

**Water Supply Reserve Fund  
Water Activity Summary Sheet  
Request for Change of Grantee  
March 11-12, 2020  
Agenda Item 23(y)**

**Current Grantee:** Colorado State University – Colorado Climate Center

**Proposed Grantee:** Colorado River Engineering (CRE)

**Water Activity Name:** Continuation of Lysimeters in North Park to Determine High Altitude Hay Meadow Crop Coefficients

**Water Activity Purpose:** Agricultural

**County:** Jackson

**Drainage Basin:** North Platte

**Water Source:** n/a

**Amount Requested:** \$44,000 North Platte Basin Account (A portion of remaining funds - \$50,468.51)

**Matching Funds:** See attached memo dated September 11-12, 2014

<b>Staff Recommendation:</b>
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Staff recommends approval of change of grantee from Colorado State University to Colorado River Engineering.
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**Water Activity Summary:** In order for the North Platte Basin to better quantify consumptive use in the basin, this project aims continue lysimeter measurements in the high altitude, hay meadow environment of North Park. Although lysimeters have been historically run in the basin, the data have been deemed questionable due to site exposure, infrequent watering and what appears to be a leak in one of the compensating lysimeters. This project will utilize the three existing weather stations to calculate American Society of Civil Engineers reference evapotranspiration ET. Two lysimeters have been installed side by side at the Cowdrey site for redundancy in case of failure. The lysimeters being collocated with the COW01 weather station allows for actual consumptive use from the meadow to be directly compared to Reference ET estimates calculated from the weather variables. These two measurements are then used to calculate crop coefficients for hay meadow environment. The lysimeters have been installed in an undisturbed soil column adjacent to the station. The two lysimeters and the hay meadow are equipped with soil moisture sensors in order to keep conditions in the lysimeters as close to field conditions as possible. The lysimeter platform includes a bi-directional pump that can add or remove water from the system to keep it in the same conditions as the field. Once data is collected for several seasons, a final report will be drafted which summarizes the work and reports on findings.

**Discussion:** The original grant was approved by CWCB during their September 11-12, 2014 meeting and expired December 31, 2019. This approval granted WSRF Funds to CSU to install and operate the lysimeters, and operate the CoAgMet station in North Park, however due to personnel changes at CSU they no longer have the expertise to operate the existing lysimeters, however Colorado River Engineering, hence the request for a change of grantee. While CRE will (with CWCB approval) assume responsibility for lysimeters operation, Colorado State University has applied for new WSRF Grant via the North Platte Basin Roundtable (see Agenda Item 22(x)).

**Issues/Additional Needs:** None

**CWCB Project Manager:** Craig Godbout

**Water Supply Reserve Account – Grant and Loan Program**  
**Water Activity Summary Sheet**  
**September 11-12, 2014**  
**Agenda Item 13(l)**

**Applicant:** Colorado Climate Center

**Program Sponsor:** Colorado State University

**Water Activity Name:** Re-establishment of Lysimeters in North Park to Determine High Altitude, Hay Meadow Crop Coefficients.

**Water Activity Purpose:** Agricultural Needs Assessment

**County:** Jackson

**River Basin:** North Platte

**Water Source:** North Platte

**Total Amount Requested:** \$194,102

**Source of Funds:** \$97,051 North Platte Basin Account; \$97,051 Statewide Account

**Matching Funds:** Basin Account Match (\$97,051) = 50% of total grant request  
Basin Account & Applicant Match (\$134,647) = 69% of total grant request  
Applicant Match (\$37,596) = 16% of total project costs (\$231,698)  
(refer to *Funding Summary/Matching Funds*)

<b>Staff Recommendation:</b>
Staff recommends approval of up to \$97,051 from the North Platte Basin Account; and \$97,051 from the Statewide Account to help complete the project titled: Re-establishment of Lysimeters in North Park to Determine High Altitude, Hay Meadow Crop Coefficients.

**Water Activity Summary:** The funding requested is to further study crop consumptive use to provide additional information for the North Platte Basin Needs Assessment as well as various educational opportunities focused on agricultural water use, weather and climate. The project aims to re-establish lysimeter measurements in the high altitude, hay meadow environment of North Park. Although lysimeters have been historically operated in the basin, the data collected has been deemed questionable due to site exposure, infrequent watering and possible equipment failures. The project will build upon 5 years of data from three existent weather stations by providing ongoing support for the weather stations and installing and running two new lysimeters. Once fully installed the system is almost completely automated, and will mimic operations in the hay meadows (irrigation and cutting) to get an actual crop consumptive use to be used to calculate crop coefficients. The project will provide quantitative assessments of irrigated hay meadow consumptive use and its relationship to local weather conditions. The bulk of project costs will be installation and operation of the lysimeters.

**Discussion:**

WSRA Grant funds of \$100,694 were expended from 2008 through 2014 to fund an earlier attempt to quantify crop consumptive use.

**Issues/Additional Needs:**

No additional issues or needs were identified.

**Threshold and Evaluation Criteria:**

The application meets all four Threshold Criteria.

**Tier 1-3 Evaluation Criteria:**

Tier 1: (a) The project is supported by the North Platte Basin Roundtable.

(b) The water activity has committed support from the Division of Water Resources Division 6 Office. The entities represented in the application include Colorado State University (CSU) and CoAgMet. The water activity is effective in addressing intrabasin or interbasin needs because the Yampa-White roundtable has a similar project to quantify consumptive use near Hayden. The combined results will cover a range of elevations in the two basins and could possibly be extended to other Colorado basins.

(c) This project will provide quantitative assessments of irrigated hay meadow consumptive use and its relationship to local weather conditions. This type of information is essential for the basin's on-going needs assessment and to better quantify consumptive water needs.

Tier 2: (d) This project will likely not be funded by any other entity but the Roundtable and Statewide funds. If this new lysimeter technology works as expected, other basins could benefit from this reach and perhaps invest in the technology.

(e) 16% of the total grant request has been contributed through the CSU's Unrecovered Indirect Costs.

Tier 3: (f) The project will help sustain agriculture in the basin by better understanding the crop water use requirements from irrigated hay meadows in North Park.

(g) This project has the potential to impact the interstate compact on the North Platte by quantifying actual crop consumptive use in the North Platte Basin. Once a better handle on crop consumptive use is understood, it may have an impact on the compact with Wyoming about the consumptive use of irrigated hay meadows in the Basin.

(h) n/a (not addressed)

(i) This project has a high cost/benefit for Colorado because lysimeter studies have been performed in the past, however methods and systems differ. The Rocky Ford

lysimeter that CSU installed was very expensive and requires a full-time staff person to operate and maintain, which is not feasible for many basins. If this smaller, lower cost system is proven to give reliable data, the state can benefit from this knowledge by using this system across Basins to quantify consumptive use. Additionally, if lysimeters cannot be funded in other Basins, relationships between the CoAgMet stations can be assessed and perhaps aid in transferring results based on the weather data and reported reference evapotranspiration.

(j) n/a

**Funding Overview/Matching Funds:**

	<u>Cash</u>	<u>In-kind</u>	<u>Total</u>
WSRA Statewide Basin Account	\$91,051	n/a	\$91,051
WSRA Arkansas Basin Account	\$91,051	n/a	\$91,051
CSU Cost-share	<u>\$37,596</u>	<u>\$0</u>	<u>\$37,596</u>
<b>Total Project Costs</b>	<b>\$231,698</b>	<b>\$0</b>	<b>\$231,698</b>

All products, data and information developed as a result of this grant must be provided to the CWCB 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 will help promote the development of a common technical platform. In accordance with the revised WSRA Criteria and Guidelines, staff would like to highlight additional reporting and final deliverable requirements. The specific requirements are provided below.

**Reporting and Final Deliverable:** The applicant shall provide the CWCB a progress report every 6 months, beginning from the date of the executed contract. The progress report shall describe the completion or partial completion of the tasks identified in the scope of work including a description of any major issues that have occurred and any corrective action taken to address these issues. At completion of the project, the applicant shall provide the CWCB a final report that summarizes the project and documents how the project was completed. This report may contain photographs, summaries of meetings and engineering reports/designs.

**Engineering:** All engineering work (as defined in the Engineers Practice Act (§12-25-102(10) C.R.S.)) performed under this grant shall be performed by or under the responsible charge of professional engineer licensed by the State of Colorado to practice Engineering.

Dear Craig,

The North Platte Basin Roundtable voted unanimously on January 21, 2020 to allow the fiscal agent change between, C.S.U. and Colorado River Engineering, for the North Park CoAgMet weather station WSRF Grant. This grant is in compliance with our BIP Goals to maintain and maximize the consumptive use of water permitted in the Equitable Apportionment Decree and the baseline depletion allowance of the Three State Agreement

Thank you,

Ty Wattenberg

RT Chair.



Colorado River Engineering  
P.O. Box 1301  
Rifle, CO 81650  
(970) 625-4933

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## Memorandum

To: Craig Godbout  
From: Wendy Ryan  
Date: 2/14/2020  
Subject: North Platte Lysimeter Change of Fiscal Agent  
Job #: 1133

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In order to continue the lysimeter project in the North Platte Basin, Colorado River Engineering (CRE) is willing to act as the fiscal agent. CRE works on a time and material basis and invoices are sent once per month.

If you need any additional information or have any questions, please do not hesitate to contact me at (970) 625-4933 ext. 116.



Last Update: January 9, 2018

<b><u>Colorado Water Conservation Board</u></b>	
<b>Water Supply Reserve Fund</b>	
<b><u>Exhibit A - Statement of Work</u></b>	
<b>Date:</b>	<b>November, 8, 2019</b>
<b>Water Activity Name:</b>	<b>Re-establishment of lysimeters in North Park to determine high altitude, hay meadow crop coefficients</b>
<b>Grant Recipient:</b>	<b>Colorado River Engineering</b>
<b>Funding Source:</b>	<b>North Platte Basin Roundtable WSRF</b>
<b>Water Activity Overview:</b> (Please provide brief description of the proposed water activity (no more than 200 words). Include a description of the overall water activity and specifically what the WSRF funding will be used for.)	
<p>In order for the North Platte Basin to better quantify consumptive use in the basin, this project aims to re-establish lysimeter measurements in the high altitude, hay meadow environment of North Park. Although lysimeters have been historically run in the basin, the data have been deemed questionable due to site exposure, infrequent watering and what appears to be a leak in one of the compensating lysimeters.</p> <p>This project will utilize the three existing weather stations to calculate ASCE (American Society of Civil Engineers) reference evapotranspiration (ET). Two lysimeters will be installed side by side at the Cowdrey site for redundancy in case of failure. The lysimeters being collocated with the COW01 weather station allows for actual consumptive use from the meadow to be directly compared to Reference ET estimates calculated from the weather variables. These two measurements are then used to calculate crop coefficients for hay meadow environment. The lysimeters are installed in an undisturbed soil column adjacent to the station. The two lysimeters and the hay meadow are equipped with soil moisture sensors in order to keep conditions in the lysimeters as close to field conditions as possible. The lysimeter platform includes a bi-directional pump that can add or remove water from the system to keep it in the same conditions as the field. Once data is collected for several seasons, a final report will be drafted which summarizes the work and reports on findings.</p>	
<b>Objectives:</b> (List the objectives of the project)	
<ol style="list-style-type: none"><li>1. Maintain automated lysimeter system</li><li>2. Prepare final report summarizing work and findings</li></ol>	





Last Update: January 9, 2018

Tasks
Provide a detailed description of each task using the following format:
<b><u>Task 1 – Install (complete) and maintain lysimeter system including data archival.</u></b>
Description of Task:  The lysimeter has already been installed. Now that the system is installed, data collection has been on-going. Data will be investigated to make sure equipment is working properly. Each winter, the system will be winterized prior to freezing. Each spring, the system will be brought online after the last freeze and before irrigation begins.
Method/Procedure:  The lysimeter system has been operated each growing season to calculate actual water use by the high-altitude hay meadow grasses. The system is started in the spring prior to irrigation water being applied. The lysimeter cans are watered with drip irrigation to ensure a full water supply is delivered.
Grantee Deliverable: (Describe the deliverable the grantee expects from this task)
Quantification of annual consumptive use and description of the season's operations.
CWCB Deliverable: (Describe the deliverable the grantee will provide CWCB documenting the completion of this task)
Datasets and calculated consumptive use.



Last Update: January 9, 2018

Tasks
Provide a detailed description of each task using the following format:
<b><u>Task 2 – Final report summarizing work and findings</u></b>
Description of Task: Prepare a report summarizing the annual data collection efforts, documented issues with the system and quantified consumptive use. Compare to weather station reference ET estimates.
Method/Procedure: Prepare written report.
Grantee Deliverable: (Describe the deliverable the grantee expects from this task) Report and datasets collected.
CWCB Deliverable: (Describe the deliverable the grantee will provide CWCB documenting the completion of this task) Final report.



Last Update: January 9, 2018

### Budget and Schedule

**Exhibit B - Budget and Schedule:** This Statement of Work shall be accompanied by a combined [Budget and Schedule](#) that reflects the Tasks identified in the Statement of Work and shall be submitted to CWCB in excel format. A separate excel formatted Budget is required for engineering costs to include rate and unit costs.

### Reporting Requirements

**Progress Reports:** The grantee shall provide the CWCB a progress report every 6 months, beginning from the date of issuance of a purchase order, or the execution of a contract. The progress report shall describe the status of the tasks identified in the statement of work, including a description of any major issues that have occurred and any corrective action taken to address these issues. The CWCB may withhold reimbursement until satisfactory progress reports have been submitted.

**Final Report:** At completion of the project, the grantee shall provide the CWCB a Final Report on the grantee's letterhead that:

- Summarizes the project and how the project was completed.
- Describes any obstacles encountered, and how these obstacles were overcome.
- Confirms that all matching commitments have been fulfilled.
- Includes photographs, summaries of meetings and engineering reports/designs.

### Payments

Payment will be made based on actual expenditures, must include invoices for all work completed and must be on grantee's letterhead. The request for payment must include a description of the work accomplished by task, an estimate of the percent completion for individual tasks and the entire Project in relation to the percentage of budget spent, identification of any major issues, and proposed or implemented corrective actions.

The CWCB will pay the last 10% of the entire water activity budget when the Final Report is completed to the satisfaction of CWCB staff. Once the Final Report has been accepted, and final payment has been issued, the water activity and purchase order or contract will be closed without any further payment. Any entity that fails to complete a satisfactory Final Report and submit to CWCB within 90 days of the expiration of a purchase order or contract may be denied consideration for future funding of any type from CWCB.

### Performance Requirements

Performance measures for this contract shall include the following:

(a) Performance standards and evaluation: Grantee will produce detailed deliverables for each task as specified. Grantee shall maintain receipts for all project expenses and documentation of the minimum in-kind contributions (if applicable) per the budget in Exhibit B. Per Grant Guidelines, the CWCB will pay out the last 10% of the budget when the final deliverable is completed to the satisfaction of CWCB staff. Once the final deliverable has been accepted, and final payment has been issued, the purchase order or grant will be closed without any further payment.

(b) Accountability: Per the Grant Guidelines full documentation of project progress must be submitted with each invoice for reimbursement. Grantee must confirm that all grant conditions have been complied with on each invoice. In addition, per the Grant Guidelines, Progress Reports must be submitted at least once every 6 months. A Final Report must be submitted and approved before final project payment.

(c) Monitoring Requirements: Grantee is responsible for ongoing monitoring of project progress per Exhibit A. Progress shall be detailed in each invoice and in each Progress Report, as detailed above. Additional inspections or field consultations will be arranged as may be necessary.

(d) Noncompliance Resolution: Payment will be withheld if grantee is not current on all grant conditions.



Last Update: January 9, 2018

### Reporting Requirements

Flagrant disregard for grant conditions will result in a stop work order and cancellation of the Grant Agreement.



### Water Supply Reserve Fund

## Date: November 8, 2019

Grantee Name: Colorado River Engineering

<b>Task No.</b> <sup>(1)</sup>	<b>Description</b>	<b>Start Date</b> <sup>(2)</sup>	<b>End Date</b>	<b>WSRF Funds (Basin &amp; Statewide combined)</b> <sup>(3)</sup>
1	Install (complete) and maintain lysimeter system including data archival	1/5/2015	12/31/2022	\$36,500
2	Final report summarizing work and findings	1/5/2015	12/31/2022	\$7,500
<b>Total</b>				<b>\$44,000</b>

(2) Start Date for funding under \$100K - 45 Days from Board Approval; Start Date for funding over \$100K - 90 Days from Board Approval.

**(3)** Round values up to the nearest hundred dollars.

- Additional documentation providing a Detailed/Itemized Budget may be required for contracting. Applicants are encouraged to coordinate with the CWCBC Project Manager to determine specifics.

- Reimbursement eligibility commences upon the grantee's receipt of a Notice to Proceed (NTP)
- NTP will not be accepted as a start date. Project activities may commence as soon as the grantee enters contract and receives formal signed State Agreement.

The CWCB will pay the last 10% of the entire water activity budget when the Final Report is completed to the satisfaction of the CWCB staff project manager. Once the Final Report has been accepted, the final payment has been issued, the water activity and purchase order (PO) or contract will be closed without any further payment. Any entity that fails to complete a satisfactory Final Report and submit to the CWCB with 90 days of the expiration of the PO or contract may be denied consideration for future funding of any type from the CWCB.

- Additionally, the applicant shall provide a progress report every 6 months, beginning from the date of contract execution
- Standard contracting procedures dictate that the Expiration Date of the contract shall be 5 years from the Effective Date.