THE COLORADO BASIN ROUNDTABLE
C/O P.O. BOX 1120
GLENWOOD SPRINGS, COLORADO
81602

February 9, 2012

Todd Doherty
COLORADO WATER CONSERVATION BOARD
1580 Logan Street, Suite 600
Denver, CO 80203

Dear Todd:

The Colorado Basin Roundtable voted at its February 6, 2012, meeting to approve two grant requests and to seek waivers from the 60-day rule so that these requests may come before the Colorado Water Conservation Board at its March meeting. The reason for the waiver requests relate to the need for field work to begin this summer.

Both grants were unanimously approved by the Roundtable. One, from Colorado State University and Denis Reich, concerns deficit irrigation and the study of how these practices affect alfalfa. This information is important in its own right but may do well to inform the search for consumptive water that may supply a future water bank on the West Slope.

The other grant is sought by the Blue River Watershed Group in Summit County to address Swan River restoration related to the cleanup of gold dredging rock piles that are left from the early part of the previous century. We see this as a good, collaborative start to addressing nonconsumptive needs.

Sincerely yours,

Jim Pokrandt
Chair, Colorado Basin Roundtable

Attachment: CFWE grant applications

COLORADO WATER CONSERVATION BOARD

WATER SUPPLY RESERVE ACCOUNT
GRANT APPLICATION FORM

Investigation of Water Savings, Water Quality benefits and Profitability of Sub Surface Drip on Alfalfa in Grand Valley

Name of Water Activity/Project **Approving Basin Roundtable**

$46,894		**Amount from Statewide Account**	
Total Amount of Funds Requested		**Amount from Basin Account**	$46,894

Application Content

Attachments

1. Reference Information
2. Insurance Requirements (Projects Over $25,000)
3. WSRA Standard Contract (Projects Over $100,000)
4. W-9 Form (Required for All Projects)

Instructions

To receive funding from the Water Supply Reserve Account (WSRA), a proposed water activity must be approved by the local Basin Roundtable AND the Colorado Water Conservation Board (CWCB). The process for Basin Roundtable consideration/approval is outlined in Attachment 1.

Once approved by the local Basin Roundtable, the applicant should submit this application, a detailed statement of work, detailed project budget, and project schedule to the CWCB staff by the application deadline.

The application deadlines are:

- Basin Account – 60 calendar days prior to the bi-monthly Board meeting
- Statewide Account – 60 calendar days prior to the September Board meeting

Board Meeting Dates	Basin Account Deadlines	Statewide Account Deadlines
July 20-21, 2010	May 21, 2010	n/a
September 21-22	July 23, 2010	July 23, 2010
November 16-17	September 17, 2010	n/a
January 2011	60 days prior	n/a
March 2011	60 days prior	n/a
May 2011	60 days prior	n/a
July 2011	60 days prior	n/a
September 2011	60 days prior	60 days prior

When completing this application, the applicant should refer to the WSRA Criteria and Guidelines available at: http://cwcb.state.co.us/IWMD.

The application, statement of work, budget, and schedule must be submitted in electronic format (Microsoft Word or text-enabled PDF are preferred) and can be emailed or mailed on a disk to:

Mr. Todd Doherty
Colorado Water Conservation Board
Water Supply Planning Section
WSRA Application
1580 Logan Street, Suite 200
Denver, CO 80203
Todd.Doherty@state.co.us

If you have questions or need additional assistance, please contact Todd Doherty of the Water Supply Planning Section at 303-866-3441 x3210 or todd.doherty@state.co.us.

Water Supply Reserve Account – Grant Application Form
Form Revised March 2009

Part A. - Description of the Applicant (Project Sponsor or Owner);

1. Applicant Name(s): Colorado State University: Colorado Water Institute; Colorado State University Extension; Colorado Climate Center

Mailing address: Colorado State University Extension
Western Region Office
2764 Compass Drive / Suite 232
Grand Junction, CO 81506

Taxpayer ID#: 846000545

Email address: Denis.Reich@Colostate.edu

Phone Numbers: Business: 970-242-8683

Cell: 970-201-8467

Fax: 970-241-3643

2. Person to contact regarding this application if different from above:

Name: Denis Reich

Position/Title: Water Resources Specialist

3. Eligible entities that may apply for grants from the WSRA include the following. What type of entity is the Applicant?

[X] Public (Government) – municipalities, enterprises, counties, and State of Colorado agencies. Federal agencies are encouraged to work with local entities and the local entity should be the grant recipient. Federal agencies are eligible, but only if they can make a compelling case for why a local partner cannot be the grant recipient.

4. Provide a brief description of your organization

The **Colorado Water Institute** (CWI), an affiliate of Colorado State University, exists for the express purpose of focusing the water expertise of higher education on the evolving water concerns and problems being faced by Colorado citizens.

The Colorado Water Institute (CWI) is authorized and funded by Congress and the Colorado Legislature. CWI is accountable to Congress via its annual appropriation, a required annual report, and a thorough congressionally mandated peer review conducted every five years under the auspices of the U.S. Geological Survey. Copies of CWI's Federal and State authorizing legislation are attached to the Annual Report PDF. CWI is operated, by law, as a state-wide water research institute, obligated to connect all water expertise in Colorado's higher education system with research and education needs of Colorado's water managers and users.

CSU Agricultural Experiment Station combines the research and outreach arms of Colorado State University to help sustain the state's natural resources and improve the food and fuel production from rural areas to the benefit of all Coloradans. Colorado agriculture is as varied as the state's climate and geography. The agricultural sector has developed in response to the different environments throughout the state. The irrigated and dryland farms, orchards, ranches and feedlots of Colorado produce a diverse array of crops and livestock. These enterprises require expertise in many scientific areas to enhance profitability and protect the environment. Basic and applied research performed on Colorado Agricultural Experiment stations addresses the economic viability, environmental sustainability, and social acceptability of activities impacting agriculture, natural resources, in addition to food and fuel consumers in Colorado.

The passage of the Hatch Act in 1887 provided research at these institutions by authorizing a state agricultural experiment station for each state to support each land grant institution's educational mission. State agricultural experiment stations are located in every state and territory, covering all the ecological, environmental and socioeconomic regions of the nation.

The Colorado Agricultural Experiment Station, an integral part of Colorado State University, was established in 1888 as a result of the Colorado General Assembly's having ratified during the preceding year the provisions of the Hatch Act. State and federal funds support the research program of the CAES.

The Fruita Research Center, like all CSU Research Farms has its own irrigation shares that allow for irrigation to be managed like all agricultural operations in the region.

Colorado State University is a Public Institution of Higher Education and an 1862 land grant university.

5. If the Contracting Entity is different then the Applicant (Project Sponsor or Owner) please describe the

Contracting Entity here.

CSU Office of Sponsored Programs
Attn: Marilyn Morrissey, Senior Research Administrator
2002 Campus Delivery, Fort Collins, CO 80523-2002
Phone: (970) 491-2375
Fax: (970) 491-6147
Email: Marilyn.Morrissey@Colostate.edu

The person authorized to sign an agreement is Douglas Leavell, Director, Office of Sponsored Programs. Funds will be administered through the CSU financial system, in accordance with federal regulations.

6. Successful applicants will have to execute a contract with the CWCB prior to beginning work on the portion of the project funded by the WSRA grant. In order to expedite the contracting process the CWCB has established a standard contract with provisions the applicant must adhere to. A copy of this standard contract is included in Attachment 3. Please review this contract and check the appropriate box.

[X] The Applicant will be able to contract with the CWCB using the Standard Contract

[ ] The Applicant has reviewed the standard contract and has some questions/issues/concerns. Please be aware that any deviation from the standard contract could result in a significant delay between grant approval and the funds being available.

7. The Tax Payer Bill of Rights (TABOR) may limit the amount of grant money an entity can receive. Please describe any relevant TABOR issues that may affect the applicant.

Part B. - Description of the Water Activity

1. Name of the Water Activity/Project:
Investigation of Water Savings, Water Quality benefits and Profitability of Sub Surface Drip on Alfalfa in Grand Valley

2. What is the purpose of this grant application? (Please check all that apply.)

[ ] Environmental compliance and feasibility study

[ ] Technical Assistance regarding permitting, feasibility studies, and environmental compliance

[X] Studies or analysis of structural, nonstructural, consumptive, nonconsumptive water needs, projects

Study or Analysis of:

- [ ] Structural project or activity
- [ ] Nonstructural project or activity
- [X] Consumptive project or activity
- [ ] Nonconsumptive project or activity

[ ] Structural and/ or nonstructural water project or activity

3. Please provide an overview/summary of the proposed water activity (no more than one page). Include a description of the overall water activity and specifically what the WSRA funding will be used for.

Description: The study is a side-by-side comparison of furrow and sub-surface drip irrigation (SDI) on alfalfa over two years starting in 2012. The study will be performed on about 3 acres under the supervision of the Colorado Water Institute and Agricultural Experiment Station staff at the Fruita Research Center in the Grand Valley of Western Colorado.

The funding for this study will work collaboratively with a $8,841 request to the Alternatives Agricultural Water Transfer Methods program in addition to CSU match of $7,782 and a cash match of $1,000 from the Colorado River District. Additionally, match in the form of salary is provided by Colorado State University specifically for this project. The Agricultural Transfers request will fund a comparison of SDI to furrows in a plot arrangement. The combination of basic research at the Fruita Research Center and applied research on-farm will provide a conclusive summary for all Grand Valley (and Western Slope producers) interested in more efficient and profitable alfalfa.

Results are expected to show SDI will generate some water savings on-farm for alfalfa production; that alfalfa will be more profitable and productive under SDI than furrow irrigation; and that SDI will have significant water quality benefits over furrow.

Background: The program is needed to help provide a profitable alternative to the subdivision of prime Grand Valley agricultural land into smaller "ranchettes." Small acreage owners are not motivated by agricultural production for profit but rather by the rural experience and lifestyle. The water stays in place but its use sees a shift away from commercial agriculture. This can and does result in water waste i.e. ponding evaporation and weed growth, which leads to water quality problems and neighbor disputes.

Agriculture is a large part of the Grand Valley and Western Slope economy. While "buy and dry" transfers out of agriculture to municipal use are still in their infancy in Western Colorado, the amount of irrigation water committed to *commercial* agriculture is shrinking through purchase of ranch land for anticipated growth, and by subdivision of commercial farms into small acreages or "ranchettes." Better irrigation technology such as SDI is a means to keep more West Slope commercial agriculture viable and retaining agricultural land for food and fuel production.

Innovative producers in the Grand Valley have been curious about SDI for a number of years but are hesitant to test it given the investment required (even with NRCS incentive payments) and the unproven nature of the technology on perennials (pasture, hay, alfalfa) in our poorly structured Western Colorado soils.

Summary: The study will test a series of SDI configurations (tape type, depth, and row spacing) for water savings, yield improvement, and water quality benefits (salt, nutrients, selenium) against furrow irrigation; the traditional technique for the Grand Valley. The on-farm component will emphasize an evaluation of the economics of alfalfa production under SDI versus furrow. <u>The water budget and water quality comparisons are also of interest to the Colorado River District, prompting them to provide $1,000 in cash match for the Ag Transfer project.</u>

With savings and benefits quantified this analysis can educate local farmers and ranchers on the advantages of SDI. Should the study be successful in proving SDI has an edge over furrow irrigation, local early adopters of new

irrigation technology should be encouraged to begin installing SDI under alfalfa. Producers have the reassurance of knowing this can be done without removing older furrow systems as a safety net.

Also a delivery system has an opportunity to make significant jumps in conveyance efficiency with ditch-wide adoption of systems like SDI, since SDI is less dependent on gravity pressure and water levels in laterals to be effective.

Part C. – Threshold and Evaluation Criteria

1. Describe how the water activity meets these **Threshold Criteria.** (Detailed in Part 3 of the Water Supply Reserve Account Criteria and Guidelines.)

c) The water activity is consistent with Section 37-75-102 Colorado Revised Statutes.[1]

This project will in not affect or injure water rights. The primary project collaborators are an irrigator and the Fruita Research Center both with irrigation shares in the Grand Valley Canal of the Grand Valley Irrigation Company. The deliverables of the project will not impact the title, allocation, priority, transferability of irrigation shares (or water rights) in the valley; but rather provide irrigators with important information regarding SDI under alfalfa.

b) The water activity underwent an evaluation and approval process and was approved by the Basin Roundtable (BRT) and the application includes a description of the results of the BRTs evaluation and approval of the activity. At a minimum, the description must include the level of agreement reached by the roundtable, including any minority opinion(s) if there was not general agreement for the activity. The description must also include reasons why general agreement was not reached (if it was not), including who opposed the activity and why they opposed it. Note- If this information is included in the letter from the roundtable chair simply reference that letter.

This project will be reviewed by the Colorado Basin Roundtable and voted on at the January 2012 meeting.

[1] 37-75-102. Water rights - protections. (1) It is the policy of the General Assembly that the current system of allocating water within Colorado shall not be superseded, abrogated, or otherwise impaired by this article. Nothing in this article shall be interpreted to repeal or in any manner amend the existing water rights adjudication system. The General Assembly affirms the state constitution's recognition of water rights as a private usufructuary property right, and this article is not intended to restrict the ability of the holder of a water right to use or to dispose of that water right in any manner permitted under Colorado law. (2) The General Assembly affirms the protections for contractual and property rights recognized by the contract and takings protections under the state constitution and related statutes. This article shall not be implemented in any way that would diminish, impair, or cause injury to any property or contractual right created by intergovernmental agreements, contracts, stipulations among parties to water cases, terms and conditions in water decrees, or any other similar document related to the allocation or use of water. This article shall not be construed to supersede, abrogate, or cause injury to vested water rights or decreed conditional water rights. The General Assembly affirms that this article does not impair, limit, or otherwise affect the rights of persons or entities to enter into agreements, contracts, or memoranda of understanding with other persons or entities relating to the appropriation, movement, or use of water under other provisions of law.

c) The water activity meets the provisions of Section 37-75-104(2), Colorado Revised Statutes.[1] The Basin Roundtable Chairs shall include in their approval letters for particular WSRA grant applications a description of how the water activity will assist in meeting the water supply needs identified in the basin roundtable's consumptive and/or non-consumptive needs assessments.

SWSI has identified a 22 thousand to 48 thousand acre feet shortfall in the Colorado Basin by the year 2050[2]. This is equivalent to dry-up of about 17 thousand to 37 thousand acres of irrigated land (based on a conversion of 1.3 acre feet of consumed water per acre of irrigated ground). Mesa County is the dominant county in terms of water use (absorbing between a quarter and a half of this irrigated land dry-up)[3]. 23,473 acres of alfalfa were irrigated in Mesa county in 2007[4] so this project has the potential to significantly reduce projected dry-up of irrigated land in the region. Extrapolating this benefit to other West Slope basins, that impact would be even more significant.

SWSI and the Colorado have voiced a commitment to preserving agricultural water, especially its role in protecting food production on prime agricultural land. As an indication of how land use is shifting in Mesa Co. (out of commercial agriculture), the land in farms in 2002 was about 385,250 acres (about 12,750 acres more than 2007) but number of farms increased from 1,599 in 2002 to 1,767 five years later. This is consistent with a decrease in the average farm size from 241 acres to 211 acres across the same time period. All these changes can be explained by subdivision of larger commercial farms into housing development (loss of total acreage) or into small acreages (increase in farms, decrease in farm size)[5].

Of the total irrigated acreage in Mesa county (64,272 acres) alfalfa accounts for about one-third and consistently has the highest acreage. Alfalfa has good local demand as livestock feed which provides a degree of price stability not necessarily enjoyed by row crops like wheat and field corn. Alfalfa is a versatile crop that can be grown in many soil types, with a preference for the deeper loamier soils of the Grand Valley i.e. prime agricultural ground. Any enhancement developed in irrigated alfalfa has the potential to protect a significant portion of the region's agricultural ground, high value or otherwise.

Alfalfa is also a crop that is largely untested under SDI in Western Colorado. This study would be an important "early adoption" step for local producers, absorbing the increased cost that is usually associated with participating in early adoption of new practices.

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[1] 37-75-104 (2)(c). Using data and information from the Statewide Water Supply Initiative and other appropriate sources and in cooperation with the on-going Statewide Water Supply Initiative, develop a basin-wide consumptive and nonconsumptive water supply needs assessment, conduct an analysis of available unappropriated waters within the basin, and propose projects or methods, both structural and nonstructural, for meeting those needs and utilizing those unappropriated waters where appropriate. Basin Roundtables shall actively seek the input and advice of affected local governments, water providers, and other interested stakeholders and persons in establishing its needs assessment, and shall propose projects or methods for meeting those needs. Recommendations from this assessment shall be forwarded to the Interbasin Compact Committee and other basin roundtables for analysis and consideration after the General Assembly has approved the Interbasin Compact Charter.

[2] Statewide Water Supply Initiative 2010. Jan 2010. Colorado Water Conservation Board. Section 5: Consumptive Projects and Methods and the M&I Gap. Table 5.12 Statewide M&I and SSI Gaps in 2050.

[3] Statewide Water Supply Initiative 2010. Jan 2010. Colorado Water Conservation Board. Section 5: Consumptive Projects and Methods and the M&I Gap. Table 5.12

[4] 2007 USDA-NASS Agricultural Census.

[5] Includes data from 2002 and 2007 USDA-NASS Agricultural Censuses.

d) Matching Requirement: <u>For requests from the Statewide Fund</u>, the applicants is required to demonstrate a 20 percent (or greater) match of the request from the Statewide Account. Sources of matching funds include but are not limited to Basin Funds, in-kind services, funding from other sources, and/or direct cash match. Past expenditures directly related to the project may be considered as matching funds if the expenditures occurred within 9 months of the date the application was submitted to the CWCB. Please describe the source(s) of matching funds. (NOTE: These matching funds should also be reflected in your Detailed Budget in Part D of this application)

The total overall project cost for the four year project: "Investigation of Water Savings, Water Quality benefits and Profitability of Sub Surface Drip on Alfalfa in Grand Valley" is $72,618[1] (including match). **Total Request for this WSRA proposal is $46,894**[1] or $11,724 per year with a **total $8,101 in match**. Additionally $8,841[1] has also been requested from CWCB's "Alternatives Agricultural Water Transfer Methods" program which is accompanied by $8,782 in total match.

<u>On-farm component</u>
Requested from WSRA (Colorado RT): $46,894
Requested from WSRA (State): $0
Salary Match: $8,039
Total Match Percent: 14.6%**.**

<u>Experiment station component</u> (Submitted for funding)
Alternatives Agricultural Water Transfer Methods: $8,841
Cash Match: $1,000 (11.3% cash match).
Salary Match: $7,782
Total Match Percent: 50%

Correspondence from Todd Doherty (CWCB staff), program manager of "Alternatives Agricultural Water Transfer Methods":

From: Doherty, Todd [Todd.Doherty@state.co.us]
Sent: Thursday, November 03, 2011 12:32 PM
To: Reich,Denis
Subject: RE: Sub-surface drip budget for Ag Transfers

Hi Denis—
I appreciate your patience. I've been running from meeting to meeting and trying to get out board memos for the upcoming CWCB meeting. I plan on reserving some money to help accommodate your project. Obviously, I need to provide a more detailed review and have an application in hand but from what I know, the project seems to have some merit. Is the amount of grant request from the CWCB the $9,611?

Todd

[1] Revised February 7th, 2012 with new 15% indirect rate (previously 25%).

2. For Applications that include a request for funds from the Statewide Account, describe how the water activity meets the **Evaluation Criteria.** (Detailed in Part 3 of the Water Supply Reserve Account Criteria and Guidelines.)

The proposed project addresses a number of Water Supply Reserve Account Evaluation criteria:

Tier 1

c. The use of sub-surface drip is a proven form of irrigated agriculture that enhances the value of agricultural through increased yields and profitability – a recommendation identified by the SWSI process for limiting the dry up of agriculture[1]. There is also the potential for conserved consumptive use through the elimination of the evaporation portion of crop evapotranspiration. According to the United Nations approximately 10 to 20 percent of total evapotranspiration (in a fully established crop) is accounted for by surface evaporation[2]. Conservation has also been identified as one of the "four legs of the stool" on which the solutions to Colorado's future water supply sits[3] - which includes evaporative loss from surface irrigation, a form of "minimizing non-beneficial consumptive use (CU)."

Tier 2

e. Colorado State University is Colorado's land grant university with a proven record in applied and basic research related to agricultural irrigation questions.

f. PI salary match has been quantified for this project. The accompanying Ag Transfer Study with its matching component, as well as additional PI and Co-PI time and resources will be used as needed to meet the objectives of this project, however these resources will not be quantified and tracked for reporting purposes.

Tier 3

j. The water activity will help quantify the advantages (and disadvantages) of sub-surface drip over furrow irrigation in one of Western Colorado's most agriculturally productive valleys, especially the conserved consumptive use. Studies of this nature are rare and will likely have benefits for other parts of the state where SDI on alfalfa has potential. At less than $10,000 ($9,930) per year of requested funds this study – which includes on-farm and experiment station approaches – this project is exceptional value to the Colorado Basin Roundtable and the State.

k. This request is being complimented by a Alternative Agricultural Water Transfer Methods grant request which has met with a favorable initial response from CWCB staff (see email excerpt Part C1.d).

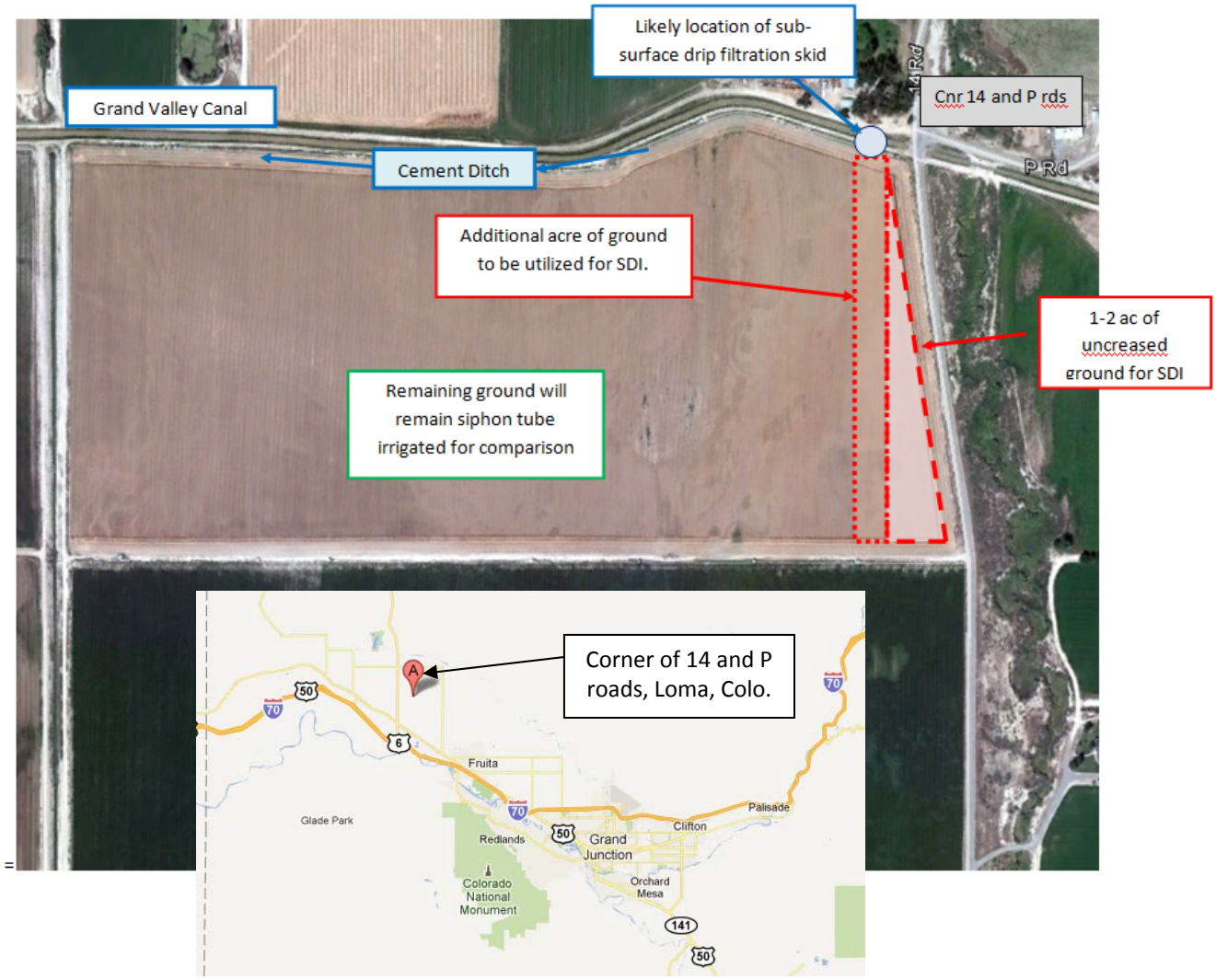
[1] Statewide Water Supply Initiative 2010. May 2011. "Section 8: Recommendations" Colorado Water Conservation Board.
[2] Allen, R.G.; et al. 1998. Irrigation and Drainage Paper No. 56. Figure 2. United Nations - Food and Agriculture (FAO)
[3] Statewide Water Supply Initiative 2010. May 2011. "Section 7: Portfolios and Strategies" Colorado Water Conservation Board.

Part D. – Required Supporting Material

1. Water Rights, Availability, and Sustainability

This information is needed to assess the viability of the water project or activity. Please provide a description of the water supply source to be utilized, or the water body to be affected by, the water activity. This should include a description of applicable water rights and the name/location of water bodies affected by the water activity.

The field hosting the on-farm comparison of SDI to furrow is located in Loma, Colo. under the stewardship of a local commercial producer. The water source is the Grand Valley Canal of the Grand Valley Irrigation Company.



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2. Please provide a brief narrative of any related or relevant previous studies.

Comparison of irrigation systems on alfalfa at Rogers Mesa Research Center 2006-2008*. USDA-SARE (Sustainable Agriculture, Research, and Education) project led by Colorado State University Agricultural Experiment Station in partnership with the Delta Conservation District and Bureau of Reclamation. The study compared irrigation efficiency and some performance parameters on Pioneer 53V08 alfalfa under furrow, solid set sprinkler, and sub-surface drip irrigation (SDI). SDI proved to be the most efficient, but neither water savings (in terms of consumption) nor water quality benefits were quantified.*

Water-Use Efficiency of Cool-Season Turf Grasses in Western Colorado 2000-2001. *DOI-USBR (Bureau of Reclamation) project led by Dr. Calvin Pearson at the Fruita Research Center. This project was designed to evaluate the water quality (salt) and irrigation efficiency benefits of sub-suface drip irrigation on common turf varieties.*

The proposed project will build on the efficiency evaluation established by the Rogers Mesa study, utilizing the experience established with the turf study. This study will assess alfalfa evapotranspiration, yield, and return on investment information in addition to conserved consumptive use and reduced salt, selenium, and nutrient loading to local waterways.

3. Statement of Work, Detailed Budget, and Project Schedule

The statement of work will form the basis for the contract between the Applicant and the State of Colorado. In short, the Applicant is agreeing to undertake the work for the compensation outlined in the statement of work and budget, and in return, the State of Colorado is receiving the deliverables/products specified. Please note that costs incurred prior to execution of a contract or purchase order are not subject to reimbursement.

Please provide a detailed statement of work using the following template. Additional sections or modifications may be included as necessary. Please define all acronyms. If a grant is awarded an independent statement of work document will be required with correct page numbers.

Statement of Work

WATER ACTIVITY NAME - Investigation of Water Savings, Water Quality benefits and Profitability of Sub Surface Drip on Alfalfa in Grand Valley

GRANT RECIPIENT – Colorado State University

FUNDING SOURCE – Water Supply Reserve Account: Colorado Basin Roundtable and Statewide funds (plus match)

INTRODUCTION AND BACKGROUND

This study is a side-by-side comparison of furrow and sub-surface drip irrigation (SDI) on alfalfa over four years starting in 2012. The study will be performed on 3 acres of sub-surface drip irrigated alfalfa alongside approximately 70 acres of furrow irrigated alfalfa (same plant date) on an agricultural cooperators ground in Loma, Colorado.

The program is needed to determine first how much conserved water SDI irrigated alfalfa provides. If significant it has the potential to be an alternative to municipal water providers over the purchase of additional farms and ranches for their water rights. Secondly it provides a *profitable* and proven alternative to the subdivision of Grand Valley agricultural land into smaller "ranchettes." Small acreage owners are not motivated by agricultural production for profit but rather by the rural experience and lifestyle. The water stays in place but its use sees a shift away from commercial agriculture. If commercial agriculture has a more economic resilient means to raise one of the most popular crops in the basin, then it should slow the loss of (prime) commercial agricultural ground.

OBJECTIVES

The study will test and characterize a series of SDI configurations for water savings, yield improvement and water quality benefits. There is a potential for up to 20 percent savings (or 7.2 inches in the Fruita area) on water consumption through the reduction of surface evaporation that SDI provides. With savings and benefits quantified this analysis can educate local farmers, ranchers, and municipal water providers on the advantages of SDI. With a broader understanding of SDI the adoption of sub-surface drip in the Grand Valley among commercial alfalfa producers should increase.

TASK 1: Installation of SDI and monitoring equipment

Prior to planting alfalfa and a "nurse crop" of oats drip tape needs to be installed and connected to header and filtration equipment. The filtration skid will be rented from the Shavano Conservation District at a rate of $1,000 per year.

Monitoring flumes (portable broad crested weirs), flow totalizers, and soil moisture equipment are on-hand with the Experiment Station and Water Institute staff and will be installed in conjunction with SDI tape as part of water quantity and water quality assessments.

Method/Procedures

The project team will relocate (from Montrose County), clean, and service the filtration skid. Team members will purchase and install a series of SDI configurations prior to planting alfalfa in both the SDI and furrow treatments. Configurations will be for determining optimum tape depth, tape spacing, emitter size, and emitter spacing. Western Colorado soils are relatively new to SDI so these four parameters are the key to matching water delivery with soil wetting properties and plant water requirements.

As tape is being installed soil moisture sensors will be installed in and below the root zone. Sensors will be spread from top to bottom of both treatments to account for the uneven wetting front of furrow irrigation.

Deliverables

Installation of SDI at the study site so as to fulfill the objectives of the study.

Flume readings and soil moisture sensors when correlated with soil type provide an understanding of water volumes applied to and below the root zone during an irrigation. Measured soil moisture volumes will be compared to the CoAgMet station (at Fruita Research Center) daily evaporation and transpiration records to provide overall efficiency and consumption determinations.

Deep percolation (below root zone) water amounts can also be correlated with known loading rates of salt and in a more limited fashion selenium and nitrogen.

TASK 2: Planting of alfalfa

Alfalfa (for seed) will be planted on both furrow and SDI irrigated treatments.

Method/Procedures

Fruita Research Center staff will work with the cooperating producer to seed alfalfa once tape has been laid and creases cut. Alfalfa (for seed) will be used which does not require a nurse crop.

Deliverables

A consistent stand of alfalfa for the SDI comparison with furrow irrigation will be raised across all 3 acres of SDI and 70 acres of furrow irrigation.

TASK 3: Monitoring water use and loss

From the first irrigation water amounts will be recorded in conjunction with crop growth stages and root depth.

Method/Procedures

Using a level transducer in field flumes and in-pipe flow totalizers , the irrigation amounts applied to SDI and furrow treatments will be carefully recorded throughout the growing season. Combined with water amounts measured in root zones and percolating below root zones a water balance will be used to calculate evapo-transpiration (ET). The local CoAgMet site (located within 7 miles) will also be maintained and monitored for calculated ET as a guide for separating evaporation and transpiration portions – which will be the key to determining seasonal conserved consumptive use.

Deliverables

A measure of water consumed by alfalfa on SDI and furrow irrigation treatments on first and second year alfalfa and the likely water savings, and water quality benefits to alfalfa grown under SDI.

TASK 4: Yield and Profit Comparison

The second year of alfalfa and a small series of harvested oat plots in the first year will be sampled to compare the relative yield value, quality, and biomass of each irrigation treatment.

Method/Procedures

Fruita Research Center staff will work in cooperation has plot harvesting equipment designed to bale small treatments of field crops including alfalfa for the purposes of comparing yield characteristics. These will be used to determine the relative differences between SDI and furrow irrigation.

Deliverables

Measures of yield biomass (tons), value (farm gate prices), and quality (protein content) will be taken on harvest samples. These measures can be then used as part of the return on investment comparison between SDI and furrow treatments. Biomass will also be used to validate measured differences in water consumption between treatments.

TASK 5: Outreach and reporting

Reporting will be issued to funding and partners as the project progresses and is completed. Field days at the Research Center will include a tour of the study. The demonstration will be made available to local producers who want to learn more about the study via field days. The study is also close to the road for local producers to observe as they drive by.

Method/Procedures

At the end of year one a report will be compiled of first year progress and results. At the end of the second year a full project will be completed. Fruita Research Center typically has at least one field day a year in which a tour of this study will be included.

Deliverables

In addition to the required 6-monthly progress reports for CWCB staff, larger end-of-year reports will be produced for CWCB, the Colorado River District, and CSU Agricultural Experiment Station. An end of project report will also be provided to CWCB, the Colorado River District, and CSU Agricultural Experiment Station.

Reports will describe in detail (across treatments):

- Crop water use
- Conserved consumptive use of SDI treatments
- Yield biomass, value, quality
- Water quality impacts
- Return on investment analysis (final report)
- Saved water implications (final report)
- Next steps (final report)

Condensed/modified versions of these reports will also be included in the annual technical bulletins published by Western Colorado Research Center and the Colorado Water newsletter.

Future Tasks

After four years there will be the opportunity to invest in further analysis of both furrow and SDI irrigated alfalfa. The life of alfalfa in the Grand Valley is as long as 7 years once established so additional study at a small annual cost (mostly monitoring and harvest labor) would be achievable.

Method/Procedures

The same methods described in Tasks 2, 3, and 4.

Deliverables

A larger data set which adds more credibility to data.

REPORTING AND FINAL DELIVERABLE

Reporting: 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 statement of work including a description of any major issues that have occurred and any corrective action taken to address these issues.

Final Deliverable: 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.

BUDGET

Budget Table 1: Labor Costs – Field Technician

Personnel: Rate:	Months $12/hr	Fringe		Total Costs
Tasks 3 & 4	504			
Hours:				
2012	144	13.2%		
2013-2015	120 x 3	12.5%;12.68%;12.85%		
Cost:	$6,404	$821		$7,225

Budget Table 2: Total Direct Costs

Item:	Monitoring Labor	SDI Installation	SDI Materials	Outreach	Mileage	**Total**
Units:	504 hours	3 zones	3 acres	field days Pubs/Sheets	PI/Co-PI 8 trips	Without
Unit Cost:	$12/hr	~$3,000/zone	$5,000		$0.50/mi	$match
Task 1 – Install Skid Rental	Cooperating Producer w/ Fruita Res Ctr	$9,000	$16,508 $4,247			$29,755
Task 2 – Plant						
Task 3 – Monitor	$5,780					$5,780
Task 4 – Comparison	$1,445					$1,445
Task 5 – Outreach				$3,047	$750	$3,797
Total Units:	4 yrs pt time			2 field days 3 printings	692 mi	
Total Cost:	$7,225	$9,000	$20,755	$3,047	$750	**$40,777**

Budget Table 3: Total Costs

Total Direct Costs:		**$40,777**
Indirect Costs:	Colorado State University (15% TDC)	$6,117
Total Funds Requested:		**$46,894**
Total CSU Match:	Colorado State University (14.7%)	**$8,101**
Total Project Costs:		**$54,995**

Accompanying study	CWCB – Alternative Ag Transfers	$8,841
Accompanying study	Colorado River District	$1,000

*Accompanying study information is for informational purposes only and does not represent quantified cost share for this requested funding.

Budget Narrative:

REQUESTED FUNDS: $46,894 Matching Funds: $8,101

*Figures in Years 2 - 4 have been adjusted for inflation at 4%, unless otherwise noted.

Personnel ($7,225)

Funds are requested for a Field Technician (non-student hourly) for 144 hours in Year 1 and 120 hours in Years 2 - 4 at $12/hr. This person will be responsible for monitoring the study in the field.

Fringe has been calculated at CSU established rates for non-student hourly of 13.2% in Year 1, 12.5% in Year 2, 12.68% in Year 3, and 12.85% in Year 4.

Travel ($750)

Funds are requested in for mileage from Grand Junction to Glenwood Springs (173 mi/trip @ $0.50/mi) to present to the Colorado Roundtable and at the River District Board Meeting in each of Years 2 & 4.

Supplies ($16,058)

Funds are requested for sub-surface drip supplies such as headers, filters, valves, connectors, vents, and tape for sub surface drip ($5,000 per acre for 3 acres). Funds are also requested for a pump, replacement pump seals, wiring ($1,058).

Other ($16,744)

Funds are requested for professional service of a project team for the SDI Tape Installation at $3000/acre for 3 acres.

Funds are requested for rental of a filtration skid from Shavano Conservation District at $1,000/yr.

Funds are requested for professional service of an electrician to wire skids @ $75/hr for 6 hours.

Funds are requested to host a project outreach field day in each of Years 2 & 4 ($1000 each - $700 space rental and $300 advertising).

Funds are requested for publications: Year 2 report (20 copies @ $5 ea); End of project report (60 copies @ $5 ea); Fact Sheets (100 copies @ $1 ea).

Funds are requested for printing of a 2-fold brochure in Year 2 (50 copies @ $2 ea) and again in Year 4 (100 copies @ $2 ea)

Indirect Costs ($6,117)

As of February 2012, the approved indirect rate for this proposal is 15% TDC.

CSU Match: $8,101

*Personnel adjusted for inflation in Years 2 - 4 @ 4%.

CSU Personnel ($6,429)

PI, Denis Reich ($4,775/month) will contribute 0.25 months per year in Years 1 - 4 and fringe at 26.3% Y1; 26.6% Y2; 26.97% Y3; and 27.35% Y4.

Indirect Costs ($1,672)

Indirect Costs have been calculated at CSU's federally negotiated rate of 26% MTDC.

SCHEDULE

May 1st 2012 to April 30th 2016	2012		2013		2014		2015	2016
	Growing Season	Off-season	Growing Season	Off-season	Growing Season	Off-season	Growing Season	Off-season
1. Installation								
a. SDI								
b. Monitoring								
2. Plant								
3. Monitoring								
4. Harvest								
5. Outreach								
a. Reporting				Mid-Project				Final
b. Field Days								

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 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 help promote the development of a common technical platform.

The above statements are true to the best of my knowledge:

Signature of Applicant:

Print Applicant's Name:

Project Title:

Return this application to:

Mr. Todd Doherty
Intrastate Water Management and Development Section
COLORADO WATER CONSERVATION BOARD
1580 Logan Street, Suite 200
Denver, CO 80203

To submit applications by Email, send to: todd.doherty@state.co.us

Attachment 1
Reference Information

The following information is available via the internet. The reference information provides additional detail and background information.

Colorado Water Conservation Board (http://cwcb.state.co.us/)

Loan and Grant policies and information are available at – http://cwcb.state.co.us/Finance/

Interbasin Compact Committee and Basin Roundtables (http://ibcc.state.co.us/)

Interbasin Compact Committee By-laws and Charter (under Helpful Links section) –

http://ibcc.state.co.us/Basins/IBCC/

Legislation

House Bill 05-1177 - Also known as the Water for the 21st Century Act –

http://cwcbweblink.state.co.us/DocView.aspx?id=105662&searchhandle=28318

House Bill 06-1400 – Adopted the Interbasin Compact Committee Charter –

http://cwcbweblink.state.co.us/DocView.aspx?id=21291&searchhandle=12911

Senate Bill 06-179 – Created the Water Supply Reserve Account –

http://cwcbweblink.state.co.us/DocView.aspx?id=21379&searchhandle=12911

Statewide Water Supply Initiative

General Information – http://cwcb.state.co.us/IWMD/

Phase 1 Report – http://cwcb.state.co.us/IWMD/SWSITechnicalResources/SWSIPhaseIReport/

Attachment 2
Insurance Requirements

NOTE: The following insurance requirements taken from the standard contract apply to WSRA projects that exceed $25,000 in accordance with the policies of the State Controller's Office. Proof of insurance as stated below is necessary prior to the execution of a contract.

13. INSURANCE

Grantee and its Sub-grantees shall obtain and maintain insurance as specified in this section at all times during the term of this Grant: All policies evidencing the insurance coverage required hereunder shall be issued by insurance companies satisfactory to Grantee and the State.

A. Grantee

i. Public Entities

If Grantee is a "public entity" within the meaning of the Colorado Governmental Immunity Act, CRS §24-10-101, et seq., as amended (the "GIA"), then Grantee shall maintain at all times during the term of this Grant such liability insurance, by commercial policy or self-insurance, as is necessary to meet its liabilities under the GIA. Grantee shall show proof of such insurance satisfactory to the State, if requested by the State. Grantee shall require each Grant with Sub-grantees that are public entities, providing Goods or Services hereunder, to include the insurance requirements necessary to meet Sub-grantee's liabilities under the GIA.

ii. Non-Public Entities

If Grantee is not a "public entity" within the meaning of the GIA, Grantee shall obtain and maintain during the term of this Grant insurance coverage and policies meeting the same requirements set forth in **§13(B)** with respect to sub-Grantees that are not "public entities".

B. Sub-Grantees

Grantee shall require each Grant with Sub-grantees, other than those that are public entities, providing Goods or Services in connection with this Grant, to include insurance requirements substantially similar to the following:

i. Worker's Compensation

Worker's Compensation Insurance as required by State statute, and Employer's Liability Insurance covering all of Grantee and Sub-grantee employees acting within the course and scope of their employment.

ii. General Liability

Commercial General Liability Insurance written on ISO occurrence form CG 00 01 10/93 or equivalent, covering premises operations, fire damage, independent Grantees, products and completed operations, blanket Grantual liability, personal injury, and advertising liability with minimum limits as follows: **(a)**$1,000,000 each occurrence; **(b)** $1,000,000 general aggregate; **(c)** $1,000,000 products and completed operations aggregate; and **(d)** $50,000 any one fire. If any aggregate limit is reduced below $1,000,000 because of claims made or paid, Sub-grantee shall immediately obtain additional insurance to restore the full aggregate limit and furnish to Grantee a certificate or other document satisfactory to Grantee showing compliance with this provision.

iii. Automobile Liability

Automobile Liability Insurance covering any auto (including owned, hired and non-owned autos) with a minimum limit of $1,000,000 each accident combined single limit.

iv. Additional Insured

Grantee and the State shall be named as additional insured on the Commercial General Liability and Automobile Liability Insurance policies (leases and construction Grants require additional insured coverage for completed operations on endorsements CG 2010 11/85, CG 2037, or equivalent).

v. Primacy of Coverage

Coverage required of Grantee and Sub-grantees shall be primary over any insurance or self-insurance program carried by Grantee or the State.

vi. Cancellation

The above insurance policies shall include provisions preventing cancellation or non-renewal without at least 45 days prior notice to the Grantee and the State by certified mail.

vii. Subrogation Waiver

All insurance policies in any way related to this Grant and secured and maintained by Grantee or its Sub-grantees as required herein shall include clauses stating that each carrier shall waive all rights of recovery, under subrogation or otherwise, against Grantee or the State, its agencies, institutions, organizations, officers, agents, employees, and volunteers.

C. Certificates

Grantee and all Sub-grantees shall provide certificates showing insurance coverage required hereunder to the State within seven business days of the Effective Date of this Grant. No later than 15 days prior to the expiration date of any such coverage, Grantee and each Sub-grantee shall deliver to the State or Grantee certificates of insurance evidencing renewals thereof. In addition, upon request by the State at any other time during the term of this Grant or any sub-grant, Grantee and each Sub-grantee shall, within 10 days of such request, supply to the State evidence satisfactory to the State of compliance with the provisions of this **§13**.

Attachment 3
Water Supply Reserve Account Standard Contract

NOTE: The following contract is required for WSRA projects that exceed $100,000. (Projects under this amount will normally be funded through a purchase order process.) Applicants are encouraged to review the standard contract to understand the terms and conditions required by the State in the event a WSRA grant is awarded. Significant changes to the standard contract require approval of the State Controller's Office and often prolong the contracting process.

It should also be noted that grant funds to be used for the purchase of real property (e.g. water rights, land, conservation easements, etc.) will require additional review and approval. In such cases applicants should expect the grant contracting process to take approximately 3 to 6 months from the date of CWCB approval.

Attachment 4
W-9 Form

NOTE: A completed W-9 form is required for all WSRA projects prior execution of a contract or purchase order. Please submit this form with the completed application.