CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

The following file is part of the Grover Heinrichs Mining Collection

ACCESS STATEMENT

These digitized collections are accessible for purposes of education and research. We have indicated what we know about copyright and rights of privacy, publicity, or trademark. Due to the nature of archival collections, we are not always able to identify this information. We are eager to hear from any rights owners, so that we may obtain accurate information. Upon request, we will remove material from public view while we address a rights issue.

CONSTRAINTS STATEMENT

The Arizona Geological Survey does not claim to control all rights for all materials in its collection. These rights include, but are not limited to: copyright, privacy rights, and cultural protection rights. The User hereby assumes all responsibility for obtaining any rights to use the material in excess of "fair use."

The Survey makes no intellectual property claims to the products created by individual authors in the manuscript collections, except when the author deeded those rights to the Survey or when those authors were employed by the State of Arizona and created intellectual products as a function of their official duties. The Survey does maintain property rights to the physical and digital representations of the works.

QUALITY STATEMENT

The Arizona Geological Survey is not responsible for the accuracy of the records, information, or opinions that may be contained in the files. The Survey collects, catalogs, and archives data on mineral properties regardless of its views of the veracity or accuracy of those data.

MAP I-358

DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

PREPARED WITH THE COOPERATION OF
THE NEW MEXICO BUREAU OF MINES AND MINERAL RESOURCES AND
THE DEPARTMENT OF GEOLOGY, UNIVERSITY OF NEW MEXICO

PRELIMINARY GEOLOGIC MAP OF THE NORTHEASTERN PART OF NEW MEXICO

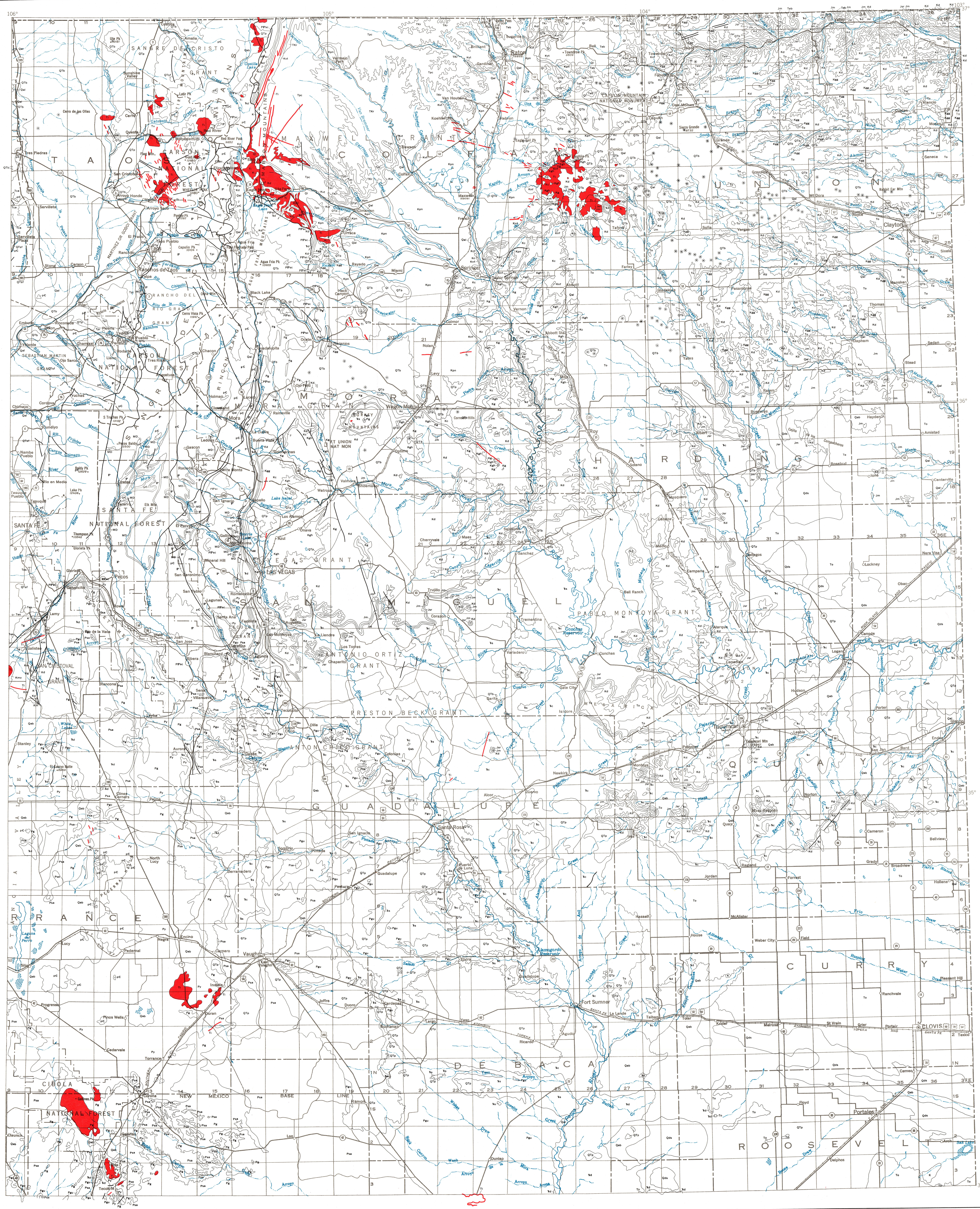
By
George O. Bachman and Carle H. Dane

MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-358

PUBLISHED BY THE U. S. GEOLOGICAL SURVEY
WASHINGTON, D.C.
1962

MAP I-358

PREPARED WITH THE COOPERATION OF
THE NEW MEXICO BUREAU OF MINES AND MINERAL RESOURCES AND
THE DEPARTMENT OF GEOLOGY, UNIVERSITY OF NEW MEXICO



EXPLANATION

SEDIMENTARY ROCKS

QUATERNARY

Pleistocene and Recent

Qal — Alluvium

Qab — Alluvium, bolson deposits, dune sand, and other surficial deposits

Qds — Dune sand

Ql — Landslide deposits

QTp — Gravel, sand, and caliche
Includes some pediment and high level terrace gravel. May include some redeposited material from Ogallala formation

TERTIARY

Oligocene(?) to Pleistocene(?)

QTsf — Santa Fe group
Includes basalt flows, rhyolite tuff, sandstone, conglomerate, and associated rocks

Tca — Carson conglomerate of Just (1937) and equivalent beds
Gravel, sand, boulder conglomerate of granitic and quartz latite debris, and associated tuff and lava flows

Tpi — Picuris tuff of Cabot (1938)
Rhyolite tuff with some conglomerate and sandstone

To — Ogallala formation
Irregularly bedded sand, grit and local conglomerate cemented by caliche, and local beds of shale, clay and limestone. Of Pliocene age

Eocene

Tes — Espinaso volcanics of Stearns (1943)
Andesite to quartz latite tuff conglomerate, and breccia

Tg — Galisteo formation
Red and tan or variegated shale, siltstone, sandstone, and conglomerate

Paleocene

Tpc — Poison Canyon formation
Tan to yellowish conglomerate, arkose, sandstone, siltstone, and shale. Intertongues with the Raton formation

TKr — Raton formation
Gray conglomerate and sandstone and gray to black shale with coal beds. Intertongues with Poison Canyon formation

CRETACEOUS

Upper Cretaceous

Kvt — Vermejo formation and Trinidad sandstone, undivided
Vermejo formation consists of interbedded gray sandstone, and gray to black shale with coal beds. The Trinidad is gray to tan, medium-grained sandstone

Kmv — Mesaverde group, undivided
Tan, brown, and gray shale and interbedded sandstone

Kpn — Pierre shale and upper part of Niobrara formation
Gray to black fissile shale with some thin calcareous beds and nodules

Knf — Fort Hays limestone member of Niobrara formation
Gray, thin-bedded marine limestone with some thin shale interbeds. Includes overlying beds of Niobrara formation in northwestern San Miguel County

Km — Mancos shale
Light-gray to dark-gray shale with some thin beds of fine-grained sandstone

K — Cretaceous rocks, undivided
In Roosevelt County probably represented by equivalent of Tucumcari shale of Early Cretaceous age

Kc — Carlile shale
Gray sandy shale with some gray to tan beds of sandstone

Kgh — Greenhorn limestone
Gray marine limestone with thin interbeds of gray shale

Kgg — Greenhorn limestone and Graneros shale
Includes Carlile shale in northwestern Union County and western Colfax County

Kg — Graneros shale
Dark gray fissile shale with sandy shale and some thin gray sandstone beds at base

Lower Cretaceous

Kd — Dakota sandstone
Conglomeratic sandstone, sandstone, and gray or greenish gray or tan shale. Includes the Purgatoire formation in Union County, and Pajarito shale, Mesa Rica sandstone, and Tucumcari shale in eastern San Miguel and western Quay Counties. Includes probable equivalents of these formations elsewhere

JURASSIC

Upper Jurassic

Jm — Morrison formation
Gray, green, tan, and red variegated shale with gray or red sandstone. May include the Todilto limestone at base in places

J — Jurassic rocks, undivided

Jsr — San Rafael group equivalent, undivided, and younger rocks
Includes rocks equivalent to the Todilto limestone, the Summerville formation, and the Entrada sandstone. The Todilto limestone is gray to black thinly laminated fetid limestone. Equivalents to the Summerville formation are thin-bedded, red-brown shale, siltstone, and sandstone. The Entrada sandstone is gray, tan, or pink crossbedded sandstone. As mapped this unit may include lateral equivalents of the Morrison formation in southern Quay County

TRIASSIC

Upper Triassic

Ꞓc — Chinle formation
Maroon to greenish variegated shale with prominent beds and lenses of maroon to gray or tan conglomeratic sandstone and limestone pebble conglomerate

Ꞓs — Santa Rosa sandstone
Gray to brown, thin-bedded to massive beds of sandstone with thin maroon to greenish variegated shale interbeds

Ꞓd — Triassic rocks, undivided
Dockum group of Union County

PERMIAN

Guadalupe

Pgu — Undifferentiated rocks of Guadalupe age
Gypsum, anhydrite, dolomite, and light red shale, siltstone, and sandstone. Includes red beds assigned to the Bernal, Chalk Bluff, and Whitehorse formations of some authors

Psa — San Andres limestone
Light- to dark-gray evenly bedded limestone and dolomite. Includes undifferentiated rocks of Guadalupe age in parts of Torrance, San Miguel and Santa Fe Counties

Leonard

Pg — Glorieta sandstone
White to gray or tan, fine- to medium-grained quartz sandstone

Py — Yeso formation
Pink to gray and yellowish-gray shale, siltstone, and sandstone with some beds of gypsum and anhydrite

P — Permian rocks, undivided

Middle or Upper Pennsylvanian and Wolfcamp

PIPsc — Sangre de Cristo formation
Maroon to greenish-gray shale, arkose, sandstone, and conglomerate. May include some thin limestone beds in places

PENNSYLVANIAN / CARBONIFEROUS

IP — Pennsylvanian rocks, undivided
Includes the Madera limestone and Sandia formation. The Madera limestone consists of gray limestone and shale and tan to brown shale, siltstone, and sandstone with some beds of arkosic sandstone in the upper part. The Sandia formation consists of gray to brown shale, siltstone, sandstone, and conglomerate with a few thin beds of limestone and coal. May include a basal unit of Mississippian or Devonian(?) age in places

DEVONIAN(?) AND MISSISSIPPIAN

MD — Mississippian and Devonian(?) rocks, undivided
Gray, medium- to thick-bedded limestone and sandy limestone. Includes the Tererro and Espiritu Santo formations

IGNEOUS AND METAMORPHIC ROCKS

TERTIARY AND QUATERNARY

QTb — Basalt flows
Includes other rock types such as andesite, latite and tuff.
✳ Indicates volcanic center

TERTIARY

Teb — Basalt flows
Includes other rock types such as andesite, latite and small amounts of tuff. May include some flows of Quaternary age.
✳ Indicates volcanic center

Tv — Extrusive rocks of varied composition
Includes some associated sedimentary rocks

Ti — Intrusive rocks of varied composition and form
Includes some intrusive rocks of Quaternary age

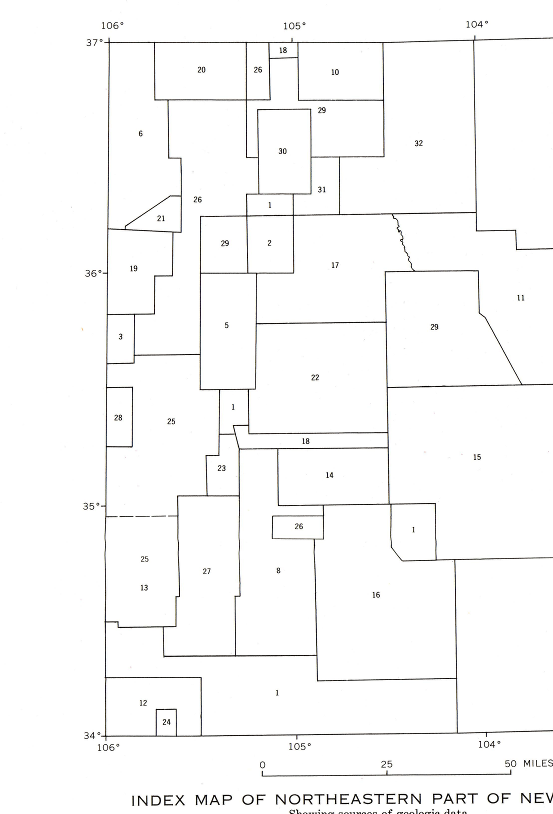
PRECAMBRIAN

pC — Precambrian rocks, undivided
Quartzite, schist, gneiss, granite and associated rocks

Contact

Approximate location of lateral gradation between map units

Fault



INDEX MAP OF NORTHEASTERN PART OF NEW MEXICO

Showing sources of geologic data
(Numbers refer to list of Sources of data)

SOURCES OF DATA

Numbers correspond to those given on key map
(*) Indicates unpublished map

1. Bachman, G. O., U. S. G. S. reconnaissance mapping (*)
2. Bachman, G. O., U. S. G. S. Oil and Gas Inv. Map OM-137
3. Baldwin, B., N. Mex. Bur. Mines and Min. Res. (*)
4. Baldwin, B., and Muehlberger, W. R., N. Mex. Bur. Mines and Min. Res. Bull. 63
5. Baltz, E. H., Jr., U. S. G. S. (*)
6. Barnes, Harley, U. S. G. S. reconnaissance mapping (*)
7. Berkstresser, C., U. S. G. S. (*)
8. Clebsch, A., U. S. G. S. (*)
9. Dane, C. H., U. S. G. S. reconnaissance mapping (*)
10. Dixon, G. H., U. S. G. S. (*)
11. Duncan, D. C., U. S. G. S. reconnaissance mapping (*)
12. Fischer, W. A., U. S. G. S. photogeologic and reconnaissance mapping (*)
13. Foster, R. W., and Stipp, T. F., N. Mex. Bur. Mines and Min. Res. and U. S. G. S. (*). Precambrian contacts only
14. Gorman, J. M., and Robeck, R. C., U. S. G. S. Oil and Gas Inv. Map-44
15. Griggs, R. L., U. S. G. S. (*)
16. Harbour, R. L., U. S. G. S. reconnaissance mapping (*)
17. Hayes, P. T., U. S. G. S. reconnaissance mapping (*)
18. Johnson, R. B., U. S. G. S. reconnaissance mapping (*)
19. Kelley, V. C., U. S. G. S.
20. McKinlay, P. F., N. Mex. Bur. Mines and Min. Res. Bull. 42
21. Montgomery, Arthur, N. Mex. Bur. Mines and Min. Res. Bull. 30
22. Northrop, S. A., and others, U. S. G. S. Oil and Gas Inv. Map-54
23. Olson, A. B., U. S. G. S. photogeologic mapping (*)
24. Rawson, D. E., Univ. N. Mex. Thesis (*)
25. Read, C. B., and others, U. S. G. S. Oil and Gas Inv. Map-21
26. Read, C. B., and others, U. S. G. S. (*), supplemented by Montgomery, Arthur, and others, N. Mex. Bur. Mines and Min. Res. (*)
27. Smith, R. E., N. Mex. Bur. Mines and Min. Res. Ground Water Rept. 5
28. Stearns, C. E., Geol. Soc. America Bull., v. 64, no. 4
29. Wanek, A. A., U. S. G. S. (*)
30. Wanek, A. A., and others, U. S. G. S. open-file report
31. Wood, G. H., Jr., U. S. G. S. reconnaissance mapping (*)
32. Wood, G. H., Jr., and others, U. S. G. S. Oil and Gas Inv. Map OM-141. Basalt in T. 30 N., R. 30 E., after Collins, R. F., Geol. Soc. America Bull., v. 60 no. 6.

REFERENCES CITED IN EXPLANATION

Cabot, E. C., 1938, Fault border of the Sangre de Cristo Mountains north of Santa Fe, New Mexico: Jour. Geology, v. 46, p. 88-105.
Just, Evan, 1937, Geology and economic features of the pegmatites of Taos and Rio Arriba Counties, New Mexico: New Mexico Bur. Mines and Mineral Resources Bull. 13.
Stearns, C. E., 1953, Tertiary geology of the Galisteo-Tonque area, New Mexico: Geol. Soc. America Bull., v. 64, no. 4.

Base from U. S. G. S. map of New Mexico 1:500,000 with some modification to drainage and culture

PRELIMINARY GEOLOGIC MAP OF THE NORTHEASTERN PART OF NEW MEXICO

By
George O. Bachman and Carle H. Dane

SCALE 1:380160
5 0 5 10 15 20 MILES

1962

INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—10051

For sale by U. S. Geological Survey, price 1.25