ATTACHMENT 5

TRINITY RIVER RESTORATION PROGRAM

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MEMORANDUM

TO: ROBIN SCHROCK
FROM: ANDREAS KRAUSE, DAVE GAEUMAN
CC: FLOW WORKGROUP, PHYSICAL WORKGROUP
SUBJECT: **COMMENTS ON PROPOSED WY13 FLOW RELEASE SCHEDULE**
DATE: 4/1/13

This memorandum provides comments and cautions on the newly proposed consensus flow release alternative developed at the March 28, 2013 flow workgroup meeting. Development of the consensus alternative did not follow the current process for proposing flow release alternatives. As such, the consensus alternative lacks input from program scientists who are not part of the flow workgroup. This memorandum provides such input. No supporting analysis for the consensus alternative has been provided. In our judgment, the proposed consensus alternative does not meet the geomorphic objectives for a dry water year stated in the 1999 Trinity River Flow Evaluation Report. Given that lack of analytical support for the consensus alternative and the inability to meet dry year geomorphic objectives, we recommend the default of implementing the ROD dry year hydrograph. We have no objections to adjustments to the rising and falling limbs of the hydrograph, provided the 5-day peak of 4,500 cfs specified in the ROD remains intact.

BACKGROUND:

On March 28, 2013, the flow workgroup met to discuss flow release schedules for WY13. In addition to the ROD recommended releases, two additional alternative flow schedules (DRYALT-1 and DRY ALT-2) had been jointly proposed by a several program scientists including geomorphologists, fish biologists, and riparian ecologists. As per the current flow scheduling process, the rationale and supporting analysis for these two alternatives were written up and circulated prior to the flow workgroup meeting, allowing for review and comment by technical staff from across the restoration program. This memorandum refers to the DRY ALT-1 and DRYALT-2 alternatives as the "7,500 cfs peak alternatives".

During the flow workgroup meeting a new, previously unconsidered, alternative was developed that was materially different than the ROD recommended or the proposed 7,500 cfs peak alternatives. The new alternative reduced the ROD recommended dry year peak release of 4,500 cfs from 5 days to 2 days, a 60 percent reduction in duration. The water from the reduced high flow peak was utilized to modify the ROD Dry hydrograph to introduce a new 8-day bench release of 2,000 cfs prior to the high flow release. The stated purpose of the 2,000 cfs bench flow release is to provide improved rearing habitat conditions for the large population of fry and juveniles salmonids from the record setting spawner escapement this year. No geomorphic or biologic analysis was submitted or presented for this newly proposed alternative. The flow workgroup reached a consensus to recommend the new alternative for WY13. The Trinity Adaptive Management Working Group and Trinity Management Council are meeting on April 1 and 3 respectively to consider the WY13 flow release schedule.

COMMENTS ON THE PROPOSED CONSENSUS ALTERNATIVE:

Comments on the proposed consensus alternative address four primary concerns:

1) Misinterpretation of the significance of hysteresis in the bedload transport data;
2) Inability to meet stated geomorphic objectives for a dry year;
3) Incomplete evaluation of recommendations from Program physical scientists developed in light of observed physical river conditions.
4) Lack of analytical support for the consensus alternative

Misinterpretation of the significance of hysteresis in the bedload transport data:
The flow workgroup drew premature and inappropriate conclusions from sediment monitoring data (GMA, 2012) that were used to develop the consensus release alternative. Graham Matthews presented bedload transport data at the February Physical Workgroup meeting suggesting that recent flows are transporting less bedload sediment than in the past. The data also frequently show clockwise hysteresis in transport rates. Hysteresis means transport rates differ for the same flow magnitude on the rising and falling limb of the hydrograph.

A trend toward less bedload transport is expected, given that bed transport rates are dependent on channel geometry and the supply of all size classes of sediment. In particular, the transport rates of all size classes would be expected to decrease as the ROD objective to decrease the content of fine sediment in the bed (sand) is achieved. The significance of a decrease in gravel transport rates for program management can be interpreted in various ways. It could be interpreted in a positive light, e.g. watershed restoration and flow management efforts have been effective for reducing the sand supply, or the decreased rate of gravel export is preserving gravel storage in the upper river. Others may choose to see decreased transport in a negative way, e.g., fluvial process rates are inadequate. In that case one might conclude that the ROD recommended peak releases may need to be increased in magnitude and/or duration. These issues have yet to be resolved by program scientists and are the subject of on-going investigations.

Bedload hysteresis in Trinity River data has been a topic of discussion for several years (e.g., Gaeuman 2010). Hysteresis is often, but not always observed, at the Program's sediment monitoring transects and the degree of hysteresis varies. In any given year, there are locations along the river where little or no hysteresis occurs and a significant portion of the sediment load is transported late in the release hydrograph. It appears that many of those present at the March 28 Flow Workgroup meeting are under the mistaken impression that no significant transport occurs beyond the first day or two of the flow peak. This is an overly simplistic interpretation. Similarly, it is also incorrect to assume that declining transport rates at the sediment monitoring transects imply a lack of transport at other locations in the river.

A five-day duration of flows at or above 4,500 cfs is important to meet ROD geomorphic objectives. This is especially true in areas where recent rehabilitation actions have changed channel geometry and substrate characteristics. High rates of geomorphic adjustment and sediment transport should be expected at those locations, regardless of any trends at the monitoring transects. The ROD makes it clear that stimulating geomorphic adjustment is among the primary objectives for TRRP channel rehabilitation actions.

Inability to meet stated geomorphic objectives for a dry water year.
The ROD recommended hydrographs were developed to accommodate a variety of geomorphic and biological objectives. In particular, the high flow peak magnitude and duration were specifically developed to transport coarse sediment delivered by the tributaries with an emphasis on Rush Creek. The 1999 Trinity River Flow Evaluation Final Report states "The 5-day peak release during all water years except critically dry provides sufficient duration to transport coarse bed material originating from tributaries in most years." Table 8.8 states the geomorphic objectives for a dry year are:

1. Peak threshold: Mobilize D_{84} on bar flank features (median bars, pool tails)
2. Duration: Transport coarse sediment (>5/16 inch) through the mainstem at a rate equal to the tributary input downstream of Rush Creek.
3. Transport fine sediment (<5/16 inch) through the mainstem at a rate greater than tributary input (as measured at Lime Kiln Gulch gaging station).

Sediment monitoring (GMA, 2012) indicates that the flow releases are transporting less sediment than originally envisioned by the ROD. That means the original ROD recommended hydrographs are unlikely to meet geomorphic objectives 2 and 3. The proposed consensus alternative eliminates 3 of the 5 days of 4,500 cfs peak flows recommended by the ROD. This 60% reduction of peak flow duration will further decrease the total sediment transport and the ability to meet geomorphic objectives 2 and 3.

Rush Creek contributed significant amounts of sediment this year due to large storms in December. Those storms transported enough sediment to aggrade the delta by roughly 0.75 feet vertically. This level of tributary sediment input is more in line with a wet water year type. It is unlikely that a regular ROD Dry year release will be able recruit this volume of sediment to provide the coarse sediment supply needed for long-term habitat gains. The 1999 Trinity River Flow Evaluation Study acknowledged that the target of recruiting Rush Creek sediments in dry and wetter years may not always be possible. The 7,500 cfs peak alternatives offered this year recognized this and proposed to increase the peak flow magnitude to better recruit the sediment delivered by Rush Creek and provide a coarse sediment supply to the river. If the 7,500 peak alternative is not adopted, the long-term habitat gains associated with mobilization and recruitment of tributary sediments will be delayed until future high flow years.

Incomplete evaluation of recommendations by Program physical scientists developed in light of observed river physical conditions:
The majority of the Physical Workgroup members present at their February meeting agreed to propose a higher magnitude peak release for WY2013. This agreement came in light of the physical river conditions observed this year. The 7,500 cfs peak flow alternatives reflect this recommendation. The goal of the increased peak flow was to better meet the stated sediment transport objectives for a dry year, better recruit Rush Creek delta sediments to provide a coarse sediment supply to the river, flush sand and induce gravel sorting at the newly constructed Upper Junction City site[1], and improve the post construction habitat evaluation of the newly constructed Dark Gulch rehabilitation site. The rationale for the 7,500 cfs peak alternatives and accompanying analyses was documented and circulated for review per the current process set forth by the flow workgroup. In the middle of evaluating the merits of the 7,500 cfs alternatives the workgroup focus changed to formulating the new rearing habitat bench flow alternative. The

[1] The Flow Workgroup questioned this objective so additional information will be forthcoming in a separate document.

flow workgroup did not retrace its steps to compare the relative merits of the 7,500 cfs alternatives with the new rearing habitat bench alternative before adopting the new bench flow alternative as the consensus recommendation. A full evaluation of the 7,500 cfs peak flow alternatives was not completed during the workgroup meeting and these alternatives were neither accepted nor rejected by the flow workgroup.

Lack of Analytical Support for the Consensus Alternative
The new bench flow alternative was conceived, developed, and recommended during the meeting. No analyses of the geomorphic or biologic affects of the proposed consensus release were presented at the meeting. Neither is such analysis presented in the subsequent briefing document developed following the meeting. An attempt was made to utilize existing analyses developed for the ROD recommended and 7,500 cfs peak alternatives to justify the consensus alternative. However, the consensus alternative is materially different than the ROD recommended or the submitted 7,500 cfs peak alternatives (i.e. the consensus alternative reduces geomorphic effectiveness and introduces a new rearing habitat bench flow release). As previously discussed, the flow workgroup drew inappropriate conclusions from the sediment monitoring data that were used to justify the consensus recommendation. The consensus alternative fails to meet the stated geomorphic objectives for dry water year and risks perpetuating a flawed conceptual model that ROD geomorphic objectives can be accomplished by reducing peak flow duration without a corresponding increase in flow magnitude.

The consensus alternative introduces a new 2,000 cfs bench flow on the ascending limb of the ROD dry year flow releases to 'improve rearing habitat conditions'. However, no analysis justifying the bench flow magnitude or duration was presented at the meeting or in the subsequent briefing document from the flow workgroup. Figures 5.17 to 5.21 in the 1999 Trinity River Flow Evaluation Report seem to indicate that rearing habitat is minimal at flows ranging from roughly 500 to 2,500 cfs depending on species, life stage, and location. Additional analysis and deliberation is warranted to determine the optimum bench flow magnitude and duration to provide the improved rearing habitat conditions being sought.

Lastly, providing rearing habitat bench flows comes at the expense of achieving the geomorphic objectives recommended by the ROD that are intended to improve habitat over the long-term. This trade off may well be warranted this year due to the large fry and juvenile population anticipated from the record setting adult escapement. However, this trade off was inadequately assessed at the meeting due to inappropriate conclusions regarding sediment monitoring data. There is a lack of geomorphic and biological analyses to support the consensus flow alternative. Additional analysis and deliberation may determine that targeting optimal rearing habitat bench flows is more important this year than the long-term habitat gains from geomorphic peak flow releases. If this is the case, consideration should be given to foregoing the minimal amount of geomorphic work possible under the consensus alternative and dedicating the entire dry year water volume to rearing habitat bench flows this year. Doing so would add an additional 12 days of 2,000 cfs bench flow releases to the consensus alternative.

References

Gaeuman, D., 2010. Mechanics of bedload rating curve shifts and bedload hysteresis in the Trinity River, California. *Proceedings of the 9th Federal Interagency Sedimentation Conference*, June 27 – July 1, 2010, Las Vegas, NV.

Graham Matthews and Associates. 2012. *Trinity River WY2011 Sediment Transport Monitoring Final Report.* Weaverville, CA.