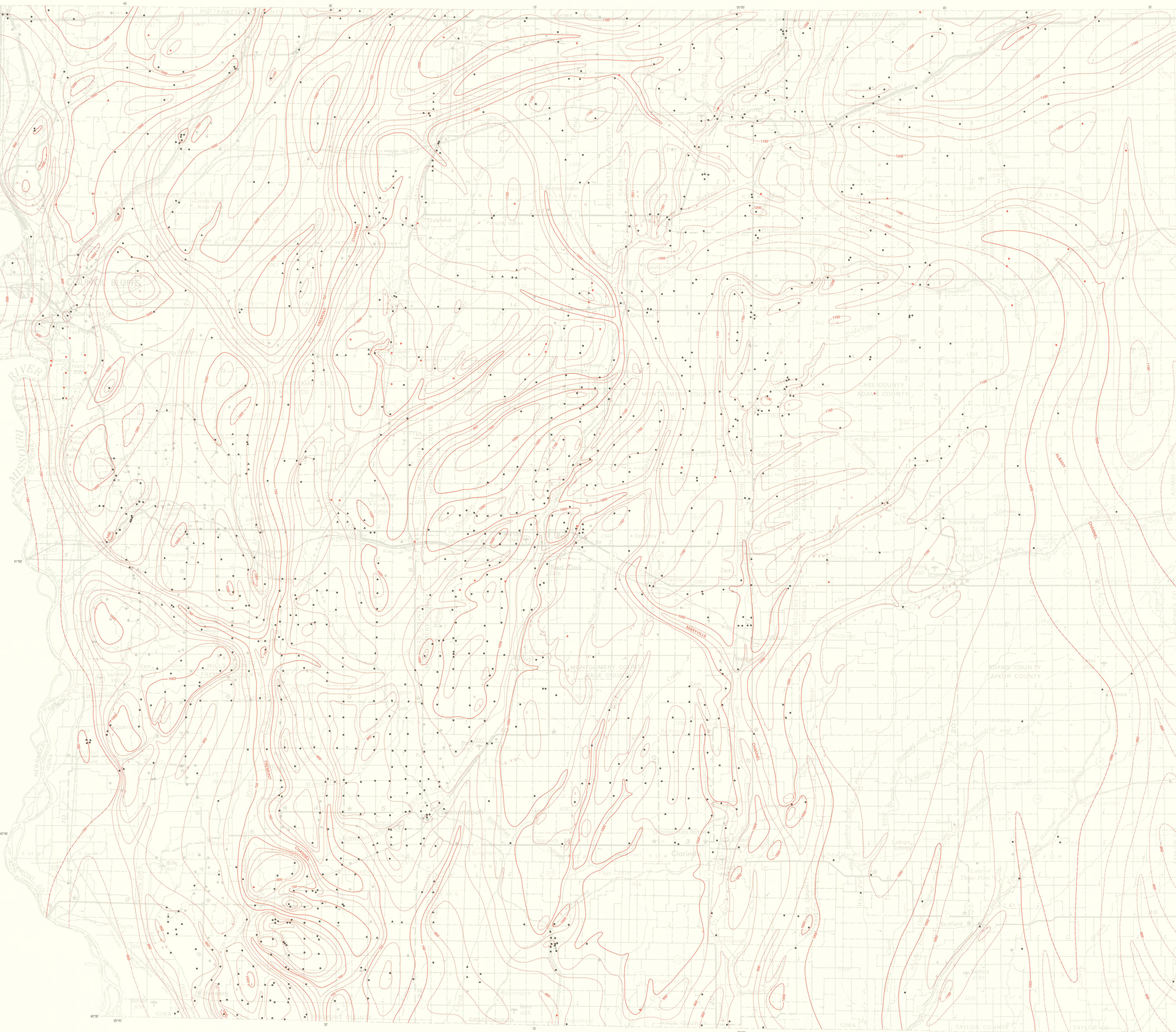
PREPARED IN COOPERATION WITH THE
IOWA GEOLOGICAL SURVEY



Base From U.S. Geological Survey 1;250,000
Nebraska City, 1955 and Omaha, 1954

EXPLANATION

—1000— **Bedrock contour**—Shows altitude of bedrock surface. Dashed were approximately located. Contour interval 50 feet with heavy line weight contours shown every 250 feet. National Geodetic Vertical Datum of 1929

Control points

- ● **Log data**—Bedrock penetrated
- ○ **Log data**—Bedrock not penetrated
- ● **Published data**—Bedrock penetrated
- ○ **Published data**—Bedrock not penetrated
- x **Quarry or outcrop**
- ▲ **Seismic station**

INTRODUCTION

Map report is a revision of Miscellaneous Investigations Series Map I–1222, "Bedrock Topography of Southwest Iowa," by Lyle V.A. Sendlein and Jack L. Gilmore.

The bedrock in Iowa (Hershey, 1969) generally is overlain by unconsolidated deposits consisting of glacial drift, alluvium, and loess. Loess deposits are most extensive in areas bordering the Missouri River flood plain, where they are more than 200 ft (feet) thick in places. The total thickness of the unconsolidated sediments ranges from less than 1 ft to more than 450 ft. The configuration of the underlying bedrock surface is the result of a complex system of ancient drainage courses that developed during the long period of preglacial erosion and during shorter, but more intense, periods of interglacial erosion.

CONVERSION FACTORS

The following conversion factors can be used to convert inch-pound units in this report to the International System of Units (SI):

Inch-pound	Multiply by	Metric (SI)
foot (ft)	0.3048	meter (m)
gallon per minute (gal/min)	0.0630	liter per second (l/s)

BEDROCK TOPOGRAPHY

This map shows the bedrock topography of southwest Iowa. The area mapped includes Adair, Adams, Cass, Fremont, Mills, Montgomery, Page, Pottawattamie, and Taylor counties.

Primary control for the map is geological log data and information from quarries, outcrops, and seismic refraction surveys. Well data from Norton (1912) provide additional control, but they are not as precise as log data and are used principally in areas where primary log data is limited. More detailed information concerning the control data is available in the files of the Iowa Department of Natural Resources and the U.S. Geological Survey, Iowa City, Iowa.

The accuracy of the map is directly related to the density of control points; the greater the number of points in a given area, the more reliable is the placement of the contours. Because of the lack of control points in eastern and south-central parts of the map area, dashed contours are used extensively. Most of the interpretation of the bedrock topography along the eastern edge of the map is inferred from comparison with an adjacent bedrock topographic map (Cagle, 1973). Dashed contours are used in other parts of the map where it seems reasonable to continue a ridge or valley, but where no control point was available to confirm the contours.

The principal features of the bedrock surface are the deeply buried bedrock channels and the present-day bedrock-incised stream valleys. Several bedrock channels are located in eastern and western parts of the map area; the most prominent of these is the Fremont channel which extends northward through Fremont, Mills, and Pottawattamie counties. The buried channels characteristically are (1) relatively wide with gently-sloping walls where they have been cut in easily erodible, predominantly shale bedrock; (2) narrow and steep walled where they have been cut in more resistant, predominantly carbonate bedrock. Bedrock uplands form the divides between and adjacent to the buried channels; they have a maximum altitude of about 1,250 ft.

The bedrock surface in the central part of the area has been sculpted primarily by present-day streams. The streams have deeply incised the bedrock uplands and have extended their valleys by headward erosion. The bedrock-incised valleys tend to be narrow and steep-walled. In places, present-day streams are situated over buried channels and, because they have not eroded into bedrock, relatively broad valleys have developed.

The buried-bedrock channels shown on the map are the headward extensions of ancient bedrock drainage courses that continue into Missouri. Heim and Howe (1963) applied the names Albany Valley, Grand River Valley, and Maryville Valley to buried valleys in Missouri that originate in or cross the map area. In this report the names Albany and Maryville have been retained, but the name Fremont has been assigned in place of Grand River. Furthermore, in this study, the term "channel" is used instead of "valley" to conform to general usage in Iowa reports.

USES OF THE MAP

The bedrock map, when used in conjunction with land-surface altitudes, is a valuable tool in studying hydrologic, environmental, and geologic problems.

HYDROLOGY

The map is an aid in locating ground-water supplies. The sources of these supplies are water-bearing sand and gravel in deposits of glacial drift and alluvium that overlie the bedrock.

Drill-hole data show a relation between the physical features of the bedrock surface and the occurrence of ground water in the overlying surficial deposits. The areas most favorable for the development of supplies are buried-bedrock channels and the alluvial valleys of present-day streams that may not have incised the bedrock.

Drift-filled buried channels are favorable sites for obtaining ground-water supplies at relatively shallow depths because they commonly contain extensive sand-and-gravel deposits. Recent hydrologic studies of the drainage basin of the Nishnabotna River have confirmed the presence of water-bearing sand-and-gravel deposits in parts of the Fremont Channel (Sendlein, 1971), but few data are available for the bedrock channels in other parts of the map area. Although sand-and-gravel aquifers often are distributed irregularly and are not present at all places within the drift-filled bedrock channels, they do occur more frequently and are more extensive within areas underlain by bedrock channels than in areas underlain by bedrock uplands. Alluvial aquifers are somewhat more regularly distributed and predictable in their occurrence. Test drilling should precede the development of ground water from these sources.

Yields from buried-channel aquifers generally range from 1 to 15 gal/min (gallons per minute); however, yields of as much as 100 gal/min have been recorded from individual wells penetrating buried sand-and-gravel aquifers within the Fremont Channel. The alluvial aquifers will yield from 20 to 300 gal/min.

This map can aid drilling contractors in planning the construction of a well. By determining the depth to bedrock, the contractor can estimate casing needs and, therefore, prepare more accurate cost estimates. Where the overburden is thick, they can be better prepared for conditions attendant to drilling this material.

ENVIRONMENT

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 the overburden, which can be determined with the aid of this map, is an important consideration in the protection of aquifers from potential sources of contamination, such as landfills.

GEOLOGY

The map shows the location of bedrock highs, information of value to quarry operators and to construction engineers concerned with foundation problems. The map also aids in the interpretation of drainage changes caused by glacial movements and in mapping the areal distribution of consolidated rocks.

ACKNOWLEDGMENTS

Particular recognition is given to the present and past members of the Iowa Geological Survey who, for many years, have collected and analyzed drill-hole samples, determined land-surface altitudes, and compiled other information necessary to the preparation of the map. Recognition is also due the students of the Department of Geology, Iowa State University, who assisted in compiling much of the field data. Appreciation is extended to the many well-drilling contractors who have voluntarily collected drill cuttings and provided other well data.

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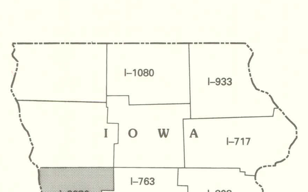

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BEDROCK TOPOGRAPHY OF SOUTHWEST IOWA

By
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1992

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