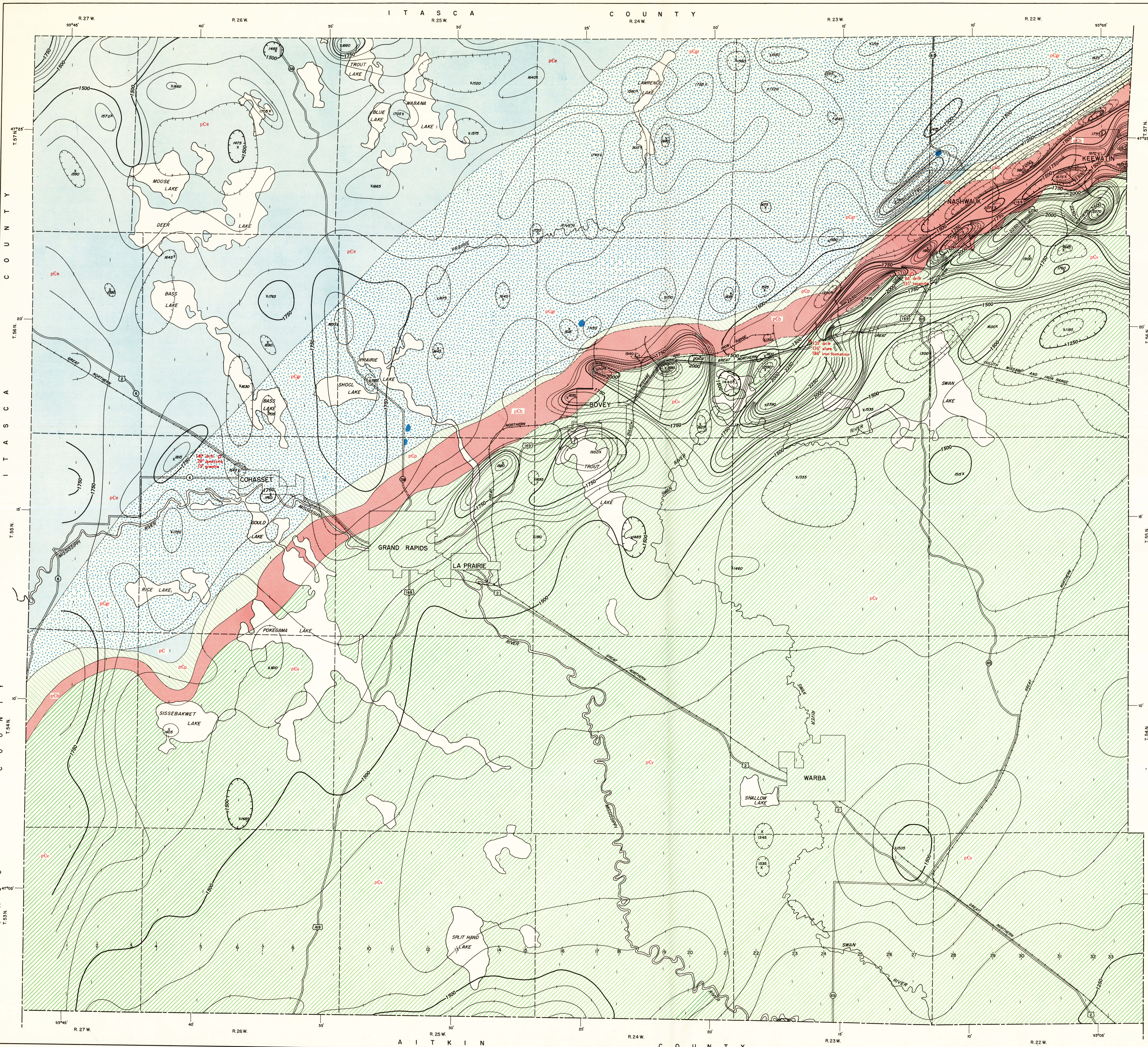
PREPARED IN COOPERATION WITH
THE MINNESOTA GEOLOGICAL SURVEY



EXPLANATION

FORMATIONS

PRE-CAMBRIAN

Huronian

pCv — Virginia slate--possibly includes older slate (Animikie)

pCb — Biwabik iron-formation (Animikie)

pCp — Pokegama quartzite (Animikie)

Huronian(?)

pCgr — Giants Range granite (Algoman)

Keewatin

pCe — Ely greenstone

OUTCROPS
(Lithologic symbols)

Granite

Contact

Indefinite contact

Drill hole

The stratigraphic classification and nomenclature of this report follow the usage of the Minnesota Geological Survey.

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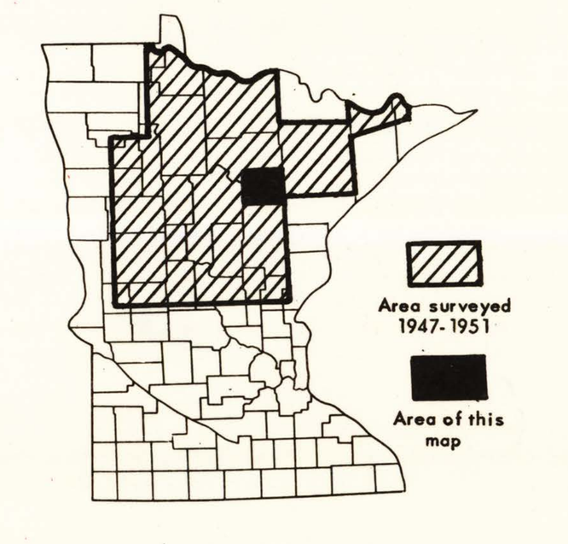
X1680

Magnetic contours with flight traverse; dashed contours indicate incomplete or doubtful data; hachured contour encloses area of lower magnetic intensity; 'x' and number denote location and value of measured maximum or minimum intensity within closed contour.



Index map of Minnesota

An aeromagnetic survey covering an area of approximately 30,000 square miles in north-central Minnesota was made during May and August 1947, May 1948, and September and October 1949 by the U. S. Geological Survey in cooperation with the Minnesota Geological Survey. The purpose of the survey was to delineate the major magnetic trends associated with known iron ore deposits and to indicate areas that may be favorable for additional exploration.

North-south traverses were flown at 1-mile intervals. This spacing was selected to cover as large an area as possible with a minimum of flying. The aeromagnetic information is presented in two forms: as an aeromagnetic map, contoured to a common arbitrary datum, and as magnetic profiles that accompany the map.

The measurements were made with an AN/ASQ-3A airborne magnetometer installed in a Beechcraft AT-11 airplane for the 1947 and 1948 flights and in a Douglas DC-3 for the 1949 flights; the detecting element of the magnetometer was towed about 75 feet below the plane. The elevation of the plane, ranging between 900 and 1,100 feet above the ground, was recorded with a continuous-recording radio altimeter. Aerial photographs were used for pilot guidance during the flights, and the flight path was recorded by a gyrostabilized continuous-strip camera. Positional accuracy of all the surveys after 1947 was increased by use of a gyrostabilized vertical sight.

G. M. Schwartz, Director of the Minnesota Geological Survey, provided the geologic and drill-hole information presented here.

The southeastern part of Itasca County is a region of thick moraines. The Mesabi iron district extends diagonally from the northeastern corner of this area southwestward to T. 54 N., R. 27 W. Of the hundreds of holes drilled throughout tne length of the range there are surprisingly few records of penetration of bedrock either north or south of the iron-bearing district. With the exception of holes drilled within a mile or two of the Mesabi range, no holes have penetrated bedrock south of the Biwabik iron-formation. This area, however, is assumed to be uniformly underlain by Virginia slate, which is found in drill holes farther south in northern Aitkin County. The magnetic pattern south of the iron district is typical of that associated with the Virginia slate area to the east.

North of the Biwabik iron-formation and the Pokegama quartzite is an extensive area of Giants Range granite, the westward extension of the batholith of Algoman age. The region has not been mapped in detail, but widely scattered outcrops are known to exist. There is one area of outcrops north of the town of Nashwauk in T. 57 N., R. 22 W. Thiel[1] reports that a well half a mile north of the dam at Grand Rapids entered granite at a depth of 70 feet. The contact zone between the granite and the Ely greenstone is not apparent from the magnetic information. The contact trends southwest from the northern edge of the area, middle of R. 24 W., to the southwestern corner of T. 55 N., R. 27 W. There is no noticeable difference in the magnetic patterns of the greenstone and granite areas.

It should be noted that the magnetic trend associated with the Biwabik iron-formation terminates in T. 55 N., R. 25 W., although the formation continues for many miles. This condition, which was known from early explorations, was verified recently by ground work with both the superdip and the Askania magnetometer. This nonmagnetic facies of the Biwabik iron-formation continues westward as far as T. 141 N., R. 25 W., according to Leith.[2]

[1]Thiel, G. A., The geology and underground water of northeastern Minnesota: Minnesota Geol. Survey Bull. 32, p. 125, 1947.
[2]Van Hise, C. H., and Leith, C. K., The geology of the Lake Superior region: U. S. Geol. Survey Monograph 52, pl. 8, 1911.

Note

Aeromagnetic data are obtained and compiled along a continuous line, whereas ground magnetic surveys are made at separate points. Errors within the normal limits of any magnetic measurement may cause slight discrepancies between flight lines in an aeromagnetic map, which would be more obvious than similar discrepancies between points in a ground magnetic map. For this reason as much care should be exercised in evaluating magnetic features that appear as elongations along a single aeromagnetic traverse as in interpreting an anomaly indicated by a single ground station.

Base from Minnesota Department of Highways maps

TOTAL INTENSITY AEROMAGNETIC AND GEOLOGIC MAP OF SOUTHEASTERN ITASCA COUNTY, MINNESOTA

RELATIVE TO ARBITRARY DATUM

1 ½ 0 1 2 3 4 MILES

Contour interval 50 & 250 gammas

Flown 1000 feet above surface

1953

SHEET 1 OF 2

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.

Aeromagnetic survey 1948 by J. R. Henderson and J. L. Meuschke
Compilation directed by J. L. Meuschke