Arkansas Basin Roundtable
Official Records Location
c/o Board of Water Works of Pueblo
Attention: Leslie Martinez
P.O. Box 400
Pueblo CO 81002-0400

January 12, 2012

Mr. Todd Doherty
Interstate Water Management Development Section
Colorado Water Conservation Board
1580 Logan Street, Suite 600
Denver, Colorado 80203

Re: Water Supply Reserve Account Grant Application for Build, Assess and Document Accounting and Administrative Tools for Lease Fallowing in the Arkansas River Valley

Dear Todd:

The WSRA grant application for Build, Assess and Document Accounting and Administrative Tools for Lease Fallowing in the Arkansas River Valley was approved by the Arkansas Basin Roundtable with a commitment of $20,000 of Basin Funds at the January, 2012 meeting. You will receive the application under separate cover from the applicant.

Please do not hesitate to contact me if you have any questions.

Sincerely,

Gary Barber
Chair

c: Executive Committee, Ark Roundtable

COLORADO WATER CONSERVATION BOARD

WATER SUPPLY RESERVE ACCOUNT
GRANT APPLICATION FORM

Build, Assess, and Document Accounting and Administration Tools for Lease Fallowing in the Arkansas River Valley

Name of Water Activity/Project

Approving Basin Roundtable: Arkansas

$59,215	**Total Amount of Funds Requested**	**Amount from Statewide Account**	$39,215
		Amount from Basin Account	$20,000

Total Matching Funds: $17,605

TOTAL PROJECT COST $76,820

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ATTACHMENTS

Part A. - Description of the Applicant

1. Applicant Name: Upper Arkansas Water Conservancy District

Mailing address: 339 East Highway 50
P.O. Box 1090
Salida, CO 81201

Taxpayer ID#: 84-0817067 Email address: manager@uawcd.com

Phone Numbers: Business: 719-539-5425
Home: 719-539-6067
Fax: 719-539-7579

2. Person to contact regarding this application:

Name: Ralph L. Scanga, Jr. "Terry"

Position/Title Manager

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

[X] Public (Districts) – special, water and sanitation, conservancy, conservation, irrigation, or water activity enterprises.

4. Provide a brief description of your organization.

The Upper Arkansas Water Conservancy District (UAWCD) was formed in 1979 pursuant to C.R.S. 37-45-102 and case number 79CV30. The district is a quasi-municipality created to conserve water resources and to provide the greatest beneficial use of water in the Upper Arkansas River Basin by construction as defined in C.R.S. 37-45-103(10): dams, reservoirs, canals, conduits, pipelines, tunnels, and all works, facilities, improvements, and property necessary or convenient for supplying water for domestic, irrigation, power, milling, manufacturing, mining, metallurgical, and all other beneficial uses. About 7,000 District customers use water for irrigation (38% of use); municipal storage (25%); and domestic and commercial augmentation (18%). Its service area covers over 2 million high mountain acres in Chaffee, Fremont, Custer and parts of Saguache and El Paso Counties.

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

Not applicable.

6. Successful applicants will execute a contract with the CWCB prior to beginning work on the portion of the project funded by the WSRA grant. Please review this contract and check the appropriate box.

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

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.

The District is able to receive the grant funding requested herein during its fiscal year 2011 – 2012 without triggering any issues related to TABOR limitations.

Part B. - Description of the Water Activity

1. Name of the Water Activity/Project:

Build, Assess, and Document Accounting and Administration Tools for Lease Fallowing in the Arkansas River 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
- [X] Nonstructural project or activity
- [X] Consumptive project or activity
- [X] 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.

In summary, this project will build, assess, and document accounting and administration tools for lease fallowing, as part of a "Super Ditch" style plan, among seven Arkansas River ditches located between Pueblo Reservoir and John Martin Reservoir. Figure 1 shows the boundaries of the three water conservancy districts in the Arkansas River Basin. Figure 2 depicts the lower Arkansas River valley ditch system from Pueblo Reservoir to John Martin Reservoir. Figure 3 shows the irrigated acreage of the seven ditches participating in the "Super Ditch" style lease fallowing plan.

The requirements of the accounting and administration tools are to:

(1) Quantify the transferrable consumptive use derived from fallowed land parcels;
(2) Quantify the associated changes in the *amount, timing, and location* of:
    (a) surface runoff to drains and to the Arkansas River,
    (b) recharge to the alluvial aquifer, and
    (c) groundwater return flow to drains and to the Arkansas River;
(3) Support the development of plans to maintain return flows at or above historical levels and to quantify transferrable consumptive use at or below historical levels in a manner that complies with Colorado water law and the Arkansas River Compact; and
(4) Develop data interfaces that will complement the Arkansas River Decision Support System (ArkDSS) and build a common technical platform for the transfer of data to and from Hydrobase.

The water activity will solve the need to calculate transferable consumptive use and assess impacts on the stream aquifer system. Lease fallowing is complex: the *amount, timing, and location* of water use changes annually. Leasable water is derived through changes of water rights from disparate parcels of land spread along one ditch, in combination with parcels fallowed from other ditches. Compounded by annual rotational fallowing, the potential for injury is exponential. Each annual change of water rights under rotational crop fallowing will require water court approval and the associated scrutiny: each applicant and all objectors develop, at great expense, competing methodologies for quantifying transferable consumptive use and assessing return flow impacts. In a "Super Ditch" style lease fallowing plan, this will drive the cost of the temporary change to prohibitive levels — with the result that water derived from rotational crop fallowing/leasing would not be marketable.

The project will be completed in seven phases. The accounting tool will be built in phase 1, 2 and 3, where work is on field headgate diversion, crop evapotranspiration (ET), surface runoff, and aquifer recharge accounting. Phase 1, 2 and 3 were fully funded by the Alternative Agricultural Water Transfer Methods Competitive grant program funds of $121,500, matched with $157,395 cash contributions in the form of $10,000 each from four project co-sponsors: Upper Arkansas Water Conservancy District, Southeastern Colorado Water Conservancy District, the Board of Water Works of Pueblo, and Colorado Springs Utility with $117,395 from the Lower Arkansas Valley Water Conservancy District. Phase 4 will document the accounting tool and prepare the methods reference document.

WSRA funding will be used to continue work begun to build, assess, and document tools that will reduce the complexity of calculating transferrable consumptive use and assessing impacts to return flows resulting from lease fallowing agreements. WSRA funding will complete phase 4 to document the accounting tool then prepare user guidelines. Phases 5 and 6 will develop the administration tool and phase 7 develops a GIS user interface.

The tools will facilitate the implementation of a "Super Ditch" style lease fallowing program to help meet water supply needs. Project benefits include: constraining costs, protecting other water rights holders from injury, sustaining agricultural economies, maintaining open space, and preserving the long established water court process — all while facilitating the implementation of lease fallowing. Leasable water can help meet the projected statewide water supply gap of 200,000 to 600,000 acre feet by 2050 (Statewide Water Supply Initiative [SWSI] 2010).

Part C. – Threshold and Evaluation Criteria

1. Describe how the water activity meets **Threshold Criteria.** (Part 3 of the WSRA Criteria/Guidelines.)

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

The Upper Arkansas Water Conservancy District recognizes water rights as a private usufructuary property right. Its water activity is consistent with both part (1) and (2) of § 37-75-102 C.R.S. regarding water rights protections. Regarding (1), it does not supersede, abrogate, or otherwise impaired the current system of allocating water within Colorado. Regarding (2), it does not 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. It does not supersede, abrogate, or cause injury to vested water rights or decreed conditional water rights. It 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.

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.

The approval letter is in Attachment A.

c) The water activity meets the provisions of Section 37-75-104(2), Colorado Revised Statutes.[2] 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.

In accordance with §37-75-104 (2)(c), the Arkansas Basin Roundtable developed its *Consumptive Use Water Needs Assessment: 2030 – 2008 Update*. It identified an anticipated municipal and industrial shortfall by 2030 of 31,500 acre feet.

[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.

[2] 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.

The gap can only be met with agricultural water, since the Arkansas River Basin is fully appropriated as a result of the 1948 Arkansas River Compact and the 1996 *Amended Rules and Regulations Governing the Diversion and Use of Tributary Groundwater in the Arkansas River Basin*. This project will build, assess, and document accounting and administration tools for lease fallowing to help meet the water supply need, while preserving non-consumptive needs such as sustaining agricultural and maintaining open space.

d) Matching Requirement: For requests from the Statewide Fund, the applicant 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: matching funds should be reflected in your Detailed Budget in Part D of this application)

Basin funds will be $20,000, which the Arkansas Basin Roundtable has approved concurrent with this application. The direct cash match will be $17,605, contributed by the Lower Arkansas Valley Water Conservancy District. Combined matching funds total $37,605, or 48.9 percent of the cost of the proposed $76,820 project.

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

Tier 1: Promoting Collaboration/Cooperation, Meeting Water Management Goals and Identified Water Needs

a. The water activity addresses multiple needs or issues, including consumptive and/or non-consumptive needs, or the needs and issues of multiple interests or multiple basins. This can be demonstrated by obtaining letters of support from other basin roundtables (in addition to an approval letter from the sponsoring basin).

Multiple needs/issues will be addressed: constraining costs, protecting other water rights holders from injury, sustaining agricultural economies, maintaining open space, preserving the long established water court process, while facilitating the implementation of lease fallowing. This project will build, assess and document accounting and administrative tools for calculating transferable consumptive use and assessing impacts to the stream aquifer system from temporary transfers of water to municipal and industrial uses in changes to agricultural water rights pursuant to rotational crop lease fallowing agreements. The project accomplishment will be an accepted basin-wide preferred methodology — a common platform — that can be a statewide template for temporary water transfers under lease fallowing in other basins.

b. The number and types of entities represented in the application and the degree to which the activity will promote cooperation and collaboration among traditional consumptive water interests and/or non-consumptive interests, and if applicable, the degree to which the water activity is effective in addressing intrabasin or interbasin needs or issues.

The proposed project to build, assess and document accounting and administration tools promotes cooperation and collaboration among traditional consumptive water interests. Past expenditures include work by a technical committee to develop the phased scope of work. This involved labor of

engineers representing each of the five Alternative Agricultural Water Transfer Methods grant project co-sponsors: Upper Arkansas Water Conservancy District, Southeastern Colorado Water Conservancy District, Lower Arkansas Valley Water Conservancy District, the Board of Water Works of Pueblo, and Colorado Springs Utility. Cooperation and collaboration includes participating representatives from the Office of the Colorado State Engineer and the Division 2 Engineer including Bill Tyner, Assistant Division 2 Engineer (Surface Water Operations), Department of Natural Resources technical staff from the Water Information Section that is developing the Arkansas Basin Decision Support System, and Timothy K. Gates, water resources systems engineer and a Professor of Civil Engineering at Colorado State University. Future in-kind contributions estimated at ~$150,000 are documented in Attachment B.

c. The water activity helps implement projects and processes identified as helping meet Colorado's future water needs, and/or addresses the gap areas between available water supply and future need as identified in SWSI or a roundtable's basin-wide water needs assessment.

The proposed project to build, assess, and document accounting and administration tools will address the anticipated statewide water supply gap of 200,000 to 600,000 acre feet by 2050 (Statewide Water Supply Initiative [SWSI] 2010). The Arkansas Basin Roundtable *Consumptive Use Water Needs Assessment: 2030 – 2008 Update* identified a municipal and industrial shortfall by 2030 of 31,500 acre feet. The State has a sense of urgency regarding its water supply future and identified alternative agricultural transfers, such as a "Super Ditch" style lease fallowing program, as a policy option to meet its gap.

The purpose of this project is not to transfer water via temporary leases but, rather, to make possible the water transfer by solving the need to calculate transferable consumptive use and assess impacts on the stream aquifer system under a complex lease fallowing system where the *amount, timing, and location* of water use changes annually. Without a common technical and widely accepted platform to quantify consumptive use and return flow impacts, marketing water through a "Super Ditch" style program may be futile. The project helps implement lease fallowing by: constraining costs, protecting other water rights from potential injury, sustaining agricultural economies, maintaining open space, and preserving the institutionalized and long recognized water court process.

Under its "Super Ditch" style program, the Lower Arkansas River Valley plans to market lease fallowing agreements pursuant to a rotational crop fallowing plan to Front Range municipalities and others. Leased water can potentially meet a portion of the demand gap. Since ~ 80 percent of shareholders among seven ditches have returned written notice of interest in participating in a "Super Ditch" style program, at best about 62,000 acre feet may be leasable. Table 1 estimates water available for lease, by estimating elements that will be refined by this project, including:

- Reported headgate diversions (minus Fryingpan-Arkansas transmountain water to avoid the complications of transferring federal water)
- Estimated consumptive use factors (from 0.408 to 0.591)
- Exchange potential factors (depending on hydrologic conditions and distance from Pueblo Reservoir, vary from 0.52 to 1.00)
- Shareholder participation rate (assumed to be 80 percent)
- Land fallowing rate (assumed to be 30 percent).

TABLE 1. AMOUNT OF LEASABLE WATER	
Participating Ditch	Leasable Water, Acre Feet
Bessemer Ditch	2,013
Rocky Ford Highline	10,990
Oxford Farmers Ditch	3,236
Otero Canal	982
Caitlin Canal	11,492
Holbrook Canal	6,712
Fort Lyon Canal	26,679
Overall Total	62,104

Source: Rotational Land Fallowing-Water Leasing Program (HDR 2007)

Tier 2: Facilitating Water Activity Implementation

d. Funding from this Account will reduce the uncertainty that the water activity will be implemented. Discuss how receiving funding from the Account will make a significant difference in the implementation of the water activity (i.e., how will receiving funding enable the water activity to move forward).

WSRA FUNDING IS CRUCIAL. It is being requested concurrent with the Alternative Agricultural Water Transfer Methods competitive grant program application. The project will be completed in seven phases. The accounting tool will be built in phase 1 thru 3, with Alternative Agricultural Water Transfer Methods Competitive grant program funds of $121,500, matched with $157,395 cash contributions project co-sponsors. Alternative Agricultural money will allow development of the accounting tool.

WSRA funding will be used to continue to build, assess, and document tools that will reduce the complexity of calculating transferrable consumptive use and assessing impacts to return flows resulting from lease fallowing agreements. WSRA funding will complete phase 4 to document the accounting tool then prepare user guidelines. WSRA funding will enable the project to move forward to phase 5 and 6, where the administration tool will be developed for operation of consumptive use transfer credits/depletions.

e. The applicant must demonstrate its ability to implement the proposed activity.

Upper Arkansas Water Conservancy District (UAWCD) has the ability to collaborate to build and assess accounting and administrative tools that are accepted basin-wide as a preferred methodology — a common platform — for calculating transferable consumptive use and assessing impacts to the stream aquifer system from temporary transfers of water rights pursuant to rotational crop lease fallowing agreements. UAWCD is a leader who can increase cooperation among partners. UAWCD can obtain cash matches and in-kind contributions from the population served by the proposed project.

f. The applicant is providing matching funds and the amount of matching funds or is obtaining partial funding from other sources and the amount and source of such other funds or is providing demonstrable in-kind contributions.

Applicant co-sponsor Lower Arkansas Valley Water Conservancy District is providing matching funds in the amount of $17,605, or 23 percent of the total project cost of this phase.

Tier 3: The Water Activity Addresses Issues of Statewide Value and Maximizes Benefits

g. The water activity helps sustain agriculture, and open space, or meets environmental or recreational needs.

The proposed project to build, assess, and document accounting and administration tools will sustain agriculture and protect open space. Table 2 tallies United States 2007 Census of Agriculture county profiles, summing the annual market value of agriculture in the five county area at $616.8 million. That is ~ $3,056 per capita for the five area counties. Nationally, the value of agricultural production is ~ $1,085 per capita.

TABLE 2. VALUE OF AGRICULTURAL LANDS SUSTAINED

County	Land in Farms (acres)	Farm Land in Pasture	Total Annual Market Value	Value of Crops	Value of Livestock
BENT	877,142	65 %	$ 82.2 million	$ 19.0 million	$ 63.2 million
CROWLEY	451,225	85 %	$ 110.9 million	$ 1.5 million	$ 109.4 million
OTERO	624,123	77 %	$ 111.1 million	$ 26.7million	$ 84.5 million
PROWERS	1,037,336	44 %	$ 263.3 million	$ 82.1 million	$ 181.2 million
PUEBLO	910,566	87 %	$ 49.3 million	$ 15.8 million	$ 33.4 million
TOTALS	3,900,392	71 % average	$616.8 million	$145.1 million	$471.7 million

h. The water activity assists in the administration of compact-entitled waters or addresses problems related to compact entitled waters and compact compliance and the degree to which the activity promotes maximum utilization of state waters.

The proposed project to build, assess, and document accounting and administration tools will assists in the administration of compact-entitled waters while promoting maximum utilization of basin water. It does this by making possible the temporary transfers of water rights pursuant to rotational crop lease fallowing agreements to meet municipal and industrial needs while preserving the five county area agricultural economy valued at $616 million annually. It assists in the administration of compact-entitled waters in two ways: by support the development of plans to maintain return flows at or above historical levels and to quantify transferrable consumptive use at or below historical levels in a manner that complies with Colorado water law and the Arkansas River Compact, and developing data interfaces that will complement the Arkansas River Decision Support System (ArkDSS) and build a common technical platform for the transfer of data to and from Hydrobase.

i. The water activity assists in the recovery of threatened and endangered wildlife species or Colorado State species of concern.

The project to build, assess, and document accounting and administration tools will facilitate lease fallowing that sustains agriculture and maintains open space that may assist in recovery of threatened and endangered wildlife species. For example, native prairie Buffalo grass is likely to be planted in agricultural fields fallowed by lease fallowing. Buffalo grasses provide food, nesting, escape cover, and winter cover for wildlife. The Arkansas River basin supports three federal endangered (E) species and four federal threatened (T) species.

TABLE 3. THREATENED AND ENDANGERED SPECIES IN THE ARKANSAS RIVER BASIN		
E/T	SPECIES	DESCRIPTION AND HABITAT REQUIREMENTS
E	Ferret, black-footed	Statewide. The ferret is 18-24" long, and weighs 1.5-2.5 pounds. Its color and markings blend with grassland soils and plants. Habitat requirements are grasses.
E	Tern, least	Known in Basin counties (Bent, El Paso, Kiowa, Otero, Park, Teller), least terns are the smallest member of the gull / tern family at ~ 9" long. Habitat requirements are to nest near water.
E	Wolf, gray	Statewide. The Gray Wolf, a keystone predator, is an integral component of the ecosystems to which it typically belongs. Habitat requirements are in a wide range including grasslands.
T	Lynx, Canada	Known in Basin counties (Chaffee, Custer, Conejos, Fremont, Park, Pueblo, and Saguache).
T	Owl, Mexican spotted	Known in Basin counties (Alamosa, Chaffee, Conejos, Costilla, Custer, El Paso, Fremont, Huerfano, Los Animas, Park, Pueblo, Rio Grande, Saguache), spotted owls are ashy with white and brown spots.
T	Plover, piping	Known in Basin counties (Bent, Crowley, El Paso, Kiowa, Otero, Park), the plower is 7.25" long and pale brown. Habitat requirements involve nest sites where scattered grass tufts are present.
T	Trout, Cutthroat	Greenbacks are Arkansas River natives known in Chaffee, Custer, Hueferno, Park, and Pueblo counties.

Open space preserved by lease fallowing can help address state concern for species in the Arkansas Basin. The Arkansas River basin supports two state threatened (ST) and six state special concern (SC; not a statutory category) species.

TABLE 4. STATE SPECIES OF CONCERN IN THE ARKANSAS RIVER BASIN		
NAME	DESCRIPTION AND HABITAT REQUIREMENTS	C/T
Bald Eagle	Found on the Arkansas River. Habitat requirements are water and large trees for nests.	SC
Burrowing Owl	Found where prairie dogs burrow from early spring through October. Habitat requirements include grasslands, prairies, and agricultural lands near prairie dog towns.	ST
Lesser Prairie-Chicken	In southeastern CO. Habitat is grassland areas. In winter, food source is primarily made up of seeds, leaves, grain and milo from agriculture lands.	ST
Peregrine Falcon	Found. Habitat requirements are open spaces overlooking water.	SC
Mountain Plover	Despite their name, mountain plovers breed in grass; breeding areas exist in southeastern CO. Habitat requirements include shortgrass, tallgrass, and fallow fields.	SC
Townsend's Big-Eared Bat	Found in upper basin only. Habitat is mines, caves and structures in woodlands and forests to elevations above 9,500 feet. Diet is mainly small moths, also beetles, flies and wasps.	SC
Black-Tailed Prairie Dog	Active in south-central/southeastern CO below 6,000 feet. Habitat is prairie ecosystems. It is a keystone species for eagles, and burrowing owls. Diet is grass and sometimes insects, such as grasshoppers.	SC
Swift Fox	The tiny swift fox (4-7 pounds) is a species of eastern plains and western valleys.	SC

j. The water activity provides a high level of benefit to Colorado in relationship to the amount of funds requested.

The proposed project to build, assess, and document accounting and administration tools will constrain costs to facilitate lease fallowing in the Arkansas River Basin by collaborating to develop a basin-wide preferred methodology — a common platform — that can be a statewide template for temporary water transfers under lease fallowing. The high level of project benefits meet various needs: constraining costs, protecting other water rights holders from injury, sustaining agricultural economies, maintaining open space, preserving the institutionalized and long recognized water court process — while facilitating the implementation of lease fallowing.

The high level of benefit to Colorado in relationship to the amount requested can be assessed in light

of costs constrained. For example, in 2009, project co-sponsor Pueblo Board of Water Works acquired ~ 27 percent of the Bessemer Mutual Irrigation Ditch Company shares for ~$56 million. The Board will gain ~7,000 acre feet to strengthen its water rights portfolio. The Pueblo Board of Water Works anticipates that its water court change case will take five years to complete at a cost of ~ $2.7 million in legal, engineering, and permitting expense. In 2011, project co-sponsor Lower Arkansas Valley Water Conservancy District estimated that the engineering costs for a single change case to implement one lease fallowing agreement are ~ $7 million (Honey Creek Resources 2011).

k. The water activity is complimentary to or assists in the implementation of other CWCB programs.

The proposed project to build, assess, and document accounting and administration tools is complementary to or assists in the implementation of the Arkansas River Decision Support System. ArkDSS will provide State agencies, water providers, and water users with the appropriate data and analytical tools to conduct water resources planning and management in the basin. The ArkDSS feasibility study identified several needs that the Arkansas River basin accounting and administration tools will help address. Those include:

- Providing a tool for analyzing the impact of a curtailment of water rights;
- Incorporating data into an accounting or administration tool;
- Providing a tool for quantifying the impacts on groundwater recharge and surface runoff; and
- Providing data on the vertical stratigraphy of the alluvial aquifer.

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 source of the water supply for the lease fallowing water market is seven irrigation ditches currently in agricultural use, where ~ 80 percent of shareholders indicated an interest in participating in a "Super Ditch" style lease fallowing program. Table 5 sums information regarding participating ditches. The tally of average annual diversions of water is 577,669 acre feet. Of this amount, it is estimated that ~ 62,000 acre feet will be leasable, at best.

TABLE 5. DESCRIPTION OF WATER SUPPLY SOURCE

Ditch	Cropping Types	Irrigated Acreage	1976-2004 Average Annual Diversions
Bessemer Ditch	Alfalfa, corn (silage), dry beans, grass/pasture	17,980	66,226 acre feet
Rocky Ford Highline	Alfalfa, grass/pasture, small grains, dry beans	22,114	89,037 acre feet
Oxford Farmers Ditch	Alfalfa, dry beans, grass/pasture, small grains	5,345	26,700 acre feet
Otero Canal	Alfalfa, grass/pasture, small grains	3,472	7,693 acre feet
Caitlin Canal	Alfalfa, grass/pasture, small grains,	18,403	92,889 acre feet

TABLE 5. DESCRIPTION OF WATER SUPPLY SOURCE			
Ditch	Cropping Types	Irrigated Acreage	1976-2004 Average Annual Diversions
	vegetables		
Holbrook Canal	Alfalfa, grass/pasture, small grains	15,097	49,979 acre feet
Fort Lyon Canal	Alfalfa, grass/pasture, small grains, wheat	92,192	245,145 acre feet
Overall Total		174,604	577,669

Source: 2003 Colorado Decision Support System Hydrobase

A successful "Super Ditch" style program could lease-fallow up to one-third of area irrigated land. Water bodies potentially affected include the mainstem Arkansas, surface water and groundwater river return flows, junior up river water calling rights, and down river water quality. Table 6 lists local canals and ditches in the five county area between Pueblo Reservoir and John Martin Reservoir.

TABLE 6. LOCAL CANALS AND DITCHES POTENTIALLY AFFECTED	
County	Canals and Ditches
PUEBLO	Excelsior Ditch, Hampbell Ditch, Bessemer Ditch, West Pueblo Ditch, Collier Ditch, Riverside Dairy Ditch, Colorado Canal
OTERO	Oxford Farmers Ditch, High Line Canal, Otero Canal, Catlin Canal, Rocky Ford Canal, Fort Lyon Canal
CROWLEY	Colorado Canal, Baldwin -Stubbs Ditch, Holbrook Canal
BENT	Fort Lyon Canal, Kicking Bird Canal (a storage artery) , Las Animas Consolidated Canal, Highland Ditch, Keesee Ditch, Riverside Lateral, Las Animas Consolidated Extension, Canal Fort Bent Canal Comanche
PROWERS	X-Y Canal, Buffalo Canal, Manvel Ditch, Fort Lyon Canal, Fort Bent Canal, Lamar Ditch, Graham Ditch, Sisson Ditch, Amity Canal, Hyde Canal, Kicking Bird Canal (a storage artery)

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

Previous studies / existing tools will be incorporated into the proposed project. Existing technical tools will be utilized to build and assess the accounting and administration tool. These include the Irrigation System Analysis Model and Colorado State University irrigation-stream-aquifer system modeling.

Irrigation System Analysis Model (ISAM) was developed by Colorado Division of Water Resources to evaluate improvement to irrigation systems, as required by the *Compact Rules Governing Improvements to Surface Water Irrigation Systems in the Arkansas River Basin in Colorado.* ISAM evaluations and any resulting plan for mitigation insure compliance with the Arkansas River Compact. ISAM incorporates several computational processes of the Hydrologic-Institutional (HI) Model, a lumped parameter model used by Colorado and Kansas to administer the Arkansas River Compact.

ISAM data requirements, and its computational logic and processes, will be incorporated into the accounting and administration tool. For instance, ISAM uses available data to simulate the application

of irrigation water to a field. ISAM relies upon input data parameters of crop types, crop evapotranspiration (ET), precipitation, soils types and available water capacity, canal and lateral seepage loss factors, irrigation efficiency, and surface runoff and deep percolation fractions to calculate monthly values of actual crop ET, surface runoff and deep percolation (recharge to the aquifer) based on monthly headgate diversions made by the canal. ISAM will be an integral part of the accounting and administration tool, coupled with an appropriate modeling scheme to determine the timing of lagged groundwater return flows (such as a Glover model).

Colorado State University (CSU) developed regional-scale models of the irrigated alluvial groundwater system to help assess the impact of water and salinity management strategies as part of its work since 1999 to identify and solve water management problems in the irrigation-stream-aquifer system of the Lower Arkansas River. CSU models join the MODFLOW-UZF (McDonald and Harbaugh 1988, Niswonger et al 2006) groundwater flow model with the MT3DMS (Zheng and Wang 1999) contaminant transport model. The model has been used to predict (among other output variables) water table depth, soil water content, crop yield, rate and concentration of groundwater return flows to the river, and contribution of groundwater upflux to consumptive use. The model can estimate impacts on these variables due to changes in irrigation patterns and amounts, like those under the proposed lease fallowing program.

An enhanced version of the CSU model forms a basis for supplying input data and for evaluating the accuracy of developed accounting and administration tools. The enhanced model is designed to predict groundwater flows and return flows to tributaries and the Arkansas in an upstream region (near La Junta, 1999-2009) and in a downstream region (Lamar to the stateline, 2002-2007). The modeled upstream region coincides within the area served by "Super Ditch" canals. It covers ~125,000 acres (~65,300 irrigated). The flow model has been calibrated against depth to groundwater, river return flows, canal seepage, groundwater upflux, and estimates of ET.

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.

Scope of Work

WATER ACTIVITY NAME — Building, Assessing, and Documenting Accounting and Administration Tools for Lease Fallowing in the Arkansas River Basin Between Pueblo Reservoir and John Martin Reservoir

GRANT RECIPIENT — Upper Arkansas Water Conservancy District

FUNDING SOURCE — Water Supply Reserve Account Competitive Grant Program along with a cash match from the Lower Arkansas Valley Water Conservancy District of $17,605, plus an Arkansas Basin Roundtable contribution of $20,000.

INTRODUCTION AND BACKGROUND

Provide a brief project description. (No more than 200 words; to inform reviewers and the public.)

WSRA funding will be used to build, assess, and document tools that will reduce the complexity of calculating transferrable consumptive use and assessing impacts to return flows resulting from lease fallowing agreements. The tools will facilitate the implementation of a "Super Ditch" style lease fallowing program in the Arkansas River Valley between Pueblo Reservoir and John Martin Reservoir to help meet water supply needs. Leasable water can help meet the projected statewide water supply gap of 200,000 to 600,000 acre feet by 2050 (Statewide Water Supply Initiative [SWSI] 2010). The Arkansas Basin Roundtable *Consumptive Use Water Needs Assessment: 2030 – 2008 Update* identified a municipal and industrial shortfall by 2030 of 31,500 acre feet. The State has a sense of urgency regarding its water supply future and identified alternative agricultural transfers as a policy option to meet its gap.

Project benefits include: constraining transactional costs, protecting existing water rights from injury in the least costly fashion, sustaining the area agricultural economy valued at $616.8 million annually, maintaining open space, and preserving the institutionalized and long recognized water court process, while facilitating the implementation of lease fallowing.

OBJECTIVES

The objective of this project is to build, assess, then document tools for accounting and administration of a "Super Ditch" style lease fallowing program in the Arkansas River Basin between Pueblo Reservoir and John Martin Reservoir. The requirements of the accounting and administration tools are:

(1) Quantify the transferrable consumptive use derived from fallowed land parcels;
(2) Quantify the associated changes in the *amount, timing, and location* of:
    (a) surface runoff to drains and to the Arkansas River,
    (b) recharge to the alluvial aquifer, and
    (c) groundwater return flow to drains and to the Arkansas River;
(3) Support the development of plans to maintain return flows at or above historical levels and to quantity transferrable consumptive use at or below historical levels in a manner that complies with Colorado water law and the Arkansas River Compact; and

(4) Develop data interfaces that will complement the Arkansas River Decision Support System (ArkDSS) and build a common technical platform for the transfer of data to and from Hydrobase.

TIMELINE

The lease fallowing tools to be developed are an accounting tool and an administration tool. The project will be completed in seven phases. Work will begin in early 2012 on Phases 1 thru 3, which are fully funded by Alternative Agricultural Water Transfer Methods Competitive grant program funds of $121,500, matched with $157,395 cash contributions in the form of $10,000 each from four project co-sponsors: Upper Arkansas Water Conservancy District, Southeastern Colorado Water Conservancy District, the Board of Water Works of Pueblo, and Colorado Springs Utility with $117,395 from the Lower Arkansas Water Conservancy District.

WSRA funding will complete phase 4 to document the accounting tool then prepare user guidelines. The fully developed accounting tool is scheduled for completion in February 2014.

Phases 5 and 6 involve the development of the administration tool. These phases utilize CDWR hydro-base integration. The final phase 7, deals with development of a GIS interface and annual review process.

TASKS

Phase 1. Define Basic Data Requirements for Accounting Tool (Procedure)

- Task 1a. Define the nature of the required output of the Accounting Tool, considering:
  - Type and units of calculated variables
  - Spatial and temporal resolution of calculations
  - Format of calculations
    - Database structure and access
    - Plots
    - Reporting forms
    - Spatial depiction (GIS)
  - User preferences
  - Requirements of daily river water rights administration
  - Requirements of Compact administration

- Task 1b. Describe the general approach for determining farm headgate (FHG) deliveries of native water rights, considering:
  - Canal headgate diversions
  - Canal system delivery losses
  - On-farm lateral losses

- Task 1c. Describe the general approach for determination of crop ET and consumptive irrigation requirement, considering:
  - Colorado Agricultural Meteorological (CoAgMet) or National Weather Service (NWS) weather station data

  - Compatibility with H-I Model canal-wide crop potential ET estimates
  - Field specific crops
  - Field locations relative to specific weather stations

- Task 1d. Describe the general approach for estimating the impact on the water balance in the unsaturated zone (including the crop root zone), considering:
  - Change in soil water content during fallowing year and post-fallowing year
  - Re-irrigation by groundwater wells during fallowing year
  - Impact of precipitation
  - Contribution from shallow groundwater to changes in soil water content and to soil evaporation

- Task 1e. Describe the general approach for modeling the process by which inflows to the alluvial aquifer accrue to the surface drainage system (open drains, tributary streams, and Arkansas River) for both historic (baseline) and lease fallowing conditions, considering:
  - Deep percolation from the crop root zone, canal and lateral seepage losses, and groundwater recharge
  - Site specific aquifer transmissivity, specific yield, and distances to aquifer boundaries
  - Regional groundwater flow patterns and location of accretion to the surface drainage system
  - Farm specific analyses
  - Patterns of return flow to the surface drainage system during both fallowing year and post-fallowing years

- Task 1f. Technical Committee review and feedback of Phase 1 work

- Task 1g. Deliverable Prepare a detailed memorandum including Technical Committee review describing all methods and results of Phase 1

Phase 2: Develop and Evaluate Accounting Tool - Farm Headgate (FHG) Diversion, Crop ET, Surface Runoff, and Recharge to Aquifer (Procedure)

- Task 2a. Describe land parcels within the CSU upstream study region (from west of Manzanola to near Las Animas) for specific investigation as the development context for the Accounting Tool, considering:
  - Super Ditch Pilot Project fields under the Catlin Canal
  - Rule 14 fields (Amended Use Rules well augmentation fallowed parcels) under the Catlin, Holbrook and Ft Lyon Canals

- Task 2b. Define the required data inputs for existing models
  - Irrigation System Analysis Model (ISAM)
  - CSU MODFLOW-UZF models
  - Glover (stream-aquifer response function type) groundwater model (using data derived from calibrated CSU MODFLOW-UZF models)

- Task 2c. Modify and Enhance ISAM (implemented in Excel)

  - Convert to Access and or SQL database
  - Provide flexibility in selection of input data
    - Interface to import data from Hydrobase
    - Incorporate canal diversions, climatic data, and cropping data
    - Provide capability to enter user-developed data independently
    - Interface with CoAgMet data
  - Provide for adjustable distribution of surface runoff and deep percolation fractions (for "water-short" versus "water-long" conditions)
  - Prepare a draft users' manual and example application for the ISAM component

- Task 2d. Develop link to export ISAM prediction of deep percolation (aquifer recharge) to the Glover (or similar) groundwater model (using a standardized form and format of the output)

- Task 2e. Refine the development and calibration of the CSU model
  - Develop model logic to incorporate differences in the unit area water supply (cfs/acre or shares/acre) as it may vary from farm to farm
  - Develop model logic to incorporate definition of a farm unit and to allow rotational fallowing within the farm unit
  - Update calibration against observed groundwater levels, return flows to the Arkansas River, etc.

- Task 2f. Technical Committee review and feedback of Phase 2 work
  - Provide ISAM Model with user manual and example data set

- Task 2g. <u>Deliverable</u> Prepare a detailed memorandum describing all methods and results of Phase 2

Phase 3: Develop and Evaluate Accounting Tool -- Alluvial Aquifer Response (<u>Procedure</u>)

- Task 3a. Define the alluvial aquifer parameters required for groundwater flow modeling using the Glover model, relying upon calibrated values from CSU MODFLOW-UZF model
  - Outer boundary conditions
  - Saturated thickness
  - Transmissivity and harmonic transmissivity
  - Void ratio
  - Distance to the stream from considered fields (parcels), distance from stream to aquifer boundaries
  - Groundwater gradients (flow paths)
    - Elevation contours
    - Location of impact on streams and rivers with
      - Respect to water rights
      - Respect to inflow to John Martin Reservoir

  Consideration must be given to changes in parameter values as a function of
    - Type of water year (dry, average, wet)
    - Water table elevation

  - Differing share loads among parcels
  - Dispersed versus concentrated parcel locations

- Task 3b. Simulate and compare the timing of recharge (deep percolation, canal seepage, and artificial recharge) to accrue to the surface drainage system, using both the Glover model and the calibrated CSU MODFLOW-UZF model, considering:
  - Regional groundwater flow gradients
  - Effects of selected parcels
  - Evaluation of differences in Glover and CSU model predictions with respect to magnitude, timing, and location and in relation to
    - Impact on water rights
    - Impact on inflow to John Martin Reservoir

- Task 3c. If Task 3b differences are significant,
  - Step 1: Compare ISAM predictions of deep percolation (aquifer recharge) with CSU model predictions of deep percolation under irrigated parcels. If necessary, adjust ISAM parameters to achieve an acceptable match.
  - Step 2: Adjust Glover model parameters to achieve an acceptable match.

- Task 3d. Technical Committee review and feedback of Phase 3 work

- Task 3e. Deliverable Prepare a detailed memorandum describing all methods and results of Phase 3

Phase 4: Document Accounting Tool and Prepare Guidelines for Use (Procedure)

- Task 4a. Prepare a Methods Reference Document and a Users' Manual for the Accounting Tool.
- Task 4b. Technical Committee review and feedback for review of document.
- Task 4c. Deliverable Revise and finalize the Methods Reference Document and User's Manual.

Phase 5: Develop and Evaluate an Administration Tool for Augmentation (Procedure)
Development of the Administration Tool requires that the engineering to be conducted by LAVWCD with WSRA grant funding be completed. It is anticipated that the completion of that study will provide data and information (particularly the location of storage vessels and recharge facilities) required for development of this tool. It will also be necessary for the Super Ditch to declare the location or the planned location of augmentation stations and recharge facilities along the routes of the seven participating canals.

- Identify the procedures required to protect all in-basin water rights considering:
  - Location of controlling call and by pass call
  - Replacement water requirements by stream reach, considering timing, amount, and location
  - Volumetric limits including limits on diversions and CU credits to historical levels
  - Protections to insure compliance with River Compacts
  - Protections of non-participants within each ditch
  - Others

- Additional tasks may be identified upon completion of Phases 1 – 4 and review of the engineering completed by LAVWCD with WRSA grant funding.
- Deliverable Subject the methods and results to review by the Technical Committee

Phase 6: Develop an Operational Tool for transfer of consumptive use credits or net depletions to new points of diversions.
The scope of work for this phase can only be generally described at this time. The completion of Phase 1 – 5 will primarily determine the nature and extent of engineering required. The Operational Tool must incorporate terms and conditions required to maintain historical return flows, prevent expansion of use, hold transferrable consumptive use at or below historical levels, prevent injury to other Arkansas River basin water rights, and insure compliance with the Arkansas River Compact.

- Evaluate whether the Alluvial Aquifer Accretions/Depletions Analysis Tool (AAA/DAT) might be useful as part of the Administration Tool.
- Evaluate administration/operational tools of existing or pending augmentation plans to determine if they may be useful as an Operational Tool.
- Develop the Operational Tool in coordination with the Colorado Division of Water Resources (CDWR) Information Technology (IT) staff to ensure that all facets of the tool can be fully integrated into Hydrobase and meets all DWR IT requirements
- Subject the methods and results to review of the Technical Committee

Phase 7: Evaluate the extent to which GIS-based data display and management might be used to enhance the Administration Tools and the review process for annual operations of a "Super Ditch" style lease fallowing program. **The scope of work for this phase can only be generally described at this time. The completion of Phase 1 – 6 will determine the nature and extent of engineering required.**

BUDGET

Attachment B contains detailed budget documentation, specifically:

Total Costs By Task
Labor Hours By Task and Personnel
Other Direct Costs By Task and Item
In-Kind Contributions By Task

SCHEDULE

The proposed project schedule is reflected Total Costs By Task in Attachment B.

PAYMENT / REQUESTS FOR REIMBURSEMENTS

Payment will be made based on actual expenditures and invoicing by the applicant. 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 Upper Arkansas Water Conservancy District W-9 Form (Required for All Projects) is in Attachment C.

REPORTING

The last five 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 to 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: Ralph L. Scanga, Jr., General Manager, Upper Arkansas Water Conservancy Dist.

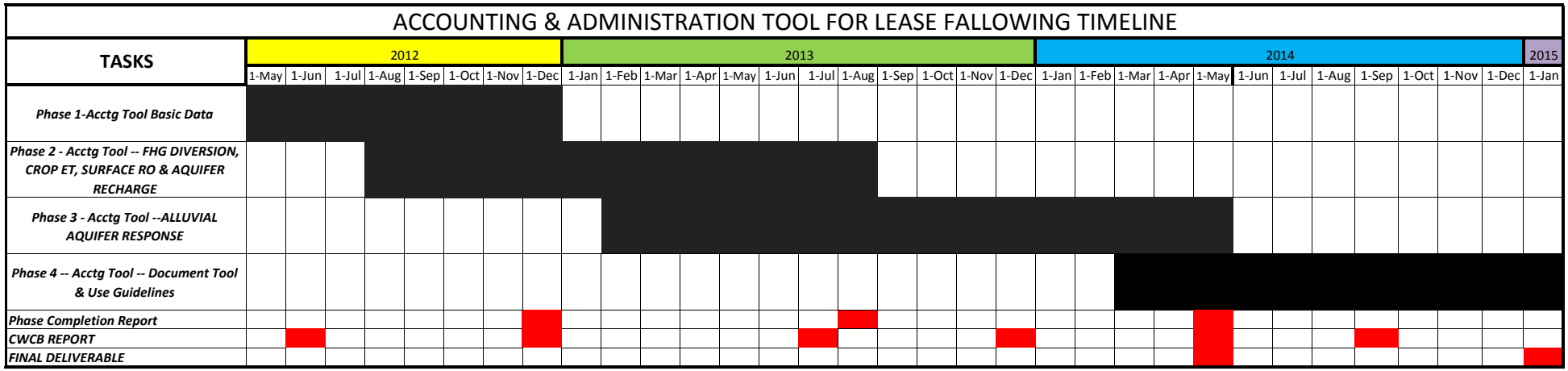
Project Title: Building & Assessing Accounting & Administration Tools for Lease-Fallowing in Colorado's Lower Arkansas River Valley

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

ACCOUNTING & ADMINISTRATION TOOL FOR LEASE FALLOWING TIMELINE



Build, Assess, and Document Accounting and Administration Tools for Lease Fallowing in the Arkansas River Valley

TOTAL COST BY TASK	Personnel Costs	Other Direct Costs	Matching Funds	In-Kind	Total Project Costs
Timeline: 1 Mar - 31 Aug 2012 (6 months)					
Phase 1: Define Accounting Tool Basic Data Requirements					
SubTotal Task Costs	$53,708	$5,925		$13,800	$59,633
Timeline: 1 Jun 2012 - 31 May 2013 (12 months; overlap 3 months with Phase 1)					
Phase 2: Accounting Tool-FHG Diversion, Crop ET, Surface RO, and Aquifer Recharge					
SubTotal Task Costs	$94,417	$6,470		$27,600	$100,886
Timeline: 1 Dec 2012 - 28 Feb 2014 (15 months; overlap 6 months with Phase 2)					
Phase 3: Develop and Evaluate Accounting Tool-Alluvial Aquifer Response					
SubTotal Task Costs	$113,052	$5,323		$27,600	$118,376
Timeline: 1 Mar - 31 Dec 2014 (10 months)					
Phase 4: Document Accounting Tool and Prepare Use Guidelines					
SubTotal Task Costs	$74,989	$1,831		$6,900	$76,820
Timeline: 12 months					
Phase 5: Develop and Evaluate Adminstration Tool for Augmentation					
SubTotal Task Costs	$100,260	$4,462		$27,600	$104,722
Timeline: 12 months, 6 months overlap with Phase 5					
Phase 6: Develop/ Evaluate Adminstration Tool for Operation of CU Transfer Credits/Depletions					
SubTotal Task Costs	$62,994	$4,462		$27,600	$67,456
Timeline: 6 months					
Phase 7: Evaluate GIS Enhancement Options and the Annual Review Process for Operations					
SubTotal Task Costs	$78,070	$4,597		$27,600	$82,667
Total for Phases 1 - 4	$336,166	$19,549			$355,715
Total for Phases 5 - 7	$241,325	$13,520			$254,845
Grand Total	$577,490	$33,070			$610,560
In-Kind Contribution Total				$158,700	