

## **Exhibit A Statement of Work**

**WATER ACTIVITY NAME** - A Multi-Media Program for Reporting Crop and Turf Water Use Estimates from the Colorado Agricultural Meteorological Network (CoAgMet)

**GRANT RECIPIENT** – Arkansas Groundwater Users’ Association

**FUNDING SOURCE** – Arkansas Basin Roundtable (20%) and Statewide (80%) Water Supply Reserve Account

### **INTRODUCTION AND BACKGROUND**

A multi-media approach (3-yrs) in order to expand access to the crop water use reports provided by CoAgMet. Feedback from CoAgMet users indicates that CoAgMet is appealing and helpful, but not used to full advantage due to two primary obstacles: 1) field schedules do not afford irrigators consistent time to access the online site, and; 2) some irrigators are not regular online computer users. An expanded multi-media approach will work to overcome these obstacles by using print media (e.g., local newspapers) and cellular telephone text-messaging for interested subscribers.

### **OBJECTIVES**

1. The program will mimic a successful CoAgMet outreach program in the San Luis Valley, by coordinating with newspapers and radio stations to disseminate weekly ET reports for local crops and weather conditions.
2. The other project component will develop a telemetric system for distributing daily (or weekly) ET reports through cellular telephone text-messaging.

### **TASK 1 – Distribution of crop and turf water use reports to newspapers and print media outlets .**

*Description of Task.* Currently, CoAgMet users can only access the network through the Internet website. A major focus of this project is to expanded use of the CoAgMet data. Many newspapers in the Arkansas Basin print public service announcements and upcoming events for the benefit of their readers. These news outlets will be interested providing CoAgMet data to their readers, some of whom will be irrigators or landowners who wish to conserve water through irrigation scheduling. These news outlets include, but are not limited to the *Rocky Ford Daily Gazette, Lamar Ledger, Ordway New Era, Trinidad Times, The Plainsman Herald, Canon City Daily Record, The Mountain Mail, Chaffee Times, Salida Citizen, The Chieftain (Pueblo), La Junta Tribune, Bent County Times, Fowler Tribune, and Ag Journal*. The list could include as many as 13 newspapers. A similar program was conducted in the Arkansas Valley years ago.

*Method/Procedure.* Over a 3-year period, AGUA staff will generate weekly ET reports during the growing season, based on the preferences of local irrigators and landowners. The reports will utilize ET rate estimates from the nearest CoAgMet station in the vicinity of the participating news outlet. Example reports are provided in Table 2.1, 2.2 and 2.3 (following page) for the Rocky Ford, Lamar, and Hoehne irrigated regions, respectively. The staff will send the reports to participating newspapers for weekly printing.

*Deliverable.* The primary output will be improved access to daily agricultural water use data for key crops irrigated in the Arkansas Basin. To the extent that irrigators use the reports, the primary outcome will be the water savings achieved through irrigation scheduling.

**Table 2.1.** 7-Day Crop and Turf ET Report for April 26, 2010 (Rocky Ford, CO)**Station:**CSU Expt Stn Rocky Ford**Location:**2.5 mi SE Rocky Ford**Elevation:**4180**Longitude:**103.695**Latitude:**38.0385*Crop Evapotranspiration in Inches*

Date	Alfalfa	Corn	Drybeans	Smallgrn	Sgrbeets	Potatoes	Onion/sd	WntrWheat	Turf	RefET	Precip
04/26/2010	0.06	0.03		0.13	0.04		0.07	0.17	0.09	0.17	0.15
04/27/2010	0.08	0.05		0.18	0.05		0.10	0.23	0.13	0.23	0.00
04/28/2010	0.14	0.07		0.30	0.08		0.16	0.35	0.20	0.35	0.00
04/29/2010	0.13	0.06		0.28	0.08		0.14	0.31	0.18	0.31	0.00
04/30/2010	0.11	0.05		0.22	0.06		0.11	0.24	0.14	0.24	0.00
05/01/2010	0.10	0.04		0.19	0.05		0.10	0.21	0.12	0.21	0.00
05/02/2010	0.10	0.04		0.18	0.05		0.09	0.19	0.11	0.19	0.00
<b>Sum</b>	0.72	0.34	0.00	1.48	0.41	0.00	0.78	1.71	0.97	1.71	0.15
<b>Average</b>	0.10	0.05	0.00	0.21	0.06	0.00	0.11	0.24	0.14	0.24	0.02

**Table 2.2.** 7-Day Crop and Turf ET Report for April 26, 2010 (Lamar, CO)**Station:**Lamar #4**Location:**4.5 mi NNE Lamar**Elevation:**3705**Longitude:**102.599**Latitude:**38.1539*Crop Evapotranspiration in Inches*

Date	Alfalfa	Corn	Drybeans	Smallgrn	Sgrbeets	Potatoes	Onion/sd	WntrWheat	Turf	RefET	Precip
04/26/2010	0.08	0.04		0.16	0.05		0.10	0.22	0.12	0.22	0.17
04/27/2010	0.08	0.04		0.17	0.05		0.10	0.22	0.12	0.22	0.00
04/28/2010	0.08	0.04		0.18	0.05		0.10	0.22	0.13	0.22	0.09
04/29/2010	0.10	0.05		0.20	0.06		0.11	0.24	0.14	0.24	0.00
04/30/2010	0.10	0.05		0.20	0.06		0.11	0.24	0.14	0.24	0.00
05/01/2010	0.09	0.04		0.17	0.05		0.09	0.20	0.11	0.20	0.00
05/02/2010	0.08	0.03		0.15	0.04		0.08	0.17	0.10	0.17	0.00
<b>Sum</b>	0.60	0.30	0.00	1.23	0.35	0.00	0.68	1.51	0.86	1.51	0.26
<b>Average</b>	0.09	0.04	0.00	0.18	0.05	0.00	0.10	0.22	0.12	0.22	0.04

**Table 2.3.** 7-Day Crop and Turf ET Report for April 26, 2010 (Hoehne, CO)**Station:**Hoehne**Location:**NE Trinidad**Elevation:**5625**Longitude:**104.313**Latitude:**37.2893*Crop Evapotranspiration in Inches*

Date	Alfalfa	Corn	Drybeans	Smallgrn	Sgrbeets	Potatoes	Onion/sd	WntrWheat	Turf	RefET	Precip
04/26/2010	0.05	0.03		0.11	0.03		0.06	0.14	0.08	0.14	0.11
04/27/2010	0.09	0.05		0.19	0.06		0.11	0.24	0.13	0.24	0.00
04/28/2010	0.13	0.07		0.29	0.08		0.16	0.35	0.20	0.35	0.00
04/29/2010	0.16	0.08		0.33	0.09		0.17	0.38	0.22	0.38	0.00
04/30/2010	0.10	0.04		0.20	0.05		0.10	0.22	0.13	0.22	0.00
05/01/2010	0.09	0.04		0.17	0.05		0.09	0.19	0.11	0.19	0.00
05/02/2010	0.08	0.03		0.14	0.04		0.07	0.16	0.09	0.16	0.00
<b>Sum</b>	0.70	0.34	0.00	1.42	0.40	0.00	0.76	1.68	0.95	1.68	0.11
<b>Average</b>	0.10	0.05	0.00	0.20	0.06	0.00	0.11	0.24	0.14	0.24	0.02

## **TASK 2 – Distribution of crop and turf water use reports to radio stations .**

*Description of Task.* Radio stations throughout the Arkansas Basin broadcast public service announcements and upcoming events for the benefit of their listeners. These radio stations will be interested providing CoAgMet data to their listeners, some of whom will be irrigators or landowners who wish to conserve water through irrigation scheduling. These news outlets include, but are not limited to KLMR (Lamar), KVAY (Lamar), KRLN (Canon City), KBLJ/KTHN (La Junta), and KSPK (Walsenburg). This list could include as many as 5 radio stations.

*Method/Procedure.* Over a 2-year period, AGUA staff will generate weekly ET reports, based on the preferences of local irrigators and landowners. The reports will utilize ET rate estimates from the nearest CoAgMet station in the vicinity of the participating radio station. The generated reports will be read and digitized as a sound recording, then sent to participating radio stations for daily (or weekly broadcast). Should the station choose to broadcast the information themselves, an ET report will be generated and sent to them, in a fashion similar to that used for the print media outlet.

*Deliverable.* The primary output will be improved access to daily agricultural water use data for key crops irrigated in the Arkansas Basin. To the extent that irrigators utilize the information provided in the reports, the primary outcome will be the water savings achieved through irrigation scheduling.

## **TASK 3 – Development of coding and programming for pilot telemetric subscription service (\$24,000).**

*Description of Task.* A customary form of communication popularized by cellular telephone services is “text messaging.” A text allows the cell phone user to receive a single message not exceeding 160 characters. A system will be developed through CSU (via sub-award agreement) by contracting the CoAgMet programmer (Mr. John Kleist) to write the necessary coding for a pilot subscription service. A beta-version of the service, CoAgMet-PRO (Personal Records Outreach) will be tested by participating producers. An example text message that would appear on the participant’s phone is shown below for ET and Precipitation during a 7-day period for the week of April 26, 2010 in Rocky Ford, CO:

```
04/26 A 0.06 C 0.03 P 0.15
04/27 A 0.08 C 0.05 P 0.00
04/28 A 0.14 C 0.07 P 0.00
04/29 A 0.13 C 0.06 P 0.00
04/30 A 0.11 C 0.05 P 0.00
05/01 A 0.10 C 0.04 P 0.00
05/02 A 0.10 C 0.04 P 0.00
7DSUM A 0.72 C 0.34 P 0.15
```

Where A = Alfalfa, C = Corn, and P = Precipitation

The above text message is longer than 160 characters, so some modifications may be necessary for participants to receive single messages. *The system is currently established for daily reports, which are much shorter. To simplify, a modification may require those choosing weekly reports to get only the summation of the 7-day period.* Other modifications would include removal of spaces, symbols, and unnecessary punctuation, or perhaps only texting the summation quantity (i.e., 7-day summary, abbreviated “7DSUM”) instead of each daily ET rate. A standardized messaging system will be developed in cooperation with pilot partner-irrigators.

*Method/Procedure.* The CoAgMet text/email service will consist of two parts. The first part will require a Web page developed to handle user authentication and user preferences. The user will be able to select which crops to monitor, specify the period over which to summarize and specify the frequency of text/email should be sent. For example: “Send a 7 day summary for corn and small grains every 3 days.” The second part is the delivery routine that will run periodically and send the summaries. The delivery will use the same hypertext preprocessor (php) code that is already part of CoAgMet's Web based crop ET reports. Four planning meetings are also scheduled for

this task, three of which will involve travel from Ft. Collins to Pueblo for Mr. Bauder (and perhaps the programmer, Mr. Kleist).

*Deliverable.* The primary output will be an automated data delivery approach for sending ET rates to participant cell phones, based on simple text messaging tools. Text messages will be customized based on the preferences of the receiver, who may select which crops and CoAgMet stations serve as the basis of the ET rates. This output will also serve as the underpinning for a statewide model of information transfer, coordinated with CoAgMet.

#### **TASK 4 – Deployment of telemetric subscription service to cooperators.**

*Description of Task.* Upon development of the text messaging system, pilot participants will be enlisted to utilize and troubleshoot the data delivery service.

*Method/Procedure.* A major element of this task will involve setting up user review groups in the various regions of the Arkansas Basin that will benefit from the service. Meetings will be conducted each year in the Upper and Lower Arkansas Basin areas (Salida, Trinidad, Rocky Ford, Lamar). During these workshops, producers will be introduced to the text messaging subscription service and instructed on how they can subscribe in order to receive ET reports according their preferences, which will be customized to the extent possible.

*Deliverable.* The primary output will be a standard presentation that will be available for the program in the event that a statewide application is recommended. As irrigators utilize the information provided by the text messaging service, the primary outcome will be the water savings achieved through irrigation scheduling.

#### **TASK 5 – Monitoring and assessment of program.**

*Description of Task.* A program evaluation will be necessary to systematically collect information about the activities, characteristics, and results of the program. The evaluation will enable judgments to be made about the program, improve or further develop program effectiveness, inform decisions about future program development, and increase understanding of our accomplishments.

*Method/Procedure.* The majority of the evaluation work will focus on the innovative use of text messaging in order to reduce water consumption. Surveys will be administered at the workshops listed in Task 4 and at a post program follow-up in order to assess long-term change due to program participation. Questions will include concepts such as attitudes toward water conservation (e.g., water survey questionnaire that measures attitudes, knowledge, and behavioral intention to save water; Watson et al., 1988) and self-efficacy of ET text reports (i.e., the irrigator's belief in their ability to use the text reports to conserve water).

*Deliverable.* The primary output will be a professional evaluation that will be utilized to allow the program to be developed for statewide application.

### **SCHEDULE**

Provide a project schedule including key milestones for each task and the completion dates or time period from the Notice to Proceed (NTP). This dating method allows flexibility in the event of potential delays from the procurement process. Sample schedules are provided below. Please note that these schedules are examples and will need to be adapted to fit each individual application.

**Table 10. Project Timeline for WSRA Project (Arkansas Basin)**

<b>Table 10. Project Timeline for WSRA Project (Arkansas Basin)</b>	<b>YEAR 1 (2013)</b>	<b>YEAR 2 (2014)</b>	<b>YEAR 3 (2015)</b>
<b>OBJECTIVES and TASKS</b>	JFMAMJJASOND	JFMAMJJASOND	JFMAMJJASOND
<b>Task 1. Print Media Outlet Distribution</b>			
Interview and hire student intern; begin on-the-job training	[X]		
Develop protocol for reporting system through CoAgMet (e.g., contacts with newspapers, etc.)	[X]		
Begin deploying weekly ET reports to participating newspaper outlets	[X]	[X]	[X]
<b>Task 2. Radio Media Distribution</b>			
Develop protocol for reporting system through CoAgMet (e.g., contacts with radio stations, etc.)	[X]		
Begin deploying weekly (or daily) ET reports to participating radio stations	[X]	[X]	[X]
	[X]		
<b>Task 3. Telemetric Subscription Service Development</b>			
Development of web page developed to handle user authentication and user preferences	[X]		
Development of delivery routine to run periodically and send the summaries		[X]	
Initial run of text-messaging delivery service			
Trouble-shooting and revision of text-messaging delivery service		[X]	
Full deployment of text-messaging delivery service to Arkansas Basin		[X]	[X]
Re-evaluation and modification of text-messaging delivery service, based on assessment phases		[X]	[X]
<b>Task 4. Telemetric Subscription Workshops</b>			
Initial planning meetings to prepare for first run of text-messaging service	[X]		
After-action review (AAR) meetings to receive feedback on first run of text-messaging service		[X]	
Mini-Workshop and Coordination Meeting (Upper Arkansas area serving Chaffee, Fremont, and Custer Counties)		[X]	
Mini-Workshop and Coordination Meeting (Lower Arkansas Valley area serving Pueblo, Otero, Crowley, Bent Counties)		[X]	
Mini-Workshop and Coordination Meeting (Ogallala Aquifer area serving Prowers and Baca Counties)		[X]	
Mini-Workshop and Coordination Meeting (Purgatoire River area serving Las Animas and Huerfano Counties)		[X]	
Full Workshop (Upper Arkansas area serving Chaffee, Fremont, and Custer Counties)		[X]	[X]
Full Workshop (Lower Arkansas Valley area serving Pueblo, Otero, Crowley, Bent Counties)		[X]	
Full Workshop (Ogallala Aquifer area serving Prowers and Baca Counties)		[X]	[X]
Full Workshop (Purgatoire River area serving Las Animas and Huerfano Counties)		[X]	
<b>Task 5. Evaluation and Assessment</b>			
Phase I: Program Design (Literature Search & Instrument Development)	[X]	[X]	[X]
Phase II: Program Implementation & Assessment	[X]	[X]	[X]
Phase III: Data Analysis & Reporting Statistics	[X]	[X]	[X]
Phase IV: Program Improvement, Interpretations & Recommendations	[X]	[X]	[X]

## **PAYMENT**

Payment will be made based on actual expenditures and invoicing by the applicant. Invoices from any other entity (i.e. subcontractors) cannot be processed by the State. The request for payment must include a description of the work accomplished by major task, and estimate of the percent completion for individual tasks and the entire water activity in relation to the percentage of budget spent, identification of any major issues and proposed or implemented corrective actions. The last 5 percent of the entire water activity budget will be withheld until final project/water activity documentation is completed. All products, data and information developed as a result of this grant must be provided to the CWCBC in hard copy and electronic format as part of the project documentation. This information will in turn be made widely available to Basin Roundtables and the general public and help promote the development of a common technical platform.

