

Grant Application
On-going Implementation of Continuous Flow Monitoring Gaging Stations
Colorado River Irrigation Project



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TABLE OF CONTENTS

- 1 Technical Proposal and Evaluation Criteria 1
 - 1.1 Executive Summary..... 1
 - 1.2 Project Title and Location 1
 - 1.3 Project Description..... 1
 - 1.3.1 Hydrology..... 3
 - 1.3.2 Water Rights 4
 - 1.3.3 Current and Projected Water Uses..... 5
 - 1.4 Technical Project Description and Milestones..... 6
 - 1.4.1 Problem Statement and Justification for Need..... 6
 - 1.4.2 Status of Existing Water Measurement Infrastructure on the CRIP 6
 - 1.4.3 Project Objectives, Management, and Activities..... 9
 - 1.4.4 Expected Outcomes 9
 - 1.5 Evaluation Criteria..... 9
 - 1.5.1 Evaluation Criterion A—Project Benefits (35 points)..... 9
 - 1.5.2 Evaluation Criterion B—Planning Efforts Supporting the Project (35 points) 12
 - 1.5.3 Evaluation Criterion C—Project Implementation (10 points)..... 13
 - 1.5.4 Evaluation Criterion D—Nexus to Reclamation (10 points)..... 14
- 2 Project Budget..... 16
 - 2.1 Funding Plan..... 16
 - 2.2 Budget Proposal 16
 - 2.3 Budget Narrative..... 19
 - 2.3.1 Salaries and Wages 19
 - 2.3.2 Fringe Benefits 19
 - 2.3.3 Travel..... 19
 - 2.3.4 Equipment..... 19
 - 2.3.5 Supplies and Materials..... 20
 - 2.3.6 Contractual..... 21
 - 2.3.7 Environmental and Regulatory Compliance 21
 - 2.3.8 Other Expenses 21
 - 2.3.9 Indirect Costs 21
 - 2.3.10 Total Costs..... 22
- 3 Environmental and Cultural Resources Compliance..... 23





4 Required Permits or Approvals 25

5 Letters of Project Support 26

6 Official Resolution 27

7 Unique Identifier 28

8 References 29

Appendix A: Contractor Cost Estimates 30

Appendix B: Equipment Quotes 31

Appendix C: Supplies and Materials Quotes 39

Appendix C: Letter of Support 52

Appendix D: Federal Forms 54

LIST OF FIGURES

Figure 1. Overview map of the Colorado River Indian Reservation and the Colorado River Irrigation Project, La Paz County, Arizona 2

Figure 2. Water balance components and estimated project efficiency based on USBR Decree Accounting methodology for estimated consumptive use 7

LIST OF TABLES

Table 1. Mean Monthly and Annual Average Weather Data and Grass Reference Evapotranspiration, 1996-2015, for the Colorado River Indian Reservation (source: AZMET, <http://ag.arizona.edu/AZMET/08.htm>). 3

Table 2. Sites proposed for Pressure Transducer/ADVM installation. 8

Table 3. Project Implementation Plan and Schedule 14

Table 4. Programs implemented by CRIT in their continued attempt of voluntary water conservation for the Lower Colorado River Basin 15

Table 5. Summary of Federal and Non-Federal Funding Sources 16

Table 6. Details of Budget Proposal 17





1 Technical Proposal and Evaluation Criteria

1.1 Executive Summary

The Colorado River Indian Tribes (CRIT) are pleased to submit this proposal to the United States Bureau of Reclamation WaterSMART Small-Scale Water Efficiency Projects grant program. CRIT believes that there is a clear need to take a prominent role in managing the water resources that sustain their culture and livelihoods. The proposed project is located on the Colorado River Irrigation Project, which is owned and operated by the US Bureau of Indian Affairs (BIA) in trust for the Colorado River Indian Tribes. This project's goal is to install continuous water flow measurement at nine locations—six at sublateral heading sites and three at spill sites on the Colorado River Irrigation Project (CRIP). A combination of Acoustic Doppler Velocity Meter (ADVM) gaging stations and Pressure Transducer gaging stations will be utilized for optimal implementation. The purpose is to obtain reliable, real-time discharge data and develop and maintain a continuous record of discharge at prioritized locations not currently equipped with continuous water measurement infrastructure. It is anticipated some of these sites will subsequently be added to the CRIP SCADA system. Expected results of this project are more accurate accounting of water deliveries and spills within the CRIP, which will provide system operators with the information and data to improve water delivery service to water users and reduce water losses, thereby resulting in more efficient water use and overall improved water management and sustainability. Total costs of the proposed project are estimated to be \$157,076. The proposed project is expected to be completed within 18 months of notice to proceed. A start date of February 1, 2022 is requested.

1.2 Project Title and Location

This proposed project is titled: “On-going Implementation of Continuous Flow Monitoring Gaging Stations, Colorado River Irrigation Project”, and it is located entirely on the Colorado River Indian Reservation. The Colorado River Indian Tribes are a federally recognized Indian Tribe. The Colorado River Irrigation Project (CRIP) is located in La Paz County, Arizona. The Project latitude is 33°56'N and longitude is 114°26'W. The current Project service area is approximately 80,000 acres (125 square miles). The map presented in Figure 1 shows an overview of the Reservation and the CRIP area as well as its geographic location on the Colorado River in southwest Arizona / southeast California.

1.3 Project Description

The Colorado River Indian Reservation was established March 3, 1865 by the Federal Government for the Indian Tribes of the Colorado River and its tributaries. The collective Colorado River Indians Tribes include the Mohave, whose aboriginal territory includes the Reservation lands along the River; the Chemehuevi, who were displaced when Parker Dam was constructed; and Navajo and Hopi who were relocated to the Reservation.



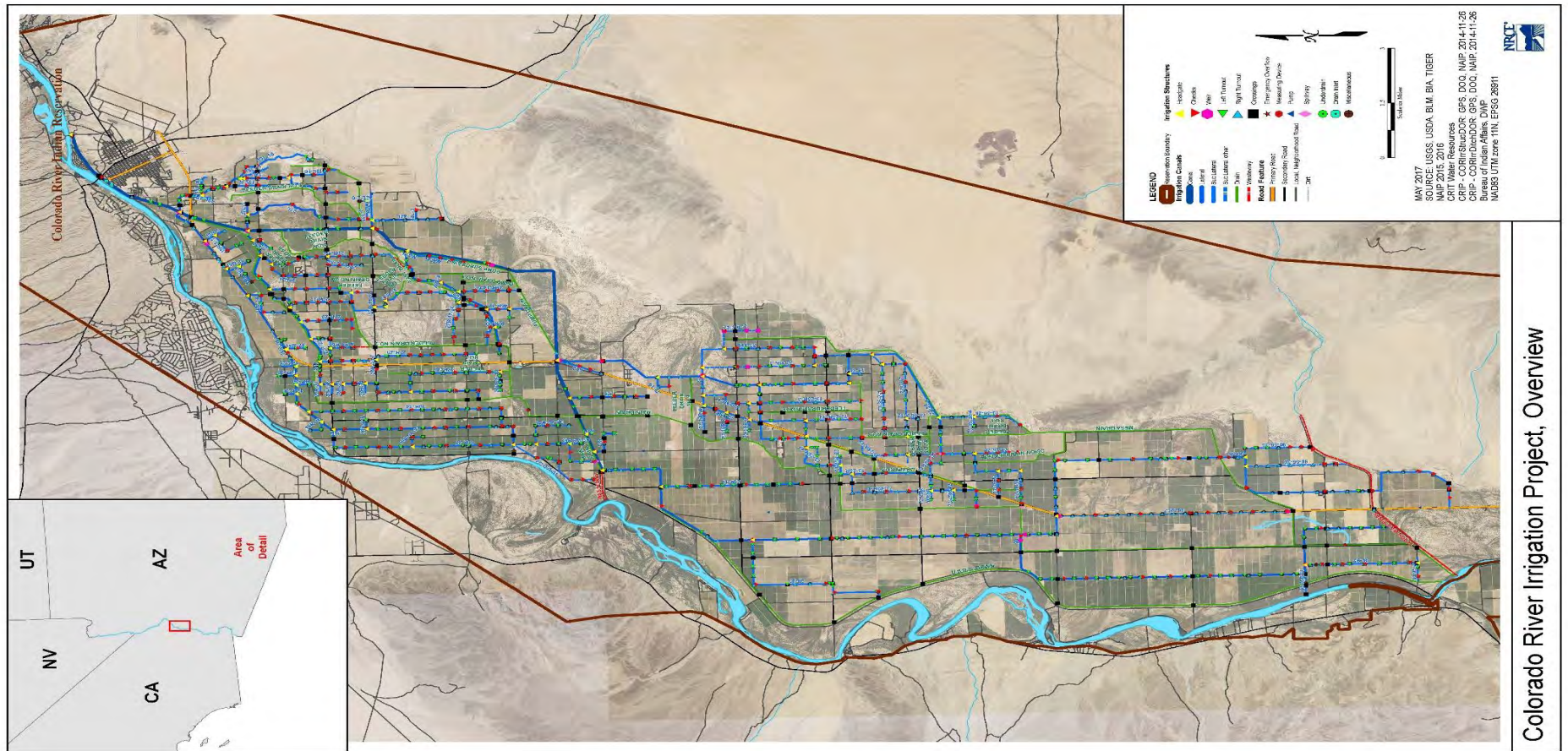


Figure 1. Overview map of the Colorado River Indian Reservation and the Colorado River Irrigation Project, La Paz County, Arizona





1.3.1 Hydrology

The Colorado River Indian Reservation lies entirely within the Lower Colorado River Valley (LCRV) which is the largest, hottest, and driest subdivision of the Sonora and Mohave Deserts (University of Arizona, 2008). The Reservation encompasses a total of 432 square miles (1,119 square kilometers), the majority of which is in the Parker Valley of Arizona (Colorado River Indian Reservation, 2009).

The Colorado River runs through the Reservation delineating its Arizona and California land areas. Most of the Reservation is in western La Paz County in Arizona. Parts of the Reservation also lie in southeastern San Bernardino County and northeastern Riverside County, California. However, the project area only falls within La Paz County, Arizona.

The Colorado River is a significant and, in general, the only source of water for the Reservation providing for agriculture in an arid environment as well as for recreation and tourism (University of Arizona, 2008). The Reservation is located in an area characterized as an arid climate with hot, dry summers, and mild winters. Table 1 presents a summary of weather data for the period 1996-2015 collected at the Arizona Meteorological Network (AZMET) climate station at Parker, Arizona (Parker No. 1). Maximum air temperature averages around 105 °F in July and August, with winter minimum air temperatures averaging around 36-37 °F. Total annual grass reference evapotranspiration (*ET_o*) is estimated at 77.89 inches per year. Total annual precipitation is very low, averaging 3.12 inches per year.

Table 1. Mean Monthly and Annual Average Weather Data and Grass Reference Evapotranspiration, 1996-2015, for the Colorado River Indian Reservation (source: AZMET, <http://ag.arizona.edu/AZMET/08.htm>).

	Max. Temp. (°F)	Min. Temp. (°F)	Precipitation (inches)	Relative Humidity (%)	Wind Speed (mph)	Solar Radiation (Langleys)	ET _o (inches)
Jan	68.46	37.12	0.48	52.40	4.93	289.49	3.04
Feb	71.43	40.52	0.57	53.05	5.26	369.62	3.51
Mar	79.22	45.24	0.29	45.71	5.81	509.94	5.86
Apr	84.56	51.07	0.08	39.41	6.85	622.46	7.64
May	94.47	59.76	0.06	35.30	6.67	692.26	9.68
Jun	101.32	66.12	0.01	34.27	6.46	717.75	10.37
Jul	104.79	74.53	0.23	42.46	6.01	640.49	10.17
Aug	104.73	74.35	0.31	45.19	5.50	592.97	9.17
Sep	100.44	67.31	0.37	46.32	4.63	521.65	7.10
Oct	88.94	54.21	0.22	44.76	4.71	419.67	5.38
Nov	76.58	43.08	0.23	48.31	4.31	313.74	3.35
Dec	66.42	35.90	0.27	54.17	4.76	263.55	2.64
Annual	86.78	54.10	3.12	45.11	5.49	496.13	77.89

Historically, and currently, surface water diversions from the Colorado River make up the primary source of irrigation water supply for the Reservation. Reclamation prepares annual





water accounting reports to provide final records of diversions of water from the mainstream of the Colorado River, return flows to the mainstream, and the consumptive use of such water within the Lower Colorado River Basin States of Arizona, California, and Nevada.

Diversions for Colorado River Indian Reservation are reported for both Arizona and California in the USBR decree accounting reports (<https://www.usbr.gov/lc/region/g4000/wtracct.html>). Diversions to Reservation land served by the Colorado River Irrigation Project (CRIP) are made at Headgate Rock Dam and are measured using the US Geological Survey (USGS) gage: 09428500 Colorado River Indian Reservation Main Canal near Parker, Arizona. Other diversions to Reservation lands in Arizona not served by CRIP are also reported for decree accounting purposes. Return flows of water to the mainstem of the Colorado River are categorized as measured and unmeasured. Measured returns have historically been recorded at multiple spills and wasteway gaging stations operated by the USGS.

There currently is no use of groundwater and wells to supply water for irrigation on the Reservation. The Reservation is situated within the Parker Basin of western Arizona. Groundwater in the floodplain alluvial deposits is hydraulically connected to the River. Shallow groundwater in the floodplain generally reflects the chemical characteristics of Colorado River water (Metzger, Loeltz, & Irelan, 1973). Groundwater development in the basin is small as a consequence of the availability of surface water for irrigation and the low population in the basin. The ADWR estimated that less than 4,000 acre-feet were withdrawn in 1985 (ADWR, 2006). Current groundwater use in the basin is generally not reported and/or records are unavailable.

1.3.2 Water Rights

The Colorado River Indian Tribes have Colorado River water rights decreed by the United States Supreme Court in the case: *Arizona v. California*, 547 U.S. 150 (2006), also known as the 2006 Consolidated Decree. CRIT's Colorado River water rights are the lesser of: 719,248 acre-feet of diversions from the mainstream, or, the quantity of mainstream water needed to supply the consumptive use required for irrigation of 107,903 acres of land and satisfaction of related uses. The rights are "present perfected rights" meaning they are considered to be in existence prior to the effective date of the Boulder Canyon Project Act, and that with respect to Federal reserved water rights they are rights to use of water on Federal reserved lands under Federal law whether or not the water has been applied to beneficial use (*Arizona v. California*, 2006). The Reservation land is divided between the states of Arizona and California, and the water rights are accordingly partitioned for use in the two states. Priority dates are associated with the dates that CRIT land was reserved under Executive Order. CRIT has the right to divert the lesser of 662,402 acre-feet of water from the mainstream, or, the quantity of mainstream water needed to supply the consumptive use required for irrigation of 99,375 acres of land and satisfaction of related uses in Arizona; and, the right to divert the lesser of 56,846 acre-feet of water from the mainstream, or, the quantity of mainstream water needed to supply the consumptive use required for irrigation of 8,528 acres of land and satisfaction of related uses in California. A unit diversion quantity of 6.67 ac-ft/ac applies in both states.





1.3.3 Current and Projected Water Uses

Colorado River Irrigation Project (CRIP)

The primary economic activity on the Reservation has traditionally been dominated by irrigated agriculture. The main crops produced are alfalfa, wheat and other small grains, cotton, Bermuda grass hay, Sudan, and miscellaneous vegetable and other crops (onions, garlic, broccoli, potato, flowers). The Colorado River Irrigation Project (CRIP) was initiated under the 1867 Appropriations Act, which included funding for the construction of canals from the Colorado River to serve Tribal Members on the Reservation. Major expansion was completed in the 1940's to supply irrigation water to the Japanese internment camp on the Reservation at Poston. This included construction of Headgate Rock Dam in 1942. CRIP is a federal irrigation project governed by 25 USC §381 et seq and 25 CFR Part 171 and is operated by the U.S. Department of Interior Bureau of Indian Affairs (BIA) for the benefit of the Colorado River Indian Tribes. CRIP serves approximately 80,000 acres of land that are assessed an annual fee for irrigation system O&M.

Approximately 232 miles of supply canals, which consist of the Main Canal, laterals, sublaterals, and sub-sublaterals, are used to convey water under primarily gravity flow conditions from Headgate Rock Dam to CRIP farms (BIA, 2002). Of the 232 miles of supply canals, 90 miles are concrete-lined, and 142 miles are unlined earthen channels. The CRIP Main Canal is 18 miles long, 15 miles of which are concrete-lined. There are eight principal lateral canal offtakes from the Main Canal (19R, 19L, 27R, 27L, 42L, 46R, 73 and 90), not including smaller laterals, which are considered to reflect the function of lower order "sublateral" canals. Lateral canals comprise a total of 65 miles of channel, 36 miles of which are concrete-lined. In addition, there are 149 miles of lower order supply canals, of which 39 miles are concrete-lined. There are six principal drains in the CRIP with additional feeder drains and wasteway ditches, comprising a total of 133 miles of drainage channels (BIA, 2002). There are no storage facilities on the CRIP. See Figure 1.

Agricultural Water Use

NRCE (2016) performed an annual water balance at the irrigation project level to estimate overall irrigation efficiencies and to estimate operational water losses on the CRIP. The extent to which such losses are avoidable and recoverable represents a gross quantification of the potential volume of water that may be conserved. The period of study was 1996-2015. Measured diversions of water from the mainstream of the Colorado River into the CRIP Main Canal represent total inflows. Surface return flows to the mainstream are measured at four USGS gages. Diversions from and total return flows to the Colorado River showed a slightly increasing trend over the period. See Figure 2. Return flows tend to follow the same trend as diversions suggesting the annual return flow volumes are responsive to diversion volumes. Consumptive use is computed as diversions minus return flows. The ratio of consumptive use to diversions, a measure of Project irrigation efficiency, shows a generally decreasing trend over the period studied, especially for the latter part of the period (2007-2015).

Estimated consumptive use is noted to decrease over the study period ranging from 296,935 AFY to 425,492 AFY. The estimated consumptive use by this approach lumps crop





consumptive use together with open water evaporation losses and water use by phreatophytes and other riparian vegetation that are occurring on the CRIP. Thus, it should be noted that the overall Project efficiency estimates using this approach will be biased to the high side, since typically the Project agricultural water use efficiency would be computed using only agricultural crop consumptive use.

1.4 Technical Project Description and Milestones

1.4.1 Problem Statement and Justification for Need

Problem Statement

The accurate measurement of water being delivered and lost from the CRIP is essential to develop the data necessary to support design and implementation of conservation measures to minimize losses to excessive operational spills, seepage, evaporation from standing water, over-delivery and deep percolation of water applied on-farm. The CRIP has several lateral headings, sublateral headings, and minor spill sites that are currently not equipped with continuous water flow measurement infrastructure resulting in a lack of data that are needed for decision-making to result in water savings and more sustainable water resource management.

NRCE (2017a; b) has identified and prioritized several sublateral headings and small spill sites where there is currently no continuous water measurement. This project proposes to improve water measurement on the CRIP through the installation of Acoustic Doppler Velocity Meter (ADVM) gaging stations at two Headings sites and Pressure Transducer gaging stations at seven sites (4 Headings and three Spills). These sites were selected based on area served, volume of spill, and other factors.

1.4.2 Status of Existing Water Measurement Infrastructure on the CRIP

NRCE (2017a) provided a review of water measurement infrastructure across the CRIP, identified issues, and developed priorities for making improvements to the overall water measurement program of the CRIP. Among the recommended improvements was to install water measurement infrastructure at lateral and sublateral headings and at spill sites not currently equipped with measurement infrastructure. The typical water measurement structure used on the Project is the broad-crested weir or ramp flume. It has been found through site measurements and modeling that ramp flumes are not feasible at many of the locations not currently equipped due to: relatively flat topography, effects of the first downstream check structure on water surface elevations that cause submergence of the ramp flume, or lack of physical space for installation of a ramp flume (many spill sites).

Several levels of recorded water measurement occur on the CRIP including USGS stations, the CRIP SCADA system, CRIT Water Resources Dept. (WRD) data collection from non-SCADA measurement sites, and CRIT WRD manual measurement of spill sites. SCADA equipment are installed at several locations on the CRIP to provide remote monitoring and control of canal water surface elevations for flow regulation, and to measure and record parameters necessary to determine discharge rates. System operators monitor the stage and rate of flow and remotely operate the SCADA gates to change water level or flow rates to meet irrigation demand in





various parts of the system. There are currently 13 CRIP SCADA sites which provide flow measurement and/or upstream water level regulation, including 11 canal headings or along-canal sites, and 2 main spill sites. Many of the existing SCADA sites are over 15 years old and are due for hardware modernization. A SCADA system modernization plan has been developed and CRIT is working towards its implementation.

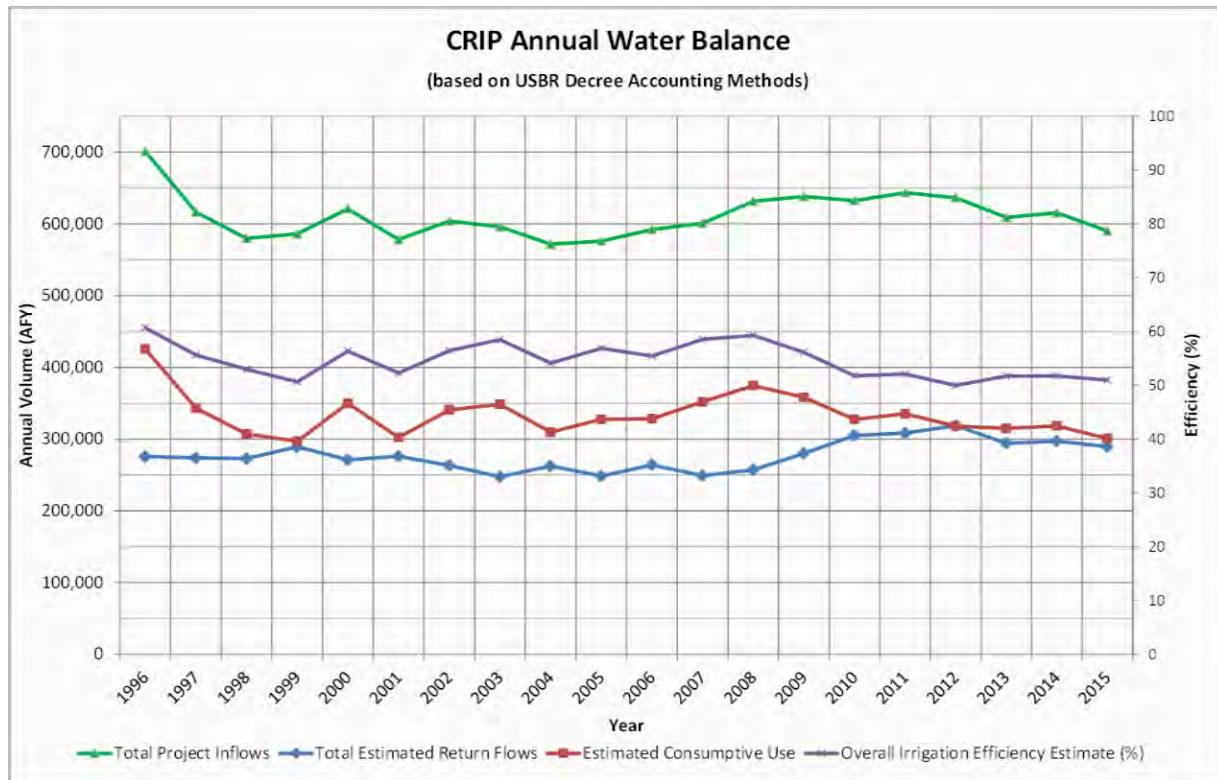


Figure 2. Water balance components and estimated project efficiency based on USBR Decree Accounting methodology for estimated consumptive use.

The water measurement site inventory (NRCE, 2017a) included 76 lateral, sublateral, and sub-sublateral heading sites. Water measurement infrastructure consisting of either a flume or an acoustic Doppler device was found at 30 locations, only 12 of which have continuous measurement either through the CRIP SCADA system or a datalogger operated and maintained by CRIT WRD.

Ramp flumes are the most common flow measurement structure on the CRIP. Direct reading staff gages are present at most ramp flumes at canal headings. Due to poor condition, inconsistency of units, and the lack of information concerning the installation and calibration techniques used for many staff gages, an effort is currently underway to replace the staff gages at all ramp flumes on the CRIP. A first effort to replace staff gages was undertaken during the 2018/2019 dry-up. In this effort, staff gages were replaced at 15 ramp flumes which included all the first order laterals and the largest sublaterals. CRIT WRD then completed the replacement of all remaining staff gages in 2020.

CRIT WRD is in the process of developing a hydrographic discharge measurement program to routinely survey and check elevations of independent primary reference gages and elevations of





flume or weir crests; and to routinely perform independent discharge measurements (stage and flow) to check and update stage-discharge relationships at any of the installed water measurement structures at lateral and sub-lateral headings. Such a program has not existed in the past.

Canals and laterals on the CRIP commonly have terminal check structures, which under certain flow conditions allow irrigation water to flow to CRIP spillways or drains. Spills occur due to imbalance between supply and demand for a particular canal resulting in spill of excess water, due to release of canal storage following an irrigation cycle, due to check structure leakage at the spill site, or other reasons. There are several typical structures observed which control discharge of water to spillways or drains, including in-line check structures, perpendicular gate structures, passive overflow weir structures, and combination structures. At most spill sites, staff gages for the direct reading of stage or for verification of independently measured flow depth (or flow) are not present.

Continuous flow measurement is currently made at six spill sites through the CRIP’s SCADA system (2 sites) and CRIT WRD datalogger sites (4 sites). There are 29 active minor spill sites that do not have continuous water measurement. Periodic manual measurements of flow conditions (depth, width, date/time) are made at these sites from one to three times per week by a CRIT WRD technician. Discharge is estimated at these sites using these measurements, but there is considerable uncertainty in the estimated total spill volume at a location when synthesizing a continuous daily record from the periodic manual measurements. Details are provided in NRCE (2017b).

The nine sites selected for this project proposal are listed in Table 2. These sites were selected based on the area served by the laterals, the estimated annual spill rate, the ease of installation, and other factors.

Table 2. Sites proposed for Pressure Transducer/ADVM installation.

Site No.	Site Name	Site Type	Installation Type	Pressure Transducer or ADVM Installation	No. of Turnouts Served ¹	Estimated Annual Spill Volume (AFY) ¹
NA	19R-37	Heading	Upstream of Ramp Flume	Pressure Transducer	62	NA
NA	27R-11	Heading	Upstream of Ramp Flume	Pressure Transducer	47	NA
NA	19R-34	Heading	Upstream of Ramp Flume	Pressure Transducer	37	NA
NA	27R-25	Heading	Upstream of Ramp Flume	Pressure Transducer	29	NA
NA	19R Downstream of Check 8	Along	Open Channel	ADVM	27	NA
NA	27R-4-2	Heading	Open Channel	ADVM	23	NA
3148	73-25R	Spill	Upstream of Ramp Flume	Pressure Transducer	NA	3762
3083	73-36 check 4	Spill	Upstream of Weir Crest	Pressure Transducer	NA	2790
1174	90-56 check 4	Spill	Upstream of Weir Crest	Pressure Transducer	NA	2727

¹ from Appendix B, NRCE (2017b).





1.4.3 Project Objectives, Management, and Activities

The objectives of this proposed project are to procure necessary equipment and install nine new gaging stations, seven of which will be Pressure Transducer gaging stations (four at sublateral headings and three at sublateral spill sites), and two of which will be ADV gaging stations (one on sublateral heading and one at a checkpoint along a lateral). All Headings [and one checkpoint] will be equipped with SCADAPak 350 RTU's to allow for easy integration into the Project's SCADA system as a future project. CRIT WRD will be responsible for the on-going operation and maintenance of the nine gaging stations.

Project Manager will be Mr. Devin Heaps, Director of CRIT WRD. He actively manages the department and will play a crucial role in successful implementation of this proposed project.

The proposed project tasks, activities, and implementation schedule are described below in Section 1.5.3.

1.4.4 Expected Outcomes

The installation and operation of the proposed continuous flow measurement sites will provide reliable, real-time flowrate data that will enable more efficient regulation of water distribution. Accurate measurement and control of water being delivered will help to minimize losses due to seepage, evaporation of standing water, over-delivery and deep percolation on irrigated fields, and excessive operational spills. The accurate measurement of operational spills will provide the data required to identify the causes of avoidable spills and enable preventative actions.

1.5 Evaluation Criteria

1.5.1 Evaluation Criterion A—Project Benefits (35 points)

NRCE conducted an inventory and assessment of CRIP flow measurement in 2016, including CRIP SCADA sites, continuous record sites, periodic measurement spill sites, and canal heading sites. A comprehensive report has been prepared to summarize findings and recommendations (NRCE, 2017a). A well-designed and maintained water measurement program is required for good water management and efficient water use at all levels of the irrigation project. Maintaining records of flow measurement is required to monitor water use and efficiency in time.

NRCE (2017a, 2017b) has identified approximately 42 sub-lateral headings and 29 active canal spill locations which do not have adequate water measurement infrastructure installed. These include canal headings which serve five or more turnouts, and all active non-SCADA spill locations in the CRIT WRD measurement program. The nine proposed sites for continuous flow measurement were selected according to service acreage, spill volume, ease of device installation, and other factors.

The proposed continuous flow measurement project coupled with future integration into the SCADA system will result in improved data management including data collection, data processing, custom report preparation, and data archival. This will directly benefit the Tribes by providing improved and more accurate accounting of their Colorado River water allocation. This improved control, measurement, and accounting capability is fundamental to successful implementation of current and future CRIP improvements envisioned by the Tribes including following, cropping pattern changes, operational spill capture and use, drainage water reuse, and





others, that will allow the Tribes to increase the economic benefit derived from their Colorado River water rights, while also protecting those rights.

CRIT has openly expressed a desire to assist with drought planning and mitigation and has negotiated a key agreement with the State of Arizona to provide conserved water amounting to 50,000 AFY for three years, during 2020-2022, as part of Arizona's Drought Contingency Plan (AZ DCP). This action along with other components of the AZ DCP increase the water supply reliability to the State of AZ and the Lower Colorado River Basin. At the same time, CRIT Tribal Council strongly desires to maintain an agricultural economy on the Reservation, keeping current irrigated acreages in production. The key to this requires the implementation of multiple water conservation interventions to increase efficiencies and reduce losses. The fundamental base for this is the modernization of water control and measurement on the CRIP. This proposed continuous flow measurement project is a necessary step towards modernization.

The majority of acreage on the CRIP is irrigated using low gradient border to near-level basin irrigation methods. Local stakeholders have described that crop scalding can occur with water ponded on fields during high temperature periods, so that fields are preferred to have some slope to avoid ponding. There are approximately 50,000 acres on the CRIP with unimproved conditions with respect to efficient flood irrigation. NRCE (2017b) recommended that the Tribes encourage participation in the NRCS EQIP. Eligible measures related to irrigation include land leveling, ditch lining, large-flow turnouts, sprinkler and drip irrigation systems, irrigation pipelines, and others. The EQIP program has not been utilized recently on the CRIP, which is mainly attributed to land lease constraints, including inadequate lease duration for the participant to recuperate expenses. NRCE (2017b) recommended that the Tribes consider alternative lease conditions or other means to encourage participation in the EQIP. Farmlands operated and maintained by the CRIT Farms Tribal farming enterprise are not subject to these constraints. A conservation plan for improvements on a 600-acre CRIT Farms tract was submitted in early 2018 but was not accepted to the EQIP program due to an NRCS assessment finding insufficient conservation benefits.

However, CRIT recently submitted an \$8 Million NRCS Regional Conservation Partnership Program (NRCS RCPP) application to address these crucial on-farm improvements in November 2020. If awarded and implemented, tens of thousands of acre-feet of water would be conserved per year.

The proposed continuous flow measurement project, coupled with future SCADA integration, is expected to ultimately result in improved farm gate deliveries in terms of flow rate, timing, quantity, and duration of delivery. All of these factors facilitate on-farm water management and improved application efficiencies. The proposed project is but one component towards the improvement of on-farm efficiency and overall project efficiency.

Once tied into the SCADA system, the additional flow measurement data provided from the key delivery and spill sites selected for this proposed project will result in the improvement of monitoring and control of diversions and the distribution of water through the system. Over time, this is expected to result in water savings. A conservation plan for the Imperial Irrigation District





estimated 15,400 AFY could be saved after implementing SCADA for 61 laterals and installing new monitoring equipment at 117 spill sites, on average 250 AFY per lateral (Davids Engineering et al., 2009).

Using data available for the period 2011 through 2015, NRCE (2017b) estimated:

- operational spills at the two main spill points on the CRIP (Poston and Tyson wasteways) average approximately 60,000 AFY using flow records recorded by existing SCADA equipment; and,
- the total annual losses due to minor operational spills at 35 active minor spill sites (not currently equipped with water measurement and SCADA) averages 56,000 AFY. These estimates are based on periodic measurements made by CRIT WRD staff to estimate flows at these sites. Periodic measurements were transformed into a synthesized daily record and then aggregated by site and across all sites to monthly and annual estimates. The periodic nature of the measurements and the lack of accurate water measurement infrastructure at most of these sites contributes to a relatively high level of uncertainty in discharge estimates at these sites. NRCE (2017b) studied 13 spill sites considered to have greater certainty in the discharge estimates and found the total average annual spill volume at these was 39,272 AFY. Thus, the range of minor spill volume that could be conserved through various conservation measures was taken as 39,272 AFY to 56,000 AFY. The low end of this range, 39,272 AFY, is considered to be the most reliable current estimate in the absence of actual continuous record across all 35 laterals and sub-laterals. This is equivalent to an average of 1,122 AFY spill volume per lateral.

Various conservation measures to address the minor spill losses are discussed in Section 5, pp 5-2 through 5-8, (NRCE, 2017b). The primary methods considered were improvements in flow measurement and monitoring (the subject of this proposal) and end of lateral interties and flow interception and re-direction from spillways to either re-regulation storage or pumpback to downstream irrigation canals.

The installation of continuous water measurement at the proposed lateral and spill sites and the planned future installation of telemetry equipment at these sites is part of planned expansion of the CRIP SCADA system. Expanded real-time monitoring of flows, especially operational spills, is expected to help system operators improve management and distribution of irrigation water.

Assuming the estimated per lateral savings of 250 AFY from the above referenced study at IID is representative, an estimated 22% percent savings on CRIT laterals (250/1120) is suggested. NRCE adopted a conservation savings of 25% of minor spills that could potentially be achieved due to improved flow measurement and monitoring in real time on the CRIP. For the range of total annual minor site spill volume of 39,272 AFY to 56,000 AFY, the conservation estimate is thus, 9,818 AFY to 14,000 AFY, or, 280 AFY to 400 AFY per minor spill site. For the six spill sites proposed for water measurement improvements in this project, a total potential water savings of 1,680 AFY to 2,400 AFY is estimated. The lower end of this range, 1,680 AFY, is considered to have more certainty.





1.5.2 Evaluation Criterion B—Planning Efforts Supporting the Project (35 points)

From 2015-2017, NRCE implemented and completed three studies for CRIT Tribal Council which effectively serve the purposes of a Water Conservation Plan for the CRIP. These studies had objectives of assessing water use efficiency, gaining an understanding of opportunities for both conserving water and improving beneficial use of CRIT’s water resources, and evaluating the economic returns of various Tribal water uses, while preserving and protecting CRIT’s Colorado River water rights. CRIT has expressed a desire to improve the economic return on its Colorado River water allocation as well as to improve irrigation efficiency to conserve water. CRIT is keenly aware of water shortage conditions in the Lower Colorado River Basin and is interested in making conserved water available under different mechanisms to forestall system shortages or to make water available for other system users who may be at risk of shortages are declared.

- *Agricultural Resource Management Plan: Phase I—Integrated Agriculture Inventory and Issues* (NRCE, 2016). The primary focus of the study was to collect baseline information and data on water supply and use on the CRIP. Information and data over the period 1996-2015 were collected and summarized—climate, soil and land resources, total cropped area, cropping patterns, sources and characterization of water supply quantity and quality, CRIP water delivery and distribution system infrastructure, water delivery operations and management, flow distribution and control, methods of water ordering, water rates and allocation, and preliminary identification of potential structural and operational issues. On-farm irrigation methods and practices were characterized. Irrigation water requirements for the crops and cropped areas of the CRIP and water balance of: (1) the CRIP inflows, return flows and consumptive use, and, (2) the Colorado River reach from below Parker dam to below Palo Verde diversion dam were performed to develop estimates of CRIP level agricultural water use efficiency.
- *Water Measurement Inventory, Colorado River Irrigation Project* (2017a). The purpose of this study was to locate and describe all water measurement sites that are on, or, are related to the CRIP. A technical assessment of each water measurement site was performed to develop estimates of the accuracy and reliability of the measured flow rate data, describe any issues/deficiencies of the site (physical infrastructure, measurement location, type of measurement, rating equation used for conversion to flow rate, etc.), and recommend corrective measures. The water measurement data management system—data storage, archival, backup, processing, reporting, etc.—where do the collected raw data reside, what data QA/QC processes are used, who has access, how, what standard data processing and reporting is in place was evaluated. Water measurement site operation and maintenance procedures were reviewed. Locations on the CRIP where additional water measurements are needed were identified.
- *Agricultural Resource Management Plan: Phase II—Efficiency Analyses and Potential Water Conservation, Colorado River Irrigation Project* (NRCE, 2017b). This study addressed the conditions and operations of the CRIP and identified potential mechanisms to improve efficiency, with a goal of conserving water to allow expansion of irrigated acreage and/or make water available for alternate uses. Appraisal level estimates of costs and water savings for conveyance and farm level improvements across the CRIP were developed. Of the total average CRIP diversion of 610,000 AFY, and estimated 300,000 AFY spills, seeps, evaporates, or is lost as deep percolation of water applied on-farm.





Multiple system infrastructure rehabilitation needs were identified as first priority for improvements to improve system functionality. System modernization and other upgrades, including the expansion of flow measurement and SCADA operations on the CRIP, construction and automation of re-regulation reservoirs, canal lining, and drain water capture and re-use are recommended. Improvements at the on-farm level to address significant water losses and improve crop production were also highlighted.

The proposed project to install continuous water measurement at nine locations, and the eventual planned linkage of six Heading and Checkpoint sites with the CRIP SCADA system, is one of the necessary first steps towards operational improvements and reliable water control and measurements. The selected sites were prioritized primarily based on the number of turnouts served by the laterals and the estimated annual operational spill from spill sites. The proposed project is considered the second step in the successful previous demonstration of technology, with an objective to promote the future installation of many more continuous flow measurement sites from which system operation will continue to improve. To achieve the estimated water savings, SCADA modernization and the expansion of real-time flow measurement and monitoring is required.

1.5.3 Evaluation Criterion C—Project Implementation (10 points)

NRCE (2018) is a technical report providing details regarding ADVN general design guidelines and specific designs and cost estimates for sites on the CRIP. Three of the sites recommended for ADVN installation in that report have since been improved, and the design and cost estimates of alternative sites have been developed. Reconnaissance level site visits were conducted when preparing NRCE (2018) or in evaluation of substitute sites for this proposal.

The installation of continuous monitoring devices at the nine proposed sites involves the following specific tasks. A project implementation schedule is illustrated in Table 3. A proposed start date of February 1, 2022 is requested. This will allow for site preparation and procurement of equipment, and planned installation of the sublateral heading gage stations throughout parts of December 2022, January 2023, and February 2023 when the CRIP Lateral 90, Main Canal, and Lateral 73 services are scheduled for the annual dryup periods.

Task 1: Site Preparation and Equipment Procurement

The CRIT Project Manager will request for BIA Irrigation to perform any site preparation work required as this falls under the responsibility of BIA Irrigation towards maintaining the CRIP. In the scenario there is preparatory work BIA Irrigation is not able to perform, the CRIT Project Manager will contract this work as necessary. The Project Manager will procure the required materials and equipment. Site preparation and equipment procurement are expected to be completed over an eight-month period.

Task 2: Pressure Transducer/ADVN Gage Station Installations with Documentation and Training

The CRIT Project Manager, WRD technician, and NRCE's on-site engineer will install the Pressure Transducer/ADVN gaging stations—Pressure Transducer/ADVN sensor installation, mounting mast/tower, solar panel, battery, display, necessary enclosures, and all other equipment required for the proper operation of each site. Installation is expected to be completed over an





11-month period. Flow conditions and/or need for site dewatering may delay some installation work. The Project Manager with assistance from the on-site NRCE engineer will prepare documentation of the Pressure Transducer and ADVN installations; will prepare protocols for site operation and maintenance, data collection and processing; and provide training to CRIT WRD staff in the operation and maintenance of the proposed gaging sites.

Table 3. Project Implementation Plan and Schedule

Task No.	Description	Activity Timeline (months after notice to proceed)											
		6				12				18			
1	Site Preparation and Equipment Procurement	█	█	█	█	█	█	█	█	█	█	█	█
2	Pressure Transducer/ADVN Gage Station Installation with Documentation and Training	█	█	█	█	█	█	█	█	█	█	█	█

The project qualifies as a Categorical Exclusion (CE) on USBR’s CE checklist (USDO, not dated). This CE is for project implementation activities which include “Minor construction activities associated with authorized projects which correct unsatisfactory environmental conditions, or which merely augment or supplement, or are enclosed within existing facilities.” Because the project qualifies as a CE, no further NEPA compliance measures are required. Additionally, no negative effects are foreseen on historic properties or to endangered or threatened species because all aspects of the project take place on existing CRIP infrastructure.

Any project implementation activities which will require earth moving will require prior consultation and approval from CRIT’s Tribal Historic Preservation Office (THPO). THPO personnel must be on site to monitor any earth moving activity. If the preliminary field site visits conducted in Task 1 determine earth moving is required, the CRIT Project Manager will initiate the permitting process with THPO. No other permitting requirements are foreseen.

1.5.4 Evaluation Criterion D—Nexus to Reclamation (10 points)

The USBR Lower Colorado Region office in Boulder City, NV manages operations in the Lower Colorado River Basin at the Boulder Canyon Operations Office. Daily water orders compiled by the CRIP BIA Irrigation office are transmitted to the Boulder Canyon Operations Office for release and delivery scheduling. The CRIP diverts water from the Colorado River at Headgate Rock Dam near Parker, AZ.

The 43 Code of Federal Regulations, Part 417 obligates the Secretary of the Interior to see that releases of Colorado River water to Colorado River tribal entities will not exceed those reasonably required for beneficial use. CRIT prepares and submits an estimate of the Tribes’ twelve-month Colorado River diversion rate and anticipated monthly diversion schedules to the BIA for the following calendar year. The BIA is directed by Part 417 to consult with Colorado River tribal entities each year regarding water conservation measures, operating practices, and the beneficial use of Colorado River water. CRIT and BIA engage in the Part 417 Consultation with the USBR each year.





CRIT has worked closely with Reclamation as part of the Ten Tribes Partnership to complete the Colorado River Basin Ten Tribes Partnership Tribal Water Study in October 2018.

CRIT was recently awarded funding for fiscal year 2019 through the USBR WaterSMART Water Efficiency grant program for the modernization of the existing SCADA system on the CRIP (FOA BOR-DO-19-F004) and the WaterSMART Small Scale Water Efficiency grant program for the installation of flow measurement devices on CRIP laterals and spill sites (FOA BOR-DO-19-F005). The most recently awarded funding for fical year 2019 was for the design of a re-regulation reservoir through FOA BOR-LC-19-F002. Applications to line lateral 73-19L-1 and to complete a System Optimization Review of the CRIP’s 133 mile-long open surface drainage system were submitted under FOA BOR-DO-21-F001 and FOA BOR-LC-21-F002 and are awaiting notification of award. CRIT has and is currently participating in the Colorado River Basin Pilot System Conservation Program established by Reclamation and four municipal entities in July 2014 to fund the creation of Colorado River system water through voluntary water conservation. See Table (4) below.

Table 4. Programs implemented by CRIT in their continued attempt of voluntary water conservation for the Lower Colorado River Basin.

Project	Description
System Conservation Implementation Agreement (SCIA) No. 16-XX-30-W0606	Water Conservation through a reduction of consumptive use on the CRIP by fallowing 1,591 acres of irrigated cropland for the period October 1, 2016 - September 30, 2018
SCIA No. 18-XX-30-W0634	Water Conservation through a reduction of consumptive use on the CRIP by fallowing 1,884 acres of irrigated cropland for the period October 1, 2018 - September 30, 2019
SCIA No. 19-XX-30-W0647	Water Conservation through a reduction of consumptive use on the CRIP by fallowing 3,705 acres of irrigated cropland for the period January 1, 2019 - December 31, 2019
System Conservation Agreement under Lower Colorado River Basin Drought Contingency Plan	Water Conservation through a reduction of consumptive use on the CRIP by fallowing 10,000 acres of irrigated cropland for the period January 1, 2020 - December 31, 2020





2 Project Budget

2.1 Funding Plan

The estimated total cost of the establishing the nine proposed Gaging Stations on the Colorado River Irrigation Project is \$157,076. CRIT requests Reclamation funding in the amount of \$75,000. CRIT is committed to contributing an amount equal to \$82,076 as a monetary contribution from the Tribes’ Funds, \$59,776 of which will come out of CRIT’s System Conservation Program funds and \$22,300 of which will come out of a BIA Colorado River Agency PL93-638 contract with CRIT Water Resources work under the PL93-638 contract with CRIT Water Resources Department for Irrigation Engineering Services (these are not federal funds). CRIT Water Resources work under the PL93-638 contract is current and on-going. No costs will be incurred before the start of the project. There is no funding received from other Federal partners, and there are no other pending funding requests for this project. Table 5 is a summary of Federal and non-Federal funding sources for the proposed project.

Table 5. Summary of Federal and Non-Federal Funding Sources.

Funding Source	Funding Amount
Non Federal Entities	
1. Colorado River Indian Tribes SCP Funds	\$ 59,776
2. Colorado River Indian Tribes 638 Funds	\$ 22,300
Non Federal Subtotal	\$ 82,076
Other Federal Entities	
None	-
Other Federal Subtotal	-
Requested Reclamation Funding	\$ 75,000
Total Project Funding	\$ 157,076

2.2 Budget Proposal

Table 6 provides details of the estimated project costs in the format provided in the Funding Opportunity Announcement.





Table 6. Details of Budget Proposal.

BUDGET ITEM DESCRIPTION	Computation		Quantity Type	Funding Request (\$)
	\$/Unit	Quantity		
Salaries and Wages				
Devin Heaps	\$ 42.10	40	Hours	\$ 1,680
Water Resources Supervisor	\$ 38.86	216	Hours	\$ 8,390
Temp Laborer 1	\$ 20	216	Hours	\$ 4,320
Temp Laborer 2	\$ 20	216	Hours	\$ 4,320
Fringe Benefits				
Devin Heaps	\$ 10.60	40	Hours	\$ 420
Water Resources Supervisor	\$ 9.78	216	Hours	\$ 2,110
Temp Laborer 1	\$ 2.47	216	Hours	\$ 530
Temp Laborer 2	\$ 2.47	216	Hours	\$ 530
Equipment				
ADVM Gage Station for Sub-Lateral Heading Sites				
SCADA Pak 350 with encl, solar, batt	\$ 9,350	2	Each	\$ 18,700
Sontek IQ plus and cable	\$ 8,850	2	Each	\$ 17,700
Sontek Flow Display with 4-20mA output	\$ 1,495	2	Each	\$ 2,990
SS riser mount	\$ 165	2	Each	\$ 330
Pressure Transducer Gage Station for Sub-Lateral Heading Sites				
SCADA Pak 350 with encl, solar, batt	\$ 9,350	4	Each	\$ 37,400
PT, display and mounting	\$ 2,000	4	Each	\$ 8,000
Pressure Transducer Gage Station for Sub-Lateral Spill Sites				
GeoTech SitePro Telemetry 1 Solar Panel, 1 Battery, Display	\$ 1,665	3	Each	\$ 4,995
GeoTech Gauged Poly Pressure Transducer & Poly Cable	\$ 689	3	Each	\$ 2,067
Siteview, 15 Minute Logging Annual Data and Cloud Services	\$ 216	3	Each	\$ 648
Supplies and Materials				
6 ft T-Post	\$ 5.99	27	Each	\$ 161.73
4-inch Diameter PVC Pipe (Comes in 10 ft lengths and will be cut to 4 ft)	\$ 21.99	14	Each	\$ 307.86
4-inch PVC Caps	\$ 10.59	27	Each	\$ 285.93
2-inch x 10 ft Galv steel pipe (TOE)	\$ 50.99	9	Each	\$ 458.91
2-inch Galv Steel Cap (FPT)	\$ 8.29	9	Each	\$ 74.61
8-inch Diameter x 2 ft Sonotube (sold in 4 ft lengths)	\$ 9.30	5	Each	\$ 46.50





1-inch Diam PVC Electrical Conduit (sold in 10 ft lengths)	\$ 5.65	18	Each	\$ 101.70
1-inch PVC Electrical Conduit Couplers	\$ 0.37	27	Each	\$ 9.99
1-inch 90degree elbow PVC Electrical Conduit (pack of 10)	\$ 37.88	3	Each	\$ 113.64
1-inch 45degree elbow PVC Electrical Conduit (sold as pack of 15)	\$ 18.83	2	Each	\$ 37.66
2x6 lumber (12 ft)	\$ 15.57	1	Each	\$ 15.57
QuikCrete (60 lb bags)	\$ 3.55	45	Each	\$ 159.75
Shotcrete [NRCS 2021 EQIP PMT SCHEDULE CODE 428]	\$ 348.17	1	Cubic Yard	\$ 350
1.5-inch (-) Gravel	\$ 49.96	1	Cubic Yard	\$ 49.96
Arizona Sales Tax (5.6% of all Supplies and Materials)	-	-	-	\$ 122
Contractual				
NRCE, Inc.	\$ 38,700	1	Each	\$ 38,700
Environmental and Regulatory Compliance				
Tribal Historic Preservation	\$ 53	18	Hours	\$ 950
Other Costs				\$ -
Indirect Costs				\$ -
Direct Costs				\$ 157,076
Total Estimated Project Costs				\$ 157,076





2.3 Budget Narrative

2.3.1 Salaries and Wages

The Project Manager is Mr. Devin Heaps, CRIT WRD Director. The Project Manager will procure all materials and equipment required for the Pressure Transducer/ADVM installations. Where necessary, he will coordinate with the BIA Irrigation Office for site preparation including the removal of debris and vegetation and the installation of downstream erosion protection. He will procure shotcrete installation services. The Project Manager will lead and direct the CRIT WRD in the installation and programming of all Pressure Transducer/ADVM sites. Installation of equipment will be performed by a CRIT WRD technician with assistance from an NRCE engineer located on-site at CRIT. Two CRIT WRD laborers may be employed to provide assistance with site cleanup and preparation.

2.3.2 Fringe Benefits

Fringe and overhead costs are currently Workman's Compensation (1.8% of Total Salary), FICA (7.65% of Total Salary), Unemployment (2.9% of Total Salary), Pension (5% of Total Salary), Health and Dental Benefits (6.7% of Total Salary), and Life Insurance (1.13 % of Total Salary).

Fringe benefits total 25.18% of Total Salaries for CRIT WRD Employees.

2.3.3 Travel

None. Travel expenses including mileage for round trip field visits to project sites for CRIT staff as required for Project field support and implementation is considered within the scope of normal duties.

2.3.4 Equipment

Equipment costs per proposed site are listed in Table 6. These costs are based on June 2020, January 2021, and February 2021 price quotes from equipment suppliers. Three site types are broken down along with the equipment requirements for each installation type.

ADVM Gage Stations for Sublateral Heading Sites cost \$19,860 each (2 total). Equipment requirements and associated costs and sources are as follows: SCADA Pak 350 with encl, solar, batt via Sierra Controls (\$9,350); Sontek IQ plus and cable via GeoTech Environmental Equipment, Inc. (\$8,850); Sontek Flow Display with 4-20mA output via GeoTech Environmental Equipment, Inc. (\$1,495); and SS riser mount via GeoTech Environmental Equipment, Inc. (\$165). Quotes can be found in Appendix B.

Pressure Transducer Gage Stations for Sublateral Heading Sites cost \$11,350 each (4 total). Equipment requirements and associated costs and sources are as follows: SCADA Pak 350 with encl, solar, batt via Sierra Controls (\$9,350); Pressure Transducer, display, cable, and mounting via GeoTech Environmental Equipment, Inc. (\$2,000-Estimate). Quotes can be found in Appendix B.

Pressure Transducer Gage Stations for Sublateral Spill Sites cost \$2,570 each (3 total). Equipment requirements and associated costs and sources are as follows: GeoTech SitePro Telemetry 1 Solar Panel, 1 Battery, Display (\$1,665); GeoTech Gauged Poly Pressure





Transducer & Poly Cable (\$689), Siteview, 15 Minute Logging Annual Data and Cloud Services (\$216). GeoTech Environmental Equipment is proposed as the sole-source for these installation types. A quote from GeoTech was received in February 2021 for six installations of this type in Appendix B. This was then converted to a cost for three installations.

2.3.5 Supplies and Materials

A concrete pad will be required at the 27R-4-2 Heading. Also, all nine sites will require protection and equipment masts, as well as electrical conduit to protect all cables from the measurement device to the flow display. The total expected cost for supplies and materials is estimated as \$2,295.

Concrete Pad

Reconnaissance level site assessments indicated the installation of an Acoustic Doppler Velocimeter in an earthen open channel at 27R-4-2's heading will require a concrete section to fasten the device to. Quantities of shotcrete were estimated based on preliminary site measurements, which was estimated as roughly 1 cubic yard. Table 6 shows the estimated total shotcrete cost for one ADVN installation site (27R-4-2 Heading). Also required will be 1 cubic yard of a gravel foundation and lumber forms (Costs seen in Table 6). The total expected cost of material to install a concrete pad in 27R-4-2's open channel near the heading is \$413.70.

Protective Bollards

The Supplies and Materials required to create protective bollards at each site are: (3) 6-ft T-Posts, (3) 4-inch Diameter PVC pipe at 4-ft lengths per site, (3) 4-inch PVC caps per site, and (4) 60-lb bags of QuikCrete per site. Costs for each item can be found in Table 6. The total cost to implement protective bollards is \$96.93 at each of the nine sites, totaling \$872 overall.

Equipment Mast

Equipment and their associated enclosures and solar panels will be required to be mounted at least four feet above ground. This will be achieved with a 2-inch, 10-ft long Galvanized Steel Pipe at all nine installation sites along with a 2-inch Galvanized Steel Cap at all locations. Also, a concrete form (8-inch x 2-ft sonotube) and one bag of quickcrete will be required to install mast into the ground. The mast is expected to cost \$67.48 per site at all nine sites, totaling \$607 overall.





Protective PVC Conduit

Each site will require conduit to protect each flow device's cable from the bottom of the channel to the flow display fastened within the equipment enclosure on the mast. Straight 1-inch PVC conduit will be required along with an assortment of 1-inch couplings, 90 deg elbows, and 45 degree elbows. It is estimated that 20-ft of the 1-inch PVC conduit, three 1-inch couplings, three 90 degree elbows, and three 45 degree elbows will be required. All costs can be found in Table 6. It is estimated to cost \$27.54 per site to protect equipment cables from the bottom of the channel as they are routed to the equipment enclosures, totaling \$248 overall.

Sales Tax

A sales tax of 5.6% was added onto the supplies and materials section, totaling \$122.

With exact amounts not available, there may be leftover materials (e.g. assortment of conduit elbows and couplings, etc.). Having these additional materials will provide a buffer in case they are needed for any reason throughout the project.

2.3.6 Contractual

NRCE currently is under contract with CRIT in a Professional Services Agreement (PSA) to provide continuing irrigation engineering technical support. Under this PSA, an NRCE Engineer is located on site at CRIT for day to day continuing technical/engineering support to the CRIT WRD. The NRCE Engineer will assist with all aspects of the implementation of the proposed project including site assessments, site installations, and documentation and training, totaling 216 hours at \$150/hour.

2.3.7 Environmental and Regulatory Compliance

Tribal personnel from the Tribes Historic Preservation Office are required to be on site whenever any earth-moving works are in progress. This is expected to be minimal. Monitoring costs are estimated a rate of \$53 per hour and 2 hours per site at nine sites, totaling \$950.

2.3.8 Other Expenses

None.

2.3.9 Indirect Costs

None.





2.3.10 Total Costs

The total cost of this project is estimated as \$157,076.





3 Environmental and 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.*

No impacts to the environment are expected. The scope of the disturbance resulting from the installation of Pressure/ADVM sensors and associated equipment will be negligible. It is possible new conduit wire may need to be buried for encasement of wiring between sensors, data loggers, and solar panels. Any ground disturbance will potentially be: 1) a minimal amount of trenching along ditch banks and/or across existing canal/drain roads and other disturbed lands, and, 2) installation of a tower/mast on the ditch bank for mounting of solar panels, enclosures, and other hardware. Tribal personnel from the Tribes Historic Preservation Office will be on site whenever any earth-moving works are in progress.

- *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?*

According to the Fish and Wildlife Services IPAC tool there are a total of seven threatened or endangered species that are potentially affected by activities on the CRIP. These include three bird species (Southwestern Willow Flycatcher, Yellow-billed Cuckoo, and Yuma Clapper Rail), two reptile species (Desert Tortoise, and Northern Mexican Gartersnake), and two fish species (Bonytail Chub, and Razorback Sucker). The CRIP is outside of the final critical habitat published in the Federal Register for five of these species. The critical habitat for the Yuma Clapper Rail has not yet been designated. The CRIP is within the proposed critical habitat of the Yellow-billed Cuckoo published in the Federal Register on August 15, 2014. Yellow-billed cuckoos use wooded habitat with dense cover. In western states, nests are often placed in willows along streams and rivers with nearby cottonwoods serving as foraging sites (USFWS, 2019). The minor scope of field work does not involve the removal of riparian habitat and is not expected to affect critical habitat of the Yellow-billed cuckoo or any other species listed or proposed to be listed as Federal threatened or endangered species.

- *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 system construction was originally authorized in the late 1860's. Construction and expansion continued through the early 1900s. Major work was initiated in the 1940's. The most recent canals and laterals were completed in the 1960's and early 1970's.





- *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.*

Seven gage stations in this proposal will have a Pressure Transducer installed just upstream of the sites' existing ramp flumes in a concrete-lined section or just upstream of a check structure. One ADV gage will be in an earthen open channel and will have a concrete pad constructed at the bottom of the channel for mounting the ADV sensor. The final ADV gage will be installed in a concrete-lined open channel. Datalogger enclosures and solar panels will be installed on road shoulders or canal banks. Modifications to any of these structures is negligible.

- *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.*

There are no structures listed or eligible for listing on the National Register of Historic Places within the project area that will be disturbed or modified.

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

There are no known archeological sites within the proposed project area that will experience disturbance or modification.

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

No.

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

No.

- *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.





4 Required Permits or Approvals

Any project implementation activities which will require earth moving will require prior consultation and approval from CRIT's Tribal Historic Preservation Office (THPO). THPO personnel must be on site to monitor any earth moving activity.





5 Letters of Project Support

A letter of support from the Bureau of Indian Affairs is attached in Appendix C.





6 Official Resolution

The official resolution of the CRIT Tribal Council approving this WaterSMART grant application was reviewed and approved during a Special meeting in March 2021. A copy is included with this proposal.





7 Unique Identifier

The Colorado River Indian Tribes is currently registered in the System for Award Management (SAM), and maintains an active registration in SAM. The registration number is 074481706 / 3UHH4.

The organizational DUNS number for the Tribe is 074481706.



8 References

BIA (2002). Colorado River Irrigation Maximo. Data field collected in 2002. Geodatabase published in August 2013.

Davids Engineering Inc., Keller-Bliesner Engineering, and Irrigation Training and Research Center, Cal Poly, San Luis Obispo. (2009). Imperial Irrigation District System Conservation Plan and Delivery Measurement Description, Technical Memorandum.

NRCE (2016). Agricultural Resource Management Plan: Phase I—Irrigated Agriculture Inventory and Issues. Technical Report prepared for the Colorado River Indian Tribes. Ft Collins CO. April.

NRCE (2017a). Water Measurement Inventory, Colorado River Irrigation Project. Technical Report prepared for the Colorado River Indian Tribes. Ft Collins CO. April 2017.

NRCE (2017b). Agricultural Resource Management Plan: Phase II – Efficiency Analyses and Potential Water Conservation. Technical Report prepared for the Colorado River Indian Tribes. Ft Collins CO. May.

NRCE (2018). Acoustic Doppler Velocity Meter (ADVM) Gauging Stations: A. General Design Guidelines, B. Site Specific Designs and Cost Estimates. Technical Report prepared for the Colorado River Indian Tribes. Ft Collins CO. September 2018.

University of Arizona (2008). *The Colorado River Indian Tribes Reservation and Extension Programs. Publication AZ1461*. University of Arizona Cooperative Extension Service (ACES).

USDOI (not dated) *Existing Categorical Exclusions*. Retrieved March 15, 2019:
https://www.doi.gov/sites/doi.gov/files/uploads/doi_and_bureau_categorical_exclusions.pdf

USFWS (2019, March 15). *Species List: Arizona Ecological Services Field Office*. Official species list requested and received March 15, 2019 from FWS Arizona Ecological Field Office using IPAC online tool. <https://ecos.fws.gov/ipac/>





Appendix A: Contractor Cost Estimates

Staff Title	Hourly Rate	Task 1		Task 2		Task 3		Totals	
		Coordination and Project Management		Technical Support		Field Work Preparation and Completion			
		Hours	Cost	Hours	Cost	Hours	Cost	Hours	Cost
Associate Engineer III	\$150.00	72	\$ 10,800	72	\$ 10,800	72	\$ 10,800	216	\$ 32,400
Sub-Total Labor	-	72	\$ 10,800	72	\$ 10,800	72	\$ 10,800	216	\$ 32,400
Contingencies (15%)	-		\$ 1,620		\$ 1,620		\$ 1,620		\$ 4,900
Travel Expenses (Associate Engineer III)	-								\$ 1,400
Task Total	-	72	\$ 12,420	72	\$ 12,420	72	\$ 12,420	216	\$ 38,700





Appendix B: Equipment Quotes





Quote Number: 4356
 Quoted By: Geotech
 Quote Date: 1/22/2021
 Quote Expires: 3/31/2021

TO ORDER: Make PO out to and fax to:

**Geotech Environmental Equipment, Inc.
 Attn: Order Entry - Fax #(303) 322-7242
 2650 E. 40th Avenue
 Denver, CO 80205**

Quote Address

CRIT Water Resources Dept.
 Mr. Devin Heaps, Director
 26600 Mohave Road
 Parker, AZ 85344

PartNumber	Description	Price	Qty	Extended
SON-FD-ANA	SonTek Flow Display with (4) 4-20ma analog outputs.	\$1,495.00	2	\$2,990.00
Grand Total:				\$2,990.00

NOTES: This quote does not include any applicable taxes.
 All returned or cancelled orders will be subject to a 20% restock fee.

OrderNotes: This is a note field for your order notes that will show up on the quote

TERMS: Purchase Order or Prepayment

F.O.B: Denver, Colorado

SHIPMENT: Once approval is received and parts are available.
 (Call for Leadtime)

FREIGHT: FOB Shipping point, Prepaid and added to invoice.

Please feel free to contact Geotech Environmental Equipment, Inc. anytime at (800) 833-7958 or at Sales@Geotechenv.com should you have pricing or technical questions.
 Phone: (800) 833-7958 Fax: (303) 322-7242
 Email: Sales@Geotechenv.com

If you specifically do not see an item listed on this quote, then it is not included.



Quote Number: 4377
 Quoted By: Geotech
 Quote Date: 2/25/2021
 Quote Expires: 4/30/2021

TO ORDER: Make PO out to and fax to:
Geotech Environmental Equipment, Inc.
Attn: Order Entry - Fax #(303) 322-7242
2650 E. 40th Avenue
Denver, CO 80205

Quote Address
 TJ Trujillo
 NATURAL RESOURCES CONSULTING ENGINEERS I
 131 LINCOLN AVE #300
 FORT COLLINS, CO 80524

PartNumber	Description	Price	Qty	Extended
SON-IQP	SonTek-IQ Plus. Low profile, five beam up-looking real-time acoustic Doppler current meter/flowmeter (3.0-MHz). The SonTek-IQ Plus includes an extended operating range (5-m), advanced data processing including the SmartPulseHD feature, and current profili	\$8,565.00	1	\$8,565.00
son-iqxp	Sontek IQ Pipe	\$8,565.00	1	\$8,565.00
36-0040-010	10-m power and RS232/SDI-12/Modbus communications cable, compatible with the SonTek-IQ Flow Display, 5-pin male dry-pluggable to terminal block	\$285.00	2	\$570.00

Grand Total: \$17,700.00

NOTES: This quote does not include any applicable taxes.
 All returned or cancelled orders will be subject to a 20% restock fee.

OrderNotes: Equipment to add to SitePro Project with CRIT
 TERMS: Purchase Order or Prepayment
 F.O.B: Denver, Colorado
 SHIPMENT: Once approval is received and parts are available.
 (Call for Leadtime)
 FREIGHT: FOB Shipping point, Prepaid and added to invoice.

Please feel free to contact Geotech Environmental Equipment, Inc. anytime at (800) 833-7958 or at Sales@Geotechenv.com should you have pricing or technical questions.
 Phone: (800) 833-7958 Fax: (303) 322-7242
 Email: Sales@Geotechenv.com

If you specifically do not see an item listed on this quote, then it is not included.



Quote Number: 2132
 Quoted By: Jassen Savoie
 Quote Date: 6/1/2020
 Quote Expires: 7/1/2020

TO ORDER: Make PO out to and fax to:
Geotech Environmental Equipment, Inc.
Attn: Order Entry - Fax #(303) 322-7242
2650 E. 40th Avenue
Denver, CO 80205

Quote Address
 CRIT Water Resources Dept.
 Mr. Devin Heaps, Director
 26600 Mohave Road
 Parker, AZ 85344

PartNumber	Description	Price	Qty	Extended
SON-IQP	SonTek-IQ Plus. Low profile, five beam up-looking real-time acoustic Doppler current meter/flowmeter (3.0-MHz). The SonTek-IQ Plus includes an extended operating range (5-m), advanced data processing including the SmartPulseHD feature, and current profili	\$8,480.00	6	\$50,880.00
SON-IQXP	SonTek-IQ Pipe. Low profile, five beam real-time acoustic Doppler current meter/flowmeter (3.0-MHz). The SonTek-IQ Pipe includes a measurement range of 5-m, advanced data processing including the SmartPulseHD feature, and current profiling. Features dyna	\$8,480.00	2	\$16,960.00
36-0040-010	10-m power and RS232/SDI-12/Modbus communications cable, compatible with the SonTek-IQ Flow Display, 5-pin male dry-pluggable to terminal block	\$270.00	8	\$2,160.00
28-0103-02	Pipe Ring assembly, for 24-in (61-cm) to 36-in (91-cm) ID pipes. For SonTek-IQ Pipe system only	\$1,445.00	2	\$2,890.00
SitePro IQ	SitePro Configured for Sontek IQ Flow Sensors -Enclosure, Battery, Solar Reg, SitePro Radio -Solar Panel with mount, rated for Sontek IQ -Siteview Data, first year no charge (\$216.00 value)	\$3,450.00	6	\$20,700.00
24-0208	Custom 1-inch (2.54-cm) tall stainless steel riser mount, completely compatible with existing hole patterns on the SonTek-IQ and the standard SonTek-IQ mounting brackets.	\$165.00	6	\$990.00
SON-FD	SonTek Flow Display.	\$1,130.00	6	\$6,780.00

OrderNotes:

TERMS: Purchase Order or Prepayment

F.O.B: Denver, Colorado

SHIPMENT: Once approval is received and parts are available.
 (Call for Leadtime)

FREIGHT: FOB Shipping point, Prepaid and added to invoice.

Please feel free to contact Geotech Environmental Equipment, Inc. anytime at (800) 833-7958 or at JassenS@Geotechenv.com should you have pricing or technical questions. Phone: (800) 833-7958 Fax: (303) 322-7242 Email: Sales@Geotechenv.com

If you specifically do not see an item listed on this quote, then it is not included.

PartNumber	Description	Price	Qty	Extended
Est Ship	Estimated Shipping Charges (Ground Service and Insurance)	\$400.00	1	\$400.00

Grand Total: \$101,760.00

NOTES: This quote does not include any applicable taxes.
All returned or cancelled orders will be subject to a 20% restock fee.

OrderNotes:

TERMS: Purchase Order or Prepayment

F.O.B: Denver, Colorado

SHIPMENT: Once approval is received and parts are available.
(Call for Leadtime)

FREIGHT: FOB Shipping point, Prepaid and added to invoice.

Please feel free to contact Geotech
Environmental Equipment, Inc. anytime at (800)
833-7958 or at JassenS@Geotechenv.com
should you have pricing or technical questions.
Phone: (800) 833-7958 Fax: (303) 322-7242
Email: Sales@Geotechenv.com

If you specifically do not see an item listed on this quote, then it is not included.



Geotech Environmental Equipment, Inc.
2650 East 40th Avenue

Denver, CO 80205
Phone 303.320.4764 Fax 303.322.7242
sales@geotechenv.com www.geotechenv.com
EIN# 84-0753199

Quotation

Quote No: 09909278
Quote Date: 02/19/2021
Customer No: 000006610264
Salesperson No: 208 REGION 8
Account Terms: NEED CA/TERMS
Payment Method: PO
Placed By: TJ Trujillo

Bill To: **NATURAL RESOURCES CONSULTING ENGINEER I**

131 LINCOLN AVE #300
FORT COLLINS, CO 80524
UNITED STATES OF AMERICA

Ship To: **NATURAL RESOURCES CONSULTING ENGINEERS I**

131 LINCOLN AVE #300
FORT COLLINS, CO 80524
UNITED STATES OF AMERICA

Phone No: (970) 224-1851 Ext No:

Shipping Date	Ship Via	Bill Frt Carrier #	Location
02-19-2021	UPS GROUND		CO

Shipping Instructions

(719) 691-9063

Line No.	Item No.	Item Description	UOM	Quantity Ordered	Unit Price	Amount
1	82350004	GEOTECH SITEPRO TELEMETRY 1 SOLAR PANEL,1 BATT,DISPLAY	EA	6.00	\$1,665.00	\$9,990.00
2	82051000	GEOTECH GAUGED POLY PRES TRAN TRANSDUCER & POLY CABLE	EA	6.00	\$689.50	\$4,137.00
	52050087	ASSY,TRANS BODY,0-5 PSIG 4-20MA,GAUGED	EA	1.00		
	22050025	CABLE,POLY,VENTED TRANSDUCER	FT	30.00		
	52050246	ASSY,TRANS,STANDARD TOP	EA	1.00		
	82050129	BELLOWS KIT,TRANSDUCER	EA	1.00		
	S85101	CAL,0.25% ACCURACY,GEO TRANS NEW GEOTECH TRANSDUCER ONLY	EA	1.00		
3	12350012	SITEVIEW,15 MINUTE LOGGING ANNUAL DATA AND CLOUD SERVICES	EA	6.00	\$216.00	\$1,296.00

Special Instructions:

Gross Amount \$15,423.00

Quote Total Does Not Include Taxes or Shipping/Handling.



SIERRA CONTROLS, LLC

PROPOSAL

Sierra Controls, LLC
5470 Louie Lane Ste. 104
Reno, NV 89511
(775) 236-3350

Quote / Project #: 18-5727 Rev 4
Date : 6/3/2020
Estimator: Daniel Hunsaker
Project Mgr: David Zink

- To:** Natural Resources Consulting Engineers, Inc. (NRCE)
Attention: Mr. Devin Heaps, Director CRIT Water Resources Dept.
Project: CRIT - Monitoring Telemetry Sites
Rev 4: Update pricing to reflect current rates & costs.
Rev 3: * Remove item 6
Rev 2: * Remove all items other than 1 and 6. Price shown on proposal is price per each item actual price will be based on quantity ordered. Pricing updated to reflect current labor rates and vendor pricing.
Rev 1: * Remove Radios from Sites - Reconfigure for Sites to Radio Ready for Future Additions
 * Combine (9) Sites Into Single Installation Trip
 * Add Campbell Scientific CR310 Option(s)

Sierra Controls LLC (SC) is pleased to provide this proposal for Natural Resources Consulting Engineers, Inc. (NRCE) in support of the CRIT - Monitoring Telemetry Sites project.

Item #	Description	Quantity	Unit Price	Tribal Tax	Line Total Each
Item 1	Sontek Monitoring Site w/ Scada Pack	2	\$ 9,350	\$ 374	\$ 19,448

Pricing Includes:

- (1) ENCLOSURE 24X20X8 NEMA 4
- (1) PANEL A24P20
- (1) SCADAPACK 350 w/ISaGraph
- (1) SOLAR REGULATOR ASC 12/16
- (1) OIT MAPLE 3185
- (1) BATTERY 12V 35AH
- (1) ENCLOSURE 12X12X8 NEMA 3R LOCK
- (1) SOLAR PANEL MOUNTING BRACKET F
- (1) 140 WATT SOLAR PANEL 12VDC
- (1) RELAY RH1B-UDC12V
- (1) RELAY SOCKET SH1B-05

Note: Site with SCADAPack Controller includes:

- * Radio Comm Status / History
- * Panel Temperature
- * Local USB DataLogging Access
- * Solar Battery Info (VDC)
- * Site Intrusion Status
- * Expandability to add future instrumentation.
(Level, Water Quality, etc)

Note: Item 1 does not include flowmeter listed as Item 6. Full site would require item 1 and item 6.

Pricing also Includes:

Project Management, Engineering, Design, Manufacturing, Electrical Testing, PLC Programming, OIT Programming, As Builts, Shipping

Project Total:

Price	Tribal Tax	Total Price
\$ 18,700	\$ 748	\$ 19,448



Notes & Disclaimers:

Integration: For the purpose of this project SC acts as the equipment manufacturer. SC in no way assumes responsibility for the conceptual design or integration of these additional sites into districts current SCADA system. Site additions are done at the request of NRCE and end customer directly.

Installation: All installation, startup and commissioning by others.

Flowmeter: Flowmeters proposed in this project is an open channel meter that require distance between the point of installation and any structures or obstructions in the canal it is measuring to gaurentee accurate measurement. Failure to adhere to manufacturer guidelines could result in bad flow calculations. SC provides this quotation based on customer engineering company's requests but makes no gaurentees of the operation of the units if engineer deviates from manufacturer installation requirements.

Existing Conditions: Proposal is based upon the presumption that all existing programs, hardware, and controls are complete and functional. Additional programming, hardware or adjustments required by SC to fix / modify existing programming or PCIS / SCADA SYSTEM outside of the scope of this agreement to be billed on a T&M basis.

Additional T&M Work: This proposal represents the complete scope of work to be performed by SC. Any additional requirements, specifications or construction details outside of this proposal are not included and will be billed on a T&M basis as mutually agreed upon by all parties.

Wage Rates: Pricing is based upon SC standard wage rates and does not include any provisions for any type of Prevailing Wage Requirements. Client to notify SC prior to the beginning of work if different or indemnify SC for any loss or penalties assessed if deteremined otherwise after the execution of this agreement.

Delivery: Scheduled ARO
Terms: NET 30
FOB: RENO, NV

**RESPECTFULLY SUBMITTED,
SIERRA CONTROLS, LLC**


Danny Hunsaker, P.E. – General Manager

This quote is valid for 60 days.

To proceed with this order please sign below with an authorized signature and return.

Signed

PO Number

Date



Appendix C: Supplies and Materials Quotes

FREE IN-STORE PICKUP Over one million online items eligible

Home / Electrical / Electrical Boxes, Conduit & Fittings / Conduit Fittings

Internet #206865969 Model #UATAFR-CTN Store 60 SKU #1001771171

1 in. 45 Degree Schedule 40 PVC Plain End Standard Radius Elbow (Case of 15)
by **Carlton** (Brand Rating: 4.5/5)

★★★★★ Write the First Review Questions & Answers

- Enables a 45 degree change of directions in a run of conduit
- Plain end
- Compatible with Sch. 40 rigid non-metallic conduit
- See More Details

\$18.83 /case

Save up to \$100* on your qualifying purchase. Apply for a Home Depot Consumer Card

Trade Size (in.): 1
1 3/4

How to Get It Delivering to: 86404 | Change

<p>Ship to Store</p> <p>Pickup Mar 12 - Mar 17</p> <p>FREE</p>	<p>Ship to Home</p> <p>Get it by Tue, Mar 16</p> <p>Free with \$45 order</p>	<p>Scheduled Delivery</p> <p>Not available for this item</p>
--	--	--

We'll send up to 20 to Lake Havasu City for free pickup. Curbside pickup available. [Change Store](#)

Figure C1. 45 degree PVC conduit elbow quote obtained online from The Home Depot in Lake Havasu City, AZ.





FREE IN-STORE PICKUP Over one million online items eligible >

Home / Electrical / Electrical Boxes, Conduit & Fittings / Conduit Fittings

Internet #202210584 Model #UB8AF-CAR

1 in. 90 Degree Schedule 80 PVC Plain End Standard Radius Elbow (Case of 10)
by Carlon > (Brand Rating: 4.5/5)

★★★★★ (8) Write A Review Questions & Answers (1)

- Enables a 90 degree change of directions in a run of conduit
- Plain end
- Compatible with Sch. 80 rigid non-metallic conduit
- See More Details

\$37⁸⁸ /case

Save up to \$100* on your qualifying purchase. Apply for a Home Depot Consumer Card

Trade Size (in.): 1

Package Quantity: 10

How to Get It Delivering to: 86404 | Change

<p>Ship to Store Not sold in stores.</p>	<p>Ship to Home Get it by Tue, Mar 16 Free with \$45 orders</p>	<p>Scheduled Delivery As soon as Tomorrow \$30.00</p>
--	---	---

Hover Image to Zoom

Figure C2. 90 degree PVC conduit elbow quote obtained online from The Home Depot in Lake Havasu City, AZ.






FREE IN-STORE PICKUP Over one million online items eligible

Home / Outdoors / Garden Center / Landscaping Supplies / Landscape Rocks / Bagged Landscape Rocks

Internet #304525920 Model #CALQ-40



0.50 cu. ft. 40 lbs. 3/4 in. to 1-1/2 in. California Gold Landscaping Gravel
by Butler Arts

★★★★☆ (81) Write A Review Questions & Answers (12)

\$24.98

Save up to \$100* on your qualifying purchase. Apply for a Home Depot Consumer Card.

Unavailable combination. Please make another selection.

Color Family: Assorted Colors

Assorted Colors Red

How To Get it

This item is currently out of stock
Receive an email if this item is back in stock.

Email **Notify Me**

Figure C3. 1.5-inch (-) gravel quote obtained online from The Home Depot in Lake Havasu City, AZ.





FREE IN-STORE PICKUP Over one million online items eligible >

Home / Plumbing / Pipe & Fittings / Fittings / PVC Fittings

Internet #307851998 Model #PVC 02100 1025HD Store SKU #1003953857 Store SO SKU #1003933719

1 in. PVC Schedule 40 Coupling S x S (25-Pack)
by Charlotte Pipe >

★★★★★ (254) Write A Review Questions & Answers (20)

Lake Havasu City Store
✓ 4 in stock Aisle 17, Bay 003 Text to Me

- PVC Sch 40 fittings are white and used in pressure applications
- Sch 40 fittings are installed using primer and solvent cementing
- PVC Sch 40 fittings are for use where systems won't exceed 140'
- See More Details

Contains 25 units (37c /unit)
\$9.22 /package

Save up to \$100* on your qualifying purchase.
Apply for a Home Depot Consumer Card

Color Reference Size: 1"
1" 1/2" 2" 2 1/2" 3" 3 1/2" 4" 4 1/2" 6" 8" 10" 12"

Double Fitting Size: 1" x 1"
1" x 1" 1 1/2" x 1 1/2" 2" x 2" 2 1/2" x 2 1/2" 3" x 3" 3 1/2" x 3 1/2" 4" x 4" 4 1/2" x 4 1/2" 6" x 6" 8" x 8" 10" x 10" 12" x 12"

Pack Size: 25
1 25

Hover Image to Zoom

Figure C4. 1-inch PVC conduit coupling quote obtained online from The Home Depot in Lake Havasu City, AZ.



The screenshot shows a product page for '1 in. x 10 ft. Sch. 40 PVC Conduit' on The Home Depot website. The search bar at the top contains '1 in. pvc conduit'. The product is shown in a large image on the left. To the right, the price is listed as \$5.65, with a note 'Buy 10 or more \$4.80'. There are three delivery options: 'Store Pickup Today' for free, 'Ship to Home' (not selected), and 'Scheduled Delivery' for \$79.00. The page also shows a 'FREE IN-STORE PICKUP' banner and a '276 in stock at Lake Havasu City' notification.

Figure C5. 1-inch x 10-ft PVC conduit quote obtained online from The Home Depot in Lake Havasu City, AZ.



Shop > Plumbing Supplies > Pipe Fittings > Galvanized Pipe Fittings > Galvanized Cap > Southland 2 In. Malleable Iron Galvanized Cap



Southland 2 In. Malleable Iron Galvanized Cap



Southland 2 In. Malleable Iron Galvanized Cap

2" GALV CAP MODEL # 511-4088G

by Southland Item #422541 UPC: 00032888405707

\$8.29

In-store price may vary from online price. Not all products available at all stores.

Quantity:

- 1 +

ADD TO CART

Free Store Pickup

✓ HAVASU HARDWARE INC.
2039 MC CULLOCH BLVD.
LAKE HAVASU CITY, AZ 86403 US
Estimated pickup days: 3/15/2021

Ship to Address

✓ Ground Shipping Available
✓ Expedited Shipping Available

Figure C6. 2-inch Galvanized Steel Pipe Cap quote obtained online from Havasu Hardware in Lake Havasu City, AZ.





Shop > Plumbing Supplies > Pipe & Tubing > Galvanized & Black Pipe > Galvanized Pipe > Southland 2 In. x 10 Ft. Carbon Steel Threaded Galvanized Pipe



Southland 2 In. x 10 Ft. Carbon Steel Threaded Galvanized Pipe

2"X10' GALV PIPE MODEL # 10924

by Southland Item #424133 | UPC: 00636660109243

\$50.99

In-store price may vary from online price. Not all products available at all stores.

Quantity:

- 1 +

ADD TO CART

Free Store Pickup

✓ HAVASU HARDWARE INC.
2059 MC CULLOCH BLVD.
LAKE HAVASU CITY, AZ 86403 US
Estimated pickup day: 3/15/2021

Ship to Address

✗ Ground Shipping Unavailable
✗ Expedited Shipping Unavailable

Southland 2 In. x 10 Ft. Carbon Steel Threaded Galvanized Pipe




Figure C7. 2-inch x 10 ft Galvanized Steel Pipe quote obtained online from Havasu Hardware in Lake Havasu City, AZ.



FREE IN-STORE PICKUP Over one million online items eligible >

Home / Lumber & Composites / Dimensional Lumber / Framing Lumber

Internet #208604070 Model #HCF-KDDF-PRIME-2x6x12 Store SKU #803886



2 in. x 6 in. x 12 ft. #2 and Better Prime Douglas Fir Board ♥ 220

★★★★☆ (144) [Write A Review](#) [Questions & Answers \(6\)](#)

Lake Havasu City Store
 ✓ 407 in stock Aisle 24, Bay 002 [Text to Me](#)

- Renewable, making this an environmentally friendly choice
- Dense board free of knots and deep grain for a smooth finish
- Unfinished and ready to accept paint or stain
- [See More Details](#)

\$15⁵⁷ /piece

Save up to \$100* on your qualifying purchase. Apply for a Home Depot Consumer Card.

Nominal Product Length (ft.): 12

10 12

How to Get It Delivering to: 86404 | [Change](#)

 Store Pickup Pickup Today FREE	 Ship to Home Not available for this item	 Scheduled Delivery As soon as Tomorrow \$79.00
--	---	--

Figure C8. 2”x 6”x 12-ft lumber quote obtained online from The Home Depot in Lake Havasu City, AZ.



The screenshot shows the Ace Hardware website interface. At the top left is the Ace Hardware logo with the tagline "The helpful place." and a search bar. Below the search bar is a navigation menu with categories like Departments, Sales & Specials, Local Ad, The Paint Studio, Tips & Advice, and Ace Handyman Services. A breadcrumb trail indicates the current location: Back / Plumbing / Pipe Fittings / Plastic Fittings. The main product is a "Charlotte Pipe Schedule 40 4 in. Slip x 4 in. Dia. Slip PVC Cap" with item number 47551 and a price of \$10.59. The page also features an "Add To Cart" button, an "Add To Wish List" button, and options for "Free Store or Curbside Pickup" and "Ship to Home".

Figure C9. 4-inch PVC pipe cap quote obtained online from Ace Hardware in Lake Havasu City, AZ.



< Back / Plumbing / Pipe / Plastic Pipe

Charlotte Pipe Schedule 40 PVC Dual Rated Pipe 4 in.
Dia. x 10 ft. L Plain End 220 psi

Item no. 43993 | PVC 07400 0600

☆☆☆☆☆
No Reviews | Write Review

\$21.99

ACE REWARDS 219 Estimated Points

- 1 +

Add To Cart

Add To Wish List

Free Store or Curbside Pickup

In stock. Get it today at Crown Ace Hardware - Lake Havasu City, AZ

[Check Nearby Stores](#)

Ship to Home

Ship it to 86403

[Check Arrival Date and Cost](#)



Roll Over to Zoom



Figure C10. 4-inch x 10-ft PVC pipe quote obtained online from Ace Hardware in Lake Havasu City, AZ.



The screenshot displays a product page for an 8 in. x 48 in. Concrete Form Tube by SAKRETE. The product is shown in two views: a small thumbnail on the left and a larger image of the tube on the right. The price is \$930. The page includes a search bar with 'sonotube' entered, navigation menus, and a 'FREE IN-STORE PICKUP' banner. The product details section shows a rating of 4.5 stars from 327 reviews. The delivery location is Lake Havasu City Store, with 26 in stock. The price is \$930. There is a 'Save up to \$100' offer on qualifying purchases. The 'How to Get It' section shows 'Store Pickup Today FREE' and 'Scheduled Delivery As soon as Tomorrow \$79.00'. The page also includes a 'FREE IN-STORE PICKUP' banner and a 'Save up to \$100' offer.


Figure C11. 8-inch x 4-ft Sonotube quote obtained online from The Home Depot in Lake Havasu City, AZ.



FREE IN-STORE PICKUP Over one million online items eligible >

Home / Building Materials / Concrete, Cement & Masonry / Concrete Mix Share Print

Internet #100216478 Model #110160 Store SKU #929514



Hover Image to Zoom

60 lb. Concrete Mix ❤️ 8453

by Quikrete >

★★★★★ (1997) Write A Review Questions & Answers (622)

Lake Havasu City Store

✓ 690 in stock Aisle 26, Bay 016 Text to Me

- Ideal for pouring concrete slabs and setting posts
- 4000 psi average compressive strength
- Easy to use by simply adding water
- See More Details

BLK PRICE **\$3.55** Buy 56 or more \$2.84

Save up to \$100* on your qualifying purchase. Apply for a Home Depot Consumer Card

Product Weight (lb.): 60 lb

10 lb **60 lb** 80 lb 90 lb

How to Get It Delivering to: 86404 | Change

Store Pickup Pickup Today FREE	Ship to Home Not available for this item	Scheduled Delivery As soon as Tomorrow \$79.00
--	--	--

Figure C12. 60 lb bag Quikrete quote obtained online from The Home Depot in Lake Havasu City, AZ.



< Back / Building Supplies / Gates and Fences / Fence Posts



American Posts 6 ft. H Powder Coated Green Steel Studded T-Post

Item no. 7801343 | 81070272125

★★★★★

[Read 1 Review](#) | [Write Review](#)

\$5.99

ACE REWARDS 59 Estimated Points

- 1 +

Add To Cart

Add To Wish List

Free Store or Curbside Pickup

In stock. Get it **today** at Crown Ace Hardware - Lake Havasu City, AZ

[Check Nearby Stores](#)

Ship to Home

Unavailable for shipping.

Figure C13. 6-ft T-Post quote obtained online from Ace Hardware in Lake Havasu City, AZ.



Appendix C: Letter of Support

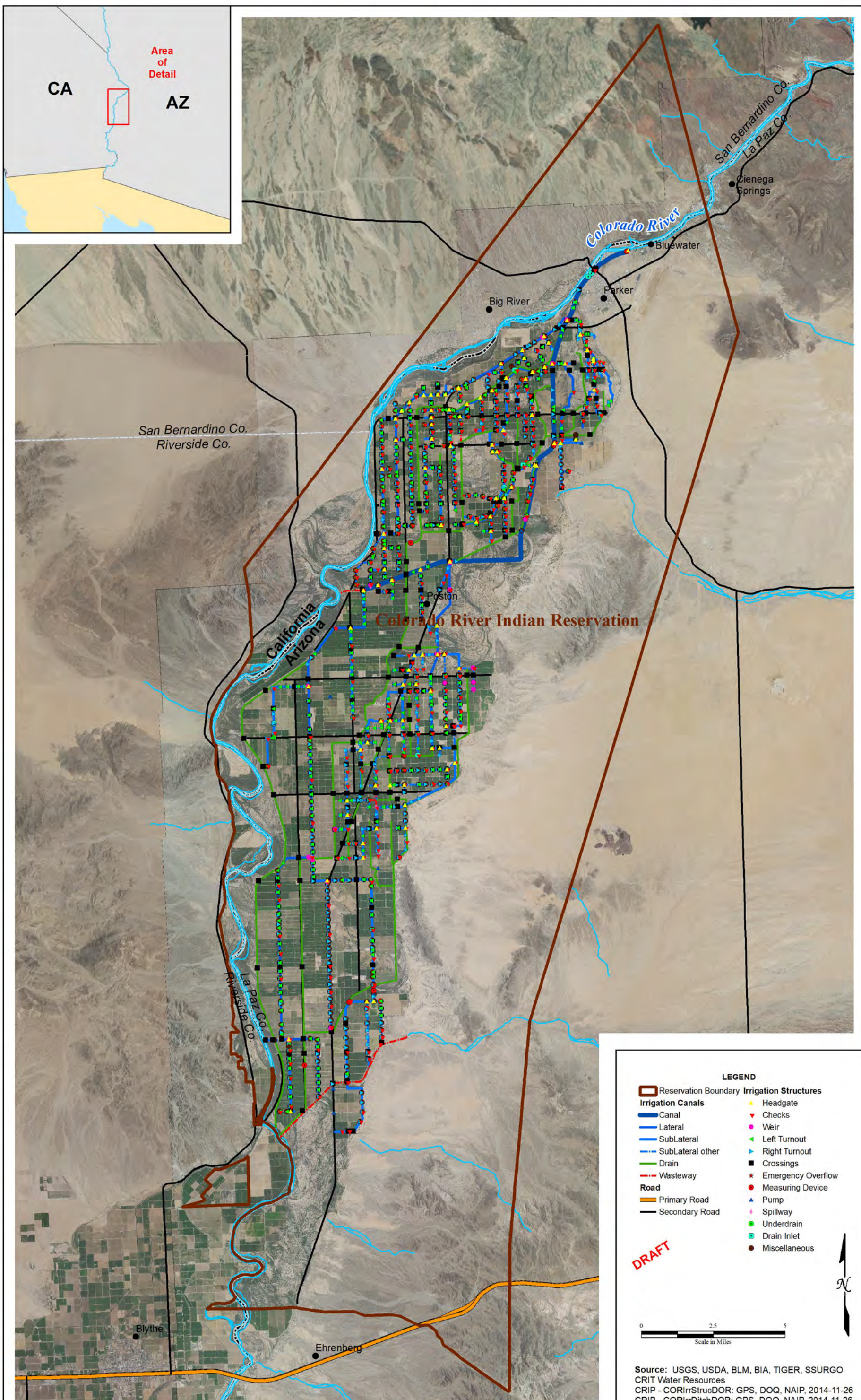




Appendix D: Federal Forms

- SF-424A BUDGET INFORMATION FOR NON-CONSTRUCTION PROGRAMS
- SF-424B ASSURANCES—NON-CONSTRUCTION PROGRAMS
- SF-LLL DISCLOSURE OF LOBBYING ACTIVITIES

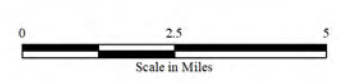




Colorado River Irrigation Project, Overview

- LEGEND**
- | | |
|--------------------------|--------------------|
| Reservation Boundary | Headgate |
| Irrigation Canals | Checks |
| Canal | Weir |
| Lateral | Left Turnout |
| SubLateral | Right Turnout |
| SubLateral other | Crossings |
| Drain | Emergency Overflow |
| Wasteway | Measuring Device |
| Road | Pump |
| Primary Road | Spillway |
| Secondary Road | Underdrain |
| | Drain Inlet |
| | Miscellaneous |

DRAFT



Source: USGS, USDA, BLM, BIA, TIGER, SSURGO
 CRIT Water Resources
 CRIP - CORIrrStrucDOR: GPS, DOQ, NAIP, 2014-11-26
 CRIP - CORIrrDitchDOR: GPS, DOQ, NAIP, 2014-11-26
 Projection: NAD 1983 UTM Zone 11N
 Scale: 1:200,000
 Date: Friday, February 14, 2020

