, and another South of Delta CVP contract for 35,300 AF

- *Is the applicant a Tribe?*

No tribes or federal lands are located within the MAGSA Plan area.

PERFORMANCE MEASURES

Performance Measure A.2: Measuring Devices: Good water management requires accurate and timely water measurement at appropriate locations throughout a conveyance system. This includes irrigation delivery systems and municipal distribution systems.

Measuring Devices: A.2.b. Irrigation Metering: Measuring devices that may be installed can include, but is not limited to, the following:

Flow meters: Water Conservation will be achieved and quantified with the installation of permanently installed irrigation flow meters with telemetry. A key metric of this proposal will be the objective to install **925** metered telemetry stations on large capacity irrigation wells in MAGSA.

Potential benefits from improved irrigation delivery system measurement include being able to:

- *Facilitate accurate and equitable distribution of water within a district*

For a water market to work, accurate measurement of water pumped is necessary to ensure compliance with pumping allocations and to facilitate trading water credits among users. Permanently installed totalizing flow meters with telemetry will facilitate accurate and equitable water marketing in MAGSA under this proposal.

Pre-project estimations of baseline data:

Most irrigation wells in MAGSA were not metered prior to the formation of MAGSA, the development of MAGSA's Meter Regulations, or this proposal. Consequently, water use projections were estimates and are likely **over-estimated**. The installation of permanently installed totalizing flowmeters will provide the most accurate measurement of irrigation water use in the district and facilitate water conservation.

Post-project methods for quantifying the benefits of projects to install measuring devices:

- *Present how measurement devices were used to identify water losses which were previously unknown and how these will be addressed*

At the conclusion of this project, all groundwater extractions will be metered with real-time telemetry. Once this goal has been accomplished, accurate and reliable measurements of water use will be available to water users as well as the district. Flow meter readings will be used to improve the management of irrigation water to reduce or eliminate water losses including runoff and deep percolation which are considered non-beneficial uses and achieve groundwater sustainability by 2040. Meters will also provide the basis for verifiable water conservation once this project has been implemented.

Performance Measure A.3: SCADA: SCADA systems provide water managers with real-time data on the flow rates and volumes of water at key points within an irrigation water delivery system.

The projected opportunities for improved operational efficiencies that could be realized through implementation of a SCADA or SCADA:

SCADA or Real-time telemetry benefits for groundwater extractions will be as follows:

- Real-time telemetry will make Water Trading possible in the **MAGSA Marketing Program** when **925** totalizing flowmeters will be installed with this capability.

- Real-time telemetry will enable irrigators to track water use daily and more accurately match water applications to local environmental conditions from weather stations in MAGSA for improved **Irrigation Water Management** and programs like **IMO**.
- Groundwater extraction data will be delivered daily to MAGSA water managers which would have been impossible without the use of telemetry for remote reading of irrigation flowmeters.

Pre-project estimations of baseline data:

- *Collect data on diversions and deliveries to water users*

Data on previous groundwater extractions was not available since wells in MAGSA were not metered and the remote data collection system was not in place.

Post-project methods for quantifying benefits of SCADA or SCADA/GIS system projects:

- *Calculate amount of increased carryover storage in associated reservoirs. This is a longterm measure which will be more meaningful over a period of years.*

Once this goal of installing **925** metered telemetry stations has been accomplished, accurate and reliable measurements of water use for trading water credits will be possible in the MAGSA Water Marketing Program. The proposed project will provide valuable metered groundwater extraction data daily to MAGSA as well as irrigators for advanced irrigation water management. Water conserved will remain in the reservoir that is the local aquifer to achieve sustainability for all uses in MAGSA.

Estimates for increased storage in the local aquifer over a ten-year period are:

Improved Irrigation Water Management: $20,508 + 4559 = \mathbf{25,067 \text{ AF/yr}}$.

Annual Positive Affect on the Aquifer: **25,067 AF**

Ten Year Aquifer Affect: + 250,670 AF or

12.5% of the 2M AF Overdraft on MAGSA

PROJECT BUDGET

Funding Plan

The non-federal cost share required for the project has been appropriated in expectation of pursuing this project and is already available to the MAGSA. Non-federal funding will be provided solely by MAGSA. MAGSA currently has and will budget over the three-year duration of the project a cash balance sufficient to pay for the non-federal portion of the project. MAGSA does not seek to include any in-kind costs incurred before the project start date. Letters of support and participation from project partners are attached. No funding requests are pending that have not been approved.

The funding commitment from the MAGSA is **\$4,085,260**. The MAGSA board has resolved to budget these funds over the three-year span of this grant proposal. MAGSA 's contribution to the cost-share requirement will be monetary. Funds expended by the MAGSA landowners will be used to purchase the meters, telemetry equipment, miscellaneous equipment for installation, contractor services for installation, and telemetry software licenses. Grant funds from the Bureau would be used for the same expenses and represent **\$2,800,000**. No other federal sources of funds

have been requested. No pending funding requests would negatively affect the project if not approved.

BUDGET PROPOSAL

Funding Sources	% of Total Cost	Total Cost by Source
MAGSA	59.33%	\$4,085,260
BOR Water & Energy Efficiency Grant	40.67%	\$2,800,000
Totals	100.00%	\$6,885,260

Budget Item Description	Computation		Quantity Type (hours/days)	Total Cost
	\$/unit	Quantity		
Salaries and Wages				
	No federal funds to be used for salaries/wages			
Fringe Benefits				
	No fringe benefits provided by this project			
Travel				
Environmental Compliance Costs				
				500
Equipment				
Flow Meter Stations	\$3,096.80	925	ea	\$2,864,540
Remote Telemetry Units	\$2,317.10	925	ea	\$2,143,318
ET Weather Stations	\$5,750.38	6	ea	\$34,502
				\$0
				\$0
Subtotal				\$5,042,360
Supplies and Materials				
Telemetry Software	\$ 20,000.00	1	ea	\$20,000
Quick Connect Cabling (Meter to RTU)	\$ 118.00	925	ea	\$109,150
				\$0
Subtotal				\$129,150
Contractual/Construction				
Flow Meter Installation	\$500.00	925		\$462,500
Telemetry Installation	\$350.00	925		\$323,750
Data Acquisition/Processing	\$500.00	310	Year 1	\$155,000
Data Acquisition/Processing	\$500.00	620	Year 2	\$310,000
Data Acquisition/Processing	\$500.00	925	Year 3	\$462,500
Subtotal				\$1,713,750
Total Project Costs				
				\$6,885,260

BUDGET NARRATIVE

As indicated in Table 2, the only costs for which the MAGSA is seeking reimbursement are the costs of the equipment and supplies associated with the project and contract services to install the meters, water management sensors, and telemetry equipment. No salaries, wages, or travel costs are included. MAGSA staff will administer the project tasks including landowner communication, site selection, equipment purchase, and contractor management. No in-kind services by the district are matching federal funds requested which represents a matching component not reflected in this budget proposal. No reimbursement for fringe benefits or travel will be sought and are not included as project costs. The equipment costs listed in Table 2 are the result of quotes MAGSA has received for meters and telemetry equipment required for collecting data from meters, water management sensors, and weather sensors. Costs for telemetry software have been quoted by the telemetry manufacturer. All equipment will be installed under a contract quoted by an installer experienced in this work.

The environmental and regulatory compliance costs of \$500 listed in the budget table are minimal because the project primarily consists of installing meters and telemetry equipment on existing equipment that are currently in compliance with environmental regulations. If environmental and regulatory costs exceed the budgeted amount, MAGSA will pay additional and necessary amounts. The total project costs are **\$6,885,260**. The MAGSA will be responsible for **59%** of the costs and the Bureau for **41%**.

UEI AND SAM

MAGSA is registered with SAM, and the UEI is 081310209/85BF3

ENVIRONMENTAL AND CULTURAL RESOURCES COMPLIANCE

To allow Reclamation to assess the probable environmental and cultural resources impacts and costs associated with each application, all applicants must respond to the following list of questions focusing on the NEPA, ESA, and NHPA requirements. Please answer the following questions to the best of your knowledge. If any question is not applicable to the project, please explain why. The application should include the answers to:

Environmental and Cultural Resources Compliance *To allow Reclamation to assess the probable environmental and cultural resources impacts and costs associated with each application, all applicants must respond to the following list of questions focusing on the NEPA, ESA, and NHPA requirements. Please answer the following questions to the best of your knowledge. If any question is not applicable to the project, please explain why. The application should include the answers to:*

- ***Will the proposed project impact the surrounding environment (e.g., soil [dust], air, water [quality and quantity], animal habitat)? Please briefly describe all earth-disturbing work and any work that will affect the air, water, or animal habitat in the project area. Please also explain the impacts of such work on the surrounding environment and any steps that could be taken to minimize the impacts.***

No. The project will not impact the surrounding environment, no earth-disturbing activity will occur at any of the 925 metering sites that would affect water, animals, or water.

- ***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?***

No. The access to wells and installation of the project equipment will not impact any threatened or endangered species or their habitat.

- *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 proposed project may have.*

No.

- *When was the water delivery system constructed?*

The water delivery structures being measured in this grant application are the **925** high-capacity irrigation wells. Irrigation well drilling started in the early 1930s and proliferated in the later 1970s following the advancement of reverse-rotary mud drilling and rural electrification.

- *Will the proposed project result in any modification of or effects to, individual features of an irrigation system (e.g., headgates, canals, or flumes)? If so, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features completed previously.*

No. Project sites are on existing wells, the areas immediately surrounding the wells are in active farmland with access roads leading to the wells.

- *Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places? A cultural resources specialist at your local Reclamation office or the State Historic Preservation Office can assist in answering this question.*

None of these sites have cultural or historical significance, nor to MAGSA’s understanding have any of the 1,200 wells in the GSA been registered with the State Historical Preservation Office.

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

No known archeological sites exist in the project areas proposed.

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

No. To the contrary, this project may assist low income or minority populations by sustaining the agricultural economy in the region.

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

No sacred Indian sites or tribal lands exist in the project locations.

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

No, the project will not involve any excavation or movement of soils, so no effect on any noxious weed species in the project areas.

REQUIRED PERMITS OR APPROVALS

No permits will be required of MAGSA for this project.

REFERENCES

Bretreger, D., Yeo, I.-Y., Quijano, J., Awad, J., Hancock, G., & Willgoose, G. (2019). Monitoring irrigation water use over paddock scales using climate data and Landsat observations. *Agricultural Water Management*, 221, 175– 191.

MRNRD. (2021). Personal communication with Middle Republican NRD (Curtis, NE) regarding realized irrigation water conservation from enhanced irrigation water management using water meters with remote telemetry.

Kranz, W. L. Eisenhauer, D. E., Retka, M. T., 1992. Water and energy conservation using irrigation scheduling with center-pivot irrigation systems. *AGRICULTURAL WATER MANAGEMENT*, 22 (1992) 325-334.

LETTERS OF COMMITMENT/PARTICIPATION



3255 West Stetson Avenue
Hemet, CA 92545 USA
Tel (951) 652-6811
Fax (951) 652-3078
www.mccrometer.com

July 14, 2022

McMullin Area GSA
Attn: Matt Hurley, General Manager
275 S Madera Avenue, Suite 301
Kerman, CA 93630

Re: Bureau of Reclamation Water Smart Water and Energy Efficiency Grant Program Application;
"Optimizing Water and Energy Efficiency by the Addition of Precision Metering with Real-Time Remote Telemetry"

Dear Mr. Hurley:

McCrometer is glad to be a partner in the project titled **"Optimizing Water and Energy Efficiency by the Addition of Precision Metering with Real-Time Remote Telemetry"**. McCrometer will commit to supplying irrigation flow meters and telemetry equipment as well as technical support for installation and data management upon the successful award of this grant proposal.

McCrometer has provided durable and accurate flow measurement devices for the agricultural irrigation industry for over 65 years. This project will support agriculture, improved water management for groundwater preservation, and local communities in the Kings Sub-basin of California.

McCrometer applauds the Bureau of Reclamation for the recognition of practices that will enhance irrigation water management in the industry of agriculture by supporting projects through the Water and Energy Efficiency Grant Program and strongly encourages the approval of this proposal.

Respectfully Submitted,

A handwritten signature in black ink, appearing to read "Kenneth A. Quandt".

Kenneth A Quandt
Regulatory Development Manager, Agriculture
McCrometer, Inc.

LETTERS OF COMMITMENT/PARTICIPATION



3255 West Stetson Avenue
Hemet, CA 92545 USA
Tel (951) 652-6811
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Respectfully Submitted,

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Kenneth A Quandt
Regulatory Development Manager, Agriculture
McCrometer, Inc.



815 NW James Ave
Corvallis, OR, 97330, USA
t.530.7607173
info@iff.ag

July 18, 2022

McMullin Area GSA
Attn: Matt Hurley, General Manager
275 S Madera Avenue, Suite 301
Kerman, CA 93630

Re: Bureau of Reclamation Water Smart Water and Energy Efficiency Grant Program Application; **"Water Conservation by Metering Groundwater Extraction with Remote Telemetry"**

To Matt Hurley:

Irrigation for the Future (IFF) is excited to partner with MAGSA and McCrometer for the project titled: **"Water Conservation by Metering Groundwater Extraction with Remote Telemetry"**. IFF will provide an advanced water management decision support system (DSS), software tools, and technical support for set-up and field calibration of the DSS. The DSS platform, known as IMO, integrates flow meter data with other field data to give producers highly accurate assessments of crop water availability in spatially variable fields, designed to target full and deficit irrigation strategies coupled with energy demand management for optimizing net returns to the producer.

IFF works at the forefront of irrigation management technology, developing software tools to optimize water and energy management especially where water is the limiting factor and where irrigation is energy intensive. The IMO platform was developed with funding from NRCS, the California Energy Commission (CEC), and the Bonneville Power Administration, to provide producers with tools to integrate irrigation decisions with energy use strategies, energy conservation, load shifting and grid congestion issues. Irrigation for the Future is currently working with NRCS as part of a Conservation Innovation Grant (CIG) to foster adoption of IMO as part of the EQIP practice known as Advanced IWM.

We are encouraged by the Bureau of Reclamation's interest and support for this timely project. This is an opportunity to demonstrate how a ground water district of 120,000 acres can increase producers' agricultural water use efficiency and net farm income through better tracking and management of their water and energy resources. And how increased accuracy in measurement and management will lead to improved groundwater accounting and preservation, and support local communities in the Kings Sub-basin of California. It will give producers the management accuracy they need to navigate the biggest challenges facing agriculture today in the western United States: groundwater limitations, climate variability and drought. While providing tools for energy demand management

Regards,

J. Collin English
Chief Operating Officer
Irrigation for the Future



October 18, 2021

Matthew H. Hurley
General Manager
McMullin Area GSA
275 S Madera Avenue, Suite 301
Kerman, California 93630

Re: Bureau of Reclamation Water Smart Water and Energy Efficiency Grant Program Application; "Water Conservation and Management by Metering Groundwater Extraction with Remote Telemetry"

Dear Matt,

Aegis Technologies Group, Inc. and SGMA Water Analytics, Inc. (hereinafter the Aegis Companies") are excited to be members of the MAGSA Team and will commit to providing software development services upon the successful award of this grant proposal for the metering of groundwater extraction with remote telemetry.

Aegis, a Service-Disabled Veteran-Owned Small Business, has been developing secure technologies and software solutions for its USG and commercial customers since 1995. The MAGSA Groundwater Conservation Project will support agriculture, improve water management operations for ground water preservation, and benefit local communities in the Kings Sub-basin of California. We look forward to providing the secure communications, data and software solutions that will power the MAGSA groundwater conservation program.

The Aegis Companies commend the Bureau of Reclamation for the recognition of practices that will enhance groundwater management in the agriculture industry by supporting projects through the Water and Energy Efficiency Grant Program and without reservation encourages the approval of this proposal.

Very respectfully,

AEGIS TECHNOLOGIES GROUP, INC.

A handwritten signature in black ink, appearing to read "Mark S. Tiernan".

Mark S. Tiernan
CEO



Aegis Technologies Group, Inc.
www.AegisGrp.com
t 206 708 6504 • f 206 402 5731
655 South Orcas Street, Suite 100 • Seattle, Washington 981082



October 19, 2021

McMullin Area GSA
Attn: Matt Hurley, General Manager
275 S. Madera Avenue, Suite 301
Kerman, California 93630

Re: Bureau of Reclamation WaterSMART WEEG Project; "Metering Groundwater Extraction and Remote Telemetry for Water Management and Conservation"

Dear Mr. Hurley:

OTT HydroMet Corporation is glad to be a partner in the project titled "Metering Groundwater Extraction and Remote Telemetry for Water Management and Conservation." Through our OTT and ADCON product offerings, OTT HydroMet will provide equipment for remote meter reading, flow and pressure monitoring, groundwater level monitoring, ETo weather stations, server software and data access for district staff, and support resources for network operation and data interpretation.

As this project has developed, we have seen your Agency's forward-thinking vision to integrate in-field data collection with water marketing tools to support efficient allocation of water resources during periods of drought or scarcity. We look forward to partnering with Agency staff, McCrometer, and other program partners to conserve and protect water resources in the region.

Thank you for the opportunity to serve and support the patrons and stakeholders of the McMullin Area GSA.

Respectfully,

Cristina Windsor

Business Development Manager
OTT HydroMet Corporation

LETTERS OF SUPPORT



3510 W SAGINAW AVE.
CARUTHERS, CA
93609-9568

Phone 559.269.4882
Fax: 559.864.8832
gunlund@sbcglobal.net

MORE-GUN FARMS

October 20, 2021

McMullin Area GSA
Attn: Matt Hurley, General Manager
275 S Madera Avenue, Suite 301
Kerman, CA 93630

Re: Bureau of Reclamation Water Smart Grant Application; **"Water Conservation and Management by Metering Groundwater Extraction with Remote Telemetry"**

Dear Mr. Hurley:

This is a letter of support for the McMullin Area Groundwater Sustainability Agency's (MAGSA)'s grant application for metering with real-time telemetry and water reporting. Having these meters available for me and other irrigators within the GSA will give us a tool to manage water better to achieve sustainability. This tool will help me decide if I am over or under watering. These meters will also help me save time in making water management decisions on my farm while also potentially achieving greater water use efficiency.

Assistance from the GSA is needed for the educational programs associated with these irrigation systems as well. We need this type of assistance if we are going to succeed in the goal of sustainable groundwater management in MAGSA and the State of California.

Efforts from MAGSA to provide assistance for meters with telemetry is very helpful and greatly appreciated. Thank you for pursuing this project.

Respectfully Submitted,

R. G. Gunlund

October 21, 2021

McMullin Area GSA
Attn: Matt Hurley, General Manager
275 S Madera Avenue, Suite 301
Kerman, CA 93630

Re: Bureau of Reclamation Water Smart Grant Application; **"Water Conservation and Management by Metering Groundwater Extraction with Remote Telemetry"**

Dear Mr. Hurley:

This is a letter of support for the McMullin Area Groundwater Sustainability Agency's (MAGSA)'s grant application for metering with real-time telemetry and water reporting. Having these meters available for me and other irrigators within the GSA will give us a tool to manage water better to achieve sustainability. This tool will help me decide if I am over or under watering. These meters will also help me save time in making water management decisions on my farm.

Assistance from the GSA is needed for the educational programs associated with these irrigation systems as well. We need this type of assistance if we are going to succeed in the goal of sustainable groundwater management in MAGSA and the State of California.

Efforts from MAGSA to provide assistance for meters with telemetry is very helpful and greatly appreciated. Thank you for pursuing this project.

Respectfully Submitted,

Jeanne Harguindeguy

Partner
Harguindeguy Family Farms

Fresno County
CA

October 19, 2021

McMullin Area GSA
Attn: Matt Hurley, General Manager
275 S Madera Avenue, Suite 301
Kerman, CA 93630

Re: Bureau of Reclamation Water Smart Grant Application; **"Water Conservation and Management by Metering Groundwater Extraction with Remote Telemetry"**

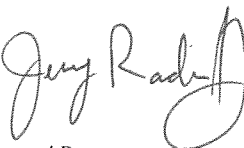
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Efforts from MAGSA to provide assistance for meters with telemetry is very helpful and greatly appreciated. Thank you for pursuing this project.

Respectfully Submitted,



Jerry Radinoff, General Partner
Radinoff Farms L P

OFFICIAL RESOLUTION

The MAGSA Board of Directors adopted a resolution at their meeting on **July 6, 2022**.

Resolution No. 2022-01

**RESOLUTION OF THE
MCMULLIN AREA GROUNDWATER SUSTAINABILITY AGENCY (MAGSA)
CONFIRMING SUPPORT, FINANCIAL CAPABILITY AND COOPERATION WITH
THE US BUREAU OF RECLAMATION IN REACHING COOPERATIVE
AGREEMENT(S) RELATIVE TO GRANT FINANCING**

WHEREAS, the United States Department of Interior, Bureau of Reclamation, has announced the WaterSMART Water and Energy Efficiency Program Grants for Funding Group II Projects for Fiscal Year 2023 to provide financial assistance to water managers;

WHEREAS, MAGSA has a present need for funding to deploy groundwater measurement, observation and telemetry devices necessary under the Sustainable Groundwater Management Act (SGMA) of the State of California.

NOW, THEREFORE, BE IT RESOLVED that the MAGSA Directors agree to and authorize the following;

1. The MAGSA Directors have reviewed and support the proposal submitted;
2. MAGSA is capable of providing the amount of funding needed for the matching grant from the WaterSMART Grant; and
3. If selected for a WaterSMART Grant, MAGSA will work with Reclamation to meet the established deadlines for entering into a cooperative agreement.

Resolved Further, that **MAGSA** staff is authorized and directed to take such further actions as they deem necessary or appropriate for the foregoing resolutions.

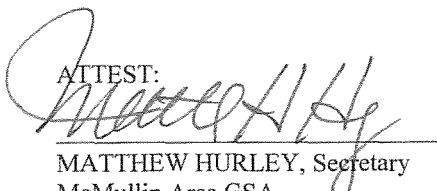
The foregoing resolution was approved by the McMullin Area Groundwater Sustainability Agency Board of Directors at a regular meeting held on the 6th day of July, 2022 by the following vote, to wit:

AYES: Abercrombie, Cameron, DeGroot, Namvar, Pacheco

NOES:

ABSENT:

ATTEST:


MATTHEW HURLEY, Secretary
McMullin Area GSA

APPENDIX A

6.3.1 Education and Outreach Management Actions

6.3.1.1 Notification of Annual Groundwater Use

EO-1 Regular Communication

The GSA will promote education and outreach to all beneficial uses and users within the GSA as detailed in *Chapter 2 Plan Area 2.5 Notice and Communication*. Specific to projects and management actions, the GSA may adopt a program which provides groundwater users their approximate groundwater use in acre-feet on a per acre basis as an education tool every year. The program may be established before the GSA would consider enforcement action on an established groundwater allocation. The goal is to provide ongoing correspondence to groundwater users and promote awareness of the overdraft condition in the GSA, particularly for those groundwater users who do not currently have metered wells. This correspondence may provide individual user information as well as aggregate GSA groundwater data for comparison purposes. The ongoing correspondence may contain the following information:

- Individual grower's estimated groundwater use amount in acre-feet/acre.
- Average crop demand in acre-feet/acre based upon published evapotranspiration values specific to individual's location and corresponding California Department of Water Resources ETo Zone.
- GSA average groundwater use amount for individual grower's crop in acre-feet/acre.
- GSA average groundwater overdraft in acre-feet/acre.
- Current status of GSA adoption of groundwater allocation per acre or groundwater allocation, if applicable, per **Section 6.3.3**.
- Detailed reminder of the GSA powers and authorities granted in SGMA.
- Additional quarterly statements.

In order to determine the individual grower's groundwater use amount, the GSA may consider multiple quantification methods for a consistent determination of groundwater use per acre. The various quantification methods will be discussed further below in **Section 6.3.3**.

EO-2 Non-Routine Responses to Minimum Threshold Exceedances

In addition to regular correspondence, the GSA may also immediately notify individual growers of a Minimum Threshold (MT) exceedance as defined in **Section 4.3**. The notice of MT exceedance would alert the monitoring well owner and groundwater users within a defined radius of the MAGSA boundary. In order to provide communication and outreach, the notification may contain the following information:

- Description and location of the MT exceedance.
- Notice of increased frequency of water level and/or water quality monitoring.
- The potential effects to the individual growers (i.e. their well potentially going dry or drinking water quality concerns).
- The planned GSA response (i.e. trigger of specific projects and management actions).
- Current funding opportunities available through the GSA or other entities, which would combat the determinantal effects of the MT exceedance.
- A written reminder of how individuals can communicate with the GSA, find more information, and provide public input regarding the implementation of the GSP.
- A written reminder of the GSA powers and authorities granted in SGMA and potential for State intervention should Undesirable Results occur.

The regular correspondence and notice of MT exceedance may not generate a quantifiable groundwater demand reduction. However, they would serve as useful education and outreach tools which may change individual pumping practices and encourage growers to implement water conservation Best Management Practices (BMPs) and/or other demand reduction solutions.

The goal is to provide education and correspondence with groundwater users and promote awareness of the GSA overdraft condition, particularly for those groundwater users who do not currently have metered wells. The measurable objective would be the number of annual correspondence letters and MT exceedance notices that are mailed each year. In preparation of the quarterly or annual letters and immediate notices, the GSA would develop template letters and a current mailing address database to expedite the notification process. In addition, other ancillary measurable objectives may include the increase of persons on the GSA's Interested Person's List, visits to the GSA website, and attendance at public GSA meetings and events. If the education and outreach program did result in a reduction of groundwater extraction, the marginal amount would be estimated at 1-100 acre-feet/year.

6.3.1.2 Measurable Objectives Check List

Groundwater Level	X
Storage Change	X
Groundwater Quality	X
Land Subsidence	X
Surface Water-Groundwater Interconnection	NA
Seawater Intrusion	NA

6.3.1.3 Circumstances for Implementation EO-1 - EO-2 (Sec. 354.44.b.1.A)

The education and outreach management action may be developed and implemented prior to adoption of the GSP. The policy would remain indefinitely and be reevaluated every five years. A trigger for the end of this management action may be that another management action or program provides comparable annual education letters and outreach notices.

6.3.1.4 Process for Public Notification EO-1 - EO-2 (Sec. 354.44.b.1.B)

The process for public notification will be addressed by the consistent communication and outreach between the GSA and the groundwater user. The GSA will develop a system to initiate communication with the grower on a regular basis and will additionally respond to overdraft or non-compliance with minimum thresholds with escalating correspondence as deemed necessary. The cost associated with GSA correspondence will be assessed on an annual basis.

6.3.1.5 Permitting and Regulatory Process EO-1 - EO-2 (Sec. 354.44.b.3)

No permit or regulatory process is required for the GSA to adopt the policy. The management action may be accomplished by GSA policy adoption.

6.3.1.6 Status and Schedule EO-1 - EO-2 (Sec. 354.44.b.4)

The education and outreach program with annual education letter and notice of MT exceedance has not been drafted. It is expected to commence shortly after the adoption of the GSP and be completed within 1 year. The initial focus will be the annual correspondence letter since the notices of MT exceedance may not occur for many years.

APPENDIX B

6.3.2 Well Head Requirements Management Actions

6.3.2.1 Well Metering and Sampling Requirements

The GSA recognizes that community involvement and outreach alone will not curtail groundwater overdraft. Additional well requirements will likely be required to more effectively manage and understand the dynamic groundwater conditions. Within the MAGSA, well construction permitting is managed by Fresno County Environmental Health Division (FCEHD) as detailed in **Section 2.3.4**. Obtaining a well permit is currently a ministerial process, not requiring discretionary action or CEQA. The intent of this management action is to have the MAGSA work cooperatively with the FCEHD to increase well requirements without disrupting the current ministerial permit process. Additionally, the GSA would promote constant communication with the FCEHD and would seek to maintain more monitoring responsibility. The GSA may adopt a policy to augment the current well requirements set by the State/FCEHD and establish new permit criteria, enforce GSA policies, and require GSA approval of all permit paperwork for non-de minimis users before FCEHD permit issuance. The policy would affect permits to construct, deepen, destroy, recondition, or repair a well. In order to increase data collection, reporting, and ongoing groundwater management efforts, the additional well requirements policy may contain the following information:

- Registration of pumping facilities with the GSA.
- Require the installation of well flow meters, sounding tubes, and water quality sample ports.
- Require the well owner to self-report groundwater pumping volumes, static water levels, and water quality data.
- Regulate new well construction.

The GSA may consider separating the additional well requirements management action into multiple policies or be silent on various bulleted components until the GSA deems them necessary. For example, the requirement of installing sounding tubes and water quality sample ports may be enacted before the requirement of a well flow meter. Further explanation and detail of the potential additional well requirements are continued below.

The desired outcome of additional well permitting requirements is the ability to monitor groundwater extractions, water levels, and water quality in a thorough, accurate, and efficient manner across the GSA. The measurable objectives differ amongst the bulleted considerations.

WH-1 Registration of Extraction Facilities

As stated in SGMA §10725.6, “a GSA may require the registration of a groundwater extraction facility within the management area of the GSA.” The GSA may adopt this policy to hopefully improve and supplement the existing well records housed by the FCEHD and DWR. The GSA has greatly benefited from the current exchange of well information and use of the online DWR Well Completion Report Map Application tool found here:

<https://dwr.maps.arcgis.com/apps/webappviewer/index.html?id=181078580a214c0986e2da28f8623b37>.

However, through local outreach and research of the proposed well monitoring network, the GSA suspects many existing wells do not have the State and FCEHD well completion reports (the well driller documentation on the geology and well construction details) or have not been entered into the DWR database and may be absent from the existing FCEHD records. Unfortunately, the historic well completion reports (especially the older ones) and available DWR 429 Forms (Well Data Form indicating the state well number and detailed well location information) often have insufficient information to confidently locate the exact position of an older well. In recent decades, the advances in technology, standardization of forms, and accessibility to GPS location have significantly improved the accuracy of well locations and recordkeeping. The intent of registration of groundwater extraction facilities would be to complement existing well recordkeeping and ensure that the GSA can fully understand and quantify the potential impacts of

groundwater decline. In addition to the registration of extraction facilities, the GSA may invest in a complete well canvass study to verify the number of wells and presence of a flow meter.

The goal would be to monitor the number of documented extraction facilities. The method of evaluation may be comparing the number of registered wells to the FCEHD and DWR well records.

WH-2 Installation of Well Flow Meters

The GSA may require the installation of a flow meter on all groundwater extraction facilities to provide more accurate quantities of groundwater extraction and serve as the nexus to other management actions. The policy would describe the acceptable types of flow measurement devices, installation standards and requirements, operation and maintenance requirements, and penalties for tampering, neglect, or misconduct. For example, the flow meter would be installed at each source facility inline before any other connections or discharge points in accordance with the meter manufacturer's specifications. The meter must accurately quantify the volume of extracted groundwater in acre-feet and be routinely maintained by the well owner. Failure to comply with the policy may result in civil penalty or criminal fine in accordance with SGMA §10732. Once the well construction, deepening, or destruction work was completed, the well drilling contractor would be required to provide a Notice of Completion, also known as a Well Completion Report (DWR Form 188), Driller's Report, or Well Log, to the FCEHD office within thirty (30) days of completion. The report would document that the work was completed in accordance with the Well Standards Ordinance and the GSA additional well requirements policy.

The metric would be the number of installed meters. The method of evaluation would be reviewing the number of well permits and confirming whether meters were installed.

WH-3 Installation of Sounding Tubes and Water Quality Sample Ports

The GSA may require the installation of a well sounding tube, air line, electric depth gauge, and/or other water level sensor for the purpose of measuring water levels throughout the GSA. In addition, the GSA may require the installation of a sample port on the well discharge piping for the purpose of collecting water quality samples throughout the GSA. The accurate and widespread collection of water level and water quality data will provide the GSA with the necessary information to monitor the success/failure of the GSP against the established Sustainable Management Criteria in **Section 4**. The policy would describe the acceptable types of water level measuring devices and sample ports, installation requirements, and penalties for tampering, neglect, or misconduct. The installation must provide or allow for the accurate measurement of static groundwater level in feet below the ground surface and water sample collection. If applicable, the water level measurement device must be routinely maintained by the well owner. Once the well construction, deepening, or destruction work was completed, the contractor would be required to provide a Notice of Completion, also known as a Well Driller's Report or Well Log, to the FCEHD office within thirty (30) days of completion. The report would document that the work was completed in accordance with the Well Standards Ordinance and GSA additional well requirements policy.

The metric would be to monitor the number of installed sounding tubes and water quality sample ports. The method of evaluation would be reviewing the number of well permits and confirming whether sounding tubes and sample ports were installed.

WH-4 Self-Reporting of Groundwater Extraction, Level, and Water Quality

The GSA may require the well owner to self-report to the GSA the groundwater extraction volumes, static water levels, and water quality data twice per year, generally in March and October. The policy would describe the frequency of reporting, various methods of reporting, due dates, and specific instructions for data collection. The GSA may provide users with a self-addressed mailer for return mailing. The mailer may include information on which water quality constituents are being requested and reporting instructions. For example, "the well owner must report the groundwater extraction volume in acre-feet and include the current

flow meter totalizer reading” would be a sample reporting instruction. Other example instructions may indicate that static water level measurements should be taken once water levels have stabilized after the last pumping cycle. If there is limited compliance with self-reporting, the GSA may elect to gather the appropriate data with their own staff. The policy would describe that the frequency of the reporting may be temporarily increased if minimum thresholds are exceeded.

The goal would be to monitor received reports for each mailing cycle. The method of evaluation would be reviewing the number of responses from groundwater users (excluding de minimis users), analyzing data validity/accuracy, and filling data gaps.

6.3.2.2 Measurable Objectives Check List

Groundwater Level	X
Storage Change	X
Groundwater Quality	X
Land Subsidence	X
Surface Water-Groundwater Interconnection	NA
Seawater Intrusion	NA

6.3.2.3 Circumstances for Implementation of WH-1 – WH-4 (Sec. 354.44.b.1.A)

The current situation of unsustainable management of groundwater resources leading to critical groundwater overdraft justifies the implementation of additional well requirements. This policy requires the support and coordination of the FCEHD for successful implementation. In addition, the users and beneficial uses within the GSA must be properly notified far in advance of the policy adoption, especially because of the increased well owner costs and self-reporting efforts. For existing wells, there may be extenuating circumstances where the installation of flow meters, sounding tubes, and/or water quality sample ports are not practical or financially advisable. These situations would need further analysis on a case-by-case basis. The policy would remain indefinitely or until another GSA or FCEHD program serves the same purpose.

6.3.2.4 Process for Public Notification of WH-1 – WH-4 (Sec. 354.44.b.1.B)

Educational correspondence regarding self-reporting of groundwater extractions would be accomplished through direct communication between the GSA and the grower. This will take place in the form of self-reporting and the monitoring of water level and water quality, which will then be compiled and distributed through each cycle of correspondence mailings. Should the Board of Directors choose to adopt a policy addressing WH-1-WH-5, the public will be notified through established GSA correspondence methods as explained in **Section 2.5**.

6.3.2.5 Permitting and Regulatory Process of WH-1 -WH-4 (Sec. 354.44.b.3)

The regulatory process would require FCEHD coordination and support to ensure new well permits issued within the GSA adhere to GSA policy. No other environmental or regulatory permits would be required.

6.3.2.6 Status and Schedule of WH-1 - WH-4 (Sec. 354.44.b.4)

The additional well requirements policy has not been drafted, but preliminary discussions with the County have commenced. The draft policy and GSA discussions may commence shortly after the adoption of the GSP and be completed within 2 years.

6.3.2.7 Benefit Realization and Evaluation of WH1 - WH-4 (Sec. 354.44.b.5)

An expected benefit would be a complete geo-database of groundwater extraction locations. Requiring new well permit applicants to provide accurate information on location, depth, perforated zone, and measured

APPENDIX C



DEPARTMENT OF VETERANS AFFAIRS
Center for Verification and Evaluation
Washington DC 20420

2/12/2021

In Reply Refer To: 00VE

Mr. Mark S. Tieman
Aegis Technologies Group, Inc.
DUNS: 145690850
655 S. Orcas Street, Suite 100
Seattle, WA 98108

Dear Mr. Tieman:

On behalf of the U.S. Department of Veterans Affairs (VA), Center for Verification and Evaluation (CVE), I am writing to inform you that Aegis Technologies Group, Inc. has been verified as a Service-Disabled Veteran-Owned Small Business (SDVOSB) and added to the Vendor Information Pages (VIP) at <https://www.vip.vetbiz.gov/>. Aegis Technologies Group, Inc. will be eligible to participate in Veterans First Contracting Program opportunities with VA.

This verification is valid for three (3) years from the date of this letter. Please retain a copy of this letter to confirm Aegis Technologies Group, Inc.'s continued program eligibility in accordance with 38 Code of Federal Regulations (CFR) § 74.12. You may reapply 120 days prior to your expiration date by logging in to your VIP profile.

To promote Aegis Technologies Group, Inc.'s verified status, you may use the following link to download the logo for use on marketing materials and business cards: https://www.va.gov/OSDBU/docs/cve_completed_s.jpg. In addition, please access the following link for information on the next steps and opportunities for verified businesses: <http://www.va.gov/osdbu/verification/whatsNext.asp>.

To ensure that Aegis Technologies Group, Inc. is correctly listed in the Vendor Information Pages, check Aegis Technologies Group, Inc.'s profile for the verified logo. Please notify us if the logo is not present within 72 hours of receipt of this letter.

While CVE has confirmed that Aegis Technologies Group, Inc. is presently, as of the issuance of this notice, in compliance with the regulation, Aegis Technologies Group, Inc. must inform CVE of any changes or other circumstances that would adversely affect its eligibility. Eligibility changes not reported to CVE within 30 days could result in a referral to the Office of Inspector General (OIG), a referral to the Debarment and Suspension Committee, and the initiation of cancellation proceedings—

"World Class Professionals

Enabling Veteran Business Opportunities by Protecting the Veteran Advantage - One Vet at a Time"

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APPENDIX D

2015 Commissioner's Report on Underserved Communities

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Table A - ZIP Codes in Underserved Communities

ZIP Codes	City	County
92236	COACHELLA	RIVERSIDE
92249	HEBER	IMPERIAL
92254	MECCA	RIVERSIDE
92259	OCOTILLO	IMPERIAL
92273	SEELEY	IMPERIAL
92335	FONTANA	SAN BERNARDINO
92337	FONTANA	SAN BERNARDINO
92401	SAN BERNARDINO	SAN BERNARDINO
92408	SAN BERNARDINO	SAN BERNARDINO
92410	SAN BERNARDINO	SAN BERNARDINO
92411	SAN BERNARDINO	SAN BERNARDINO
92701	SANTA ANA	ORANGE
92703	SANTA ANA	ORANGE
92704	SANTA ANA	ORANGE
92707	SANTA ANA	ORANGE
92801	ANAHEIM	ORANGE
92805	ANAHEIM	ORANGE
93036	OXNARD	VENTURA
93219	EARLIMART	TULARE
93227	GOSHEN	TULARE
93234	HURON	FRESNO
93239	KETTLEMAN CITY	KINGS
93241	LAMONT	KERN
93256	PIXLEY	TULARE
93261	RICHGROVE	TULARE
93266	STRATFORD	KINGS
93272	TIPTON	TULARE
93458	SANTA MARIA	SANTA BARBARA
93608	CANTUA CREEK	FRESNO
93624	FIVE POINTS	FRESNO
93640	MENDOTA	FRESNO
93646	ORANGE COVE	FRESNO
93648	PARLIER	FRESNO
93660	SAN JOAQUIN	FRESNO
93701	FRESNO	FRESNO
93702	FRESNO	FRESNO
93703	FRESNO	FRESNO
93706	FRESNO	FRESNO
93721	FRESNO	FRESNO
93725	FRESNO	FRESNO

APPENDIX E

IMPLEMENTING RULES AND REGULATIONS

FOR THE MCMULLIN AREA GROUNDWATER SUSTAINABILITY AGENCY GROUNDWATER WELL METERING, MEASUREMENT, MONITORING AND CONSTRUCTION POLICY AND RELATED POLICIES

(adopted October 6, 2021)

1. Purpose

- a) The purpose of this document is to provide specific guidance to landowners and their respective vendors and contractors when contemplating new and/or replacement well construction or retrofitting of existing wells, which are designed to produce more than two (2) acre feet of water annually, on lands within the boundary of the McMullin Area Groundwater Sustainability Agency (MAGSA) and the requisite acquisition and installation of well metering, measurement and/or monitoring hardware to assure compliance with the MAGSA's associated standing policies in that regard. Specifically, these Implementing Rules and Regulations outline the acceptable range of type, performance, accuracy and reliability of required hardware for compliance with said policies. As a Groundwater Sustainability Agency ("GSA"), properly organized pursuant to the Sustainable Groundwater Management Act ("SGMA"), MAGSA is authorized to adopt rules, regulations, ordinances, and resolutions for purposes of fulfilling its obligations as a GSA. (Water Code § 10725.2(b).) MAGSA adopts these Implementing Rules and Regulations pursuant to this authority.
- b) All newly constructed and/or replacement wells drilled within the MAGSA service area are subject to permit approval by the Fresno County Department of Public Health, Environmental Health Division, ("Fresno County Health") and shall be further regulated by MAGSA, as set forth herein. A new well is any well, designed to produce more than two (2) acre feet of water annually, that does not presently exist but is proposed to be constructed. A replacement well is a specific kind of new well that is located within 300 feet of an existing well, with the existing well appropriately designated for abandonment and destruction, and owned by the same Party that intends to construct the new well. Procedures set forth herein are not meant to duplicate or replace well permitting and well abandonment/destruction procedures implemented by Fresno County. Fresno County Health is cooperating with MAGSA by providing additional information to applicant landowners seeking to drill new or replacement wells within MAGSA on MAGSA's supplemental requirements to more easily facilitate compliance by the landowners and their contractors with these rules and regulations. Fresno County Health is in no way responsible for enforcement of these rules and regulations.
- c) Existing wells, not already in compliance with these rules and regulations, are subject to additional retrofitting and or modification requirements, as further set forth herein, in order to comply with SGMA and/or the policies adopted by MAGSA relative thereto.

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2. Scope

2.1 These Implementing Rules and Regulations apply to any and all groundwater wells, designed to produce more than two (2) acre feet of water annually, currently existing within the MAGSA service area and/or to wells which shall be constructed during the period within which these rules and regulations shall be in effect and are intended to clarify the specifications for compliance with existing standing MAGSA policies, as appropriate.

3. Recitals

WHEREAS, MAGSA is a joint powers authority formed pursuant to the Joint Exercise of Powers Act (Gov't Code section 6500 et seq.) and acts pursuant to that authority;

WHEREAS, MAGSA's mission is to: (1) sustainably manage, protect and maintain the groundwater resources within the McMullin Area of the Kings Subbasin consistent with the Sustainable Groundwater Management Act of 2014 (Water Code section 10720 et seq.) ("SGMA") for the benefit of water users within the McMullin Area of the Kings Subbasin, Basin No. 5-22.08 as identified in the Department of Water Resources' ("DWR") Bulletin 118 and designated as subject to conditions of critical overdraft; and (2) to coordinate with other Groundwater Sustainability Agencies ("GSAs") and management activities throughout the region;

WHEREAS, pursuant to Water Code section 10725.2, the MAGSA Board of Directors is authorized to adopt rules, regulations, ordinances and resolutions for the purpose of complying with SGMA;

WHEREAS, MAGSA, in carrying out its mission, has a continuous need to acquire groundwater data, including, but not limited to, well location, well construction, geological information, water quality, water level data and extraction quantity (pumping data) from its landowners within the McMullin Area, and to compile and manage those data in a Confidential Data Management System;

WHEREAS, MAGSA has and plans to continue to develop and/or acquire confidential, technical and proprietary information related, but not limited to, well location, well construction, geological information, groundwater level data and extraction quantity (pumping data), groundwater production data and groundwater quality information for the McMullin Area ("Confidential Information") and desires to ensure that any Confidential Information that may be disclosed to MAGSA is treated in the strictest confidence consistent with the requirements of the law;

WHEREAS, MAGSA has adopted the following policies which remain as standing policies of MAGSA, the provisions of which are incorporated herein by reference as if set forth herein:

1. Policy No. 2020-02, dated June 3, 2020, entitled the McMullin Area Groundwater Sustainability Agency Accountability and Transparency Policy; and
2. Policy No. 2020-06, dated September 2, 2020, entitled the McMullin Area Groundwater Sustainability Agency Groundwater Data Policy; and

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3. Policy No. 2021-09, dated February 3, 2021, entitled the McMullin Area Groundwater Sustainability Agency Groundwater Well Metering, Measurement, Monitoring and Construction Policy.

WHEREAS, the aforementioned policies contain language specifying adoption of clarifying implementing regulations to carry out their stated intent (please see policies for specific directives and references);

NOW, THEREFORE, BE IT RESOLVED that the following Implementing Rules and Regulations shall provide the clarifying implementing regulation as specified in said policies, shall be effective upon adoption, and shall remain in effect until further modified or rescinded.

Implementing Rules and Regulations

2021.01 Well Registration

- a) All existing groundwater wells located within MAGSA's service area designed to produce more than two (2) acre feet of water shall be registered with MAGSA no later than January 1, 2022.
- b) All new groundwater wells located within MAGSA's service area designed to produce more than two (2) acre feet of water annually shall be registered with MAGSA no later than January 1, 2022 or within thirty (30) days of commencement of drilling for new well, whichever occurs later.
- c) "Registration" shall include (to the extent known to landowner at the time of registration) well owner's (landowner) name and contact information, assessor's parcel number, well geo-location, date of construction (or reasonable estimate), well construction detail, a copy of the well completion report (if available), overall depth of well, and other such relevant information, as may, from time to time by appropriate regulation or ordinance, be determined to be necessary by MAGSA for implementation of the GSP and compliance with SGMA.
- d) Groundwater well registration information shall be provided on a MAGSA issued confidential registration form, as the same may be amended and supplemented from time to time, an initial example of which is included as Attachment A to these rules and regulations.

2021.02 Well Construction

- a) All new groundwater wells, designed to produce more than two (2) acre feet of water annually, shall meet standards established in Department of Water Resources Bulletin 74 or as the same may be hereafter revised, or as established by Fresno County Department

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of Public Health, Environmental Health Division, whichever is more stringent, and shall be subject to permitting as required by Fresno County Health.

- b) New groundwater wells and replacement groundwater wells, designed to produce more than two (2) acre feet of water annually, constructed within the MAGSA boundary, in addition to all hardware and appurtenant power supply requirements required for Fresno County permitting, shall, in addition, include all of the following:
 - i. An electromagnetic flow metering device that meets the specifications set forth herein in Section 2021.03;
 - ii. A water quality sampling spigot (90 degree from horizontal downward facing spigot, capable of producing a smooth and laminar flow) on the discharge piping; and
 - iii. A groundwater elevation sounding tube of at least one (1) inch in diameter, accessing the inside of the casing and constructed to a depth at least 100 feet below the existing static water level, to facilitate accurate water elevation measurements.

2021.03 Well Metering

- a) MAGSA policy requires all groundwater wells designed to produce more than two (2) acre feet of water annually located within the MAGSA boundary to be outfitted with compliant electromagnetic flow metering devices on or before January 31, 2025. All newly constructed groundwater wells or replacement groundwater wells designed to produce more than two (2) acre feet of water annually are required to include an electromagnetic flow metering device on the new or replacement well at the time of construction thereof. In complying with these groundwater well metering requirements, all landowners and/or well owners shall ensure that all groundwater wells located within the MAGSA boundary have an electromagnetic flow metering device that meets the following criteria and/or specifications:
 - i. The meter shall be either a flange type or a saddle type meter;
 - ii. The meter shall be an electromagnetic flow meter and microprocessor based signal converter, capable of communicating with remote telemetry;
 - iii. The meter shall contain a flow sensor based on Faraday's law of electromagnetic induction;
 - iv. The meter shall be accurate to within \pm two percent (2%) of actual flow;
 - v. The meter shall report actual flow rate and contain an aggregate flow totalizer to capture production volume, with flow reported in cubic feet per second and total pumping reported in acre-feet;
 - vi. Each meter shall be appropriately sized for the production rate and discharge piping of the well;

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