



PRIVATE GRANT AGREEMENT

TNC Accounting Information	
Agreement #:	AZFO-151124
Project Record ID / Activity#:	P102103 102138
Account #:	5076
Prime Grant:	WFF V 2014-15

December 8, 2015

Cochise County
Attn: Karen Riggs, Cochise County Engineer
1415 Melody Lane, Building F
Bisbee, AZ 85603

Re: Grant to Cochise County for up to \$70,375 to Support 1) San Pedro Ephemeral Streamflow Monitoring and 2) Complete two Recharge Feasibility Studies

Dear Ms. Riggs,

We are very pleased to inform you that The Nature Conservancy (the "Conservancy") has agreed to make this Grant to Cochise County Flood Control District ("Awardee") in the amount not to exceed \$70,375. These funds are under the grant **dated December 2, 2013** ("Prime Award") between The Conservancy and The Walton Family Foundation, to work with partners, such as Cochise County, to design and develop a Regional Aquifer Recharge Network, and ensure that water supplies are optimally managed to sustain riparian health within the San Pedro Riparian National Conservation Area (SPRNCA), thereby protecting Arizona's San Pedro River.

I. OBJECTIVE

The purpose of this Grant is to provide funds to support two projects: 1) \$29,515 to establish an ephemeral streamflow monitoring network to quantify the actual amount of urban enhanced runoff flowing to the Upper San Pedro River recharge sites ("Program 1") more particularly described in the draft Scope of Work (SOW) (Attachment A), and 2) \$40,860 for the technical analysis, feasibility study and conceptual design of the next recharge project/s agreed upon by the Cochise Conservation and Recharge Network ("Program 2") more particularly described in the draft Scope of Work (SOW) (Attachment B). The Grant will be contingent upon Grantee providing matching funds in the amount of \$33,000 and \$280,000.00 for Program 2.

II. TERM

This grant shall commence upon execution and shall expire on **December 23, 2016**.

III. REPORTING

Awardee shall submit programmatic and financial reports as follows:

1. Copy of Contract as Awarded between Cochise County and JE Fuller Hydrology & Geomorphology, Inc. for Ephemeral Streamflow Monitoring Proposal (Program 1).

2. Quarterly Program 1 updates, final monitoring report and copy of monthly invoices.
3. Copy of Contract as Awarded between Cochise County and selected contractor for Recharge Feasibility Study Scope of Work (Program 2) schedule laid out by task name and number, start and finish dates, and formatted in Microsoft Project or similar project management program.
4. Recharge Feasibility Study (Program 2) progress updates presented **monthly** at recharge project team meetings, copy of deliverables as listed in the Scope of Work, and copy of invoices.
5. Final financial reports for both Program 1 and 2 demonstrating full expenditure of TNC funds using the attached forms ("Attachments C & D"), due by **12/16/2016**.

Such reports shall be submitted via post or email to:

Brooke Bushman
TNC Arizona Water Projects Coordinator, 1510 E. Fort Lowell Road, Tucson, AZ 85719
bbushman@tnc.org

IV. PAYMENTS

A full disbursement of **\$70,375** will be made upon signing.

V. EXPENDITURE LIMITED TO DESIGNATED PURPOSES

Grant funds may be spent only in accordance with the provisions of the Awardee's funding request and budget submitted to the Conservancy. Expenditure of Grant funds is subject to modification only with the Conservancy's prior written approval. Any Grant funds not expended or committed for the purposes of this Grant must be returned to the Conservancy.

The Conservancy may monitor and evaluate the Program's activities, which may include visits by personnel and agents, discussions with Awardee's personnel, and review of financial and other records and materials related to the Program activities financed by this Grant in an effort to determine whether Awardee's activities meet the Conservancy's funding objectives.

To the extent that all activities described in the Scope of Work (Attachment A and Attachment B) are not completed before the Grant Term expires, Grant funds dedicated to, or associated with completion of the incomplete activities under the Scope of Work shall be returned to the Conservancy or shall be disbursed pursuant to directions from the Prime Award.

VI. PROVIDING FUNDS TO OTHERS

The Awardee is prohibited from using the Conservancy's funds and/or assets for grants to others without the Conservancy's written permission.

VII. DISCLOSURE OF INTERNAL CONFLICTS OF INTEREST

The Awardee must disclose to the Conservancy any proposed use of funds and/or assets for activities in which there is an apparent or actual conflict of interest between the Awardee and its employees, board members, or close relatives of the Awardee's employees or board members and make such expenditure subject to prior Conservancy approval.

VIII. PROCUREMENT

The Awardee will follow its own policies with regard to documentation of procurements and maintain that documentation in their organization's grant files. If the Awardee does not have written procurement policies, it must retain documentation for procurements (over US \$5,000 outside the U.S. or over \$10,000 in the U.S.). Such documentation will include sole source justification, if appropriate, or documentation of a competitive process or comparison shopping.

IX. RECORDS AND AUDITS

The Awardee agrees to maintain books, records, documents and other evidence pertaining to all costs and expenses incurred and revenues acquired under this Award to the extent and in such detail as will properly reflect all costs and expenses for which reimbursement is claimed. These records shall be maintained for a period of three years after the final expenditure report is submitted.

The Conservancy and its auditors (internal and external) will have access to all records relating to the award for three years after the final financial and programmatic reports for the award have been submitted to TNC, unless local law requires a longer retention period.

The Awardee shall be responsible for reimbursing for any disallowance of any expenditures related to the work the Awardee has performed.

X. SEGREGATION OF COSTS

The Awardee will segregate the costs of the project described herein from other projects that it currently administers.

XI. TITLE TO AND USE OF PROPERTY

Title to any property purchased with Award funds vests in the Awardee. The Conservancy may not be charged for use of any property purchased with Grant funds.

XII. INTELLECTUAL PROPERTY LICENSE

Title to any Materials developed with Grant funds vests in the Grantee, with the Conservancy getting free irrevocable license to use, publish or distribute all such copyrighted, trademarked, patented Materials, or inventions, trade secrets or other intellectual property rights. The word "Materials" may include, but is not limited to reports, studies, photographs (and negatives), computer programs, drawings, writings or other similar works or documents, along with all supporting data and material, produced under this Grant. The Grantee agrees to provide the Conservancy, and, if applicable, the Grantor to the Conservancy with copies of the Materials at no cost.

XIII. ACKNOWLEDGMENTS

The Awardee agrees to acknowledge the Conservancy's support of the project, including funding contributions and sponsorship, on all media announcements, programs and publications.

XIV. ASSIGNMENT

This Award may not be assigned by the Awardee in whole or in part without the prior written consent of the Conservancy.

XV. NO AGENCY

No legal partnership or agency is established by this Award. Neither party is authorized or empowered to act as an agent, employee or representative of the other, nor transact business or incur obligations in the name of the other party or for the account of the other party. Neither party shall be bound by any acts, representations, or conduct of the other.

XVI. TERMINATION AND REMEDIES

The Conservancy shall have the right to terminate this Award by giving 30 (thirty) days written notice to the Awardee of intent to terminate. Should this occur, payment for work satisfactorily completed will be adjusted accordingly. In addition, if in the judgment of the Conservancy the Awardee defaults in performance of Awardee duties under this Award, whether for circumstances within or beyond the control of the Awardee, the Conservancy may immediately terminate this Award by written notice to the Awardee. Upon receipt of the termination notice from the Conservancy, the Awardee shall take all necessary action to cancel outstanding commitments relating to the work under this Award. In the event of termination prior to the originally agreed upon expiration, the Conservancy shall pay of any obligations incurred by the Awardee that could not reasonably be canceled.

If at any time the Prime Award is terminated, this Award shall also be automatically terminated as of the termination date of the Prime Award.

XVII. LOBBYING AND POLITICAL CAMPAIGNING

Awardee shall not use any portion of funds transferred under this Award to engage in any lobbying activities unless the parties specifically agree to such lobbying activities in this agreement.

Awardee shall not use any portion of funds transferred under this Award to participate or intervene in any political campaign on behalf of or in opposition to any candidate for public office, to cause any private inurement or improper private benefit to occur, or to take any other action inconsistent with Section 501(c)(3) of the US Internal Revenue Code.

XVIII. LIABILITY

Awardee shall be solely responsible for the payment of any and all claims for loss, personal injury, death, property damage, or otherwise, arising out of any act or omission of its employees or agents in connection with the performance of this Program. Awardee agrees to indemnify and hold the Conservancy harmless from any and all claims, loss, damages, costs and expenses, including attorney fees through the appellate levels, made against or incurred by the Conservancy arising out of work performed by the Awardee under this Award, or arising out of any act or omission of the Awardee. Conservancy agrees to indemnify and hold the Awardee harmless from any and all claims, loss, damages, costs and expenses, including attorney fees through the appellate levels, made against or incurred by the Awardee arising out of work performed by the Conservancy under this Award, or arising out of any act or omission of the Conservancy.

XIX. USE OF CONSERVANCY NAME/LOGO

The Awardee may not use the Conservancy's name and/or logo in any way without prior written consent from the Conservancy, except to the extent the work performed contemplates their inclusion in the final work product.

XX. CONFIDENTIAL INFORMATION.

During the course of the performance of this Award, the Awardee may have access to materials, data, strategies, other information relating to the Conservancy and its programs, or systems, which are intended for internal use only. Subject to Arizona's Open Meeting Law, any such information acquired by the Awardee shall not be used, published, or divulged by the Awardee to any person, firm, or corporation or in any advertising or promotion regarding the Awardee or the Awardee's services, or in any manner or

connection whatsoever without first having obtained the written permission of the Conservancy, which permission the Conservancy may withhold in its sole discretion.

XXI. TAXES

The Awardee agrees to be responsible for any and all filing and payment of taxes and for compliance with any and all provisions and requirements arising under any applicable tax laws. Neither federal, nor state, nor local income tax, nor payroll tax of any kind shall be withheld or paid by the Conservancy on behalf of the Awardee, or employees of the Awardee. If appropriate, the Conservancy shall report all fees paid to the Awardee to the IRS on Form 1099.

XXII. COMPLIANCE WITH LAWS

The Awardee represents, warrants, and agrees that, in connection with the transactions contemplated by this Award: (a) the Awardee can lawfully work in the United States; (b) the Awardee shall obtain, at its own expense (except to the extent otherwise explicitly stated in this Award) any permits or licenses required for the Awardee's services under this Award; and (c) the Awardee shall comply with all statutes, laws, ordinances, rules, regulations, court orders, and other governmental requirements of the United States, the State of Arizona, and any other jurisdiction(s) in which the Awardee is organized or authorized to do business, including but not limited to any applicable anti-bribery statutes, which are applicable to the work to be done by the Awardee under this Award (in each case, an "Applicable Law"). The Awardee shall not take any actions that might cause the Conservancy to be in violation of any of such Applicable Laws.

XXIII. COMPLIANCE WITH ANTI-TERRORISM LAWS.

The Contractor agrees that it will use any funds received under this Contract in compliance with all applicable antiterrorist financing and asset control laws, regulations, rules and executive orders, including, but not limited to the USA Patriot Act of 2001 and Executive Order 13224.

XXIV. CHOICE OF LAW/FORUM

This Award shall be interpreted, construed and governed by the laws of the State of Arizona and such laws of the United States as may be applicable. In the event of any litigation over the interpretation or application of any of the terms or provisions of this Award, the Conservancy and the Awardee agree that litigation shall be conducted in the State of Arizona.

XXV. BINDING EFFECT/AMENDMENTS

This Award shall become binding when signed by the parties. This Award supersedes all prior or contemporaneous communications and negotiations, both oral and written and constitutes the entire Award between the parties relating to the work set out above. No amendment shall be effective except in writing signed by both parties.

XXVI. SEVERABILITY

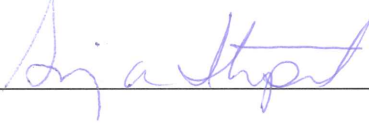
If any provision of this Award is held invalid, the other provisions shall not be affected thereby.

COCHISE COUNTY FLOOD CONTROL DISTRICT

THE NATURE CONSERVANCY

Richard Searle, Chair,
Cochise County Flood Control District Board

Sonja Stupel
AZ Chapter, Director of Finance & Operations

 12/8/15

Date: _____

Melinda Ching (by email) _____ 12/03/2015
Attorney Date

Attest:

Arlenthe Rios, Clerk of the Board

Approved by Melinda Ching
Attorney

on 12/03/15

by email

Attachments:

A- Draft Ephemeral Streamflow Monitoring proposal

B- Draft Scope of Work Outline, Recharge Feasibility Study

C- Financial Report, TNC – Cochise County AZFO-151124 Grant SOW A

D- Financial Report, TNC- Cochise County AZFO-151124 Grant SOW B



June 4, 2015

Karen Riggs
Cochise County Highway & Floodplain Department
1415 Melody Lane, Bldg F.
Bisbee, AZ 85603

Re: Proposal for San Pedro Ephemeral Streamflow Monitoring

Dear Karen,

GeoSystems Analysis, Inc. (GSA) is pleased to present this proposal for ephemeral streamflow monitoring in the San Pedro Basin using the continuous slope area (CSA) method. The proposed work will be performed by GSA, in collaboration with JE Fuller/Hydrology & Geomorphology, Inc. (JEF). Also included in this document are estimated costs to complete the proposed work, as well as our basic assumptions.

We look forward to your comments and review of this proposal. If you have any questions, please feel free to contact me or Lindsey Bunting.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael Milczarek", is written over a light gray dotted rectangular background.

Michael Milczarek
Program Director
GeoSystems Analysis, Inc.

cc: Brooke Bushman, Upper San Pedro Program Coordinator, the Nature Conservancy

1.0 INTRODUCTION

The continuous slope-area (CSA) method is an indirect method for calculating flow rates (instantaneous discharge) from ephemeral streams, and allows for estimation of stormwater runoff volumes and recharge potential (Smith et al. 2010). CSA monitoring provides advantages over traditional direct methods in that it does not require installation of costly stages, cableways/bridges with current meters, or mobilization to stream channels to manually measure flow velocity during runoff events.

A CSA gauge monitoring network is proposed for several stream channels within the San Pedro River basin to monitor streamflow for a period of time prior to the installation of any proposed stormwater capture and groundwater recharge facilities. This will allow for better estimates of streamflow in response to precipitation and improve any predictions of potential groundwater recharge. The proposed CSA monitoring locations are presented in Figure 1 through Figure 3. All stream channels are located within Cochise County, within watersheds that originate in developed areas of Sierra Vista and are subject to urban enhanced runoff.

Proposed monitoring at each CSA monitoring location consists of four stilling wells installed at equal spacing along the channel reach equipped with datalogging pressure transducers (Rugged TROLL 100, In-Situ, Inc, Fort Collins, CO). Installation of equipment at proposed locations is contingent upon obtaining permission for site access and monitoring for the duration of the project.

Four CSA streamflow monitoring locations are proposed within or adjacent to the Bella Vista parcel, with two in Coyote Wash, and two in Charleston wash (Figure 1). Two of the proposed monitoring locations (CY1 and WCC1) will be replicated from Stewart et al (2012). Two CSA streamflow monitoring locations are proposed in the Palominas watershed, and also two stilling well stations installed upstream of culverts in the King's Ranch area (Figure 2). One flowtopography monitoring station will also be installed at the county parcel NW of the Palominas Flood Control and Recharge Facility (Figure 2) to monitor the extent of flow across the landscape in this undefined channel area. There is also an existing CSA monitoring location in Carr Canyon Wash and three stilling wells in retention basin and outfall areas in Ramsey Canyon and Golden acres (installed in July 2014) within the Riverstone parcel that will be monitored under this proposal (Figure 3).

CSA monitoring locations will be analyzed following methods provided in Smith et al (2010). Calculation of the complete-event hydrograph of discharge will be automated by using the CSA2SAC computer program, adapted from the USGS Slope-Area Computation (SAC) program (Fulford 1994) by the Arizona Water Science Center (provided by S. Wiele,

2014). A modified CSA method (Norman et al. 2015) will be used to analyze data from the 2014 monsoon season in Carr Canyon wash (Riverstone), as one stilling well was lost and data is only available for two stilling wells. Three additional stilling wells installed at Riverstone in retention basin and outfall areas in Ramsey Canyon and Golden acres will be utilized to estimate discharge and runoff storage volumes. Discharge and associated outflow volumes at the drop structure in Ramsey Canyon (SW-2) will be estimated using a broad-crested weir rating. Runoff volumes delivered to the two storage areas (SW-1 and SW-3) will be estimated for frequent low-intensity storms which do not supply water in excess of basin overflow elevations, using stage-storage relationships defined through the use of Cochise County's 2-foot topography data. Calculation of discharge estimations for large flow events which result in basin overflow would necessitate highly accurate ground survey data to support calculations, and will not be included in this study.

Descriptions of proposed work for each task are provided in the following sections. Budgeted costs for each task are provided in Table 2, and a detailed budget is provided in Table 3. Costs cover the purchase and installation of all monitoring equipment, and one year of monitoring, data analysis, and generation of a final report.

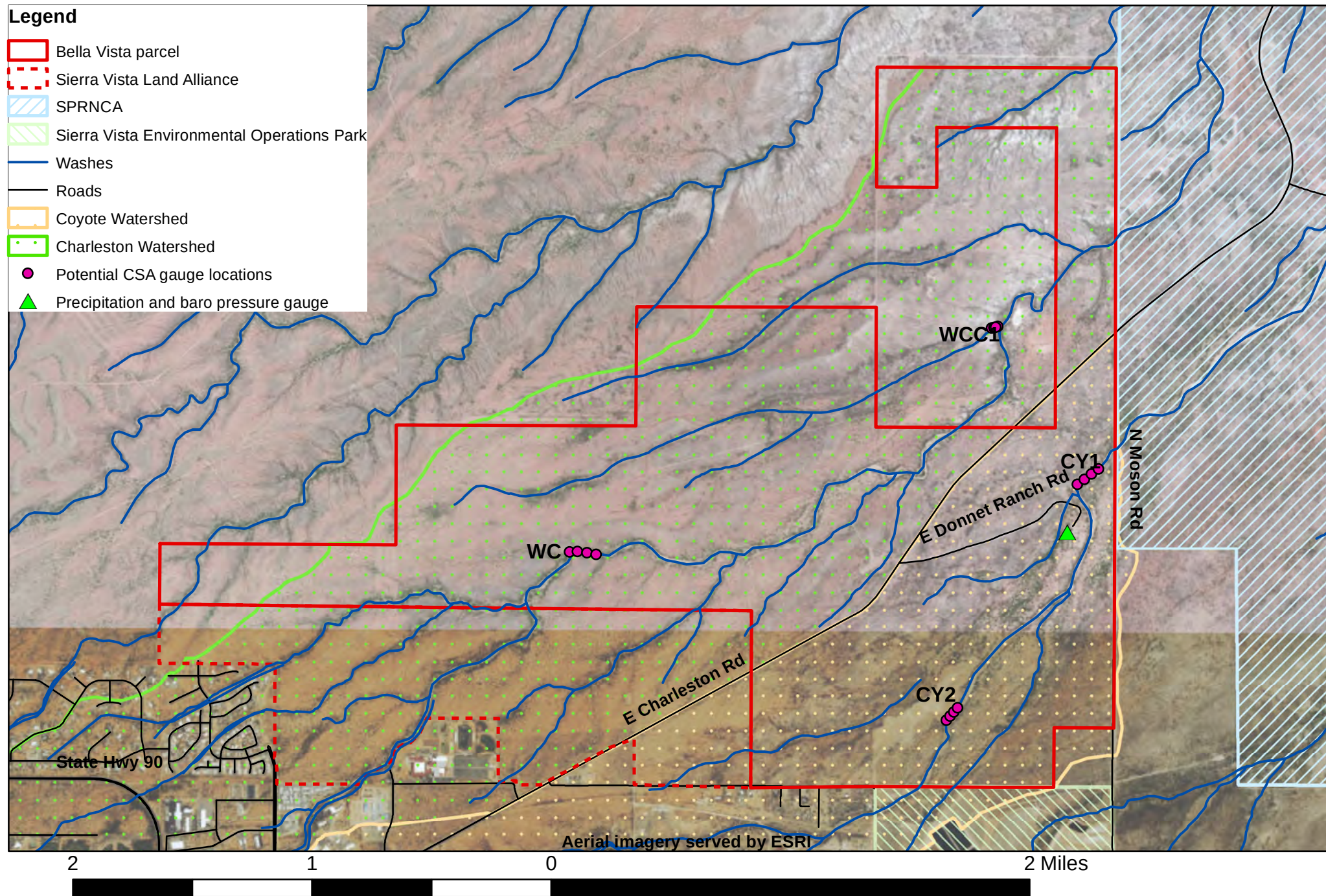


Figure 1. Proposed CSA monitoring locations: Bella Vista



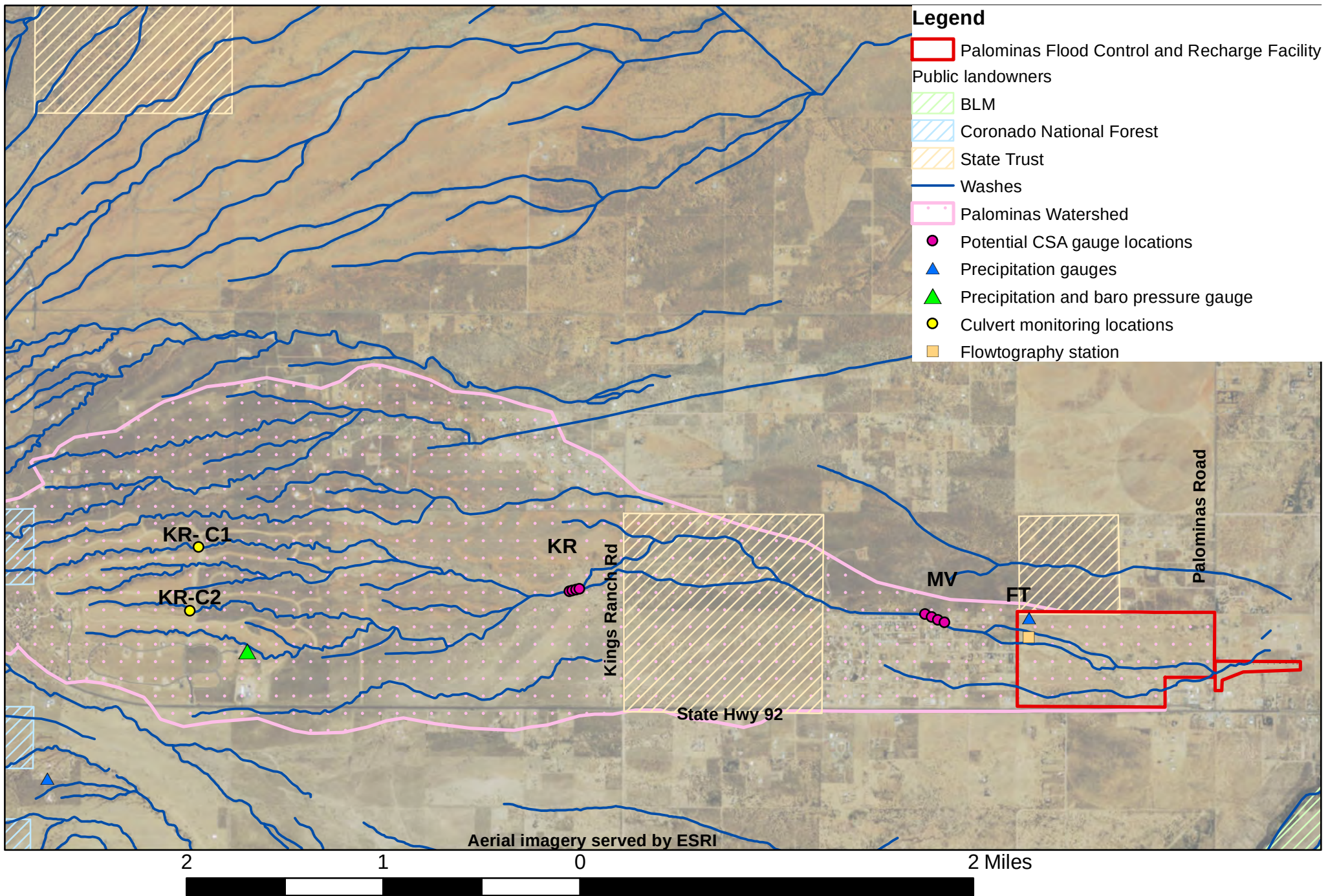


Figure 2. Proposed CSA and Stilling well (culvert) monitoring locations: Palominas



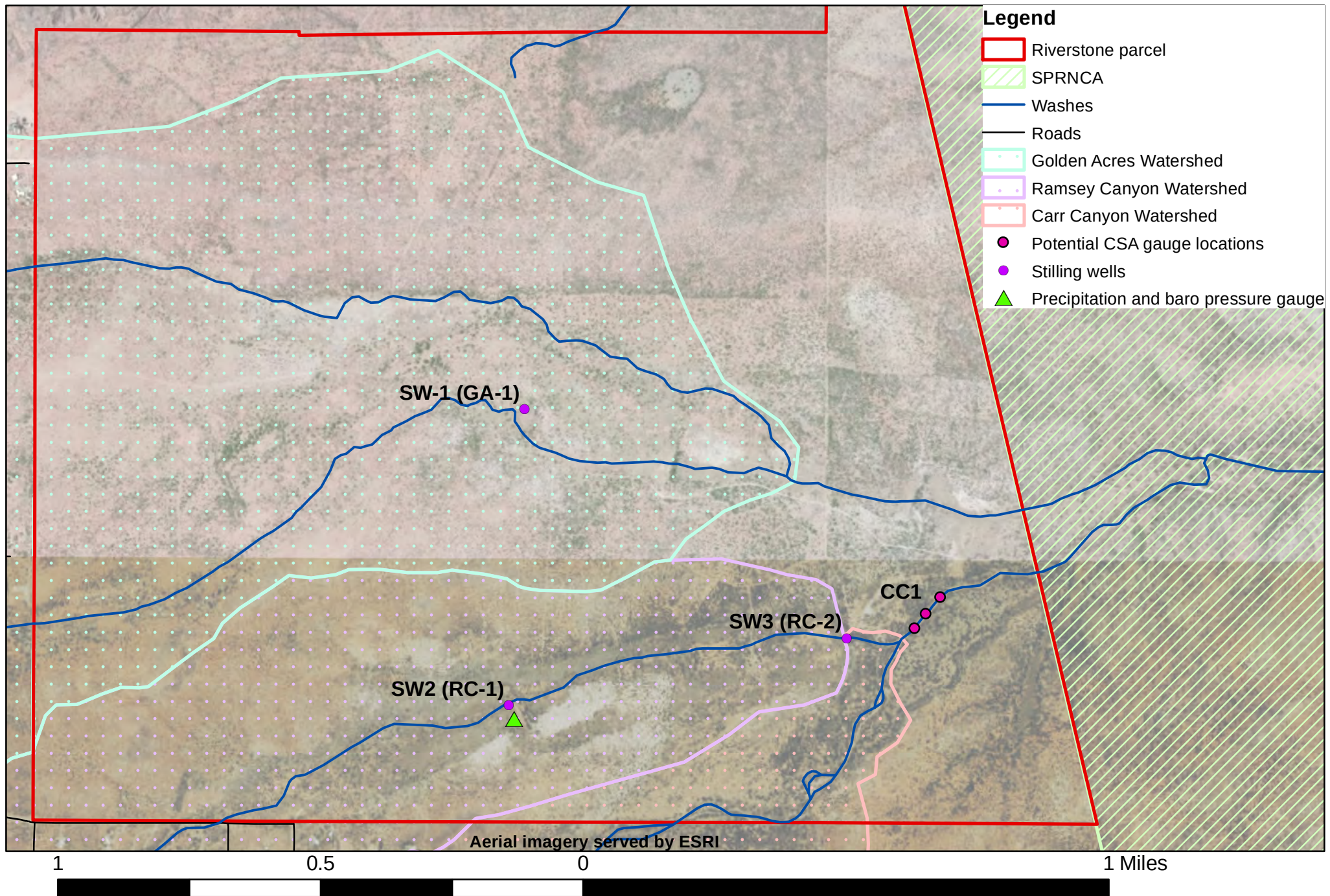


Figure 3. Proposed CSA and stilling well (retention basin) monitoring locations: Riverstone



2.0 PROPOSED TASKS

2.1 Task 1 - Project Management

Project management activities will include correspondence with Cochise County, project and field installation coordination, billing, and other administrative tasks. It will also include any necessary coordination of site use permission and access, and development of project specific health and safety and quality assurance plans.

2.2 Task 2 - Site Survey and Monitoring Equipment Installation

2.2.1 Task 2a - Purchase and Preparation of Monitoring Equipment

Monitoring equipment will be purchased and prepared immediately in order to expedite installation for streamflow monitoring during the 2015 monsoon season. Information on equipment type, use, and quantities is provided in Table 1. Holsters for CSA gauge installation will be constructed from three foot sections of 2" schedule 40 stainless steel pipe sealed with locked 2" aluminum well caps. Three 3/8" holes will be drilled in each pipe to allow inflow of water into the pressure transducer housing. A rain gauge will be purchased for precipitation monitoring at Bella Vista, and two barometric pressure transducers will be purchased for installation at Bella Vista and Palominas. Barometric pressure transducers allow for atmospheric pressure compensation of datasets generated from absolute pressure transducers.

Table 1. Proposed monitoring equipment for CSA streamflow monitoring.

Monitoring Equipment	Make/Model	Purpose	Quantity
Data Logging Pressure Transducer	In-Situ, Inc Rugged TROLL 100	CSA streamflow monitoring, culvert flow monitoring	26
Data Logging Barometric Pressure Transducer	In-Situ, Inc Rugged Baro Troll	Barometric pressure compensation	2
Rain Gauge	Onset Comp Corp, RG3	Precipitation monitoring	1
Flowtography Camera	Moultrie, Game Spy M-900Ai	Flowtography monitoring	1
Staff Gauge	Ben Meadows, Style A	Flowtography water depth	2

2.2.2 Task 2b - Survey of Monitored Channel Reaches

Selection of suitable channel reaches is of great importance for successful application of the CSA method. Prior to installation of CSA gauges, each of the proposed channel reaches will be visually assessed for straightness, uniformity, roughness, and accessibility. A Manning's n value will be assigned to each reach which describes the channel and bank roughness. Channel cross section elevations at each CSA gauge location (4) will be surveyed using real-

time kinematic satellite positioning. Information gathered during site surveys will be used to modify monitoring locations as needed, and to generate data necessary for input into the CSA2SAC computer model.

2.2.3 Task 2c – Installation of Monitoring Equipment

Installation of monitoring equipment will occur concurrently with Task 2b. CSA gauge housings will be installed in channel bottoms by driving the pipe approximately two feet below ground surface at an angle of 45 degrees. Concrete will be used as needed to secure the housings in place. Pressure transducers will be suspended immediately at ground surface inside the pipe using stainless steel wire fixed to locking well caps. They will be programmed to record water level when a pressure change of greater than 5 mm is detected (event-based logging), with sensor readings checked at one-minute intervals. Installation methods will be identical for the two stilling wells installed immediately upstream of culverts in Kings Ranch (Figure 2).

A barometric pressure transducer will be installed at the fenced Liberty Utilities facility at Kings Ranch Estates, where a rain gauge is currently installed (Figure 2). A barometric pressure transducer and rain gauge will be installed in an open area near the ranch at Bella Vista (Figure 1). Both will be mounted to a steel post approximately five feet above ground surface. The rain gauge will be set to record temperature data hourly, in addition to instantaneous tip times. Barometric pressure transducers will record data every 15 minutes. A flowtopography camera will be installed in the county parcel east of Miracle Valley, and mounted approximately 5 feet above ground surface on a steel post and set to record images every 30 minutes. Two 3.3 foot staff gauges will be installed 15 and 30 feet from the camera to allow for documentation of surface water depth.

2.3 Task 3 – Monitoring and Reporting

2.3.1 Task 3a – Quarterly Data Downloads

Data will be manually downloaded from all monitoring equipment at Riverstone, Bella Vista, and Palominas (Figure 1 through Figure 3) four times during the annual monitoring period. All pressure transducers, rain gauges, and the flowtopography station will be assessed for functionality, battery life, and sensor and clock drift. Data trends will be examined in the field to assure data quality, and any necessary adjustments will be made.

2.3.2 Task 3b – Equipment Maintenance

Large flow events have the potential to scour channel bottoms and may necessitate adjustments to sensor installation locations and depths, as well as re-survey of channel cross

sections and characteristics (roughness, uniformity, etc). One additional site visit is budgeted to allow for such maintenance, as changes may not be evident until data has been processed and analyzed.

2.3.3 Task 3c – Data Processing and Analysis

Data from the July 2015 – 2016 monitoring period at all CSA gauge locations will be analyzed following methods provided in Smith et al (2010). 2014 monsoon season data from the two CSA gauges installed in Carr Canyon Wash (Riverstone) will be analyzed following methods provided in Norman et al (2015). Vandalism of one of the three CSA gauges installed meant that data from only two CSA gauges are available for analysis, which necessitates a different approach to CSA monitoring. A third CSA gauge was re-installed at the site on November 19, 2014. Data for individual runoff events will be pre-processed and formatted as necessary for input into the CSA2SAC program developed by the USGS AZ Water Science Center (provided by Steven Wiele). Output files provide instantaneous stream discharge estimates which will be used to develop complete event hydrographs of discharge.

2.3.4 Task 3d – Data Quality Assurance/ Quality Control

Data will be reviewed internally by a GSA staff member to assure accuracy of data entry, processing, and analysis. JEF's hydrologic engineer will also review all input parameters, results, and findings for accuracy. Any errors encountered will be remedied and documented in detail.

2.3.5 Task 3e – Reporting

Following analysis of monitoring data, an annual report will be generated which summarizes project findings. The following metrics will be calculated for each of the CSA monitoring locations:

- Complete event hydrographs of discharge
- Total annual and individual event flow volumes (acre-feet, m3)
- Peak channel discharge (cfs)
- Event flow durations (hours)

At culvert stilling well locations (Palominas), culvert rating tables will be generated which provide stage-discharge relationships to estimate flow volumes. Data from the flowtopography station will be summarized to provide estimates water depth and extent during flow events. At Riverstone stilling wells, discharge and outflow volume will be provided for the outfall structure in Ramsey Canyon, and storage volumes will be estimated for detention basin areas.

A draft annual report will be submitted to the project team at the end of the one year monitoring period. A final annual report will be submitted within one month of receipt of comments from the project team. All project activities will be clearly documented, including data interpretation and analysis. All associated data will be provided in electronic format, as an appendix to the final report.

3.0 PROPOSED BUDGET AND SCHEDULE

An estimated summary budget is provided in Table 2. Table 3 presents a detailed estimated task-by-task budget.

A proposed schedule is to complete Task 2 by July 3, 2015, to prevent loss of streamflow data during summer rains. Manual data downloads (Task 3a) will occur at the end of July 2015, October 2015, February 2016, and June 2016. Data analysis and QA/QC (Tasks 3c and 3d) will begin following the preliminary download in July 2015, and will continue following each of the subsequent site visits. A draft annual report (Task 3e) will be submitted at the end of the first year monitoring period. A final report will be submitted within one month of receipt of comments from the project team.

4.0 REFERENCES

Fulford 1994. User's Guide to SAC, a Computer Program for Computing Discharge by Slope-Area Method, United States Geological Survey OFR 94-360. SAC Software and Supporting Documentation at <http://water.usgs.gov/software/SAC/>.

GSA 2014. Riverstone Stilling Well Installation Memo. Prepared for the Nature Conservancy, August 5, 2014.

Norman et al, 2015. Hydrologic Response of Streams Restored with Check Dams in the Chiricahua Mountains, Arizona. River Research and Applications, DOI: 10.1002/rra.2895.

Smith et al 2010. The Continuous Slope-Area Method for Computing Event Hydrographs. U.S. Department of the Interior, U.S. Geological Survey. Scientific Investigations Report 2010-5241.

Stewart et al, 2012. Use of the continuous slope-area method to estimate runoff in a network of ephemeral channels, southeast Arizona, USA. Journal of Hydrology 472-473, 148-158.

San Pedro CSA Monitoring
Table 2 - Cost Summary by Task

	Total Costs
1 - Project Management	\$2,942.00
2 - Site Survey and Monitoring Equipment Installation	\$22,821.82
3 - Monitoring and Reporting	\$36,949.80
Proposal Grand Total	\$62,713.62

San Pedro CSA Monitoring
Table 3 - Detailed Costs

Task: 1 - Project Management

		Quantity	Unit Cost	Shipping	Total Cost
Personnel Costs					
<i>Subtask: 1a - Project Coordination and Management</i>					
Program Director	Milczarek	8	\$145	NA	1160
Staff Hydrologist	Bunting	16	\$85	NA	1360
Clerical Staff	Torres	4	\$65	NA	260
<i>Subtask Total:</i>					<i>\$2,780</i>
Other Direct Costs					
<i>Subtask: 1a - Project Coordination and Management</i>					
Miscellaneous		2	\$50	NA	100
Communications		1	\$50	NA	50
<i>Subtask Total:</i>					<i>\$162</i>
8.00% Overhead: \$12.00			Task Total	\$2,942	

San Pedro CSA Monitoring Table 3 - Detailed Costs

Task: 2 - Site Survey and Monitoring Equipment Installation

	Quantity	Unit Cost	Shipping	Total Cost
Personnel Costs				
<i>Subtask: 2a - Purchase and Prepare Monitoring Equipment</i>				
Program Director Milczarek	0.5	\$145	NA	72.5
Staff Hydrologist Bunting	4	\$85	NA	340
Technician Harris	8	\$65	NA	520
			<i>Subtask Total:</i>	<i>\$933</i>
<i>Subtask: 2b - Survey Monitored Channel Reaches</i>				
Program Director Milczarek	0.5	\$145	NA	72.5
Hydrologic Engineer Miller	12	\$105	NA	1260
Staff Hydrologist Bunting	8	\$85	NA	680
			<i>Subtask Total:</i>	<i>\$2,013</i>
<i>Subtask: 2c - Install Monitoring Equipment</i>				
Program Director Milczarek	0.5	\$145	NA	72.5
Staff Hydrologist Bunting	24	\$85	NA	2040
Technician Harris	24	\$65	NA	1560
			<i>Subtask Total:</i>	<i>\$3,673</i>
Other Direct Costs				
<i>Subtask: 2a - Purchase and Prepare Monitoring Equipment</i>				
Hobo Rain Gauge	1	\$420	NA	420
In-Situ Rugged Baro Troll	2	\$380	NA	760
In-Situ Rugged Troll 100	26	\$380	NA	9880
Flowtopography Locked Enclosure	1	\$200	NA	200
Flowtopography Camera	1	\$150	NA	150
Stainless Steel Pipe	9	\$100	NA	900
Shipping	1	\$50	NA	50
Miscellaneous Items	3	\$50	NA	150
2" locking well cap	26	\$20	NA	520
Padlock	26	\$10	NA	260
			<i>Subtask Total:</i>	<i>\$14,353</i>
<i>Subtask: 2b - Survey Monitored Channel Reaches</i>				
RTK GPS Rental	2	\$400	NA	800
Miscellaneous Items	3	\$50	NA	150
Subsistence	2	\$46	NA	92
4WD Truck	200	\$1	NA	130
			<i>Subtask Total:</i>	<i>\$1,266</i>
<i>Subtask: 2c - Install Monitoring Equipment</i>				
Lodging	2	\$85	NA	170

San Pedro CSA Monitoring
Table 3 - Detailed Costs

Miscellaneous Items	3	\$50	NA	150
Subsistence	2	\$46	NA	92
4WD Truck	200	\$1	NA	130
Subtask Total:				\$585
8.00% Overhead: \$1200.32				Task Total
				\$22,822

San Pedro CSA Monitoring

Table 3 - Detailed Costs

Task: 3 - Monitoring and Reporting

			Quantity	Unit Cost	Shipping	Total Cost
Personnel Costs						
<i>Subtask: 3a - Quarterly Data Downloads</i>						
	Program Director	Milczarek	2	\$145	NA	290
	Staff Hydrologist	Bunting	48	\$85	NA	4080
					<i>Subtask Total:</i>	<i>\$4,370</i>
<i>Subtask: 3b - Equipment Maintenance</i>						
	Program Director	Milczarek	1	\$145	NA	145
	Staff Hydrologist	Bunting	12	\$85	NA	1020
					<i>Subtask Total:</i>	<i>\$1,165</i>
<i>Subtask: 3c - Data Processing and Analysis</i>						
	Program Director	Milczarek	4	\$145	NA	580
	Hydrologic Engineer	Miller	72	\$105	NA	7560
	Staff Hydrologist	Bunting	120	\$85	NA	10200
					<i>Subtask Total:</i>	<i>\$18,340</i>
<i>Subtask: 3d - Data QA/QC</i>						
	Hydrologic Engineer	Miller	16	\$105	NA	1680
	Staff Hydrologist	Bunting	4	\$85	NA	340
	Hydrologist 1	Calabrese	8	\$75	NA	600
					<i>Subtask Total:</i>	<i>\$2,620</i>
<i>Subtask: 3e - Reporting</i>						
	Program Director	Milczarek	4	\$145	NA	580
	Hydrologic Engineer	Miller	12	\$105	NA	1260
	Staff Hydrologist	Bunting	64	\$85	NA	5440
	AutoCAD/GIS	Buchanan	8	\$85	NA	680
					<i>Subtask Total:</i>	<i>\$7,960</i>
Other Direct Costs						
<i>Subtask: 3a - Quarterly Data Downloads</i>						
	Communications		1	\$50	NA	50
	Miscellaneous		2	\$50	NA	100
	Subsistence		4	\$46	NA	184
	4WD Truck		1000	\$1	NA	650
					<i>Subtask Total:</i>	<i>\$1,063</i>
<i>Subtask: 3b - Equipment Maintenance</i>						
	Equipment Replacement		1	\$800	NA	800
	Miscellaneous Items		2	\$50	NA	100
	Communications		1	\$50	NA	50
	Subsistence		1	\$46	NA	46

San Pedro CSA Monitoring
Table 3 - Detailed Costs

4WD Truck	200	\$1	NA	130
Subtask Total:				\$1,216
Subtask: 3c - Data Processing and Analysis				
Communications	1	\$50	NA	50
Subtask Total:				\$54
Subtask: 3e - Reporting				
Communications	1	\$50	NA	50
Reproduction	2	\$50	NA	100
Subtask Total:				\$162
8.00% Overhead: \$184.80				
Task Total				\$36,950
PROPOSAL GRAND TOTAL:				\$62,714

**DRAFT SCOPE OF WORK OUTLINE
RECHARGE FEASIBILITY STUDY
Dated December 8, 2015**

Introduction

Through hydrological, geological, hydrogeological, and geotechnical investigation the feasibility of an urban enhanced runoff recharge facility on locations identified in the Phase 1 Site Investigation on Coyote Wash (Bella Vista) will be assessed. Additionally, a potential site on the east side of the San Pedro River will be analyzed for feasibility as a recharge project. Both projects are aimed at increasing baseflows in the San Pedro River to the maximum extent possible.

Project deliverables will include identified locations for potential recharge, based on the analyses and field work. Design tasks are not part of this scope of work; the following paragraphs discussing potential design focus areas are intended to guide this scope of work and development of future phases and budgets. If recharge proves to be feasible, budgeting for future phases will include 100% design and bid package deliverables.

Summary of Approach

The approach to recharge feasibility study will include decision points following each primary field task that may affect the type and/or extent of subsequent investigations due to the different recharge options being evaluated and their dependence on site-specific conditions. The goal is to maintain flexibility in the approach to ensure a cost-effective program for obtaining sufficient and critical data to evaluate feasibility of potential recharge methods to meet the project's recharge goals, while acknowledging that significant departure from scope could have substantial effects on cost and schedule.

Scope of Work Outline

The tasks listed below are the proposed elements to this draft scope of work. Exact tasks and deliverables achievable with available budget will be determined at time of SOW finalization.

Task 1: Project Management

A Consultant shall:

- Identify a project manager responsible for managing the budget, schedule, and deliverables throughout the project, including the management of budget, schedule, and deliverables of any Sub consultants, as well as report directly to the County's project manager;
- Identify all Sub consultants who will be involved in the project;
- Participate in and/or lead as appropriate all monthly conference calls/meetings;

- Suggest modification of project scope details, including phasing, critical path items and decision points, as the project progresses;
- Suggest modifications to clarify and prioritize recharge goals/approaches;
- Suggest additional milestones leading to ensure achievement of project goals; and
- Assign roles and communication system for Consultant and Sub-consultant project team members.

Task 2: Data Collection and Evaluation

Data collection and evaluation of existing documentation appropriate to the project and related to other aquifer recharge efforts, and build upon the 'living document' prepared during previous work on Riverstone and Bella Vista site investigations by adding documents and references to that bibliography as appropriate. The Contractor shall finalize the Bibliography with additional data and documentation appropriate to the project, and finalize the updated bibliography during the final task.

Task 3: Review Existing Preliminary Hydrologic Analyses for East side site

Task 4: Pipeline Preliminary Design and Cost Estimate for East side site

Task 5: Screening Site Investigation for Recharge Feasibility for East side site

Comprehensive preliminary site investigation (geologic, hydrogeologic, and geotechnical) regarding the feasibility of recharge on this site, including, but not necessarily limited to evaluating hydrogeologic, soil, and surface geology data to determine suitability for recharge.

Task 6: Conduct Near Surface Recharge Feasibility Study on East side site

A recharge feasibility study with subtasks that may include, but are not necessarily limited to:

- Conducting shallow subsurface geologic, hydrogeologic, and geotechnical site characterization to determine recharge feasibility and to help develop options to maximize recharge effectiveness, including, but not necessarily limited to:
 - o Backhoe test pit/trenching investigations for lithologic characterization of sediments,
 - o Collecting geotechnical soil samples for determination of geotechnical parameters, and
 - o Infiltration testing for evaluation of infiltration rates pertaining to possible recharge methods, including but not necessarily limited to recharge basins, in-channel recharge, injection wells (vadose zone and/or saturated zone), and other emerging technologies;
- Developing estimates of "achievable" recharge volume (that the aquifer can accept) for possible recharge methods;
- Proposed additional testing, including, but not necessarily limited to:

- o Number and selected locations for exploration of deeper subsurface site characterization
- o Appropriate drilling method at selected locations for characterization of upper 50 to 100 feet of subsurface sediments, and
- o Appropriate testing methods (if necessary) such as down-borehole permeability tests to evaluate subsurface hydraulic properties.

Task 7: Coordination Meeting to Present Initial Feasibility Study Results and Recommendations for Detailed Recharge Feasibility Study for Field Investigations at both East side site and Coyote Wash (Bella Vista)

The Consultant shall prepare a visual presentation summarizing the results of the Initial Feasibility Studies from both sites and develop recommendations for the Detailed Recharge Feasibility Study. Supporting groundwater modeling information will also be presented.

Task 8. Conduct Deeper Subsurface Recharge Feasibility Study

Based decisions resulting from Task 7, and subsequent decision of the Cochise Conservation and Recharge Network leadership team (the “Leadership Team”), the Contractor shall conduct deeper subsurface geologic, hydrogeological, and geotechnical site characterizations at locations identified in Task 7. Resulting data will include engineering soil descriptions, graphic logs, cross sections, and contoured geophysical survey results.

Task 9. Install Shallow Monitor Wells

Install a minimum of three to a maximum of 5 shallow (exact depth to be determined) monitoring wells at each property in a method and at locations agreed upon by the Leadership Team based upon previous study findings. Three monitoring wells are the minimum number capable of determining groundwater flow direction and gradient. Also, conduct aquifer pumping tests for determining transmissivity of the alluvial or shallow regional aquifer (depending on aquifer that is present below the site).

Task 10. Coordination Meeting to Present Deeper Subsurface Feasibility Study Results and Recommendations for Additional Field Investigations/Tasks

A visual presentation summarizing the results of the Detailed Feasibility Study and recommendations for the additional field investigations if necessary.

Task 11. Perform additional tasks. Cost to be negotiated if required.

The Contractor shall perform additional tasks as determined in Task 10 if needed to refine recharge methods and locations.

Task 12. Preparation of Draft and Final Conceptual Recharge Facility Technical Memorandum

A draft and final Technical Memoranda that summarizes and analyzes recharge feasibility results. Conceptual designs (10% level designs, maximum 2 locations/facilities) shown on letter-size sheets will also be developed, including engineering calculations on facility sizing and resulting impacts to flood flow/low-flow conditions and elevations. The results from any associated groundwater modeling efforts will also be included. The Project Team will present its recommendations to the Leadership Team for conceptual design review and approval. This report shall recommend recharge facilities for both Coyote Wash (Bella Vista) and the East side site, including recharge method(s), locations, and source water quantities according to the conceptual designs of potential future facilities. The Consultant shall also review the Revised Regulatory Review Report (Mulhern, 2014) and identify the state, federal and local requirements for the conceptual designs.

Schedule

The Contractor shall work closely with the County's project manager to develop a schedule for review and approval by the Project Team within 10 days of contract award.