



COLLEGE OF ENGINEERING
IIHR—Hydrosience & Engineering
100 C. Maxwell Stanley Hydraulics Laboratory
Iowa City, Iowa 52242-1585 USA
319-335-5237 Fax 319-335-5238

March 19, 2019

MEMORANDUM

TO: Tony Trotter, City Engineer, City of Fort Dodge

FROM: Dan Gilles, Water Resources Engineer, Iowa Flood Center, IIHR – Hydrosience & Engineering

COPY TO: Nathan Young, Research Engineer, (IFC, IIHR)

SUBJECT: Downstream flood impacts of Fort Dodge low head dams

Dear Mr. Trotter,

Removal of the former Hydroelectric Dam and what is known as the “Little” Dam located in Fort Dodge will have a negligible effect on flood storage and impacts downstream. Low head dams located on Iowa Rivers typically provide water level control for a variety of purposes – water intake structures, recreation, or in this case, hydro-power. Low head dams typically operate as “run-of-the-river” dams, meaning the natural river flow rate is essentially unaltered. Modifying river flow rates for flood control requires relatively large storage volumes. Reservoirs on major Iowa Rivers that have sufficient storage to provide flood control are those managed by U.S. Army Corps of Engineers – Saylorville, Red Rock, and Coralville.

Using measurements of the river bed elevations collected by the Iowa Flood Center (IFC) in July 2014, we estimated the maximum storage below the dam crests if the river were completely dry. The total volumes pooled at the spillway crest by the Hydroelectric and Little Dams in Fort Dodge are 585 acre-feet and 161 acre-feet, respectively. The unit of acre-feet is the volume of 1 acre filled to 1 foot of depth. The spatial extent of the pooling is shown in Figure 1. The pooled volume below the spillway crest cannot be utilized for flood storage because it was filled with water or sediment after construction was completed.

The National Inventory of Dams lists estimates for maximum storage (including surcharge) provided by the Fort Dodge Hydroelectric and Little Dams as 2,525 acre-feet and 338 acre-feet, respectively. Subtracting the previously discussed pooled volume from the maximum storage volume leaves 1,940 acre-feet of flood storage provided by the Hydroelectric Dam, and 177 acre-feet of flood storage provided by the Little Dam. The storage provided by the Hydroelectric Dam and the Little Dam are relatively small in comparison to the Des Moines River drainage area of 4,190 square miles at Fort



Dodge. For comparison, the drainage area to Saylorville Reservoir is 5,841 square miles and it provides a total of 641,000 acre-feet of storage for flood control. In order to significantly affect the flood peak flow rate below Fort Dodge, storage must be kept empty until the peak of the flooding event, which is not possible with low head, "run-of-the-river" dams.

The approximate Des Moines River flow rate on March 19, 2019 at the Fort Dodge U.S. Geological Survey (USGS) Station 05480500 is 25,000 cubic feet per second (cfs). At this flow rate, if the total flood storage were kept empty until now, the storage provided by the Hydroelectric Dam would be filled in less than 1 hour. The flood storage provided by the Little Dam would be filled in 5 minutes. A comparison of maximum flood storage volumes with the relative river flow volumes over different time periods is shown in Figure 2. In reality, the majority of flood storage volume provided by low head dams are filled well before arrival of the flood peak, having negligible effect on the peak flow rate downstream.

We are happy to provide additional explanation or answer any questions you might have. Feel free to email or call at 319-353-0216.

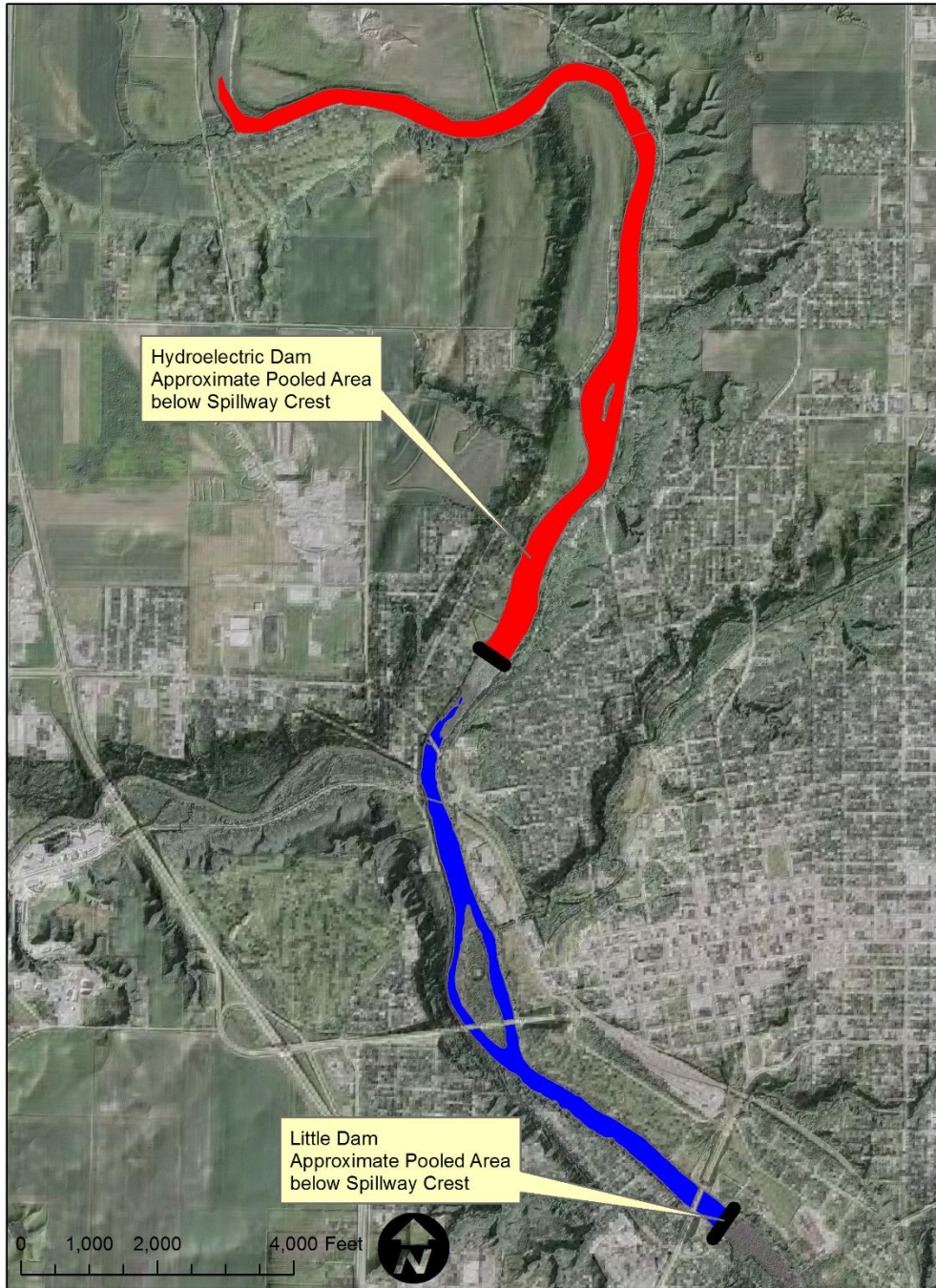


Figure 1. Approximate extent of pool provided by each low head dam spillway crest in Fort Dodge, Iowa.

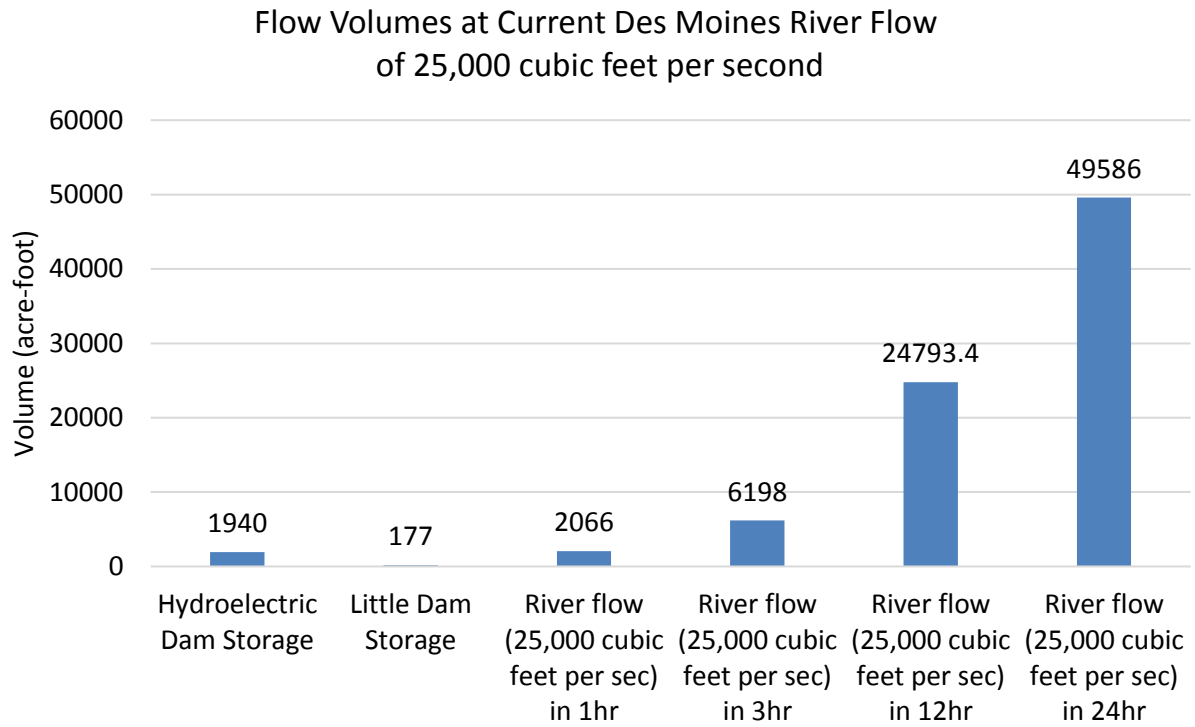


Figure 2. Comparison of maximum flood storage available with river flow volumes at the current Des Moines River flow rate of 25,000 cubic feet per second