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State of South Dakota  
M.Q. Sharpe, Governor  
STATE GEOLOGICAL SURVEY  
E.P. Rothrock, State Geologist

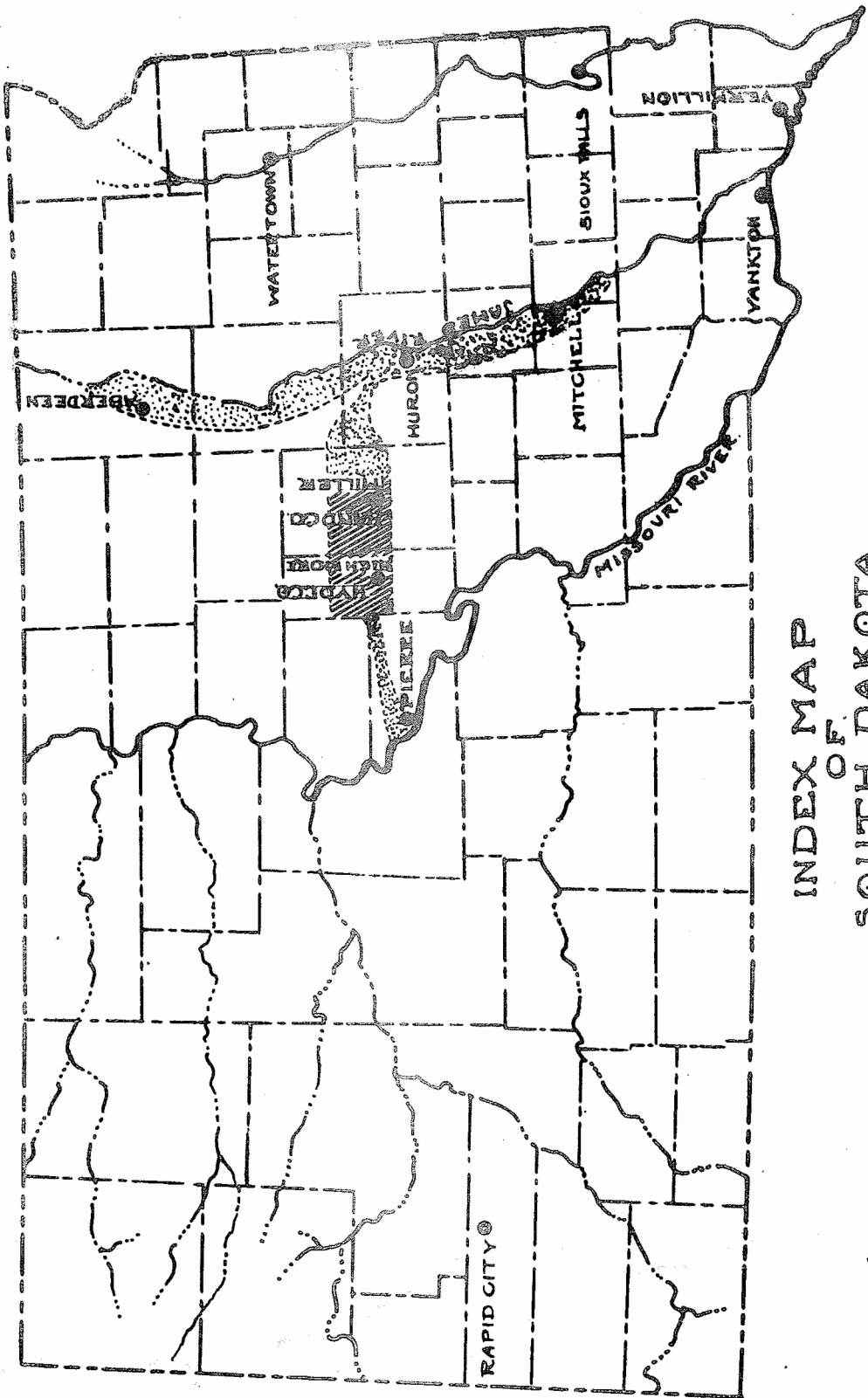
REPORT OF INVESTIGATIONS  
No. 51

TOPOGRAPHY OF THE LOW LYING AREA  
across the  
MISSOURI VALLEY-JAMES BASIN DIVIDE  
IN HYDE AND HAND COUNTIES, S.D.

by  
H.E. Brookman

University of South Dakota  
Vermillion, South Dakota  
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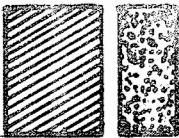
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INDEX MAP  
OF  
SOUTH DAKOTA

Area including survey covered by this report. ~ See topographic maps with 5 ft. contour interval.

Additional area to which report refers.



TOPOGRAPHY OF THE LOW LYING AREA  
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PURPOSE OF SURVEY

The growing interest in the development of the Missouri River and the likelihood of dams being built across the stream at carefully considered points has called for considerable additional thought as to the utilization of great bodies of impounded water.

The control of flood water and the degree of security which may be offered to farmers and ranchers in the fertile valley is, and should be the first aim in this conservation project. The water held back by great dams, however, must be disposed of in order to make room for yet more water and its flow through controlled spillways and penstocks offers attractive possibilities in the field of hydraulic power and irrigation.

The irrigation of a large area of land in the valley of the James River has been considered as a part of the Missouri River Development Project. This area might include as much as 750,000 acres of rich land. At the present time the uncertainty of plentiful rainfall causes crop farming in this area to be hazardous whereas a certain amount of irrigation would remove the drouth hazard and stabilize crop production at a high level.

The land referred to lies between the cities of Aberdeen and Mitchell. Water from the Missouri River impounded by a dam north of the city of Pierre could be delivered to this area by a main and branch canals. The project would require the lifting of water at certain points along the course of the main canal and it is believed that the head of water due to the height of the dam would supply the power necessary for this pumping.

A study of the topography of Central South Dakota as shown by maps having 100 foot contour intervals prepared some time ago from data obtained by the U.S. Coast and Geodetic and U.S. Geological Surveys indicates in a very general manner the course of a main and branch canals. The possible location of these has been shown on the accompanying map of Central South Dakota. Water would be pumped from the great storage reservoir behind the dam into the main canal, a height depending upon the height to which the dam is built and the stage of the impounded water, probably from 100 to 150 feet. It would then be caused to flow by gravity and be again lifted by pumping at various points through Hyde and Hand Counties as indicated on the map, the main canal branching at a point north and east of the city of Miller, one branch extending northward through Spink County toward the city of Aberdeen and the other in a southeasterly direction across Beadle County toward the city of Mitchell.

Because of its general nature and large contour interval, the surveys referred to do not make clear at what point along the canal's course through Hyde County continuous gravity flow would begin or the most feasible location of such main canal.

The South Dakota State Geological Survey has considered advisable the development of a set of maps representing a width of about two miles showing the topography of this section by contours of five foot interval and the determination by the plotting of cross sections of the approximate point at which continuous flow by gravity would begin. It is believed that this information will be helpful in determining definitely the course of canals if irrigation is included in the Missouri River Development Project.

#### LOCATION AND AREA

The area of the survey includes a strip of country about 30 miles long in Hand and Hyde Counties north of the Chicago & Northwestern Railroad line and Highway 14, as indicated by the index map. This area includes much of the valley of the intermittent stream, Wolf Creek. The artificial lake, Lake Louise, and such lake beds as Mitchell Lake which contain water only during the wet periods of the year.

## PROCEDURE

The work was carried on by the plane table method. At the beginning of the project the party could not be certain as to where to lay out the two mile wide strip for contouring because of the flatness of the country. It was evident, of course, that this strip should follow the lowest land, but an extremely flat country is difficult to judge in this respect without the use of instruments. It was decided, therefore, to extend traverses northward from bench marks along the Chicago & Northwestern Railroad line, recording elevations from which data cross sections could be drawn. The traverses were continued in each case until it was quite certain that the lowest point in the line had been reached and that the country was again rising continuously. The cross sections are shown on the accompanying sheet, together with an index map of Hyde and Hand Counties which shows where the traverses which they represent were taken.

The general direction of the lowest country having been determined, the work of locating contour lines and physical characteristics of the area was started. Three plane tables were kept in operation, each with one instrument man and one rod man. During the second month of work it was possible to secure the help of a second rod man for work with one of the plane tables.

The method followed was carrying lines from points of known elevation to key points in each section. These key points form the corners of a closed traverse. With the key points as reference elevations, the elevations of from one hundred and fifty to two hundred points on each section were determined. By aid of these elevations the contour lines were drawn in the field. Where it was necessary to extend long lines of elevations from bench marks to the work areas, the surveyor's level was used.

Although time did not permit carrying the detailed work of contouring so far westward as Highmore, long traverses were extended northward from Highmore and from Holabird and cross sections plotted, in order to determine the point at which water would flow continuously eastward by gravity. The Highmore and the Holabird traverses and cross sections are also shown on the accompanying sheet referred to above.

The party included the following:

Instrument Men

S.W. Howell  
R.R. Ruelle  
Harold Adamson

Rod Men

Leon Kaltsulas  
John Barton  
Robert Waddel  
Harold Houck

Drafting, Plotting, and General Supervision

Ordell Jaeger  
H.E. Brookman

ACKNOWLEDGMENT

The South Dakota State Geological Survey wishes to express appreciation to the citizens of Miller and of the area over which the survey was carried for the many courtesies extended. These include the housing of the party, aid in securing supplies and in the permission of land owners to cross fence lines and carry on work in their fields. It wishes also to express appreciation to the instrument men for their painstaking work in securing field data, to the rod men for their patient and often difficult work of selecting and reaching points, the elevations of which were most needed, and to Mr. Jaeger for his care in providing level lines and preparing data.

## RESULTS

A review of the survey indicates that through that extremely flat country, in Hyde and Hand Counties, the lowest area through which a main canal could be carried would in general follow the course of Wolf Creek about seven miles north of the city of Miller. It would extend in a westerly direction to a point north of the city of Highmore and swing northward to a point about ten and one-half miles north of Holabird. This area north of Holabird as shown on the index map includes a number of lake beds, dry excepting during wet seasons, and a low elevation of about 1750 feet was found. This should represent the low point in the saddle-like topography of this section through which it would seem feasible to extend a main irrigation canal.

A study of the survey also indicates that although the course of Wolf Creek is extremely crooked, it has cut a deep channel, portions of which might be included in constructing a main canal. The detailed contour maps show the portions of this channel which might be so used.

Plane table maps and field notes on file at the office of the South Dakota State Geological Survey show in detail elevations and data made use of in preparing the accompanying maps.

# INDEX TO TOPOGRAPHIC MAPS

R 71 W

9	10	11	12
16	15	14	13

R 70 W

7	8	9	10
18	17	16	15

R 70 W      R 69 W

2	1	6	5
11	12	7	8
14	13		

R 69 W

4	3	2	1
9	10	11	12

R 68 W

	32	33	34
6	5	4	3
7	8		

T 114 N  
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T 113 N