

Comments on Hemphill Diversion Structure Design
California Department of Fish and Wildlife (CDFW)
11/30/2018

CDFW comments below are based on the October 2018 Geotechnical Engineering and Hydraulics Report for the Hemphill Diversion Structure (Hydraulics Report) report submitted by NV5 and the follow-up technical advisory group (TAG) meeting on October 23, 2018.

Nevada Irrigation District (NID) received a Proposition 1 Watershed Restoration Grant in 2017 for Phase 2 of the Hemphill Diversion Assessment. The purpose of this project was to complete additional studies to evaluate site conditions near the Hemphill Diversion structure to inform the planning process for possible removal of the diversion structure. The project scope of work included hydraulic analysis of the project-affected area which included various alternative configurations of the dam and diversion, a sediment transport study of the project-affected area, collection of baseline water quality data, and salmonid redd surveys in Auburn Ravine. Additionally, one of the project objectives was to form a TAG to aid in the planning process for developing alternatives for diversions at this site. At this time, CDFW comments are not submitted as a part of a formal environmental review process, but are intended as a part of the TAG to help guide NID's choices for developing alternatives that can both provide long-term water reliability for NID's customers at this location as well as reducing existing problems associated with fish passage and fish entrainment at this location.

CDFW expressed four primary concerns at the October 23 meeting with the design proposed in the Hydraulics Report:

1. Uncertainty around future erosional and depositional processes at this site location;
2. Compliance with fish screening criteria;
3. Presence of Chinook redds and juveniles salmonids in the area; and
4. Difficulty measuring fish protection performance and effectiveness of the cleaning system post-construction.

Each of these concerns are discussed in detail below:

1 - Future Sedimentation and Deposition near the Project Site

The Hydraulics Report does not contain a sediment transport model of the site. Although NV5 developed a detailed hydraulics model of the site, the report states that a sediment transport model has not been prepared for this preliminary design effort. Therefore, the post-project site conditions have been calculated by performing five different calculations to determine the eventual stable slope of Auburn Ravine. Although this seems a reasonable approach to begin with, a true sediment transport modeling effort that extends further upstream and downstream will give us more information about what the steady-state depth of erosional sediments will be after the dam removal effort and will help characterize uncertainty around future conditions at this location.

The bed and banks of the Auburn Ravine are highly dynamic, and we expect that both erosion and/or deposition could be problematic at this site. The Hydraulics Report authors acknowledge this same concern stating that "It is unknown at this time to what extent channel and bank protection will be implemented in this reach." Erosional processes could be an issue using this current design because scour around the facility would likely reduce the diversion and fish protection effectiveness. Alternately, depositional processes have a high potential to clog the gravel, non-woven protective fabric, and diversion pipes of the infiltration gallery.

2 - Fish Protection

The CDFW's fish screen criteria are included in Appendix S of Volume One of the California Salmonid Stream Habitat Restoration Manual, which can be found at:

<https://nrm.dfg.ca.gov/FileHandler.ashx...>

The CDFW fish screen numeric criteria addresses conventional screen technology but does not cover infiltration galleries or experimental technology. For this reason, CDFW applies the current National Oceanic and Atmospheric Administration Fisheries' (NOAA Fisheries) Salmonid Passage Facility Design document.

The NOAA Fisheries Salmonid Passage Facility Design fish screening criteria specifically mentions fish protection in the design of infiltration galleries in the National Marine Fisheries Service Anadromous Salmonid Passage Facility Design document from July 2011. This document can be found online at: https://www.westcoast.fisheries.noaa.gov/.../fish_passage_des...

Section 12 of NOAA Fisheries' document explains that infiltration galleries are considered "experimental technology" and can/should be designed to meet the same level of protection as conventional fish screens, but that the risk of improperly siting these facilities is that "failure may occur that results in severe adverse habitat impacts and loss of habitat access in addition to the loss of the diversion." The following NOAA criteria for siting of infiltration galleries do not appear to be met for the current project proposal:

1. Infiltration galleries should not be installed at sites where natural sedimentation occurs that would plug a gallery. (Section 12.4)
2. The infiltration gallery must be designed to withdraw water primarily from the portion of the stream located directly above the infiltration gallery. (Section 12.5.1.1)
3. Infiltration galleries should not be operated when the water depth above the river bed over any part of the infiltration gallery is less than 0.5 feet. (Section 12.5.1.2)
4. The maximum vertical interstitial velocity through the substrate, V_s , must not exceed 0.05 ft/s when the substrate is new and/or after backwashing. (Section 12.5.1.6)
5. Infiltration galleries should not be constructed in areas where spawning may occur. Should spawning occur within 10 feet of a portion of an infiltration gallery, then use of those portions of the infiltration galleries within 10 feet of the redd should be discontinued for 90 days, or as directed by NMFS. (Section 12.5.1.9)

Section 5.F of CDFW's fish screen criteria addresses variances to standard screen construction: Written variances to these criteria may be granted with the approval of the appropriate Regional Manager and concurrence from both the Deputy Director, Habitat Conservation Division and the Deputy Director, Wildlife and Inland Fisheries Division. At a minimum, the rationale for the variance must be described and justified in the request.

Evaluation and monitoring may be required as a condition of any variance, to ensure that the requested variance does not result in a reduced level of protection for the aquatic resources. It is the responsibility of the project sponsor to obtain the most current version of the appropriate fish screen criteria. Project sponsors should contact the Department of Fish and Game, the National Oceanic and Atmospheric Administration Fisheries (for projects in marine and anadromous waters) and the U.S. Fish and Wildlife Service (for projects in anadromous and fresh waters) for guidance.

3 - Presence of Redds and Juvenile Salmonids in the Project Area

Attached is a report documenting CDFW's survey results from 2012-2014 Chinook spawning surveys in Auburn Ravine. Additionally attached is a close-up map showing the locations where spawning was observed near Hemphill Dam. As discussed above, locating an infiltration gallery near salmonid spawning locations is specifically discussed in NOAA's fish screening criteria. On the map attached to these comments, two redd locations were noted in the pool tailout downstream of the dam. However, at this time without understanding the potential future gradient, morphology, and therefore habitat type of this location, we cannot clearly determine whether Chinook will continue to spawn in this same location. As discussed above in reference to NOAA's fish screening criteria, construction of an infiltration gallery at

this site has a high potential for operations to be discontinued for up to 90 days if spawning occurs within 10 feet of the redd (NMFS 2011).

4 - Diversion Effectiveness

Permeable infiltration galleries are considered experimental technology by NOAA fisheries because they are “prone to become ineffective due to plugging by sediments.” Because the site is in a stream with highly mobile bed and banks, and the post-dam-removal topography is unknown at this stage, the amount of erosion around the facility, sedimentation volume, and cleaning system effectiveness are all very difficult to forecast at this time.

NOAA Fisheries’ criteria (12.5.1.7) states that an infiltration gallery should be backwashed using air or water when head loss measurements indicated that the average vertical interstitial velocity through the gravel is equal to or greater than 0.10 ft/second. However, to make this determination, one would need to calculate the effective porosity of the gravel substrate after some amount of time. To do this, NID would need to conduct regular hydraulic conductivity testing, or use multiple on site piezometers to determine head loss across the substrate. This regular testing would need to be written into an operation and maintenance plan.

Even with a well-calibrated sediment transport model, it would be difficult to know how much erosion/deposition would impact this facility each year. NOAA Fisheries’ operations and maintenance responsibilities (Section 14) state that “This includes immediate restoration of the passage facility (including repair of damage and sediment/gravel removal) after flooding, and prior to the arrival of migratory fish.” The uncertainty around the impact these natural processes could have on this facility could mean: 1) that NID would potentially be unable to divert to their full capacity at this facility, and 2) that if the facility is not functioning properly, NID may need to do immediate restoration of the site. As stated in the TAG meeting on October 23, CDFW supports NID’s efforts to find an alternative that would resolve the fish passage problem at the diversion site. Given the uncertainties surrounding the current design, CDFW recommends considering more traditional fish-screening alternatives that may be less costly in the long-run when considering operation, maintenance, and potential for remediation if the system does not perform as expected. CDFW staff welcome the opportunity to discuss this and other solutions that can effectively divert water and protect fisheries resources at the Hemphill site.