

KANSAS GEOLOGICAL SURVEY
OPEN-FILE REPORT 42-3

Geology of the Vicinity of a Proposed Damsite
Near Strawn, Coffey County, Kansas

by

John M. Jewett

Disclaimer

The Kansas Geological Survey does not guarantee this document to be free from errors or inaccuracies and disclaims any responsibility or liability for interpretations based on data used in the production of this document or decisions based thereon. This report is intended to make results of research available at the earliest possible data, but is not intended to constitute final or formal publications.

KANSAS GEOLOGICAL SURVEY
1930 Constant Avenue
University of Kansas
Lawrence, KS 66047

GEOLOGY OF THE VICINITY OF A PROPOSED DAMSITE NEAR STRAWN,
COFFEY COUNTY, KANSAS

John M. Jewett, State Geological Survey of Kansas

The axis for a proposed dam on Neosho River near Strawn extends from a point in the SW NW NW sec. 22, T. 20 S., R. 14 E., to a point in the SE SE SW sec. 29, T. 20 S., R. 14 E. The direction of the axis measured at the first point is approximately S. $43^{\circ} 30'$ W. The length of the axis is about 12,000 feet. The axis crosses Kansas highway 57 at a point which is approximately 2 miles north of Strawn and it crosses the M. K. and T. railway at a point which is approximately $1\frac{1}{2}$ miles northwest of Strawn. The location is shown on a map prepared by Mr. J. E. Shrock, Kansas State Board of Agriculture. Mr. Shrock's map shows also locations of test holes which were drilled, under my supervision, by the drilling crew of the State Highway Commission. The field work was done in July, 1942.

This report is based chiefly on data which were obtained through study of cores and cuttings from ten test holes drilled along the dam axis. The report is the result of a preliminary survey and is not intended to be a guide for designing a dam, but rather to be a report on the general geological conditions and as an aid in determining the feasibility of planning construction.

The trench of Neosho River in this part of Kansas is eroded in rocks of the Shawnee group of Pennsylvanian age. The bed rock is shale, limestone, and a minor amount of sandstone. The river's trench is approximately 2 miles wide and 120 feet deep. The lower approximate 45 feet is filled with alluvium, chiefly fine sand and clay but in part coarse flint gravel. From information

at hand it is believed that the deepest part of the stream valley is near its south wall. The river flows in a general southeastwardly direction. Its gradient is about 5 feet per mile (measured parallel to the valley walls and not along the actual channel which meanders rather broadly).

The uplands on each side of Neosho River are maturely dissected. Streams tributary to the river enter the larger stream at grade. Coarse flint gravels of probable Tertiary age partly cover the uplands to a depth of several feet. The uplands are largely covered with native blue stem grass but nearly all of the area of the river's flood plain is under cultivation.

Bed rock in the dam site

The rocks in which Neosho River has eroded its valley and which will form the abutments and floor of the dam are relatively impervious limestones, shales and a very minor amount of sandstone. Named in downward order these rocks include Calhoun shale, Ervine Creek limestone, Larsh-Mission Creek shale, Rock Bluff limestone, Oskaloosa shale, Avoca limestone, King Hill shale, and Beil limestone.

Structure of rocks.--The Pennsylvanian formations dip gently to the west. Because of slight variations in thicknesses of beds and because of differential movements that have affected the strata, dip is not uniform. That is to say that any one stratigraphic horizon is not a geometric plane but is a warped surface having slight deviations from a plane. The general dip of rock layers is, however, easily determined. In a triangular area bounded by the locations of test hole no. 1, test hole no. 3, and a point at the center of the south line of sec. 16, T. 20 S., R. 14 E. the dip of the upper surface of the Rock Bluff limestone (Deer Creek formation) is $2^{\circ} 4'$ feet per mile. The strike (direction normal to the dip) is north $2^{\circ} 30' 30''$ east.

Calhoun shale.--The lower part of the Calhoun shale and sandstone was drilled through in holes nos. 1 and 3. Hole no. 3 passes through a thickness of 23.30 feet, the upper 3 feet of which is fine grained sandstone. The remainder is fine-textured clay shale. In this vicinity the total thickness of the Calhoun formation is about 30 feet. It is overlain by the Topeka limestone.

Ervine Creek limestone.--This limestone is slightly more than 8 feet thick and it comprises rather soluble granular limestone largely of algal origin. In both holes 1 and 3 it was found to contain rather large solution cavities. It should be removed and sealed off for a distance of several feet in the south valley wall, but because it dips gently into the reservoir its cavernous condition should occasion no difficulty.

Larsh-Mission Creek shale.--The Larsh-Mission Creek shale is about 6 feet thick. The upper part is gray clay shale and the lower part is black, carbonaceous and fissile. Water passes readily along bedding planes in the fissile shale, but like the overlying limestone (ErvineCreek) it will offer no serious difficulty if properly sealed.

Rock Bluff limestone.--The Rock Bluff limestone is dark bluish gray, dense, and has a thickness slightly in excess of 2 feet.

Oskaloosa shale.--In this member of the Deer Creek formation are included dense clay shale, fine sandstone and a minor amount of limestone and calcareous shale. The limestone and calcareous shale occur in the middle part. The total thickness ranges from about 28 to 33 feet. Because of the sandstone included locally in its lower part, it should be sealed in the south valley wall in the vicinity of hole no. 4.

Ozawkie limestone.---The Ozawkie limestone is 5.7 feet thick in hole no. 1, and 5.5 feet in hole no. 4. It consists of rather fine-grained compact limestone. Fossil fusulines are abundant. It is deeply weathered in hole no. 2 but has not been affected by weathering in hole no. 1.

Tecumseh shale.---The Tecumseh shale is about 15 feet thick in this area. It is a water-tight clay shale.

Avoca limestone.---The Avoca limestone in this area consists of (1) an upper limestone, about $4\frac{1}{2}$ feet thick, (2) a shale, about $2\frac{1}{2}$ feet thick, (3) a limestone of about 2 feet, (4) a shale about 1 foot thick, and (4) a lower limestone about 1 foot thick. The limestones are relatively dense and hard and the shales are somewhat calcareous. None of the rock material has been affected here by solution.

King Hill shale.---This shale is present below the valley fill and, in my judgment, forms a suitable dam floor. Its total thickness is about 15 feet. The upper approximate one half is calcareous, containing thin zones of limestone, but the lower half is non-calcareous and quite water tight. It is believed that the lower part will constitute an excellent floor for a dam and that all of the calcareous shale in the upper part of the King Hill shale should be removed along the center line of the dam along the entire distance overlain by valley fill.

Beil limestone.---The Beil consists of about 5 feet of rather dense, gray, limestone, and about 2 feet of underlying calcareous shale and granular limestone and the overlying shale. It will serve as a firm foundation for a dam.

Alluvium in the damsite

Valley fill material ranging up to nearly 36 feet in thickness underlies the flood plain of Neosho River along the dam axis. It is understood, of course, that these weak, pervious materials must be removed along the axis of the dam. As shown in test holes nos. 7 and 9, about 12 feet of clay is present along the axis in the northern part of the site. From observing the topography, it is evident that this clay underlies an area of at least a square mile and hence is an excellent source of material from which the core of a dam can be constructed.

Reservoir site

Although I have not been furnished a map showing the complete area of the proposed reservoir site, I am of the opinion that the site is excellently chosen from both topographic and geologic viewpoints. The rock formations dip gently upstream and none of them have been made cavernous or otherwise pervious except well on the uplands. There is nothing to indicate any probability of important leakage in the reservoir.

Available materials for dam construction

As mentioned above, there is an abundant supply of impervious clay in the northern part of the reservoir site along the dam axis. This material is, in my opinion, entirely suitable for use in the core of an earth fill dam. The great abundance of other surficial material, principally sand, sandy clay and comparatively fine gravel is readily available for constructing the earth fill. Suitable limestone for riprap and rock fill can be obtained from quarry sites within less than one mile from the south end of the dam axis. There are extensive

deposits of relatively clean flint gravel, suitable for concrete aggregate, within one or two miles distance from the south end of the axis.

Logs of test holes

Test hole no. 1. Elevation 1109.2 feet.

	Thickness, feet	Depth, feet
<u>soil</u> , black	2.50	2.50
<u>clay</u> , buff to gray	1.50	4.00
<u>gravel</u> , flint fragments	4.30	8.30
Calhoun shale		
<u>shale</u> , light gray, hard	0.30	8.60
Deer Creek limestone		
Ervine Creek limestone		
Limestone, brown and gray, weathered, numerous soft pitted zones, abundance of algal remains	8.20	16.80
Larsh-Mission Creek shale		
Shale, buff and gray clay	2.50	19.30
Shale, black, fissile	0.40	19.70
Shale, dark gray to black	0.80	20.50
Rock Bluff limestone		
Limestone, dark bluish gray	2.70	23.20
Oskaloosa shale		
Shale, light gray, soft	9.80	33.00
Shale, greenish gray, hard	2.00	35.00
Shale, light gray	1.80	36.80
Limestone, light gray, hard	1.50	38.30

(Test hole no. 1 (continued))

	Thickness, feet	Depth, feet
Shale, light gray, calcareous	4.10	42.40
Shale, gray, calcareous	1.50	43.90
Shale, gray, slightly calcareous	2.30	46.20
Shale, gray	0.80	47.00
Shale, gray, hard	0.60	47.60
Shale, dark, gray.....	8.60	56.20
Ozawkie limestone		
Limestone, dove gray, dense, numerous fusu- linids.....	5.70	61.90
Tecumseh shale		
Shale, dark gray	14.70	76.60
Lecompton limestone		
Avoca limestone		
Limestone, light gray	4.30	80.90
Shale, gray	2.20	83.10
Limestone, gray, hard, fusulines	1.90	85.00
Shale, dark gray, hard	1.00	86.00
Limestone, gray, argillaceous	1.40	87.40
King Hill shale		
Shale, gray, hard	0.60	88.00
Shale, gray, calcareous, hard	5.40	93.40
Shale, dark gray	1.00	94.40
Shale, gray	7.50	101.90

Beil limestone

Limestone, brownish gray, sparse fusulines	4.80	106.70
Shale, gray, calcareous	0.20	106.90
Shale, gray, soft	0.40	107.30
Limestone, gray, crinoidal	0.30	107.60

Queen Hill shale

Shale, dark gray	0.40	108.00
------------------------	------	--------

Test hole no. 2. Elevation 1070.78 feet

	Thickness, feet	Depth, feet
Soil, black	3.10	3.10
Deer Creek limestone		
Oskaloosa shale		
Shale (weathered) light gray to buff.....	0.40	3.50
Shale (weathered) red and brown	8.50	12.00
Sandy clay (weathered sandy shale)	2.50	14.50
Clay (weathered shale)	4.80	19.30
Ozawkie limestone		
Calcareous clay (weathered limestone)	0.30	19.60
Shale, gray	0.30	19.90
Calcareous clay (weathered limestone)	1.60	21.50
Shale, buff, soft	1.00	22.50
Limestone, deeply weathered	0.50	23.00
Shale, gray	0.80	23.80
Limestone, hard	0.20	24.00
Tecumseh shale		
Shale, buff, weathered	7.20	31.20
Shale, gray and buff, slightly sandy	2.50	33.70

Test hole no. 2 (continued)	Thickness, feet	Depth, feet
Shale, gray and buff, slightly sandy, soft	3.50	37.20
Shale, dark gray	1.60	38.80
Lecompton limestone		
Avoca limestone		
Limestone, light gray	4.50	43.30
Shale, gray, hard	1.10	44.40
Calcareous shale	0.40	44.80
Shale, gray hard	0.30	45.10
Limestone, gray hard	1.30	46.40
Limestone, hard, with shale breaks	0.80	47.20
Shale, light gray in part, part dark	0.95	48.15
Limestone, shaly	1.35	49.50
Limestone and shale	0.30	49.80
King Hill shale		
Shale, calcareous	3.40	53.20
Shale, gray	4.00	57.20
Shale, gray, hard	6.60	63.80
Beil limestone		
Limestone, dark gray, dense to slightly		
granular	1.1	64.90
		T.D.

Test hole no. 3. Elevation 1100.27 feet.

	Thickness, feet	Depth, feet
Calhoun shale		
Sandstone, weathered, thin sandy soil at top	2.80	2.80
Sandstone, brown, hard	0.20	3.00
Shale, yellow and gray, clay	9.80	12.80
Shale, yellow and gray, clay	3.00	15.80
Shale, gray, clay	7.50	23.30
Deer Creek limestone		
Ervine Creek limestone		
Limestone, light gray, granular, cryptozoans, pitted by weathering in lower part	8.30	31.60
Larsh-Mission Creek shale		
Shale, dark gray, hard	3.60	35.20
Shale, black, fissile	1.90	37.10
Rock Bluff limestone		
Limestone, bluish-gray, sparse fusulines ...	1.60	38.70
Oskaloosa shale		
Shale, light gray, clay, calcareous zones	9.90	48.60
Shale, calcareous	2.30	50.90
Limestone, medium gray, lower part shaly	2.40	53.30
Limestone, gray shaly	0.90	54.20
Shale, gray, clay	14.40	68.60
Ozawkie limestone		
Limestone, gray, shaly	1.00	69.60
Limestone, gray, granular	3.00	72.60
		T.D.

Log of test hole no. 4. Elevation 1050.40 feet.

	Thickness, feet	Depth feet
Soil, black	1.40	1.40
Clay, yellow	1.60	3.00
Clay, yellow, and loose blocks of limestone	1.00	4.00
Deer Creek limestone		
Oskaloosa shale		
Sandstone, brown	1.10	5.10
Sandstone, brown, fine-grained, and some shale	0.90	6.00
Sandstone, brown, shaly	3.50	9.50
Sandstone, brown, fine grained	5.00	14.50
Shale, sandy	1.00	15.50
Shale, gray, clay .;.	2.20	17.70
Ozawkie limestone		
Limestone, brownish gray, dense, sparse algal remains, abundant fusulines, especially in lower part	5.50	23.20
Tecumseh shale		
Shale, dark gray, clay	15.10	38.30
Lecompton limestone		
Avoca limestone		
Limestone, brownish gray in upper part, dove gray in lower part, sparse fusulines	4.20	42.50
Shale, dove gray, clay	1.20	43.70
Limestone, gray, dense, fusulines	1.70	45.40
Shale, gray	1.00	46.40
Limestone, gray, dense to granular	0.50	46.90

Test hole no. 4 (continued)

King Hill shale

Shale, gray, calcareous	7.50	54.40
Shale, gray, clay	5.00	59.40

Beil limestone

Limestone, gray, hard	0.30	59.70
		T.D.

Log of test hole no. 5. Elevation 1046.00 feet.

	Thickness, feet	Depth, feet
Alluvium		
Soil, black	2.40	2.40
Soil, black, slightly sandy	0.50	2.90
Sand, brown, some clay in upper part	10.00	12.90
Sand, brown	5.30	18.20
Gravel, flint fragments	3.10	21.30
Tecumseh shale		
Shale, gray, clay	2.70	24.00
Lecompton limestone		
Avoca limestone		
Limestone, dove gray, granular, numerous fossil fragments	4.00	28.00
Shale, gray	0.90	28.90
Limestone	0.10	29.00
Shale, gray	0.60	29.60
Limestone, gray, granular	1.80	31.40
Shale, calcareous	1.50	32.90
Limestone, gray, soft in upper part, hard in lower part	1.50	34.40

Test hole no. 5 (continued)

King Hill shale

Shale, gray, hard, calcareous	0.4	34.60
		T.D.

Log of test hole no. 6. Elevation 1050.38 feet.

	Thickness, feet,	Depth, feet.
Alluvium		
Soil, black	2.50	2.50
Soil, black, sandy	0.50	3.00
Clay, sandy	1.50	4.50
Sand	2.00	6.50
Sand and clay, coarser sand in lower part	3.50	10.00
Sand, medium coarse	3.00	13.00
Sand, medium fine, little flint gravel in lower part	10.00	23.00
Gravel, flint fragments	2.50	25.50
Lecompton limestone		
Avoca limestone		
Limestone, dove gray, dense, cryptozoans in upper part, sparse fusulines in lower part	4.10	29.60
Shale, gray	1.30	30.90
Limestone	0.20	31.10
Shale	0.30	31.40
Limestone, gray	1.40	32.80
Limestone and shale	0.30	33.10
Shale, gray	1.50	34.60
Shale, calcareous	0.60	35.20
Limestone, brownish gray, granular	1.10	36.30

King Hill shale

Shale, light gray, calcareous	0.9	37.20
		T.D.

Test hole no. 7. Elevation 1054.8 feet

	Thickness, feet	Depth, feet
Alluvium		
Soil, black	2.20	2.20
Clay, buff	10.50	12.70
Clay, buff, with little gravel in basal part ...	10.00	22.70
Clay, slightly sandy	3.00	25.70
Sand, fine	3.80	29.50

Lecompton limestone

Avoca limestone

Limestone, light bluish gray, dense sparse algal remains	1.70	31.20
		T.D.

Test hole no. 8. Elevation 1040.90 feet

	Thickness, feet	Depth, feet
Alluvium		
Soil, black	1.00	1.00
Clay and gravel, slightly sandy	1.70	2.70
Clay and gravel, flint fragments in clay	5.20	7.90
Sand, small amount of gravel	4.80	12.70
Sand, fine	3.80	16.50

Lecompton limestone

Avoca limestone

Test hole no. 8 (continued)

Limestone	1.40	17.90
Shale, gray, clay	0.30	18.20
Limestone	0.10	18.30
Shale, gray clay	0.20	18.50
Limestone	0.20	18.70
Shale, green	1.40	20.10
Shale, calcareous	0.70	20.80
Limestone	0.60	21.40

King Hill shale

Shale, light gray, clay	1.60	23.00
Shale, calcareous	7.30	30.30
Shale, clay	5.20	35.50
Shale, calcareous	0.30	35.80

Beil limestone

Limestone	0.80	36.60
		T.D.

Test hole no. 9. Elevation 1057.87 feet.

	Thickness, feet	Depth, feet
Alluvium		
Soil, black	2.40	2.40
Clay, buff	5.30	7.70
Clay, reddish brown	14.70	22.40
Clay and sand	0.50	22.90
Sand, fine	6.00	28.90
Gravel and sand	4.10	33.00
Gravel, flint	0.90	33.90
Sand	0.80	34.70

Test hole no. 9 (continued)

Tecumseh shale		
Shale, broken	0.80	35.50
Lecompton limestone		
Avoca limestone		
Limestone, weathered, pitted	1.30	36.80
King Hill shale		
Shale, calcareous	6.10	42.90
Shale, clay	0.10	43.00
Shale, calcareous	1.30	44.30
Shale, clay	7.20	51.50
Beil limestone		
Limestone	0.20	51.70
		T.D.

Test hole no. 10. Elevation 1040.00 feet

	Thickness, feet	Depth, feet
Alluvium		
Soil and clay	2.90	2.90
Clay and fine silt	10.00	12.90
Clay, soft, slightly sandy	2.50	15.40
Clay, soft	5.90	21.30
Clay, bluish gray	4.90	27.20
Sand and gravel	6.70	32.90
Gravel	3.00	35.90
Lecompton limestone		
King Hill shale		

Test hole no. 10 (continued)

Shale, calcareous	7.00	42.90
Shale, clay	0.60	43.50
		T.D.

Cores of most of the limestone strata were taken and are filed in the storerooms of the State Geological Survey at Lawrence. They are available for inspection and further study as needed.

KGS
OF
42-3

August 26, 1942

Mr. George S. Knapp
Chief Engineer
Kansas State Board of Agriculture
Topeka, Kansas

Dear Mr. Knapp:

Herewith is a report on the geology of the vicinity of the proposed damsite on Neosho River near Strawn, Coffey County, Kansas.

My studies, as you know, included a visit to the damsite with Mr. Schrock, Kansas State Board of Agriculture, and Mr. Horned, Kansas State Highway Commission; and later I supervised the drilling of ten test holes along the proposed axis of the dam. The holes were drilled by the drilling crew and with the drilling equipment of the Highway Commission. Mr. Virgil Burket was in charge. Drilling was done during the period between July 15 and July 30, 1942. The stratigraphic files of the State Geological Survey include considerable data relative to rock formations in the vicinity. These have been useful in my study.

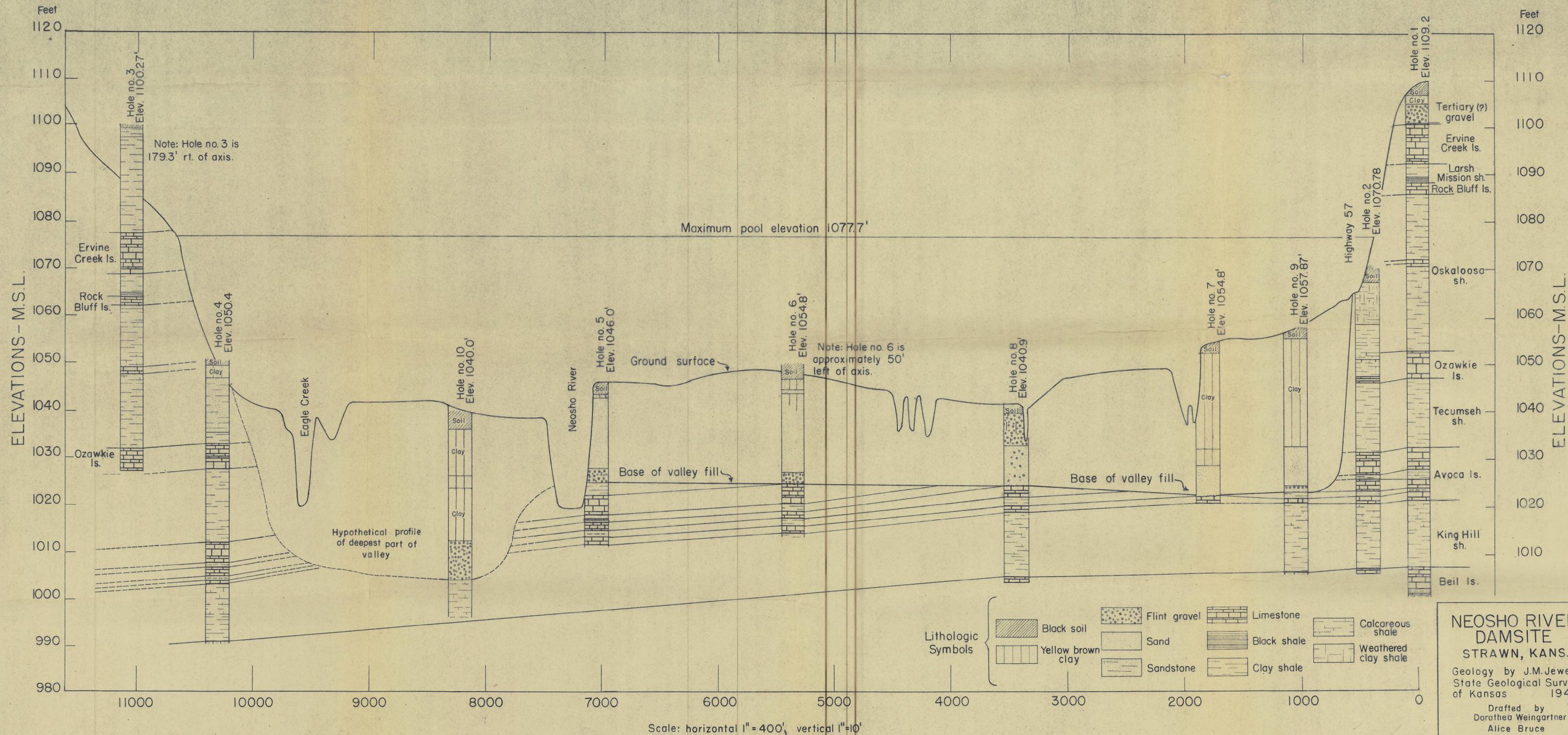
A copy of the plan and profile of the damsite with locations of drill holes was furnished me by Mr. Schrock. After studying the core and other sources of information, I prepared a drawing showing the nature of the bed rock and surficial material. This information is shown on a profile which I prepared from the data furnished by Mr. Schrock. A copy of my drawing accompanies this report.

Respectfully yours,

J. M. Jewett,
Geologist.

TEST HOLE DATA

SECTION THROUGH PROPOSED DAM AXIS



NEOSHO RIVER DAMSITE
STRAWN, KANS.
 Geology by J.M. Jewett
 State Geological Survey of Kansas 1942
 Drafted by Dorothea Weingartner
 Alice Bruce