

Comments and Responses on Fourmile Canyon Creek Design

Comments From	Comment	Response
State TA Team	<p>Geomorphic Conditions: Reach assessments conducted to identify: existing channel dimension, pattern, and profile characteristics including classification of existing and potential stream type.</p> <p>The project uses reference reaches on the East Fork of the Arkansas River as well as North Elk Creek to determine what appropriate channel planform, slope, and dimensions should be. The reference to the East Fork Arkansas River (drainage area 49.9 square miles; reported valley and water surface slope of 1%; bankfull flow 375 cfs) seems to be quite a bit larger and significantly less steep than Four Mile Canyon Creek (drainage area 4.9 square miles, average slope is 4%, project length is 7268 feet with 306 feet of elevation loss; 60-75 cfs via StreamStats or 120-130 cfs survey of ordinary highwater marks). Four Mile Canyon Creek also is a seasonal stream while the east fork of the Arkansas River is perennial. Using the characteristics of the East Fork Arkansas as a reference is likely to result in an over expression of sinuosity and riffle-pool-glide spacing in the design and an underestimate of the scour potential within the stream system. It may also impose an unnatural form (e.g., riffle-pool-glide) on a creek that is more naturally prone to a steep step-pool configuration.</p>	<p>Reference selection was based on choosing streams in a similar hydrophisographic region (similar hydrology, geology, and vegetation). Consultation between internal staff and external sub-consultants occurred to determine that selected reference reach data was sufficient. It is important to note that reference reach information was used as a starting point for developing design parameters. Many geometric variables had to be adjusted due to constraints in the watershed. Geometric parameters were then modified based on constraints. Then a sediment and hydraulic model was created for the final stream layout.</p>
State TA Team	<p>Sediment Transport: A WARSS study was conducted to identify sediment sources. Calculations looking at critical shear stress and incipient motion are included in the worksheets in Appendix A. They indicate a channel designed with a continual trend toward incision/degradation of the system.</p>	N/A
State TA Team	<p>Ecological Considerations: Sheet #11 of plan-set is a revegetation plan with specifics on species and quantity by reach. Attention was also given to in-channel structures to provide habitat for stream biota via log vanes to create pocket pools and rock weirs.</p>	N/A
State TA Team	<p>Safety Benefits and Concerns: Undersized bridge crossings and roadway profile a concern for residents. Wagonwheel Gap Road improvement plans should strive to go beyond current Boulder County crossing standards to account for sediment and debris transport.</p>	<p>Crossings were sized for Aquatic Organism Passage (AOP) and sediment transport. The culvert design at stream station 149+00 was designed by the roadway project and will be a barrier to AOP and likely result in additional maintenance to address sediment issues. All proposed culverts will handle 10-year storm events as well as 100-year storm events with no more than 12 inches of overtopping. Additionally it is anticipated that the bottom of all of the box culverts will contain 1 to 1½ feet of fill to provide a natural channel bottom through the culvert.</p>
State TA Team	<p>Access: Ease of access addressed as part of reach priority ranking but access points for heavy machinery and staging areas for materials not expected for 30% plans.</p>	N/A
State TA Team	<p>Crossings: Crossings addressed in Wagonwheel Gap Road plan set. There are three crossings, Bow Mountain Road (Sta. 112+00), Wagonwheel Gap Road (Sta. 126+00), Wagonwheel Gap Road (Sta. 149+00), and Wagonwheel Gap Road (Sta. 163+50). Wagonwheel Gap Road (Sta. 149+00) is very long and appears to elbow under the roadway--given the debris and sediment loads in this creek and the instability of the hillslopes, it is recommended that this culvert be realigned to encourage unencumbered sediment passing. Additionally there is a private bridge near Sta. 132+00, a private crossing at Sta. 135+50 and if 123 Pinto Drive is reoccupied, a private crossing will be needed in the vicinity of Sta. 103+00.</p>	<p>Crossings were sized for Aquatic Organism Passage (AOP) and sediment transport. The culvert design at stream station 149+00 was designed by the roadway project and will be a barrier to AOP and likely result in additional maintenance to address sediment issues. There are seven proposed crossing in the Wagonwheel Gap Road Plan set. Two bridge crossing at Bow Mountain Road (Sta. 112+00) and Wagonwheel Gap Road (Sta. 163+50) and five culverts, four crossing Fourmile Canyon Creek at the following stations: 117+50, 126+00, 143+50, 149+00 and one crossing Pinto Drive. As road plans progress into the final design phase, the long crossing at Sta. 149+00 will be re-evaluate.</p>

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State TA Team	<p>In-channel Structures: A combination of rock cross vanes, log vanes, and constructed riffles are proposed. Generally, these are contextually appropriate and achieve the goal of using natural materials to enhance stability and aquatic habitat in the system. However we caution the overuse of these structures in a way that looks unnatural and forces an unnatural form into Four Mile Canyon Creek. Alternate means of dissipating energy might be found through boulder clusters, bank boulders, and rock steps that do not have the perfect symmetry depicted in the engineering typicals but instead strive to achieve a natural-looking configuration as would be found in the nearby gulches and canyons. Additionally, bank protection structures (e.g. riprap, soil lifts) should be limited to only where infrastructure is directly threatened (e.g., along a road, crossing, driveway, or house). Opportunities to remove engineered bank work from the plans should be explored in favor of more passive bank sloping and planting techniques.</p>	<p>Structures were recommended to 1) improve habitat conditions and 2) provide additional stability in areas where ideal stable channel geometry could not be attained because of adjacent constraints (i.e. road infrastructure). It is the intent of this plan that vegetation will provide stability in the long-term, however, some additional provisions need to be implemented to provide stability in the short-term while vegetation becomes established. Will review and reduce structure where possible. Will add boulder cluster detail.</p>
State TA Team	<p>Project's Impact on Regulatory Floodplain: Topic not addressed in planset or basis of design. CLOMR/LOMR likely needed for the adjacent roadway project. If relic channels and flood chutes are being filled, this will likely increase the BFE.</p>	<p>The CLOMR will be completed as a part of the roadway project. Will provide a brief description in the design memorandum explaining this.</p>
State TA Team	<p>Comments on constructability: In Reach 2, at station 111+50 to 112+00 there is a proposed cut of over 12 feet for the main channel. If this is not a relic of a remote data set that defines the existing condition, consideration of alternate, less expensive alignment to provide a stable slope, bed form, and tie in to upstream and downstream reaches is suggested. If the existing profile shows the bridge deck, ignore this comment. We also suspect that due to the presence of bedrock on adjacent side slopes it is likely that placement of in-channel structures may be impeded by the presence of shallow bedrock under the existing channel bed. Field installation should be flexible to allow for removing structures that cannot be placed. The stream restoration design included in this planset requires that the adjacent roadway and crossing work be in construction/completed before restoration work begins. This is important to consider when CWCB Technical Assistance Team Project Review looking for construction funding sources. Additionally, the roadway work in this canyon is unlikely to generate the material needed for the construction of the river elements, meaning that all material for river structures will need to be imported.</p>	<p>1) Large cut is because of channel needing to be realigned due to new bridge/road alignment. Keeping channel in existing alignment would result in a sharp bend through new bridge opening and potentially threaten road embankment. 2) Agree that field fit will be necessary to accommodate unforeseen conditions. 3) Agree, all material in cost was assumed to be imported.</p>
State TA Team	<p>Connectivity with Physical and Ecological Floodplain: Design memo indicates that 3 main floodplain connection approaches will be used (called out as Priority 1-3). These could be called out in the design plan cross-sections as well as perhaps in the planset to better illustrate how and where the channel will be elevated or excavated to increase floodplain connectivity. Ecological connectivity is excellent in that the design team surveyed existing vegetation and made all efforts to maintain it while determining their channel alignment. There is some concern that filling relic channels could reduce floodplain complexity and the potential for off-channel and backwater habitat.</p>	<p>Will call out restoration priorities on plan set. Filling of relic channel is only recommended at locations where the risk of avulsion is present.</p>
State TA Team	<p>Integration with upstream and downstream reaches: Restoration seeks to address the reaches with the greatest impact on the County roads (Wagonwheel Gap primarily). Without a complete Creek Master Plan it is unknown whether upstream or downstream tie in points should be extended.</p>	<p>Will clarify in the design memo. The upstream tie-in point is at the mouth of the canyon, downstream of Anne-U-White. The downstream tie-in point is just upstream of where the valley narrows, which provides a good tie-in point.</p>
State TA Team	<p>Integration with adjacent infrastructure projects: The project responds to the road realignment and culvert designs for Wagon Wheel Gap Road. The design integrates the constraints and opportunities presented by the reconstruction of Wagonwheel Gap Road.</p>	<p>N/A</p>
State TA Team	<p>Additional Comments on Risk and Resiliency: The road corridor's encroachment on the channel floodplain will put it at permanent risk. The long culvert at the bottom of reach 9 may be difficult to maintain (interior access difficult/costly) and plugged culverts often cause channel avulsions and put infrastructure at risk - in particular the properties at 388 Wagonwheel Gap Road, 67 Wagonwheel Gap Road, and 1073 Lee Hill Drive might become susceptible if an avulsion occurs and properties upstream may be susceptible if sediment is unable to move beyond the culvert inlet.</p>	<p>This is area is narrow passage between two hills on both sides. The culvert proposed at this location will handle the 100-year storm event with no more than 12 inches of overtopping on the road. This crossing will be evaluated during the final design phase for alternative crossing.</p>

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State TA Team	<p>Cost Effectiveness: Review of the preliminary cost estimate provided by the engineer did not turn up any red flags and most reaches have a reasonable per linear foot cost, although some reaches are high considering they are rural reaches with no adjacent assets that require protection - for these reaches reduction of in-channel structures and engineered bank work may be possible to attain cost savings. Additionally, the plan set indicates that repair work is recommended for every foot of river within the project boundaries. In consideration that parts of the river may already be recovering on their own we suggest a review of each reach that could tie desired design elements into existing, functional features in order to lower overall construction costs.</p>	<p>Areas of high unit costs are because of additional structures required to protect infrastructure/homes directly adjacent to the stream. Reaches with high cost are at the upstream end of the project and in the area of two potential buyouts. We will be providing an alternative channel alignment in this location that assume these homes will be bought out which will require less structure and cost less. Wholesale stream restoration is not recommended for the entire project length. Several sections will be restored by only excavating pools and revegetating.</p>
State TA Team	<p>Innovative and creative aspects that could be applied in other projects: We appreciate the consultant's response to natural re-vegetation that has occurred on site and designing around existing vegetation when possible to save costs as well as to acknowledge and access that this vegetation is likely to have a more rapid impact on channel stability and ecology. To the greatest extent possible, all designs should adopt this approach of designing around the parts of the system that have naturally adjusted and are trending toward recovery on their own.</p>	N/A
POS	<p>I just had a good discussion with Al Hardy, our Recreation and Facilities Manager that came to the public meeting on WWG Road a couple of weeks ago. We do have one recommended change we'd like to see in future WWG Road plans—please leave adequate space and slopes for a five-car parking lot at the very end of Pinto (7+60 to 8+00 or so on the uphill side)... This would allow us to open the trailhead once the road construction project is completed. And, that would replicate our parking capacity for the site pre-flood.</p> <p>If the home buyouts at the top of Pinto do happen at some point in the near future, POS will undertake a public process to determine an appropriate use and design of potential trailhead expansion into the buyout areas.</p> <p>We'd also ask that both the future road and creek designs not preclude our ability to expand parking into the buyout lots should they occur and if our process supports such an expansion.</p>	<p>We will be providing an alternative channel alignment in this location that assume these homes will be bought out. Pinto Drive reconstruction will restore the prior flood parking area at the end of the road. The 30% design shows the proposed road fill in this area is approximately 1.5 to 7 feet from sta. 5+50 to 8+00, see sheet 47 for profile view.</p>
Resident- 778 Wagonwheel	<p>There is a area right behind my house designated for gravel sourcing. As this is in an area that I have already paid to have restored I am concerned about the specific intent of such a designation.</p>	Will incorporate.
Resident- 778 Wagonwheel	<p>The cost estimates seem high. I paid to have my property cleared and restored for about \$8000. I had been quoted about \$12,000 to restore it to "artistic" condition. My property is about 1/2 the entire reach yet your estimate is closer to \$60,000 for the reach. Seems pretty high.</p>	Cost for stream restoration work is typically different than for conventional landscaping work.
Resident- 778 Wagonwheel	<p>The road plan details are hard (for me)to interpret. I cannot accurately identify where some structures are placed.</p>	<p>At the public meeting on October 20, 2015 we were able to speak with this homeowners and I hope at that meeting some of these structures were explained to him. If needed, the project manager will contact this homeowner.</p>
Resident- 778 Wagonwheel	<p>I see considerable money estimated for vegetation plantings. But I see none for soil amendmets or replacement. Most of the soil in the flood path is sterile sand and rock. We have a few hardy weeds emerging but I feel that this part could be a total failure. We have already quoted having natural grasses restored to our property at a quote of \$7000 -\$12,000 that would include soil preparation.</p>	Soil amendmets are included in costs.
Resident- 778 Wagonwheel	<p>I was concerned about the "pools" designed into the creek path. This creek was often dry in the late summer and low in early summer. I do not believe that we need mosquito breeding ponds purposely designed in.</p>	Pools won't cause more standing water than exists today, or prior to the flood.

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Resident- 778 Wagonwheel	Also logs seem to be designed into the plan. If one thing we learned during the flood was logs anywhere in the creekpath became battering rams and flow blockage. I believe they would be a bad long term idea.	We aren't recommending "placing" logs in stream. They will be anchored.
Resident- 778 Wagonwheel	I am concerned about just what will be the plan for existing trees in the floodplain. I see them located but I did not see which would be removed as part of this plan. We have already lost many and have more to remove. Who decides which must go and what access is needed for their removal.	Disturbance to trees will be minimized to the maximum extent possible during construction. Some trees will need to be removed. When this occurs the trees will either be transplanted or recycled for use with the in-stream structures shown on the plans.
Resident- 778 Wagonwheel	Accuracy of the plan. I have constructed a permitted patio with flood protection wall behind my house, yet it is not shown on the plan. I also was prepared to restore the landscaping adjacent to it but now am hesitating as I am uncertain what heavy equipment may be driving up and down the creek. Just how flexible is this plan going forward? Do I have a conflict with my restoration verses the plan?	Will protect. Will update plan and note to protect.
POS	First, we know that there are Transportation schedules you need to adhere to, however, it seems like it would be great if the upper 500 feet of the creek project (and Pinto Dr.) could wait until the buyouts are complete. If the County ends up with those lots, that could really open up some nice design possibilities for that area.	Agree. Will provide alternative channel alignment (see comment above).
POS	The road and creek designs around 103+00 don't seem to respond or align with each other.	Agree. Will provide alternative channel alignment (see comment above).
POS	Finally, is there anything we should know or being doing to prepare for the 100+00 transition on our property upstream?	No - the upstream extents of the stream restoration project will tie into existing conditions.
Enginuity	The grading between Station 103+00 and 104+00 and between 140+00 to 141+00 look dangerously close to the roadway embankment. Please double check these locations.	Agree for STA 103+00 and 104+00 - Will provide alternative channel alignment (see comment above). For STA 140+00 to 141+00 - will revise channel alignment and/or coordinate with road improvements to minimize impacts.
Enginuity	The grading upstream of the culvert at Station 163+00 needs to be double checked.	Will incorporate into the roadway plans.
Enginuity	Aside from our two comments, the drawings appear to be consistent with the recommendations from local master plans and also for stream restorative measures typical for this type of environment. We appreciate the opportunity to provide comments and are happy to be working with Boulder County's Transportation Department and their consultants during this important time of re-construction. Please let us know if you have any questions.	N/A
Transportation	What portions of the creek will need to be constructed with the road?	The portions of the creek that will be constructed as part of the road have been labeled on the plans.