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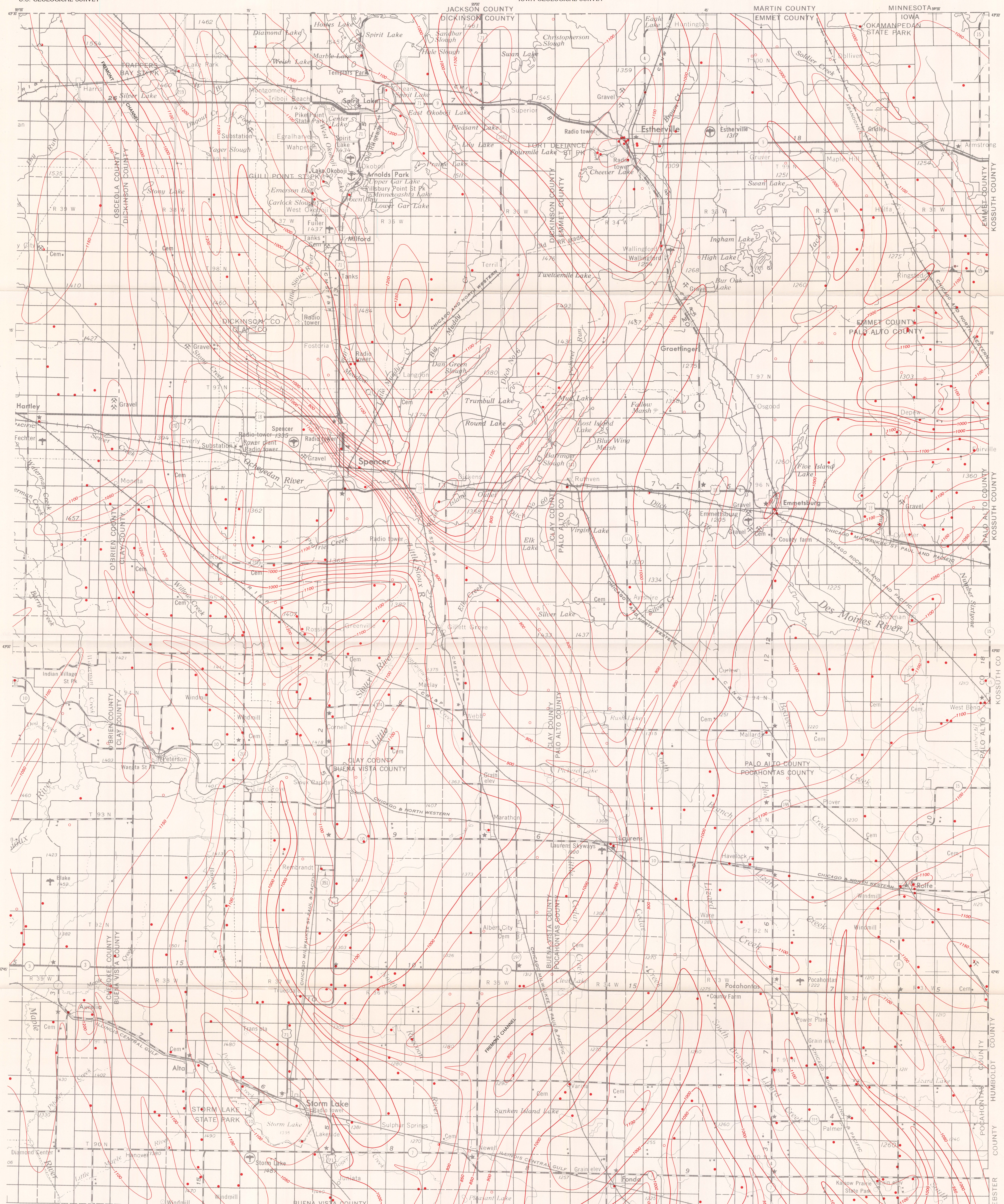
IOWA GEOLOGICAL SURVEY



BEDROCK TOPOGRAPHY OF NORTHWEST IOWA

By

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1986

EXPLANATION

LOG DATA
Bedrock penetrated

LOG DATA
Bedrock not penetrated

TEST HOLE
Bedrock penetrated

PUBLISHED DATA
Bedrock penetrated

PUBLISHED DATA
Bedrock not penetrated

QUARRY OR OUTCROP

1250
1200

BEDROCK CONTOUR
Shows altitude of bedrock surface. Dashed where approximately located. Contour interval 50 feet. National Geodetic Vertical Datum of 1929.

INTRODUCTION

Bedrock in Iowa (Hershey, 1969) generally is overlain by glacial drift and alluvium. The drift, comprised of glacial till and glacial outwash, varies in thickness from less than 1 foot to more than 500 feet; the alluvium in interior stream valleys in western Iowa varies in thickness from less than 1 foot to about 70 feet. The configuration of the bedrock surface is the result of a complex system of ancient drainage courses that were developed during a long period of preglacial erosion and during shorter, but more intense, periods of interglacial erosion. This map, for a 12-county area in northwest Iowa, is the ninth of a series of 9 reports that provide statewide coverage of the bedrock surface in Iowa.

METHODS OF INVESTIGATIONS

Primary control for the map is published and unpublished geological well logs, logs of test holes, and information from quarries and outcrops. Some published well data are contained in old U.S. and State Geological Survey volumes, however, most of the well locations given in these publications are too general to locate and assign land-surface altitudes with reasonable accuracy. These data, when used, are used in areas where primary control is limited and to support the contouring of major features such as bedrock channels. More detailed information about the control data is available in the cooperative files of the Iowa Geological Survey and the U.S. Geological Survey, Iowa City, Iowa.

The accuracy of the map is related to the density of control points; the greater the number of points there are in a given area, the more confidence can be assigned to the contours. Contours are dashed in several areas where it seems reasonable to indicate the possibility of rock at a higher altitude but where data are not available to confirm the contours.

BEDROCK TOPOGRAPHY

Bedrock topography reflects both the lithology of the underlying rock and the erosional history of the bedrock surface. The principal features of the map are the buried channels that traverse the area. These channels are incised into bedrock that consists of sandstone, limestone, siltstone, and shale and tend to be broad with gently sloping walls. The divide areas generally are rounded and dissected.

The principal buried channels are the Fremont channel in the eastern one-half of the area and the Anthon Channel in the western one-half of the area. Both of these channels originate in Minnesota and trend south across this area and both are part of the generally southwest trending buried drainage system that exists in western Iowa. The ancient divide between southwest and southeast trending drainage in Iowa arcs through Pocahontas County. Only the east one-half of Pocahontas County, which is in the extreme southeastern corner of the mapped area, is east of the divide. The divide for the present-day surface drainage is several miles further west and trends north through Palo Alto and Emmet counties.

Occasionally, parts of the valleys of present-day streams overlie buried channels and relatively broad valleys have developed. Examples are the Des Moines River in Palo Alto county, Little Sioux River in Cherokee County, Rock River in Sioux County, and Floyd River in Sioux County.

USES OF MAP

The bedrock map, when used in conjunction with land-surface altitudes, is a very useful tool for studying hydrological, environmental and geological problems.

Hydrology.—The map is an aid in locating supplies of ground water. The areas that generally are favorable for the development of ground-water supplies are the buried-bedrock channels and the alluvial valleys of present-day streams. In areas that are underlain by shale, the deposits in buried bedrock channels usually are the principal source of potable water for private domestic and stock wells and for a few small towns. Although not all of these channels contain sand and gravel aquifers, the larger, and more extensive channels shown on the map may contain aquifers that could supply many local needs. Recorded yields from similar aquifers in other parts of Iowa generally range from 10 to 30 gallons per minute but yields of 100 to 300 gallons per minute may be possible. Test drilling usually is necessary to determine the location of such aquifers and availability of large yields.

The alluvial deposits along present-day streams, which are as much as 70 feet thick and contain sand and gravel aquifers, commonly will yield from 10 to 40 gallons per minute to individual wells and may yield 60 to 80 gallons per minute in some localities. Large yields for municipal supply have been developed in the alluvial deposits of the larger rivers that cross the area. Because few wells have been completed in the alluvium and information is limited, test drilling to determine local conditions is needed, especially when attempting to develop a large supply of water.

The map will help the drilling contractor when planning the construction of a well. By determining the depth to bedrock, the contractor can estimate casing needs and prepare more accurate cost estimates. And, where the unconsolidated overburden is particularly thick, the contractor can be better prepared for any problems attendant to drilling this material.

Other uses for the map are in river-basin hydrology studies and in determining surface-water and ground-water relationships at selected locations.

Environment.—The bedrock information is particularly valuable to State, regional, and local planners concerned with environmental problems such as the location of landfill sites. The thickness of overburden, which can be determined with the aid of this map, is an important factor that needs to be considered to protect ground-water supplies from potential contamination.

Geology.—The bedrock map shows the location of bedrock highs, which are of interest to quarry operators and to construction engineers concerned with foundation problems. The map also aids in the interpretation of drainage changes caused by glacial advances and in mapping the areal distribution of consolidated rocks.

ACKNOWLEDGMENTS

Particular recognition is made to the present and past members of the Iowa Geological Survey who, during many years, have collected and analyzed drill-hole samples, determined land-surface altitudes, and compiled other information necessary to prepare this map. Further acknowledgment is made to the many well-drilling contractors who have voluntarily collected drill cuttings and have provided other well data.

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CONVERSION FACTORS

For use of readers who prefer to use metric units, conversion factors for terms used in this report are listed below:

Multiply	by	To obtain
foot	0.3048	meter
mile	1.609	kilometer
gallon per minute	0.003785	cubic meter per minute

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