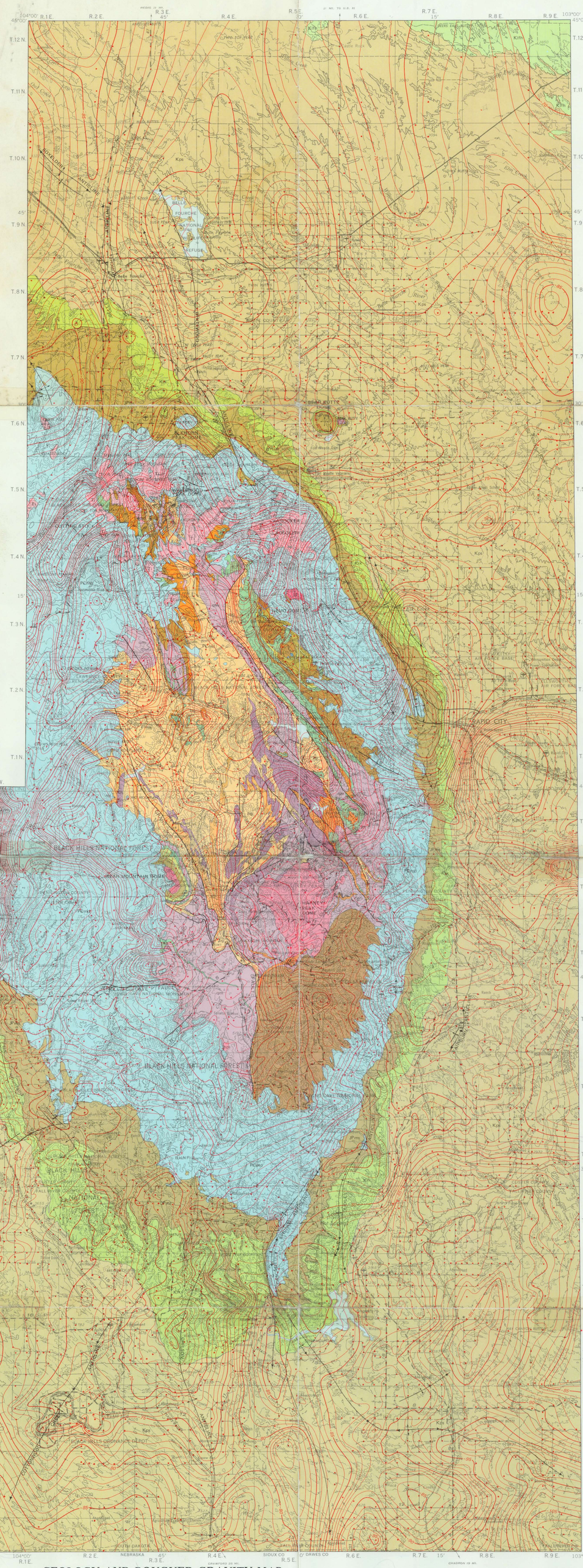
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

GEOPHYSICAL INVESTIGATIONS
MAP GP-903



Base from U.S. Geological Survey Hot Springs, 1955–64, Rapid City, 1953–64, and Newcastle, 1955–62

GEOLOGY AND BOUGUER GRAVITY MAP

Geology compiled by J. A. Redden
Gravity survey by R. M. Hazlewood, R. A. Black and J. C. Roller

SCALE 1:250 000

5 0 5 10 15 20 25 MILES

5 0 5 10 15 20 25 KILOMETRES

CONTOUR INTERVAL 200 FEET
WITH SUPPLEMENTARY CONTOURS AT 100-FOOT INTERVALS
DATUM IS MEAN SEA LEVEL

1972 MAGNETIC DECLINATION FOR THIS SHEET VARIES FROM 13°45' WESTERLY FOR THE CENTER OF THE WEST EDGE TO 13°00' WESTERLY FOR THE CENTER OF THE EAST EDGE. MEAN ANNUAL CHANGE IS 0°02' WESTERLY

DESCRIPTION OF MAP UNITS

EXPLANATION

TERTIARY

- **Ti** — IGNEOUS ROCKS

CRETACEOUS

- **Klfh** — LANCE FORMATION AND FOX HILLS SANDSTONE – Mainly shale and sandstone
- **Kps** — PIERRE SHALE, NIOBRARA FORMATION, CARLILE SHALE, GREENHORN LIMESTONE, BELLE FOURCHE AND MOWRY SHALES, NEWCASTLE SANDSTONE, AND SKULL CREEK SHALE – Mainly shales
- **Kik** — INYAN KARA GROUP – Mainly sandstones and siltstones of the Lakota and Fall River Formations

PERMIAN TO JURASSIC

- **JPms** — MORRISON FORMATION, UNKPAPA SANDSTONE, AND SUNDANCE FORMATION (JURASSIC), AND SPEARFISH FORMATION (TRIASSIC AND PERMIAN) – Mainly shale and sandstone

CAMBRIAN TO PERMIAN

- **PЄmd** — MINNEKAHTA LIMESTONE AND OPECHE FORMATION (PERMIAN), MINNELUSA FORMATION (PERMIAN AND PENNSYLVANIAN), PAHASAPA LIMESTONE (MISSISSIPPIAN), ENGLEWOOD LIMESTONE (MISSISSIPPIAN AND DEVONIAN), WHITEWOOD LIMESTONE (ORDOVICIAN), AND DEADWOOD FORMATION (CAMBRIAN) – Mainly carbonate rocks

PRECAMBRIAN

- **hp** — HARNEY PEAK GRANITE – Unit L
- **bg** — BIOTITE-GARNET PHYLLITE OR SCHIST – Unit K. Mainly thin-bedded iron- or graphite-rich metamorphic rocks derived from black shales and siltstones
- **ms** — MICACEOUS PHYLLITE OR SCHIST – Unit J. Typically magnetite-bearing; derived from aluminous shales
- **qs** — QUARTZOSE SCHIST – Unit I. Thick-bedded quartz-rich schist derived from impure sandstones and graywackes
- **qm** — QUARTZ-MICA SCHIST AND PHYLLITE – Unit H. Dominantly muscovite-bearing medium- to thick-bedded metamorphic rocks derived from siltstones and subgraywackes
- **a** — AMPHIBOLITE AND METAGABBRO – Unit G. Includes amphibole schists and amphibolite derived from basaltic flows, and interbeds of streaked quartzite or metachert beds
- **bsc** — INTERBEDDED SCHIST, IMPURE QUARTZITE, META-IRON FORMATION, STREAKED QUARTZITE, METACONGLOMERATE, AND AMPHIBOLITE – Unit F
- **mp** — INTERBEDDED MARBLE AND PHYLLITE OR SCHIST – Unit E
- **mc** — METACONGLOMERATE AND QUARTZITE – Unit D
- **t** — TACONITE IRON-FORMATION – Unit C
- **q** — QUARTZITE AND SCHIST OR PHYLLITE – Unit B. Thick-bedded quartzite containing interbeds of various foliated rocks
- **gg** — GNEISSIC GRANITE – Unit A. Includes gneissic granite and biotite gneiss

CONTACT – Dashed where inferred or covered by younger Tertiary sediments

FAULT – Dashed where inferred. D, downthrown side

ANTICLINE – Showing trace of axial plane and general plunge of axis. Long arrow indicates flatter dipping limb

SYNCLINE – Showing trace of axial plane and general plunge of axis. Long arrow indicates flatter dipping limb

DOME

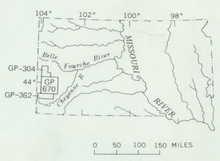
MONOCLINE – Showing direction of dip

60 BOUGUER GRAVITY CONTOURS – Hachured on low side of contour. Interval 1 mgal. Bouguer density factor, 2.43 g/cm³. Simple Bouguer gravity data north of lat 44° N., complete Bouguer to south

GRAVITY STATION

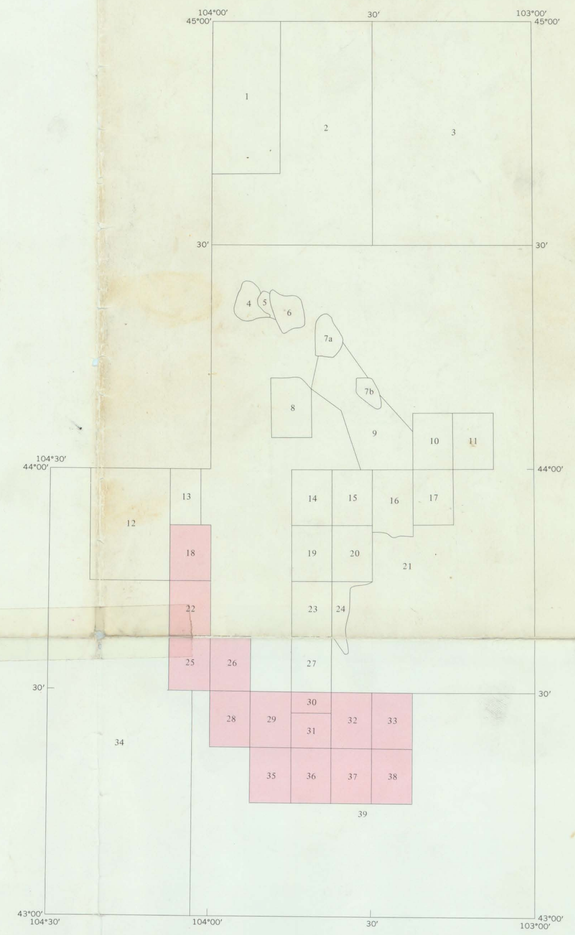
4300 MAGNETIC CONTOURS – Showing total intensity magnetic field of the earth in gammas, relative to arbitrary datum. Hachured to indicate closed areas of lower magnetic intensity; dashed where data are incomplete. Intervals are 20, 100, or 500 gammas

FLIGHT PATH – Showing location of data



INDEX SHOWING SOURCE OF AEROMAGNETIC DATA

GP-304 (Survey flown at 500 feet above ground, 1955)
GP-362 (Survey flown at 500 feet above ground, 1953)
GP-670 (Survey flown at 7,500 feet barometric elevation, 1967)



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7a. Bayley (1970a)
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31. Wilmarth and Smith (1957a, b, c, d)
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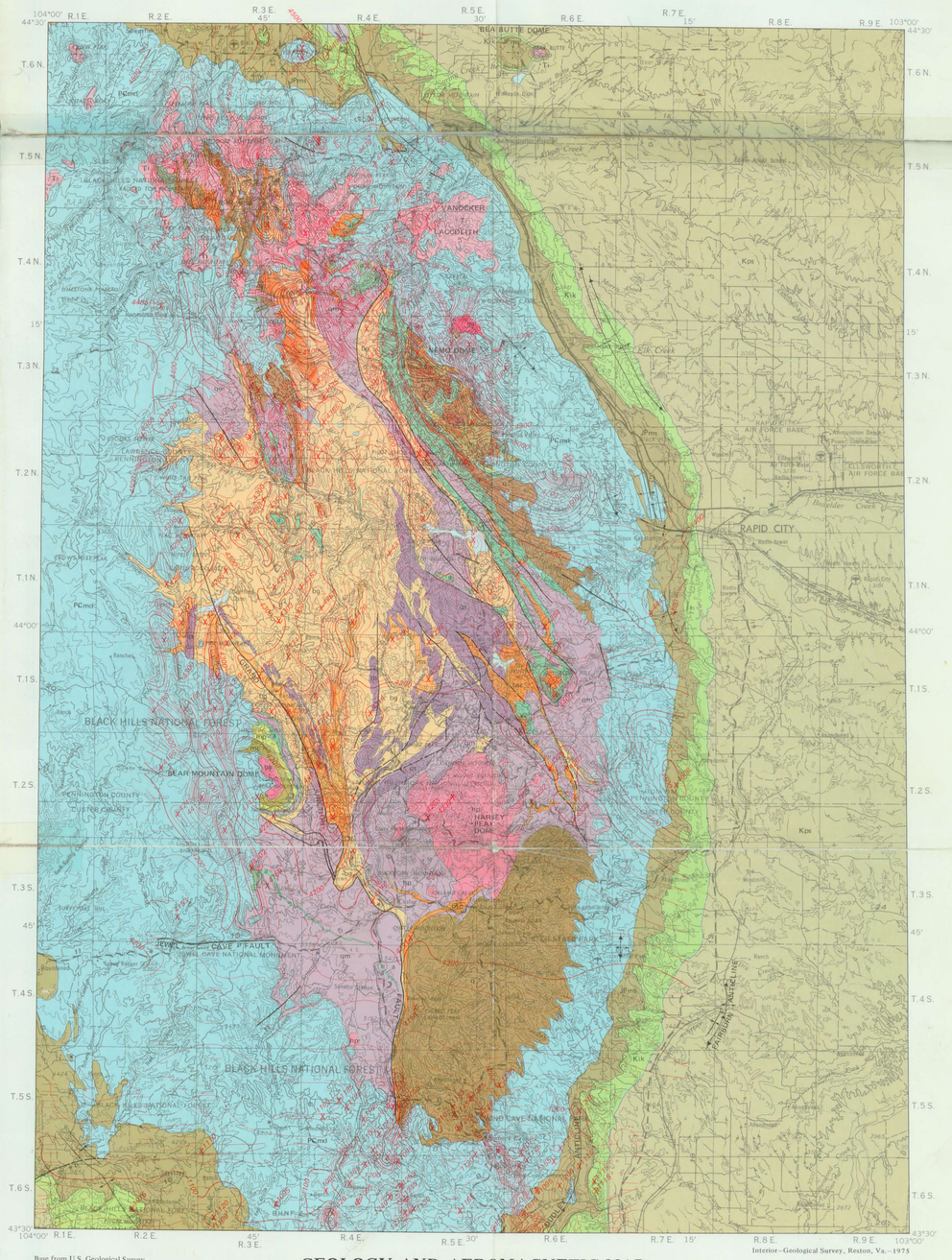
33. Wolcott (1967 pl. 28)
34. Dobbin and others (1957)
35. Ryan (1964, pl. 27)
36. Bell and Post (1971, pl. 32)
37. Post (1967, pl. 29)
38. Connor (1963, pl. 11)
39. Keene (1973)



Base from U.S. Geological Survey Hot Springs, 1955–64, and Rapid City, 1953–64

GEOLOGY AND AEROMAGNETIC MAP

Interior—Geological Survey, Reston, Va.—1975
Geology compiled by J. A. Redden

BOUGUER GRAVITY, AEROMAGNETIC, AND GENERALIZED GEOLOGIC MAPS OF PART OF THE BLACK HILLS OF SOUTH DAKOTA AND WYOMING

By
M. Dean Kleinkopf and Jack A. Redden

1975

For sale by U.S. Geological Survey
Denver, Colo. 80225 and Reston, Va. 22092, price $1.00
Explanatory pamphlet accompanies map