FINAL REPORT

Post-fire Restoration Design and Planning in the Cache la Poudre Basin project – Final Report

Prepared for: **CWCB Watershed Restoration Grant**

#POGG1 PDAA 201700000327

Attn: Chris Sturm

Date: 8/7/2018

Coalition for the Poudre River Watershed

Grant Amount: $45,000

Prepared by: J. Kovecses

Introduction

The project was created to help address remaining planning & design needs emanating from the High Park & Hewlett Gulch Fires, which damaged aquatic resources and water supplies. This project was part of a larger effort to identify and prioritize remaining unmet needs from the wildfires of 2012. In 2015, the Coalition for the Poudre River Watershed (CPRW) hired JW Associates, Inc. to develop and implement a process for identifying and prioritizing areas where there are still significant risks to watershed health, water supply, and communities remaining from the High Park Fire.

CPRW worked closely with technical experts and stakeholders to identify & prioritize remaining needs. From that effort, a few project areas were determined to be the highest priority. CPRW then focused on developing planning and design for these projects. Of those unmet needs, post fire restoration at the Unnamed Tributary 3 was determined to be the highest priority. Project funds from this grant were therefore applied to this project to help ensure planning & design could be completed, providing a solid foundation for moving forward with construction.

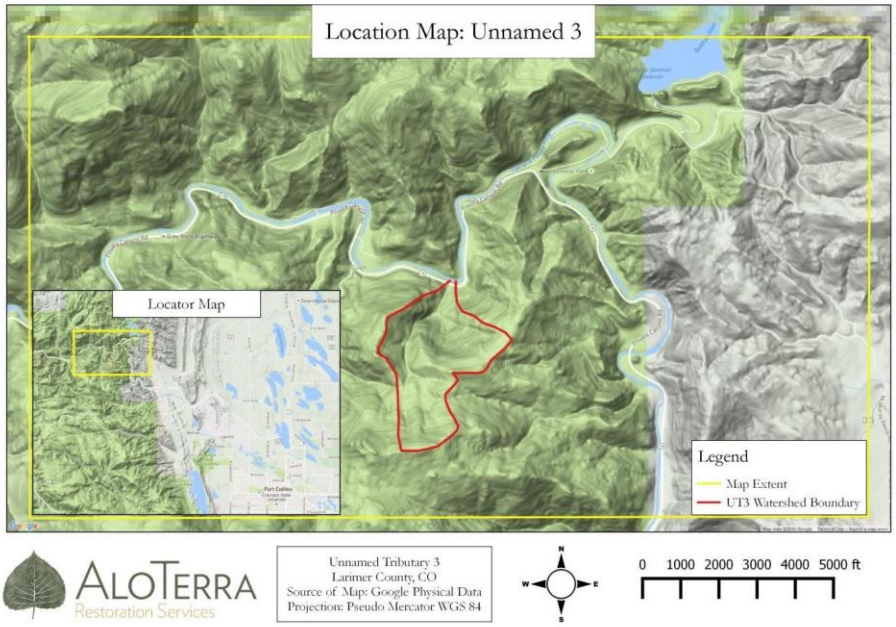
Background

The Unnamed 3 sub-watershed (UT3) is a small drainage that flows directly into the Cache la Poudre River (Poudre) and lies above CO Highway 14 (Figure 1). Fort Collins is the nearest large city (140,000 residents), with the smaller town of Poudre Park being located approximately three miles upstream. UT3 is located at Latitude 40°41'29.37"N and Longitude 105°15'22.43"W. Approximately 500 ft downstream from UT3 lies a water supply diversion known as the Munroe Gravity Tunnel, which supplies irrigation & drinking water to Fort Collins, Greeley, Northern Water, & the Soldier Canyon Water Districts. This drainage was severely burned during the High Park Fire and as a result, saw dramatic changes in its hydrology resulting in large sediment and debris flows that overtopped HWY 14, sent debris into the Munroe Tunnel, and into the Poudre River. Our assessments indicated that post-fire risks remain high in this area – we estimate that with discharges of 200-300 cfs (~25–40 yr storm event) could result in 300-350 tons (TNs) of sediment being transported downstream and ultimately to the Poudre River or the Munroe Tunnel.

In January 2016, a 30% design was completed for this project site. The primary objective for this project was to take this 30% design to at least 60% design and develop any necessary permitting/other plans required to move the UT3 project to implementation. The primary tasks for the project were to conduct field analysis for post-fire restoration design; analyze data and create design options; & manage project deliverables. The study reach for this 60% design report, is 966 ft. in length, with the downstream end forming a confluence with the main stem of the Poudre River.

The long-term objective for the site is to stabilize potential erosion and water quality degradation & to reduce downstream risk to watershed values like instream habitat and water supply.

Figure 1: Location of UT3



Methods & Results

This project was primarily a design and planning project. The project work involved field & desktop analysis, in addition to modelling work. In June 2016, AloTerra was contracted by CPRW to advance design to a 60% level of completion. As part of this project, analyses included initial geomorphic surveys, ecological assessments, hydrologic and hydraulic modeling, and stakeholder engagement. Site surveys, field inventories (including photographic inventories), a basic hydraulic model, and desktop analyses were used to develop a summary of existing conditions. During the 60% design, the description of existing conditions was further refined, goals were re-evaluated, design alternatives were chosen, the design flow was refined, and additional surveying and analysis of site conditions were conducted.

The design team organized the reach into 7 problem areas (Figure 2). Further field assessments were conducted for each of these problem areas. Based on site characterization and identification of these seven problem areas, five conceptual alternatives for watershed resiliency were developed. These alternatives were ranked using a Multi-Criteria Decision Analysis (MCDA) tool. The MCDA compared multiple design alternatives and ranked how each scheme was anticipated to meet project criteria (roadway improvements, ecosystem enhancements, sediment reduction and stabilization, & overall risk reduction). Discussions with CPRW staff and key stakeholders determined that design Alternative Four - *Priority II Geomorphic Restoration and Re-alignment for 400cfs and sediment transport* was the preferred alternative. This alternative is characterized in the following manner:

General Design Metrics (60% design):

- Design Stream Type E3/2a
- Priority II Restoration
- Design for Sediment Transport
- Design Q = 400cfs (700cfs was design flow in the 30% plan)

A stable reference reach with a functioning floodplain was chosen to assist with the design of a re-alignment section of the UT3. The design team located a reference reach for the UT3 main stem based on aerial imagery and local knowledge. Reference reach surveys consisted of detailed measurements of the channel cross-section (in pools and riffles), longitudinal profile, and channel planform. Channel morphology was quantified by a detailed topographic survey using a survey grade Global Positioning System (GPS) or a Total Station. Field investigation measurements were then processed using Excel, AutoCAD, and/or RIVERMorph.

Analyses indicated that with discharges of 200-300 cfs there could be major damage to the culverts, roadway, sediment traps and grade control structures (e.g., check dams) that could result in 300-350 TNs of sediment transported downstream, and ultimately to the Poudre River.

Wetlands were surveyed according to USACE standards using the May 2010 Regional Supplement to 1987 Wetlands Delineation Manual. Sample points were taken to describe the degree of hydric soils, hydrophytic vegetation, and wetland hydrology. Off channel wetlands were delineated as well. During the wetland delineation, field indicators of bank erosion were also noted and cover of herbaceous species and shrubs & trees. Soils were evaluated in wetland areas and using the Web Soil Survey Data. Field surveys were also conducted of the contributing gulleys to asses bank condition, bed condition, & knickpoints using a standardized gulley stability assessment protocol.

As part of the 60% design, a surface model was developed representing existing morphological conditions at UT3. This model was created from survey points (X, Y, Z) taken in December 2015 as well as data generated in July 2016. Using a total base station, surveyed elements at this time included: thalweg profile and plan view, cross-sectional morphology of major valley forms, existing culverts (inverts and tops; inlets and outlets), edge of road, and channel and valley breaklines. The regional curve method was used to estimate bankfull elevations in UT3.

This information was analyzed and reviewed by CPRW staff and stakeholders to determine design options for each problem area. All design options used a bioengineering approach. The 60% design included an estimated opinion of cost which allowed staff, stakeholders, and the design team to prioritize implementation for each of the problem areas. The technical team also worked on developing all the necessary permits and regulatory requirements including a pre-construction notification for USACE. CPRW staff completed the wildlife component for threatened and endangered species regulations.

The 60% design was used to finalize construction ready designs to the draft 65% submittal of design drawings (attached Appendix 1) and develop a construction schedule, which is slated to begin fall 2018.

Figure 2: The general location of the seven problem areas

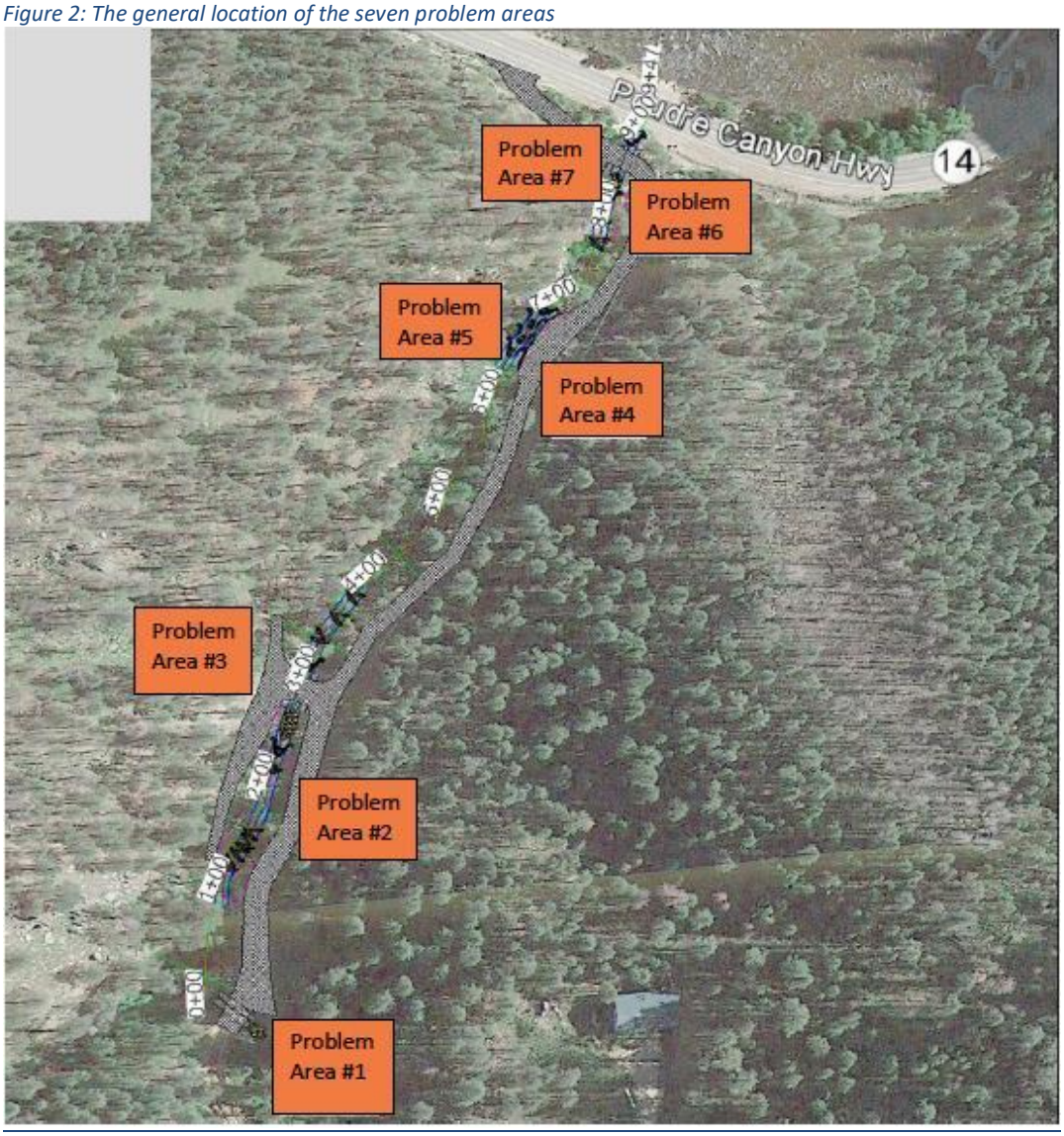


Figure 3: AloTerra crew doing field evaluations

Conclusions and Discussion

The project objectives for this funding were met. The technical team has produced sufficient design and planning to help move this project to construction, which we anticipate happening in the fall of 2018. Except for final details for construction permits, all necessary permits are in place and regulatory requirements have been completed.

Design for this project was a challenge given site constraints (existing private road, terrain and new landowners) and the narrow canyon. There are limited options to fully integrate bioengineering approaches. We believe the technical team has arrived at a reasonable design that will meet our site objectives for the budget that we currently have. Immediately after the fire, there was only one landowner. That landowner soon sold the land to two new landowners. The window of opportunity to

achieve more in terms of restoration gain at the site was lost when the property was divided and sold. With 3 landowners, planning and design was more challenging because of additional communication constraints and also because the new landowners made significant changes to landscape in the meantime. Thus, our top lesson learned from this site is the key importance of communicating early and often with landowners to maximize future restoration/recovery.

Actual Expense Budget

Task	Description	Total Budget/Grant Funds	Previously Invoiced	Current Invoice	Remaining Total	Percent Complete
TASK 1 –	Conduct field analysis for post-fire restoration design	$23,500	$21,856	$900.00	$744.10	96.8%
TASK 2 –	Analyze data and create design options	$20,000	$18,788	$807.50	$404.88	98.0%
TASK 3 –	Manage project deliverables	$1,500	$1,307		$192.94	87.1%
	TOTALS	**$45,000.00**	**$41,951**	**$1,707.50**	**$1,341.92**	

Match Reported		***Total Match Required***	**Previously Invoiced**	***Current Match Reporting***	***Remaining Match Needed***	
		$45,500.00	***$43,879.83***	$ 1,471.50	***$148.67***	

Appendix 1- 65% Submittal of Design Drawings

DRAFT 65% SUBMITTAL

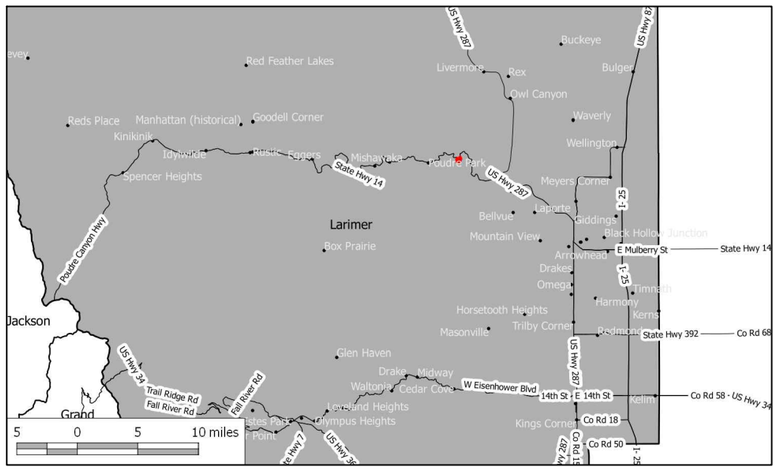
UNNAMED 3 POST-FIRE RESTORATION
STREAM RESTORATION AND RESILIENCY

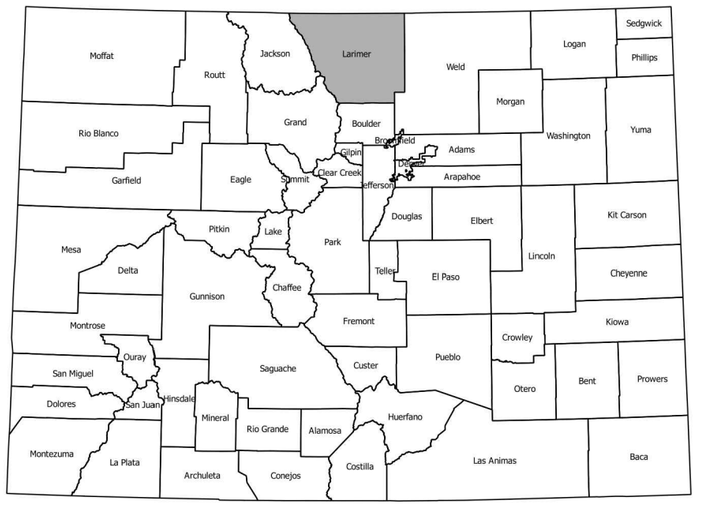
NEAR BELLVUE
LARIMER COUNTY, CO
12/27/2017

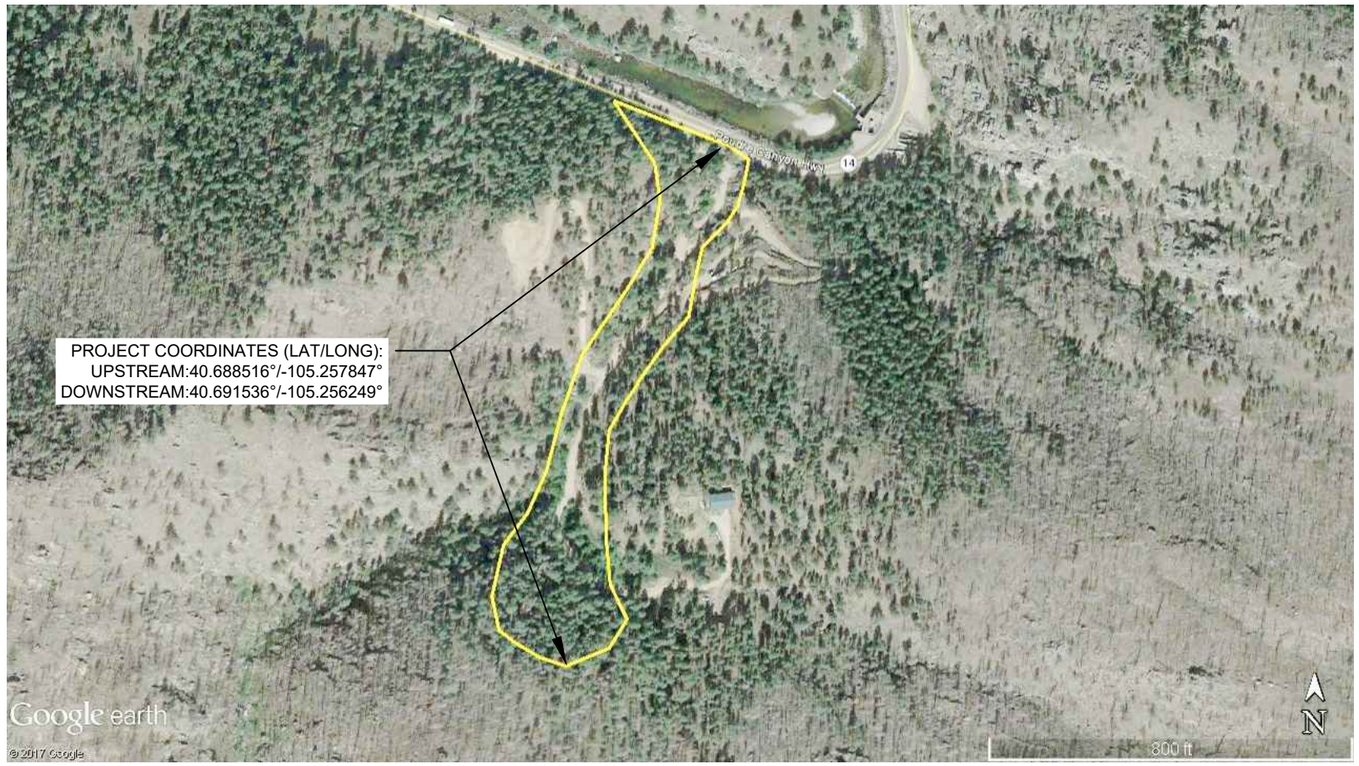
PROJECT MANAGER:
JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

PROJECT DESIGNER/RESTORATION ECOLOGIST:
JOHN GIORDANENGO
ALOTERRA RESTORATION SERVICES, LLC
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

ENGINEER:
DAVID BIDELSPACH
5 SMOOTH STONES RESTORATION, PLCC
754 MOUNT MAHOGANY
LIVERMORE, CO 80536







UNNAMED 3 POST-FIRE RESTORATION
STREAM RESTORATION AND RESILIENCY
DRAFT 65% SUBMITTAL

PLAN LEGEND

- DESIGN CENTERLINE
- DESIGN BANKFULL CHANNEL
- DESIGN BANKFULL BENCH
- GRADING
- LIMITS OF DISTURBANCE
- PROPOSED CULVERTS
- SCOUR POND
- LOG DROP
- CROSS-VANE
- ROCK WEIR
- EXISTING CULVERT
- WATERBAR
- BOULDER TOE
- EXISTING UTILITY POLE

PROFILE LEGEND

- EXISTING GROUND
- DESIGN THALWEG
- DESIGN BANKFULL
- PROFILE ROCK
- PROFILE LOG
- CULVERT

SECTION LEGEND

- EXISTING GROUND
- DESIGN THALWEG

Sheet List Table

DATE:DATE

SHEET 2 OF 30

DRAFT 65% SUBMITTAL
TABLE OF CONTENTS/LEGEND

NOT TO SCALE

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION

STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE

LARIMER COUNTY, CO

PROJECT MANAGER: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

DESIGNER: JOHN GIORDANENGO
ALOTERRA RESTORATION SERVICES, LLC
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

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GENERAL CONSTRUCTION NOTES:

1. THE WORK ON THIS PROJECT SHALL ADHERE TO THE FOLLOWING SPECIFICATIONS, STANDARDS AND/OR REGULATIONS:
2. THIS PROJECT IS NOT LOCATED WITHIN A FEMA 100-YEAR FLOODPLAIN AND WILL NOT AFFECT FLOODPLAIN BOUNDARIES.
3. INSTREAM STRUCTURES SHALL BE INSTALLED AS THE CHANNEL IS BEING CONSTRUCTED AND NOT POST CONSTRUCTION. FILTER FABRIC INSTALLED AS PART OF THE INSTREAM STRUCTURE SHALL BE A NONWOVEN GEOTEXTILE UNLESS OTHERWISE SPECIFIED IN STRUCTURE DETAILS OR SPECIFICATIONS.
4. WHERE PRACTICABLE, EXISTING TREES AND VEGETATION SHOULD BE LEFT IN PLACE TO FACILITATE NATURAL REGENERATION AND SOIL STABILIZATION.
5. DEFINITIONS:
   A. THE THALWEG IS THE LOWEST PORTION OF THE CHANNEL. IN THIS PLAN SET, THE DESIGNED THALWEG IS REFERRED TO AS "DESIGN ALIGNMENT: CENTERLINE".
   B. THE CHANNEL TOE IS THE OUTER EDGE OF THE FLAT BOTTOM OF THE LOW FLOW CHANNEL, WHERE IT MEETS THE LOW FLOW CHANNEL SLOPE.
   C. THE INNER BERM IS THE TOP OF LOW FLOW CHANNEL SLOPE OF THE DESIGNED, TRAPEZOIDAL, LOW FLOW CHANNEL. IN THIS PLAN SET, IT IS REFERRED TO AS "DESIGN ALIGNMENT: INNER BERM".
   D. THE LOW-FLOW WATER SURFACE IS THE ELEVATION OF THE CREEK'S WATER SURFACE WHEN FLOW IS AT ITS LOWEST ANNUAL VOLUME.
   E. THE NORMAL WATER SURFACE LINE IS THE ELEVATION AT WHICH TYPICAL BASE FLOWS OCCUR. EXISTING NORMAL WATER SURFACE LINE IS REFERRED TO IN SHEET 12 OF THIS PLAN SET AS "NORMAL WATER SURFACE LINE". IN DESIGNED PORTIONS OF THE CHANNEL, NORMAL WATER SURFACE LINE IS LABELED AS "BASE FLOW" AND IS TYPICALLY LOCATED HALFWAY BETWEEN THE INNER BERM AND THE CHANNEL TOE.
   F. BANKFULL ELEVATION IS THE POINT OF INCIPIENT FLOODING IN AN ALLUVIAL CHANNEL. THIS ELEVATION IS THE REFERENCE FOR DEPTHS ON OR ALONG THE CHANNEL PROFILE AND STRUCTURES DESCRIBED IN THESE SHEETS. IN THIS PLAN SET, BANKFULL ELEVATION IN DESIGNED PORTIONS OF THE CHANNEL IS REFERRED TO AS "DESIGN ALIGNMENT: BANKFULL"; BANKFULL ELEVATION IN AREAS THAT HAVE NOT BEEN REGRADED IS REFERRED TO AS "BANKFULL (EXISTING)". FOLLOWING ROUGH GRADING AND PRIOR TO INSTALLATION OF SOIL IN RIPRAP AND/OR REVEGETATION TREATMENTS, CONTRACTOR SHALL FLAG "BANKFULL ELEVATION" ON SITE.
   G. THE BANKFULL BENCH IS A CONSTRUCTED FLOODPLAIN ADJACENT TO THE CHANNEL. THE BANKFULL BENCH IS CONSTRUCTED AT THE BANKFULL ELEVATION. IN THIS PLAN SET, THE BANKFULL BENCH "EXTENDS TOWARDS THE THALWEG TO "DESIGN ALIGNMENT: BANKFULL" AND AWAY FROM THE THALWEG TO "DESIGN ALIGNMENT: FLPLN GRADING LIMIT".
   H. 5-YR FLOOD FREQUENCY ELEVATION IS... FOLLOWING ROUGH GRADING, AND PRIOR TO INSTALLATION OF SOIL IN RIPRAP AND/OR REVEGETATION TREATMENTS, CONTRACTOR SHALL FLAG 5 YEAR FLOOD FREQUENCY ELEVATION ON SITE.
   I. 10-YR FLOOD FREQUENCY ELEVATION IS... FOLLOWING ROUGH GRADING, AND PRIOR TO INSTALLATION OF SOIL IN RIPRAP AND/OR AND REVEGETATION TREATMENTS, CONTRACTOR SHALL FLAG 10 YEAR FLOOD FREQUENCY ELEVATION ON SITE.
   J. THE VANE LENGTH IS THE STRAIGHT LINE DISTANCE BETWEEN THE VANE ARM AND A LINE TANGENT TO THE STREAMBANK AT THE POINT WHERE THE VANE ARM INTERSECTS THE STREAMBANK.
   K. THE VANE ANGLE IS THE ANGLE BETWEEN THE VANE ARM AND A LINE TANGENT TO THE STREAMBANK AT THE POINT WHERE THE VANE ARM INTERSECTS THE STREAMBANK.
   L. INSTREAM STRUCTURES ARE THOSE STRUCTURAL DESIGN FEATURES OCCURING WITHIN THE BANKFULL CHANNEL, AND INCLUDE CROSS VANES AND LOG DROPS. INSTREAM STRUCTURES DO NOT INCLUDE TOE WALLS OR BIOENGINEERING TREATMENTS.
   M. BIOENGINEERING TREATMENTS ARE SLOPE STABILIZATION TREATMENTS ABOVE THE BANKFULL BENCH, COMPOSED OF PLANTS, SOIL, AND STRUCTURES (TOE WALLS, SELECTED BACKFILL, EROSION CONTROL BLANKET, AND SOIL LIFTS).
6. THE CONTRACTOR SHALL STAKE OUT THE PROPOSED STREAM CENTERLINE (REFERRED TO IN THIS PLAN SET AS "DESIGN ALIGNMENT: CENTERLINE") FOR REVIEW BY THE ENGINEER BEFORE INITIATING EXCAVATION. DEPENDING ON ENCOUNTERED CONDITIONS SOME SHIFTING OF THE STREAM CHANNEL MAY BE NECESSARY. ANY COST ASSOCIATED WITH CHANGING STRUCTURE LOCATIONS OR ALIGNMENT SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION. STAKING MAY BE OMITTED FOR PORTIONS OF THE STREAM WHEN SURVEY-GRADE GPS IS USED TO CONSTRUCT THE CHANNEL. IF GPS IS USED IN LIEU OF STAKING THE CHANNEL IN THE FIELD, THE CONTRACTOR ASSUMES ALL RESPONSIBILITY FOR THE STREAM BEING CONSTRUCTED AS DESIGNED, INCLUDING ANY ISSUES RELATED TO PROJECTIONS, BASE POINTS OR CONVERSION OF DIGITAL TERRAIN MODELS.
7. PRIOR TO CLEARING AND GRUBBING, CONTRACTOR SHALL MARK THE LIMITS OF CLEARING NEAR TREES FOR VERIFICATION OF INTENT BY THE PROJECT DESIGNER OR ENGINEER. SOME MINOR ADJUSTMENT OF CHANNEL ALIGNMENT MAY BE REQUIRED TO PRESERVE TREES OR MINIMIZE IMPACT TO TREES.
8. ANY HARVESTING OF WILLOWS FROM ONSITE MUST BE APPROVED BY THE PROJECT DESIGNER.
9. CONTRACTOR SHALL MINIMIZE, TO THE MAXIMUM EXTENT POSSIBLE, IMPACTS TO ADJACENT TREES. CONSTRUCTION EQUIPMENT TRACKS AND PATHWAYS SHALL BE GRADED AND RECONTOURED AFTER CONSTRUCTION TO PREVENT RILL AND GULLY EROSION.
10. THE LIMITS OF CONSTRUCTION ARE SHOWN ON THESE PLAN SHEETS. THE CONTRACTOR MAY EXTEND THE LIMITS OF CONSRUCTION ONLY WITH THE APPROVAL OF THE PROJECT MANAGER.
11. CONTRACTOR SHALL USE AN EXCAVATOR WITH A HYDRAULIC THUMB TO INSTALL INSTREAM STRUCTURES.
12. CHANNEL RELOCATION WORK SHALL BE COMPLETED AND STABILIZED PRIOR TO ALLOWING FLOW TO ENTER INTO THE NEWLY CONSTRUCTED STREAM CHANNEL.
13. THE CONTRACTOR SHALL NOT OPEN UP MORE THAN 200 FEET OF CHANNEL WITHOUT EROSION CONTROL BLANKET IN PLACE OR BY APPROVAL OF THE ENGINEER.
14. THE PROPOSED STREAM CHANNEL SHALL BE CONSTRUCTED BY FIRST GRADING THE FLOODPLAIN ADJACENT TO THE CHANNEL TO THE ELEVATION INDICATED ON THESE PLANS. THIS MAY BE DONE AS GENERAL EXCAVATION. THE PROPOSED STREAM CHANNEL SHALL THEN BE EXCAVATED TO THE PROPER DEPTHS INDICATED ON THE PROFILE AND PROPOSED CONTOURS. THIS SHALL BE DONE AS SPECIALIZED EXCAVATION AND IS TYPICALLY ACCOMPLISHED WITH A TRACK EXCAVATOR. THE PROFILES AND CONTOURS SHOWN PROVIDE WIDTHS AND SLOPES FOR AID IN CONSTRUCTING THE CHANNEL TO THE APPROPRIATE DIMENSIONS. THE THALWEG CAN FIRST BE EXCAVATED TO THE POINT INDICATED ON THE PROFILE. EXCAVATION AND FINE GRADING OF THE CROSS SECTIONS SHALL THEN BE PERFORMED AS SHOWN ON THE TYPICAL CROSS SECTIONS AND PROPOSED CONTOURS. ANY STOCKPILING OF MATERIALS OR "DOUBLE HANDLING" NECESSARY TO BUILD THE CHANNEL SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.
15. IF THE EXISTING GROUND IS LESS THAN 0.2 FEET HIGHER THAN THE PROPOSED BANKFULL ELEVATION, IT IS NOT NECESSARY TO EXCAVATE MATERIAL TO THE PROPOSED ELEVATION SHOWN ON THE PROFILE.
16. THE SURFACE OF ALL INSTREAM STRUCTURES SHALL BE FINISHED TO A SMOOTH LINE IN ACCORDANCE WITH THE LINES, GRADES, AND CROSS SECTIONS OR ELEVATIONS SHOWN ON THE DRAWINGS. THE DEGREE OF FINISH FOR THE VANE SLOPES AND INVERT ELEVATIONS SHALL BE WITHIN 0.1 VERTICAL FEET OF THE GRADES AND ELEVATIONS INDICATED. ALL GAPS OR VOIDS BETWEEN THE ROCKS OF INSTREAM STRUCTURES SHALL BE PLUGGED WITH SMALL GRAVEL TO FORM A TIGHT-FITTING SEAL.
17. CONSTRUCTION SPECIFICATIONS FOR BANKFULL CHANNEL DIMENSIONS OR CROSS SECTIONS WILL BE HELD TO THE DIMENSIONS SHOWN ON THE TYPICAL CROSS SECTIONS. ELEVATIONS SHALL BE CONSTRUCTED WITHIN 0.1 VERTICAL FEET; WIDTHS AND MEAN DEPTHS MUST FALL WITHIN THE RANGES SHOWN IN THE DRAWINGS.
18. THE IN-STRUCTURE BID ITEMS SHALL INCLUDE ALL LABOR AND MATERIALS NECESSARY TO CONSTRUCT THE STRUCTURE. BID ITEMS INCLUDE SEEDING, PLANTING, AND MULCH AND EROSION CONTROL BLANKETS AND INCLUDE ALL LABOR AND MATERIALS NECESSARY TO STABILIZE AREAS DISTURBED DURING CONSTRUCTION OF STRUCTURES. AFTER THE STRUCTURE IS COMPLETE AND FLOW IS RESTORED TO THE CHANNEL, SOME ADJUSTMENT TO THE STRUCTURE OR ADDITIONAL STABILIZATION MEASURES MAY BE NECESSARY TO ACHIEVE DESIRED EFFECT. ANY COSTS ASSOCIATED WITH THESE ADJUSTMENTS SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.
19. EXCESS SPOIL MATERIAL MAY BE SPREAD AND GRADED ONSITE OR IN THE ONSITE PIT AS APPROVED BY THE ENGINEER. PLACEMENT OF ANY ON-SITE OR OFF-SITE SPOIL MATERIAL SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.
20. TOPSOIL SHALL BE REMOVED FROM EXCAVATION AND SPOIL AREAS PRIOR TO CUT OR FILL. ANY TOPSOIL REMOVED DURING EXCAVATION SHOULD BE STORED SEPARATELY AND USED SELECTIVELY WHERE SEEDING IS TO OCCUR AFTER ROUGH GRADING IS COMPLETE. STOCKPILING AND PLACEMENT OF TOPSOIL SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION AND APPROVED BY THE PROJECT MANAGER.
21. CONTRACTOR SHALL CALL FOR UTILITY MARKING AT LEAST 48 HOURS PRIOR TO START OF CONSTRUCTION. IT MAY BE NECESSARY FOR THE CONTRACTOR TO CONTACT THE COUNTY CLERK TO DETERMINE WHAT UTILITY COMPANIES HAVE FACILITIES IN THE PROJECT AREA. LOCATING UTILITIES IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE ENGINEER AND PROJECT OWNER WILL NOT BE RESPONSIBLE FOR ANY DAMAGES TO UTILITIES.
22. CONTRACTOR SHALL UTILIZE NATIVE MATERIAL FROM THE SITE WHERE AVAILABLE AND ALLOWED BY THE ENGINEER. NATIVE MATERIAL THAT CAN BE FOUND ON SITE INCLUDE TREES THAT CAN BE USED FOR LOG STRUCTURES AND WOOD DEBRIS.
23. AFTER CONSTRUCTION, THE ACCESS ROADS LEADING TO THE PROJECT SITE SHALL BE RESTORED TO AS GOOD OR BETTER CONDITION THAN BEFORE CONSTRUCTION.
24. FOOTER DEPTH ON ALL STRUCTURES REQUIRING FOOTERS SHALL BE AT LEAST 6 TIMES GREATER THAN THE DROP BETWEEN THE STRUCTURE AND THE FOOTERED STRUCTURE DIRECTLY UPSTREAM OR APPROVED BY THE ONSITE ENGINEER.

EROSION/SEDIMENTATION CONTROL NOTES:

1. GRADING (ROUGH AND FINAL) SHALL NOT OCCUR MORE THAN 1 MONTH PRIOR TO REVEGETATION MEASURES. SHOULD GRADING OCCUR MORE THAN 1 MONTH PRIOR TO REVEGETATION ACTIVITIES, CONTRACTOR SHALL DEVELOP A TEMPORARY EROSION STABILIZATION PLAN THAT MEETS THE APPROVAL OF THE PROJECT MANAGER, PRIOR TO CONSTRUCTION.
2. TEMPORARY DIVERSION OF RUNOFF/RUNON WATER SHALL BE INSTALLED AS NEEDED TO FACILITATE CONSTRUCTION OR AS DIRECTED ON-SITE BY THE ENGINEER.
3. ALL DISTURBED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY AFTER THE COMPLETION OF THE GRADING OPERATION. ALL TEMPORARY MEASURES SHALL BE REMOVED ONCE ACCEPTABLE PERMANENT STABILIZATION IS ACHIEVED. THE ENGINEER SHALL DETERMINE IF THE PERMANENT STABILIZATION IS ACCEPTABLE.
4. THE BANKS AND BANKFULL BENCH OF THE CONSTRUCTED STREAM CHANNEL SHALL BE STABILIZED AS SOON AS POSSIBLE.
   4.1. BANKS AND BANKFULL BENCH SHALL BE SEEDED IN ACCORDANCE WITH THE "REVEGETATION NOTES" AND "REVEGETATION PLANTING PLAN" OF THIS PLAN SET.
   4.2. EROSION CONTROL BLANKET SHALL BE INSTALLED FROM THE INNER BERM TO BEYOND THE OUTER EXTENTS OF THE BANKFULL BENCH (DESIGN ALIGNMENT: FLOODPLAIN). PRIOR TO INSTALLING BLANKET, PREPARE THE BED BY LOOSENING THE SOIL 3 TO 6 INCHES, APPLY SEED AND THEN SURFACE MULCH. THE BLANKET SHALL BE ROLLED OUT IN THE DIRECTION OF THE ANTICIPATED RUN-OFF FLOW. INSTALL BLANKET IN ACCORDANCE WITH DETAIL SHOWN IN THIS PLAN SET. REWORKING OF AREAS THAT DO NOT ESTABLISH VEGETATION OR BECOME UNSTABLE SHALL BE NECESSARY IF THE EROSION CONTROL BLANKET SEPARATES FROM THE SOIL. EXCELSIOR CC4 ALL-NATURAL OR APPROVED EQUAL SHALL BE USED FOR THE EROSION CONTROL BLANKET.
5. PERMANENT STABILIZATION TREATMENTS SHALL BE INSTALLED IN ALL AREAS LABELED ON PLANS AS "REGRADING AND BANK REVEGETATION" ACCORDING TO THE TABLE LABELED "BIOENGINEERING TREATMENT" IN THESE NOTES.
   5.1. AT SLOPES LESS STEEP THAN 3H:1V, SOIL SHALL BE AMENDED AS SPECIFIED IN THESE NOTES. PREPARE THE BED BY LOOSENING THE UPPER-MOST INSTALLED TOP SOIL LAYER 3 TO 6 INCHES. APPLY SOIL AMENDMENTS AS NECESSARY TO MEET SOIL CHEMISTRY CHARACTERISTICS SPECIFIED IN THE "REVEGETATION NOTES" OF THIS PLAN SET. APPLY SEED AND MULCH ACCORDING TO THE "REVEGETATION NOTES" AND "REVEGETATION PLANTING PLAN" TABLES IN THIS PLAN SET.
   5.2. AT SLOPES RANGING BETWEEN 2H:1V AND 3H:1V, EROSION CONTROL BLANKET SHALL BE INSTALLED FROM THE OUTER EXTENTS OF THE BANKFULL BENCH (I.E. "DESIGN ALIGNMENT: FLPLN GRADING LIMIT") TO THE UPPER EXTENTS OF THE AREA MARKED AS "REGRADING AND BANK REVEGETATION" (TYPICALLY TOP OF REGRADED HILLSLOPE AND/OR EDGE OF ROAD). SEE EROSION CONTROL BLANKET DETAIL. PRIOR TO INSTALLING BLANKET, PREPARE THE BED BY LOOSENING THE UPPER-MOST INSTALLED TOP SOIL LAYER 3 TO 6 INCHES. APPLY SOIL AMENDMENTS AS NECESSARY TO MEET SOIL CHEMISTRY CHARACTERISTICS SPECIFIED IN THE "REVEGETATION NOTES" OF THIS PLAN SET. APPLY SEED AND MULCH ACCORDING TO THE "REVEGETATION NOTES" AND "REVEGETATION PLANTING PLAN" TABLES IN THIS PLAN SET. THE BLANKET SHALL BE ROLLED OUT IN THE DIRECTION OF THE PRIMARY ANTICIPATED RUN-OFF FLOW. INSTALL BLANKET IN ACCORDANCE WITH DETAIL SHOWN HEREIN. "WILLOW / COTTONWOOD CUTTINGS" SHALL BE INSTALLED, AS INDICATED ON THE PLAN AND PROFILE SHEETS, ACCORDING TO THE "REVEGETATION NOTES" AND "REVEGETATION PLANTING PLAN" TABLES IN THIS PLAN SET. REWORKING OF AREAS THAT DO NOT ESTABLISH VEGETATION OR BECOME UNSTABLE SHALL BE NECESSARY IF THE EROSION CONTROL BLANKET SEPARATES FROM THE SOIL. EXCELSIOR CC4 ALL-NATURAL OR APPROVED EQUAL SHALL BE USED FOR THE EROSION CONTROL BLANKET. AREAS REQUIRING COCONUT COIR MATTING SHALL BE SEEDED AND MULCHED FOR STABILIZATION PRIOR TO THE INSTALLATION OF THE MATTING. REFER TO EROSION CONTROL BLANKET DETAIL FOR PLACEMENT OF EROSION CONTROL BLANKET.
   5.3. AT SLOPES RANGING BETWEEN 1H:1V AND 2H:1V, "SELECTED BACKFILL" RIPRAP SHOULD BE APPLIED BEHIND TOE WALLS TO THE UPPER EXTENTS OF THE AREA MARKED AS "REGRADING AND BANK REVEGETATION" (TYPICALLY TOP OF REGRADED HILLSLOPE AND/OR EDGE OF ROAD). "SELECTED BACKFILL" SHALL BE OF A CLASS RANGE AS SPECIFIED BY THE NOTES OF THE "SELECTED BACKFILL MATERIAL" DETAIL IN THESE PLANS. SOIL SHALL BE TAMPED (IN VOIDS AND ABOVE RIPRAP) WITH HAND TOOLS OR SIMILAR EQUIPMENT, TO REDUCE THE INCIDENCE OF AIR POCKETS. VOIDS BETWEEN RIPRAP SHALL BE FILLED COMPLETELY WITH SOIL. TAMPED SOIL SHALL NOT RESULT IN A COMPACTION THAT WOULD RESTRICT ROOTING OF TRANSPLANTED VEGETATION OR SEEDLINGS. SURFACE OF SELECTED BACKFILL SHALL BE GRADED ROUGHLY TO PREVENT RILLING AND PROMOTE INFILTRATION. TOP SOIL SHALL BE APPLIED TO A DEPTH OF 6" ABOVE SELECTED BACKFILL, SUCH THAT: IT COMPLETELY COVERS RIPRAP, BUT DOES NOT EXCEED 6" ABOVE RIPRAP, AND; SUCH THAT IT IS NOT AN IMPEDIEMNT TO DRAINAGE AWAY FROM THE ROADWAY. SURFACE OF TOP SOIL SHALL BE COVERED WITH EROSION CONTROL BLANKET.
   5.4. AT SLOPES RANGING BETWEEN 0.5V:1H AND 1H:1V, SOIL LIFTS SHALL BE CONSTRUCTED, ACCORDING TO THE "VEGETATED SOIL LIFTS" DETAIL IN THIS PLAN SET. A TOE WALL SHALL BE OF 2 COURSES OF 24" DIAM BOULDERS. EACH LIFT SHALL BE WRAPPED WITH GEOTEXTILE FABRIC. GEOCOIR / DEKOWE 700 OR APPROVED EQUAL SHALL BE USED.
      5.4.1. IMMEDIATELY ADJACENT TO THE TOE WALL SHALL BE FILLED WITH "SELECTED BACKFILL", AS DEFINED IN THE NOTES ASSOCIATED WITH THE "SELECT BACKFILL MATERIAL" DETAIL IN THESE PLANS.
      5.4.2. ALL LIFTS PLACED AT AN ELEVATION EXCEEDING THE TOP ELEVATION OF THE TOE WALL SHALL BE FILLED WITH COMPACTED SOIL MEETING SOIL CHEMISTRY CHARACTERISTICS AS SPECIFIED IN THE "REVEGETATION NOTES" OF THIS PLAN SET. BETWEEN EACH OF THESE LIFTS, 2" OF SOIL SHALL BE INSTALLED, AND PLANTS WILL BE INSTALLED ACCORDING TO THE "VEGETATED SOIL LIFTS" DETAIL AND "REVEGETATION NOTES" OF THIS PLAN SET.

SPECIAL NOTE:

THE ELEVATIONS SHOWN HEREIN ARE BASED ON 5SSR TOTAL STATION SURVEY THAT ENCOMPASSES THE EXISTING GROUND SURFACE FROM WHICH ALL COMPUTATIONS FOR CUT/FILL ARE BASED. SLIGHT DISCREPANCIES BETWEEN THE EXISTING GROUND DIGITAL SURFACE AND FIELD CONDITIONS CAN RESULT IN SIGNIFICANT VARIATIONS IN TOTAL EXCAVATED QUANTITIES. THUS, QUANTITIES OF MATERIAL EXCAVATED SHOULD BE COMPARED TO THOSE SHOWN ON THE DRAWINGS TO MANAGE THE MOVEMENT OF MATERIAL ACROSS THE SITE.

TOPOGRAPHIC INFORMATION:

EXISTING GROUND SURFACES ARE BASED ON A SURVEY COMPLETED IN JUNE OF 2016. THE USE OF TOTAL STATION SURVEY EQUIPMENT WAS USED TO COLLECT THE DATA WITHIN A TOLERANCE OF 0.08 VERTICAL AND 0.06 HORIZONTAL. THE DATA WAS NOT COLLECTED BY A PLS. BENCHMARKS WERE SET THROUGHOUT THE SITE AND CAN BE PROVIDED AT ANY TIME. CHANGES IN EXISTING SURFACES SHALL BE INCIDENTAL TO CONSTRUCTION. THE ENGINEER MAKES NO WARRANTY FOR THE ACCURACY OF ANY SURVEY INFORMATION SHOWN IN THESE DRAWINGS. IF DISCREPANCIES EXIST BETWEEN THE THREE DIMENSIONAL DIGITAL SURFACE AND THE ACTUAL GROUND SURFACE, SIGNIFICANT VARIATIONS IN THE EXCAVATIONS QUANTITIES CAN BE EXPECTED, WHICH COULD AFFECT HANDLING AND PHASING CONSIDERATIONS FOR THE PROJECT. THE ENGINEER ACCEPTS NO RESPONSIBILITY FOR CHANGES TO EXCAVATION QUANTITIES THAT CHANGE AS A RESULT OF ANY DISCREPANCIES BETWEEN THE DIGITAL SURFACE AND EXISTING GROUND.

SPECIAL GRADING NOTE:

THE AGREED UPON INTENT OF THIS GRADING PLAN IS TO MAINTAIN A "LIVE" SURFACE SO THAT ANY CHANGES THAT ARISE DURING CONSTRUCTION CAN BE QUICKLY ENCOMPASSED INTO THE THREE-DIMENSIONAL SURFACE GENERATED DURING THIS DESIGN PROCESS. AS SUCH, FINE TUNING OF THE SURFACE THAT WOULD ELIMINATE THE APPEARANCE OF JAGGED CONTOUR LINES WHERE SLIGHT VARIATIONS BETWEEN THE EXISTING AND PROPOSED SURFACES WAS NOT COMPLETED.

DATE:DATE

SHEET 3 OF 30

NOT TO SCALE

DRAFT 65% SUBMITTAL
NOTES - (1)

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION

STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE

LARIMER COUNTY, CO

PROJECT MANAGER: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

DESIGNER: JOHN GIORDANENGO
ALOTERRA RESTORATION SERVICES, LLC
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

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REVEGETATION NOTES:

1. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING VEGETATION DURING REVEGETATION WORK.
2. CONTAINERS (SHRUBS) SHALL BE PROTECTED FROM BEAVER AND OTHER WILDLIFE USING CDOT STANDARD DETAIL OR EQUIVALENT WITH 2"X4" WELDED WIRE MESH FENCE 4' HIGH, WHERE LOCATED ABOVE THE NORMAL HIGH WATER MARK. CONTAINERS (SHRUBS) BELOW BANKFULL SHALL BE PROTECTED FROM POTENTIAL FOOT TRAFFIC WITH WOOD STAKES. CONTAINERS (HERBACEOUS) SHALL NOT BE FENCED OR STAKED.
3. ALL SOIL APPLIED TO THE SITE MUST BE FREE OF COLORADO STATE NOXIOUS, AND COLORADO A AND B LISTED WEED PROPAGULES.
4. THE FOLLOWING SOIL CHEMISTRY CHARACTERISTICS MUST NOT BE EXCEEDED IN SOILS THAT BOTH RECEIVE SEED OR PLANT MATERIALS AND HAVE EITHER BEEN AMENDED OR INSTALLED BETWEEN OR OVER RIPRAP:
   - 4.1. SOIL PH SHALL BE BETWEEN 6 AND 8.
   - 4.2. SOIL ELECTRICAL CONDUCTIVITY (MMHOS/CM SOLUBLE SALTS) SHALL BE LESS THAN 7.
   - 4.3. SODIUM ABSORPTION RATIO SHALL BE LESS THAN 8.
   - 4.4. SOIL ORGANIC MATTER SHALL BE BETWEEN 4% AND 10%. THE DESIRED PORTION OF RECALCITRANT ORGANIC MATTER IS BETWEEN 20% AND 50% BY WEIGHT.
   - 4.5. IN GENERAL, NITROGEN SUPPLEMENTING IS NOT RECOMMENDED FOR NATIVE PLANT RESTORATION, EXCEPT IN VERY SMALL QUANTITIES WHEN A DEFICIENCY IN NATIVE OR IMPORTED TOPSOIL IS NOTED. A SOIL TEST SHALL BE CONDUCTED BEFORE PRESCRIBING ANY NITROGEN ADDITIONS.
   - 4.6. IN SEEDED AREAS, IF IMPORTED TOPSOIL IS ABSENT IN NITROGEN AND LOW IN ORGANIC MATTER, SOIL AMENDMENTS USED SHALL INCLUDE BIOSOL (300–400 LBS/ACRE) AND HUMATE (300–500 LBS/ACRE) OR SIMILAR. COMPOST MAY ALSO BE MIXED WITH TOPSOIL TO MEET ORGANIC CONTENT REQUIREMENTS, ONLY IF THE COMPOST MEETS THE ABOVE SOIL CHEMISTRY CRITERIA.
5. ALL SEED MUST BE INSPECTED BY THE CONTRACTOR PRIOR TO INSTALLATION, AND ALL TAGS MUST BE MAINTAINED FOR DOCUMENTATION. ALL SEED MUST BE LABELED AS "CERTIFIED" BY THE COLORADO SEED GROWERS ASSOCIATION, AND SHALL NOT INCLUDE THE PRESENCE OF NOXIOUS OR INVASIVE SPECIES PROHIBITED UNDER THE COLORADO SEED ACT. A "ZERO WEED TOLERANCE" RULE SHALL BE USED FOR SEED MIXES (I.E., NO NOXIOUS OR INVASIVE SPECIES INCLUDED IN THE MIX). A RESTORATION ECOLOGIST SHOULD BE CONSULTED WHEN REVIEWING THE WEED–FREE SEED PRODUCT, INCLUDING THE LIST OF POTENTIAL WEEDS PRESENT IN THE SEED, AND THE PRODUCT INFORMATION. SEED IDENTIFICATION AND CERTIFICATION TAGS, SHALL BE PROVIDED TO THE PROJECT MANAGER FOR REVIEW AND APPROVAL PRIOR TO USE.
6. SEEDING SHALL BE BROADCAST AT RATES LISTED IN SEED MIX, RAKED, AND COVERED WITH MULCH AT A RATE THAT ATTAINS 70% COVERAGE AND IS NO DEEPER THAN 1". SEED SHALL BE BROADCAST EVENLY OVER THE AREA EITHER BY HAND OR BY USING A BROADCAST SPREADER.
7. THE RIPARIAN BANK AND TRANSITION ZONE SEED MIX SHALL BE APPLIED TO ALL REGRADED OR OTHERWISE DISTURBED SLOPES (I.E. AREAS LABELED "REGRADING AND BANK REVEGETATION" ON THE PLAN SET), FROM A LINE ROUGHLY 1/3 (SURFACE MEASURED) OF THE DISTANCE BETWEEN "DESIGN ALIGNMENT: INNER BERM" AND "DESIGN ALIGNMENT: BANKFULL" TO THE UPPER EXTENTS OF THE AREA MARKED AS "REGRADING AND BANK REVEGETATION" (TYPICALLY TOP OF REGRADED HILLSLOPE AND/OR EDGE OF ROAD). THE RIPARIAN BANK AND TRANSITION ZONE SEED MIX SHALL ALSO BE APPLIED TO AREAS LABELED AS "BANK REVEGETATION" IN THE PLAN SET, BETWEEN THE "NORMAL WATER SURFACE LINE" (EXISTING) AND THE UPPER EXTENTS OF THE AREA MARKED AS "BANK REVEGETATION" (TYPICALLY TOP OF REGRADED HILLSLOPE AND/OR EDGE OF ROAD).
8. THE GREENLINE MIX SHALL BE APPLIED TO ALL REGRADED OR OTHERWISE DISTURBED SLOPES, FROM THE "DESIGN ALIGNMENT: INNER BERM" TO A LINE ROUGHLY 1/3 (SURFACE MEASURED) OF THE DISTANCE BETWEEN "DESIGN ALIGNMENT: INNER BERM" AND "DESIGN ALIGNMENT: BANKFULL". THE GREENLINE MIX SHALL ALSO BE APPLIED TO AREAS LABELED AS "BANK REVEGETATION" IN THE PLAN SET, (TYPICALLY BETWEEN LOW FLOW WATER SURFACE AND NORMAL WATER SURFACE LINE).
9. WOOD STRAW OR WOOD SHRED SHALL BE USED FOR "SURFACE MULCH" ON SEEDED AND PLANTED AREAS. IF WOOD SHRED IS USED, IT SHALL CONTAIN A DIVERSITY OF WOOD FIBER LENGTHS, WITH A MINORITY OF FINES (I.E., LESS THAN 2" IN LENGTH). IF APPROVED BY THE PROJECT MANAGER, ALTERNATIVE WEED–FREE AND WIND RESISTANT MULCH MAY BE USED.
10. THE PLACEMENT OF "SURFACE MULCH" SHALL OCCUR A MAXIMUM OF 48 HOURS AFTER SEEDING. MULCH WILL BE SPREAD TO COVER THE INSTALLED AREAS AT A MINIMUM RATE OF 1.5 TONS PER ACRE. MULCH SHALL BE KEPT OUT OF THE CROWNS OF SHRUBS AND GROUND COVER.
11. CERTIFIED WEED–FREE MULCH SHALL BE USED IN ALL SITUATIONS. PROPER LABELING FOR EACH BALE OR LOT OF MULCH USED IS REQUIRED. PROJECT MANAGER HAS THE RIGHT TO INSPECT AND REJECT BALES IF THEY ARE SUSPECTED TO CONTAIN UNACCEPTABLE WEED CONTENTS. SPECIFICALLY, SMOOTH BROME (BROMUS INERMIS), CHEATGRASS (ANISANTHA TECTORUM), FIREWEED (KOCHIA SCOPARIA), AND OTHER AGGRESSIVE EXOTIC PLANT SPECIES SHALL NOT BE PRESENT IN MULCHES USED FOR THE PROJECT. A RESTORATION ECOLOGIST SHOULD BE CONSULTED WHEN REVIEWING THE WEED–FREE MULCH PRODUCT. A LIST OF POTENTIAL WEEDS PRESENT IN THE MULCH AND THE PRODUCT INFORMATION SHALL BE PROVIDED TO THE PROJECT MANAGER AND PROJECT DESIGNER FOR REVIEW AND APPROVAL PRIOR TO USE. HAY SHALL NOT BE USED AS A SURFACE MULCH.
12. FOM THE "DESIGN ALIGNMENT: INNER BERM" TO A LINE ROUGHLY 1/3 (SURFACE MEASURED) OF THE DISTANCE BETWEEN "DESIGN ALIGNMENT: INNER BERM" AND "DESIGN ALIGNMENT: BANKFULL", "CONTAINERS (HERBACEOUS)" SHALL BE PLANTED AS SPECIFIED IN THE "REVEGETATION PLANTING PLAN" TABLE OF THIS PLAN SET.
13. WTHIN AREAS IDENTIFIED ON THE PLANS AS "BANK REVEGETATION" OR "REGRADING AND BANK REVEGETATION" AND BELOW A FINISHED SLOPE OF 60%, "REVEGETATION ISLANDS" OF SHRUBS AND TREES SHOULD BE ESTABLISHED EVERY 18 FEET WHERE THERE IS REASONABLE DISTANCE TO THE GROUNDWATER SUCH THAT ARTIFICIAL IRRIGATION IS NOT REQUIRED.
   - 13.1. ON SLOPES REQUIRING SOIL RIPRAP TREATMENT, RIPRAP SHOULD BE REMOVED BY MACHINERY AND HAND LABOR (ROCK BARS). ON SLOPES STEEPER THAN 60%, ROCK SHOULD NOT BE REMOVED AND "REVEGETATION ISLANDS" SHOULD NOT BE INSTALLED. ROCK SHOULD BE REMOVED TO A DEPTH OF 2.5 FEET, 2.5 ±0.5 FEET WIDE (PERPENDICULAR TO FALL LINE), AND 6 ±2 FEET LONG, DEPENDING ON THE OPPORTUNITIES AFFORDED BY THE SPECIFIC PLANTING SITE. THE PLANTING HOLE SHOULD BE BACKFILLED WITH SOIL MEETING SPECIFICATIONS LISTED IN THESE NOTES. RIPRAP SHALL NOT BE REMOVED IN ANY INSTANCE WHERE STRUCTURAL INSTABILITY OF RIPRAPPED SLOPE MAY RESULT. WHERE INSTABILITY IS POSSIBLY ANTICIPATED TO OCCUR AS A RESULT OF RIPRAP REMOVAL, CONTRACTOR SHALL CONSULT WITH PROJECT MANAGER PRIOR TO DETERMINATION OF FINAL DESIGN.
   - 13.2. IN GENERAL, REVEGETATION ISLANDS SHOULD BE INSTALLED BETWEEN THE 5–YEAR FLOOD FREQUENCY ELEVATION AND 10–YEAR FLOOD FREQUENCY ELEVATION. "CONTAINERS (SHRUBS)" SHALL BE INSTALLED, MULCHED, AND FENCED ACCORDING TO THE "REVEGETATION PLANTING PLAN" TABLE IN THIS PLAN SET. A TOTAL OF ONE TREE OR SHRUB SHALL BE INSTALLED FOR EVERY 2 SQUARE FEET OF SURFACE AREA WITHIN THE REVEGETATION ISLAND (I.E., A 2' X 6' REVEGETATION ISLAND, IN PLAN VIEW, WOULD RECEIVE 6 TOTAL PLANTS). THE PLANTING PALETTE FOR "REVEGETATION ISLANDS" SHALL BE APPLIED TO ALL ISLANDS, AT RATIOS INDICATED IN THE PROVIDED PALETTE. "REVEGETATION ISLANDS" WILL NOT BE SEEDED, AS AGGRESSIVE HERBACEOUS PLANT GROWTH WILL COMPETE WITH SHRUBS AND TREES FOR LIMITED RESOURCES.
14. WITHIN AREAS TREATED WITH SOIL LIFTS (THOSE IDENTIFIED ON THE PLANS AS "BANK REVEGETATION" OR "REGRADING AND BANK REVEGETATION", AT SLOPES RANGING BETWEEN 0.5V:1H AND 1H:1V), BARE–ROOT OR TALL–POT CONTAINERS OF XERIC SHRUBS FROM THE "CONTAINERS (SHRUB)" PORTION OF THE "REVEGETATION PLANTING PLAN" TABLE OF THIS PLAN SET SHALL BE INSTALLED AT A FREQUENCY OF 1 PLANT EVERY 18".
15. EACH PLANT CONTAINER MUST CONTAIN A LABEL IDENTIFYING THE SPECIES IN THE CONTAINER. LABELS SHALL BE LEFT WITH THE PLANT AND BE AVAILABLE FOR INSPECTION BY THE PROJECT MANAGER AND PROJECT DESIGNER PRIOR TO INSTALLATION, AND MUST BE KEPT IN THE GROUND FOLLOWING TRANSPLANTING, FOR FOLLOW–UP IDENTIFICATION.
16. ECOTYPIC (I.E., LOCALLY SOURCED, AS DEFINED BY THE SOUTHERN ROCKIES SEED NETWORK, SYNERGY ECOLOGICAL RESTORATION) PLANT MATERIALS ARE REQUIRED WHEN AVAILABLE. REFER TO THE PLANT MATERIALS YELLOWPAGES (WWW.SYNERGY3.ORG) FOR AN UP–TO–DATE LIST OF ECOTYPIC PLANT MATERIALS AVAILABLE FOR THIS PROJECT. WHEN ECOTYPES ARE NOT AVAILABLE, SITE ADAPTED CULTIVARS MAY BE APPROVED BY THE PROJECT MANAGER IF THEY ARE SUITED TO THE UNIQUE SITE CONDITIONS. FOR THE PURPOSES OF THIS PROJECT, ECOTYPES ARE THOSE WHOSE ORIGIN (CUTTINGS, SEEDS, OR BERRIES) MEETS THE FOLLOWING CRITERIA. MATERIAL IS SOURCED:
   - 16.1. NOT MORE THAN 1,000 FEET HIGHER OR LOWER (AND PREFERENTIALLY, NOT MORE THAN 500 FEET HIGHER OR LOWER) IN ELEVATION THAN THE RESTORATION SITE.
   - 16.2. NOT MORE THAN 150 MILES IN ANY DIRECTION OF THE RESTORATION SITE.
   - 16.3. FROM ONE OF THE FOLLOWING WATERSHEDS, IN ORDER OF PRIORITY: CACHE LA POUDRE RIVER, BIG THOMPSON RIVER, LITTLE THOMPSON RIVER, BOULDER CREEK, SOUTH BOULDER CREEK, COAL CREEK, CLEAR CREEK.
17. SHRUBS AND TREES PLANTED AS CONTAINER STOCK OR BARE–ROOT STOCK SHALL BE SURROUNDED BY A PLANTING DEPRESSION OF 1–2" DEEP, AND UP TO TWICE THE DIAMETER OF THE CANOPY.
18. DUE TO THE CONDITION OF SUBSTRATE IN WHICH CONTAINER STOCK WILL BE INSTALLED, PROPER BACKFILLING AROUND ROOT BALLS IS ESSENTIAL. BACK–FILL SHALL BE APPLIED TO TWICE THE DIAMETER OF THE ROOT BALL, AND 4–6" DEEPER THAN THE ROOT BALL. SOIL MUST BE A MODERATE LOAM (NOT HIGH IN CLAY), WITH BETWEEN 5% AND 10% ORGANIC MATTER. DEPENDING ON THE NITROGEN CONTENT OF THE SOIL, A SLOW RELEASE ORGANIC FERTILIZER MAY BE ADDED AS NECESSARY TO MEET SOIL CHEMISTRY CHARACTERISTICS AS DEFINED BY THESE NOTES. BACK–FILL SHALL BE TAMPED MODERATELY TO REMOVE AIR POCKETS AND WATERED THOROUGHLY WHILE BACKFILLING AROUND THE ROOT BALL. BACK–FILL SOIL SHALL COMPLETELY COVER THE ROOT BALL SO THAT NO ROOTS ARE EXPOSED ABOVE THE EXISTING GROUND SURFACE.
19. WEED–FREE SURFACE MULCH (AS DESCRIBED IN THESE PLAN NOTES) SHALL BE PLACED BETWEEN THE STEM/TRUNK OF EACH TRANSPLANT AND 3" BEYOND THE DRIPLINE. MULCH SHALL BE 1–2" DEEP, AND SHALL NOT BE CLOSER THAN 1" TO ANY TRUNK OR STEM.
20. CUTTINGS SHALL BE INSTALLED ALONG LINES LABELED AS "WILLOW/COTTONWOOD" IN THE PLAN SET. THESE LOCATIONS ARE GENERALLY ABOVE THE TOE OF THE REGRADED HILLSLOPES RECEIVING BIOENGINEERING TREATMENTS (I.E. "DESIGN ALIGNMENT: FLOODPLAIN"). CUTTINGS SHALL BE COTTONWOODS OR WILLOWS, PER THE PLANTING PALETTE FOR "CUTTINGS" FROM THE "REVEGETATION PLANTING PLAN" TABLE OF THIS PLAN SET. WILLOW CUTTINGS SHALL BE INSTALLED AT A FREQUENCY OF ONE (1) CUTTING EVERY 2.5' (ON CENTER); COTTONWOOD CUTTINGS SHALL BE INSTALLED AT A FREQUENCY OF ONE (1) EVERY 8' (ON CENTER).
21. HARVESTING AND INSTALLATION OF CUTTINGS (WILLOW/COTTONWOOD) SHALL FOLLOW THE "FIELD GUIDE FOR HARVESTING AND INSTALLING WILLOW AND COTTONWOOD CUTTINGS" (AKA "WILLOW AND COTTONWOOD GUIDE" @ WWW.SYNERGY3.ORG/LITERATURE.PHP).
22. CUTTINGS (WILLOW/COTTONWOOD) SHALL BE ECOTYPES HARVESTED FROM NATIVE SPECIES STOCK.

STAPLE INSTALLATION SPACING	
SLOPE RANGE	DISTANCE BETWEEN STAPLES (PARALLEL TO FLOW; PERPENDICULAR TO FLOW)
x < 4:1 side slope	3" ; 4"
4:1 side slope < x < 2:1 side slope	30" ; 42"
x > 2:1 side slope	24" ; 36"

DOWNSTREAM REACH

ZONES:	REGRADNING AND BANK REVEG	BANK REVEG	TREE/SHRUB ENHANCEMENT	WILLOW/ COTTONWOOD CUTTINGS	
TOTAL AREA (SQ–FT)	1508	584	0	N/A	
TOTAL AREA (ACRES)	0.03	0.01	0	N/A	
TOTAL LINEAR FEET	N/A	N/A	N/A	281	
	CONTAINERS (SHRUBS)	CONTAINERS (HERBACEOUS)	CUTTINGS	RIPARIAN BANK AND TRANSITION ZONE SEED MIX	GREENLINE MIX
TOTAL AREA (SQ–FT)	2092	310	N/A	2092	310
TOTAL AREA (ACRES)	0.05	0.01	N/A	0.05	0.01
TOTAL LINEAR FEET	N/A	N/A	281	N/A	N/A

MIDDLE REACH

ZONES:	REGRADNING AND BANK REVEG	BANK REVEG	TREE/SHRUB ENHANCEMENT	WILLOW/ COTTONWOOD CUTTINGS	
TOTAL AREA (SQ–FT)	1420	0	1461	N/A	
TOTAL AREA (ACRES)	0.03	0	0.03	N/A	
TOTAL LINEAR FEET	N/A	N/A	N/A	136	
	CONTAINERS (SHRUBS)	CONTAINERS (HERBACEOUS)	CUTTINGS	RIPARIAN BANK AND TRANSITION ZONE SEED MIX	GREENLINE MIX
TOTAL AREA (SQ–FT)	2881	38	N/A	1420	38
TOTAL AREA (ACRES)	0.07	0	N/A	0.03	0
TOTAL LINEAR FEET	N/A	N/A	136	N/A	N/A

UPSTREAM REACH

ZONES:	REGRADNING AND BANK REVEG	BANK REVEG	TREE/SHRUB ENHANCEMENT	WILLOW/ COTTONWOOD CUTTINGS	
TOTAL AREA (SQ–FT)	5610	716	0	N/A	
TOTAL AREA (ACRES)	0.13	0.02	0	N/A	
TOTAL LINEAR FEET	N/A	N/A	N/A	590	
	CONTAINERS (SHRUBS)	CONTAINERS (HERBACEOUS)	CUTTINGS	RIPARIAN BANK AND TRANSITION ZONE SEED MIX	GREENLINE MIX
TOTAL AREA (SQ–FT)	6326	595	N/A	6326	595
TOTAL AREA (ACRES)	0.15	0.01	N/A	0.15	0.01
TOTAL LINEAR FEET	N/A	N/A	590	N/A	N/A

ENITRE PROJECT REACH

ZONES:	REGRADNING AND BANK REVEG	BANK REVEG	TREE/SHRUB ENHANCEMENT	WILLOW/ COTTONWOOD CUTTINGS	
TOTAL AREA (SQ–FT)	8538	1300	1461	N/A	
TOTAL AREA (ACRES)	0.20	0.03	0.03	N/A	
TOTAL LINEAR FEET	N/A	N/A	N/A	1007	
	CONTAINERS (SHRUBS)	CONTAINERS (HERBACEOUS)	CUTTINGS	RIPARIAN BANK AND TRANSITION ZONE SEED MIX	GREENLINE MIX
TOTAL AREA (SQ–FT)	11299	943	N/A	9838	943
TOTAL AREA (ACRES)	0.26	0.02	N/A	0.23	0.02
TOTAL LINEAR FEET	N/A	N/A	1007	N/A	N/A

DATE:DATE

SHEET 4 OF 30

DRAFT 65% SUBMITTAL
SHEET TITLE 1
SHEET TITLE 2

NOT TO SCALE

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION

STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE

LARIMER COUNTY, CO

PROJECT MANAGER: JENNIFER KOVESCES
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320 E. VINE DRIVE, SUITE 213
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STREAM RESTORATION AND RESILIENCY 60% DESIGN FOR UT3			
ITEM	QUANTITY	UNITS	NOTES
INSTREAM AND BIOENGINEERING STRUCTURES			
LOG DROP	10	EA	SEE DETAILS SHEET. APPROXIMATELY 4 TONS OF BOULDERS PER STRUCTURE, OR 40 TONS TOTAL.
ROCK CROSS VANE	8	EA	SEE DETAILS SHEET. APPROXIMATELY 56 TONS OF BOULDERS PER STRUCTURE. OR 450 TONS TOTAL.
TOE WALL	245	LF	SEE DETAILS SHEET. APPROXIMATELY 1 TON OF BOULDERS REQUIRED FOR 1 LF OF 6FT TALL WALL
LIVE STAKES	2000	EA	TO BE INSTALLED AS DIRECTED
RIFFLE STONE	36	TONS	STONE REQUIRED FOR BACKFILLING INSTREAM STRUCTURES. STONE SHALL BE D84 SIZE. THIS MATERIAL SHOULD BE AVAILABLE ONSITE FROM MATERIAL LEFT FROM CONSTRUCTION ENTRANCE.
72" CULVERTS	250	LF	72" CULVERTS GALZANIZED – 8 SECTIONS VARYING LENGTH AND INSTALLATION
EROSION CONTROL			
EROSION CONTROL BLANKET	1250	SQ YD	SEE DETAILS SHEET. FOR USE ON ALL DISTURBED SURFACES, INCLUDING STREAM BANK SIDE SLOPES, FLOODPLAIN, AND FLOODPLAIN SIDE SLOPES.
24" ECO STAKES	2500	EA	SEE DETAILS SHEET. STAKES SHALL BE 24" IN LENGTH AND PLACED ON 2.5' BY 2' STAGGERED SPACING ALONG THE MATTING.
SURFACE MULCH	0.8	ACRES	BASED ON SURFACE AREA OF CHANNEL SIDE SLOPES AND DISTURBED SURFACES
PERMANENT NATIVE SEED	0.8	ACRES	PERMANENT SEED SHALL BE A MIX OF NATIVE WETLAND AND MEADOW FLOWERING FORBS AND GRASSES ACCORDING TO REVEGETATION NOTES AND REVEGETATION PLANTING PLAN IN THIS PLAN SET.
EARTHWORK			
CUT	1640	CU YD	
FILL	268	CU YD	
NET	–1372	CU YD	EXCESS MATERIAL NEEDED TO BE DELIVERED TO PROJECT SITE – MATERIAL SHALL BE USED AS ROADWAY FILL

REVEGETATION PLANTING PLAN							
CONTAINER STOCK							
SPECIES NAME	LIFE FORM*	COMMON NAME	CONTAINER TYPE	% IN PALETTE	ECO TYPE AVAILABLE?	SOURCE	NOTES
CONTAINERS (SHRUBS)							
Alnus incana var tenuifolia	NS	thinleaf alder	60 CI	20	YES	BUTTONROCK PRESERVE OR FOURMILE CREEK	
Betula occidentalis var rivularis	NS	western riverbirch	60 CI	20	YES	BUTTONROCK PRESERVE OR FOURMILE CREEK	
Coralys cornuta	NS	american hazelnut	60 CI	2	YES	BUTTONROCK PRESERVE	
Populus angustifolia	NS	narrowleaf cottonwood	60 CI	15	YES	ESTES PARK	
Padus virginiana	NS	chokecherry	60 CI	20	YES	BUTTONROCK PRESERVE	
Rosa Woodsii	NPS	Wood's rose	1 GAL	15	NO		
Symphoricarpos rotundifolia	NPS	snowberry	1 GAL	8	NO		
			TOTAL:	100			
CONTAINERS (HERBACEOUS)							
Carex praegracilis or C. lanuginosa	NPG–L	sedge	10 CI	25	NO	BUTTONROCK PRESERVE	
Eleocharis palustris	NPG–L	sprikerush	10 CI	15	NO	BUTTONROCK PRESERVE	
Glyceria grandis	NPG	American mannagrass	10 CI	30	YES	ESTES PARK	
Panicum virgatum	NPG	switchgrass	10 CI	30	NO	BOULDER COUNTY	
			TOTAL:	100			
CUTTINGS							
Salix irrorata	NS	bluestern willow	cuttings	15	YES	BUTTONROCK PRESERVE	CAN HANDLE SOME DEEPER SHADE
Populus angustifoliia	NT	narrowleaf cottonwood	cuttings	30	YES	ON SITE	MODERATE SHADE
Populus deltoides	NT	plains cottonwood	cuttings	10	YES	ON SITE	LOW SHADE
Salix exigua	NS	coyote willow	cuttings	20	YES	BUTTONROCK PRESERVE	OPEN SUN TO VERY PARTIAL SHADE
Salix lucida var caudata	NS	shining willow	cuttings	15	YES	ESTES PARK OR POUDRE RIVER	CAN HANDLE SOME SHADE
Salix bebbiana	NS	coyote willow	cuttings	10	YES	BUTTONROCK PRESERVE AND ESTES PARK	CAN HANDLE SOME SHADE
			TOTAL:	100			

* NP=Native Perennial; NA=Native Annual; G=Grass; G–L=Grass–Like; S=shrub; T=Tree; F=Forb.

REVEGETATION PLANTING PLAN – SEED MIX							
RIPARIAN BANK AND TRANSITION ZONE							
	SEEDING AREA (ACRES):			0.2			
	PLS PER SQ–FT:	100	SEEDING AREA (SQ–FT):		9,838	TOTAL SEEDS/SITE:	983,800
SPECIES NAME (COMMON NAME)	LIFE FORM*	SEEDS PER PLS Lb	% MIX (DESIRED)	PLS Lbs NEEDED	TOTAL SEEDS/SITE	PRICE/ PLS Lb	COST OF SEED
Achillea lanulosa (Western yarrow)	NPF	4,400,000	8	0.018	78,704	$28.00	$0.50
Achnatherum hymenoides (indian ricegrass, RIMROCK)	NPG	155,000	10	0.635	98,380	$13.00	$8.25
Artemisia frigida (fringed sage)	NPF	3,875,000	10	0.025	98,380	$25.00	$0.63
Bouteloua curtipendula (sideoats grama)	NPG	159,200	12	0.742	118,056	$11.00	$8.16
Bromopsis ciliatus (fringed brome)	NPG	236,000	15	0.625	147,570		
Bromus marginatus (mountain brome, UP)	NPG	64,000	15	2.306	147,570	$5.75	$13.26
Elymus canadensis (Canada wildrye)	NPG	75,000	15	1.968	147,570	$7.50	$14.76
Elymus trachycaulus (Slender Wheatgrass, San Luis)	NPG	159,000	10	0.619	98,380		
Koeleria macrantha (prairie junegrass)	NPG	2,315,000	4	0.017	39,352	$28.00	$0.48
Regreen	N/A	12,500	1	0.787	9,838	$1.25	$0.98
		TOTAL:	100	7.741	983,800		$45.06
GREENLINE MIX (BOTTOM 1/4 OF BANK THROUGH TRANSITION ZONE)							
	SEEDING AREA (ACRES):			0.02			
	PLS PER SQ–FT:	110	SEEDING AREA (SQ–FT):		943	TOTAL SEEDS/SITE:	103,730
SPECIES NAME (COMMON NAME)	LIFE FORM*	SEEDS PER PLS Lb	% MIX (DESIRED)	PLS Lbs NEEDED	TOTAL SEEDS/SITE	PRICE/ PLS Lb	COST OF SEED
Achnatherum robustum/Stipa robusta (sleepygrass)	NPG	175,000	12	0.071	12,448	$30.00	$2.13
Andropogon hallii (sand bluestem, ELIDA, GARDEN)	NPG	113,000	16	0.147	16,597	$24.00	$3.52
Bromopsis ciliatus (fringed brome)	NPG	236,000	10	0.044	10,373		
Carex lanuginosa (wooly sedge)	NPG–L	236,000	5	0.022	5,187	$140.00	$3.08
Carex utriculata	NPG–L	712,000	7	0.010	7,261	$75.00	$0.76
Eleocharis palustris (common spikerush)	NPG–L	620000	10	0.017	10,373	$75.00	$1.25
Elymus canadensis (Canada wildrye)	NPG	75,000	10	0.138	10,373	$7.50	$1.04
Glyceria grandis or G. striata	NPG		15				
Panicum virgatum (switchgrass)	NPG–L	259,000	15	0.060	15,560	$8.00	$0.48
		TOTAL:	100	0	88,171	$359.50	$12.27

BIOENGINEERING TREATMENT			
SLOPE RANGE	SURFACE TREATMENT*	REVEGETATION TREATMENT	CROSS–SECTION DETAIL (TYP.)
x < 3:1	MULCH	RIPARIAN, UPLAND, AND WETLAND SEED; SHRUBS; CUTTINGS	N/A
3:1 < x < 2:1	EROSION CONTROL BLANKET	RIPARIAN, UPLAND, AND WETLAND SEED; SHRUBS; CUTTINGS	DETAIL EROSION CONTROL BLANKET (SHEET 18)
2:1 < x < 1:1	SOIL RIPRAP AND MULCH	RIPARIAN AND UPLAND SEED; CUTTINGS	DETAIL REVEGETATION CROSS SECTIONS (SHEET 19)
1:1 < x < 0.5:1	VEGETATED SOIL LIFTS	WETLAND PLUGS; TALL–POT SHRUBS	DETAIL REVEGETATION CROSS–SECTIONS (SHEET 19)
x > 0.5:1	SHEET PILE OR OTHER STRUCTURE	N/A	N/A

*SEE DETAIL BANK STABILIZATION (SHEET 17) FOR PLACEMENT.

DATE:DATE

SHEET 5 OF 30

DRAFT 65% SUBMITTAL
NOTES - (3)

NOT TO SCALE

UNNAMED 3 POST-FIRE RESTORATION
STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE
LARIMER COUNTY, CO

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

PROJECT MANAGER: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

DESIGNER: JOHN GIORDANENGO
ALOTERRA RESTORATION SERVICES, LLC
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

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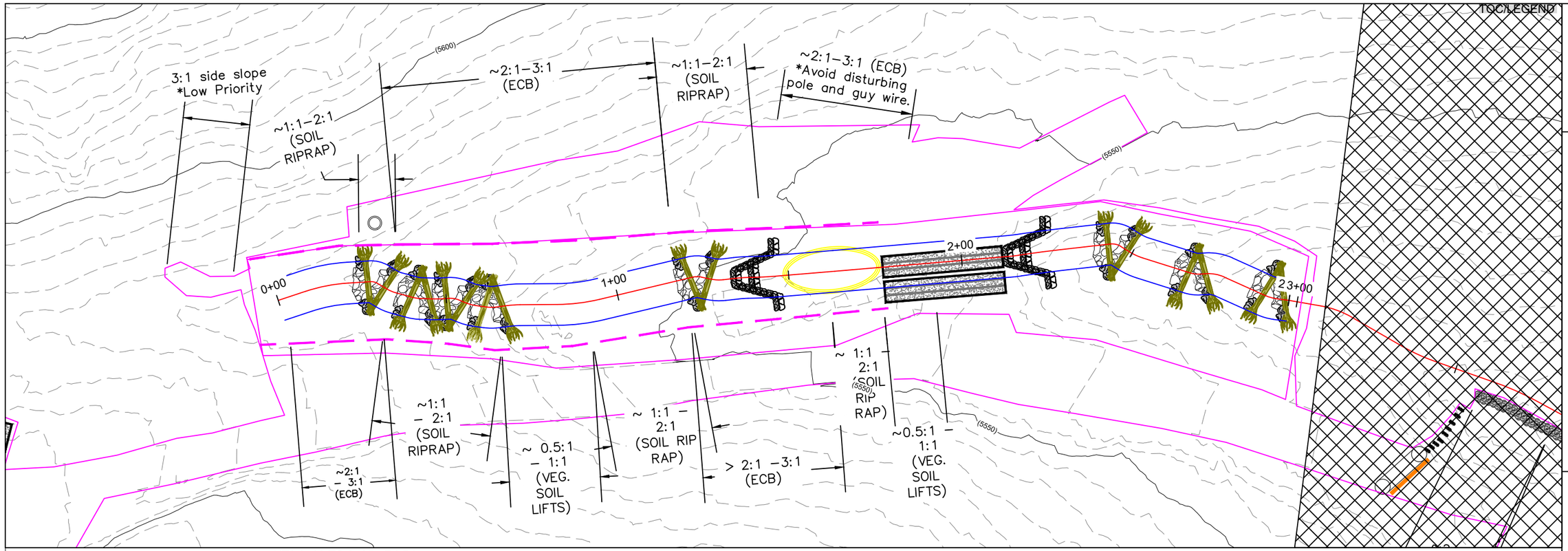
E:\Dropbox (5SSR)\UT3 Poudre River\c3d\sheets\pp_ut3.dwg DATE:20171226 05:36 PM USER:ANDREA

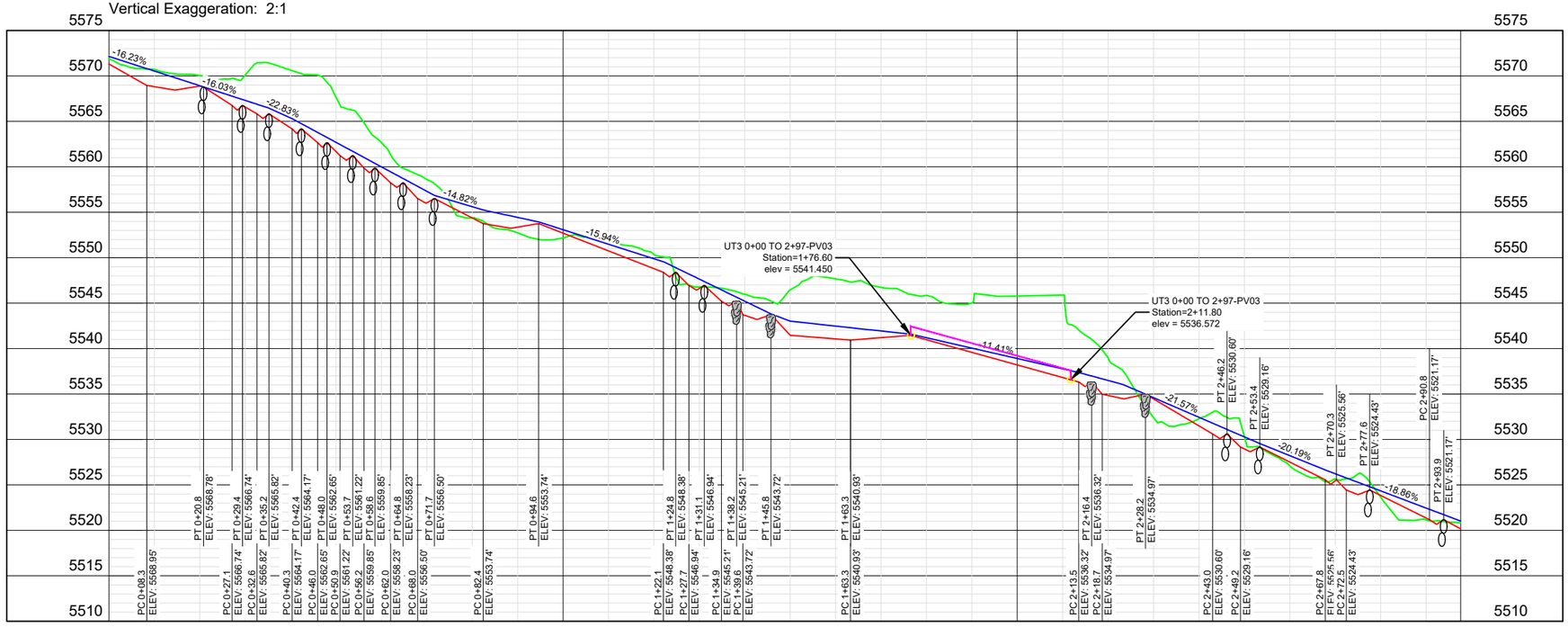
CLIENT: JENNIFER KOVESCES CPRW 320 E. VINE DRIVE, SUITE 213 FORT COLLINS, CO 80524	UNNAMED 3 POST-FIRE RESTORATION STREAM RESTORATION AND RESILIENCY	DRAFT 65% SUBMITTAL OVERVIEW ----		DATE: 12/27/2017
ENGINEER: DAVID BIDELSPACH 5 SMOOTH STONES RESTORATION, PLCC 754 MOUNT MAHOGANY LIVERMORE, CO 80536	NEAR BELLVUE LARIMER COUNTY, CO	DRAWN BY: GET CHECKED BY: JG APPROVED BY: DAB	0 75 150 SCALE:1" = 75' ANSI FULL BLEED B (17.00 X 11.00 INCHES)	SHEET: 6 OF 30

TOC/LEGEND

TOC/LEGEND



UT3 0+00 TO 2+97 - R1 P1
Vertical Scale: 1" = 15'
Vertical Exaggeration: 2:1



DATE: 12/27/2017

SHEET: 7 OF 30

SCALE:1" = 30'
ANSI FULL BLEED B (17.00 X 11.00 INCHES)
0 30 60

DRAFT 65% SUBMITTAL
PLAN AND PROFILE - 1ST PRIORITY
STA 0+00 TO 2+98

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION
STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE
LARIMER COUNTY, CO

CLIENT: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

ENGINEER: DAVID BIDELSPACH
5 SMOOTH STONES RESTORATION, PLCC
754 MOUNT MAHOGANY
LIVERMORE, CO 80536

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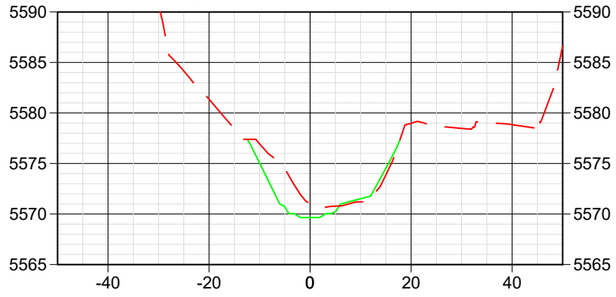
UT3 0+00 TO 2+97 - R1 P1 STA 0+04
V.SCALE: 1" = 15'; V.E.: 2



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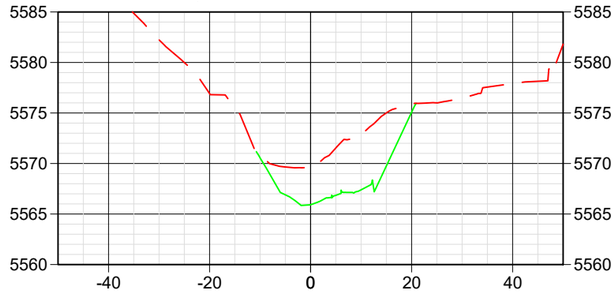

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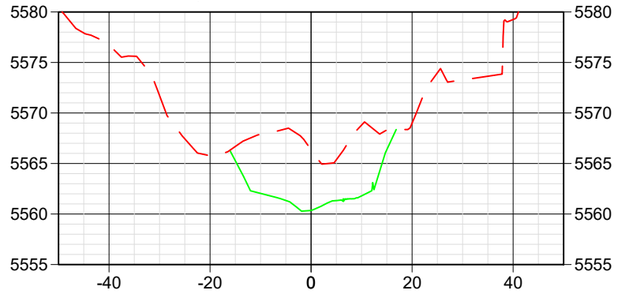

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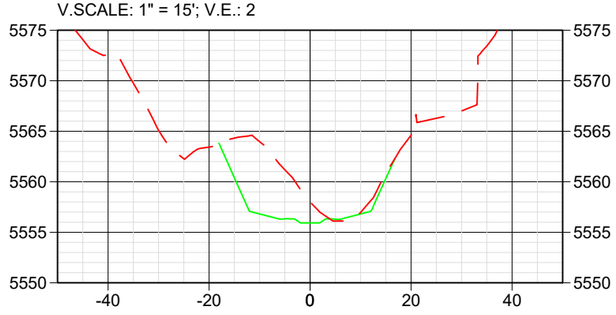
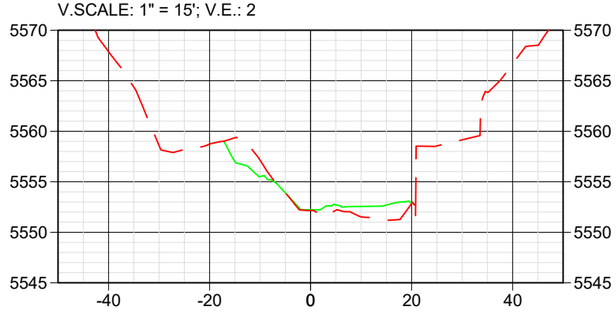
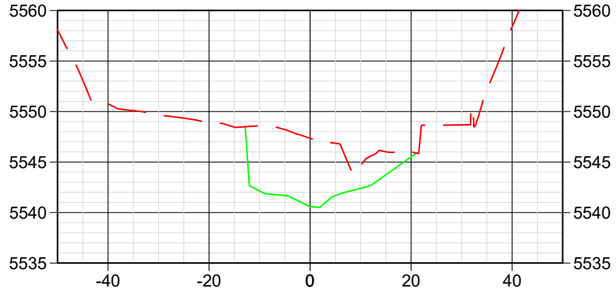


UT3 0+00 TO 2+97 - R1 P1 STA 1+00
V.SCALE: 1" = 15'; V.E.: 2



UT3 0+00 TO 2+97 - R1 P1 STA 1+29
V.SCALE: 1" = 15'; V.E.: 2

UT3 0+00 TO 2+97 - R1 P1 STA 1+63
V.SCALE: 1" = 15'; V.E.: 2



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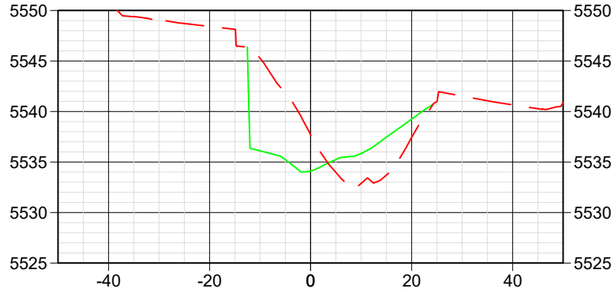
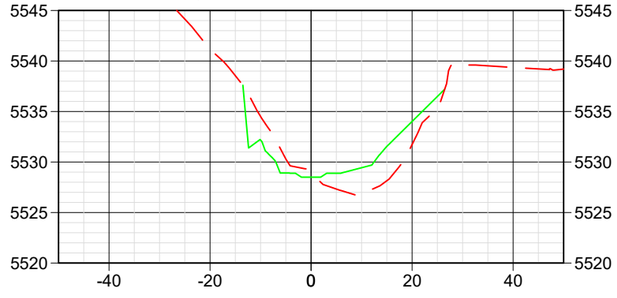
V.SCALE: 1" = 15'; V.E.: 2



UT3 0+00 TO 2+97 - R1 P1 STA 2+54
V.SCALE: 1" = 15'; V.E.: 2



DATE: 12/27/2017

SHEET: 8 OF 30

DRAFT 65% SUBMITTAL
SECTIONS - R1P1
STA 0+04 TO STA 2+54

0 30 60
SCALE:1" = 30'
ANSI FULL BLEED B (17.00 X 11.00 INCHES)

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION

STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE

LARIMER COUNTY, CO

CLIENT: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

ENGINEER: DAVID BIDELSPACH
5 SMOOTH STONES RESTORATION, PLCC
754 MOUNT MAHOGANY
LIVERMORE, CO 80536

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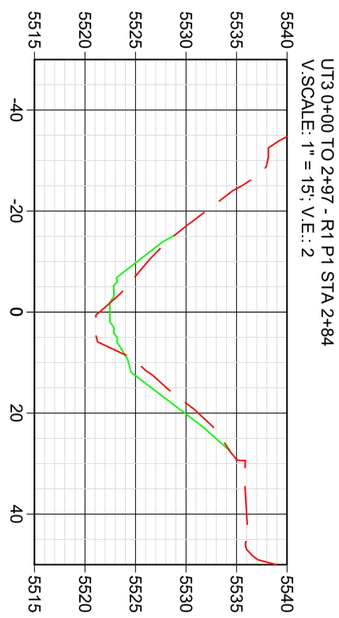

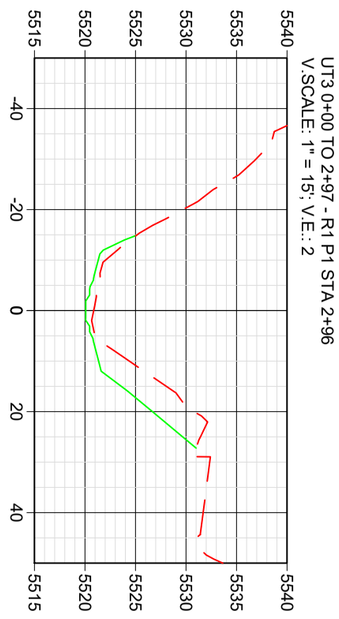

TOC/LEGEND

CLIENT: JENNIFER KOVESCES CPRW 320 E. VINE DRIVE, SUITE 213 FORT COLLINS, CO 80524	UNNAMED 3 POST-FIRE RESTORATION STREAM RESTORATION AND RESILIENCY		DRAFT 65% SUBMITTAL SECTIONS - R1P1 STA 2+84 TO 2+96	DATE: 12/27/2017
ENGINEER: DAVID BIDELSPACH 5 SMOOTH STONES RESTORATION, PLCC 754 MOUNT MAHOGANY LIVERMORE, CO 80536	NEAR BELLVUE LARIMER COUNTY, CO	DRAWN BY: GET CHECKED BY: JG APPROVED BY: DAB	0 30 60 SCALE:1" = 30' ANSI FULL BLEED B (17.00 X 11.00 INCHES)	SHEET: 9 OF 30

EOPC - 1st Priority

TOC/LEGEND

CLIENT: JENNIFER KOVESCES CPRW 320 E. VINE DRIVE, SUITE 213 FORT COLLINS, CO 80524	UNNAMED 3 POST-FIRE RESTORATION STREAM RESTORATION AND RESILIENCY		DRAFT 65% SUBMITTAL EOPC - 1ST PRIORITY ----		DATE: 12/27/2017
ENGINEER: DAVID BIDELSPACH 5 SMOOTH STONES RESTORATION, PLCC 754 MOUNT MAHOGANY LIVERMORE, CO 80536	NEAR BELLVUE LARIMER COUNTY, CO	DRAWN BY: GET CHECKED BY: JG APPROVED BY: DAB	NOT TO SCALE		SHEET: 10 OF 30

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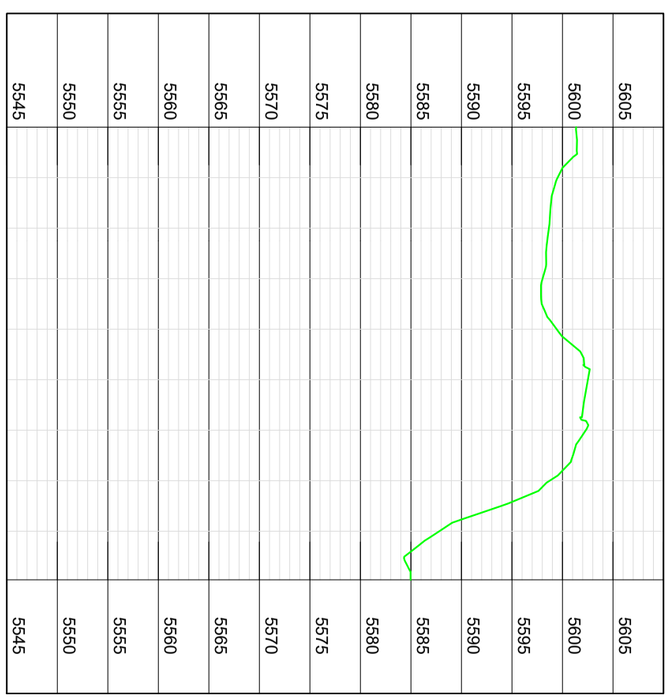
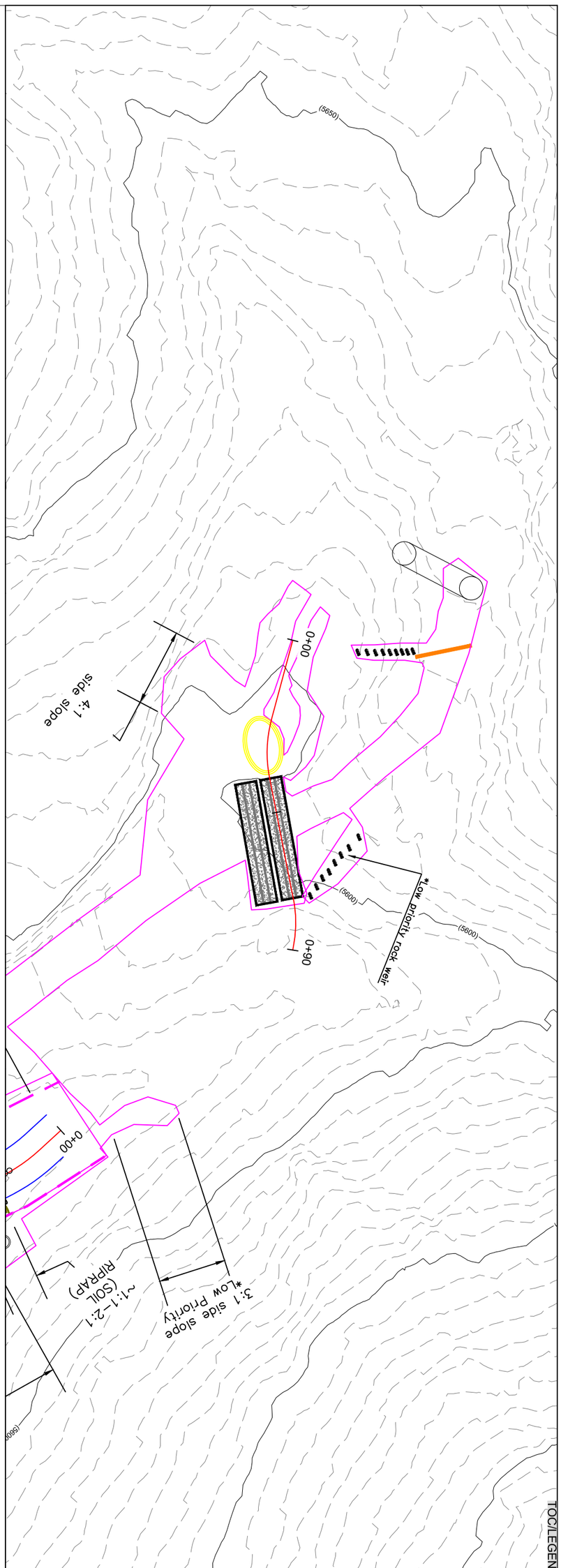


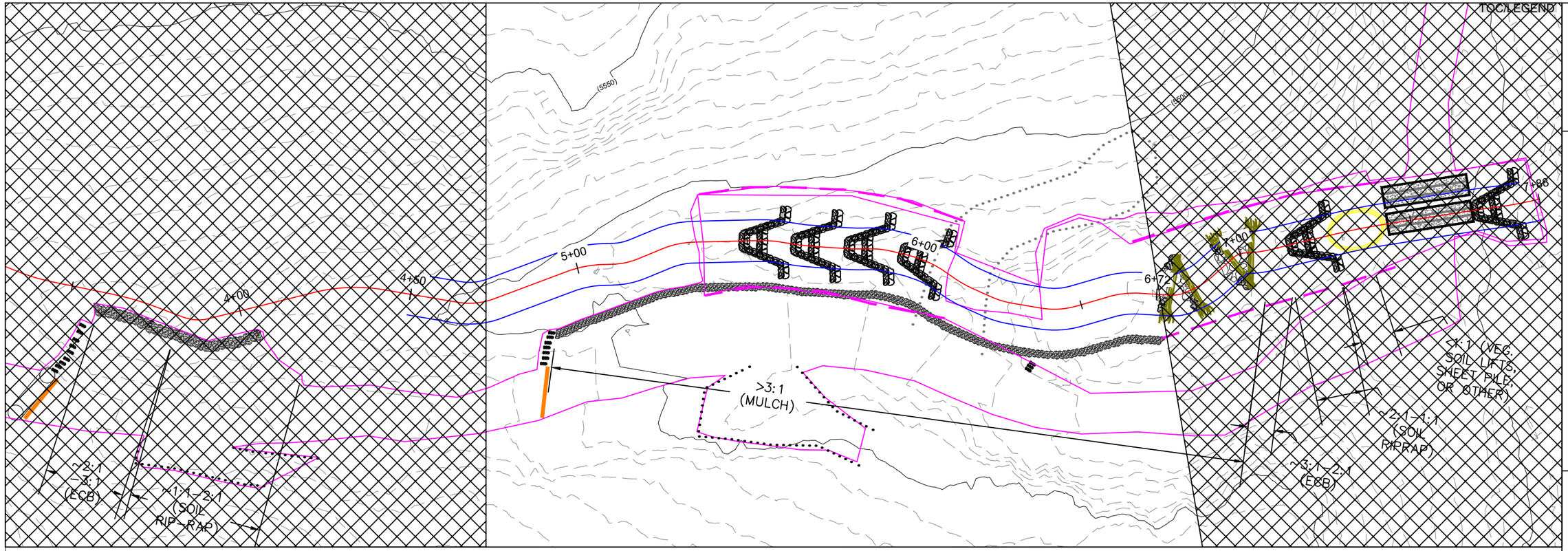


CLIENT: JENNIFER KOVESCES CPRW 320 E. VINE DRIVE, SUITE 213 FORT COLLINS, CO 80524	UNNAMED 3 POST-FIRE RESTORATION STREAM RESTORATION AND RESILIENCY	DRAFT 65% SUBMITTAL PLAN AND PROFILE - 2ND PRIORITY STA 0+00 TO STA 0+90		DATE: 12/27/2017
ENGINEER: DAVID BIDELSPACH 5 SMOOTH STONES RESTORATION, PLCC 754 MOUNT MAHOGANY LIVERMORE, CO 80536	NEAR BELLVUE LARIMER COUNTY, CO	DRAWN BY: GET CHECKED BY: JG APPROVED BY: DAB	0 30 60 SCALE:1" = 30' ANSI FULL BLEED B (17.00 X 11.00 INCHES)	SHEET: 11 OF 30

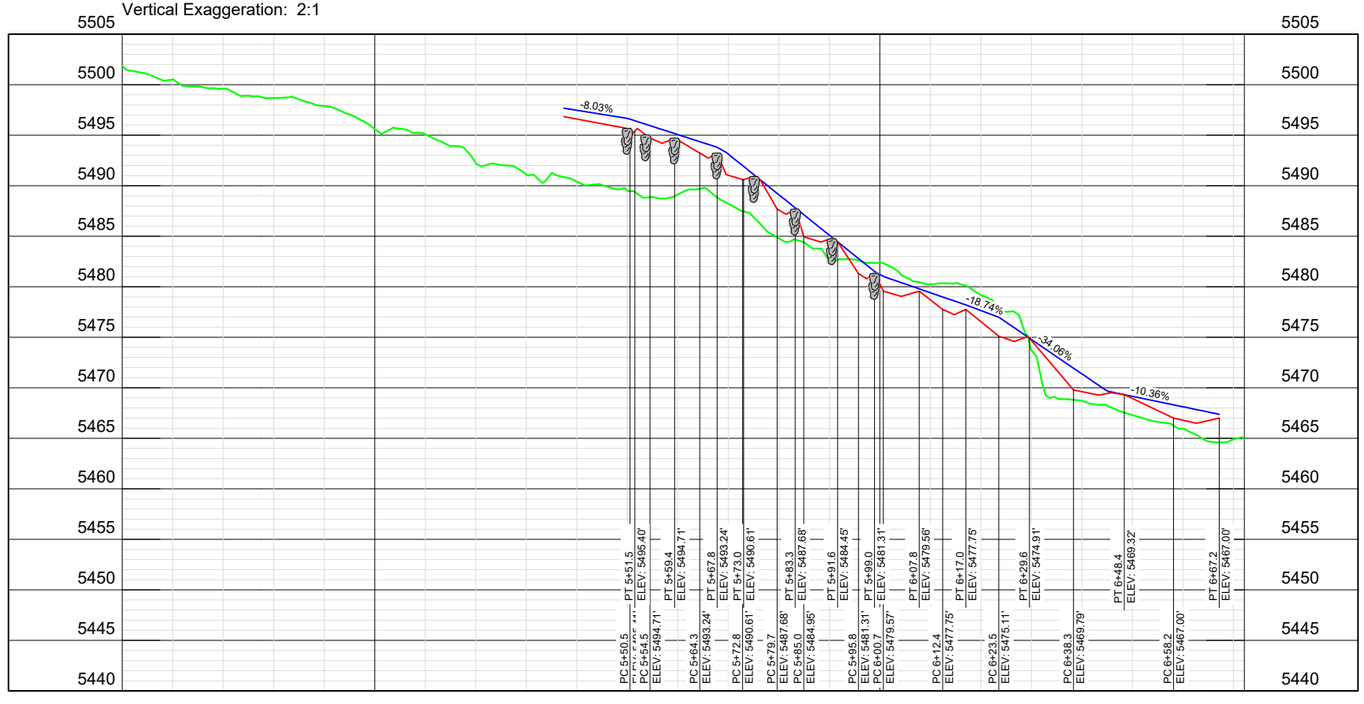
EOPC - 2nd Priority

TOC/LEGEND

CLIENT:	JENNIFER KOVESCES CPRW 320 E. VINE DRIVE, SUITE 213 FORT COLLINS, CO 80524	UNNAMED 3 POST-FIRE RESTORATION STREAM RESTORATION AND RESILIENCY		DRAFT 65% SUBMITTAL EOPC - 2ND PRIORITY ----	DATE: 12/27/2017
ENGINEER:	DAVID BIDELSPACH 5 SMOOTH STONES RESTORATION, PLCC 754 MOUNT MAHOGANY LIVERMORE, CO 80536	NEAR BELLVUE LARIMER COUNTY, CO	DRAWN BY: GET CHECKED BY: JG APPROVED BY: DAB	NOT TO SCALE	SHEET: 12 OF 30



UT3 4+50 TO 6+72 - R3P3
Vertical Scale: 1" = 15'
Vertical Exaggeration: 2:1



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DATE: 12/27/2017

SHEET: 13 OF 30

DRAFT 65% SUBMITTAL
PLAN AND PROFILE - 2ND PRIORITY
STA 4+50 TO 6+72

SCALE:1" = 30'
ANSI FULL BLEED B (17.00 X 11.00 INCHES)
0 30 60

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION

STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE

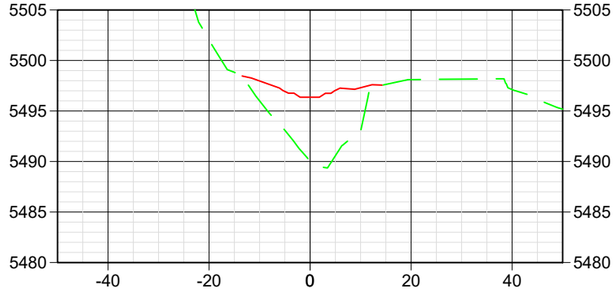
LARIMER COUNTY, CO

CLIENT: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

ENGINEER: DAVID BIDELSPACH
5 SMOOTH STONES RESTORATION, PLCC
754 MOUNT MAHOGANY
LIVERMORE, CO 80536

TOC/LEGEND

UT3 4+50 TO 6+72 - R3P3 STA 5+42
V.SCALE: 1" = 15'; V.E.: 2



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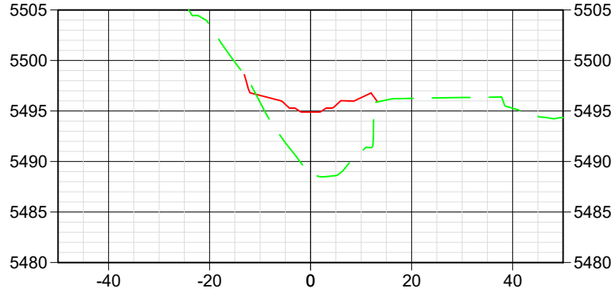

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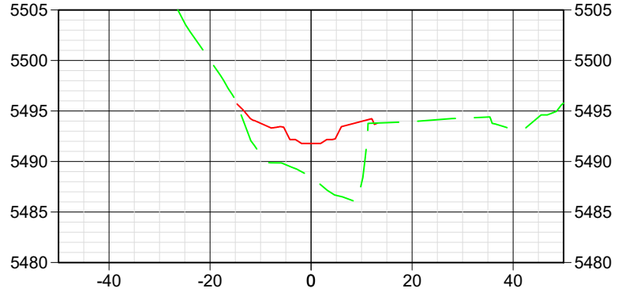

UT3 4+50 TO 6+72 - R3P3 STA 5+90
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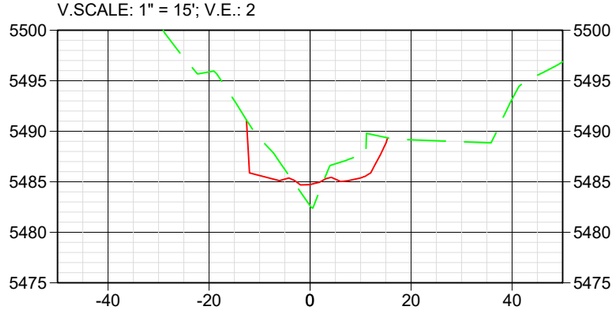

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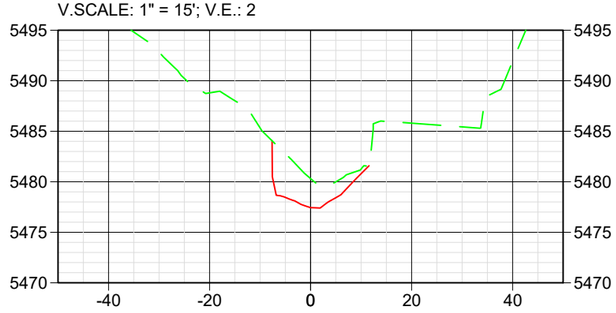
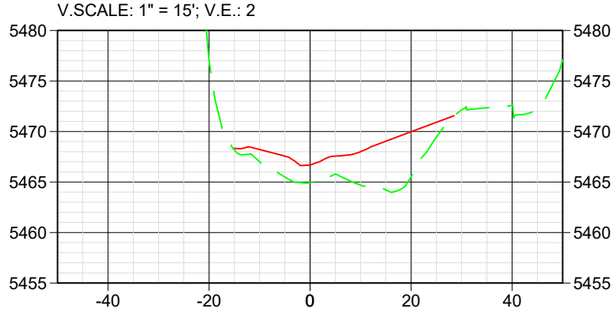
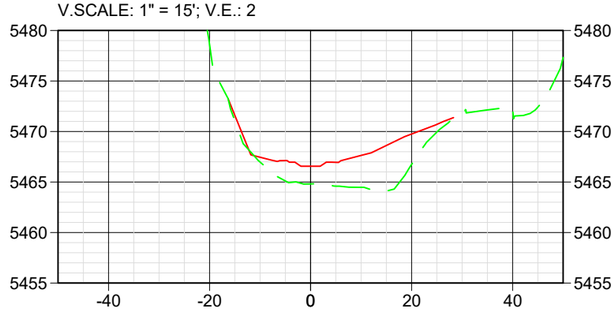


UT3 4+50 TO 6+72 - R3P3 STA 6+37
V.SCALE: 1" = 15'; V.E.: 2

UT3 4+50 TO 6+72 - R3P3 STA 6+64
V.SCALE: 1" = 15'; V.E.: 2



UT3 4+50 TO 6+72 - R3P3 STA 6+70
V.SCALE: 1" = 15'; V.E.: 2



DATE: 12/27/2017

SHEET: 14 OF 30

DRAFT 65% SUBMITTAL
SECTIONS - R3P3
STA 5+42 TO 6+70

60
30
0
SCALE:1" = 30'
ANSI FULL BLEED B (17.00 X 11.00 INCHES)

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION

STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE

LARIMER COUNTY, CO

CLIENT: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

ENGINEER: DAVID BIDELSPACH
5 SMOOTH STONES RESTORATION, PLCC
754 MOUNT MAHOGANY
LIVERMORE, CO 80536

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EOPC - 3rd Priority

TOC/LEGEND

CLIENT:	JENNIFER KOVESCES CPRW 320 E. VINE DRIVE, SUITE 213 FORT COLLINS, CO 80524	UNNAMED 3 POST-FIRE RESTORATION STREAM RESTORATION AND RESILIENCY		DRAFT 65% SUBMITTAL EOPC - 3RD PRIORITY ----	DATE: 12/27/2017
ENGINEER:	DAVID BIDELSPACH 5 SMOOTH STONES RESTORATION, PLCC 754 MOUNT MAHOGANY LIVERMORE, CO 80536	NEAR BELLVUE LARIMER COUNTY, CO	DRAWN BY: GET CHECKED BY: JG APPROVED BY: DAB	NOT TO SCALE	SHEET: 15 OF 30

UT3 6+72 TO 7+87 - R4P4
Vertical Scale: 1" = 15'
Vertical Exaggeration: 2:1

DRAFT 65% SUBMITTAL
PLAN AND PROFILE - 4TH PRIORITY
STA 6+72 TO 7+87

DATE: 12/27/2017

SHEET: 16 OF 30

SCALE:1" = 30'
ANSI FULL BLEED B (17.00 X 11.00 INCHES)
0 30 60

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION
STREAM RESTORATION AND RESILIENCY

CLIENT: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

ENGINEER: DAVID BIDELSPACH
5 SMOOTH STONES RESTORATION, PLCC
754 MOUNT MAHOGANY
LIVERMORE, CO 80536

NEAR BELLVUE
LARIMER COUNTY, CO

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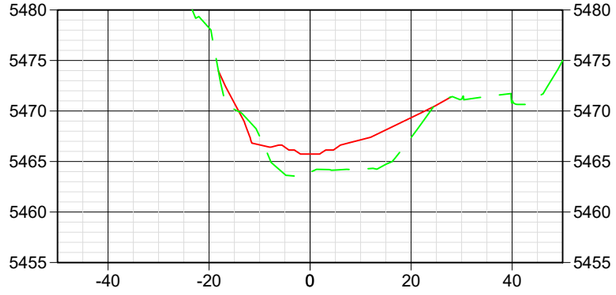
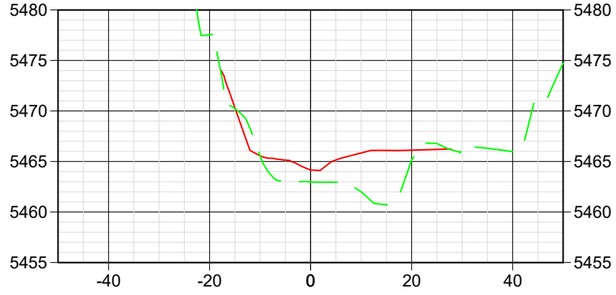
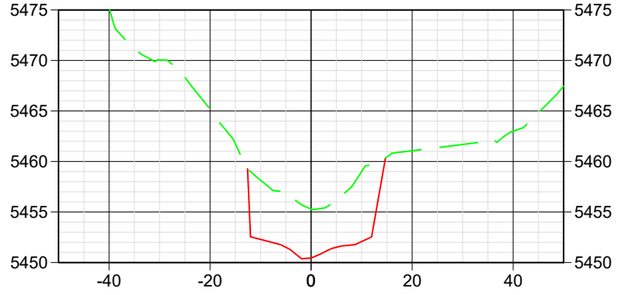
UT3 6+72 TO 7+87 - R4P4 STA 6+74
V.SCALE: 1" = 15'; V.E.: 2



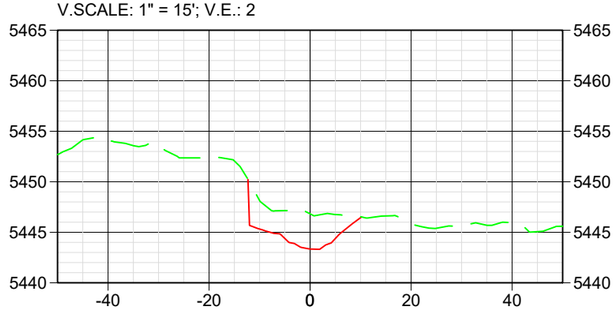
UT3 6+72 TO 7+87 - R4P4 STA 6+87
V.SCALE: 1" = 15'; V.E.: 2



UT3 6+72 TO 7+87 - R4P4 STA 7+34
V.SCALE: 1" = 15'; V.E.: 2



UT3 6+72 TO 7+87 - R4P4 STA 7+77
V.SCALE: 1" = 15'; V.E.: 2



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DATE: 12/27/2017

SHEET: 17 OF 30

DRAFT 65% SUBMITTAL
SECTIONS - R4P4
STA 6+74 TO 7+77

0 30 60
SCALE:1" = 30'
ANSI FULL BLEED B (17.00 X 11.00 INCHES)

UNNAMED 3 POST-FIRE RESTORATION

STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE

LARIMER COUNTY, CO

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

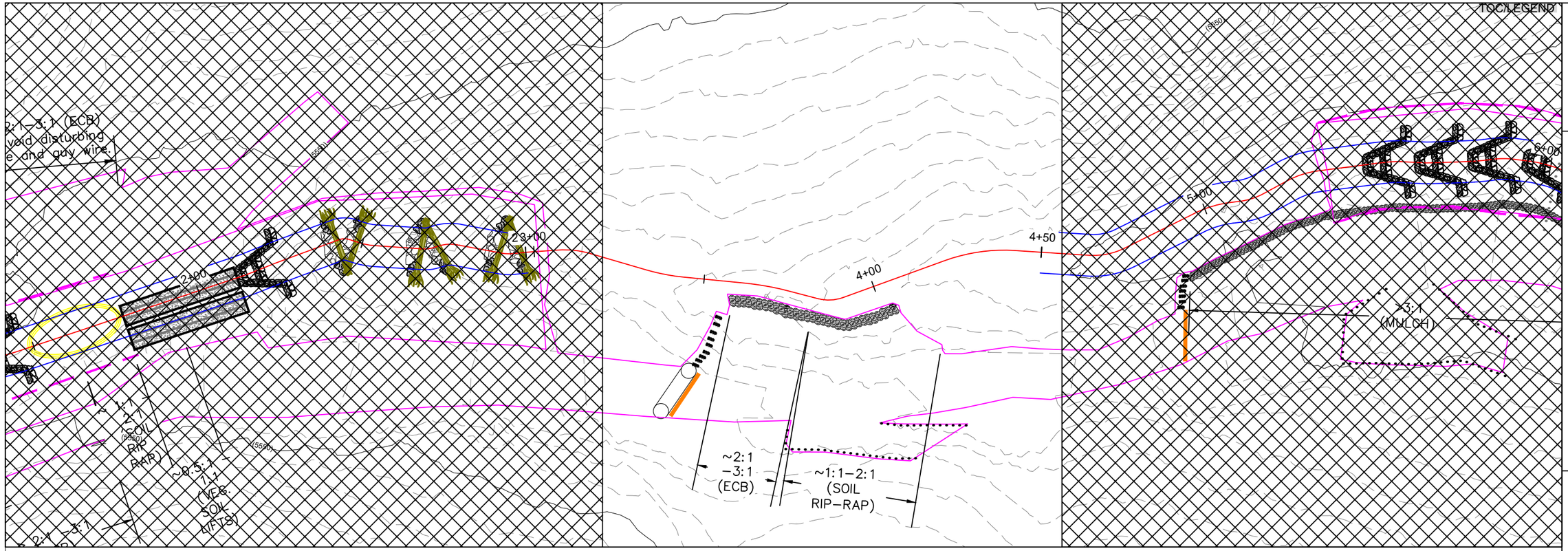
CLIENT: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

ENGINEER: DAVID BIDELSPACH
5 SMOOTH STONES RESTORATION, PLCC
754 MOUNT MAHOGANY
LIVERMORE, CO 80536

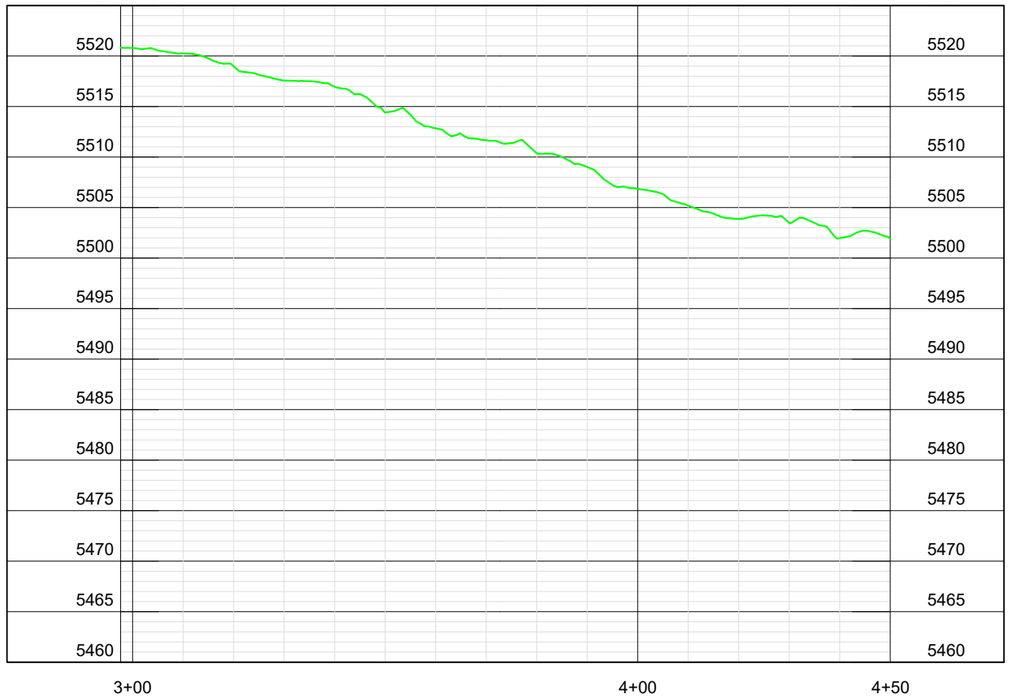
EOPC - 4th Priority

TOC/LEGEND

CLIENT:	JENNIFER KOVESCES CPRW 320 E. VINE DRIVE, SUITE 213 FORT COLLINS, CO 80524	UNNAMED 3 POST-FIRE RESTORATION STREAM RESTORATION AND RESILIENCY		DRAFT 65% SUBMITTAL EOPC - 4TH PRIORITY ----	DATE: 12/27/2017
ENGINEER:	DAVID BIDELSPACH 5 SMOOTH STONES RESTORATION, PLCC 754 MOUNT MAHOGANY LIVERMORE, CO 80536	NEAR BELLVUE LARIMER COUNTY, CO	DRAWN BY: GET CHECKED BY: JG APPROVED BY: DAB	NOT TO SCALE	SHEET: 18 OF 30



UT3 2+97 TO 4+50 - R2 P5
Vertical Scale: 1" = 15'
Vertical Exaggeration: 2:1



TOC/LEGEND

DATE: 12/27/2017

SHEET: 19 OF 30

SCALE:1" = 30'
ANSI FULL BLEED B (17.00 X 11.00 INCHES)
0 30 60

DRAFT 65% SUBMITTAL
PLAN AND PROFILE - 5TH PRIORITY
STA 2+97 TO 4+50

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION

STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE

LARIMER COUNTY, CO

CLIENT: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

ENGINEER: DAVID BIDELSPACH
5 SMOOTH STONES RESTORATION, PLCC
754 MOUNT MAHOGANY
LIVERMORE, CO 80536

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EOPC - 5th Priority

TOC/LEGEND

CLIENT:	JENNIFER KOVESCES CPRW 320 E. VINE DRIVE, SUITE 213 FORT COLLINS, CO 80524	UNNAMED 3 POST-FIRE RESTORATION STREAM RESTORATION AND RESILIENCY		DRAFT 65% SUBMITTAL EOPC - 5TH PRIORITY ----	DATE: 12/27/2017
ENGINEER:	DAVID BIDELSPACH 5 SMOOTH STONES RESTORATION, PLCC 754 MOUNT MAHOGANY LIVERMORE, CO 80536	NEAR BELLVUE LARIMER COUNTY, CO	DRAWN BY: GET CHECKED BY: JG APPROVED BY: DAB	NOT TO SCALE	SHEET: 20 OF 30

TOC/LEGEND

UPSTREAM REACH - 2ND PRIORITY SHEET 11

REACH 1 - 1ST PRIORITY SHEET 7

REACH 2 - 5TH PRIORITY SHEET 19

REACH 3 - 3RD PRIORITY SHEET 13

REACH 4 - 4TH PRIORITY SHEET 16

0+00

0+90

0+00

1+00

2+00

3+00

4+00

4+50

5+00

6+00

6+72

7+00

7+88

Poudre Canyo

LEGEND

TYPE	AREA (ACRES)
REVEGETATE ONLY	X.XX
TREE AND SHRUB ENHANCEMENT	X.XX
GRADE AND REVEGETATE	X.XX
WILLOWS AND COTTONWOODS	X.XX

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DATE: 12/27/2017

SHEET: 21 OF 30

DRAFT 65% SUBMITTAL
PLANTING PLAN
---

0 75 150
SCALE:1" = 75'
ANSI FULL BLEED B (17.00 X 11.00 INCHES)

UNNAMED 3 POST-FIRE RESTORATION

STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE

LARIMER COUNTY, CO

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

CLIENT: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

ENGINEER: DAVID BIDELSPACH
5 SMOOTH STONES RESTORATION, PLCC
754 MOUNT MAHOGANY
LIVERMORE, CO 80536

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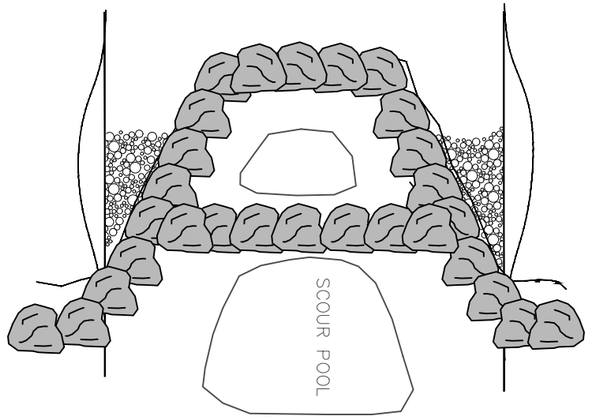
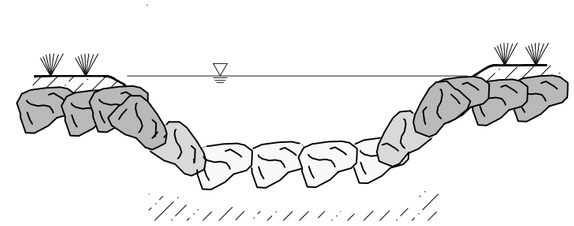
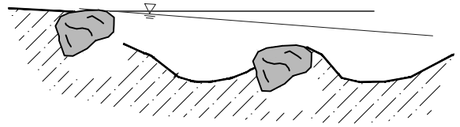
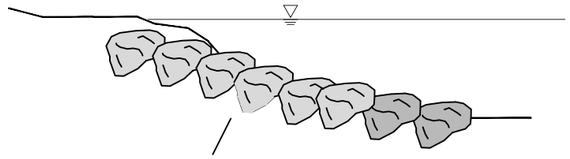
CLIENT: JENNIFER KOVESCES CPRW 320 E. VINE DRIVE, SUITE 213 FORT COLLINS, CO 80524	UNNAMED 3 POST-FIRE RESTORATION STREAM RESTORATION AND RESILIENCY		DRAFT 65% SUBMITTAL WETLAND IMPACTS ----	DATE: 12/27/2017
ENGINEER: DAVID BIDELSPACH 5 SMOOTH STONES RESTORATION, PLCC 754 MOUNT MAHOGANY LIVERMORE, CO 80536	NEAR BELLVUE LARIMER COUNTY, CO	DRAWN BY: GET CHECKED BY: JG APPROVED BY: DAB	0 75 150 SCALE:1" = 75' ANSI FULL BLEED B (17.00 X 11.00 INCHES)	SHEET: 22 OF 30

TOC/LEGEND









1. ALL STONES ARE TO BE STRUCTURE STONE.
2. GAPS BETWEEN BOULDERS SHALL BE MINIMIZED BY FITTING BOULDERS TOGETHER AND PLUGGING WITH STRUCTURE STONE CLASS A AND SELECT MATERIAL OR CHINKING STONE APPROVED BY THE ENGINEER, AND LINING WITH FILTER FABRIC.
3. DIMENSIONS AND SLOPES MAY BE ADJUSTED TO FIT BY THE ENGINEER.
4. CONTRACTOR WILL BE REQUIRED TO FIT BOULDERS TIGHTLY.
5. FOOTER BOULDERS AND VANE BOULDERS SHALL BE 1–2 TONS MINIMUM AND NATIVE STONE OR SHOT ROCK, CUBICAL OR RECTANGULAR IN NATURE.
6. SLOPE OF VANE FROM CENTERLINE TO THE TOP OF THE VANE ARM SHALL BE 2–5%.
7. THERE SHALL BE NO DROP GREATER THAN 6".
8. THE ELEVATION OF EACH GRADE CONTROL STRUCTURE SHOULD BE EQUAL TO OR GREATER THAN THE ELEVATION OF THE TOP OF THE FOOTER ROCKS DIRECTLY UPSTREAM.
9. FILTER FABRIC SHALL BE PLACED ON THE UPSTREAM SIDE OF THE STRUCTURE TO PREVENT WASHOUT OF SEDIMENT THROUGH BOULDER GAPS. FILTER FABRIC SHALL EXTEND FROM THE BOTTOM OF THE FOOTER BOULDER TO THE FINISHED GRADE ELEVATION AND SHALL BE PLACED THE ENTIRE LENGTH OF THE STRUCTURE.
10. FOOTER DEPTH ON ALL STRUCTURES REQUIRING FOOTERS SHALL BE 6 TIMES GREATER THAN THE DROP BETWEEN THE STRUCTURE AND THE FOOTERED STRUCTURE DIRECTLY UPSTREAM.

DETAIL – ROCK CROSS–VANE

NOT TO SCALE
ROUGHLY 2x VERTICAL EXAGGERATION

DATE: 12/27/2017

SHEET: 23 OF 30

DRAFT 65% SUBMITTAL
DETAILS
ROCK CROSS-VANE

NOT TO SCALE

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION

STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE

LARIMER COUNTY, CO

CLIENT: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

ENGINEER: DAVID BIDELSPACH
5 SMOOTH STONES RESTORATION, PLCC
754 MOUNT MAHOGANY
LIVERMORE, CO 80536

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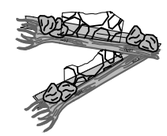
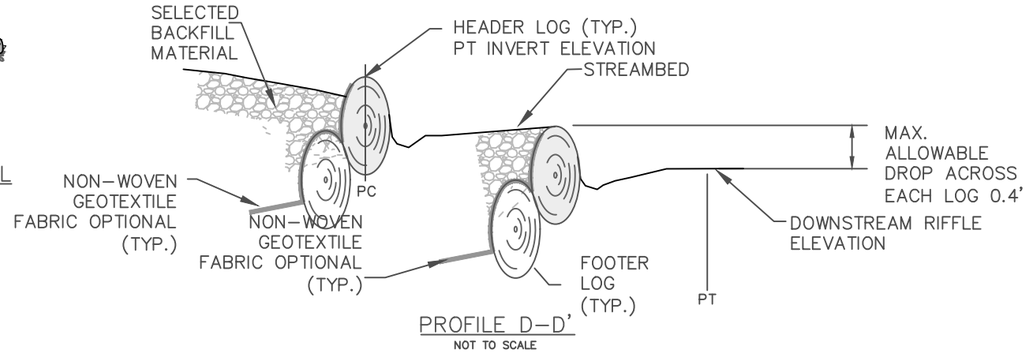
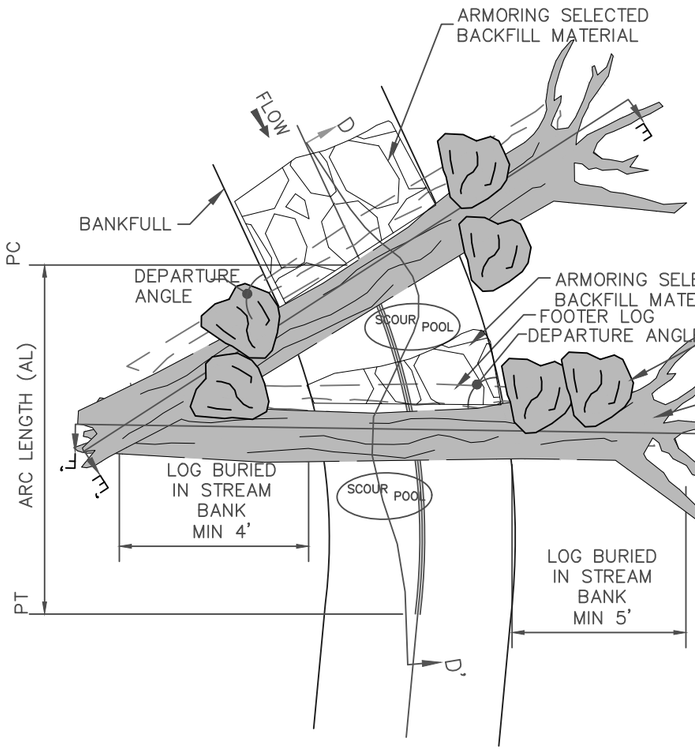


PLAN–SYMBOL



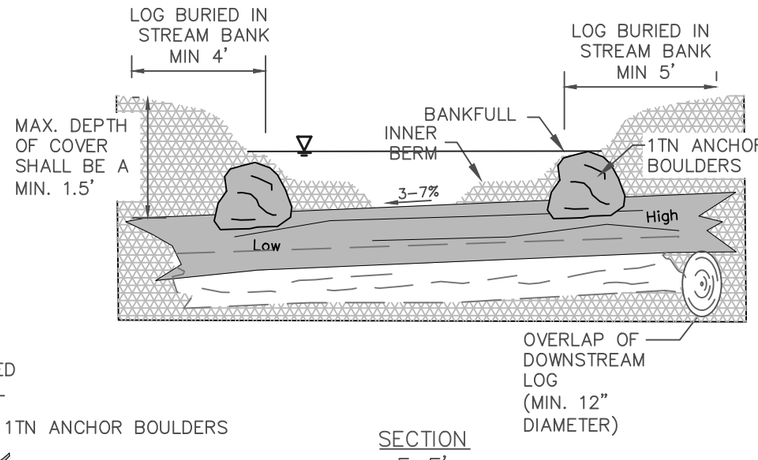
PROFILE D–D'
NOT TO SCALE



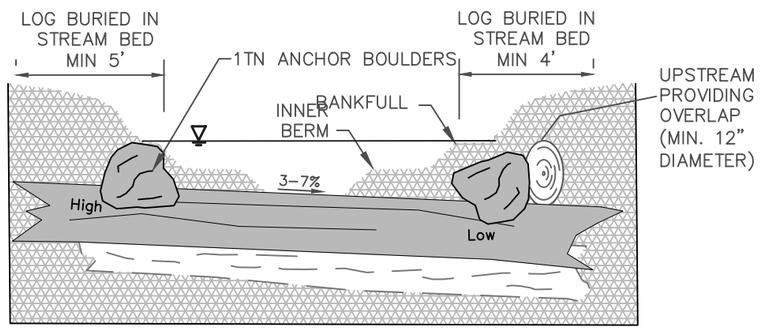
PLANVIEW

NOTE:

THE DEPARTURE ANGLE SHOWN ABOVE IS DEPICTED IN SUCH A WAY TO EMPHASIZE DETAIL. ACTUAL DEPARTURE ANGLE SHALL BE AS SHOWN ON THE PLAN AND PROFILE SHEETS AND WILL BE PROVIDED TO THE CONTRACTOR AS A 2013 FORMAT DWG FILE AND LN3 FILE.



SECTION
E–E'



SECTION
F–F'

DETAIL – LOG DROP WITH BOULDERS

NOT TO SCALE

NOTES:

1. BANKFULL WIDTHS WILL BE BETWEEN 8'–14' WITH SLOPES THAT RANGE FROM OF 2.5% TO 5.0% AND WITH AVAILABLE COURSE SUBSTRATE.
2. THIS STRUCTURE REQUIRES LOGS THAT ARE SIGNIFICANTLY LONGER THAN THE BANKFULL WIDTH. THE MINIMUM LOG LENGTH FOR THIS STRUCTURE IS 2 TIMES THE REACH BANKFULL WIDTH OR 20'.
3. THE MIN. MAXIMUM DEPTH OF COVER IS 1.5 TIMES THE REACH BANKFULL MAXIMUM RIFFLE DEPTH OR 1.5'.
4. LOGS SHALL HAVE MINIMUM DIAMETER OF 18".
5. ALL LOGS SHALL BE RELATIVELY STRAIGHT AND LIMBS SHALL BE TRIMMED FLUSH.
6. FOOTER LOGS ARE LOGS PLACED TO PROVIDE A FOUNDATION AND SCOUR PROTECTION FOR THE HEADER LOGS. FOOTER LOGS ARE ALSO REFERRED TO AS BACKER LOGS. THE HEADER LOG DOES NOT REST ON TOP OF THE FOOTER LOG.
7. THE UPSTREAM AND DOWNSTREAM HEADER LOGS SHALL BOTH BE UNDERLAIN BY FOOTER LOGS UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
8. HEADER LOGS ARE THE TOP MOST LOGS USED IN EACH LOG STRUCTURE. HEADER LOGS FOR THIS STRUCTURE ARE ONLY VISIBLE BETWEEN THE INNER BERMS.
9. HEADER LOGS SHALL BE OFFSET SLIGHTLY DOWNSTREAM OF THE FOOTER LOGS. HEADER LOG SHALL BE INSTALLED BEFORE THE FOOTER LOG. THE FOOTER LOG WILL BE PLACED UPSTREAM AND AGAINST THE LOWER HALF OF THE HEADER LOG.
10. SET INVERTS AT ELEVATION SHOWN ON THE PLAN AND PROFILE SHEETS. PLAN AND PROFILE SHEETS WILL BE PROVIDED TO THE CONTRACTOR AS A 2013 FORMAT DWG FILE. NO ELEVATIONS OF THE LOG DROP STRUCTURE MAY VARY FROM THE PLAN LOCATIONS WITHOUT DIRECTION FROM THE ENGINEER.
11. THE DROP IN ELEVATION ACROSS THE STRUCTURE SHALL NOT EXCEED 0.6' UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
12. ALL LOGS ARE PLACED SUCH THAT THEY OVERLAP THE NEXT DOWNSTREAM LOG; THEREFORE, IT IS RECOMMENDED THAT THIS STRUCTURE BE CONSTRUCTED FROM DOWNSTREAM TO UPSTREAM.
13. THE VERTICAL SLOPE OF EACH LOG SHALL NOT EXCEED 6% UNLESS OTHERWISE DIRECTED BY THE ENGINEER. THE SLOPES WILL BE DICTATED BY THE WIDTH–TO–DEPTH RATIO OF THE REACH, TYPICAL RIFFLE INNER BERM CHANNEL, AND VERTICAL DROP OVER THE LOG AND LOG DIAMETER.
14. IT IS LIKELY THAT EACH LOG WILL REQUIRE NOTCHING WHERE THEY OVERLAP IN ORDER TO NOT EXCEED THE MAXIMUM VERTICAL SLOPE SPECIFICATIONS AND SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION. THE CONTRACTOR SHOULD CHOOSE LOGS FROM THE SITE THAT CAN BE USED TO MEET THE SPECIFICATIONS OF THIS DETAIL.
15. THE NOTCH DEPTH FOR ANY LOG SHALL NOT EXCEED HALF THE DIAMETER OF THE LOG BEING NOTCHED UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
16. ALL GAPS/VOIDS SHALL BE CHINKED WITH LIMBS AND/OR BRUSH ON THE UPSTREAM SIDE PRIOR TO PLACEMENT OF THE GEOTEXTILE FABRIC. ANY NOTCHED LOGS SHALL BE APPROVED BY THE DESIGN ENGINEER BEFORE THE LOGS ARE BACKFILLED.
17. ON THE UPSTREAM SIDE OF THE LOGS A LAYER OF WOVEN GEOTEXTILE FABRIC SHALL BE PLACED AS SHOWN IN THE GEOTEXTILE PLACEMENT DETAIL (SHEET 20) THE ENTIRE LENGTH OF THE LOG.
18. BACKFILL STRUCTURE WITH SELECTED BACKFILL MATERIAL AS SHOWN AND DEFINED IN THE GEOTEXTILE PLACEMENT DETAIL (SHEET 20).
19. SELECTED BACKFILL AND SOIL BACKFILL MATERIAL SHALL BE COMPACTED SUCH THAT FUTURE SETTLEMENT OF THE MATERIAL IS KEPT TO A MINIMUM.
20. NAIL WOVEN GEOTEXTILE TO EDGE OF HEADER LOG AND BACKFILL AS SHOWN IN THE GEOTEXTILE PLACEMENT DETAIL (SHEET 20).
21. THE SURFACE OF THIS STRUCTURE SHALL BE FINISHED TO A SMOOTH AND COMPACT SURFACE IN ACCORDANCE WITH THE LINES, GRADES, AND CROSS–SECTIONS OR ELEVATIONS SHOWN ON THE DRAWINGS. THE DEGREE OF FINISH FOR INVERT ELEVATIONS SHALL BE WITHIN 0.1' OF THE GRADES AND ELEVATIONS INDICATED, PROVIDED ANY HEIGHT DOES NOT EXCEED MAX. ALLOWABLE DROP OF 0.4' FOR THIS STRUCTURE.
22. RE–DRESSING OF CHANNEL AND BANKFULL BENCH/FLOODPLAIN WILL LIKELY BE REQUIRED FOLLOWING INSTALLATION OF INSTREAM STRUCTURES AND SHALL BE CONSIDERED INCIDENTAL TO CONSTRUCTION.
23. SEE THE PLANTING TABLE IN NOTES AND SPECIFICATIONS 3 (SHEET 3) FOR DETAILS ON HIGH DENSITY LIVE STAKING.
24. THERE SHALL BE 6 1–TON ANCHOR BOULDERS INSTALLED IN THIS STRUCTURE TO HELP SECURE LOGS.

DATE: 12/27/2017

SHEET: 24 OF 30

DRAFT 65% SUBMITTAL
DETAILS
LOG DROP WITH BOULDERS

NOT TO SCALE

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION

STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE

LARIMER COUNTY, CO

CLIENT: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

ENGINEER: DAVID BIDELSPACH
5 SMOOTH STONES RESTORATION, PLCC
754 MOUNT MAHOGANY
LIVERMORE, CO 80536

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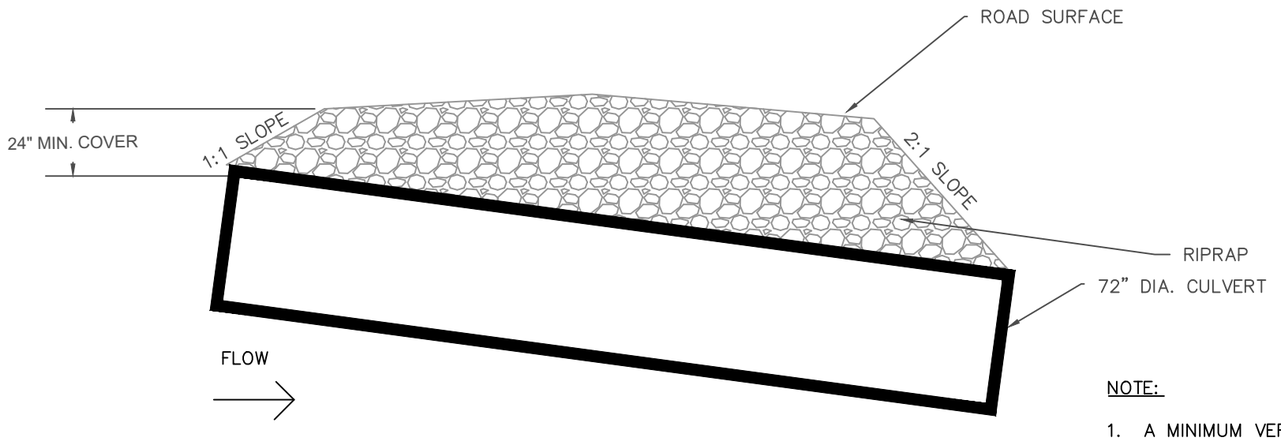
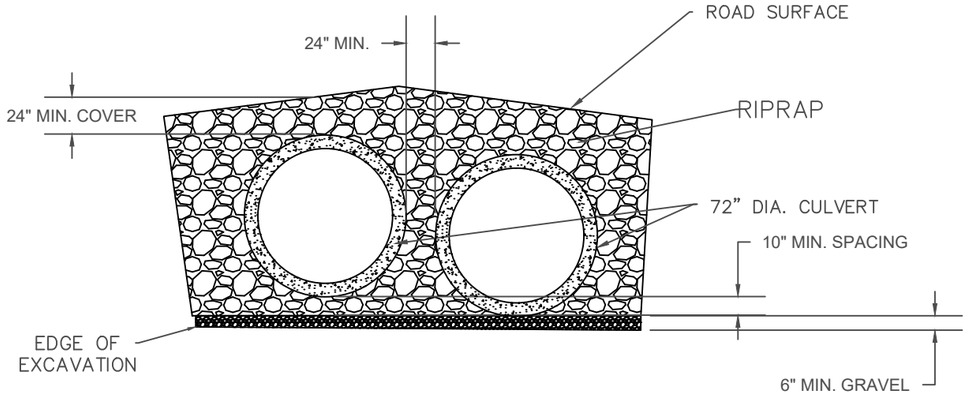


PROFILE VIEW



CROSS-SECTION VIEW

DETAIL – CULVERT
NOT TO SCALE

NOTE:

1. A MINIMUM VERTICAL CULVERT INVERT SPACING OF 10" AND A MINIMUM HORIZONTAL DISTANCE OF 24" BETWEEN CULVERTS SHOULD BE ACHIEVED.
2. ALL CULVERTS MUST HAVE AT LEAST 24" OF TOP COVER IN ALL LOCATIONS UNLESS OTHERWISE APPROVED BY THE ENGINEER.
3. THE LOWEST FLOW CULVERT SHOULD REST ON A MINIMUM OF 6" OF GRAVEL.
4. THE TOP COVER OF THE CULVERT SHOULD HAVE A 1:1 SLOPE RATIO ON THE UPSTREAM END OF THE CULVERTS AND A 2:1 SLOPE RATIO ON THE DOWNSTREAM END OF THE CULVERTS.
5. DEPENDING ON DESIRED DESIGN FLOW RATE, EITHER A 2–CULVERT OR 3–CULVERT DESIGN WILL BE USED. INSTALLATION INSTRUCTIONS WILL BE THE SAME FOR EITHER DESIGN.

CULVERT INVERT LOCATIONS

CULVERT	US INVERT STATION	US INVERT ELEVATION	DS INVERT STATION	DS INVERT ELEVATION
1*	0+40.6*	5550.6	0+74.4*	5544.3
2	1+76.6	5541.45	2+11.8	5536.57
3	7+42.6	5450.84	7+69.5	5445.07

*CULVERT 1 IS NOT ON THE MAIN CHANNEL ALIGNMENT AND IS NOT SHOWN ON A PROFILE. LOCATION OF CULVERT 1 IS SEEN ON PLAN VIEW SITE OVERVIEW AND UPSTREAM REACH PLAN PROFILE SHEET

DATE: 12/27/2017
SHEET: 25 OF 30

DRAFT 65% SUBMITTAL
DETAILS
CULVERT

NOT TO SCALE

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION
STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE
LARIMER COUNTY, CO

CLIENT: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

ENGINEER: DAVID BIDELSPACH
5 SMOOTH STONES RESTORATION, PLCC
754 MOUNT MAHOGANY
LIVERMORE, CO 80536

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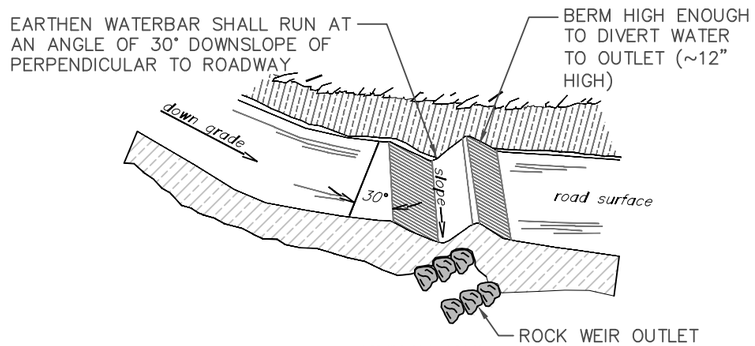
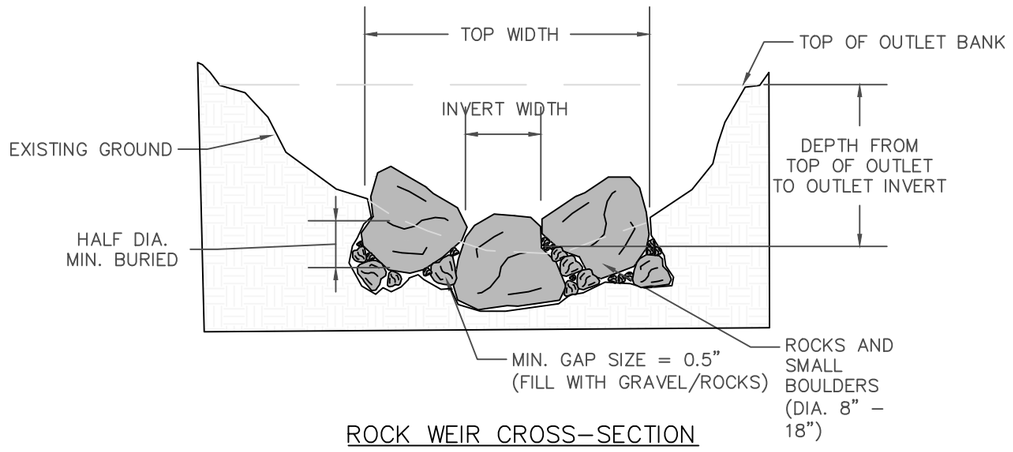
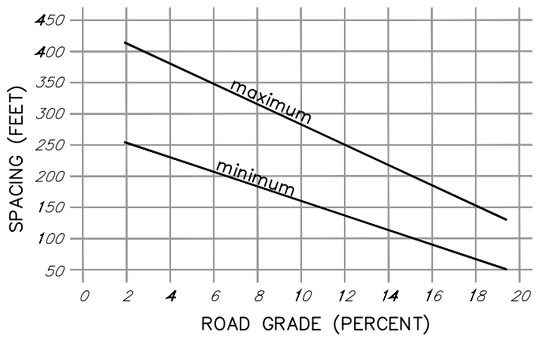


ISOMETRIC

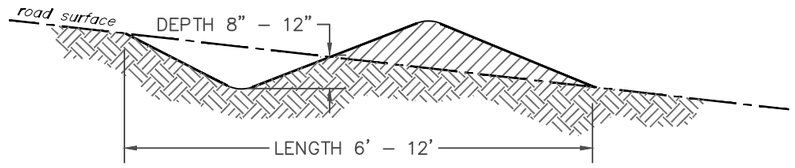


ROCK WEIR CROSS–SECTION

MINIMUM SPACING OF EARTHEN WATERBARS



$$EQ\ 1 = \frac{400}{\text{slope }\%} + 100\text{ft}$$



PROFILE

NOTES:

1. EARTHEN WATERBARS ARE FOR LIGHT USE ROADS ONLY.
2. THE LANDOWNER IS RESPONSIBLE FOR PROCURING AND COMPLYING WITH ALL PERMITS AND EASEMENTS, INCLUDING ALL FEDERAL, STATE, AND LOCAL REQUIREMENTS. tHE LANDOWNER IS ALSO RESPONSIBLE FOR INSURING THAT ALL WORK DONE ON ACCESS ROADS THAT JOIN STATE OR COUNTY ROADS SHALL BE IN COMPLIANCE WITH THE REQUIREMENTS FOR THESE ROADS.
3. ALL CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT POTENTIAL EROSION, AIR, AND WATER POLLUTION ARE MINIMIZED. WORK SHALL BE PERFORMED IN ACCORDANCE WITH CS–OR–001, CLEARING, CS–OR–002, CLEARING AND GRUBBING, AND CS–OR–005, POLLUTION CONTROL.
4. MINIMUM SPACING OF WATERBARS SHALL BE DETERMINED USING EQ#1 OR GRAPH. ADDITIONAL SPACING MAY BE NEEDED BASED ON SITE–SPECIFC CONSIDERATIONS. WHEN A ROAD IS WITHIN 25 FEET OF A STREAM AND RUNS PARALLEL TO A STREAM FOR MORE THAN 300 FEET, DECREASE SPACING (AS SPECIFIED BY EQ#1 OR GRAPH) BY MINIMUM OF 25 PERCENT.
5. WHERE A ROAD IS GRADING DOWN TOWARDS A STREAM, LOCATE THE LAST WATERBAR AT ABOUT 10 TO 30 FEET FROM STREAM (DEPENDING UPON FILTERING CAPABILITY AT THE OUTLET). PLACE THE NET WATERBARD UPGRADE AT 75 PERCENT OF THE SPACING GUIDE VALUE.
6. IF ROAD HAS DRAINAGE DITCH, EXTEND WATERBAR TO INTERCEPT THE RUNOFF.
7. PROTECT OUTLET AREA OF WATERBAR WITH ROCK WEIR.
8. INSPECT WATERBARS AFTER EACH MAJOR RUNOFF EVENT AND PROVIDE MAINTENANCE AS NEEDED TO MAINTAIN PROPER DRAINAGE. SEE PRACTIVE STANDARD 560 OPERATION & MAINTENANCE FOR ADDITIONAL GUIDANCE.
9. ALL WATERBARS SHALL BEGIN AT THE INTERSECTION OF THE ROADBED AND CUT SLOPE AND SHALL EXTEND THE ENTIRE WIDTH OF THE ROADBED. THEY SHALL BE INSTALLED AT AN ANGLE OF 30° DOWNSLOPE OF PERPENDICULAR TO DIRECTION OF ROAD.
10. VEGETATED OUTLETS SHALL BE MAINTAINED WITH ADEQUATE COVER. RESEED AND MOW AS NEEDED PER PRACTIVE STANDARD 342, CRITICAL AREA PLANTING.
11. ALL WATERBARS SHALL HAVE FREE FLOWING OUTLETS AND SHALL BE ARMORED AT OUTLET. SEE ROCK WEIR DETAIL.
12. FOR ADDITIONAL INFORMATION GUIDANCE SEE OREGON'S FOREST PROTECTION LAWS, 2ND EDITION AND USDA – FOREST SERVICE "ENVIRONMENTALLY SENSITIVE MAINTENANCE FOR DIRT AND GRAVEL ROADS", APRIL 2012.

**DRAWINGS WERE DEVELOPED BY THE OREGON NRCS STATE DESIGN ENGINEER AND STATE FORESTER.

DESIGN CRITERIAL

MINIMUM SPACING _____ (ft)

WATERBAR DEPTH _____ (ft)

WATERBAR LENGTH _____ (ft)

DETAIL – WATERBAR

NOT TO SCALE

DATE: 12/27/2017

SHEET: 26 OF 30

DRAFT 65% SUBMITTAL
DETAILS
WATERBAR

NOT TO SCALE

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION

STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE

LARIMER COUNTY, CO

CLIENT: JENNIFER KOVESCES
CPRW
320 E. VINE DRIVE, SUITE 213
FORT COLLINS, CO 80524

ENGINEER: DAVID BIDELSPACH
5 SMOOTH STONES RESTORATION, PLCC
754 MOUNT MAHOGANY
LIVERMORE, CO 80536

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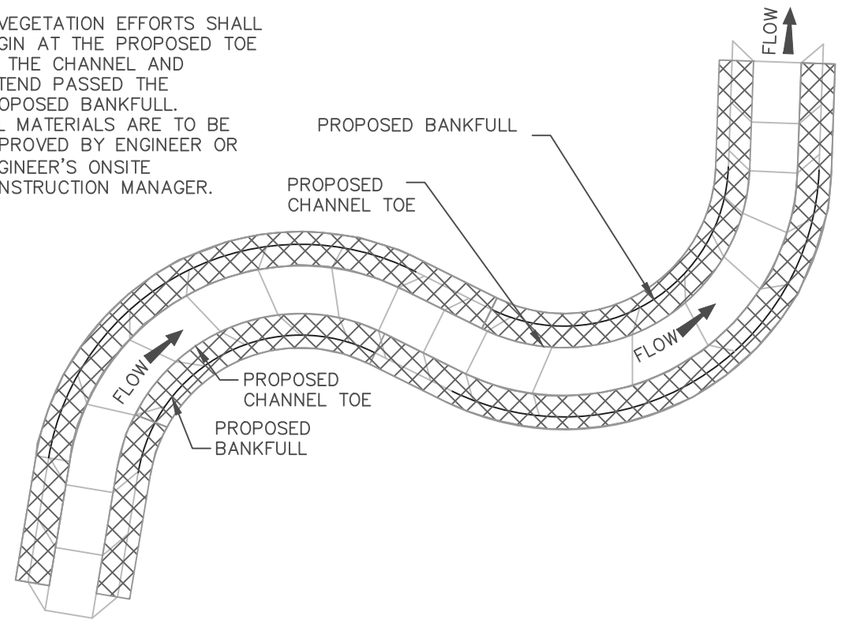
NOTE:

1. REVEGETATION EFFORTS SHALL BEGIN AT THE PROPOSED TOE OF THE CHANNEL AND EXTEND PASSED THE PROPOSED BANKFULL.
2. ALL MATERIALS ARE TO BE APPROVED BY ENGINEER OR ENGINEER'S ONSITE CONSTRUCTION MANAGER.



DETAIL – BANK STABILIZATION EXTENTS
NOT TO SCALE

CLIENT:	JENNIFER KOVESCES CPRW 320 E. VINE DRIVE, SUITE 213 FORT COLLINS, CO 80524
ENGINEER:	DAVID BIDELSPACH 5 SMOOTH STONES RESTORATION, PLCC 754 MOUNT MAHOGANY LIVERMORE, CO 80536

UNNAMED 3 POST-FIRE RESTORATION
STREAM RESTORATION AND RESILIENCY

DRAFT 65% SUBMITTAL
DETAILS
BANK STABILIZATION EXTENTS

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

NOT TO SCALE

DATE: 12/27/2017

SHEET: 27 OF 30

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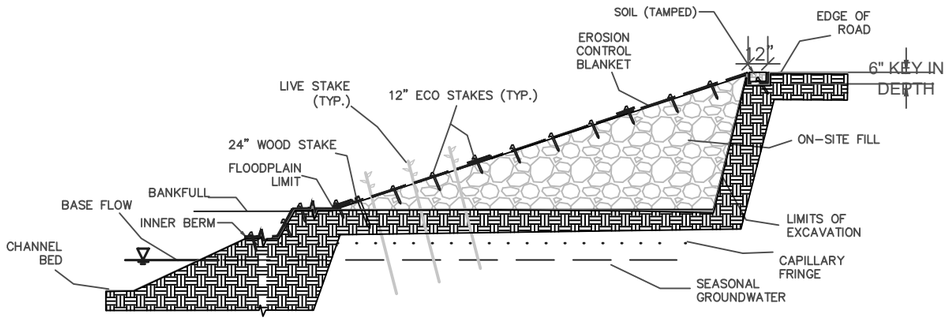
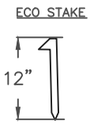
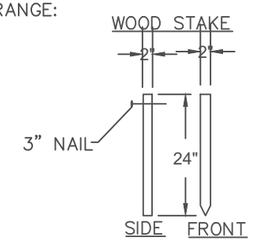


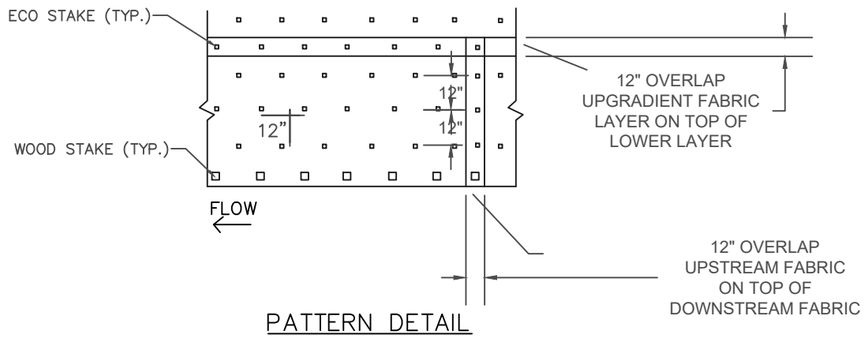
CROSS-SECTION VIEW

*SOME INSTANCES MAY INCLUDE TOE WALL. SEE DS PLAN PROFILE (SHEET 9).

FOR SIDE SLOPE RANGE:
3:1 < x < 2:1







PATTERN DETAIL

NOTES:

1. BEFORE INSTALLING EROSION CONTROL BLANKET, SCARIFY UPPER 6" OF SOIL TO HELP VEGETATION ESTABLISH.
2. RAKE SOIL LEVEL AND ADD SEED AND MULCH BEFORE INSTALLING EROSION CONTROL BLANKET.
3. LAY BLANKETS LOOSELY AND USE 12" ECO STAKES TO MAINTAIN CONTACT WITH SOIL. DO NOT STRETCH.
4. STAKES WILL HAVE A MAXIMUM SPACING OF 24" ON ALL SIDES.
5. UPSTREAM PORTIONS OF EROSION CONTROL BLANKET SHALL OVERLAP 12" OVER THE TOP OF DOWNSTREAM PORTIONS OF BLANKET. WHEN APPLICABLE, UPGRADIENT PORTIONS OF BLANKET SHALL OVERLAP 12" OVER THE TOP OF DOWNGRADIENT PORTIONS OF BLANKET (PERPENDICULAR TO DIRECTION OF FLOW). WITHIN THIS AREA OF OVERLAP, STAKES SHALL BE INSTALLED IN ZIG-ZAG PATTERN EVERY 12".
6. LIVE STAKING OF WILLOW AND COTTONWOOD MAY BE IMPLEMENTED DURING THE DORMANT SEASON.
7. ROOTS OF LIVE STAKES MUST BE IN CONTACT WITH BASE FLOW WATER TABLE TO ENCOURAGE VEGETATION ESTABLISHMENT.
8. EROSION CONTROL BLANKETS SHALL BE KEYED INTO AT THE TOP OF SLOPE AT A HORIZONTAL EXTENSION OF 12" AND A DEPTH OF 6". THIS TRENCH SHALL BE SECURED USING ECO STAKES, 18" ON CENTER, AND BACKFILLED (AND TAMPED) WITH SOIL. A SIMILAR TRENCH WILL BE USED TO INSTALL UPSTREAM EDGES OF TOTAL AREAS TO BE COVERED BY EROSION CONTROL BLANKET.
9. TO SECURE THE EROSION CONTROL BLANKET AT THE BOTTOM OF SLOPE, WOOD STAKES SHALL BE INSTALLED THROUGH THE TIGHTLY WOVEN ENDS OF THE BLANKET, 12" ON CENTER. 24" 2"X2" WOOD STAKES WITH A 3" NAIL NEAR THE TOP OF THE WOOD STAKE WILL BE USED.
10. A PRE-DRILLED HOLE 1" TO 2" BELOW THE TOP OF THE WOOD STAKE SHALL HAVE ONE 3" NAIL DRIVEN THROUGH IT.
11. THE PRE-DRILLED HOLE SHALL BE SMALL ENOUGH THAT THE NAIL MUST BE DRIVEN INTO THE STAKE, YET LARGE ENOUGH TO PREVENT SPLITTING OF THE STAKE WHILE DRIVING THE NAIL.
12. THE NAIL SHALL BE DRIVEN SUCH THAT AN EQUAL AMOUNT OF THE NAIL PROTRUDES THROUGH BOTH SIDES OF THE WOOD STAKE.
13. IN-LIEU OF PREDRILLING HOLES THROUGH THE WOOD STAKES, A NEUMATIC NAIL-GUN MAY BE USED; HOWEVER, THE AIR PRESSURE MUST BE ADJUSTED SUCH THAT NO SPLITTING OF THE WOOD STAKE OCCURS.
14. ALL VARIATIONS FROM THE STAKING DETAIL MUST BE APPROVED BY THE ENGINEER.

DETAIL – EROSION CONTROL BLANKET
NOT TO SCALE

DATE: 12/27/2017
SHEET: 28 OF 30

DRAFT 65% SUBMITTAL
DETAILS
EROSION CONTROL BLANKET

NOT TO SCALE

DRAWN BY: GET
CHECKED BY: JG
APPROVED BY: DAB

UNNAMED 3 POST-FIRE RESTORATION
STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE
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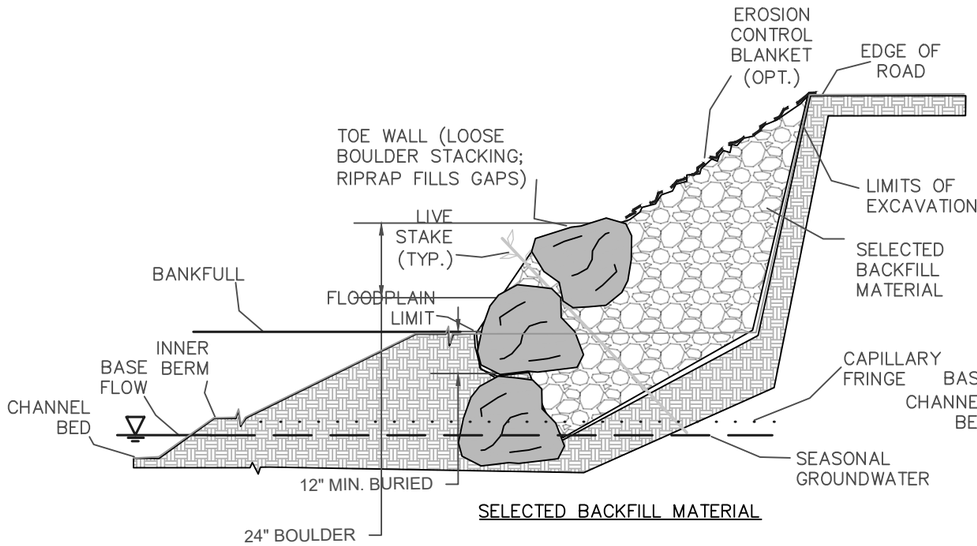
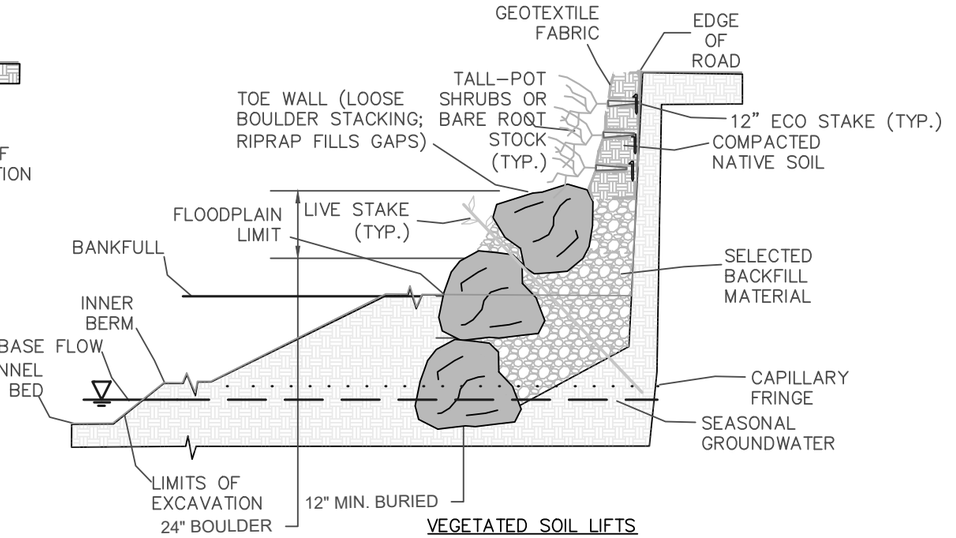
NOTES:

1. TOE WALLS WILL MADE WITH 24" BOULDERS WITH A FOOTER BOULDER BURIED A MINIMUM OF 12" AT THE TOE OF THE SLOPE AND CAN BE 2'–4' TALL DEPENDING ON DESIGN LOCATION.
2. FOR SIDE SLOPES BETWEEN 2:1 AND 0.5:1, SELECTED BACKFILL MATERIAL SHALL CONSIST OF 50% CLASS 1 RIPRAP, 30% CLASS II RIPRAP, AND 20% SOIL MATERIAL, UNLESS OTHERWISE SPECIFIED WITHIN A SPECIFIC DETAIL OR APPROVED BY THE ENGINEER. SELECTED BACKFILL MATERIAL WILL BEGIN DIRECTLY BEHIND THE TOE WALL AND BURIED TO A DEPTH EQUAL TO THE FOOTER BOULDER OF THE TOE WALL.
3. FOR SIDE SLOPES BETWEEN 2:1 AND 1:1, EROSION CONTROL BLANKETS MAY BE USED DEPENDING ON SOIL STABILITY.
4. SELECTED BACKFILL MATERIAL SHOULD BE PROPERLY COMPACTED TO AVOID POST–CONSTRUCTION SETTLING.
5. FOR SIDE SLOPES BETWEEN 1:1 AND 0.5:1, 8" SOIL LIFT LAYERS WILL BE CONSTRUCTED. COMPACTED SOIL LIFTS WILL BE USED ABOVE THE TOE WALL.
6. GEOTEXTILE FABRIC WILL SEPARATE SOIL LIFT LAYERS AND BE SECURED TO THE LAYER BELOW USING 12" ECO STAKES.
7. TALL–POT SHRUBS WILL BE PLANTED BETWEEN THE GEOTEXTILE FABRIC SEPARATING EACH SOIL LIFT LAYER.
8. BOULDERS OF TOE WALL WILL BE LOOSELY PLACED WITH GRAVEL RIPRAP FILLING ANY GAPS.
9. LIVE STAKES WILL BE PLANTED BETWEEN THE GAPS IN TOE WALL.
10. ROOTS OF LIVE STAKES WILL BE DEEP ENOUGH TO REACH CAPILLARY FRINGE OF BASE FLOW SEASONAL GROUNDWATER LINE.



SELECTED BACKFILL MATERIAL



VEGETATED SOIL LIFTS

DETAIL – BIOENGINEERING CROSS–SECTIONS

NOT TO SCALE

DATE: 12/27/2017

SHEET: 29 OF 30

DRAFT 65% SUBMITTAL
DETAILS
BIOENGINEERING

NOT TO SCALE

UNNAMED 3 POST-FIRE RESTORATION
STREAM RESTORATION AND RESILIENCY

NEAR BELLVUE
LARIMER COUNTY, CO

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CHECKED BY: JG
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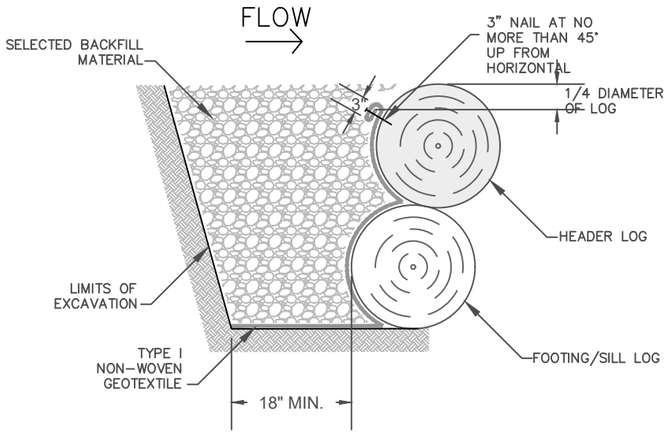

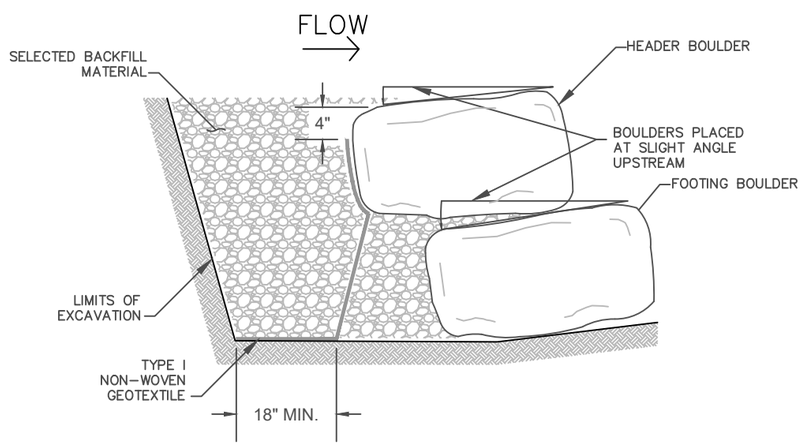

NOTES:

1. NON–WOVEN GEOTEXTILE FABRIC SHALL EXTEND A MINIMUM OF 18" FROM THE BOTTOM OF THE FOOTER LOG/ROCK OR LIMITS OF EXCAVATION, WHICHEVER IS LOWER, AND UP TO 3/4 THE DIAMETER OF THE HEADER LOG OR 4" FROM THE TOP OF THE HEADER BOULDER UNLESS OTHERWISE DIRECTED BY THE ENGINEER.
2. PRIOR TO SECURING THE NON–WOVEN GEOTEXTILE FABRIC TO HEADER LOGS, TWO 3" FOLDS SHALL BE PLACED IN THE UPPER END OF THE FABRIC CREATING THREE LAYERS OF FABRIC FOR THE NAIL TO PENETRATE PRIOR TO REACHING THE LOG.
3. SECURE THE NON–WOVEN GEOTEXTILE TO THE HEADER LOG BY NAILING 3" 10d GALVANIZED ROOFING NAILS OR APPROVED EQUIVALENT THE ENTIRE LENGTH OF THE LOG, 6" ON CENTER.
4. SELECT BACKFILL MATERIAL SHALL CONSIST OF 50% CLASS 1 RIP–RAP, 30% CLASS II RIP–RAP, AND 20% SOIL MATERIAL, UNLESS OTHERWISE SPECIFIED WITHIN A SPECIFIC DETAIL OR APPROVED BY THE ENGINEER.

DETAIL – GEOTEXTILE PLACEMENT AND SELECTED BACKFILL
NOT TO SCALE

DATE: 12/27/2017
SHEET: 30 OF 30

DRAFT 65% SUBMITTAL
DETAILS
GEOTEXTILE PLACEMENT

NOT TO SCALE

DRAWN BY: GET
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UNNAMED 3 POST-FIRE RESTORATION
STREAM RESTORATION AND RESILIENCY

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References

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