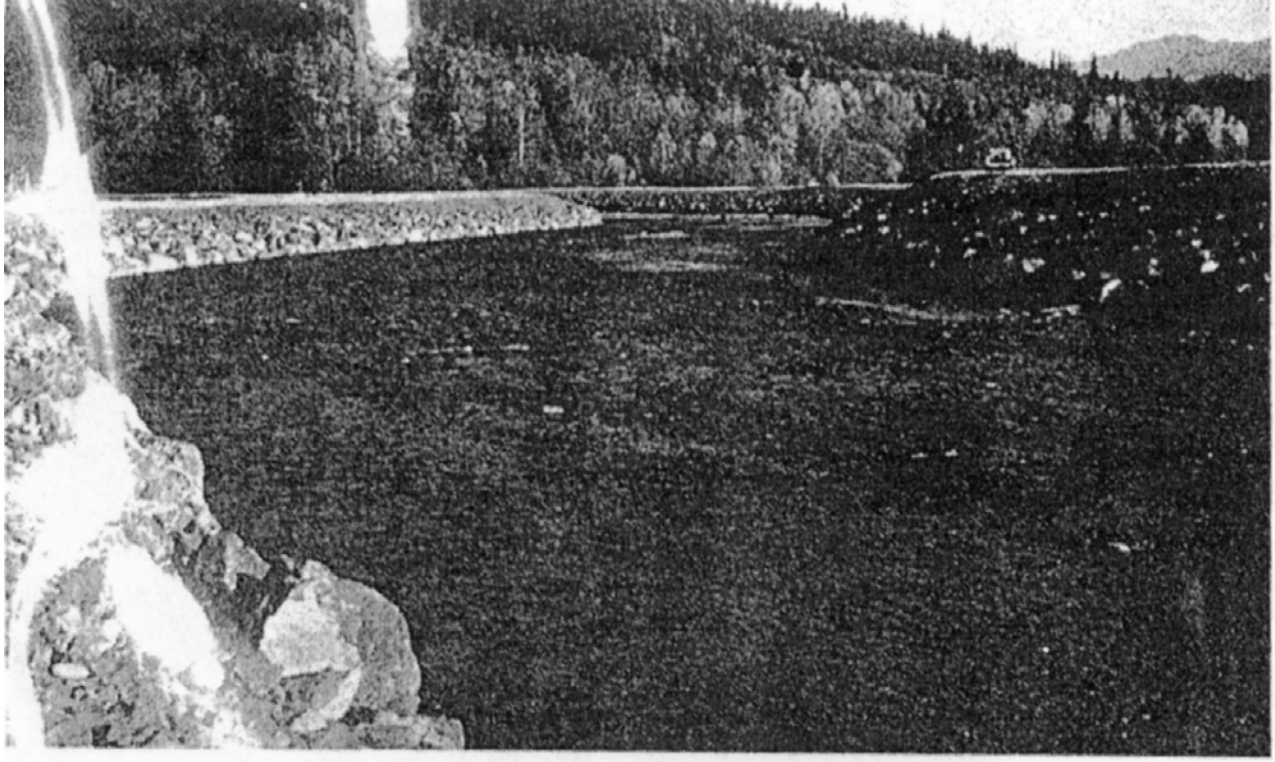


RAGING RIVER
After It Was Tamed

How King County Controlled

Raging River

By HARRY H. SISLER
Road Engineer for King County, Wash.

LOCATED in the eastern part of King County, Wash., and tributary to the Snoqualmie River, Raging River has been one of the greatest sources of worry for county officials for the past 25 years. This stream, receiving the drainage of a watershed 35 sq. mis. in area, rises in the territory above Preston. At times this watershed has considerable snow fall, which, melting with the warm winds and rain, causes a very flashy and quick run-off down the river.

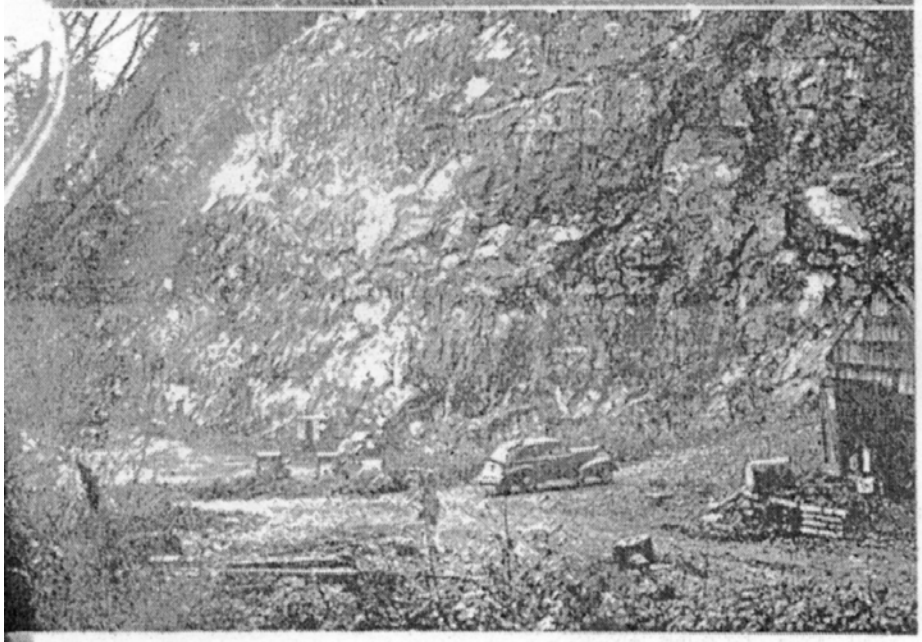
The upper gradient of the river is very steep, with a velocity of approximately 12 ft. per sec., causing this stream in its upper reaches to become a raging torrent during times of heavy run-off. Emerging from the mountainous section approximately 1½ miles southerly from the town of Fall City, it takes a winding course over a wide stretch of delta. It formerly went through what is now the town of Fall City, but its course was altered years ago in some respects, due to the development of the city itself.

GRAVEL DELTA—An immense quantity of gravel had been brought down stream by the high velocity of its water, causing a gravel delta to form in the lower reaches, in some places as great as 10'. For the people of Fall City have been apprehensive that the river would tend to seek its former channel and cause an immense amount of damage by flooding the town. For the past 20 years, residents of Fall City have continued to petition the Board of County Commissioners to undertake corrective measures on this stream to prevent a catastrophe, which would result from the flooding of the town. Their efforts were unsuccessful until the election of Mr. Tom Smith as Commissioner, who made this one of the important planks in his platform. Accordingly late in the Fall of 1937, Commissioner Smith instructed the County Engineer to take steps to correct the situation.

DESIGN—Pursuant to these instructions, surveys were made for the deepening, widening, and straightening of the lower 1½ miles of this stream and for the correction of the active slides in the upper waters, and plans were formulated for the construction work. In the design of the channel, the basic figure used was a run-off of 90 cu. ft. per sec. per sq. mi. This has been found to be substantially correct for the maximum flow of the streams in this area. Total maximum flow therefore, is 3280 cu. ft. per sec. Inasmuch as the main plan to be considered was to retard the velocity by construction of a wide channel, it was decided to provide a channel 110' wide and 6' deep at maximum flow in order to curtail the velocity to approximately 6' per sec. In the original plans, it was the intention to use a heavy brush protection for the slopes, with heavy wire cables holding it in place. This plan, however, was abandoned, and the banks were protected with heavy rock rip rap, which proved even more economical than the brush revetment. These plans were accordingly submitted to the Flood Control Engineer of the Department of Conservation and Development at Olympia and to the U.S. Army Engineer of this district for their approval, which was granted in March, 1938.

CONSTRUCTION—On approval of the plans by the State and Federal authorities, actual channel construction was begun on July 1st, 1938. Initial construction was handled by one 30-hp. Allis Chalmers tractor equipped with main line and haul back drums and a 1 cu. yd. bucket, operated by a crew consisting of one tractor operator, one hook tender, and two helpers. This crew operated from this time, at several locations along the river, until December 20, 1938, then resumed operations on March 22, 1939 and continued until April 17, 1939, at which time it was decided to discontinue. In August, 1938, a 1 cu. yd. Northwest gas shovel equipped with dragline bucket was rented and started operating at Station 24. This equipment operated intermittently until March, 1939.

At that time, it appeared advantageous for the County Engineer to assign a superintendent of construction to this project, in order to more closely correlate operations of the crews and to determine feasible equipment for use on the project. Accordingly, Mr. Ray Heath, a hydraulic engineer with considerable river experience was detailed to the project, and he



Typical Photos of Raging River Project

UPPER—Old channel, prior to start of project. Note typical erosion. CENTER—Obtaining 29,000 cu. yds. of rip rap from quarry. The shovel is a 1-yd. Northwest. LOWER—Trimming banks with "Caterpillar" D-8 and Isaacson bulldozer.

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proceeded to make a study of the operations and the equipment thus far used.

It was found that both the tractor and the 1-yd. shovel would not move sufficient dirt to be economically feasible. This equipment, therefore, was discarded in favor of a 60-hp. "Caterpillar" tractor and a 1½-yd. Bagley bucket, which started operating in March, 1939 and has been in continuous operation since.

PLAN OF OPERATION—The plan of operations for this project was to rough-grade the channel by dredging, and then to trim the toe of the banks and level the dikes by the use of a D-8 "Caterpillar" tractor equipped with an Isaacson hydraulic 'dozer. The approximate total amount of gravel which was taken from the river bed in the course of these channel operations was 125,000 cu. yds.

On March 8, 1939, the placing of the rock rip rap was commenced at the upstream end of the channel, being carried forward down stream as the rough-dredging proceeded. This rock was obtained from the Fall City quarry under a royalty agreement with owners of the property, and was produced in conjunction with the W.P.A. operations on the Snoqualmie River. The approximate cost of producing and placing rock on the banks of the channel was $1.25 per cu. yd. Due to the excessive velocity of the Raging River, it was necessary to place the rock in thick layers, especially on the outside banks of all curves. Heavy rock was used on the toe of the slopes, smaller rock filling the voids.

COSTS—With the exception of the W. P.A. crews used in the production of rock at the quarry, all work was performed by the County's north district river crews operating five 8-hour days per week. The entire cost was $50,975.86. On the basis of 7400 linear feet of channel correction, this would be $6.88 per foot.

Rough-dredging operations involved a total of 125,000 cubic yards, at a cost of 12½ cents per cubic yard.

There were 29,000 cubic yards of heavy rock used on this project at a cost of $1.25 per cubic yard in place.

PERSONNEL—In the design and construction of this work, the writer was in direct charge, acting under the instruction and orders of County Commissioner Tom Smith. Field Engineer was Mr. Ray Heath, and the County River Foreman was Mr. George Sullivan. It is largely through the efforts of this personnel and of the crews assigned to the work that the project was brought to a successful conclusion at such a very economical cost.