



COLLEGE OF ENGINEERING

IIHR—Hydrosience & Engineering

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December 5, 2012

Mr. Bill Holman
Stanley Consultants, Inc.
Minneapolis, MN

Re: Lake Delhi Dam Fish Passage

Dear Mr. Holman:

As per your request, I am providing my professional opinion regarding upstream fish passage at Lake Delhi Dam. My expertise in this subject matter has been developed during my 20-year career as a hydraulic engineer, with special emphasis on fish passage facility design and assessment. More specifically, I have been involved in fish passage facility design for anadromous salmonid fisheries in the Pacific Northwest that have resulted in successful constructed passage facilities at Wanapum, Priest Rapids, Rocky Reach, Rock Island, Lower Granite, and McNary, amongst other dams in the Northwest region. Additionally, I have also been involved in warm water fish passage design assessments in the Mississippi River Basin, including projects on the Des Moines, Wisconsin, Platte, Kaskaskia, and Mississippi Rivers. Lastly, I have provided fish passage and science-based adaptive management expertise to the US Army Corps of Engineers (Corps), Upper Mississippi River Basin – Navigation and Ecosystem Sustainability Program (NESP) as a participant on their Science Panel, charged to guide the Corps on adaptive ecosystem management.

Based on my experiences, and independent review of the literature regarding fish passage, I am not aware of any existing, successful warm water fish passage facilities, with project heights exceeding 20 vertical feet, operating in the Mississippi River Basin. I believe the lack of a single successful facility exceeding 20 vertical feet or higher is indicative of the lack of biological or engineering design data for such a facility. The following information highlights the importance of appropriate design data for fish passage facilities.

During the past two decades it has become increasingly better understood that fish make migratory movement decisions based on foraging, spawning, water quality, temperature, over-wintering habitat, abundance and/or stream carrying capacity triggers. Additionally, biologists have an increased understanding that fish make local movement decisions based on fluid and environmental queues present within the sensory ovoid of the fish. The linkage between local swim path selection and sensory triggers has been particularly important for the design of fish passage facilities, as biologically unacceptable flow or water quality conditions at any location with a bypass facility may result in failure of the system to pass fish. More explicitly, these can be summarized as follows for bypass systems that do not occupy the entire width of a stream or small river:



1. Will the desired (target) species find the bypass entrance? This is particularly important for bypass systems that connect to a stream or river downstream of hydraulic structures containing multiple flow release paths (turbines, spillway gates, weirs, etc.) that may result in complex, or changing flow patterns near the passage entrance.
2. If the target species are able to locate the entrance, will the fish enter the structure? Acceptance of the flow conditions at the entrance is dependent on species acceptance of depth, velocity, and acceleration conditions. These conditions will depend on the overall flow patterns in the river; width and depth of flow from the bypass; total bypass discharge; bypass discharge per unit width; and use of supplement attraction flow at the bypass entrance, amongst other parameters.
3. If the target species accept the entrance conditions, will they pass through the structure? This is dependent on species swimming strength, desire to move upstream, slope of structure, specific pool-riffle design, local flow conditions, and water temperature.
4. If the target species pass through the structure, will their passage result in an increase of species diversity or abundance? This will depend on habitat conditions upstream as well as the system's biological carrying capacity, both upstream and downstream.

In my opinion, adequate biological data does not exist to design an upstream fish passage at Lake Delhi Dam (or for any project site that exceeds about 10 vertical feet across the project), and hence, the risk of failure of a full implantation of a fish passage facility far exceeds the potential benefits. It is also, my opinion that requisite biological data could be developed through research and prototype facility testing at the Lake Delhi Dam site, which would be beneficial to this project, and other potential projects in the Upper Mississippi River Basin. Such a research project would require significant fiscal and technical support over several years, and would be beyond the responsibility of the Lake Delhi District who manages the Dam, but rather could be supported by the US Fish and Wildlife Service, US Army Corps of Engineers, Iowa Department of Natural Resources and others.

If you have any questions, or would like additional information, please do not hesitate to contact me.

Sincerely,



Larry J. Weber

Director, IIHR – Hydrosience and Engineering