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Subject:	Review of On-Site Mitigation Hydrology Justification
Date:	Wednesday, September 14, 2016 1:18:33 PM
Attachments:	Appendix_D_hydrology-report_small.pdf

Hi Grace,

As we discussed over the phone on August 9, 2016, it is my understanding that the County is preparing a habitat restoration and management plan for impacts associated with the Devil's Gate Sediment Removal Plan. We are concerned that the proposed sediment removal will alter the hydrology in the reservoir in a manner that may impede restoration of riparian habitat outside the project footprint. I have reviewed the information provided by the County (Veronica Mardis) on April 20, 2016 (*Devil's Gate Sediment Removal and Management Plan On-Site Mitigation Hydrology Justification*, Justification) in support of establishing riparian vegetation on the west side of the reservoir (attached). This message is to request clarification regarding the information provided and to recommend that specific information is included as part of the restoration and management plan to ensure habitat created for the vireo will be viable over the long term.

1) The information provided in the Justification does not take into consideration the proposed increase in diversion of flows from the Arroyo Seco as part of the City of Pasadena's Arroyo Seco Canyon Project. The diversion project is currently undergoing review by the CDFW and Corps. The diversion will change the hydrology in Devil's Gate Reservoir by eliminating surface flows except during large storm events. It will also redistribute flows from the west side of the basin into the spreading basins located on the east side of the basin (away from the majority of proposed habitat restoration). While the diversion will increase the amount of water spread on the east side of the reservoir, the purpose of the project is to allow increased groundwater pumping by the City of Pasadena. How will this diversion affect the long-term viability of riparian habitat for the vireo, outside the proposed sediment removal project?

2) Information provided in Attachments 5 and 6 of the Justification compares groundwater elevations over time and at various sediment levels within the reservoir. What is the source of the data provided in these graphs? Monitoring wells located on the east side of the reservoir are depicted in Attachment 4 but it is not clear if these wells were used to generate the graphs in Attachments 5 and 6. Is it possible that wells located on the east side of the spreading basins record artificially high groundwater levels due to the adjacent City of Pasadena spreading basins that are located above the elevation of the reservoir? If so, these wells may not detect changes in groundwater levels compared to sediment levels in the Reservoir. It appears the spreading basins are regularly maintained so the elevation of adjacent groundwater should be fairly stable.

3) In Attachment 6, the graph displays reservoir capacity below 1054'; however, the spillway was lowered to 1040.5' in 1997. What is the source of the data? Does this graph include data prior to 1997 (i.e., when more water could be held)? What is the relevance of capacity above the spillway elevation?

4) Table 1 includes the number of days water is present "in the pool". What is the elevation of water when a day is counted as having water present in the pool? The number of days water is

present in the pool is affected by both inflows and reservoir capacity. What is the respective reservoir capacity (i.e., water/sediment) below the spillway for each water year displayed in the table? Given the known inflow, how many days would water have been in the pool (at the same elevation) with the proposed project in place?

5) Based on updated vegetation mapping completed by ECORP, the quality of habitat for the vireo has been declining over the last several years. Black willows are sensitive to long periods of inundation. How has the increased number of inundation days associated with reduced reservoir capacity affected the quality and extent of riparian vegetation within the reservoir? How will hydrological conditions change so that riparian vegetation will be supported in the proposed restoration areas?

5) In attachment 7, what is the relevance of the 2009 water capacity? How does this compare with the current condition?

6) According to the Justification, the greater reservoir capacity will result in more water permeating into the side slopes of the reservoir. What is the reduction in surface flows downstream from Devil's Gate Dam as a result of percolation into the basin bottom and side slopes upstream from Devil's Gate Dam? How will the reduction in flows affect habitat restoration completed downstream in Arroyo Seco?

7) Given the anticipated increase in percolation, how much additional groundwater pumping will be enabled by the proposed project? Does the County have authority over the amount of water that is pumped from surrounding wells? How will the additional groundwater pumping affect the availability of water for remaining habitat for the vireo in the reservoir?

8) Attachments 8 and 9 of the Justification compare a modeled 2-year event with an actual event in January 2008. In the modeled event, the peak inflow is 3691.7 cfs and in the actual event, the peak inflow is 5720.4 cfs. Clarify if the actual event is a 2 year or 5 year event. Both events anticipate flows reaching about 1040' elevation. Clarify if this elevation is reached as a result of water backing up behind the dam or if surface flows sufficient to cause scour and deposition of sediment will occur at this elevation. If no scouring flows are anticipated during a 5720.4 cfs event, what level of flows will be required to cause scour and deposition within the remaining riparian habitat, outside the permanent impact footprint?

9) Attachments 10 and 11 compare the 2009 topography with the proposed project. How does the proposed project compare with the current topography? The approved project (attachment 11) appears to include changes in topography west of the proposed project footprint. Was the modelling based on this topography? Is the additional grading (beyond the proposed project footprint) required? Are the grading limits for the proposed project based on current topography?

10) Attachment 12 compares the slope of the low flow channel over time with the proposed project. While the streambed elevation increased between 2009 and 2014, the slope appears to remain about the same. The proposed project will increase the slope substantially relative to the 2009/2014 slope. Will this cause a headcut upstream? How far upstream do you anticipate the headcut to extend as a result of increasing the gradient of the streambed? Does the proposed annual maintenance account for erosion of the bed and banks associated with the headcut?

11) Attachments 15 and 17 compare cross sectional profiles in 2009 and with the proposed project. While the 1040' elevation contours appear similar, there is substantially more capacity below 1020' elevation with the proposed project. We are concerned the increase in capacity and confinement of flows within the permanent impact footprint will decrease the frequency of surface flows reaching remaining habitat. Riparian vegetation suitable for vireo breeding, feeding and sheltering consists of a complex structure of understory, midstory and canopy vegetation that is maintained by natural processes. Restoration conducted in areas that will be isolated from natural processes will need to be managed in a way that not only provides adequate soil moisture but also maintains the structural diversity necessary to support the species. The management actions necessary to maintain habitat for the vireo over the long term should be included as part of the proposed habitat restoration and management plan.

We look forward to the opportunity to review the proposed habitat restoration plan. Should you have any questions regarding this message, please feel free to contact me.

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"I'd like to offer a plug for actually having the natural processes instead of having to simulate them."
— Nadav Nur, PRBO Conservation Science