

SOME GEOLOGICAL FACTORS IN THE LOCATION AND CONSTRUCTION OF THE LAKE SPRINGFIELD DAM*

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Geology entered into the choice of location and the construction of the Lake Springfield dam at four separate stages in the development of the project. It was a factor in the selection of one of three valleys considered as possible reservoirs; it was one of the factors that determined the best site for a dam across the chosen valley; it had its place in guiding the design of the dam and spillway; and it was of prime importance in indicating the nearest sources of desirable material for the dam.

A surface water supply for the City of Springfield had been discussed for some years before the project was begun in 1928. The three valleys that were con-

sidered as potential reservoirs were the Sangamon, with a damsite at Peabody, five miles north and three miles east of Springfield; the South Fork, with a damsite west of Rochester, five miles east and three miles south of Springfield; and Sugar Creek, with a damsite about three miles south and three miles east of Springfield. Preliminary borings were made at all three locations.

The three sites were alike in that they are flat-bottomed valleys. The lower part of the valleywalls consists of bedrock belonging to the Pennsylvanian system, and the bedrock is covered by glacial drift mantled by weathered loess. The sites differed in that the bedrock is not the

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same at all three localities nor is the material comprising the valleybottoms the same.

In Sangamon valley, the valleybottom material is mainly sand and gravel, a fact already fairly well known; in South Fork valley it consists of as much as 40 feet of clay and sand in discontinuous lenses; and in Sugar Creek valley it consists of a downward succession of consistent layers of (1) black loam, 5 to 6 feet thick, (2) noncalcareous yellowish silt averaging 14 feet thick, (3) calcareous, bluish-gray silt averaging 18 feet thick, and (4) $\frac{1}{2}$ to $4\frac{1}{2}$ feet of gravel lying on sandstone bedrock. Along the east side of the valley the upper part of the bluish-gray silt is replaced by 8 to 10 feet of black clay and marl. The more favorable condition of the valleybottom in Sugar Creek valley was one of the factors that determined its eventual selection as the reservoir site.

After Sugar Creek valley had been chosen, it became necessary to ascertain the most favorable damsite. For this purpose numerous additional test-borings were made across the valley at possible sites for the principal dam and also at the low narrow divide between South Fork and Sugar Creek valleys, where another dam was required to complete the reservoir. Still more borings were made to ascertain the character of the material available for constructing the dams, especially that which would be excavated from the spillway for the main dam. These borings confirmed details about the valleybottom material and also revealed the character and the precise elevations of the bedrock at the various points in the valleybottom and in the valleywalls.

Outcrops and the borings showed the following succession of materials in the valleywalls at the main damsite:—(1) $\frac{1}{2}$ to $1\frac{1}{2}$ feet of loessial loam, (2) $1\frac{1}{2}$ to 15 feet of loess, (3) 2 to 16 feet of glacial

till, (4) an irregular bed of limestone, (5) calcareous shale with lenticular concretions, (6) coal up to $2\frac{1}{2}$ feet thick, (7) underclay up to $2\frac{1}{2}$ feet thick, (8) calcareous shale $1\frac{1}{2}$ to 4 feet thick with limestone lenses, and (9) shaly sandstone. The elevations of the coal bed indicated a slight northward dip of the beds. The coal, the underclay, and the underlying calcareous shale were not reported in all of the borings in which they would be expected. The test-borings at the site of the dividing dam showed a succession of soil, loess, till, and bedrock essentially the same as at the main damsite.

The data revealed by the test-borings not only served to determine the best position and alignment for the dams, but they also provided fundamental information for their design. The valleybottom material was satisfactory for a foundation so far as its bearing power was concerned, and so the only question of design was to make the base of the dam sufficiently wide to distribute its weight properly. Sheet piling was driven through the yellow silt to the bluish-gray silt at the main dam and to bedrock at the dividing dam to cut off subdam seepage. The spillway was designed to discharge its waters on the sandstone formation.

Samples from the borings made to ascertain the character of the source materials were carefully analyzed and on the basis of the results of analyses, selected material was excavated and combined in the dam in the approximate proportions that had been determined would be most stable.

Thus all the investigation and research necessary to insure the geological sufficiency of the damsites and the dam materials were undertaken. All other factors were similarly investigated and analyzed, and certainly in this respect the project was as complete and thorough as could be desired.