

Post-Fire Restoration in the Poudre River Watershed
Final Report



Skin Gulch

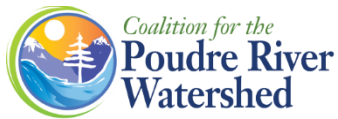


Seaman Reservoir

Prepared for:
Colorado Watershed Restoration Grant
Attn: Chris Sturm

November 30, 2016

Coalition for the Poudre River Watershed
Grant Amount: \$100,000
Prepared by: Jennifer Kovecses



Contents

Introduction	3
Background	3
Objectives and goals of the project.....	3
Background information used for the plan/ project	4
Site Summaries:	4
Site 1: Skin Gulch Post-Fire Restoration Project	5
Skin Gulch specific goals and objectives:	5
Site 2: Seaman Reservoir Delta Stabilization Project	6
Methods	7
Results	8
Skin Gulch Post-Fire Restoration Project	8
Seaman Reservoir Post-Fire Restoration Project	10
Conclusions and Discussion	11
Skin Gulch Post-Fire Restoration Project	11
Skin Gulch – lessons learned and challenges.....	11
Seaman Reservoir Post-Fire Restoration Project	12
Seaman Reservoir Challenges and Lessons Learned	12
Actual Expense Budget	14
References	15
Appendix A: Skin Gulch Supporting Documents	16
Appendix B: Seaman Reservoir Supporting Documents.....	23
Appendix C: Accounting Report (Quickbooks) Showing Match Spent	27

Introduction

The Hewlett Gulch and High Park fires of 2012 burned a total 95,172 acres and caused significant impacts throughout the Poudre watershed. These two fires combined to burn 95, 172 acres of forest, shrub land and grassland resources, heavily impacting the Poudre River watershed. Within days of containing the 87,172-acre High Park fire, a group of agencies, non-profits and individuals gathered to discuss how they could work together to rehabilitate the lands affected by the burn. This informal coalition evolved into the Coalition for the Poudre River Watershed (CPRW). CPRW's mission is to improve and maintain the ecological health of the Poudre watershed through community collaboration.

Modelling work conducted by the Natural Resources Conservation Services predicted that in many catchments in the burn area, post fire conditions would cause a 50- or 100-year (pre-fire) flood to result from a 10-year rain event on burned landscapes. In addition, alluvial fans have been observed along the Highway 14 corridor and in key water infrastructure such as the Seaman Reservoir. In the immediate aftermath of summer storms, key transportation corridors were closed due to flooding resulting from increased flows off burned slopes. Efforts were made by stakeholders to identify which burned sub-drainages were the highest priority for receiving post fire treatments. Several drainages were identified as being as high or very high priority for treatments. Many of these were treated during the Emergency Watershed Protection (EWP) program. However, several high priority areas affected by the High Park fire were not treated before the EWP concluded. Funds from this grant were used to design and implement a post fire restoration treatment at one of these high priority sites, known as Skin Gulch. In addition, funds were also used to help complete post-fire treatments at a site known as UT 21, which was damaged by the Hewlett Fire. UT 21 is critical as it drains directly into Seaman Reservoir, a drinking water supply for the City of Greeley.

We worked collaboratively with several partners to ensure that we could implement well-designed and effective post fire treatments that would reduce erosion, stabilize banks, reduce sediment delivery to the Poudre and protect water quality in high priority sub-watersheds.

Background

Objectives and goals of the project

The goal of this project was to mitigate post-fire erosion stemming from the High Park & Hewlett Gulch wildfires to protect watershed ecosystem services like water supply, transportation, & riverine habitat.

Objectives:

1. Manage a successful collaboration that reduces erosion and subsequent sedimentation in the Poudre River Watershed emanating from burn areas.
2. Coordinate and implement best management practices that increase native vegetation, reduce erosion, and stabilize high priority burn areas of the Poudre River Watershed

We relied on existing prioritizations to determine which sub-watersheds were the most in need of restoration treatments. Based on the prioritizations, we prioritized the Skin Gulch drainage and the Seaman Reservoir for these funds. We engaged local teams to develop appropriate post-fire restoration plans for site specific sub-drainages.

Background information used for the plan/ project

We relied on several sources of background information to establish this project, including:

- Immediately following the High Park Fire, a Burned Area Emergency Response analysis was completed ("[High Park Fire Burned Area Emergency Response \(BAER\) Report July 17, 2012](#)"). The BAER Report helped inform which treatment approaches we would implement.
- In November 2010, the cities of Fort Collins and Greeley funded a study titled "Cache la Poudre Wildfire /Watershed Assessment - Prioritization of watershed-based risks to water supplies", which was prepared by JW Associates. While this work was completed prior to the High Park Fire, the underlying shapefiles and general approach informed how sub-watersheds were prioritized for treatment after the fires of 2012.
- To refine what areas remained in need of treatment after 2013, JW Associates applied the same GIS analysis model to the untreated portions of the watershed. This analysis, entitled "High Park Fire Small Watershed Hazard Prioritization, February 2014" provided the foundation for identifying where restoration could occur in 2014.
- Other documents helped inform decision making including "[Cache la Poudre Rapid Assessment, NRCS - October 2009](#)". This report describes natural resources in the watershed and provided background information on the watershed.
- The High Park Fire Damage Severity Reports¹, completed following September 2013 floods described the hydrological conditions after the September 2013 storms along the Front Range. This document included some measurements of flooding in streams in the burn area and helped identify the flood response of key catchments burned during the 2012 High Park Fire.
- Skin Gulch Restoration Preliminary Design and Analysis, February 2015. Prepared by: Walsh Environmental Scientists and Engineers, LLC was used as a basis of design for our first post fire restoration project under this grant.
- Revised Sediment Mitigation Plan for Unnamed Tributary to Seaman Reservoir, March 31, 2015, AloTerra Restoration Services was used as a basis for design for our second post-fire restoration project at Seaman Reservoir.

Site Summaries:

Funds from this grant contributed to post fire restoration at two high priority sites: Skin Gulch, located near the intersection of Stove Prairie Rd and CO-14, and Unnamed Tributary 21, which drains into the Milton Seaman Reservoir.

¹ This refers to internal reports conducted after the September floods and are based on field observations. These are not formal published documents.

Site 1: Skin Gulch Post-Fire Restoration Project

Skin gulch (HUC watershed number: 101900070303) is a 13,310-acre tributary to the Cache La Poudre River that flows parallel to Stove Prairie Rd and crosses under the CO-14 to connect to the mainstem of the Poudre River (Figure 1). 89% of this drainage is owned and managed by the USFS, Canyon Lakes

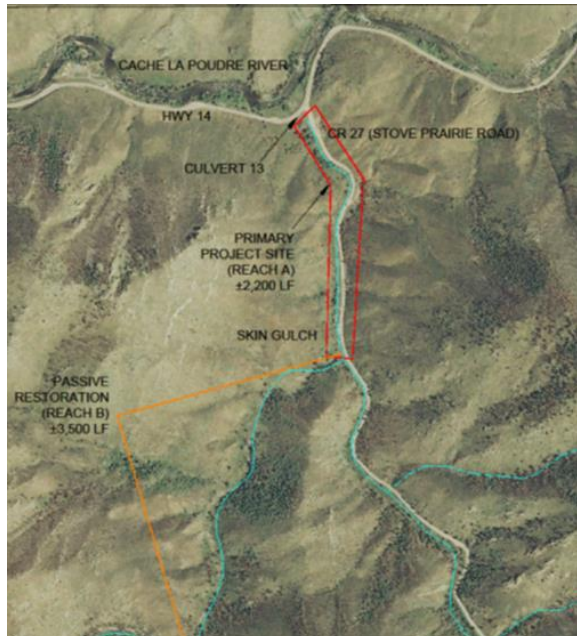


Figure 1. Location of Skin Gulch project, reach A and reach B.

Ranger district. After the 2012 High Park Fire, the USGS estimated a 486% increase in flow in this stream, and an estimated debris flow of over 100,000 m³ in a 10-year 1-hour rainfall event of 1.69 inches, making the restoration of this stream a high priority for multiple stakeholders. Stove Prairie and CO-14 are critical transportation corridors. Skin Gulch connects to the mainstem of the Poudre through a CDOT culvert under CO-14 (Culvert 13, mp 105.71). Large debris flows after the High Park Fire forced CDOT to upgrade the culvert to accommodate larger flows and prevent damage to CO-14. Similarly, post-fire rain events caused severe damage to Stove Prairie Rd multiple times. Skin Gulch was one of the few areas of the Poudre Watershed that was severely damaged during the September 2013 flood event. The post fire conditions in Skin Gulch exacerbated the impacts of the September 2013 event and significant debris

flows, scouring, aggradation, and severe damage to Stove Prairie Rd resulted from that event (Figure 2). Subsequent work by contractors to remove aggraded material and debris resulted in significant alteration to the entire floodplain where it is adjacent to CR 27, Stove Prairie Road. Finally, as Skin Gulch drains directly to the Poudre, eroded sediment and debris has the potential to degrade water quality for drinking water and recreation.

The Skin Gulch project site was divided into 2 reaches. Reach A is approximately 2,200 feet in length, with an average width of 50 feet (Figure 1). Reach B is upstream and to the west of the reach A and is 3,500 feet of stream and floodplain. USFS required more the use of passive restoration (no heavy equipment) to address erosion concerns and stream function in this reach.

In August of 2014, the Coalition for the Poudre River Watershed (CPRW) contracted with AloTerra Restoration Services, LLC (AloTerra) to begin planning for restoration of the site. On-the ground restoration began in May 2015 and the project was completed in June 2016. Restoration was completed by using a combination of heavy machinery and volunteer groups like Wildlands Restoration Volunteers, Larimer County Conservation Corps, and staff from Odell Brewing.

Skin Gulch specific goals and objectives:

Goal 1: Improved stream and floodplain function. Objectives – Enhanced connectivity of stream with floodplain; appropriate width-depth ratios and riffle-pool sequences; short-term stabilization of banks until riparian vegetation establishes; establishment of proper grade control in areas were potential for

incision exists; appropriate stream sinuosity based on stream gradient, valley type, and sediment delivery; and improvements to floodplain area by reducing and/or eliminating fill associated with current pull-offs.

Goal 2: Reduced sediment delivery to Poudre River. Objectives – Stabilize stream banks, increase sediment storage on floodplain, reduce run-off from floodplain to creek, establish grade control of primary channel, reduce sediment delivery from flood-impacted valley walls.

Goal 3: Reduced in-channel aggradation. Objectives –: Define appropriate channel dimensions and stream gradient to reduce the potential for channel aggradation.

Goal 4: Enhance biological diversity. Objectives – Restore biological and structural diversity of riparian, wetland, and floodplain vegetation; enhanced in-stream habitat such as wood, boulders, riffles, and pools; enhanced low-flow conditions.

Goal 5: No adverse impact to existing native riparian or floodplain vegetation. Objectives – Avoid regrading of existing banks that have persistent native vegetation (protection of Preble’s jumping mouse habitat). Design restoration treatments to increase stability of existing native habitat areas and enhance degraded habitat areas.

Goal 6: Improve scenic value. Objectives – Cover existing non-native pink rip-rap with soil, and revegetate those sites to improve the scenic value of the corridor.

See Appendix A for Skin Gulch design drawings and pre & post construction drawings.

Site 2: Seaman Reservoir Delta Stabilization Project

Unnamed tributary 21 (UT 21), a tributary that drains directly into the Milton Seaman Reservoir was burned at a high severity in the Hewlett Gulch Fire in 2012 (figure 2). The Hewlett Gulch Fire caused increased runoff and hillslope erosion rates. As a result, large volumes of sediment flowed into the

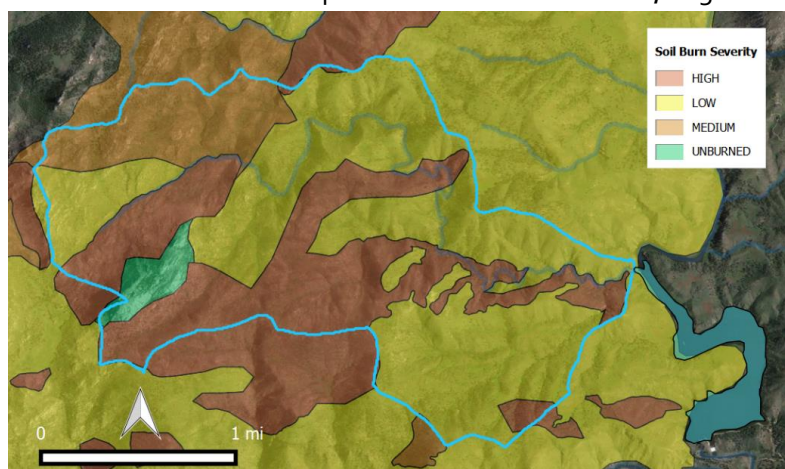


Figure 2. Location of Unnamed Tributary 21 (UT21) relative to Seaman Reservoir and the soil burn severity

reservoir and has started to create an unstable sediment fan/delta at the mouth of UT21 (Figures 3). Seaman Reservoir is owned and operated by the City of Greeley. In 2013 and 2014, restoration efforts focused on mulching and seeding of the burned areas in the headwaters of UT21. There has been continued concern about the risk the sediment in the delta poses to reservoirs water quality and storage capacity. Additionally, the delta’s proximity to the inflow into the

reservoir has raised concerns that it could negatively affect that inflow.

As part of a partnership with the City of Greeley and USFS, CPRW worked with AloTerra Restoration Services & JW Associates in spring 2015 to begin the planning process for the Seaman Reservoir delta stabilization. Work on the delta began in June 2016 and continued through November 2016. All restoration was done by hand by Rocky Mountain Conservation Corps, Wildlands Restoration Volunteers and AloTerra staff. There are still remaining tasks to be completed for Phase 3 to further protect the reservoir.



Figure 3. Left - Photo of the delta in 2012 post-fire in low water and Right - Photo of delta in 2014 during low water. Photos show increased sediment deposition to the delta over a 2 year period. Yellow line indicates the visible extent of the delta at high water.

Seaman Reservoir Delta project goals and objectives:

The project was originally proposed as two phases. The first phase was implemented during this grant period and was intended to achieve long-term solutions to stabilize the sediment within the delta as it is unconsolidated and actively delivering sediment to the reservoir during rainfall events and reservoir drawdown. Phase 1 goals included:

- 1) Reduce risk of channel incision and head-cutting;
- 2) Establish 70% cover of herbaceous and woody riparian/wetland vegetation
- 3) Reduce risk of avulsion and braiding until of vegetation becomes well established;
- 4) Reduce risk of erosion to banks;
- 5) Increase structural vegetation diversity; and
- 6) No net fill in the floodplain

See Appendix B for Seaman Reservoir Mitigation Plan and design.

Methods

Skin Gulch:

This project was completed by using a combination of heavy machinery and hand labor. The heavy machinery was used to re-establish the channel sinuosity, reconnect the channel to the floodplain, install grade control structures, install floodplain roughness features, cover riprap, and prep site for plantings. Hand labor was used to install willow and other native riparian plants, seed banks with native grass seeds, and mulch the site.

Seaman Reservoir:

The project site at Seaman Reservoir does not have access for heavy equipment therefore all work was done by hand labor. Since the Hewlett fire, a creek channel has started to form in the accumulated



Figure 4. Installation of rock structures & log weirs in delta channel to stabilize the channel at Seaman Reservoir

sediment in the delta. One goal of the restoration design was to hold this creek channel in place. The second was to stabilize the highly-mobile sand/cobble delta and prevent it from releasing sediment into the reservoir. We installed various treatments to hold the channel in place and prevent it from migrating and causing more delta instability (Figure 4). Burned trees were felled to create log structures in the banks of the channel and in the floodplain. The channel was lined with stones/rocks collected from upstream. When water levels in the reservoir dropped, crews installed media-lunas at the toe of the delta face

and installed erosion control matting on the delta face, covered it with mud, and seeded it with native vegetation.

For the Skin Gulch project, CWCB funds were used to hire labor, including volunteer labor through Wildlands Restoration Volunteers (\$28,362) or for Youth Corps (\$16,508) labor. In addition, funds were used to purchase supplies, primarily plant materials (native grass seeds, container stock), mulch (wood straw) and some tools (log carriers) (\$16,785). Some funds were used for completing project design (\$2,257). Another portion of CWCB funding was used to pay for heavy equipment contracting (\$33,593). For the Seaman Reservoir project, funds were used to hire labor (Youth Corps, WRV volunteer teams) and pay for some supplies.

Detailed descriptions of designs, methods and approaches can be found in Appendix A & B.

Results

Skin Gulch Post-Fire Restoration Project

The Skin Gulch project resulted in 5,700 feet of creek being restored, over 3 acres of floodplain habitat improved, and 50 volunteers were engaged in the project. Vegetation successfully established in the riparian and floodplain areas (Figure 5-7) and the re-aligned channel has remained stable to date.

Skin Gulch pre-treatment monitoring data was collected prior to vegetation restoration treatment in the spring of 2015. AloTerra Restoration Services completed the baseline Stream Stability Assessment (SSA). It relies on visual estimation of channel and bank stability parameters and quantifies the bed and bank stability of sub-reaches (100-300 feet) using rapidly assessed metrics like percent of bank and

riparian area coverage by vegetation type, bank and bed material composition, and percent length of actively eroding bank. Quantitative estimates of percent coverage and length of stability parameters are integrated into an overall stability score (1 – 5, with 1 indicating the most stable and 5 the least stable) for each sub-reach evaluated as well as for the entire reach. Pre-treatment monitoring found an aggregate score of 3.1 for reach A and 2.9 for reach B. Post-treatment assessment was done after the first year and found an aggregate score of 2.9 for both reach A and B. We anticipate that the difference between pre & post treatment monitoring scores will widen as the project site matures and vegetation continues to grow in.

The Skin Gulch Restoration project was important for the communities in the upper watershed. By stabilizing the stream and establishing vegetation, both Stove Prairie Road and Highway 14 were protected. The project also improved wildlife habitat by establishing vegetation like willows and cottonwoods in the riparian area and by increasing the vegetation biodiversity overall. The project site is designated Preble's habitat and our team specifically sought to either protect existing Preble's habitat or to implement vegetation designs that would be potentially beneficial to Preble's. Vegetation establishment, in-stream structures, floodplain roughness features and bank stabilization/erosion control treatments overall improved the stream function and likely reduced sediment delivery to the Poudre River and helped protect water quality in the mainstem.



Figure 5. Reach A, just upstream of CO-14 culvert. Left) pre-restoration, June 2015; Right) post-restoration August 2016.



Figure 6. Reach A, middle section. Left: pre-restoration; 2) post-restoration August 2016



Figure 7. Skin Gulch Reach A, viewed from downstream end. Photo on the left - channel construction complete, prior to first volunteer planting day, spring 2015. On the right: after all construction and planting complete, fall 2016.

Seaman Reservoir Post-Fire Restoration Project

This phase of the Seaman Reservoir project stabilized 500 feet of channel in the delta and 1 acres of the delta face. The project engaged 3 youth corps crews and ~20 volunteers.

Prior to installation of delta stabilization structures in 2016, the point-line intercept method was used to measure the vegetation cover of the delta. Field measurements and comparison with historical aerial photos were analyzed prior to restoration. The channel through the delta was assessed to be 2 feet deep at bankfull with a width of 5-7 feet. Field observations and analysis of aerial photos prior to

restoration indicated that the channel was unstable and subject to lateral migration and braiding during and after runoff events. Floodplain width was measured at 25 feet at the canyon mouth, 60 feet at midpoint and 150 feet at the reservoir edge during high water. Measurements of the channel following restoration have not yet occurred as all phases of restoration are not yet complete. Vegetation measurements will likely occur next summer during peak growing season since the site was just seeded this fall.

This project is important for protecting the water supply and water quality in Seaman Reservoir, which provides water to the City of Greeley.

Conclusions and Discussion

Skin Gulch Post-Fire Restoration Project

Goals and objectives for the Skin Gulch Post-Fire Restoration Project were achieved by the completion of on the ground work in the spring of 2016.

To monitor the success of our post-fire restoration project at Skin Gulch we are using the Stream Bank and Bed Stability Assessment Protocol developed by AloTerra Restoration Services LLC. Both pre-and post-monitoring data was collected at Skin Gulch. This monitoring protocol was designed track changes over time to assess the stream reach rapidly and in a spatially explicit manner so stability concerns would be identified and located along a reach. It is our intent to continue to use this monitoring protocol for 2-4 more years post project implementation to track how well the project is doing.

Future/continued work on the Skin Gulch project could include additional willow and cottonwood plantings, spraying/removing seed heads weedy or invasive plants including mullein (*Verbascum thapsus*), must thistle (*Carduus nutans*), and common teasel (*Dipsacus fullonum*). Clean-up of the recreational shooting area in Reach B could be implemented each spring and fall as volunteer opportunities to reduce the impact to this recently restored reach.

Skin Gulch – lessons learned and challenges

There were several challenges that arose throughout the Skin Gulch project implementation. As with any restoration project, weather events can always create unexpected problems. After the first volunteer weekend in May 2015, there were heavy spring rains that put stress on the newly installed riparian plantings, the recently modified channel, and grade control structures. While the seeds and some plantings benefitted from the additional moisture, the excess flows did rip out some of the willow and cottonwood cuttings that had not had a chance to establish roots. However, most of the cuttings did stay in place and continued to grow. We were able to replace lost cuttings at future volunteer events. Some of the grade control structures had to be fixed as well but the heavy equipment was still staged at the site so the repairs did not slow down the completion of the project in a measurable way.

Another unique challenge of this site is that reach B of Skin Gulch is frequently visited by recreational shooters who use the area for target practice. As this is not a designated shooting area, there are no facilities for managing shooting waste. As a result, the area has an accumulation of the kind of trash

associated with this activity. Aside from being unsightly, some of the waste can have negative environmental impacts. Also, the presence of people with weapons at the site presented a particular challenge for volunteer project days. To address these problems, we had to add volunteer tasks that included waste removal and also had to include a budget line in our project budget for hiring law enforcement on volunteer project days to ensure their safety. Related to this issue, we had also included in our design removing parking pull-outs on Stove Prairie Rd. This was to have a two-fold benefit: one, to discourage recreational shooters from using the area by making parking more difficult and two, increasing floodplain space and connectivity to the channel to reduce flooding impacts. However, Larimer County road and bridges would not fully approve a feasible design. This element of our project design was therefore eliminated from our scope.

Seaman Reservoir Post-Fire Restoration Project

Most of Phase 1 treatment goals were achieved including reducing the risk of channel incision and head-cutting in the delta, reducing the risk of avulsion and braiding & erosion on banks, and increasing the structural vegetation diversity. The goal of establishing 70% cover of herbaceous and woody vegetation was not achieved by November 2016. Native & local seed was spread on the delta face in the fall, but it is unknown at this time if it will seed that was spread will establish as 70% cover. Due to time constraints, willow/cottonwood plantings did not occur.

Future/continued work to implement to further stabilize the delta could include willow/cottonwood plantings to help keep sediment in place during runoff and drawdown events. Phase 2 work has yet to be completed, which includes stabilizing both the incising channels in the sub-watershed above the delta. This project will be sustained into the future by completing the Phase 2 portion of the work to reduce the amount of additional sediment coming down from the burn area to the delta. The installed structures will be monitored over the next few years to ensure their success.

Seaman Reservoir Challenges and Lessons Learned

Seaman Reservoir also faced several challenges, including the logistics of working around the reservoirs schedule and the remote nature of the project. All work had to be completed by hand, which meant that tools and materials had to be brought in by boat and volunteers working on the project had to hike in & out about 45 minutes each way. All materials had to be collected on site including logs and rocks/boulders, which was time consuming and challenging. One full week of Rocky Mountain Conservation Corps time was dedicated to only collecting materials for the project. Throughout the project additional material collection was necessary, which slowed down the project. It was challenging to install the stabilization structures (rocks,



Figure 8. Post-storm damage on recently installed bank treatments at Seaman Reservoir.

logs etc.) because the delta is mainly composed of sand. Following the two weeks of Rocky Mountain Youth Corps work, there was a summer storm that passed through, eroding sediment away from recently installed structures (Figure 8). After this storm, our priorities changed and we focused on armoring the channel to protect the bank structures and to prevent any further erosion of the channel. This challenge was compounded by the fact that levels in reservoir started to drop rapidly. This caused two issues: one, it exacerbated the erosion in the channel by initiating some headcutting and two, as we had not anticipated having the delta face exposed until 2017, we did not have a finalized design for in place when the reservoir levels dropped. This meant re-working our project schedule of tasks. It did however offer an opportunity to address one of the most important aspects of the project sooner rather than later.

While this project was difficult, it was an opportunity to learn how to manage and implement a logistically and physically challenging project. Through trial and error, we also learned the best techniques/ methods to use for installing structures into sand on the delta.

Next steps for this project include continuing re-vegetation work and implementing stabilization work in the gulleys upstream from the delta. In addition, we will need complete post project monitoring in the spring/summer of 2017

.

Actual Expense Budget

		Total project costs	CWCB budget	<i>CWCB Actuals</i>	CDPHE-NPS Budget	<i>CDPHE-NPS Actuals</i>	In-kind Match Budget (volunteer labor)	<i>In-kind Actuals*</i>	City of Ft Co Monitoring
Task 1:	Ensuring project progress, reporting, and accounting	\$8,772.40	\$0.00	0	\$8,772.40	\$7,542.00			
Task 2:	Recruit, train, and organize volunteers	\$120,805.60	\$30,825.00	\$30,825.00	\$42,527.60	\$19,279.60	\$47,453.00	\$60,170.70	\$0.00
Task 3:	Assist with implementation of best management practices (Youth Corps/sawyers)	\$26,320.00	\$13,000.00	\$13,000.00	\$13,000.00	\$0.00	\$320.00		
Task 4:	Apply mulch, seed, shrubs and trees, and other erosion control measures	\$169,988.00	\$56,175.00	\$56,175.00	\$113,813.00	\$115,647.73	\$0.00		\$0.00
task 5:	Monitoring - collect & analyze data	\$54,245.85	\$0.00	\$0	\$21,887.00	\$8,680.36	\$0.00		\$32,358.85
total		\$380,131.85	\$100,000.00		\$200,000.00	\$151,149.69	\$47,773.00		\$32,358.85

*See Appendix C for Quickbooks expense report for this match.

References

AloTerra Restoration Services (2015). *Revised Sediment Mitigation Plan for Unnamed Tributary to Seaman Reservoir*, March 31, 2015.

JW Associates (2010). *Cache la Poudre Wildfire /Watershed Assessment - Prioritization of watershed-based risks to water supplies*.

JW Associates (2014). *High Park Fire Small Watershed Hazard Prioritization*, February 2014.

Oropeza, J and J. Heath (2013). *Effects of the 2012 Hewlett & High Park Wildfires on Water Quality of the Poudre River and Seaman Reservoir. Technical Report*. City of Fort Collins Utilities. Fort Collins, CO. 33p.

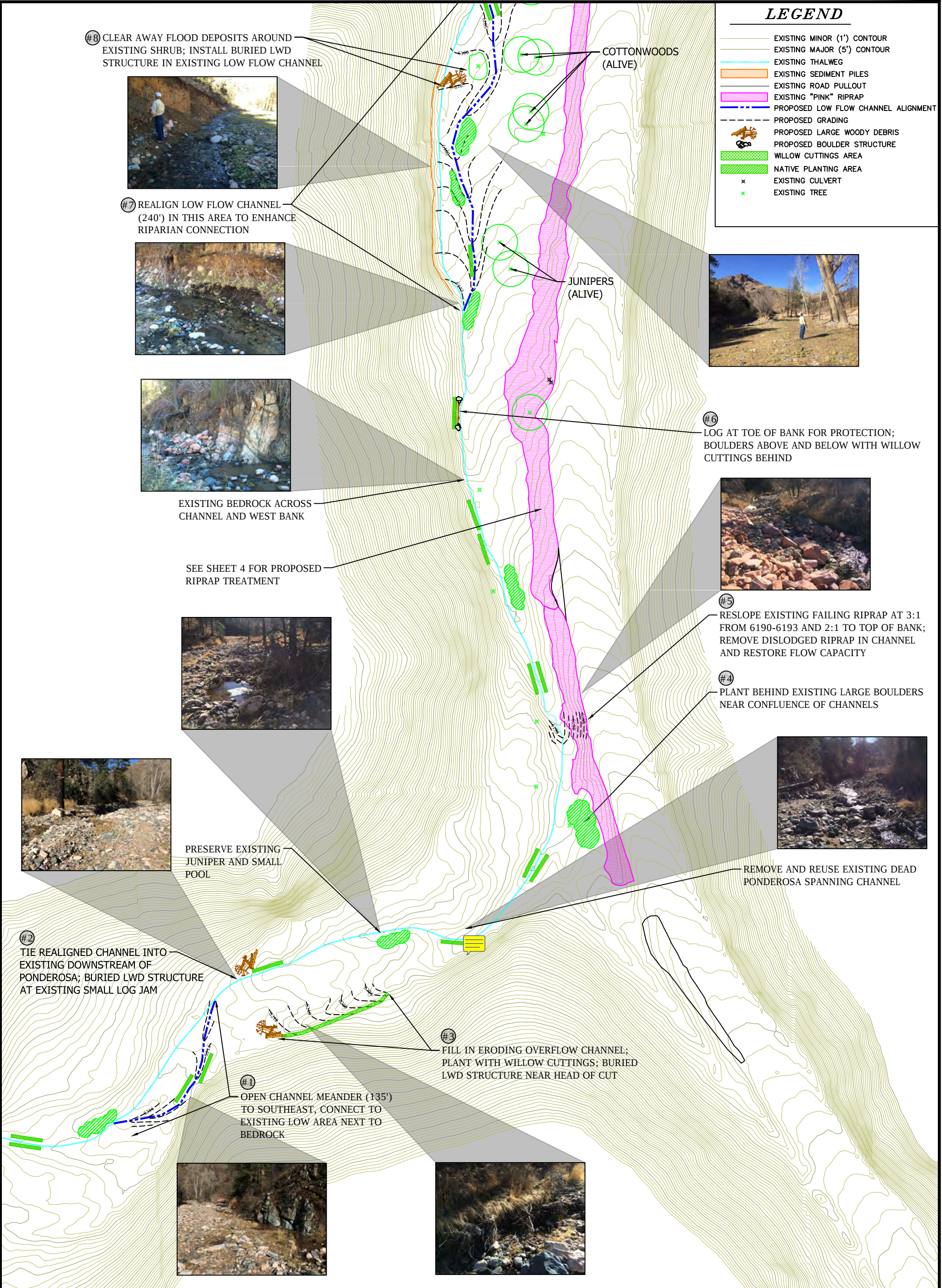
U.S.F.S. (2012). *Hewlett Gulch Burned Area Report*. BAER Reference FSH 2509.13. 8p.

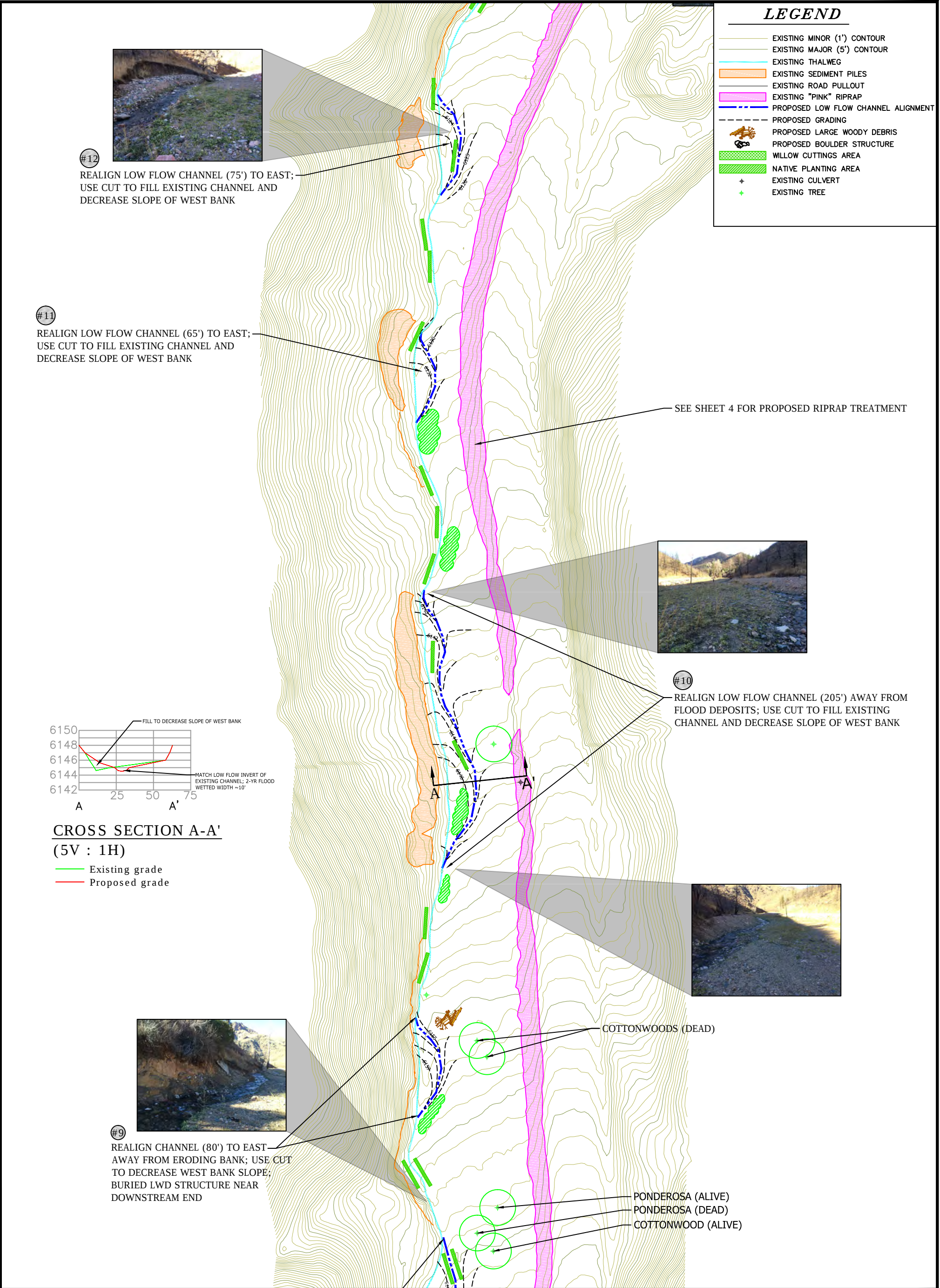
United States Forest Service (2012). *High Park Fire Burned Area Emergency Response (BAER) Report July 17, 2012*.

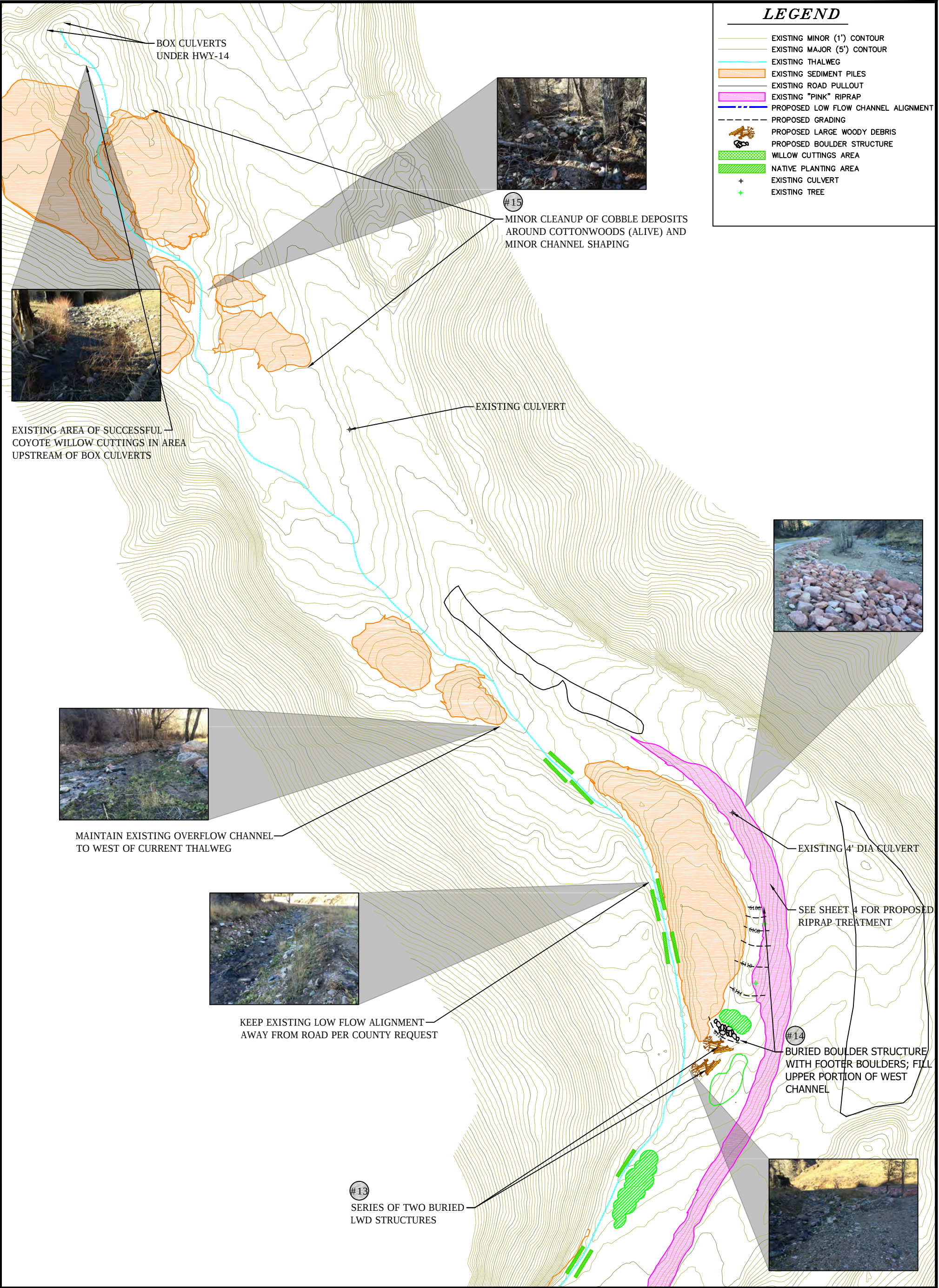
Walsh Environmental Scientists and Engineers, LLC (2015). *Skin Gulch Restoration Preliminary Design and Analysis*, February 2015.

Yochum, S. (2012). *High Park Fire: Increased Flood Potential Analysis*. USDA Natural Resources Conservation Service. Fort Collins, CO. 13p. and Appendices.

Appendix A: Skin Gulch Supporting Documents



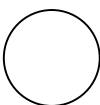
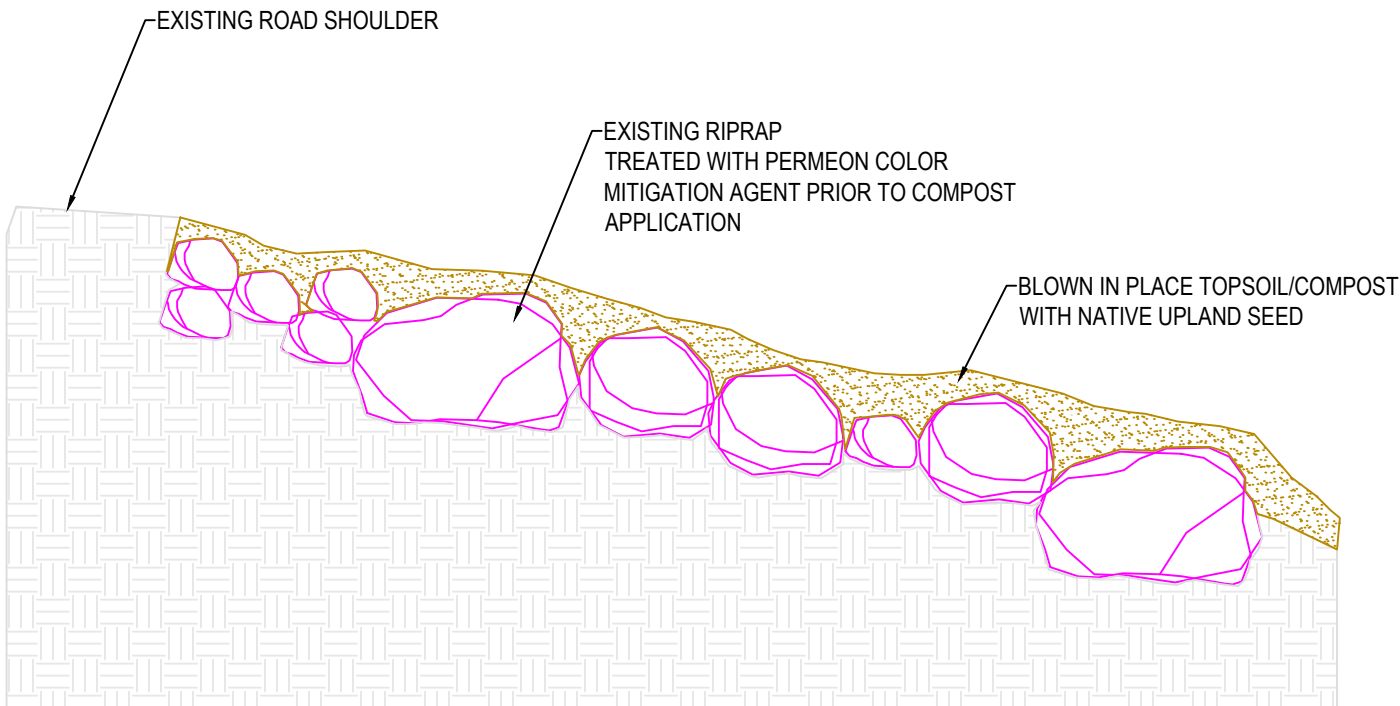




Skin Gulch - Preliminary Construction Quantities - 3/26/2015						
Work Area	CUT VOLUME	FILL VOLUME	Logs - standing dead sourced onsite	Boulders sourced onsite	Willow Cuttings	Native Planting Areas
	(CY)	(CY)	(each)	(each)	(each)	(sf)
1	75.0	0.0	-	-	160	215
2	7.0	5.0	5	-	40	-
3	7.0	60.6	5	-	190	165
4	-	-	-	-	80	450
5	10.0	10.0	-	-	160	230
6	2.5	2.5	1	4	40	-
7	133.3	133.3	-	-	120	505
8	9.5	5.0	5	-		-
9	51.4	51.4	5	-	160	260
10	113.9	113.9	-	-	200	470
11	36.1	36.1	-	-	120	340
12	41.7	41.7	-	-	200	730
13	14.0	10.0	10	-	280	-
14	20.0	160.0	-	28	-	220
15	150.0	-	-	-	-	-
TOTALS	671	630	31	32	1,750	3,585

RIPRAP TREATMENT NOTES:

1. THESE NOTES ARE INTENDED TO DESCRIBE THE TREATMENT OF THE EXISTING PINK RIPRAP LOCATED ON THE PROJECT SITE.
2. COLOR MITIGATION - PINK BOULDERS SHALL BE TREATED WITH THE COLOR MITIGATION PRODUCT PERMEON, OR APPROVED EQUAL. PERMEON WILL BE APPLIED TO A TEST SITE TO DETERMINE CONCENTRATION AND APPLICATION RATE IN ORDER TO MATCH, TO THE GREATEST EXTENT POSSIBLE, THE EXISTING TANS AND BROWNS OF THE SURROUNDING LANDSCAPE.
3. PERMEON WILL BE APPLIED WITH A BACKPACK OR OTHER SPRAYER AT SPECIFIED RATES DURING DAYS WHEN AVERAGE DAYTIME TEMPERATURE IS AT LEAST 55 DEGREES FAHRENHEIT. ENSURE WEATHER FORECAST DOES NOT CALL FOR RAIN OR WIND DURING THE DAY OF APPLICATION.
4. ALLOW PERMEON A MINIMUM OF FOUR WEEKS TO SET UP AND CURE BEFORE COVERING RIPRAP WITH TOPSOIL/COMPOST TREATMENT.
5. ONCE COLOR MATCHES CLOSELY WITH SURROUNDING LANDSCAPE, THEN THE COMPOST APPLICATION MAY COMMENCE.
6. A TOPSOIL/COMPOST MIXTURE WILL BE APPLIED TO THE ENTIRE RIPRAP AREA VIA A BLOWER TRUCK. THE VOIDS AND TOP FACE OF THE RIPRAP WILL BE FILLED WITH SCREENED TOPSOIL AND THEN FOUR INCHES ON TOP OF THE TOPSOIL WILL BE A CLASS 1 COMPOST MIXTURE.
7. THE NATIVE UPLAND SEED WILL BE APPLIED DIRECTLY TO THE TOP TWO INCHES OF COMPOST VIA A SEED BOX MECHANISM FROM THE BLOWER TRUCK.
8. THE TOPSOIL, COMPOST, AND SEEDING WILL COVER THE ENTIRE RIPRAP AREA IN ONE PROCESS DIRECTLY FROM THE BLOWER TRUCK. NO SEPARATE MATERIALS DELIVERY TO THE SITE ARE REQUIRED.
9. TRAFFIC CONTROL WILL BE NECESSARY AS THE BLOWER TRUCK WILL OPERATE FROM THE SIDE OF THE ROAD FOR THE LENGTH OF THE RIPRAP AREAS AND APPLIED WITH ONE LABORER OPERATING THE 4' DIAMETER BLOWER HOSE.
10. FOR EXTRA STABILIZATION, A BINDER AGENT MAY BE ADDED TO THE COMPOST AND/OR ADDITIONAL EROSION CONTROL FABRIC.



RIPRAP TREATMENT DETAIL

NOT TO SCALE



SKIN GULCH
LARIMER COUNTY, COLORADO

FIGURE 4 – PRELIM QUANTITIES & RIPRAP TREATMENT

Scale: NTS

DATE: March 26, 2015

DRAWN BY: TR

CHECKED BY: EA

JOB NAME: Skin Gulch

FILE: SkinGulch 2015.03.26.dwg

REVISIONS:

DRYLAND SEEDING ESTABLISHMENT:

1. THESE NOTES ARE INTENDED TO DESCRIBE THE TREATMENT OF LANDSCAPE INSTALLATIONS DURING THE FIRST GROWING SEASON ONLY. SUBSEQUENT SEASONS MAY REQUIRE DIFFERENT TASKS.
2. REQUIREMENTS FOR EROSION AND SEDIMENTATION CONTROL AS STATED IN LOCAL CODES SHALL APPLY.
3. CONTRACTOR SHALL BE REQUIRED TO TURN OVER SEED LABELS UPON INSPECTION. SEED AND SEED LABELS SHALL CONFORM TO CURRENT STATE AND FEDERAL REGULATIONS AND BE SUBJECT TO TESTING PROVISIONS OF THE ASSOCIATION OF OFFICIAL SEED ANALYSIS.
4. THE SEEDBED SHALL BE WELL SETTLED AND FIRM, BUT FRIABLE ENOUGH THAT SEED CAN BE PLACED AT THE SEEDING DEPTH SPECIFIED. THE SEEDBED SHALL BE REASONABLY FREE OF WEEDS. SOILS THAT HAVE BEEN OVER-COMPACTED BY TRAFFIC OR EQUIPMENT, ESPECIALLY WHEN WET, SHALL BE TILLED TO BREAKUP ROOTING RESTRICTIVE LAYERS AND THEN HARROWED, ROLLED OR PACKED TO PREPARE THE REQUIRED FIRM SEEDBED.
5. AT THE RISK OF THE OWNER, SEEDING MAY OCCUR ANY TIME WHEN WEATHER CONDITIONS PERMIT EXCEPT WHEN THE GROUND IS FROZEN. IT IS HIGHLY RECOMMENDED THAT SEEDING OF NON-IRRIGATED DRYLAND GRASSES OCCUR BETWEEN OCTOBER 1 AND MAY 1 TO TAKE ADVANTAGE OF NATURAL MOISTURE.
6. HYDRO OR HYDRAULIC SEEDING AND/OR BROADCAST SEEDING MAY BE USED. BROADCAST SEED SHALL BE HAND RAKED OR DRAGGED TO A DEPTH AS REQUIRED BY THE SEED.
7. MULCH SHALL BE APPLIED AT A RATE OF 2 ½ TONS PER ACRE AND SHALL BE ATTACHED BY AN APPROVED METHOD SUITABLE FOR THE TYPE OF MULCH USED. MULCH SHALL BE SPREAD UNIFORMLY, IN A CONTINUOUS BLANKET, AFTER SEEDING IS COMPLETE. MULCH SHALL BE CLEAN, WEED AND SEED FREE, LONG STEMMED GRASS OR HAY, OR PINE NEEDLE STRAW, OR HYDROMULCH. MULCH SHALL BE SPREAD BY HAND OR BLOWER-TYPE MULCH SPREADER. MULCHING SHALL BE STARTED ON THE WINDWARD SIDE OF RELATIVELY FLAT AREAS OR ON THE UPPER PART OF A STEEP SLOPE AND CONTINUED UNIFORMLY UNTIL THE AREA IS COVERED. THE MULCH SHALL NOT BE BUNCHED.IMMEDIATELY FOLLOWING SPREADING, THE MULCH SHALL BE ANCHORED OR TACKIFIED TO THE SOIL. ALL SEEDED AREAS SHALL BE MULCHED AFTER SEEDING ON THE SAME DAY AS THE SEEDING. HYDRO MULCH IS REQUIRED ON SLOPES EXCEEDING 3:1. APPLICATION OF EROSION CONTROL NETTING IS REQUIRED ON SLOPES EXCEEDING 3:1 WHERE SURFACE DRAINAGE IS PRESENT.
8. RIPRAP AREA WILL BE SEEDED WITH THE UPLAND SEED MIX AND APPLIED WITH THE BLOWER TRUCK.

Upland/Xeric Mix
Species (Common Name)
<i>Achillea lanulosa</i> (Western yarrow)
<i>Achnatherum hymenoides</i> (indian ricegrass, RIMROCK)
<i>Artemisia frigida</i> (fringed sage)
<i>Artemisia ludoviciana</i> (Louisiana sage)
<i>Symphyotrichum laeve</i> / <i>Aster laevis</i> (smooth aster)
<i>Bouteloua curtipendula</i> (sideoats grama)
<i>Bromopsis ciliatus</i> (fringed brome)
<i>Bromus marginatus</i> (mountain brome, BROMAR)
<i>Chondrosum gracile</i> (blue grama, HACHITA)
<i>Elymus canadensis</i> (Canada wildrye)
<i>Elymus trachycaulus</i> (Slender Wheatgrass, FIRST STRIKE)
<i>Festuca arizonica</i> (Arizona fescue, REDONDO)
<i>Helianthus annuus</i> (annual sunflower)
<i>Heliomeris multiflora</i> (showy goldeneye)
<i>Heterotheca villosa</i> (hairy goldenaster)
<i>Koeleria macrantha</i> (prairie junegrass)
<i>Triticale</i>

Riparian/Wetland Mix
Species (Common Name)
<i>Andropogon hallii</i> (sand bluestem, ELIDA, GARDEN)
<i>Symphyotrichum laeve</i> / <i>Aster laevis</i> (smooth aster)
<i>Bromopsis ciliatus</i> (fringed brome)
<i>Elymus canadensis</i> (Canada wildrye)
<i>Helianthus nuttallii</i> (Nuttall's sunflower)
<i>Spartina pectinata</i> (prairie cordgrass)
<i>Achnatherum robustum</i> / <i>Stipa robusta</i> (sleepygrass)
<i>Triticale</i>



SKIN GULCH
LARIMER COUNTY, COLORADO

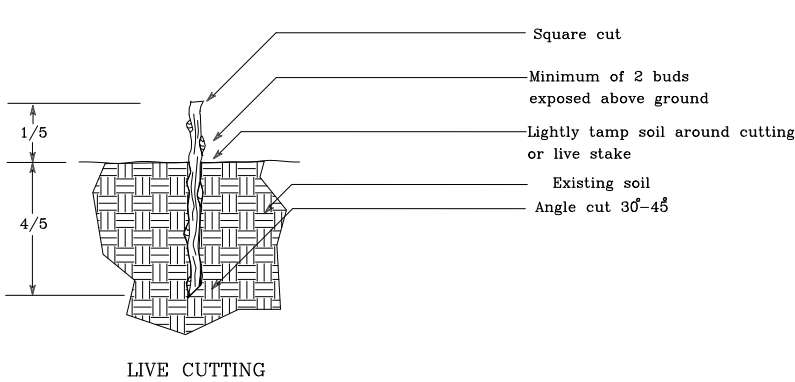
FIGURE 5 – SEEDING PLAN

Scale: NTS

DATE: March 26, 2015	REVISIONS:
DRAWN BY: TR	
CHECKED BY: EA	
JOB NAME: Skin Gulch	
FILE: SkinGulch 2015.03.26.dwg	

PROPOSED WOODY PLANTING SCHEDULE

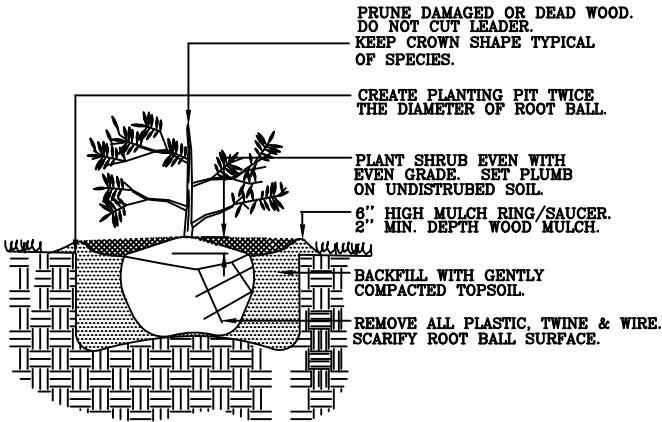
Scientific Name (USDA Plants Database)	Common Name	Type	Source
<i>Acer glabrum</i>	Rocky Mountain Maple	1 gal	Colorado ecotype
<i>Betula occidentalis</i>	water birch	1 gal	Colorado ecotype
<i>Cornus sericea</i>	redosier dogwood	1 gal	Colorado ecotype
<i>Ericameria (Chrysothamnus) nauseosa (spp?)</i>	gopher rabbitbrush	1 gal	Colorado ecotype
<i>Juniperus scopulorum</i>	Rocky Mountain Juniper	1 gal	unknown
<i>Mahonia repens</i>	creeping hollygrape	1 gal	Colorado ecotype
<i>Physocarpus monogynus</i>	Mountain ninebark	1 gal	unknown
<i>Populus tremuloides</i>	aspen	1 gal	Colorado ecotype
<i>Prunus americana</i>	American plum	1 gal	Colorado ecotype
<i>Prunus virginiana ssp. melanocarpa</i>	black chokecherry	1 gal	Colorado ecotype
<i>Ribes cereum</i>	wax currant	1 gal	Colorado ecotype
<i>Rosa woodsii</i>	Wood's rose	1 gal	Colorado ecotype
<i>Salix drummondiana</i>	Drummond's willow	1 gal	Colorado ecotype
<i>Salix exigua</i>	narrowleaf willow (foothills/mtn)	cuttings	Colorado ecotype
<i>Salix irrorata</i>	bluestem willow	cuttings	Colorado ecotype
<i>Salix lucida var caudata</i>	shining willow	cuttings	Colorado ecotype
<i>Salix monticola</i>	park willow	cuttings	Colorado ecotype
<i>Symphoricarpos oreophilus</i>	mountain snowberry	1 gal	Colorado ecotype
<i>Alnus incana var tenuifolia</i>	thinleaf alder	1gal	Colorado ecotype
<i>Populus angustifolia</i>	narrowleaf cottonwood	cuttings	Colorado ecotype



GENERAL NOTES:

- Live Stakes/Live Cuttings
1. Live stake or cutting planted perpendicular to ground surface.
 2. Cuttings to be collected from on-site sources only.
 3. Live stakes 2" diameter minimum. Live cuttings 0.5" to 1.5" diameter.
 4. Use iron bar or star drill to prepare hole in hard or rocky soil.
 5. Orient buds pointing upwards.

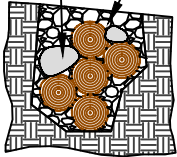
Willow Cutting Typical
Cross-section NTS



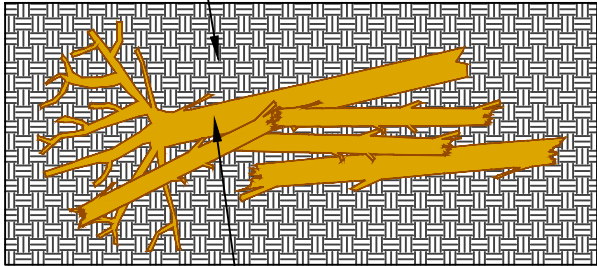
Shrub Planting Typical
Cross-section NTS

BACKFILL WITH LARGER COBBLE AND BOULDERS ENCOUNTERED DURING EXCAVATION

BACKFILL EXCAVATED AREA FOR LWD WITH NATIVE MATERIAL; PLACE IN LIFTS NO GREATER THAN 1' AND COMPACT BETWEEN LIFTS



ALL LWD PLACED BELOW ANTICIPATED SCOUR DEPTH OF CREEK



KEY MEMBER WITH ROOTWAD PLACED ON TOP OF RACKING MEMBERS



BURIED LWD STRUCTURE TYPICAL
Cross-section NTS



SKIN GULCH
LARIMER COUNTY, COLORADO

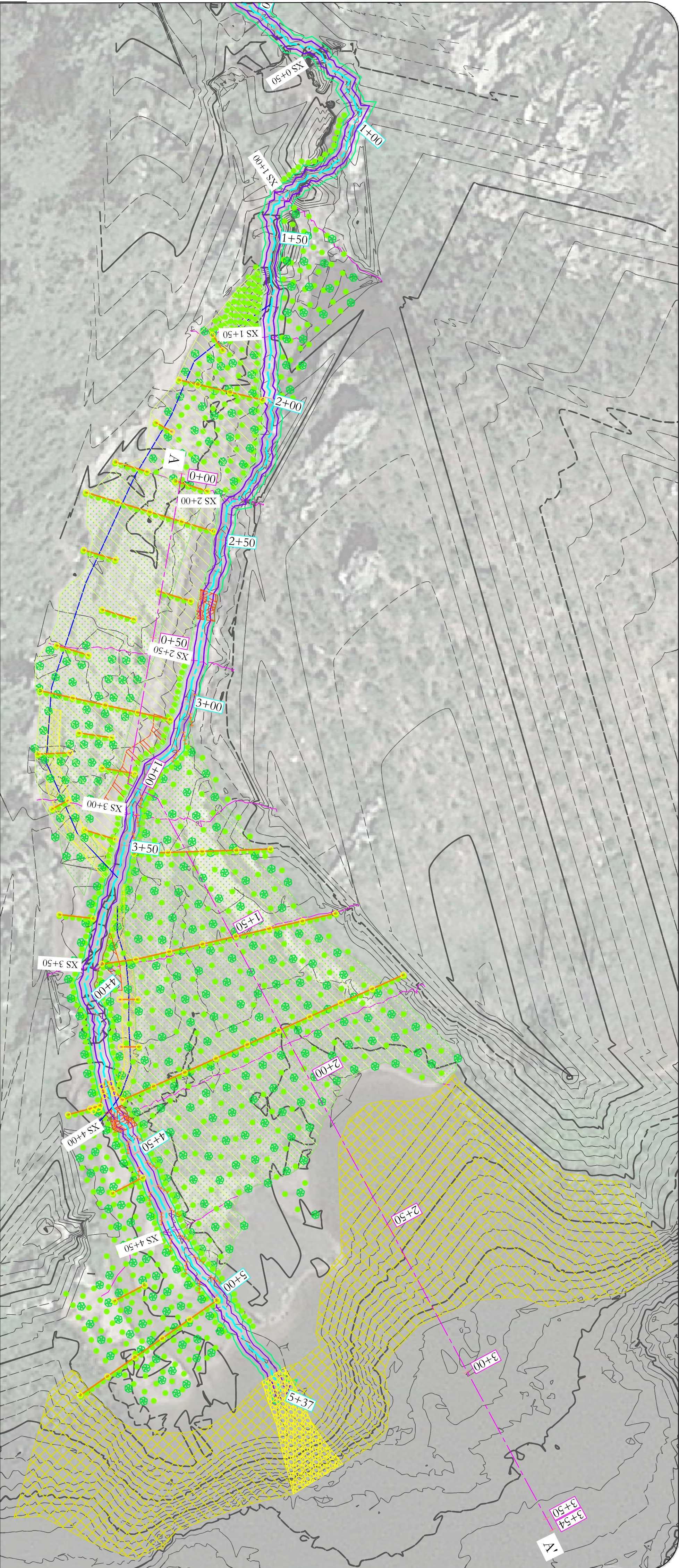
FIGURE 6 – PLANTING SCHEDULE AND TYPICALS

Scale: NTS



DATE: March 26, 2015	REVISIONS:
DRAWN BY: TR	
CHECKED BY: EA	
JOB NAME: Skin Gulch	
FILE: SkinGulch 2015.03.26.dwg	

Appendix B: Seaman Reservoir Supporting Documents



LEGEND:

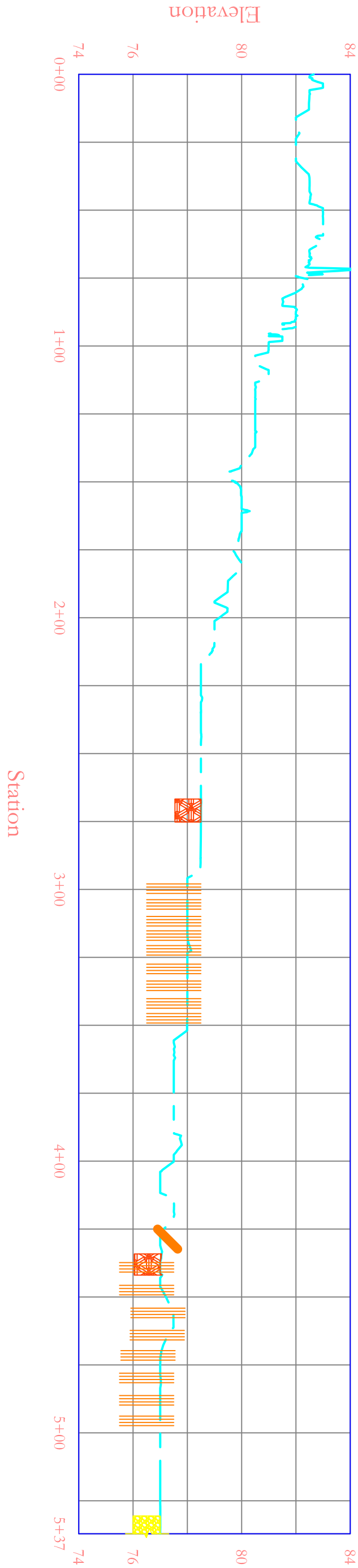
----- Existing Contour (Major = 2.5)	----- Existing Contour (Minor = 0.5)	----- Overflow Channel	----- Rock Armoring (~12" TYP)	----- Wetland Plugs (18" Triang. Spacing)
----- Channel Thalweg (Surveyed)	----- Profile AA'	----- Cross-Section (Surveyed; see survey report)	----- Geocell	----- Riparian / Xeric Mix + Humate
----- Fill (Sand and Gravel)	----- Log (10" DIAM TYP; 10' max length)	----- Cut (Sand and Gravel)	----- Willow (Whip)	----- Cottonwood (Whip)
----- Cut (Boulders)	----- Post Vane (2" DIAM)	----- Anchor (Post or Rock)	----- Cottonwood (Whip)	



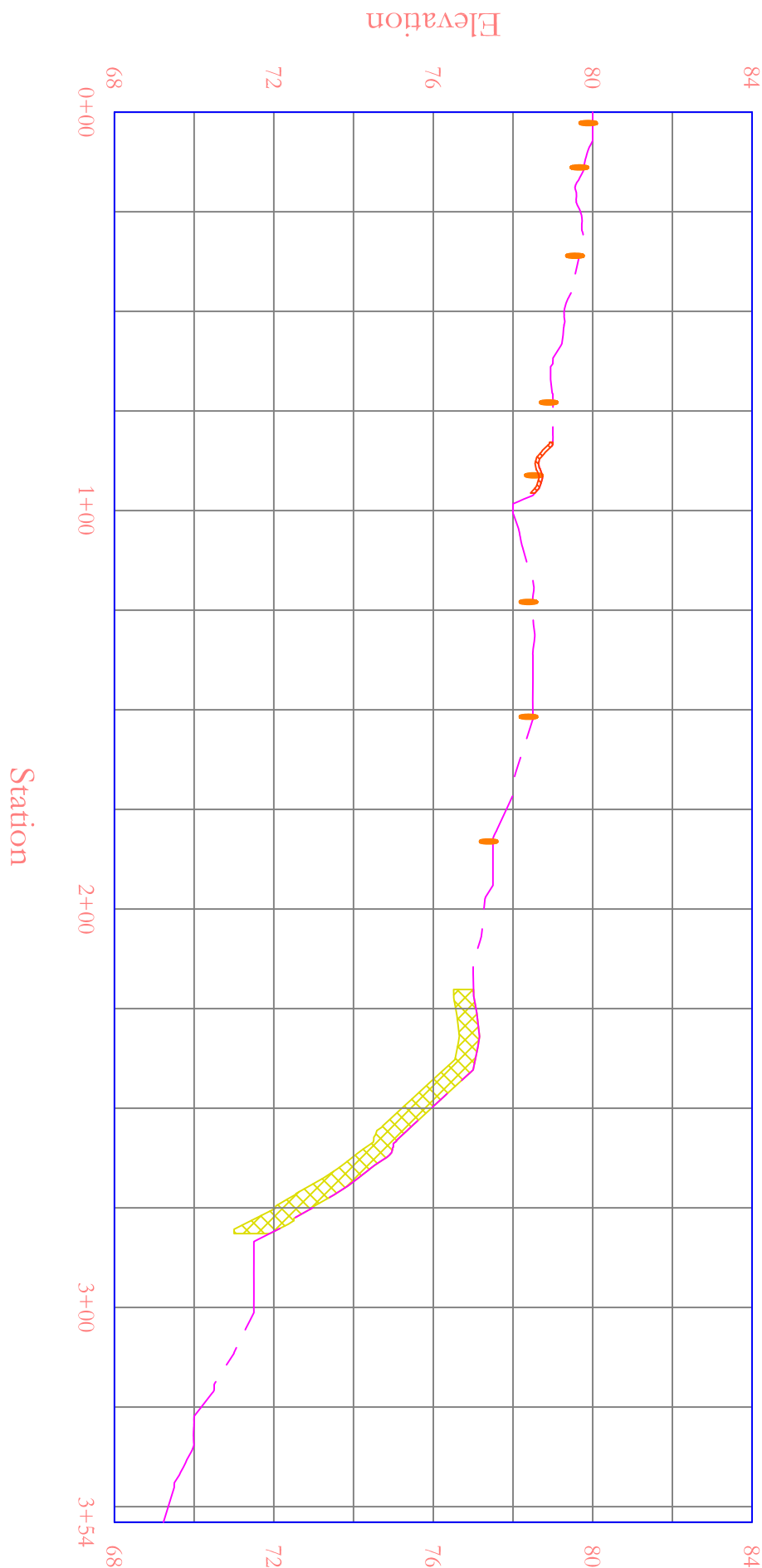
LEGEND:

----- Existing Contour (Major = 2.5')	----- Existing Contour (Minor = 0.5')	----- Overflow Channel	----- Rock Armoring (~12" TYP)
----- Channel Thalweg (Surveyed)	----- Profile AA'	----- Cut (Sand and Gravel)	----- Geocell
----- Cross-Section (Surveyed; see survey report)		----- Fill (Sand and Gravel)	----- Log (10" DIAM TYP; 10' max length)
		----- Cut (Boulders)	----- Post Vane (2" DIAM)
			----- Anchor (Post or Rock)

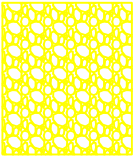
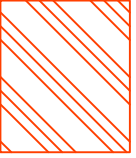
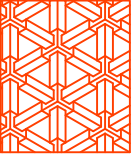
THALWEG (AND PROPOSED HARDSCAPE FEATURES): PROFILE



AA': PROFILE



LEGEND:

----- Existing Contour (Major = 2.5')		Rock Armoring (~12" TYP)
----- Existing Contour (Minor = 0.5')		Geocell
----- Channel Thalweg (Surveyed)		Log (10" DIAM TYP; 10' max length)
----- Profile AA'		Post Vane (2" DIAM)
		Cut (Boulders)

Appendix C: Accounting Report (Quickbooks) Showing Match Spent

12:13 PM

12/16/16

Accrual Basis

Coalition for the Poudre River Watershed Income by Customer Detail

All Transactions

Type	Date	Num	Memo	Account	Clr	Split	Amount	Balance
Co Dept Pub Health & Env								
NPS 2014								
Invoice	11/30/2014	6	Oct/Nov	44521 · CDPHE-N...		11200 · Acco...	6,966.60	6,966.60
Invoice	12/31/2014	7		44521 · CDPHE-N...		11200 · Acco...	5,078.50	12,045.10
Invoice	01/31/2015	4		44521 · CDPHE-N...		11200 · Acco...	9,091.93	21,137.03
Invoice	02/28/2015	5		44521 · CDPHE-N...		11200 · Acco...	3,387.00	24,524.03
Invoice	03/31/2015	8		44521 · CDPHE-N...		11200 · Acco...	15,728.00	40,252.03
Invoice	04/30/2015	0024		44521 · CDPHE-N...		11200 · Acco...	35,515.77	75,767.80
Invoice	05/31/2015	0025	CDPHE invoice 7: May work	44521 · CDPHE-N...		11200 · Acco...	3,224.73	78,992.53
Invoice	07/31/2015	9	work done in July for Skin Gulch	44521 · CDPHE-N...		11200 · Acco...	7,005.52	85,998.05
Invoice	08/31/2015	10	work done in Aug at Skin Gulch and post fire veg ...	44521 · CDPHE-N...		11200 · Acco...	6,669.05	92,667.10
Invoice	09/30/2015	0038	work done in Sept at Skin Gulch	44521 · CDPHE-N...		11200 · Acco...	11,157.75	103,824.85
Invoice	10/31/2015	0039	invoice 12 for Oct work at Skin Gulch	44521 · CDPHE-N...		11200 · Acco...	17,566.31	121,391.16
Invoice	10/31/2015	0044	invoice 13 - Skin resto	44521 · CDPHE-N...		11200 · Acco...	11,503.00	132,894.16
Invoice	10/31/2015	0044	invoice 13 - HPF veg monitoring	44521 · CDPHE-N...		11200 · Acco...	1,367.50	134,261.66
Invoice	03/31/2016	0057	post-fire restoration work at Skin Gulch invoice 14	44521 · CDPHE-N...		11200 · Acco...	6,797.97	141,059.63
Invoice	04/30/2016	0064	skin gulch work April invoice 15	44521 · CDPHE-N...		11200 · Acco...	870.00	141,929.63
Invoice	06/30/2016	0070	Skin Gulch Monitoring	44521 · CDPHE-N...		11200 · Acco...	353.56	142,283.19
Total NPS 2014							142,283.19	142,283.19
Co Dept Pub Health & Env - Other								
Invoice	06/30/2015	0026	CDPHE invoice 8 work done in June	44521 · CDPHE-N...		11200 · Acco...	1,325.50	1,325.50
Total Co Dept Pub Health & Env - Other							1,325.50	1,325.50
Total Co Dept Pub Health & Env							143,608.69	143,608.69
TOTAL							143,608.69	143,608.69

Quickbooks report showing match spending - matching funds were from a grant received from the Co. Department of Public Health and Environment.

12:34 PM

12/16/16

Accrual Basis

Coalition for the Poudre River Watershed
Income by Customer Detail

All Transactions

Type	Date	Num	Memo	Account	Amount	Balance
Colorado Water Conservation Board						
Invoice	04/30/2015	0022	Co Water Conservation Board grant for post fire restoration	44541 · CWCB 2014 post-fire	33,593.50	33,593.50
Invoice	05/31/2015	0023	Co Water Conservation Board grant for post fire restoration	44541 · CWCB 2014 post-fire	14,507.32	48,100.82
Invoice	06/30/2015	0028	Co Water Conservation Board grant for post fire restoration	44541 · CWCB 2014 post-fire	11,047.00	59,147.82
Invoice	04/30/2016	0061	Co Water Conservation Board grant for post fire restoration - Skin Gulch WRV	44541 · CWCB 2014 post-fire	6,562.00	65,709.82
Invoice	04/30/2016	0061	Co Water Conservation Board grant for post fire restoration - Skin Gulch AloTerra	44541 · CWCB 2014 post-fire	6,983.86	72,693.68
Invoice	06/30/2016	0071	Co Water Conservation Board grant for post fire restoration - Seaman Reservoir sawyer work	44541 · CWCB 2014 post-fire	3,688.00	76,381.68
Invoice	06/30/2016	0071	Co Water Conservation Board grant for post fire restoration - Seaman Reservoir RMYC	44541 · CWCB 2014 post-fire	0.00	76,381.68
Invoice	06/30/2016	0075	seaman reservoir youth corps	44541 · CWCB 2014 post-fire	6,300.00	82,681.68
Invoice	07/15/2016	0076	seaman reservoir youth corps	44541 · CWCB 2014 post-fire	6,300.00	88,981.68
Invoice	07/15/2016	0076	tools for restoration	44541 · CWCB 2014 post-fire	465.94	89,447.62
Invoice	08/31/2016	0088	Co Water Conservation Board grant for post fire restoration - WRV volunteer weekend at Seaman	44541 · CWCB 2014 post-fire	6,644.00	96,091.62
Invoice	08/31/2016	0088	Co Water Conservation Board grant for post fire restoration - portion of LCCC invoice for work a...	44541 · CWCB 2014 post-fire	3,908.00	99,999.62
Total Colorado Water Conservation Board					99,999.62	99,999.62
TOTAL					99,999.62	99,999.62