DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

GEOPHYSICAL INVESTIGATIONS
MAP GP-903

DESCRIPTION OF MAP UNITS

EXPLANATION

TERTIARY	Ti	IGNEOUS ROCKS
	Klfh	LANCE FORMATION AND FOX HILLS SANDSTONE – Mainly shale and sandstone
CRETACEOUS	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 AND JURASSIC	JPms	MORRISON FORMATION, UNKPAPA SANDSTONE, AND SUNDANCE FORMATION (JURASSIC), AND SPEARFISH FORMATION (TRIASSIC AND PERMIAN) – Mainly shale and sandstone
CAMBRIAN AND PERMIAN	PCmd	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

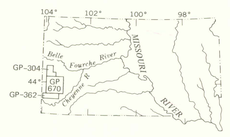
MONOCLINE – Showing direction of dip

–60– BOUGUER GRAVITY CONTOURS – Hachured on low side of contour. Interval 1 mgal. Bouguer density factor, 2.43 g/cm^3. 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)

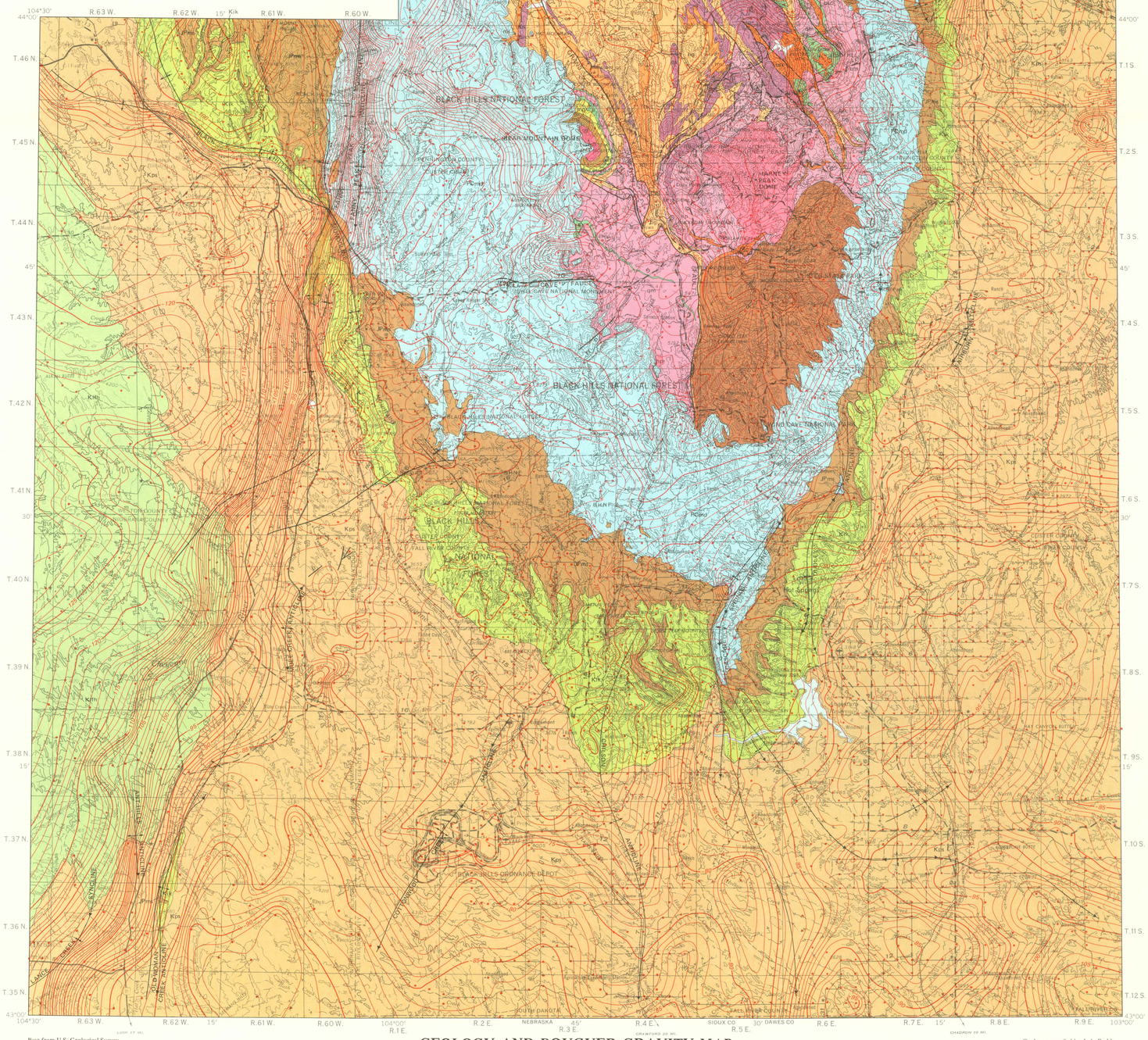
GP-362 (Survey flown at 500 feet above ground, 1953)

GP-670 (Survey flown at 7,500 feet barometric elevation, 1967)

GEOLOGIC SOURCES

Gott, Wolcott, and Bowles (1974, pl. 1)

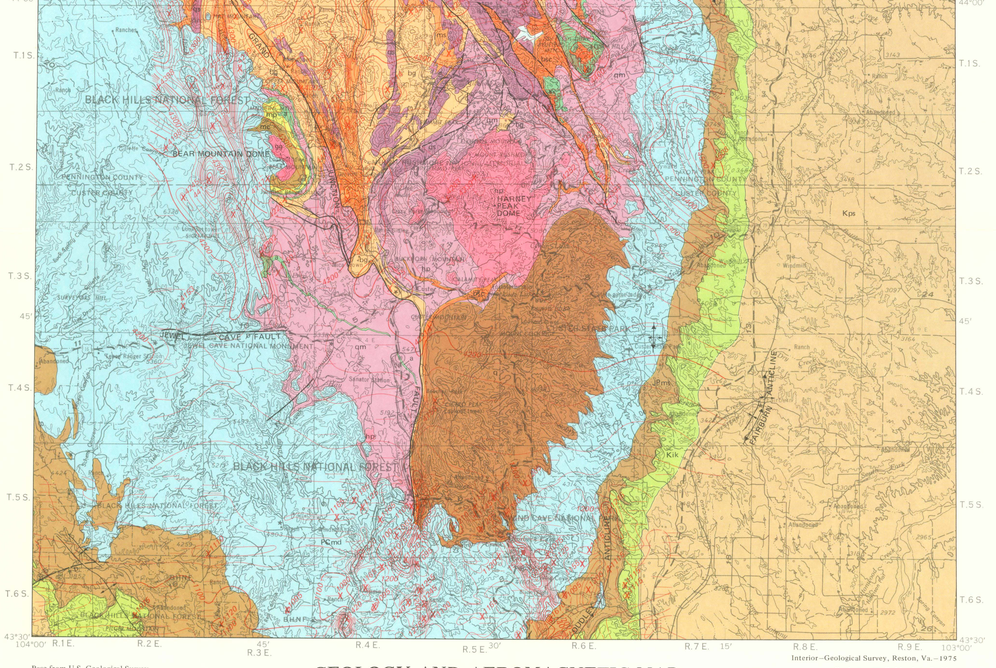
1. Knechtel and Patterson (1962)
2. Darton and O'Harra (1909)
3. Darton (1919)
4. Shapiro and Gries (1970)
5. Bayley (unpub. data)
6. Homestake, 1960 (unpub. data)
7a. Bayley (1970a)
7b. Bayley (1970b)
8. McGehee and Bayley (1969)
9. Bayley (unpub. data)
10. Cattermole (1969)
11. Cattermole (1970)
12. Mapel and Pillmore (1963)
13. Shapiro, 1971 (unpub. data)
14. Ratté (unpub. data)
15. Ratté and Wayland (1969)
16. Norton (unpub. data)
17. Norton (unpub. data)
18. Brobst and Epstein (1963, pl. 25)
19. Redden (1968)
20. Redden (unpub. data)
21. Darton and Paige (1925)
22. Cuppels (1963, pl. 23)
23. Redden (1963)
24. Redden (unpub. data)
25. Brobst (1961, pl. 5)
26. Braddock (1963, pl. 20)
27. Bowles (unpub. data)
28. Schnabel (1963 pl. 17)
29. Gott and Schnabel (1963, pl. 12)
30. Wilmarth (unpub. data)
31. Wilmarth and Smith (1957a, b, c, d)
32. Wolcott and others (1962)
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, 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



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

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

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