Bakersfield's Supervisory Control and Data Acquisition and Automation (SCADA) Project

The City of Bakersfield

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TABLE OF CONTENTS

EXECUTIVE SUMMARY

City of Bakersfield
Kern County, California
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The Bakersfield SCADA Project will install a Supervisory Control and Data Acquisition (SCADA) system for the City's Water Resources Department to accurately and remotely measure Kern River water diversions. Monitoring devices with telemetry will be installed at 20 locations along the Kern River Channel and the Carrier Canal. Each site will also require the establishment of electrical access and construction of a security housing. Four sites will require improvements to diversion structures. The total project cost is $1,664,992, which will cover planning, design, permitting, environmental compliance, the purchase of monitoring and telemetry devices, and the physical installation of all components along with the necessary diversion structure improvements. Bakersfield will provide $921,692 of Non-Federal funds toward the cost of the project; the request for Federal funds is $743,300. The project will provide real time data and easily produce reports that will be used to conserve water and use it more efficiently. The water savings for this project will be 33,264 AF per year. The project will provide long-term assets that will be used to reduce over-deliveries of water. The enormous time savings for City staff will further support conservation efforts as those employees, currently spending 28 hours per day on monitoring and reporting, will redirect their activities to other maintenance projects proven to support efficient water use. The project period will be 24 months with an estimated completion date of December 31, 2020. The project is not located on a Federal facility.

BACKGROUND DATA

The City of Bakersfield (City) is in the southern San Joaquin Valley in Kern County. The City is approximately 100 miles north of the City of Los Angeles, 271 miles south of the City of Sacramento, the capital of California, 286 miles south of San Francisco, 282 miles west of Las Vegas and about 140 miles east of the Pacific Coast. The City is partially surrounded by a rim of mountains. The Sierra Nevada mountains are located northeast of the City and the southern boundary is formed by the Tehachapi Mountains.

The City of Bakersfield is the county seat and the principle metropolitan city of Kern County. The City operates under a council-manager form of government, with the Water Board of the City recommending, administering and implementing domestic water and Kern River water policies set by the City Council. The Domestic Water System and the Wholesale Water System are municipally-owned systems, acquired by the City on December 22, 1976.

The City's Domestic Water System receives a portion of its water from wholesale treated surface water from Cal Water North Garden Water Treatment Plant and Kern County Water Agency Improvement District No. 4's Henry C. Garnett Water Purification Plant. The City's Wholesale Water System provides Kern River water to two (2) Cal Water treatment plants, the North Garden Water Treatment Plan and Northeast Treatment Plant and provides for various water demands within City limits. Cal Water serves portions of the City and unincorporated areas in Kern County and provides water mostly to single-family residences. According to the City's Urban Water Management Plan (UWMP) adopted in 2017, which is updated every five years to evaluate and implement water conservation measures, the City's Domestic Water System serves a single Public Water System (PWS) under the PWS Identification Number CA1510031. The PWS provides 43,789 municipal water connections and delivers an estimated 35,954 AF of water annually, per the 2015 UWMP update.

City's Domestic Water System service area has a population of about 150,000. **Table 1** presents the current and projected population of the area encompassed by the City's Domestic Water System service area from 2015 to 2040. Projected populations in the City's Domestic Water System service area were based on projections obtained from the Southern California Association of Governments (SCAG). The SCAG data incorporates demographic trends, existing land use, general plan land use policies, and input and projections from the Department of Finance (DOF) and the US Census Bureau.

Based on the Department of Water Resources' (DWR) Population Tool, the year 2015 population was approximately 146,500. From the City's data, the City's number of residential connections during 2015 was 41,112 meters. The "Persons per Residential Connections" is 3.56 (146,500 / 41,112). Based on the City's Planning Division, it is assumed the City's population will increase 1.8 percent per year. The City's Domestic Water Service Area is projected to have a population of approximately 228,800 people by

2040. It is anticipated the population of the City's Domestic Water System's service area will grow an average of about 1.8 percent every year.

Table 1: Retail Population

Retail: Population – Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040
	146,496	160,164	175,170	191,444	209,306	228,834

Table 2: Wholesale Population

Wholesale: Population – Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040
	278,488	293,152	308,590	324,845	341,959	359,979

The City of Bakersfield Kern River water supply is primarily derived from "pre-1914" appropriative water rights that the City acquired from Tenneco West, Inc., in 1976. Much of the urban water demand is satisfied through City Kern River water deliveries to Cal Water. The climate and hydrology of the Kern River watershed have a high degree of annual and seasonal variability. As a result, the streamflow hydrology of the Kern River in the Bakersfield area is highly variable as well. The City relies on several sources of water including local groundwater, local surface water from the Kern River, as well as imported surface water that is delivered directly to the City, both of which are treated at the City's two water treatment plants. The SWP (State Water Project) plays a significant role in the City's water resources portfolio by providing water for both direct delivery (about 20%) and regional groundwater recharge.

The City has a moderate climate with cloudless, warm, and dry summers and mild and semi-arid winters. The average temperature ranges from 47.2 degrees Fahrenheit (F) in December to 83.1 F in July. The average rainfall ranges from 0.01 inches in July to 1.16 inches in February. The Evapotranspiration ranges from 1.42 inches in December to 9.08 inches in July. The minimal rainfall creates ongoing water shortages throughout the region. For this reason, the City and its residents historically have not had, and currently do not have access to reliable, economical or clean alternate sources of water. Although limited amounts of SWP have been available to City residents in prior years, such supply has been restricted and increasingly unreliable. City residents have therefore had to increase its reliance on the Kern River as the exclusive water source; either through direct use of surface water supplies or through groundwater created by recharge from the Kern River and associated recharge projects (City's 2800 Acres facility).

The 2011 SWP Delivery Reliability Report projects that SWP deliveries during multiple-year dry periods could average about 34 to 35 percent of total usage and could possibly be as low as 9 percent during a critically dry single year. As a demand-side source of water supply, an aggressive conservation program is essential to integrated regional water management. Consumer acceptance of water-efficient technology and practices will result in long-term demand reduction that improves the Kern Region's capacity to manage drought scenarios and other strains on water supplies and the Delta. Further,

water conservation is a comparatively low-cost source of water supply with positive environmental impacts and benefits including energy savings, pollution prevention, and reduced carbon emissions.

In recent years the City and Cal Water have initiated several measures and programs to increase urban water conservation. The City is increasing urban water conservation through a combination of ordinances, municipal codes, the use of recycled water, and participation in integrated regional water planning. For example, the City has established landscape standards to promote water use efficiency by encouraging landscape design to minimize watering and avoid unnecessary runoff of irrigation water. These standards are now implemented through a model water efficient landscape ordinance (Bakersfield Municipal Code, 17.04.358, amended 17.61). The City's municipal code prohibits water flowing across sidewalks (12.28.020), allowing irrigation water to overflow into gutters (12.28.030), and creates a duty to turn off water before it flows into gutters (12.28.040). Wasting water under these municipal codes is enforceable by general penalty (provision 1.40.010). If wasting water is not corrected within 5 days, the City may discontinue service (14.04.300). The City has also adopted the Uniform Building Code, which contains water fixture efficiency measures for all new construction.

The City's water conservation measures are described in the 2015 UWMP update, which was submitted to DWR in 2017. The City implements measures to conserve water and increase the public awareness of water conservation. Customers in the City's Domestic Water Service Area are currently 100% metered. Also, the City provides detailed information to their customers on their water bill showing the change in customers' annual water use, which encourages water conservation.

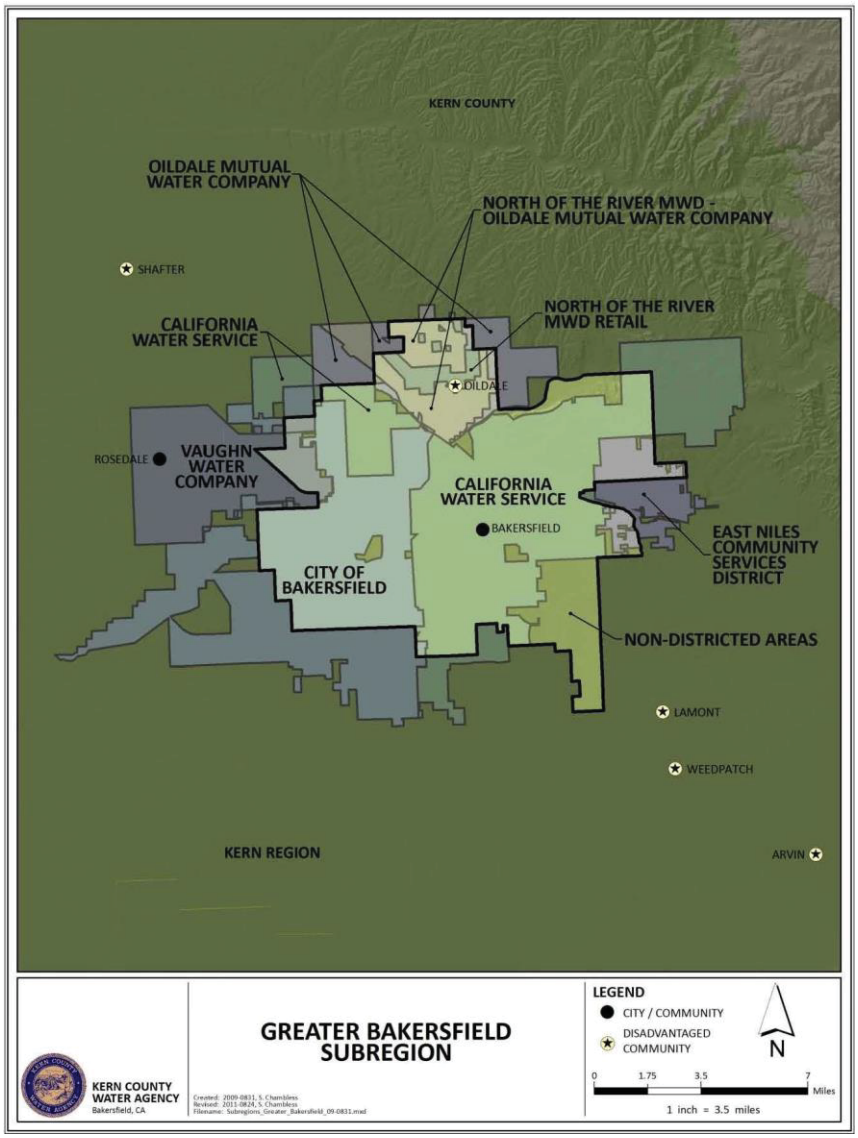
The City also closely monitors its domestic water system for leaks and water loss. Large landscaped city-owned areas are monitored with computer-controlled irrigation systems to minimize water use and identify leaks in the system. The City's Recreation and Parks Department, the single largest water user, continues to implement irrigation efficiency technology using Rainbird's Maxicom system. This master control system monitors weather conditions and water use patterns to provide for efficient park and median island irrigation as well as alerting staff to potential water line breaks or sprinkler head breaks.

Recycled water is used within the City whenever possible to offset demands for surface and groundwater. Wastewater Plant 3, within the City domestic service area, is producing approximately 1,000 AF per year of disinfected tertiary treated water for recycled water use for irrigating purposes at the City's Sports Village. When the Sports Village is completely built out, the anticipated irrigation demand of 2,000 AF per year will be supplied 100% by recycled water.

Cal Water is the largest water purveyor within the Bakersfield Metropolitan area. Cal Water's Bakersfield District Conservation Master Plan (2011–2015) (M. Cubed et al., 2011) outlines the current and proposed conservation programs for Cal Water's Bakersfield District for the next 5 years. The conservation program is expected to expand

because of SBX 7-7, which requires a mandated 20% reduction in per capita urban water use by 2020. In the previous five years, per capita demand has averaged 292 gallons per day in the Bakersfield District, which exceeds the average statewide urban water demand by 52%. For Cal Water to comply with SBX 7-7 on a regional scale, the targeted reduction in per capita demand for the Bakersfield District is an 8% reduction to 268 gallons per capita per day by 2015 and an 18% reduction to 256 gallons per capita per day by 2020. Cal Water developed a portfolio of conservation programs to meet the Bakersfield District's water conservation targets. The primary conservation programs included components from the proposed Program including residential audits; water conservation kit distribution; irrigation system controller distribution; and public information/education programs.

Figure 1: City and Cal Water Purveyor Areas



As previously stated, the City and Cal Water have separate water purveyor areas, as shown in the **Figure 1**. The City's water service area is in Northwest and Southwest Bakersfield, while Cal Water serves South, Central, and East Bakersfield. Cal Water also serves residents outside of the City limits. Approximately 75% of Cal Water's residents are within the City limits.

The Bakersfield SCADA Project will take place on the Kern River, to which the City holds water rights. The City currently utilizes the surface water from the Kern River in its wholesale water program. The water is primarily used for agricultural, domestic, or municipal purposes. Other water agencies also have water rights or receive water from the Kern River under contract and treat

water is primarily used for agricultural purposes. Since this water is delivered to other water entities for their use, it is not practicable to calculate the number of users, total acres irrigated, or actual crops irrigated but carrots, potatoes, and lettuce are major crops in the area.

On an average year, the City received about 135,000 acre-feet of water from its Kern River water rights. Much of that water is delivered to Cal Water's surface water treatment plants for delivery to Cal Water's and the City's service areas. It is estimated that there are approximately 287,000 users in 2018 that benefit from the City's surface water supply, and those users are expected to increase at a rate of approximately 1.8% annually every 5 years. The City also recharges water for the benefit of City residents. In 2020, it is expected that approximately 27,000 acre-feet will be delivered to Cal Water surface water treatment plants, and 77,000 acre-feet will be recharged for future use by City residents.

The water supply on the Kern River is highly variable in its water supply due to the location of the watershed for the North Fork and the South Fork of the Kern River. Some years are very wet, and in those years the City diverts a large amount of water off the Kern River. During dry years and extended periods of drought many of the diversion structures would not be operated due to lack of water. The Army Corps of Engineers Isabella Dam has had a restricted the pool height of the Isabella Dam elevation since 2006 due to some major repairs that are required on its Main Dam, and the Auxiliary Dam. Restricted pool heights mean the Kern River interests are restricted in how much water can be stored. The dam is expected to be repaired by the Army Corps of Engineers by 2022.

PROJECT LOCATION

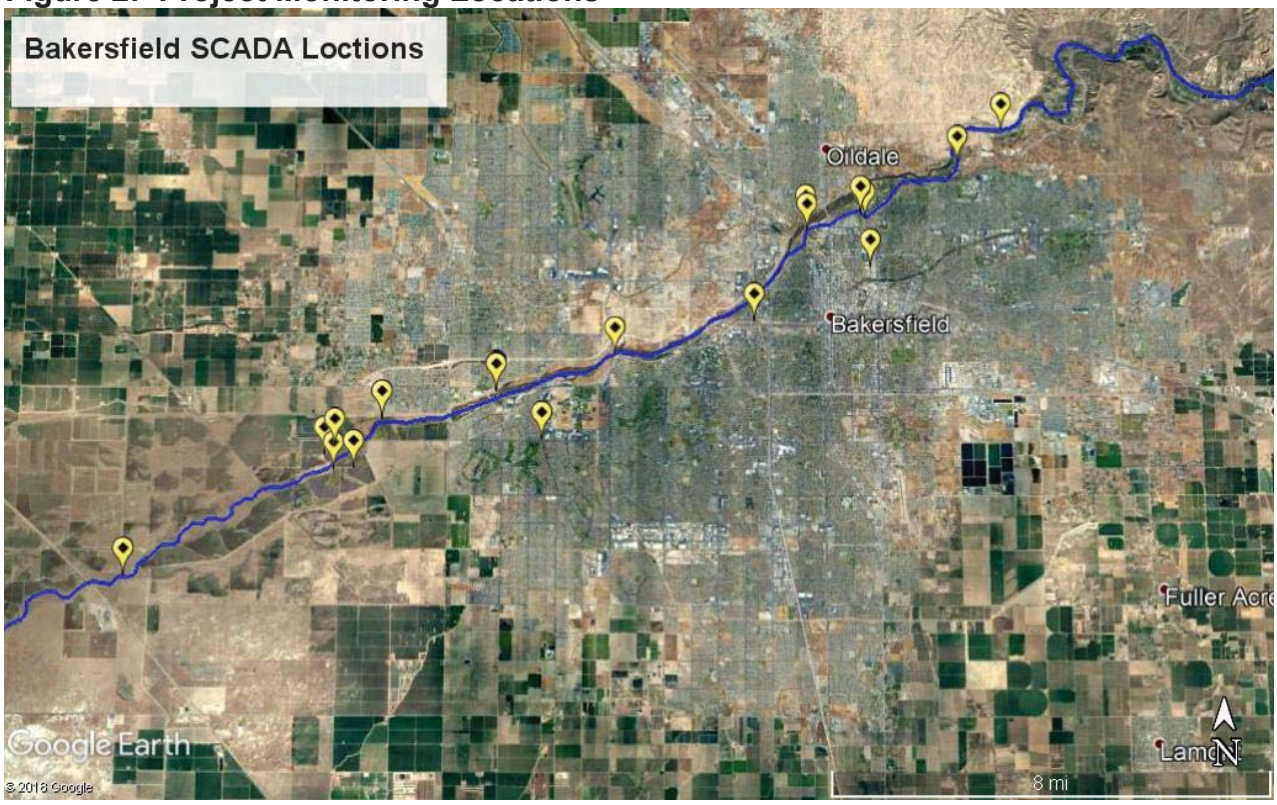
The Bakersfield SCADA Project is in Kern County, California within the city limits of Bakersfield. The project latitudes and longitudes are included in **Table 3** Project Locations.

Table 3: Project Locations

Diversion Description	Coordinate Location
Beardsley Measuring Station	Lat. 35°25'30.91"N, Long. 118°57'37.85"W
Reclamation Weir	Lat. 35°24'58.15"N, Long. 118°58'31.76"W
Eastside Canal Headgate	Lat. 35°24'2.65"N, Long. 119° 0'24.63"W
Kern Island Canal Measuring Station	Lat. 35°23'14.67"N, Long. 119° 0'19.16"W
Levee 1 Measuring Station	Lat. 35°24'7.90"N, Long. 119° 0'30.15"W
Stine Canal Measuring Station	Lat. 35°22'21.18"N, Long. 119° 2'39.60"W
Buena Vista Canal Measuring Station	Lat. 35°20'24.88"N, Long. 119° 6'53.33"W
Calloway Canal Measuring Station	Lat. 35°23'59.07"N, Long. 119° 1'36.55"W
Farmers-Stine-Anderson Measuring Station	Lat. 35°23'50.54"N, Long. 119° 1'35.05"W
River Canal Headgate	Lat. 35°21'47.84"N, Long. 119° 5'26.57"W
Rosedale-Rio Bravo Canal Measuring Station	Lat. 35°21'14.12"N, Long. 119° 7'47.94"W
Pioneer Canal Measuring Station	Lat. 35°21'12.50"N, Long. 119° 7'48.70"W
Berrenda Mesa Turnout	Lat. 35°21'12.16"N, Long. 119° 7'47.97"W
Aera Park Turnout	Lat. 35°21'12.84"N, Long. 119° 7'48.35"W
Basin 8 Headgate	Lat. 35°20'45.51"N, Long. 119°10'3.92"W
Basin 10 Headgate South	Lat. 35°20'10.25"N, Long. 119°11'11.59"W
Basin 2 Headgate	Lat. 35°19'55.80"N, Long. 119°11'0.33"W
Basin 1 Headgate	Lat. 35°19'57.34"N, Long. 119°10'36.66"W
Basin 9 Culverts	Lat. 35°20'18.38"N, Long. 119°10'59.48"W
2nd Point of Measurement	Lat. 35°18'13.52"N, Long. 119°15'5.89"W

There will also be elements of the project installed at the Water Resources Department's headquarters, which are at a latitude of 35°01'13.39"N and a longitude of 118°58'37.13"W.

Figure 2: Project Monitoring Locations



TECHNICAL PROJECT DESCRIPTION

Project Overview

The project will install SCADA telemetric measuring devices at 20 locations where diversions occur along the Kern River in the City. The devices will perform accurate measurements every 15 minutes, which will be reported through telemetry to the centralized monitoring location. Alerts will occur if abnormal flows are detected that will allow action to be taken immediately. There are also some new or improved irrigation channel control elements that will be constructed during this project. The entire proposed Project will be contracted to the most reputable and cost-effective contractors chosen through a competitive bid process.

The project will utilize electronic depth recorders on all new and existing weirs within the diversion measuring project and in the existing channel at the 2nd point measuring location. The City will also install SonTek IQ flow measuring devices in the lined channel, existing culverts, new culverts, and existing pipeline at relevant diversion locations. The SonTek IQ flow measuring device uses four velocity beams to profile water velocity along both the length and the width of the channel. It also uses pressure sensors and a vertical acoustic beam that measures water levels. The device uses SonTek's proprietary flow algorithms to calculate flow in irrigation canals, natural streams, and pipes. Each of these measuring devices will be paired with telemetry equipment that will transfer the measurements to the monitoring software to be used both for current water management operations and for easy, accurate and convenient reporting. Each project site is described in detail, below.

At the Beardsley Measuring Station there is an existing fixed crest weir. This site will require electrical access and a security structure. It will also require a stilling well be installed to obtain the most accurate measurements. An electronic depth recorder will be installed on the existing weir and connected to telemetry devices. This site's construction costs will be $28,800. The following sites have the same requirements and costs at their sites which are also comprised of existing fixed crest weirs: Reclamation Weir, Kern Island Measuring Station, Levee 1 Measuring Station, Stine Canal Measuring Station, Buena Vista Canal Measuring Station, and Pioneer Canal Measuring Station. A depth recorder and stilling well set up will also be used at the 2nd Point of Measurement location. It cost the same, but it is installed on the existing lined channel and a weir is not present at this location.

At Farmers-Stine-Anderson Measuring Station a SonTek IQ flow measuring device will be installed in the existing lined channel near the bike path bridge near Elm Street. This installation will require work to establish electrical access and the construction of a security housing. Construction and installation at this site will cost $39,600. The same process will be repeated at Rosedale-Rio Bravo Canal Measuring Station inside an existing lined measuring structure, Berrenda Mesa Turnout in the existing pipeline, Aera Park Turnout in the existing pipeline, and Basin 1 Headgate in the existing culvert. A

similar plan is in place for construction at River Canal Headgate with the installation of SonTek IQ in a lined canal upstream of Carrier Canal confluence point, but this location does not require a security housing. Therefore, construction at this location will only cost $30,000.

Two SonTek IQ devices are required at both the Eastside Canal Headgate and the Basin 2 Headgate. These sites require electrical access and security structures. The SonTek IQ devices will be secured in existing culverts. Construction at each of these sites will cost $57,600.

Basin 8 Headgate locations are inadequate due to age and capacity issues. To efficiently deliver water through these diversions this site will require a new 4-Bay box culvert that will increase water deliveries. There will be four SonTek IQ devices in the new culvert, one for each bay. The sites will also need electrical access and security structures. The construction costs for Basin 8 Headgate is estimated to be $212,000.

Basin 10 Headgate South will require a new measuring structure at a cost of $100,000. There will also be two SonTek IQ devices in the existing culverts. The site needs electrical access and a security structure. The estimated cost for this site is $176,000.

Calloway Canal Measuring Station will have a new fixed crest weir at a cost of $200,000. Currently, the Calloway Canal Headgate consists of six slide gates for controlling water. The existing flow estimate method here involves determining upstream flow depth, quantity and height of gate openings, and comparing that measured data to a rating table to obtain an estimated flow. This measuring method does not allow or is not practical for the install SCADA equipment. A more reasonable approach would be to install a new fixed crest measuring weir downstream of the existing Calloway Canal Headgate. After the new weir is constructed, an electronic depth recorder will be installed along with telemetry devices. The site will require a stilling well, electrical access, and a security structure. The cost at this site is $275,000.

The final site is the Basin 9 Culverts which requires a new turnout structure and replacement of existing culverts. The existing site consists of 6 culverts that direct uncontrolled and unmeasured flow into Basin 9. Currently there is no diversion structure. The new turnout structure will cost $100,000 and consist of a new diversion structure and the replacement of the existing 6 culverts. There will be one SonTek IQ device installed in each culvert. The site also needs electrical access and a security structure. Therefore, this site will cost $250,000 for all equipment and construction.

The project will also require planning and permitting work before construction begins. The planning process will begin July 1, 2018 and is expected to cost $178,392. This will be paid by the City's Agricultural Enterprise Fund, which comes from service fees from Wholesale water distribution.

Quantifiable Water Savings Calculations

Water savings are going to come from the increased measurement accuracy and frequency as well as from greatly reduced response times to needs for adjustment. Existing measurement devices and techniques have a margin of error of +/- 5% because of human error, tool simplicity, and delays in response times to adjust due to infrequent data collection. These inaccuracies are expected to result in an equal 5% of flow in water losses. For the purposes of quantification, the 2010 gross flow volumes have been used because they are representative of a typical water year.

The project's new measurement systems are expected to have a margin of error of +/- 2%, which is more consistent with automated flow measurement accuracies. This increased accuracy comes from reduced the opportunity for human error, improved device calibration, and increased measuring resolution. Additionally, the frequency of measurement will increase from once every 6-12 hours to once every 15 minutes which will further support water savings by greatly reducing the length of inaccurate deliveries. Based on these improvements, the City expects to see water savings of 3% of the gross flow. We anticipate saving 33,264 acre-feet in a typical year (see **Table 4**).

Table 4: Water Losses and Anticipated Savings

	2010 Gross Flow	5% Losses (AF)	3% Savings (AF)
Beardsley Measuring Station	210,498	10,525	6,315
Reclamation Weir	248,735	12,437	7,462
Eastside Canal Headgate	17,400	870	522
Kern Island Canal Measuring Station	140,655	7,033	4,220
Levee 1 Measuring Station	91,236	4,562	2,737
Stine Canal Measuring Station	37,658	1,883	1,130
Buena Vista Canal Measuring Station	40,735	2,037	1,222
Calloway Canal Measuring Station	74,519	3,726	2,236
Farmers-Stine-Anderson Measuring Station	144,775	7,239	4,343
River Canal Headgate	67,412	3,371	2,022
Rosedale-Rio Bravo Canal Measuring Station	14,965	748	449
Pioneer Canal Measuring Station	1,775	89	53
Berrenda Mesa Turnout	2,380	119	71
Aera Park Turnout	892	45	27
2800 Acres *(Basin 8 Headgate, Basin 10 Headgate South, Basin 2 Headgate, Basin 1 Headgate, Basin 9 Headgate)*	7,039	352	211
2nd Point of Measurement	8,134	407	244
Totals	**1,108,808**	**55,440**	**33,264**

Project Schedule

ACTIVITY	RESPONSIBLE PARTY	DELIVERABLE	END/START DATE
PHASE 1			5/15/2018-3/31/2019
Bid for Plan/Design	City	RFP, Contract with vendor	5/15/2018-7/1/2018
Planning & Design	Vendor 1	Planning & Design Documents	7/1/2018-9/30/2018
Permit Approvals	Vendor 1	Permit Documentation	10/1/2018-3/31/2019
NEPA/CEQA Compliance	Vendor 1	Compliance Documents Filed	10/1/2018-3/31/2019
PHASE 2			1/1/2019
Grant Execution	City	Signed Grant Documents	On or before 1/1/2019
Project Kick-Off	City	Meeting Notes	2/1/2019
Quarterly Program Meetings	City	Meeting Notes	Quarterly
Quarterly Progress / Financial Reports	City	Quarterly Report Documents	Quarterly
Bid for Construction and Installation	City	RFP, Contract with Vendor	1/1/2019-2/28/2019
Construction of Irrigation Control Elements	Vendor 2	Photos of 1 new weir, 4 new culverts and 1 new turnout structure	2/1/19-12/31/19
Site Preparation	Vendor 2	Photos of Electrical access and security housings at all sites; stilling wells at 9 sites	10/1/2019-12/31/2019
Measuring Equipment Installation	Vendor 2	Photos of measuring and telemetry devices installed at all 20 sites and connected to the existing SCADA system	1/1/2020 – 9/1/2020
Final Program / Financial Report	City	Final Report Documents	11/20/2020
PROJECT END			12/31/2020

EVALUATION CRITERIA

Evaluation Criterion A—Quantifiable Water Savings (30points)

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.*

The Bakersfield SCADA Project will install telemetric monitoring devices at twenty (20) critical points along the Kern River. Based on 2010 (126% of average water year) gross flow measurements, which totaled a little over one million acre-feet (AF), the calculated annual water savings would be about 33,000 AF or 3% of the gross flow. The savings will be split among the various diversion sites as follows:

	2010 Gross Flow	3% Savings (AF)
Beardsley Measuring Station	210,498	6,315
Reclamation Weir	248,735	7,462
Eastside Canal Headgate	17,400	522
Kern Island Canal Measuring Station	140,655	4,220
Levee 1 Measuring Station	91,236	2,737
Stine Canal Measuring Station	37,658	1,130
Buena Vista Canal Measuring Station	40,735	1,222
Calloway Canal Measuring Station	74,519	2,236
Farmers-Stine-Anderson Measuring Station	144,775	4,343
River Canal Headgate	67,412	2,022
Rosedale-Rio Bravo Canal Measuring Station	14,965	449
Pioneer Canal Measuring Station	1,775	53
Berrenda Mesa Turnout	2,380	71
Aera Park Turnout	892	27
2800 Acres *(Basin 8 Headgate, Basin 10 Headgate South, Basin 2 Headgate, Basin 1 Headgate, Basin 9 Headgate)*	7,039	211
2nd Point of Measurement	8,134	244
Totals	**1,108,808**	**33,264**

Describe current losses: *Please explain where the water that will be conserved is currently going (e.g., back to the stream, spilled at the end of the ditch, seeping into the ground)?*

Current losses are primarily lost to over-delivery of water which is then lost to irrigation or domestic use. There is some minor seepage into the ground along the unlined portions of the canals and some evaporation. The project is expected to help minimize those eventual losses by reducing over-delivery or untimely delivery of water to those customers.

Further losses in inaccurate deliveries are experienced when there is a failure or dysfunction of a diversion control device such as a weir or headgate. When an over-delivery begins, it could potentially continue unnoticed under the current monitoring system for up to 12 hours until a new measurement is taken. The SCADA system will greatly reduce the losses experienced in this way because notification of the failure will happen within fifteen (15) minutes of the incident and dispatched maintenance personnel can arrive on location to make the necessary adjustment within an hour.

Current losses are estimated at 5% of flow, which was 55,440 AF in 2010, a typical year. Nearly all loss was used in domestic, commercial, industrial or agricultural settings due to over-delivery. The project will reduce water losses to 2% of flow. The 3% of flow savings will then be used to recharge groundwater leading to a sustainable water management system even in multi-year dry situations.

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.*

Calculations of water savings were based on measurements obtained throughout 2010. The actual measurements are primarily taken using staff gauges, which are checked 2-4 times daily at the above listed locations, except three locations utilize over pour depth measurements taken 2-4 times a day and five locations also have chart recorders to track fluctuations. These actual measurements are used to calculate the gross flow at each critical point for the year. Based on the literature and professional consultation regarding SCADA systems for measuring water diversions, we expect the measurements obtained by the new telemetric measuring devices to be more accurate than human measurement by 3%. Additionally, measurements will now be taken every fifteen (15) minutes instead of every 6-12 hours. This allows adjustments to be made much more quickly than before minimizing over deliveries due to lag time. Therefore, we estimated 3% water savings that covers actual losses from over-delivery and mechanism failure.

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

*(3) **Irrigation Flow Measurement:** Irrigation flow measurement improvements can provide water savings when improved measurement accuracy results in reduced spills and over-deliveries to irrigators. Applicants proposing municipal metering projects should address the following:*

a. *How have average annual water savings estimates been determined? Please provide all relevant calculations, assumptions, and supporting data.*
b. *Have current operational losses been determined? If water savings are based on a reduction of spills, please provide support for water currently being lost to spills.*
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?*
d. *Provide detailed descriptions of all proposed flow measurement devices, including accuracy and the basis for the accuracy.*
e. *Will annual farm delivery volumes be reduced by more efficient and timely deliveries? If so, how has this reduction been estimated?*
f. *How will actual water savings be verified upon completion of the project?*

Annual water savings estimates were made considering the improved accuracy of the SCADA measuring devices which is assumed to be 3% more accurate than the previously employed manual measuring techniques. The increased measurement accuracy will in turn make water deliveries more accurate by 3% as adjustments will be made to correct water delivery amounts. The total flow measured in 2010 at the 20 measuring points to be automated was 1,108,808 acre-feet. A 3% overall water savings at that volume would equate to 33,264 AF per year.

Current operational losses have not been explicitly determined, but they are estimated to be approximately 5% of the flow. This is an assumption based on the accuracy of the types and frequency of measurement currently performed at the location sites. It is also measured by metering as diverted water is delivered to customers. The over-deliveries due to diversion flow inaccuracies are the major loss although some water is also lost to seepage through the unlined portions of the canal/channel and a minimal loss is experienced through evaporation. The infiltration of water into the ground should not really be considered a true loss for this project because the intended use of conserved water is for groundwater recharge and the infiltration is performing that same function.

Flows are currently measured by taking manual measurements at relevant locations along the Kern River and in the 2800 Acres water spreading facility. These measurements are taken 2-4 times today often by observation of depth charts but sometimes using pour over techniques and, in two instances, also using chart recorders that constantly measure fluctuations in flow velocities. These measurements are then used to find the flow on charts established through industry calculations and historical data.

SonTek IQ flow measuring devices that will be used in the lined channel, existing culverts, new culverts, and existing pipeline at relevant diversion locations. The SonTek IQ flow measuring device uses four velocity beams to profile water velocity along both the length

and the width of the channel. It also uses pressure sensors and a vertical acoustic beam that measures water levels. The device uses SonTek's proprietary flow algorithms to calculate flow in irrigation canals, natural streams, and pipes. Electronic depth recorders will be used at all other sites where the SonTek IQ is not practical or necessary.

The telemetry devices will be the Storm3-03 Turn Key System. It is a fully integrated system that includes a web-enabled data logger with integrated CDMA cellular modem with puck antenna, NEMA 4X rated enclosure, solar power system featuring a 12v/18ah battery and 20-watt solar panel with mount, terminal strip, fusing, desiccant, and internal humidity sensor. This telemetry system also requires an annual Cellular Data Telemetry Plan and a cloud-based data hosting service.

The water savings will be found through the measurements of flows and the evaluation of the delivery amounts. It can be confirmed through the quantities of water used to recharge groundwater, which is how the conserved water will be used. The amount of water used for groundwater recharge over time can be evaluated to realize water savings from more efficient water management techniques. Additional measurements can be obtained from the incoming water meters at the treatment plants receiving wholesale water deliveries from the City. These readings of water receipts from the other water agencies can help to verify the measurement accuracy and the water savings.

E.1.2. Evaluation Criterion B—Water Supply Reliability (18points)

*Up to **18 points** may be awarded under this criterion. This criterion prioritizes projects that address water reliability concerns, including making water available for multiple beneficial uses and resolving water related conflicts in the region.*

Please address how the project will increase water supply reliability. Proposals that will address more significant water supply shortfalls benefitting multiple sectors and multiple water users, will be prioritized. General water supply reliability benefits (e.g., proposals that will increase resiliency to drought) will also be considered. Please provide sufficient explanation of the project benefits and their significance.

There is widespread support of this project from the water entities that are wholesale customers. The City has obtained letters of support for the project from Kern Delta Water District, North Kern Water Storage District, and Kern County Water Agency Improvement District No. 4. Furthermore, the project is in line with new California diversion measurement reporting requirements that are a priority for water conservation efforts across the state. The improved reporting capabilities will help improve water supply reliability for the City, the surrounding area and will also contribute to water conservation efforts throughout California.

The increased accuracy of measuring diverted water will provide reduced water losses due to over deliveries and mechanical failure. The owner of saved water will be able to utilize that water as they see fit. For the City, this saved water will be used to replenish

the groundwater basin via water spreading. This is a direct benefit to the groundwater basin and helps with compliance to SGMA.

When water is conserved due to the improved accuracy of the measurement devices, that is additional water that can be stored in Lake Isabella by the Kern River interests that can be allocated to beneficial uses such as agricultural, domestic, and municipal purposes.

Historically there has frequently been tension/litigation on the Kern River over water rights. However, there are multiple agreements in place between Kern River interests and other interested parties that receive water diverted off the Kern River. These agreements, some of them going back over 140 years or so, govern the law of the river. The City currently keeps the records along the river and develops the Kern River Annual Report, which is then distributed to the various parties with Kern River water rights. The proposed measurement devices will allow the interested parties a way to better track and provide data so that the agreed upon amount of diversion is what is be delivered on a day to day basis.

E.1.3. Evaluation Criterion C—Implementing Hydropower (18 points)

*Up to **18 points** may be awarded for this criterion. This criterion prioritizes projects that will install new hydropower capacity to utilize our natural resources to ensure energy is available to meet our security and economic needs.*

There are no hydropower elements in this project.

E.1.4. 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 NRCS financial or technical assistance.*

There are no known related On-Farm Irrigation Improvements eligible for technical or financial assistance from NRCS currently.

E.1.5. Evaluation Criterion E—Department of the Interior Priorities (10 points)

*Up to **10 points** may be awarded based on the extent that the proposal demonstrates that the project supports the Department of the Interior priorities. Please address those priorities that are applicable to your project. It is not necessary to address priorities that are not applicable to your project. A project will not necessarily receive more points simply because multiple priorities are addressed. Points will be allocated based on the*

degree to which the project supports one or more of the priorities listed, and whether the connection to the priority(ies) is well supported in the proposal.

This project meets the objective of the grant by conserving water and using it more efficiently. It also supports each of the Department of the Interior's priorities.

The project creates a conservation stewardship legacy because SCADA measuring systems utilize science directly in the management of water resources. The system employs electronic measuring devices that collect information on water depth and/or flow velocities every 15 minutes and reports these measurements through radio waves to a centralized control system and database. The SCADA system greatly reduces response times to changes in the environment making water deliveries more accurate and minimizing waste.

The SCADA system also helps to streamline the environmental and regulatory review process while maintaining environmental standards because of the reporting capabilities. The data collected will be stored in a cloud-based system that will be used to generate reports on, among other things, the size of all diversions in a given year as required by California Senate Bill (SB) 88. SB 88 requires that all water rights holders meet final diversion measurement standards by 2020. For the City that means the installation and certification of measuring devices that collect data at least hourly. The installation and certification must be performed by an engineer, contractor or professional. The project meets all these standards, improves the monitoring and reporting capabilities of the City, and greatly reduces the employee hours spent measuring and reporting diversions through existing methods.

The project also helps to restore trust with local communities because it creates a dialog between Reclamation and the City and the local community. The funding opportunity and, if funded, the project period will produce further interaction, communication, and trust between the City and Reclamation. In an area with historic water tensions and litigations, the involvement of Reclamation in supporting better use of water resources is appreciated by the City, its wholesale water customers, and individual citizens alike.

If funded, this project reduces the administrative burden on the City, other water entities that receive Kern River surface water, and individuals because this water conservation and efficiency program has an additional benefit of bringing the City into compliance with a fast-approaching State level regulatory standard from SB 88.

The SCADA project modernizes our infrastructure through the construction of new and improved culverts, a new fixed crest weir, and new turnout structures. These improvements to the water infrastructure are necessary to the efficient distribution and use of water and yet are more expensive than the City would be able to provide on its own except through slow, incremental development.

Finally, the project further supports improvements to infrastructure by creating significant time savings for City staff of approximately 28 hours per day. An estimated 8 of these hours are saved in the field. Those work hours will not be eliminated but will be redirected to other water conservation and infrastructure maintenance activities. This allows for better completion of routine maintenance and for easier completion of deferred maintenance tasks by adding one FTE without having to create a new position.

E.1.6. Evaluation Criterion F—Implementation and Results (6 points)
*Up to **6 points** may be awarded for these subcriteria.*

E.1.6.1. Subcriterion F.1— Project Planning
Points may be awarded for proposals with planning efforts that provide support for the proposed project.

The Urban Water Management Plan (UWMP) updated in 2015 is supportive of water conservation efforts and improvements in water efficiency. Furthermore, the SCADA project is specifically sought in the capital improvements budget for the City. However, no future projects are outlined in the UWMP.

E.1.6.2. Subcriterion F.2— Performance Measures
Points may be awarded based on the description and development of performance measures to quantify actual project benefits upon completion of the project.

From Appendix E – SCADA Performance Measures

How SCADA or SCADA/GIS implementation will differ from pre-project operations in terms of how improved data availability will be incorporated into daily operational decisions. How the SCADA or SCADA/GIS systems will be maintained once implemented. Discuss balance of in-house expertise anticipated vs. reliance on third party service provider(s).

The projected opportunities for improved operational efficiencies that could be realized through implementation of a SCADA or SCADA/GIS system (e.g. improved delivery equity, improved response to unanticipated events, reduced administrative spillage, and enhanced productivity of human resources). *The response process to SCADA or SCADA/GIS failures/outages.*

Applicants are encouraged to review published reports on considerations when implementing a SCADA system (e.g. Freeman, B., and C. Burt (2009), Practical experience with state-of-the-art technologies in scada systems, San Luis Obispo, CA).
The following performance measures may be helpful in estimating the water conservation that will be realized upon completion and to verify this amount post-project for installing a SCADA or SCADA/GIS system.

- *Pre-project estimations of baseline data:*

- *Collect data on diversions and deliveries to water users*
- *Collect data on waste way flows*
- *Document employee pre-project time spent on ditch/canal monitoring and water control*

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 long-term measure which will be more meaningful over a period of years.*
- *Track and record the diversions to water users and compare to pre-project diversions. This would show results of improved management if yearly fluctuations in weather are accounted for.*
- *Report delivery improvements (e.g. changes in supply, duration, or frequency that are available to end users because of SCADA/GI*
- *Calculate if there was a reduction in waste way flows and, if so, how much they were reduced.*
- *Document other benefits such as less mileage by operators on dusty roads (which saves time and influences air quality) and less damage to canal banks.*

The SCADA project is expected to have an enormous impact on water management operations as the real-time data that will now be available to canal tenders and office staff with measurements every 15 minutes will mean that day to day management of flows will be efficient. The timely information will change the way the canal tenders make their adjustments and will reduce the chances that they will have to return to a diversion structure for further adjustments; instead they will be more likely to get the appropriate adjustment on their first visit to the diversion structure. On busy days that require numerous changes to diversions, canal tenders can evaluate real time data which will help identify lag times, a key element in operating a more efficient system. The algorithms utilized by the SonTek IQ system will replace most of the time consuming calculations that some sites currently require. While the tenders may have to perform some of these calculations as back up information at times, the man hours saved through the reduction is still anticipated to be 2 hours per day. The telemetry system will also reduce some trips to measuring sites on some days when time is constrained and reported measurements are as expected by allowing management to approve telemetry only monitoring of those sites in certain circumstances. This can eliminate up to 30 minutes of driving each way to remote locations to check a single gauge.

There are expectations that the SCADA system will require its own maintenance and will experience some failures from time to time. Both routine and emergency maintenance will be performed by a third-party vendor under contract with the City. The vendor and the City will institute policies for continued operation during scheduled and unexpected downtime in the SCADA system. This is anticipated to be a return to manual measurements with the frequencies currently used at each of the project locations.

To confirm that the project is performing as expected, some additional data will be gathered before the project is implemented to establish a baseline for comparison. The

number of hours spent on measuring, reporting, and controlling diversions will be documented for 24 hours on a randomly selected day. Diversion quantities are already available and will be used for comparison with after-project results. Waste water flows are not applicable in the City's Wholesale water system.

Post-project diversion measurements will be made and regularly reported. These will be compared to pre-project diversions. The amount of water used for groundwater recharge will also be particularly closely monitored and compared over time with the previous amounts of water used for recharge, which has already been collected. The number of hours spent on measuring and reporting diversions will be documented for 24 hours on a randomly selected day after the project has been completed and again 6 months later. These hours will be compared to the pre-project time spent on measuring, reporting, and controlling water flow.

E.1.7. Evaluation Criterion G— Nexus to Reclamation Project Activities (4 Points)

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

- *Is the proposed project connected to Reclamation project activities? If so, how? Please consider the following:*
- *Does the applicant receive Reclamation project water?*
- *Is the project on Reclamation project lands or involving Reclamation facilities?*
- *Is the project in the same basin as a Reclamation project or activity?*
- *Will the proposed work contribute water to a basin where a Reclamation project is located?*
- *Will the project benefit any tribe(s)?*

The project does create a nexus to Reclamation project activities through operation within the same basin as Reclamation activities. Sometimes in wet years, water from the Friant Kern Canal will be diverted to the Kern River channel. Reclamation helps coordinate this transfer from the Friant Water Authority. Reclamation has also recently worked with the City on a proposed six-mile multi-use trail along the Friant Kern Canal. The City is still in the application stage with that project. The project will help reduce over-delivery of water to other water agencies which in return conserves water than can be used to recharge groundwater. The recharge of groundwater here in the basin which is also used by Reclamation projects will directly benefit those projects. The measurements that will be obtained by the new SCADA system may even help to inform when and for how long water is diverted from the Friant Kern Canal to the Kern River channel. The project will not benefit any tribes.

E.1.8. Evaluation Criterion H— 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 is $921,692 and total project cost is $1,664,992. Non-Federal funding accounts for 55.4% of project costs, which exceeds the required 50% match.

FUNDING PLAN

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

The City of Bakersfield (COB) will contribute using the Agricultural Enterprise Fund, which is a revenue account funded by charges for service of water distribution.

COB will begin the process of planning, design, permitting and approval prior to execution of the grant agreement. Consultant fees for this process will be contributed as match by COB in the amount of $178,392. COB will, also, cover $743,300 (50%) of the cost of construction, which is estimated at $1,486,600.

The total match amount will be $921,692, which is $89,196 (5%) more than the required 50% match on the total project cost of $1,664,992. This match amount is currently available for use in the Agricultural Enterprise Fund.

Describe any donations or in-kind costs incurred before the anticipated Project start date that you seek to include as project costs.

COB will incur Project expenses prior to the anticipated start date in the amount of $178,392 for planning, design, permitting and approvals. The date of cost incurrence is anticipated to begin on July 1, 2018. The completion of these activities is necessary for the installation of SCADA. COB will cover the cost of these items using revenue from the Agricultural Enterprise Fund.

Describe any funding requested or received from other Federal partners.

The Project will not be funded by any other federal entities.

Describe any pending funding requests that have not yet been approved and explain how the project will be affected if such funding is denied.

All funding has been approved.

FUNDING SOURCES	AMOUNT
Non Federal Entities	
1. City of Bakersfield Enterprise Fund	$921,692
Non Federal Subtotal	$921,692
Other Federal Entities	
1. None	$0.00
Other Federal Subtotal	$0.00

BUDGET PROPOSAL

The entire proposed Project will be contracted to the most reputable and cost-effective contractors chosen through a competitive bid process.

CONTRACTUAL/PRE-CONSTRUCTION – ALL SITES

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Design & Planning; Permitting; Environmental Compliance Contractors (Estimated @ 12% of construction cost)	$178,392	$178,392
				PRE-CONSTRUCTION COSTS:	**$178,392**

CONTRACTUAL/CONSTRUCTION COSTS - ALL SITES

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	LS	Beardsley Measuring Station	$28,800.00	$28,800
2	1	LS	Reclamation Weir	$28,800.00	$28,800
3	1	LS	Eastside Canal Headgate	$57,600.00	$57,600
4	1	LS	Kern Island Measuring Station	$28,800.00	$28,800
5	1	LS	Levee 1 Measuring Station	$28,800.00	$28,800
6	1	LS	Stine Canal Measuring Station	$28,800.00	$28,800
7	1	LS	Buena Vista Canal Measuring Station	$28,800.00	$28,800
8	1	LS	Calloway Canal Measuring Station	$275,000.00	$275,000
9	1	LS	Farmers-Stine-Anderson Measuring Station	$39,600.00	$39,600
10	1	LS	River Canal Headgate	$30,000.00	$30,000
11	1	LS	Rosedale-Rio Bravo Canal Measuring Station	$39,600.00	$39,600
12	1	LS	Pioneer Canal Measuring Station	$28,800.00	$28,800
13	1	LS	Berrenda Mesa Turnout	$39,600.00	$39,600
14	1	LS	Aera Park Turnout	$39,600.00	$39,600
15	1	LS	Basin 8 Headgate	$212,000.00	$212,000
16	1	LS	Basin 10 Headgate South	$176,000.00	$176,000
17	1	LS	Basin 2 Headgate	$57,600.00	$57,600
18	1	LS	Basin 1 Headgate	$39,600.00	$39,600
19	1	LS	Basin 9 Headgate	$250,000.00	$250,000
20	1	LS	2nd Point of Measurement	$28,800.00	$28,800
				TOTAL ESTIMATED PROJECT COSTS:	**$1,486,600**

CONTRACTUAL/CONSTRUCTION COSTS, PER SITE

BEARDSLEY MEASURING STATION

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$10,000.00	$10,000
2	1	EA	Stilling Well	$1,000.00	$1,000
3	1	LS	Electrical	$5,000.00	$5,000
4	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$24,000
				Contingency: 20%	$4,800
				CONSTRUCTION COSTS:	**$28,800**

RECLAMATION WEIR

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$10,000.00	$10,000
2	1	EA	Stilling Well	$1,000.00	$1,000
3	1	LS	Electrical	$5,000.00	$5,000
4	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$24,000
				Contingency: 20%	$4,800
				CONSTRUCTION COSTS:	**$28,800**

EASTSIDE CANAL HEADGATE

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	2	EA	Electronic Measurement & Telemetry Devices*	$15,000.00	$30,000
2	1	LS	Electrical	$10,000.00	$10,000
3	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$48,000
				Contingency: 20%	$9,600
				CONSTRUCTION COSTS:	**$57,600**

KERN ISLAND CANAL MEASURING STATION

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$10,000.00	$10,000
2	1	EA	Stilling Well	$1,000.00	$1,000
3	1	LS	Electrical	$5,000.00	$5,000
4	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$24,000
				Contingency: 20%	$4,800
				CONSTRUCTION COSTS:	**$28,800**

LEVEE 1 MEASURING STATION

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$10,000.00	$10,000
2	1	EA	Stilling Well	$1,000.00	$1,000
3	1	LS	Electrical	$5,000.00	$5,000
4	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$24,000
				Contingency: 20%	$4,800
				CONSTRUCTION COSTS:	**$28,800**

STINE CANAL MEASURING STATION

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$10,000.00	$10,000
2	1	EA	Stilling Well	$1,000.00	$1,000
3	1	LS	Electrical	$5,000.00	$5,000
4	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$24,000
				Contingency: 20%	$4,800
				CONSTRUCTION COSTS:	**$28,800**

BUENA VISTA CANAL MEASURING STATION

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$10,000.00	$10,000
2	1	EA	Stilling Well	$1,000.00	$1,000
3	1	LS	Electrical	$5,000.00	$5,000
4	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$24,000
				Contingency: 20%	$4,800
				CONSTRUCTION COSTS:	**$28,800**

CALLOWAY CANAL MEASURING STATION

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$10,000.00	$10,000
2	1	EA	Stilling Well	$1,000.00	$1,000
3	1	LS	Electrical	$10,000.00	$10,000
4	1	EA	Security Structure	$8,000.00	$8,000
5	1	LS	Fixed Crest Weir	$200,000.00	$200,000
				Sub-total:	$229,000
				Contingency: 20%	$46,000
				CONSTRUCTION COSTS:	**$275,000**

FARMERS-STINE-ANDERSON MEASURING STATION

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$15,000.00	$15,000
2	1	LS	Electrical	$10,000.00	$10,000
3	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$33,000
				Contingency: 20%	$6,600
				CONSTRUCTION COSTS:	**$39,600**

RIVER CANAL HEADGATE

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$15,000.00	$15,000
2	1	LS	Electrical	$10,000.00	$10,000
				Sub-total:	$25,000
				Contingency: 20%	$5,000
				CONSTRUCTION COSTS:	**$30,000**

ROSEDALE-RIO BRAVO MEASURING STATION

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$15,000.00	$15,000
2	1	LS	Electrical	$10,000.00	$10,000
3	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$33,000
				Contingency: 20%	$6,600
				CONSTRUCTION COSTS:	**$39,600**

PIONEER CANAL MEASURING STATION

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$10,000.00	$10,000
2	1	EA	Stilling Well	$1,000.00	$1,000
3	1	LS	Electrical	$5,000.00	$5,000
4	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$24,000
				Contingency: 20%	$4,800
				CONSTRUCTION COSTS:	**$28,800**

BEREND MESA TURNOUT

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$15,000.00	$15,000
2	1	LS	Electrical	$10,000.00	$10,000
3	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$33,000
				Contingency: 20%	$6,600
				CONSTRUCTION COSTS:	**$39,600**

AERA PARK TURNOUT

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$15,000.00	$15,000
2	1	LS	Electrical	$10,000.00	$10,000
3	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$33,000
				Contingency: 20%	$6,600
				CONSTRUCTION COSTS:	**$39,600**

BASIN 8 HEADGATE

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	4	EA	Electronic Measurement & Telemetry Devices*	$15,000.00	$60,000
2	1	LS	Electrical	$8,000.00	$8,000
3	1	EA	Security Structure	$8,000.00	$8,000
4	1	LS	Measuring Structure	$100,000.00	$100,000
				Sub-total:	$176,000
				Contingency: 20%	$36,000
				CONSTRUCTION COSTS:	**$212,000**

BASIN 10 HEADGATE - SOUTH

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	2	EA	Electronic Measurement & Telemetry Devices*	$15,000.00	$30,000
2	1	LS	Electrical	$8,000.00	$8,000
3	1	EA	Security Structure	$8,000.00	$8,000
4	1	LS	Measuring Structure	$100,000.00	$100,000
				Sub-total:	$146,000
				Contingency: 20%	$30,000
				CONSTRUCTION COSTS:	**$176,000**

BASIN 2 HEADGATE

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	2	EA	Electronic Measurement & Telemetry Devices*	$15,000.00	$30,000
2	1	LS	Electrical	$10,000.00	$10,000
3	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$48,000
				Contingency: 20%	$9,600
				CONSTRUCTION COSTS:	**$57,600**

BASIN 1 HEADGATE

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$15,000.00	$15,000
2	1	LS	Electrical	$10,000.00	$10,000
3	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$33,000
				Contingency: 20%	$6,600
				CONSTRUCTION COSTS:	**$39,600**

BASIN 9 CULVERTS

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	6	EA	Electronic Measurement & Telemetry Devices*	$15,000.00	$90,000
2	1	LS	Electrical	$10,000.00	$10,000
3	1	EA	Security Structure	$8,000.00	$8,000
4	1	LS	Measuring Structure	$100,000.00	$100,000
				Sub-total:	$208,000
				Contingency: 20%	$42,000
				CONSTRUCTION COSTS:	**$250,000**

2ND POINT OF MEASUREMENT

Item No.	Estimated Quantity	Unit Measure	Item	Unit Price	Extension Price
1	1	EA	Electronic Measurement & Telemetry Devices*	$10,000.00	$10,000
2	1	EA	Stilling Well	$1,000.00	$1,000
3	1	LS	Electrical	$5,000.00	$5,000
4	1	EA	Security Structure	$8,000.00	$8,000
				Sub-total:	$24,000
				Contingency: 20%	$4,800
				CONSTRUCTION COSTS:	**$28,800**

BUDGET NARRATIVE

The entire proposed Project will be contracted to the most reputable and cost-effective contractors chosen through a competitive bid process. The cost of Pre-Construction, which will include design, planning, permitting and environmental compliance has been estimated based to cost $178,392, which has been estimated based on a factor of 12% of the total Project cost. The total cost will be a cash contribution on behalf of COB. Pre-construction is expected to begin July 1st, 2018 and end in April 2019.

The cost of each site will depend on the existing infrastructure at each site. A 20% contingency has been added to the cost of installation per site to allow for any unexpected factors during installation. Contractual/Construction Costs are broken down, per site, below.

Beardsley Measuring Station, Reclamation Weir, Kern Island Measuring Station, Levee 1 Measuring Station, Stine Canal Measuring Station, Buena Vista Canal Measuring Station, and Pioneer Canal Measuring Station: Each site has is an existing fixed crest weir. Each site will require electrical access at $5,000 and a security structure at $8,000. Each site will require a stilling well be installed for $1,000 to obtain the most accurate measurements. An electronic depth recorder will be installed on the existing weir and connected to telemetry devices for $10,000. Each sites' construction is estimated at $28,800.

2nd Point of Measurement: This site will require electrical access at $5,000 and a security structure at $8,000. It will require a stilling well be installed for $1,000 to obtain the most accurate measurements. An electronic depth recorder will be installed on the existing lined channel and connected to telemetry devices at $10,000. The site's construction is estimated at $28,800.

Farmers-Stine-Anderson Measuring Station, Rosedale-Rio Bravo Canal Measuring Station, Berrenda Mesa Turnout, Aera Park Turnout and Basin 1 Headgate: A SonTek IQ flow measuring device will be installed at each site for $15,000. Installation will require work to establish electrical access at $10,000 and the construction of a security housing at $8,000. Construction and installation at each site will cost $39,600.

River Canal Headgate: A SonTek IQ flow measuring device will be installed at each site for $15,000. Installation will require work to establish electrical access at $10,000. This site will not require security housing. Therefore, the construction cost at this location will be $30,000.

Eastside Canal Headgate and the Basin 2 Headgate: Two SonTek IQ devices will be required at each site. As each SonTek IQ devices is estimated at $15,000, the cost for two devices at each site is $30,000. Each site will require electrical access at $10,000 and security structures at $8,000. Construction at each site will cost $57,600.

Basin 8 Headgate: This location is suffering from inadequate culverts due to age and capacity issues. To efficiently deliver water through these diversions Basin 8 will get a new 4-Bay box culvert to cost $100,000. There will be four SonTek IQ devices installed in the new culverts at Basin 8 Headgate, which will cost $15,000 for a total of $60,000. The site will need electrical access at $8,000 and security structures at $8,000. The cost of construction at Basin 8 Headgate is estimated at $212,000.

Basin 10 Headgate South: This site will require a new measuring structure at a cost of $100,000. There will be two SonTek IQ devices installed in the existing culverts, which will cost $15,000 for a total of $30,000. The site will need electrical access at $8,000 and security structures at $8,000. The cost of construction at Basin 10 Headgate South is estimated at $176,000.

Calloway Canal Measuring Station: This site will have a new fixed crest weir at a cost of $200,000. After the new weir is constructed, an electronic depth recorder will be installed along with telemetry devices, which is estimated to cost $10,000. The site will require a stilling well at $1,000, electrical access at $10,000 and a security structure at $8,000. The cost at this site is $275,000.

Basin 9 Culverts: This site will require a new turnout structure. The new turnout structure will cost $100,000. There will be six (6) SonTek IQ devices installed, one in each existing culvert, which will cost $15,000 each for a total of $90,000. The site will need electrical access at $10,000 and a security structure at $8,000. Therefore, this site will cost $250,000 for all equipment and construction.

The total contractual construction cost is estimated at $1,486,600 of which $743,300 (50%) will be cash match. The total pre-construction and construction cost is estimated at $1,664,992 of which 55% will be contributed as cash match by COB.

ENVIRONMENTAL & CULTURAL RESOURCES COMPLIANCE

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.

The Project will not have an impact on the surrounding environment. At most of the sites where telemetry would be installed, minimal ground disturbance would occur. Ground disturbance may occur while installing conduit for underground power and communication wiring. Small, minor concrete pads may be installed at some sites. Dust control, such as water, will be used during the minor excavation activities. Water quality will not be affected at the adjacent Kern River or canal facilities. Animal habitat will not be disturbed, as any new facilities that will be constructed would be placed in areas that are previously disturbed. If required, when the telemetry enclosure boxes and shade structures are installed, a pre-construction biological survey will be conducted by the City's On-Call Biologist to ensure that no animal habitat is impacted.

Trucks and other vehicles related to construction will travel on dirt roads, but at slow speeds as to minimize dust. If dust is an issue on the roads, water could be used to wet down the dirt roads during construction.

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?

The construction activities will occur within the existing canal right of way or within previously disturbed areas adjacent to the Kern River weir structures and diversion head gates. There should be no listed species within the work area. If any species should enter the jobsite area, they shall be left alone to passively exist the area.

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.

Yes, the Kern River is listed as a "Waters of the United States" and is directly adjacent to the project area. The installation of flow measurement devices, water height measurement devices, and the associated appurtenances will have no impacts to the Kern River or water quality.

When was the water delivery system constructed?

The Kern River is a natural water way and has multiple canals that divert water from the river. The diversion points were all constructed at various points in time over the past 140 years or so. The diversion structures were constructed and have been reconstructed over this period. For example, the original Kern River canal system was completed in 1877. In 1962 the Kern River Canal was completed, and the Carrier Canal was enlarged.

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.

Most of the project will be constructed on the existing infrastructure located at each of the diversion points. At some locations flow sensors with an electrical supply and communication wires will be installed in the bottom of a canal at a specific diversion point, but this sensor will not affect the system. There may be a couple of sites where a concrete section of the canal may need to be installed within the cross section of the existing earthen lined canal. Where this occurs, the concrete section would be constructed when the canal is off, and no water is flowing. This concrete section would not significantly affect the canal cross section, but only act to stabilize that section of the canal so that a flow sensor could be installed in the bottom of the canal to measure the flow within the canal.

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.

No, there are no buildings, structures, or features in the project area listed or eligible for listing on the National Register of Historic Places.

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

No, there are no known archeological sites in the proposed project area.

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

No, the Project will not have a disproportionately high and adverse effect on low income or minority populations.

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

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

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 contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area.

REQUIRED PERMITS AND APPROVALS

PERMIT NAME	STATUS OF PERMIT	HOW WILL THE PERMIT BE OBTAINED?
Nationwide Permit or Section 404 Permit	May be required if project requires removal or placement of fill (dredging occurs) in the Kern River or the Carrier Canal. All permitting is planned for completion in Phase 1 prior to the execution of the grant contract with BOR.	Each proposed site will be evaluated on a case by case basis, which will depend on the activities will be occurring and where these activities are occurring. This permit is only expected to be required at one or two of the proposed sites.
California Department of Fish and Wildlife – Section 1600 Lake or Streambed Alteration Agreement	May be required if project requires removal or placement of fill (dredging occurs) in the Kern River or the Carrier Canal. All permitting is planned for completion in Phase 1 prior to the execution of the grant contract with BOR.	Each proposed site will be evaluated on a case by case basis, which will depend on the activities will be occurring and where these activities are occurring. This permit is only expected to be required at one or two of the proposed sites.
Regional Water Quality Control Board - Section 401 Water Quality Certification	May be required if a Section 404 Permit is required. All permitting is planned for completion in Phase 1 prior to the execution of the grant contract with BOR.	Each proposed site will be evaluated on a case by case basis, which will depend on the activities will be occurring and where these activities are occurring. This permit is only expected to be required at one or two of the proposed sites.
Central Valley Flood Protection Board - Encroachment	May be required if some work is done with the Kern River channel within the existing floodway boundary. All permitting is planned for completion in Phase 1 prior to the execution of the grant contract with BOR.	Each proposed site will be evaluated on a case by case basis, which will depend on the activities will be occurring and where these activities are occurring. This permit is only expected to be required at one or two of the proposed sites.

May 8, 2018

Bureau of Reclamation
Attn: Mr. Darren Olson
Financial Assistance Support Section
P.O. Box 25007, MS 84-27814 Denver, CO 80225

Re: USBR WaterSMART Water and Energy Efficiency Grant (No. BOR-DO-18-F006)

Dear Mr. Olson:

On behalf of Improvement District No. 4 (ID4) of the Kern County Water Agency, I would like to express my support for the City of Bakersfield's (City) WaterSMART Water and Energy Grant application. The City is proposing to install telemetry equipment that will provide water savings and improve delivery system operational efficiency. These new improvements will increase water delivery measurement accuracy, increase the frequency at which data is recorded and reported, reduce over/under-deliveries and allow the City to better manage seepage. Telemetry equipment will be installed at several major diversion points along the Kern River between first point and second point of measurement. The proposed installations will comply with Senate Bill 88 requirements for measuring and reporting of diverted water.

ID4 receives water released from Lake Isabella through water exchanges with Kern River interests. The water is transported down the Kern River and diverted to the district via the Calloway Canal. This water controlled by the City staff at various diversion points, and the diversion flow and quantities are recorded at least twice daily.

Installation of the telemetry equipment at the existing diversion points will improve the quality of the data that is collected and reported annually in the Kern River report and provide access to accurate flow data on an hourly basis. ID4 supports the installation of telemetry equipment because access to real-time data will provide more efficient water deliveries.

Sincerely,

David R. Beard
Improvement District No. 4 Manager

(661) 634-1400

Mailing Address
P.O. Box 58
Bakersfield, CA 93302-0058

Street Address
3200 Rio Mirada Drive
Bakersfield, CA 93308

Kern Delta Water District
501 TAFT HIGHWAY
BAKERSFIELD, CALIFORNIA 93307-6247
TELEPHONE (661) 834-4656
FAX (661) 836-1705

May 3, 2018

Bureau of Reclamation
Attn: Mr. Darren Olson
Financial Assistance Support Section
P.O. Box 25007, MS 84-27814 Denver, CO 80225

Re: USBR WaterSMART Water and Energy Efficiency Grant (No. BOR-DO-18-F006)

Dear Mr. Olson:

On behalf of Kern Delta Water District (Kern Delta), I would like to express my support for the City of Bakersfield's WaterSMART Water and Energy Grant application. The City is proposing to install telemetry equipment that will provide water savings and improve irrigation delivery system operational efficiency. These new improvements will increase water delivery measurement accuracy, increase the frequency at which data is recorded and reported, reduce over/under-deliveries, and allow the City to better manage operational recharge. The City will install telemetry equipment at several major diversion points along the Kern River between First Point and Second Point of measurement, which also includes points along the Carrier Canal, the Beardsley Canal head, and the River Canal. The proposed installations will be in compliance with Senate Bill 88 requirements for measuring and reporting of diverted water.

Kern Delta works closely with the City of Bakersfield measuring water as it enters the head of Kern Delta's canal systems. Proper and accurate measurement ensures proper accountability and delivery of water entitlements for all of the agencies using the Kern River channel.

Kern Delta receives water released from Lake Isabella, transported down the Kern River, and then diverted to the District via the Carrier Canal. City of Bakersfield staff manages water at various diversion points and the flow and diversion quantities are recorded at least twice daily by City staff. Kern Delta's staff coordinates with and confirms the diversion quantities. New telemetry equipment will enable both agencies to perform their functions more quickly with less error.

In order to comply with Senate Bill 88, Kern Delta supports the proposed project. Our District realizes that it is important to record accurate flow and measurement data, which has been done historically and compiled in the Kern River Annual Report. Installation of the telemetry equipment at the existing diversion points will only improve the quality of the data that is collected and

reported annually. The installation of the telemetry will provide Kern Delta access to accurate flow data on an hourly basis, which will assist in the operation our district's diversions off of the canal system. Currently, the estimated flow data is reported to our District once daily.

The Kern Delta looks forward to the completion and installation of this project in the near future. Having access to real time data will allow the District to provide more efficient water deliveries to our customers.

Sincerely,

L. Mark Mulkay,
General Manager
Kern Delta Water District

c.c. Art Chianello, City of Bakersfield

P.O. Box 81435
Bakersfield, CA 93380-1435
Administration
Telephone: 661-393-2696
Facsimile: 661-393-6884

33380 Cawelo Avenue
Bakersfield, CA 93308-9575
Water Orders and Operations
Telephone: 661-393-3361
www.northkernwsd.com

NORTH KERN WATER STORAGE DISTRICT

May 7, 2018

Bureau of Reclamation
Attn: Mr. Darren Olson
Financial Assistance Support Section
P.O. Box 25007, MS 84-27814 Denver, CO 80225

Re: USBR WaterSMART Water and Energy Efficiency Grant (No. BOR-DO-18-F006)

Dear Mr. Olson:

On behalf of North Kern Water Storage District, I would like to express my support for the City of Bakersfield's WaterSMART Water and Energy Grant application. The City is proposing to install telemetry equipment that will provide water savings and improve irrigation delivery system operational efficiency. These new improvements will increase water delivery measurement accuracy, increase the frequency at which data is recorded and reported, reduce over/under-deliveries, and allow the City to better manage seepage. The City will install telemetry equipment at several major diversion points along the Kern River between first point and second point of measurement, which also includes points along the Carrier Canal, the Beardsley Canal head, and the River Canal. The proposed installations will be in compliance with Senate Bill 88 requirements for measuring and reporting of diverted water.

North Kern receives nearly all of its surface water supplies from the Kern River and relies on the City to efficiently manage River operations to ensure water is reliably delivered to customers in the district. North Kern is therefore heavily reliant on the City's systems to control and monitor facilities required for River operations, and fully supports the City's efforts to improve these systems through the proposed grant.

More specifically, North Kern Water Storage District receives water released from Lake Isabella, transported down the Kern River, and then diverted to the district via the Beardsley and Calloway Canals. This water is controlled by the City of Bakersfield staff at various diversion points, and the diversion flow and quantities are recorded at least twice daily by City staff.

In order to comply with Senate Bill 88, North Kern Water Storage District supports the proposed project. Our district realizes that it is critical to record accurate flow and measurement data, which has been done historically and compiled in the Kern River Annual Report. Installation of the telemetry equipment at the existing diversion points will improve the quality of the data that is collected and reported annually. The installation of the telemetry will provide North Kern Water Storage District access to accurate flow data on an hourly basis, which will assist in the operation of our district's diversions off of the canal system. Currently, the estimated flow data is reported to our district once daily.

The North Kern Water Storage District is pleased that this project will be implemented over the next few years. Having access to real time data will allow the district to provide more efficient water deliveries to our customers.

Sincerely,

Richard A, Diamond, General Manager
North Kern Water Storage District

RESOLUTION NO. _____

RESOLUTION BY THE CITY COUNCIL OF THE CITY OF BAKERSFIELD, CALIFORNIA, AUTHORIZING THE WATER RESOURCES MANAGER TO APPLY FOR GRANT FUNDS FROM THE WATER AND ENERGY EFFICIENCY WATERSMART PROGRAM ADMINISTERED BY THE UNITED STATES BUREAU OF RECLAMATION FOR A SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) PROJECT.

WHEREAS, Title XVI Water Reclamation and Reuse funding applications require an adoption of a resolution by the governing legal authority of the applicant; and

WHEREAS, the Council of the City of Bakersfield desires consideration of its application for Funding Opportunity Announcement No. BOR-DO-18-F006; and

WHEREAS, the City of Bakersfield, if selected, will enter into an agreement with the Bureau of Reclamation for the proposed project; and

WHEREAS, the City certifies by resolution the approval of the application and the availability of eligible matching funds prior to submission of the application.

NOW, THEREFORE, BE IT RESOLVED, by the Council of the City of Bakersfield as follows:

1. The above recitals and findings are true and correct and are incorporated herein by reference.

2. The City Council has the legal authority to enter into a cooperative agreement with the Bureau of Reclamation.

3. The City Council and appropriate City staff have reviewed and support the application submitted.

4. The City Council certifies that City of Bakersfield will have sufficient funds and/or in-kind contributions as specified in the application funding plan.

5. The City Council certifies that, if selected, City of Bakersfield will work with the Bureau of Reclamation to meet established deadlines for entering into a cooperative agreement.

I HEREBY CERTIFY that the foregoing Resolution was passed and adopted by the Council of the City of Bakersfield at a regular meeting thereof held on _____, by the following vote:

AYES:	COUNCIL MEMBER	RIVERA, GONZALES, WEIR, SMITH, FREEMAN, SULLIVAN, PARLIER
NOES:	COUNCIL MEMBER	_____
ABSTAIN:	COUNCIL MEMBER	_____
ABSENT:	COUNCIL MEMBER	_____

_____
CHRISTOPHER GERRY
ACTING CITY CLERK and Ex Officio Clerk of the Council of the City of Bakersfield

APPROVED _____

By _____
KAREN GOH
Mayor

APPROVED AS TO FORM:
VIRGINIA GENNARO
City Attorney

By _____
RICHARD IGER
Deputy City Attorney