

Water Supply Reserve Account – Grant and Loan Program
Water Activity Summary Sheet
March 16-17, 2016
Agenda Item 14(b)

Applicant & Fiscal Agent: Coalition for the Upper South Platte

Water Activity Name: Horse Creek Restoration Project

Water Activity Purpose: Nonconsumptive (Env/Rec) & M&I

County: Douglas

Drainage Basin: South Platte

Water Source: Horse Creek

Amount Requested/Source of Funds:

\$50,000	Metro Account
\$50,000	South Platte Basin Account
\$550,000	Statewide Account [*]
\$650,000	Total Grant Request

Matching Funds:

Basin Account Match (\$100,000) = 15.4% of total grant request (meets 5% min);

Basin Account & Applicant Match (\$1,322,045) = 203% of total grant request (meets 25% min);

Applicant/3rd Party Match (\$1,222,045) = 188% of total grant request (meets 5% min)

(refer to *Funding Summary/Matching Funds* section)

***Note:** The apparent discrepancy between the \$650,000 Statewide Account request indicated in the application and the \$550,000 Statewide Account request represented herein (and on the spreadsheet accompanying the Memo) can be attributed to the applicant agreeing to reduce their Statewide Account request by \$100,000 to accommodate the Statewide Account funding shortfall.

Staff Recommendation:

Staff recommends approval of up to \$50,000 from the Metro Account; and \$50,000 from the South Platte Basin Account; and \$550,000 from the Statewide Account to help fund the project titled: Horse Creek Restoration Project.
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Water Activity Summary: WSRA funds, if approved, will be expended to: reduce erosion and flooding in Horse Creek, protecting public infrastructure and life safety; reduce approximately 50,000 tons per year of sediment moving downstream; improve habitat for threatened and endangered species (Prebbles Jumping Mouse), other species of concern, fisheries, and provide aquatic species passage from West Creek Reservoir to the mainstem of the South Platte River. These efforts are proposed to counteract the effects of the the Hayman Fire which burned over 137,000 acres of the Upper South Platte watershed in 2002, yielding long-term negative impacts to water infrastructure and environmental values downstream of the fire scar that continue today. The Horse Creek drainage was significantly damaged, and has had continued flooding, and high-levels of erosion, which delivers over 57,000 tons of excess sediment downstream in average years, and during high precipitation periods, has delivered hundreds of thousands of tons (primarily from streambank

erosion). This material has significant negative impacts on water supply infrastructure (particularly with the volume deposited in Strontia Springs Reservoir, but also affecting downstream diversions and flumes). It also has significant impacts on fisheries, and T&E species (this is a Prebbles Mouse habitat area.)

The Horse Creek Project will re-align approximately 2,000 feet of Horse Creek, restore sediment transport function within 6 sub-basins in the Horse Creek Project utilizing heavy equipment and hand crews, stabilize 2 additional sub-basins with hand crews, and replace three bridges in the project area. The new bridges will replace temporary culvert crossings that continue to fail in heavy flows, and destabilize the river with each failure, as well as acting as aquatic species blockage. The new bridges will be single span construction, to allow for debris to pass underneath the structure without damage, and will have weirs built above to direct the thalweg through the center of the channel.

Discussion: This project aligns well with several of the Goals and Measurable Outcomes as addressed in the South Platte Basin Implementation Plan. For example: Goal 1.9.4: South Platte Storage and Other Infrastructure; Goal 1.9.5: Water Quality; Goal 1.9.7 Environmental and Recreational; and Goal 1.9.8: Statewide Long-term Goals (SPBIP; Section 1.9: Goals and Measurable Outcomes, pages 1-24 thru 1-30). Furthermore, the SPBIP lists this effort as an IPP in Section 4.3.2.1: Reuse Identified Projects and Processes; Table 4-10: South Platte and Metro Provider's Reuse IPPs; page 4-25.

In addition this effort advances Colorado's Water Plan Reuse options as a means to close the supply-demand gap as highlighted in Chapter 6.3.2: Reuse (CWP; Chapter 6.3.2: Reuse; pages 6-75 thru 6-81), and promotes Water Quality goals as emphasized in Chapter 7.3: Water Quality (CWP; Chapter 7.3: Water Quality; pages 7-17 thru 7-33).

Issues/Additional Needs:

- The applicant should provide staff with a detailed monitoring plan that describes geomorphic and vegetative monitoring methodologies.
- The monitoring plan should conform to the CWCB Measurable Results Program's Standard Operating Procedures for Topographic Survey of Stream Channels.
http://cwcb.state.co.us/environment/watershed-protection-restoration/Documents/Survey_SOP_CWCB.pdf

Threshold and Evaluation Criteria: The application meets all four Threshold Criteria.

Tier 1-3 Evaluation Criteria:

This project has undergone review and evaluation and staff has determined that this request satisfies the Evaluation Criteria. Further analysis of the project, and how the project will meet Tiered Evaluation Criteria, is provided by the applicant in the WSRA Application.

Funding Summary/Matching Funds:

<u>Funding Source</u>	<u>Cash</u>	<u>In-kind</u>	<u>Total</u>
319 Nonpoint Source Program	\$600,000	\$0	\$600,000
Denver Water	\$200,000	\$0	\$200,000
Aurora Water	\$200,000	\$0	\$200,000
Douglas County	\$50,000	\$0	\$50,000
Coalition for the Upper South Platte	\$0	\$172,045	\$172,045
Subtotal Applicant Match	\$1,050,000	\$172,045	\$1,222,045
WSRA Metro Account	\$50,000	n/a	\$50,000
WSRA South Platte Basin Account	\$50,000	n/a	\$50,000
WSRA Statewide Account	\$550,000	n/a	\$550,000
Total Project Costs	\$1,700,000	\$172,045	\$1,872,045

CWCB Project Manager: Chris Sturm

All products, data and information developed as a result of this grant must be provided to the CWCB in hard copy and electronic format as part of the project documentation. This information will in turn be made widely available to Basin Roundtables and the general public and will help promote the development of a common technical platform. In accordance with the revised WSRA Criteria and Guidelines, staff would like to highlight additional reporting and final deliverable requirements. The specific requirements are provided below.

Reporting: The applicant shall provide the CWCB a progress report every 6 months, beginning from the date of the executed contract. The progress report shall describe the completion or partial completion of the tasks identified in the scope of work including a description of any major issues that have occurred and any corrective action taken to address these issues.

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.

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

January 25, 2016

Mr. Craig Godbout
Colorado Water Conservation Board
1313 Sherman St, Suite 718
Denver, CO 80203

RE: WSRA Application Letter of Support—Horse Creek Restoration Project (Coalition for the Upper South Platte)

Dear Craig,

At its January meeting, the Metro Roundtable voted unanimously to support a request from the Coalition for the Upper South Platte (CUSP) for the Horse Creek Restoration Project, with 1) a commitment from the Metro WSRA fund of \$50,000.00 (with that amount being equally matched by the South Platte Roundtable) and 2) full support and endorsement for CUSP's request to the Statewide WSRA for \$650,000.00. These funds will be matched by other funding sources exceeding \$1.1 million.

The Roundtable sees this project as meeting multiple criteria under our own WSRA Guidance and the priorities identified in the South Platte Basin Implementation Plan, including: 1) meeting environmental and recreational needs, including improving habitat for T&E species (in this case, the Prebles Meadow Jumping Mouse and the Pawnee Montane Skipper) and 2) by helping meet water-supply needs by significantly ameliorating the loss of storage capacity in Strontia Springs Reservoir from sediment depletion, thus providing indirect yield for the basin.

The Roundtable believes that this project fully meets the threshold criteria for the WSRA program. It is consistent with 37-75-102 Colorado Revised Statutes; it is supported by two Roundtables; and it exceeds the matching requirements. We also believe that it meets the criteria under all three tiers of the evaluation criteria: It is highly collaborative as CUSP is working with Denver Water, Aurora Water, the USFS, and Douglas County to name just a few, (and has supplied support letters from these entities); it is highly matched; and it addresses other issues of statewide value.

If you, or the Board, have any questions for me, please do not hesitate to call.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Barbara Biggs', with a stylized flourish at the end.

Barbara Biggs
Chair, Metro Roundtable

January 22, 2016

Craig Godbout - WSRA Application
Colorado Water Conservation Board
1313 Sherman St., Room 721
Denver, CO 80203
Craig.godbout@state.co.us

Dear Mr. Godbout:

The South Platte Basin Roundtable has reviewed the WSRA application from Coalition for the Upper South Platte entitled Horse Creek Restoration Project and voted at its January 12th, 2016 meeting to approve the grant application for \$50,000 from the SPBRT Basin account.

This letter is intended to fulfill Threshold Criteria B (Part III 1.b. in the WSRA Application). The full WSRA Application will be provided separately by the applicant. Please let me know if you need any additional information.

Sincerely,



Joe Frank, Chair
South Platte Basin Roundtable



COLORADO

Parks and Wildlife

Department of Natural Resources

6060 Broadway
Denver, CO 80127
P 303.291.7227 | F 303.291.7114

December 8th, 2015

Craig Godbout
Colorado Water Conservation Board
1313 Sherman St., Room 721
Denver, CO 80203

RE: Coalition for the Upper South Platte's Water Supply Reserve Account Application - Horse Creek Restoration Project.

Dear Craig,

As the principle Aquatic Biologist for the Upper South Platte River Basin for Colorado Parks and Wildlife (CPW), I fully support the Horse Creek Restoration Project proposed by the Coalition for the Upper South Platte (CUSP).

The South Platte River near Deckers Colorado was heavily impacted by the Hayman fire in 2002. These impacts are still occurring today. Fish survey data shows that the number of trout per mile in the South Platte River downstream of Horse Creek is only 63 percent of what it were pre Hayman. Most of these fishery related impacts are from sediment that is brought down to the South Platte River from Horse Creek. This sediment fills in adult and overwinter habitat and reduces the survival of young-of-the-year (YOY) trout.

Horse Creek historically was an important nursery for YOY and juvenile trout. During spawning, trout would migrate into Horse Creek from the South Platte River. After spawning, adult trout would return to the South Platte while once hatched, YOY and juvenile trout would remain in Horse Creek where they were better protected from predation. Due to increased sediment, flooding, and improperly placed culverts in Horse Creek after the Hayman fire, upstream migration of spawning adults has been impacted.

CUSP's proposal to re-align sections of Horse Creek, replace improperly placed culverts with bridges, and to stabilize ephemeral drainages and alluvial fans will reduce the amount of sediment that enters the South Platte River and allow adult trout to migrate up Horse Creek to spawn. These actions will benefit the fishery in the South Platte River.



If you have any questions or would like to discuss this further, please contact me at 303-981-3634.

Sincerely,

A handwritten signature in black ink, appearing to read "Jeff Spohn", with a long horizontal flourish extending to the right.

Jeff Spohn
Aquatic Biologist
Upper South Platte River Basin
Colorado Parks and Wildlife



1600 West 12th Ave
Denver, CO 80204-3412
303.628.6000
denverwater.org

November 6, 2015

Coalition for the Upper South Platte
Box 726
Lake George, CO 80827

Re: Grant Support Letter for the CUSP

To Whom It May Concern:

Denver Water is a municipal corporation that supplies water to 1.3 million people in and around Denver, Colorado. Our water supply is dependent on water generated in watersheds located primarily on U.S. Forest Service and other public and private lands west of Denver. We gather water in three watersheds west of Denver on both sides of the Continental Divide, and move it by canal and conduit as much as 80 miles to treatment facilities located near the city.

The Upper South Platte Watershed (USPW) provides Denver Water 50 percent of its water supply. The USPW has been affected by several large fires (High Meadow, Buffalo Creek and Hayman) in the last ten years. Since the fires, the USPW has been impacted by a large amount of erosion and sediment. Denver Water has spent over 16.5 million dollars to unsuccessfully remove sediment from Strontia Springs Reservoir due to the result of erosion from these fires. The end result from these impacts has been a degradation of water quality especially in the Horse Creek drainage.

Denver Water has a representative on the Coalition of the Upper South Platte (CUSP) Board of Directors and supports the CUSP proposal for this grant to help stabilize the Horse Creek drainage.

The CUSP is a proven leader in the protection and restoration of the USPW and they have a track record of proven results. The CUSP has brought thousands of volunteers to the watershed to accomplish watershed improvement projects, and with this grant support for Horse Creek will continue to accomplish beneficial projects for the watershed. Please consider awarding the CUSP as a grant recipient.

Please contact me if you need additional support information for this CUSP grant application (303-628-6524 or paula.daukas@denverwater.org).

Thank you.

Sincerely,

A handwritten signature in blue ink that reads 'Paula Daukas'.

Paula Daukas
Environmental Planning Manager

MEMORANUM

December 8, 2015

RE: Horse Creek Restoration Grant Support

Grant Review Committee:

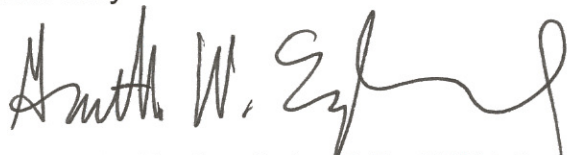
Douglas County supports the continued efforts to design, fund and restore the Horse Creek Channel to pre Hayman fire conditions. Since the Fire the County has been struggling with the degraded condition of the Horse Creek channel. The eroded banks and large sediment loads have washed out driveways and SH 67. This is a real public safety issue for the County, so the improvement of the creek has become a high priority for our County Officials.

The Coalition for the Upper South Platte's (CUSP) worked previously on Trail Creek, located upstream from Horse Creek, by stabilizing the channel and restoring the habitat. The construction of the Trail Creek improvements along with the project coordination went very smoothly with CUSP and their volunteers. They achieved a great amount of work with minimal effort and cost.

The County has coordinated with CUSP since the Hayman fire in 2002 on numerous projects. They have always done their work professionally and timely! With the diverse problems and stakeholders in the Hayman area you can be comfortable that your financial support will go directly to the project implementation.

If you have any questions or would like to speak further regarding our agencies experiences with CUSP and our commitment to this project, please give me a call.

Sincerely



Garth W. Englund, Jr., P.E., CFM | Special Projects Engineer
Douglas County Department of Public Works Engineering
Engineering Services

Address | 100 Third St., Castle Rock, CO 80104

Direct | 303-660-7479 Main | 303-660-7490

Email | genglund@douglas.co.us



Aurora Water



City of Aurora

Water Administration
15151 E Alameda Pkwy, Suite 3600
Aurora, Colorado 80012
303.739.7370

Worth Discovering • auroragov.org

December 1, 2015

Re: Support Letter for the Coalition for the Upper South Platte (CUSP) Grant for Horse Creek Project

To Whom It May Concern:

Aurora Water supplies water to approximately 333,000 people in the third largest city in Colorado. We are dependent on water generated in watersheds located primarily on U.S. Forest Service and other public and private lands west of the metro area. We gather water from three watersheds, the South Platte, the Arkansas and the Colorado, and move it over 200 miles through natural river systems and a system of reservoirs, pipes, and pump stations to treatment facilities located in the City of Aurora.

The South Platte Watershed provides Aurora with approximately 50 percent of its water supply, but nearly 90 percent of our total raw water supply travels down the South Platte River through the Upper South Platte Watershed (USPW). This watershed has been greatly affected by several large fires--High Meadow, Buffalo Creek and Hayman, over the last ten years. Since the fires, the USPW has been subject to a large amount of erosion. The end result from these impacts has been a degradation of water quality due to sediment migration and siltation especially in the Horse Creek drainage.

Aurora Water understands that CUSP is interested in pursuing a grant to help stabilize the Horse Creek drainage along the South Platte River system. Aurora Water has a representative on the Coalition of the Upper South Platte (CUSP) Board of Directors and supports the CUSP proposal for this grant.

The CUSP has brought thousands of volunteers to the watershed to accomplish watershed improvement projects, and with this grant for Horse Creek, will continue to accomplish beneficial projects for the watershed. Please consider awarding the CUSP as a grant recipient.

Sincerely,

Marshall P. Brown
Director, Aurora Water



COLORADO WATER CONSERVATION BOARD

WATER SUPPLY RESERVE ACCOUNT
APPLICATION FORM



Today's Date: November 1, 2015

Horse Creek Restoration Project

Name of Water Activity/Project

Coalition for the Upper South Platte

Name of Applicant

Metro & South Platte

Amount from Statewide Account:

\$650,000*

Amount from Metro Account(s):

\$50,000

Amount from SP Account(s):

\$50,000

Approving Basin Roundtable(s)
(If multiple basins specify amounts in parentheses.)

Total WSRA Funds Requested:

\$750,000*

FEIN: 84-1469785

Application Content

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Water Rights, Availability, and Sustainability	page 10
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Required Exhibits

- A. Statement of Work, Budget, and Schedule
- B. Project Map
- C. As Needed (i.e. letters of support, photos, maps, etc.)

Appendices – Reference Material

- 1. Program Information
- 2. Insurance Requirements
- 3. WSRA Standard Contract Information (Required for Projects Over \$100,000)

Water Supply Reserve Account – Application Form

Revised October 2013

4. W-9 Form (Required for All Projects Prior to Contracting)

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 and approval is outlined in materials in Appendix 1.

Once approved by the local Basin Roundtable, the applicant should submit this application **with a detailed statement of work including budget and schedule as Exhibit A** to CWCB staff by the application deadline.

WSRA applications are due with the roundtable letter of support 60 calendar days prior to the bi-monthly Board meeting at which it will be considered. Board meetings are held in January, March, May, July, September, and November. Meeting details, including scheduled dates, agendas, etc. are posted on the CWCB website at: <http://cwcb.state.co.us> Applications to the WSRA Basin Account are considered at every board meeting, while applications to the WSRA Statewide Account are only considered at the March and September board meetings.

When completing this application, the applicant should refer to the WSRA Criteria and Guidelines available at: <http://cwcb.state.co.us/LoansGrants/water-supply-reserve-account-grants/Documents/WSRACriteriaGuidelines.pdf>. In addition, the applicant should also refer to the [Supplemental Scoring Matrix](#) applied to Evaluation Criteria Tiers 1-3 for Statewide Account requests .

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:

Craig Godbout - WSRA Application
Colorado Water Conservation Board
1313 Sherman St., Room 721
Denver, CO 80203
Craig.godbout@state.co.us

If you have questions or need additional assistance, please contact Craig Godbout at: 303-866-3441 x3210 or craig.godbout@state.co.us.

Water Supply Reserve Account – Application Form
Revised October 2013

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

1.	Applicant Name(s):	Coalition for the Upper South Platte		
	Mailing address:	Box 726, Lake George, CO 80827		
	FEIN #:	84-1469785		
	Primary Contact:	Carol Ekarius	Position/Title:	Executive Director
	Email:	carol@uppersouthplatte.org		
	Phone Numbers:	Cell: 719-439-2268	Office:	719-748-0033
	Alternate Contact:	Mike McHugh	Position/Title:	Permitting Coord, Aurora Water
	Email:	Mmchugh@auroragov.org		
	Phone Numbers:	Cell: 720-381-8866	Office:	303-739-7006

2. Eligible entities for WSRA funds include the following. What type of entity is the Applicant?

- ☐ 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.
- ☐ Public (Districts) – authorities, Title 32/special districts, (conservancy, conservation, and irrigation districts), and water activity enterprises.
- ☐ Private Incorporated – mutual ditch companies, homeowners associations, corporations.
- ☐ Private individuals, partnerships, and sole proprietors are eligible for funding from the Basin Accounts but not for funding from the Statewide Account.
- ☒ Non-governmental organizations – broadly defined as any organization that is not part of the government.

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3. Provide a brief description of your organization

The Hayman fire burned over 137,000 acres of the Upper South Platte watershed in 2002, yielding long-term negative impacts to water infrastructure and environmental values downstream of the fire scar that continue today. The Horse Creek drainage was significantly damaged, and has had continued flooding, and high-levels of erosion, which delivers over 57,000 tons of excess sediment downstream in average years, and during high precipitation periods, has delivered hundreds of thousands of tons (primarily from streambank erosion). This material has significant negative impacts on water supply infrastructure (particularly with the volume deposited in Strontia Springs Reservoir, but also affecting downstream diversions and flumes). It also has significant impacts on fisheries, and T&E species (this is a Prebbles Mouse habitat area.)

The Horse Creek Project will re-align approximately 2,000 feet of Horse Creek, restore sediment transport function within 5 sub-basins in the Horse Creek Project utilizing heavy equipment and hand crews, stabilize 2 additional sub-basins with hand crews, and replace three bridges in the project area. The new bridges will replace temporary culvert crossings that continue to fail and destabilize the river with each failure, as well as acting as aquatic species blockage. The new bridges will be single span construction, to allow for flood debris to pass underneath the structure without damage.

CUSP and the partners in this project did a similar and highly successful restoration project upstream in Trail Creek in 2010 through 2012. We have completed a Watershed Assessment for River Stability and Sediment Supply with the USFS for this project area (this is the preferred methodology of EPA for quantifying and modeling sediment contributions, and prioritizing areas to be worked in. The WARSSS can be seen at http://cusp.ws/wp-content/uploads/2014/05/Horse-Creek-Watershed-Assessment_Final.pdf

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

5. 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 link to this standard contract is included in Appendix 3. Please review this contract and check the appropriate box.

☒ 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.

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6. 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.

NA

Part II. - Description of the Water Activity/Project

1. What is the primary purpose of this grant application? (Please check only one)

☒ Nonconsumptive (Environmental or Recreational)

☐ Agricultural

☒ Municipal/Industrial

☐ Needs Assessment

☐ Education

☐ Other Explain:

2. If you feel this project addresses multiple purposes please explain.

The project directly improves environmental and recreational values in both Horse Creek and the mainstem of the South Platte between Deckers and Strontia Springs Reservoir. It also has a major impact in reducing sediment entering Strontia, which is a municipal reservoir for both Denver and Aurora Water. Post-fire flooding has caused significant sedimentation impacts in the reservoir. Denver and Aurora tried dredging, but it was extraordinarily costly and ineffective. Keeping sediment out of this facility is by far the most cost-effective way for the reservoir to meet its purpose.

3. Is this project primarily a study or implementation of a water activity/project? (Please check only one)

☐ Study

☒ Implementation

4. To catalog measurable results achieved with WSRA funds can you provide any of the following numbers?

New Storage Created (acre-feet)

New Annual Water Supplies Developed, Consumptive or Nonconsumptive (acre-feet)

Existing Storage Preserved or Enhanced (acre-feet)

7,500 Length of Stream Restored or Protected (linear feet)

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4. To help us map WSRA projects please include a map (Exhibit B) and provide the general coordinates below:

Latitude: 105.199641

Longitude: 39.230185

5. 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. A full **Statement of Work** with a detailed budget and schedule is required as **Exhibit A** of this application.

The following is a summary of objectives for this project.

- 1.) Reduce erosion and flooding in Horse Creek, protecting public infrastructure and life safety.
- 2.) Reduce sediment moving downstream by ~50,000 tons per year.
- 3.) Improve habitat for T&E species (Prebbles Jumping Mouse), other species of concern, fisheries, and provide aquatic species passage from West Creek reservoir to the mainstem of the South Platte.

We will accomplish these objectives by

- 1.) Utilizing heavy equipment and hand crews to do restoration on approximately 7,500 feet of channel.
- 2.) Replacing three “temporary” culvert crossings that were installed in the channel after prior floods. These will be replaced with permanent, clear-span bridges which will allow aquatic species passage and eliminate the continuing cycle of the culverts damming, failing, causing bank instability and downstream destruction, and then replacement by the property owners. We will have property own “skin in the game”, however the property owners could never afford to do this on their own.
- 3.) Performing additional hillslope stabilization, seeding, and planting.

WSRA funding will cover approximately 40% the cost of the overall project.

Part III. – 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.)
 - a) The water activity is consistent with Section 37-75-102 Colorado Revised Statutes.¹
 - 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 BRT's 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.
 - 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.
 - d) Matching Requirement: For requests from the Statewide Fund, the applicants will be required to demonstrate a **25 percent** (or greater) match of the total grant request from the other sources, including

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.

Water Supply Reserve Account – Application Form

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by not limited to Basin Funds. A minimum match of 5% of the total grant amount shall be from Basin funds. A minimum match of 5% of the total grant amount must come from the applicant or 3rd party sources. 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 contract or purchase order between the applicant and the State of Colorado is executed. Please describe the source(s) of matching funds. (NOTE: These matching funds should also be reflected in your Detailed Budget in **Exhibit A** of this application)

The project does not affect current water rights holders in a negative fashion. Watershed health has been identified as a priority in the States' Water Plan. This project meets the following objectives outlined in the BIPS by the Metro and South Platte Roundtables:

METRO: Implement projects or programs that enhance environmental and recreational attributes...

SOUTH PLATTE: Identify opportunities to optimize existing and future water supply infrastructure

BOTH: Both plans call for programs or projects that that address T&E species to protect in-basin uses.

We will provide significant match. The total ask shows an 7% match from each basin compared to the state wide funds from WSRA, and the total ask is for approximately 1/3 of the project. With total project budget of \$1.85 million, we expect matching funds and/or inkind resources coming from a variety of other sources, including the 319 Nonpoint Source Grant, USFS, Douglas County, Denver Water, Aurora Water, South Platte Enhancement Board, CDOT, CPW, and other sources. CUSP expects to provide at least 4,000 volunteer hours in the upper portions of basins where handwork is required.

2. For Applications that include a request for funds from the **Statewide Account**, describe how the water activity/project meets all applicable **Evaluation Criteria**. (Detailed in Part 3 of the Water Supply Reserve Account Criteria and Guidelines and repeated below.) Projects will be assessed on how well they meet the Evaluation Criteria. **Please attach additional pages as necessary.**

Evaluation Criteria – the following criteria will be utilized to further evaluate the merits of the water activity proposed for funding from the Statewide Account. In evaluation of proposed water activities, preference will be given to projects that meet one or more criteria from each of the three “tiers” or categories. Each “tier” is grouped in level of importance. For instance, projects that meet Tier 1 criteria will outweigh projects that only meet Tier 3 criteria. The applicant should also refer to the Supplemental Scoring Matrix applied to Evaluation Criteria Tiers 1-3 for Statewide Account requests. WSRA grant requests for projects that may qualify for loans through the CWCB loan program will receive preference in the Statewide Evaluation Criteria if the grant request is part of a CWCB loan/WSRA grant package. For these CWCB loan/WSRA grant packages, the applicant must have a CWCB loan/WSRA grant ratio of 1:1 or higher. Preference will be given to those with a higher loan/grant

ratio.

Tier 1: Promoting Collaboration/Cooperation and 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).
- 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.
- 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.

Tier 2: Facilitating Water Activity Implementation

- d. Funding from this Account will reduce the uncertainty that the water activity will be implemented. For this criterion the applicant should 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 or the inability obtaining funding elsewhere).
- e. The amount of matching funds provided by the applicant via direct contributions, demonstrable in-kind contributions, and/or other sources demonstrates a significant & appropriate commitment to the project.

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

- f. The water activity helps sustain agriculture & open space, or meets environmental or recreational needs.
- g. 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.
- h. The water activity assists in the recovery of threatened and endangered wildlife species or Colorado State species of concern.
- i. The water activity provides a high level of benefit to Colorado in relationship to the amount of funds requested.
- j. The water activity is complimentary to or assists in the implementation of other CWCB programs.

Continued: Explanation of how the water activity/project meets all applicable **Evaluation Criteria**.

Please attach additional pages as necessary.

Teir 1: Meets a & b.

This project is part of an ongoing collaborative partnership that has been working on post-fire restoration in the greater Horse Creek drainage. Shortly after the fire, CUSP began running the Hayman Recovery Assistance Center, and began working closely with Douglas County and the USFS in the Horse Creek drainage. The extent and severity of the fire in this drainage continued to cause extreme flood and sediment flows. In 2009 we contracted with Dave Rosgen of Wildland Hydrology to perform a Watershed Assessment for River Stability & Sediment Supply (WARSSS) for the entire Horse Creek basin. It showed

Water Supply Reserve Account – Application Form

Revised October 2013

the Trail Creek sub-basin in the headwaters of the drainage to be the highest priority. In 2011-2013 we implemented a 4-million dollar project that included dozens of partners working collaboratively, including other nonprofits (Rocky Mountain Field Institute, Volunteers for Outdoor Colorado, Mile High Youth Corp, Groundworks Denver, Trout Unlimited), funders (CDPHE, National Forest Foundation, Coke, Vail Resorts, Gates Foundation, and Aurora Water – most of whom also provided not only funds, but also additional support in the form of volunteers), and the heavy-lifting working partners who helped us develop, manage, and implement the project (USFS, NRCS, CPW, Douglas County, Teller County). This project will move continue the collaboration downstream.

Due to the impacts to downstream water infrastructure, and the direct environmental and recreational benefits that are impacted by the erosion in and downstream of Horse Creek, this project clearly meets multiple objectives of federal, state, and local agencies. Improving the state of the Horse Creek drainage has a definite T&E impact, as this drainage was a known Prebbles mouse habitat before the fire, and though it is improving for that type of habitat, we will significantly increase its viability as Prebbles' habitat.

The work is of impact on two basin scales—the South Platte and Metro levels.

Teir 2: Meets d & e.

CUSP's ability to leverage funds from large numbers of sources has already been demonstrated, not only in the Trail Creek project, but also in projects such as our Happy Meadows Restoration, Roads-to-Rivers initiatives, and Trees for Trout projects. We will match WSRA funds at a rate of over 2.5:1.

Teir 3: Meets f, h, i and j.

This project obviously benefits environmental and recreation interests. It assists with T&E species, and in Trail Creek, we saw improvements in Northern Leopard Frog numbers, a state species of concern. It is highly beneficial relative to the funds requested, and is complimentary to other CWCB interests, such as watershed health and flood mitigation.

Part IV. – 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 water rights issues, and the name/location of water bodies affected by the water activity.

NA

2. Please provide a brief narrative of any related studies or permitting issues.

We have completed all phases of the WARSSS study and plan for this project. We will be required to have a 404 permit, stormwater permit, and floodplain permit, and will seek each prior to implementation. NEPA (completed

for the project by the USFS) is almost complete, and will be finalized prior to implementation.

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.** All WSRA funds are disbursed on a reimbursement basis after review invoices and appropriate backup material.

Please provide a detailed statement of work using the template in Exhibit A. Additional sections or modifications may be included as necessary. Please define all acronyms and include page numbers.
See attached Exhibit A.

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.

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 10 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.

Water Supply Reserve Account – Application Form
Revised October 2013

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

Signature of Applicant:

Carol Ekarius

Print Applicant's Name:

COALITION FOR THE UPPER SOUTH PLATTE
CAROL EKARIUS, EXECUTIVE DIRECTOR

Project Title:

HORSE CREEK RESTORATION

Date:

11/30/15

Return an electronic version (hardcopy may also be submitted) of this application to:

Craig Godbout – WSRA Application
Colorado Water Conservation Board
1313 Sherman St., Room 721
Denver, CO 80203
303-866-3441, ext. 3210 (office)
303-547-8061 (cell)
craig.godbout@state.co.us

Exhibit A
Scope of Work

GRANTEE and FISCAL AGENT (if different): Coalition for the Upper South Platte

PRIMARY CONTACT: Carol Ekarius

ADDRESS: Box 726, Lake George, CO 80827

PHONE: (719) 748-0033

PROJECT NAME: Horse Creek Restoration

GRANT AMOUNT:	Amount from Statewide Account:	\$650,000
	Amount from Metro Account(s):	\$50,000
	Amount from SP Account(s):	\$50,000
	Total WSRA Funds Requested:	\$750,00
	Additional Match:	\$1,122,045

INTRODUCTION AND BACKGROUND

Provide a brief description of the project. (Please limit to half a page)

The Hayman fire burned over 137,000 acres of the Upper South Platte watershed in 2002, yielding long-term negative impacts to water infrastructure and environmental values downstream of the fire scar that continue today. The Horse Creek drainage was significantly damaged, and has had continued flooding, and high-levels of erosion, which delivers over 57,000 tons of excess sediment downstream in average years, and during high precipitation periods, has delivered hundreds of thousands of tons (primarily from streambank erosion). This material has significant negative impacts on water supply infrastructure (particularly with the volume deposited in Strontia Springs Reservoir, but also affecting downstream diversions and flumes). It also has significant impacts on fisheries, and T&E species (this is a Prebbles Mouse habitat area.)

The Horse Creek Project will re-align approximately 2,000 feet of Horse Creek, restore sediment transport function within 6 sub-basins in the Horse Creek Project utilizing heavy equipment and hand crews, stabilize 2 additional sub-basins with hand crews, and replace three bridges in the project area. The new bridges will replace temporary culvert crossings that continue to fail in

heavy flows, and destabilize the river with each failure, as well as acting as aquatic species blockage. The new bridges will be single span construction, to allow for debris to pass underneath the structure without damage, and will have weirs built above to direct the thalweg through the center of the channel.

CUSP and the partners in this project did a similar and highly successful restoration project upstream in Trail Creek in 2010 through 2012. We have completed a Watershed Assessment for River Stability and Sediment Supply (WARSSS) with the USFS for this project area (this is the preferred methodology of EPA for quantifying and modeling sediment contributions), and prioritizing areas to be worked in. The WARSSS can be seen at http://cusp.ws/wp-content/uploads/2014/05/Horse-Creek-Watershed-Assessment_Final.pdf

OBJECTIVES

List the objectives of the project. Please include objectives for all aspects of the project whether funded by the CWCB or not

The following is a summary of objectives for the term of the grant.

- 1) Reduce erosion and flooding in Horse Creek, protecting public infrastructure and life safety.
- 2) Reduce sediment moving downstream by ~50,000 tons per year.
- 3) Improve habitat for both T&E species (Prebbles Jumping Mouse) and fisheries, and provide for aquatic species passage on ~7.5 miles of river where it is currently blocked.

TASKS

Provide a detailed description of each task using the following format. Detailed descriptions are only required for CWCB funded tasks. Other tasks should be identified but do not require details beyond a brief description.

TASK 1 – [Heavy Equipment: channel restoration, bridges, alluvial fan stabilization]

This task involves implementing the heavy-equipment aspects of the design. See attached design.

Method/Procedure

- 1) Contractor will be supervised by onsite project manager/hydrologist with extensive experience in implementing dozens of similar restoration projects.
- 2) Contractor will construct such items as j-hook veins, weirs, log rollers, sills, crib walls, and sediment detention basins in alluvial fans.

Deliverables

- 1) 2000 LF of channel stabilization in mainstem of Horsecreek, per attached design

document.

- 2) 5000 LF of ephemeral channel/alluvial fan stabilization in five subwatersheds, per attached design.
- 3) Removal of three temporary culvert systems put in after various floods, and replace with clear span bridges, with installation of cross veins upstream to place energy of the river into the center of the channel through the bridge.

TASK 2 – [Bridges]

The existing culverts crossing the stream have failed myriad times since the fire, and with every failure, they cause significant impacts. They typically plug with logs and debris, acting as a dam. When they blow out, they increase the flood impacts in both the area where the backwater built up and downstream. One such blowout contributed to the loss of Hwy 67, which had significant impacts on the community and economy. Another blowout this year threatened the road again. The culverts all act as fish barriers, and CPW supports their replacement, and has asked us to help make that happen if at all possible. Owners will have some “skin in the game” with regard to matching funds, but these are not people who could rebuild a bridge on their own.

Method/Procedure

- 1) Contract with engineering firm/bridge company to design and install bridges.

Deliverables

- 1.) Replace three problem culvert crossings with clear-span bridges.

TASK 3 – [Hand Crew: hillslope and small channel stabilization]

This task will involve CUSP’s field crew and volunteers working higher in the drainages in the five subbasins that are slated for heavy equipment work, as well as two other subbasins to stabilize hillslopes and zero/first-order drainages, as identified in the

Method/Procedure

1.) CUSP’s field crew is experienced at producing a variety of on-the-ground techniques for reducing erosion. The crew manages over 3,000 volunteers each field season.

Deliverables

- 1) 500 head cut stabilizations,
- 2) 3500 feet of log rollers or flying V’s depending upon site
- 3) 60,000 seedlings planted
- 4) 125 acres seeded
- 5) 20,000 willows planted (sourced in vicinity)
- 6) 2000 feet seeding and jute on cut banks and areas requiring extra TLC

- 7) Rehab all staging areas and equipment disturbance areas.

TASK 4 – [Project Management: landowner coordination, oversight, reporting, outreach]

This task involves the oversight and reporting of project activities and outcomes.

Deliverables

- 1) Facilitate stakeholder and landowner coordination
- 2) Acquire and manage additional funding
- 3) Coordinate volunteers
- 4) Contracting and management of consultants, heavy equipment crews, and agreements with other service providers (other NGOs, handcrews, etc)
- 5) Follow CWCB reporting as described below
- 6) Provide as-built drawings, shape files and pertinent monitoring data to document work completed.

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 Narrative: We have applied to the 319 Nonpoint Source Program for \$600,000. 319 has been a committed funder in the work to date, and has a good working relationship with CUSP, having awarded us with the 2015 Nonpoint Source Excellence in Stewardship Award. Additional funding and various inkind support is coming from Denver Water (\$200,000 committed), Aurora Water (\$200,000 committed), Douglas County (\$50,000 committed), USFS, CDOT, CPW, Trout Unlimited, landowners and from CUSP's regular fundraising activities. These entities have been involved in the Trail Creek project, and have participated in the planning to date.

Total Cost Analysis			
	WSRA (State & Basin Accts)	Matching	Total Project
Task 1-Heavy equip	\$554,000	\$391,860	\$945,860
Task 2- Bridges	\$120,000	\$299,375	\$419,375
Task 3-Hand work	\$45,000	\$281,910	\$326,910
Task 4- Mngmt	\$31,000	\$23,900	\$54,900
In-kind		\$125,000	\$125,000
Total	\$750,000	\$1,122,045	\$1,872,045

STAFFING								
Title	Exec Director	Op's Director/ Accountant	Deputy Op's or GIS Director	Field Crew Lead & GIS Tech	Natural Res Tech II	Natural Res Tech I & Office	Seasonal	Total
Hourly Rate	\$85.00	\$75.00	\$60.00	\$45.00	\$40.00	\$35.00	\$30.00	
Task 1- Heavy equip	\$1,000	\$6,000	\$4,000					\$11,000
Task 2- Bridges	\$1,000							\$1,000
Task 3- Hand work		\$6,500	\$22,000	\$31,500	\$50,000	\$50,000	\$20,000	\$180,000
Task 4- Mngmt	\$10,000	\$4,000	\$3,900	\$3,375		\$3,500		\$24,775
Total Hrs	141	220	498	775	1,250	1,529	667	
Total	\$12,000	\$16,500	\$29,900	\$34,875	\$50,000	\$53,500	\$20,000	\$216,775

Other Direct					
	Materials	Mileage (0.54/ Mile)	Contractors	Misc	Total
Task 1-Heavy equip	\$470,000		\$498,170		\$968,170
Task 2- Bridges	\$372,000		\$65,000		\$437,000
Task 3-Hand work	\$101,200	\$18,000		\$2,700	\$121,900
Task 4- Mngmt	\$1,000	\$1,200		\$1,000	\$3,200
Total	\$944,200	\$19,200	\$563,170	\$3,700	\$1,530,270

In Kind		
	Volunteers (25/hr)	Total
Task 1-Heavy equip		
Task 2- Bridges		
Task 3-Hand work	\$125,000	\$125,000
Task 4- Mngmt		
Hours	5,000	
Total	\$125,000	\$125,000

Schedule		
	Start: Upon Contract + Number of Days	End:Upon Contract + Number of Days (Months)
Task 1-Heavy equip	30	550 (18)
Task 2- Bridges	150	500 (16)
Task 3-Hand work	30	650 (21)
Task 4- Mngmt	1	730 (24)

Exhibit B
Maps



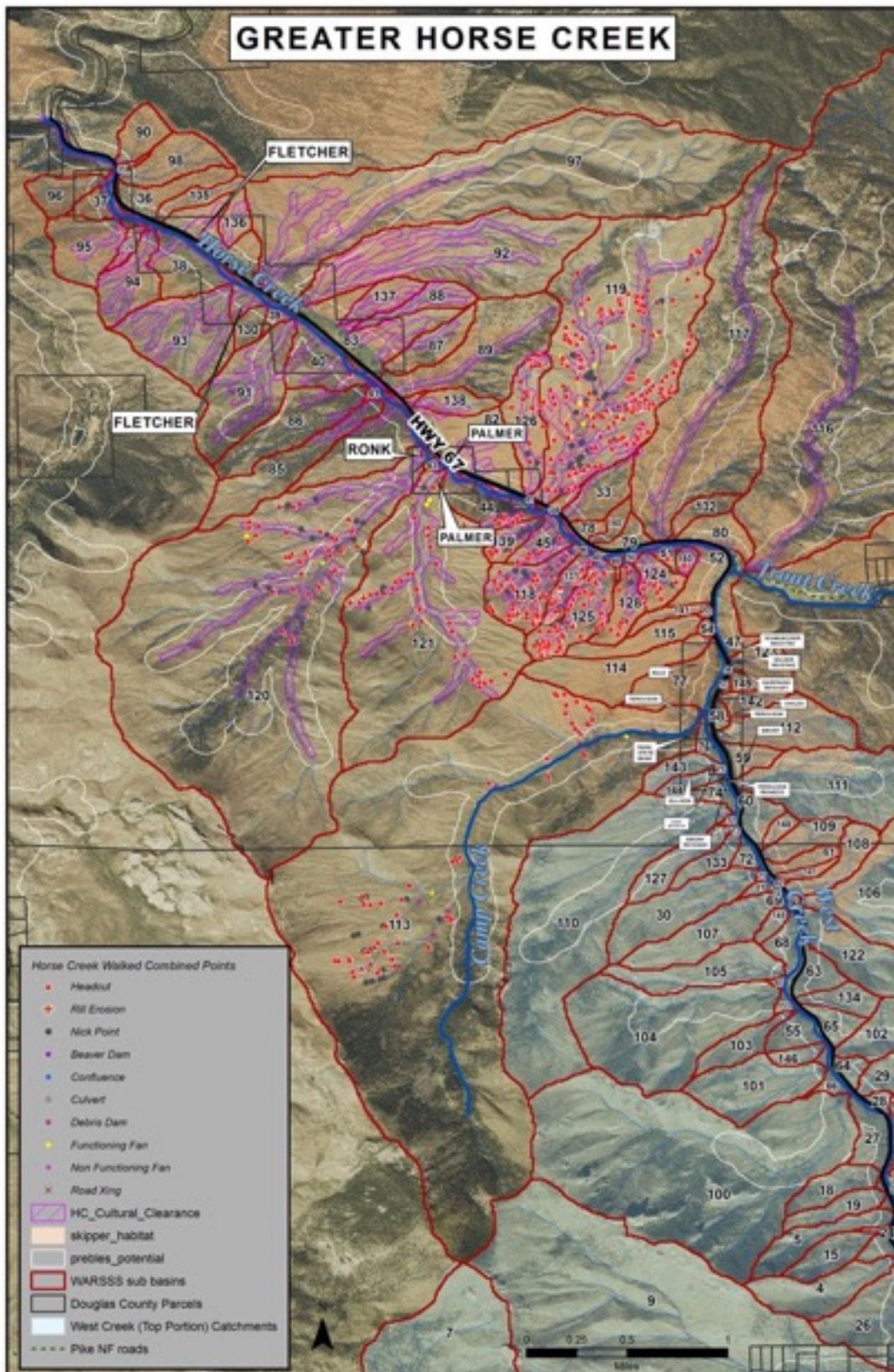
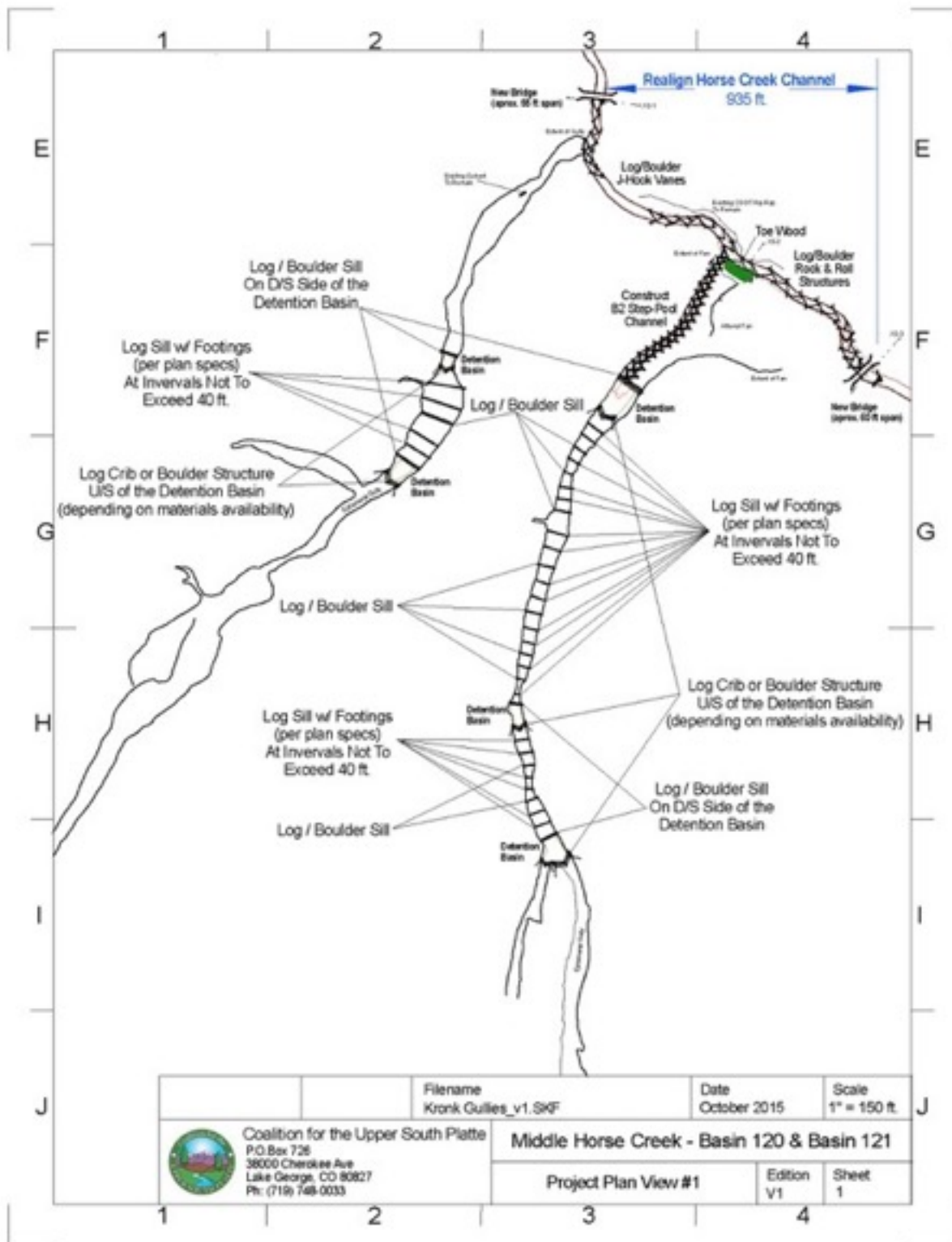
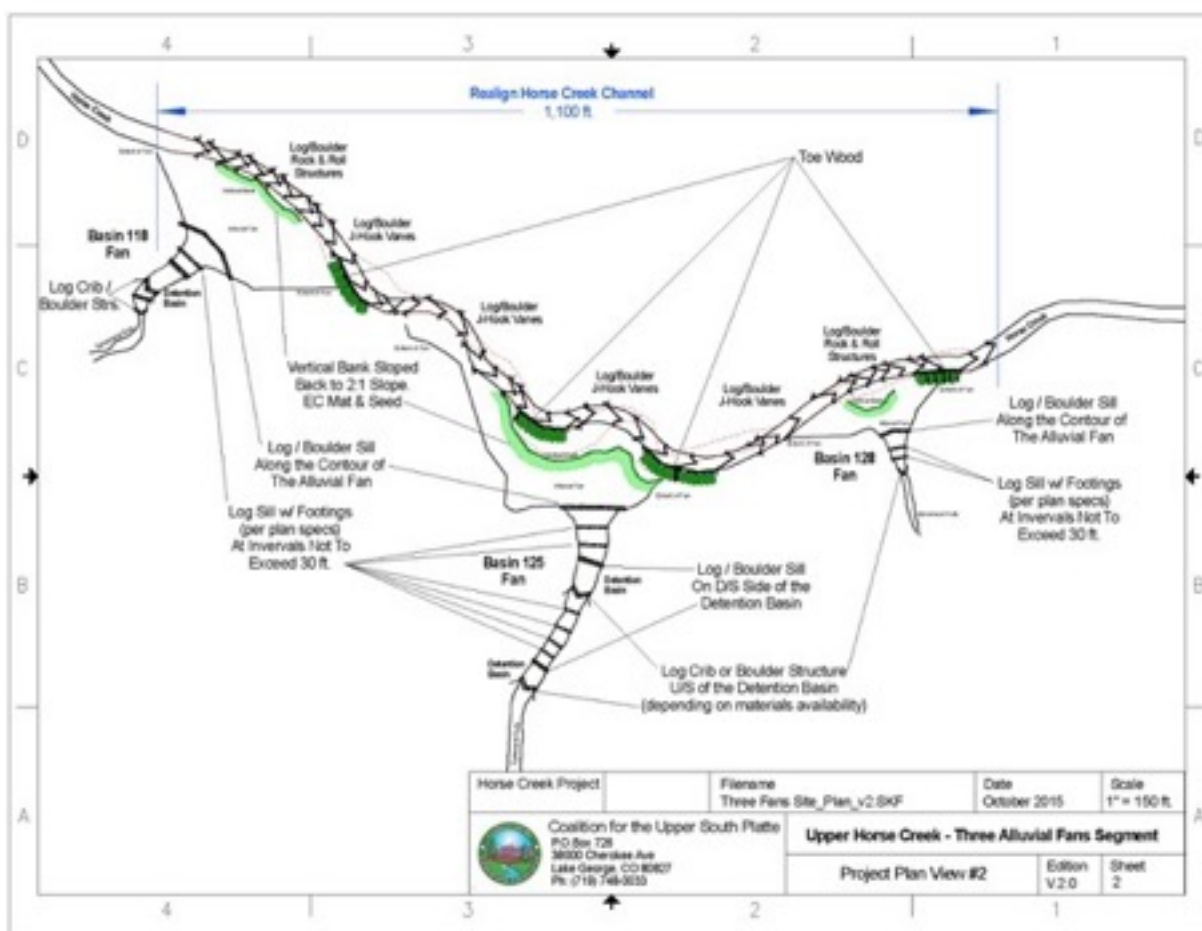
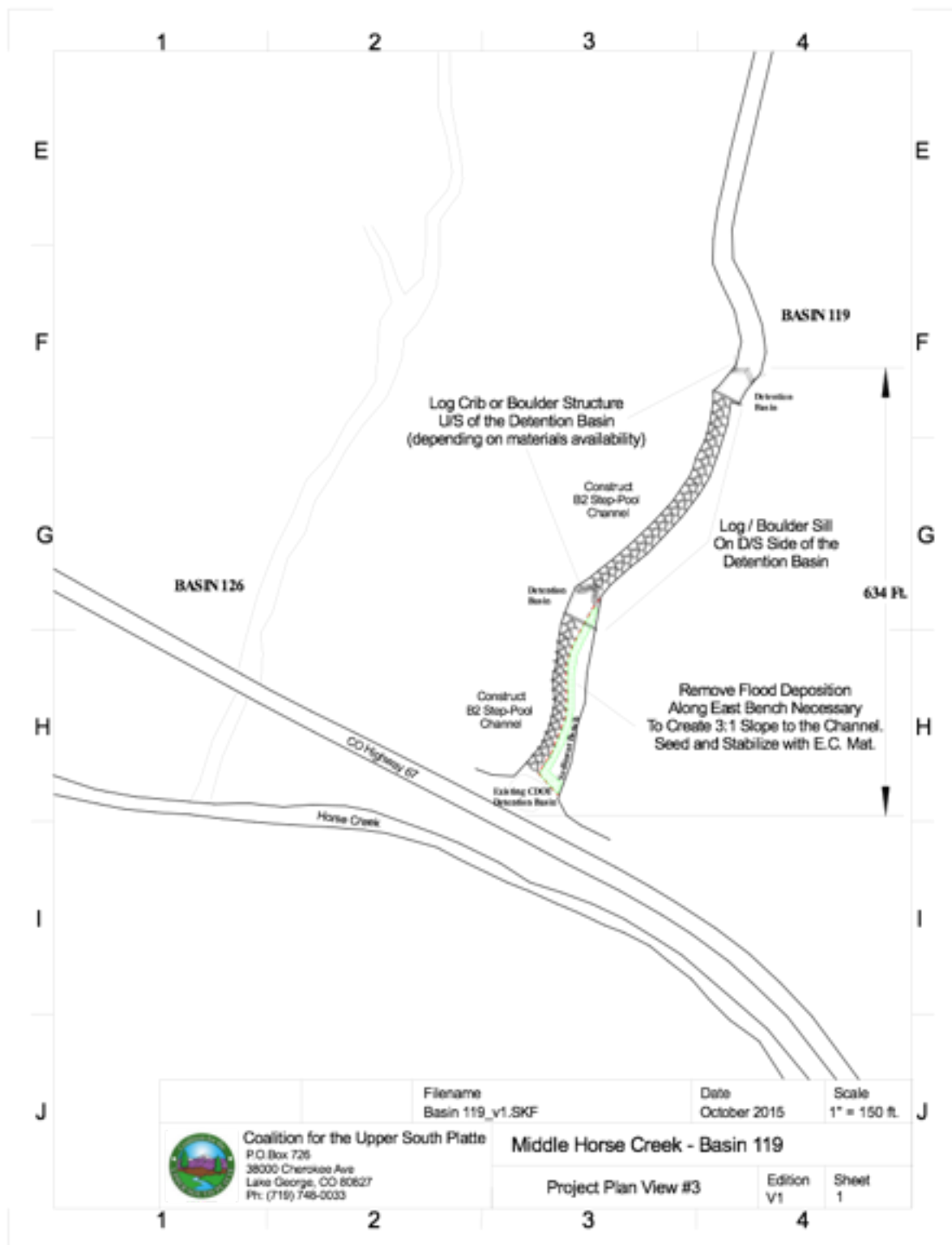


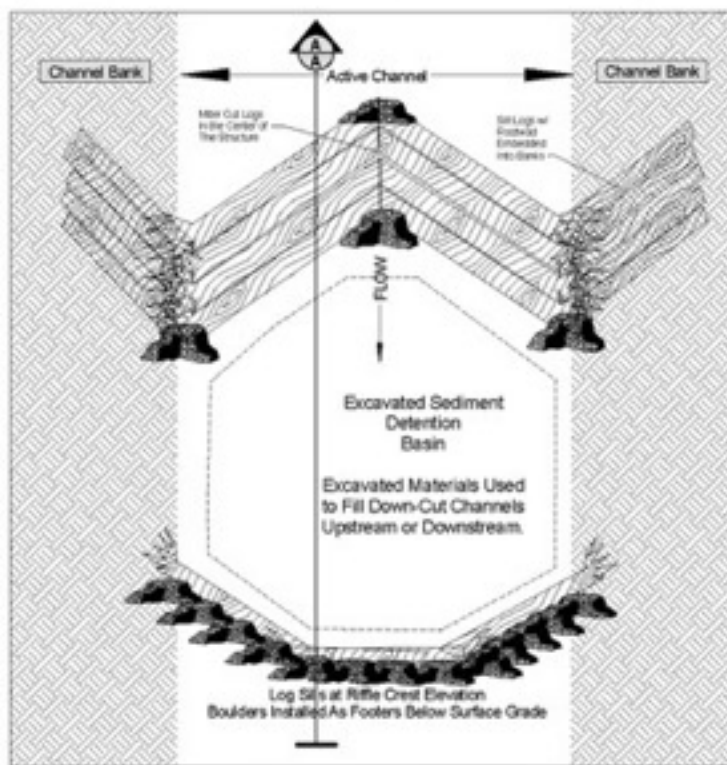
EXHIBIT B **Plans**



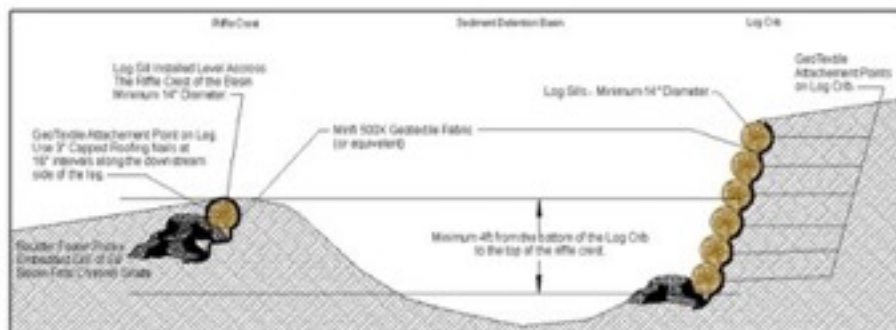





Rev/No	Revision note	Date	Signature	Checked
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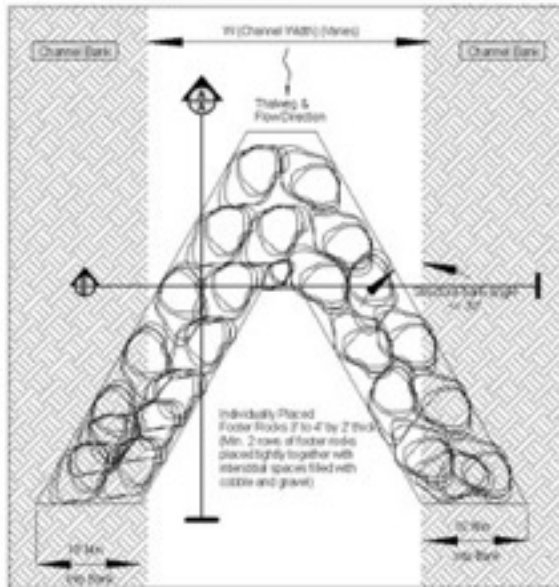
Detail Drawing #1 - Sediment Detention Basin Plan View
Not To Scale



Longitudinal Profile A-A Sediment Basin Profile
Not To Scale

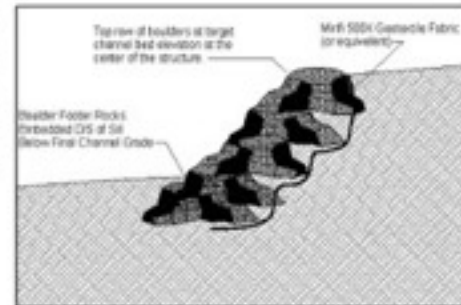
Horse Creek Project	Filename HC Detail 1_Basins.SKF	Date October 2015	Scale NTS
 Coalition for the Upper South Platte P.O. Box 726 38000 Cherokee Ave Lake George, CO 80827 Ph: (719) 748-0033		Sediment Basin Detail Project Detail #1	
		Edition V3	Sheet 3

Rev/No	Revision note	Date	Signature	Checked



Detail Drawing #2 - Boulder Cross Vane Plan View

Not To Scale



Long A-A Boulder Cross Vane Profile

Not To Scale



Cross Section B-B Boulder Cross Vane Profile

Not To Scale

Horse Creek Project

Filename
HC Detail 2_XVane SKF

Date
October 2015

Scale
NTS



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P.O. Box 726
38000 Cherokee Ave
Lake George, CO 80827
Ph: (719) 748-0033

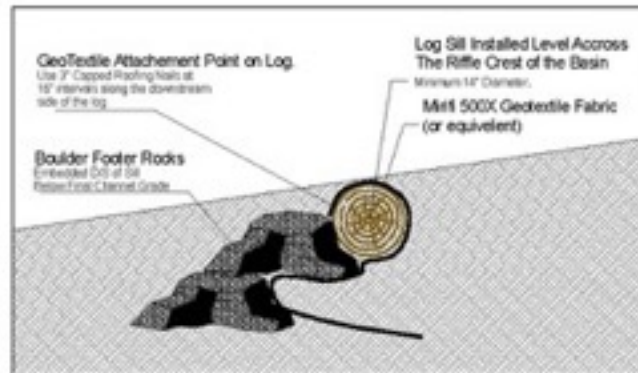
Boulder Cross Vane Details

Project Detail #2

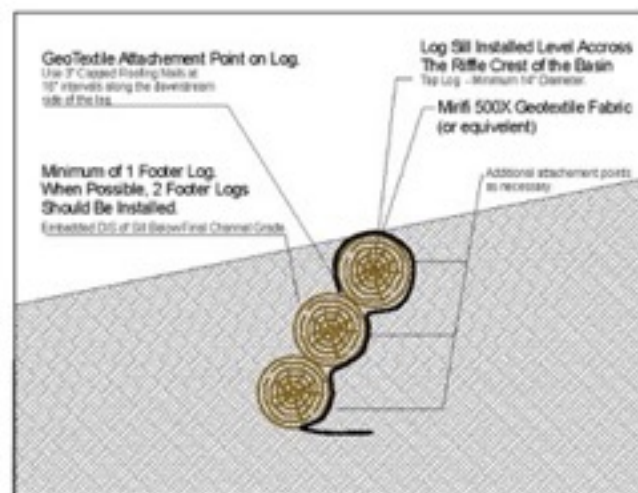
Edition
V3

Sheet
4


Rev/No	Revision note	Date	Signature	Checked
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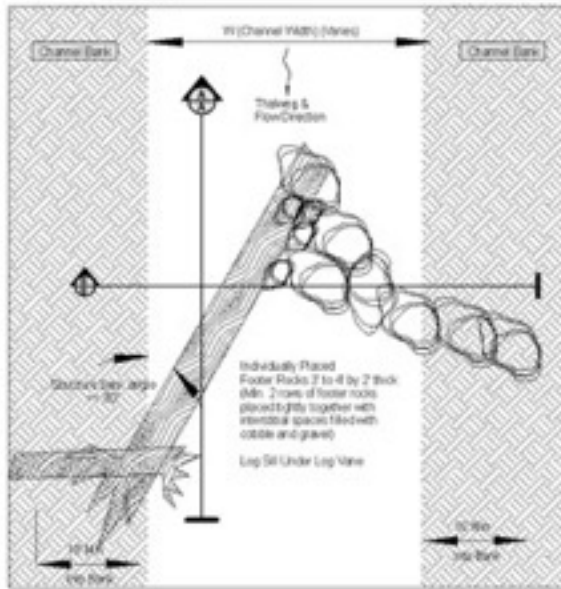
Detail Drawing #3 - Log / Boulder Sill Profile View
Not To Scale



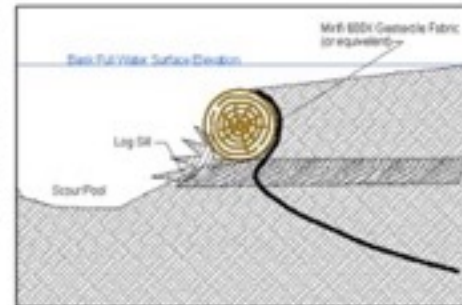
Detail Drawing #4 - Log Sill Profile View
Not To Scale

Horse Creek Project	Filename HC Detail 3_Sills SKF	Date October 2015	Scale NTS
	Coalition for the Upper South Platte P.O. Box 726 38000 Cherokee Ave Lake George, CO 80827 Ph: (719) 748-0093	Log/Boulder Sill & Log Sill Details	
		Project Detail #3	Edition V3

Rev/No	Revision note	Date	Signature	Checked



Detail Drawing #4 - Log/ Boulder J-Hook Vane Plan View
Not To Scale



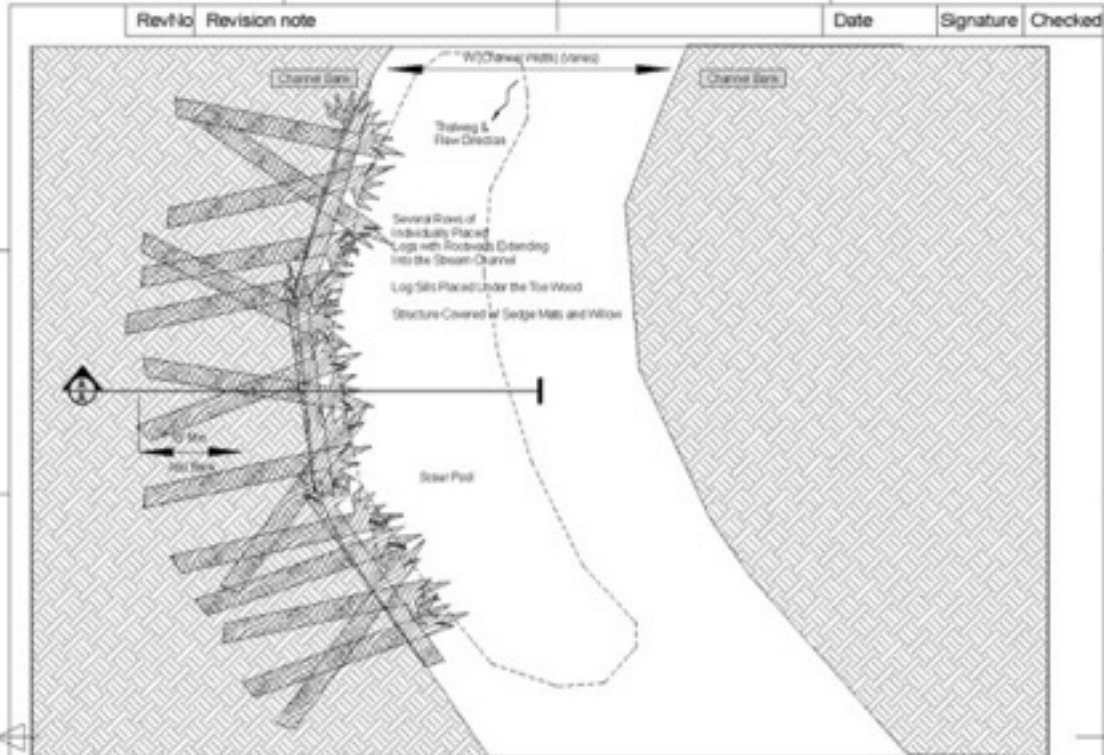
Long A-A Log / Boulder J-Hook Vane Profile
Not To Scale



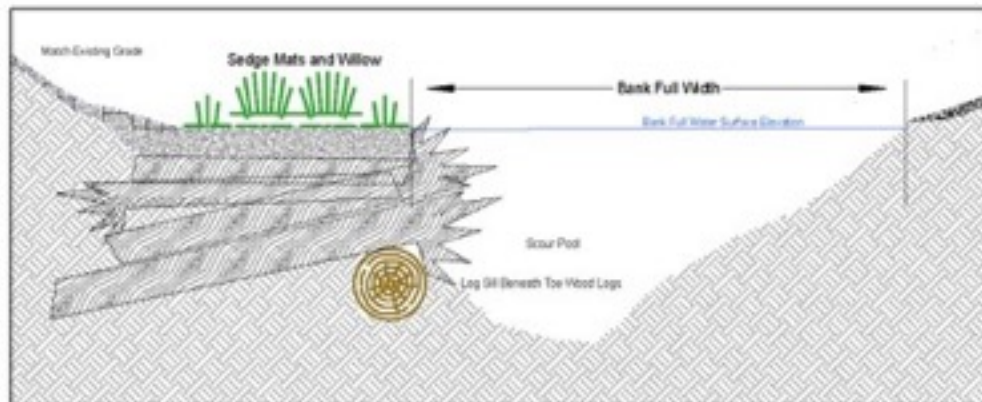
Cross Section B-B Log / Boulder J-Hook Vane Profile
Not To Scale

Horse Creek Project	Filename HC Detail 4_JHook.SKF	Date October 2015	Scale NTS
 Coalition for the Upper South Platte P.O. Box 726 38000 Cherokee Ave Lake George, CO 80827 Ph: (719) 748-0093		Log / Boulder J-Hook Vane Detail Project Detail #4	
		Edition V3	Sheet 6






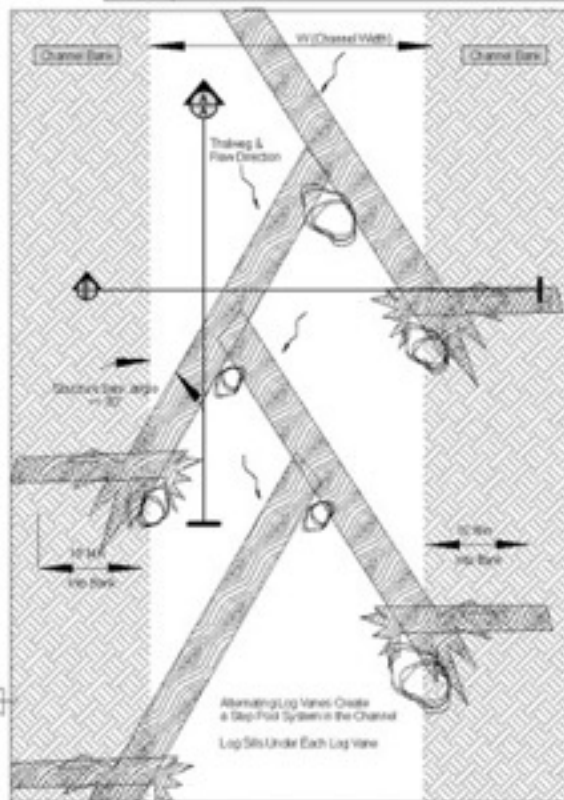
Detail Drawing #5 - Toe Wood Pool Plan View
Not To Scale



Cross Section A-A Toe Wood Pool Profile
Not To Scale

Horse Creek Project	Filename HC Detail 5 ToeWood.SKF	Date October 2015	Scale NTS
	Coalition for the Upper South Platte P.O. Box 726 38000 Cherokee Ave Lake George, CO 80827 Ph: (719) 748-0093	Toe Wood Detail	
		Project Detail #5	Edition V3

Rev'to	Revision note		Date	Signature	Checked
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[illegible]

Training & Flow Direction

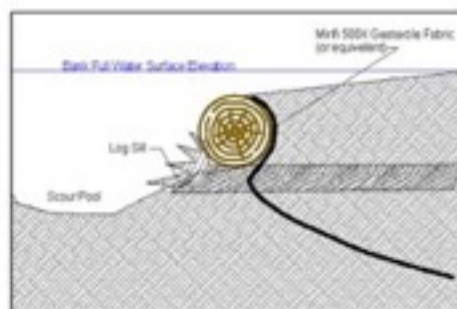
 McGraw-Hill

10

100

Alternating Log Vanes Create a Step-Pool System in the Channel

© 2000 Blackwell Science Ltd



Math 555a: Constructive Euclid

1000

29

Detail Drawing #6 - Log Rock & Roll Structure Plan View

Next To Scale




Shuttle/Vane/Wings demand
Now back full downstroke where the vane is green back to the target, green/red elevation at the root of the shuttle. Shuttle walls slope toward center of stream & between 4:30 and 6:00 o'clock.

Rank Full Width

 Cross Section B-B Log Rock & Roll Structure Profile

Not To Scale

Horse Creek Project	Filename HC Detail 6_RockRoll SKF	Date October 2015	Scale NTS
 Coalition for the Upper South Platte P.O. Box 726 38000 Cherokee Ave Lake George, CO 80827 Ph: (719) 748-0033	Log / Boulder J-Hook Vane Detail		
	Project Detail #6	Edition v3	Sheet 8

Filename
UC Detail 6 - Back-Bed SKV

Date
October 2016

Scale
NTS

Coalition for the Upper South Platte
P.O. Box 726
38000 Cherokee Ave
Lake George, CO 80827
Ph: (719) 748-0033

Log / Boulder J-Hook Vane Detail

Project Detail #6

Edition
v.1

Sheet 8