DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

COAL INVESTIGATIONS
MAP C-118-A

Base from U.S. Geological Survey, 1978
Photorevision as of 1973–75
50,000-foot grid ticks based on New Mexico coordinate system, west and central zones
10,000-meter Universal Transverse Mercator grid, zone 13

SCALE 1:100 000

5 0 5 10 15 KILOMETERS

5 0 5 MILES

CONTOUR INTERVAL 50 METERS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

APPROXIMATE MEAN DECLINATION, 1990

NEW MEXICO
QUADRANGLE LOCATION

Geology compiled in 1980–83 from sources shown on index

INTERIOR–GEOLOGICAL SURVEY, RESTON, VA.–1990

CORRELATION OF MAP UNITS

Qa, Qc, Qt		Holocene and Pleistocene	QUATERNARY
Qb			QUATERNARY OR TERTIARY
QTb			
Tb		Pliocene	TERTIARY
Tv			
Ts		Pliocene and Miocene	
UNCONFORMITY			
Kmc	Ku	Upper Cretaceous	CRETACEOUS
Kmfc			
Kp			
Kcg			
Kcm			
Kcd			
Kg			
Kgmu			
Kmdu			
Kdm			
Kmld			
UNCONFORMITY			
Ju			JURASSIC
UNCONFORMITY			
Tku			TRIASSIC
UNCONFORMITY			
Pu		Lower Permian	PERMIAN
UNCONFORMITY			
pCg			PRECAMBRIAN

DESCRIPTION OF MAP UNITS

Qa **Alluvium, eolian deposits, and associated valley fill (Holocene and Pleistocene)**—Unconsolidated silt, sand, and gravel in stream valleys and on flood plains; windblown silt and sand on mesas, benches, and in broad valleys. Partly dissected by recent gullies (Maxwell, 1977b). Thickness as much as 15 m (50 ft)

Qc **Colluvium (Holocene and Pleistocene)**—Gravel, sandstone, shale, and clay deposited as talus, landslide blocks, slope wash, and rock glaciers. Thickness as much as several meters (tens of feet)

Qt **Terrace gravel (Holocene and Pleistocene)**—Fine to coarse gravel consisting largely of volcanic rocks; present on dissected pediments. Thickness as much as several meters (tens of feet)

Qb **Basalt flows from Zuni Mountains (Quaternary)**—Mostly olivine tholeiite (Lipman and Moench, 1972), coarse-grained and vesicular in contrast to finer grained relatively dense older basalts in the Mount Taylor volcanic field. Thickness as much as several tens of meters (hundreds of feet)

QTb **Basalt flows on Flower Mountain (Quaternary or Tertiary)**—Basalt or olivine basalt. Thickness about 20 m (65 ft) (Maxwell, 1977a)

Tb **Basalt flows (Pliocene)**—Mostly dense basalt flowing from fissures, vents, and cinder cones surrounding Mount Taylor. Includes some andesite and volcanic breccia flows. Mostly followed eruptions of Mount Taylor, but includes some flows older than, or contemporaneous with Mount Taylor eruptions (Hunt, 1938). Thickness as much as tens of meters (hundreds of feet)

Tv **Volcanic rocks from Mount Taylor (Pliocene)**—Mostly porphyritic andesite, trachyte, and latite erupted from Mount Taylor stratovolcano. Includes pyroclastic deposits consisting of poorly consolidated rhyolite ash, lapilli, and bombs composed of olivine basalt; also includes volcanic conglomerate of mudflow origin composed of weakly cemented beds of conglomerate, breccia, and sandstone (Lipman and Moench, 1972). Generally erupted before basalt flows surrounding Mount Taylor, but a few eruptions occurred during basalt sheet flows (Hunt, 1938). Thickness as much as hundreds of meters (thousands of feet)

Ts **Santa Fe Formation (Pliocene and Miocene)**—Heterogeneous assemblage of sandstone, claystone, mudstone, limestone, and unconsolidated deposits of gravel, silt, and sand. Deposited as alluvial fans on flood plains of streams, playas, and dunes (A. B. Olson, written commun., 1982). Thickness as much as tens of meters (hundreds of feet)

Ku **Upper Cretaceous rocks, undivided**—Sandstone and shale; crops out in small areas close to Mount Taylor where identification of the specific formation is in doubt. Thickness as much as tens of meters (hundreds of feet)

Kmc **Cleary Coal Member of the Menefee Formation (Upper Cretaceous)**—Mostly fine- to medium-grained sandstone, sandy shale, mudstone, shale, and numerous thin beds of coal. Thickness as much as 90 m (295 ft)

Kmfc **Cleary Coal Member of the Menefee Formation and Gibson Coal Member of the Crevasse Canyon Formation, undivided (Upper Cretaceous)**—Interbedded fine- to medium-grained sandstone, siltstone, claystone, carbonaceous shale, and coal. Shown in the Herrera and Cañoncito School 7 1/2-minute quadrangles where the Point Lookout Sandstone is absent. Deposited in swamps and on flood plains of streams (Sears and others, 1941). Thickness as much as 213 m (700 ft)

Kp **Point Lookout Sandstone and Satan Tongue of the Mancos Shale, undivided (Upper Cretaceous)**

Point Lookout Sandstone—Fine- to medium-grained moderately well sorted quartzose cliff-forming sandstone; generally horizontally bedded but also crossbedded. Split into an upper and lower unit by the Satan Tongue of the Mancos Shale, which extends southward from the main body of the Mancos Shale in the north. The split occurs north of a line extending from approximately 13 km (8 mi) north of Moquino in T. 12 N., R. 5 W., to east of Mesa Prieta in the northeast corner of the map; south of this line the upper and lower sandstone units merge to become one undifferentiated unit. The Point Lookout Sandstone pinches out in the subsurface a short distance southwest of Mount Taylor; the subsurface depositional edge of the sandstone trends northwest. Referred to by Hunt (1936) as the upper and lower parts of the Hosta Sandstone Member of the Mesaverde Formation. The Point Lookout Sandstone was deposited in a nearshore marine environment. Thickness of upper sandstone ranges from 18 to 49 m (60 to 160 ft). Thickness of the lower sandstone ranges from 30 to 56 m (100 to 185 ft). Combined thickness of undifferentiated unit where the Satan Tongue of the Mancos Shale is absent is as much as 81 m (265 ft)

Satan Tongue of the Mancos Shale—Dark-gray to light-gray sandy shale and siltstone. Becomes increasingly sandy southwestward and wedges out within the Point Lookout Sandstone. The Satan Tongue merges northeastward with the main body of the Mancos Shale at the north edge of the map area 23 km (14 mi) from the eastern edge. Deposited in an offshore marine environment. Thickness as much as 43 m (140 ft)

Kcg **Gibson Coal Member of the Crevasse Canyon Formation (Upper Cretaceous)**—Mostly interbedded sandstone, siltstone, claystone, and carbonaceous shale. Contains many thin coal beds. Crops out on steep dark-gray to brown slopes beneath cliffs formed by the Point Lookout Sandstone. Deposited in swamps and on flood plains of streams (Sears and others, 1941). Combined with Menefee Formation along southeastern edge of map. Member thins slightly to the north and grades into marine shale north from T. 15 N. Thickness ranges from 20 to 150 m (65 to 492 ft)

Kcm **Dalton Sandstone Member and Stray sandstone of the Crevasse Canyon Formation and Mulatto Tongue of the Mancos Shale, undivided (Upper Cretaceous)**

Dalton Sandstone Member of the Crevasse Canyon Formation—Grayish-white to yellowish-gray, fine- to medium-grained, well-sorted sandstone; in part crossbedded. Forms massive cliffs in central and western part of map area, but is friable and inconspicuous along north and east borders, because the sandstone becomes shaly northeastward and grades into offshore marine shale of the Mancos Shale (Hunt, 1936). Deposited as a regressive, coastal-barrier sandstone. Thickness ranges from about 12 to 65 m (40 to 215 ft)

Stray sandstone of the Crevasse Canyon Formation—Yellowish-gray fine- to coarse-grained thin- to medium-bedded sandstone; fossiliferous and conglomeratic in some areas; contains a small amount of siltstone and black shale in upper part. Found only in the western half of the map area; thins until absent toward the east. Thickness ranges from 0 to 46 m (0 to 148 ft)

Mulatto Tongue of the Mancos Shale—Mostly dark-gray to yellowish-brown sandy shale; a few thin sandstone beds; shale content increases northward. At north edge of map area, the Mulatto Tongue merges with dark-gray shale in the main body of the Mancos Shale (Hunt, 1936). Best exposures are in the southwest-facing scarp beneath the San Mateo Mesa (Hunt, 1936). Deposited in an offshore marine environment. Thickness ranges from 18 m (60 ft) in the south to 122 m (400 ft) in the north

Kcd **Dilco Coal Member of the Crevasse Canyon Formation (Upper Cretaceous)**—Sandstone, siltstone, mudstone, carbonaceous shale, and a few thin coal beds. Member thins and grades into marine shale north of T. 15 N. Coal beds disappear and carbonaceous shale beds become sandy to the north also (Hunt, 1936). Crops out on gentle ledgy slopes above the cliff-forming Gallup Sandstone. Deposited in swamps and on the flood plains of streams. Thickness ranges from 24 to 61 m (80 to 200 ft)

Kgmu **Gallup Sandstone and upper part of the Mancos Shale, undivided (Upper Cretaceous)**—Differentiated below except along eastern edge of the map area (see units Kg and Kmdu). Includes the following units in descending order:

Main body of the Gallup Sandstone—Mostly light-gray to pale-reddish-brown well-cemented fine- to medium-grained massive cliff-forming sandstone containing abundant flakes of muscovite; has well-developed crossbedding; contains ironstone concretions. Upper part commonly weathers into rounded beehive forms. Becomes less massive and more evenly bedded towards north edge of the map area (Hunt, 1936). Deposited near shorelines as sea retreated. Thickness ranges from 8 to 37 m (25 to 120 ft)

Unnamed tongue of the Mancos Shale—Gray fissile marine shale. Thickens and merges northeastward with the main body of the Mancos Shale. Thickness ranges from 18 to 50 m (60 to 164 ft)

Unnamed upper tongue of the Gallup Sandstone—Light-tan to light-gray, very fine to medium-grained, massive to crossbedded sandstone; silty at base; lenses of calcareous sandstone and sandy limestone at top (Maxwell, 1977a, b). Present only in western half of quadrangle (Hunt, 1936). Thickness ranges from 0 to 24 m (0 to 80 ft)

Unnamed tongue of the Mancos Shale—Gray fissile marine shale. Thickens and merges northeastward with the main body of the Mancos Shale. Thickness ranges from 6 to 30 m (20 to 100 ft)

Unnamed lower tongue of the Gallup Sandstone—Mostly light-gray to yellowish-gray fine- to medium-grained sandstone; medium bedded to massive; weathers brown. Top meter is resistant bed of brown-weathering calcareous sandstone and sandy limestone; lower part is interbedded siltstone and calcareous sandstone containing limestone lenses (Maxwell, 1977a, b). Present only in western half of the map area (Hunt, 1936). Thickness ranges from 0 to 20 m (0 to 66 ft)

Main body of the Mancos Shale—Mostly dark-gray fissile shale containing minor thin beds of light-brown sandstone; weathers bluish gray. Lower part contains thin beds of bentonite and, locally, a bed of limestone as much as 6 m (20 ft) thick, limestone concretions, and abundant ammonite fossils (Hunt, 1936). Forms slopes and broad valleys. Deposited in a quiet-water marine environment. Thickness ranges from 125 to 229 m (410 to 750 ft); thickens northeastward

Kmld **Lower part of the Mancos Shale and Dakota Sandstone, undivided (Upper Cretaceous)**—Differentiated below except along eastern edge of the map area (see units Kmdu and Kdm). Includes the following units in descending order:

Twowells Tongue of the Dakota Sandstone—Light-gray very fine grained sandstone and siltstone; weathers pale tan. Forms bold jagged cliffs near Laguna in the south-central part of the map area; farther east the Twowells Tongue is silter and forms more subdued outcrops (Landis and others, 1973). Deposited in shallow water on an extensive offshore shelf (Landis and others, 1973). Thickness ranges from 3 to 25 m (10 to 82 ft)

Whitewater Arroyo Tongue of the Mancos Shale—Mostly dark-gray shale and yellowish-gray siltstone; contains lenticular bentonite layers and yellowish-brown-weathering limestone concretions (Landis and others, 1973). Uppermost part is light-gray shale and siltstone transitional into the overlying Twowells Tongue of the Dakota Sandstone. Probably deposited offshore in quiet, shallow water (Landis and others, 1973). Thickness ranges from 21 to 50 m (70 to 164 ft)

Paguate Tongue of the Dakota Sandstone—Mostly light-gray, very fine grained sandstone and interbedded siltstone; contains some concretionary, fossiliferous, limy sandstone beds that weather dark brown (Landis and others, 1973). Pinches out southeastward about 4 km (2.5 mi) west of San Fidel. Deposited in a nearshore marine environment (Landis and others, 1973). Thickness ranges from 1.5 to 30 m (5 to 98 ft)

Clay Mesa Tongue of the Mancos Shale—Mostly medium- to dark-gray shale, partly silty. Upper part contains interbedded grayish-tan sandstone and siltstone and grades into the overlying Paguate Tongue of the Dakota Sandstone; lower 15 m (50 ft) of the Clay Mesa Tongue contains bentonite beds and brown-weathering limestone concretions (Maxwell, 1977a, b). Forms gentle slopes. Deposited offshore in progressively shallower water (Landis and others, 1973). Thickness ranges from 14 to 21 m (45 to 70 ft)

Cubero Tongue of the Dakota Sandstone—Light-grayish-tan, very fine to fine-grained sandstone and siltstone; grain size coarsens upward; contains abundant carbonaceous material in some areas; forms resistant ledges and mesas. Deposited in a nearshore environment in progressively shallower water (Landis and others, 1973). Thickness ranges from 1.5 to 15 m (5 to 50 ft)

Unnamed tongue of the Mancos Shale—Medium- to dark-gray shale, increasing in sandiness toward upper part; a persistent sandstone bed about 0.5 m (2 ft) thick near top contains abundant gastropods (Hunt, 1936). Upper part deposited in open-water marine environment and lower part probably deposited in brackish water (Hunt, 1936). Thickness ranges from 3 to 20 m (10 to 66 ft); thins toward western edge of the map area

Main body of the Dakota Sandstone—Pale-brown to very light gray well-cemented cliff-forming sandstone in lenticular beds interbedded with minor amounts of dark-gray shale; some shaly coal near base; lower part sparsely fossiliferous, coarse grained, and commonly has quartz pebble conglomerate at base (Landis and others, 1973). Deposited in fluvial and littoral environments (Landis and others, 1973). Thickness ranges from 1 to 45 m (3 to 148 ft)

Kg **Gallup Sandstone (Upper Cretaceous)**—Shown in the eastern part of the map area in the Cerro Tinaja, Casa Salazar, Puerco Dam, Herrera, and Cañoncito School 7 1/2-minute quadrangles; extends westward as part of unit Kgmu. Mostly light-gray to pale-reddish-brown well-cemented fine- to medium-grained massive cliff-forming sandstone containing abundant flakes of muscovite; has well-developed crossbedding; contains ironstone concretions. Upper part commonly weathers into rounded beehive forms. Becomes less massive and more evenly bedded towards north edge of the map area (Hunt, 1936). Deposited near shorelines as sea retreated. Thickness ranges from 8 to 37 m (25 to 120 ft) massive and thinner bedded towards north edge of map area (Hunt, 1936). Deposited along the shore of a retreating sea. Thickness ranges from 0 to 37 m (0 to 120 ft)

Kmdu **Mancos Shale and upper part of the Dakota Sandstone (Upper Cretaceous)**—Shown in the eastern part of the map area in the Cerro Tinaja, Casa Salazar, Puerco Dam, Herrera, and Cañoncito School 7 1/2-minute quadrangles; extends westward as part of units Kgmu and Kmld. Unit Kmdu includes the following units in descending order: main body of the Mancos Shale, 125–229 m (410–750 ft) thick; Twowells Tongue of the Dakota Sandstone, 3–25 m (10–82 ft) thick; White water Arroyo Tongue of the Mancos Shale, 21–50 m (70–165 ft) thick; Paguate Tongue of the Dakota Sandstone, 1.5–30 m (5–100 ft) thick; Clay Mesa Tongue of the Mancos Shale, 14–21 m (45–70 ft) thick; Cubero Tongue of the Dakota Sandstone, 1.5–15 m (5–50 ft) thick; unnamed tongue of the Mancos Shale, 3–20 m (10–65 ft) thick

Kdm **Main body of Dakota Sandstone (Upper Cretaceous)**—Shown in the eastern part of the map area in the Cerro Tinaja, Casa Salazar, Puerco Dam, Herrera, and Cañoncito School 7 1/2-minute quadrangles. Included in unit (Kmld) as the main body of the Dakota Sandstone farther west

Ju **Jurassic rocks, undivided**—Includes one or more of the following formations in descending order:

Morrison Formation (Upper Jurassic)—Upper part, continental sequence of variegated shale, mudstone, claystone, and sandstone. Thins to zero in southwest corner of map area. Thickness ranges from 0 to 213 m (0 to 700 ft)

Eolian sandstone (Middle? Jurassic)—Yellow to pale-orange, fine-grained, crossbedded, massive. Near Haystack Mountain in the northwest part of the quadrangle, the upper part is assigned to the Morrison Formation and the lower part to the Cow Springs Sandstone (Condon and Huffman, 1984). The Bluff Sandstone of Rapaport and others (1952) is shown by them in the Laguna area as beneath the Morrison. South of Cubero, in the central part of the quadrangle, the eolian sandstone is correlated with the Zuni Sandstone by Maxwell (1977a). Farther east, as in the Arch Mesa quadrangle, it was mapped as Bluff Sandstone (Moench and Puffett, 1963a). Thickness ranges from 0 to 122 m (0 to 400 ft)

Wanakah Formation (Middle Jurassic)—Includes the younger Beclabito Member at the top and the older Todilto Limestone Member at the bottom. The Beclabito Member consists of interbedded variegated mudstone, siltstone, and fine- to very fine grained sandstone; commonly deformed by sandstone pipes and intraformational folds and faults (Schlee and Moench, 1963a). The Todilto Limestone Member consists of gypsum, anhydrite, and light- to dark-gray limestone; mostly gypsum at surface and anhydrite in subsurface (Schlee and Moench, 1963a). Mostly recrystallized in top part, crinkly bedded in middle part, and platy bedded at base. Thickness of the Beclabito Member ranges from 18 to 81 m (60 to 266 ft). Thickness of the Todilto Limestone Member ranges from 3 to 55 m (10 to 180 ft)

Entrada Sandstone (Middle Jurassic)—Sandstone and siltstone. Upper unit consists of moderate-brown fine-grained crossbedded sandstone; middle unit consists of grayish-red-brown calcareous siltstone; lower unit consists of medium-brown to medium-reddish-orange medium-grained crossbedded cliff-forming sandstone. Thickness of upper and middle units combined ranges from 37 to 58 m (120 to 190 ft). Thickness of lower unit ranges from 26 to 37 m (85 to 120 ft)

Triassic rocks, undivided—Includes one or more of the following formations in descending order:

Chinle Formation (Upper Triassic)—Variegated shale, siltstone, and limestone in upper part and conglomeratic sandstone and claystone in lower part. Exposed along the southeast edge and in the northwest part of the map. Thickness ranges from 335 to 427 m (1,100 to 1,400 ft)

Moenkopi Formation (Middle? and Lower Triassic)—Pale-reddish-brown and grayish-red arkosic micaceous sandstone interbedded with pebble conglomerate and mudstone. Exposed in northwest part of the map. Thickness ranges from 0 to 9 m (0 to 30 ft)

Pu **Lower Permian rocks, undivided**—Includes one or more of the following formations in descending order:

San Andres Limestone—Dense marine limestone interbedded with some sandstone; coarse grained in lower part; surface weathers to karst topography (Thaden and Ostling, 1967). Thickness ranges from 33 to 36 m (108 to 118 ft)

Glorieta Sandstone—White to buff pure well-sorted medium-grained crossbedded cliff-forming sandstone; well cemented with silica or calcite. Deposited in littoral environment (Hackman and Olson, 1977). Thickness ranges from 37 to 43 m (120 to 140 ft)

Yeso Formation—Pale-reddish-brown medium- to fine-grained thick- and thin-bedded locally crossbedded sandstone and siltstone grading upward into friable sandstone. Several limestone and gypsum beds present in upper part of formation. Deposited in marine and lagoonal environments (Hackman and Olson, 1977). Thickness as much as 396 m (1,300 ft)

Abo Formation—Reddish-brown medium- to fine-grained sandstone and siltstone; forms cliffs and steep slopes. Deposited on the flood plains of streams (Hackman and Olson, 1977). Thickness ranges from 366 to 396 m (1,200 to 1,300 ft)

pCg **Precambrian gneissic granite**—Pinkish- to medium-gray fine- to coarse-grained gneissic granite composed of orthoclase, quartz, minor oligoclase, and abundant hornblende and biotite. Locally porphyritic and contains phenocrysts. Apparently part of a batholith. Exposed only in southwest corner of map area (Goddard, 1966)

Contact

Fault—Dotted where concealed. Bar and ball on downthrown side. Only faults with displacement of 15 m (50 ft) or more are shown

Syncline—Approximately located. Broad northward-plunging syncline under Mount Taylor

Dike—Dotted where concealed. Includes basaltic dikes 1–2 m (3–7 ft) wide and approximately vertical occurring in the southern part of the Mount Taylor volcanic field, plagioclase basaltic dikes 0.5 m (2 ft) wide occurring in the southern part of the Mount Taylor volcanic field, and silicic dikes 2–20 m (7–65 ft) wide that form a radial pattern of ridges around the Mount Taylor volcanic cone

Volcanic vent—Associated with mostly eruptive basaltic flows of the Mount Taylor volcanic field

GENERAL GEOLOGY

MAPPED UNITS

The purpose of this map is to show the distribution of coal-bearing rocks and associated general geology in the Grants 30′ x 60′ quadrangle. The coal-bearing rocks, mapped separately, are the Dilco Coal Member of the Crevasse Canyon Formation, the Gibson Coal Member of the Crevasse Canyon Formation, and the Cleary Coal Member of the Menefee Formation.

To simplify the map, several formations and members are combined that are shown separately on more detailed maps used in the compilation. These combined units are identified by the heavily lined boundaries on the accompanying diagrammatic section showing stratigraphic relationships of Cretaceous formations and units mapped. As shown on the diagram, the Gallup Sandstone and the main body of the Mancos Shale have been combined as one unit over the entire quadrangle except along the eastern edge, where they have been separated. Likewise, the tongues of the Dakota Sandstone are combined with the lower part of the Mancos Shale below the Twowells Tongue of the Dakota Sandstone over the entire quadrangle except along the eastern edge, where the main body of the Dakota Sandstone is separated as one mapped unit and where the intertongues of the Dakota Sandstone and Mancos Shale are combined with the main body of the Mancos Shale.

The igneous rocks have been grouped into Quaternary basalts, Tertiary volcanic rocks, and Tertiary basalts. The Quaternary basalts flowed from the Zuni Mountains southwest of the Grants quadrangle. The Tertiary volcanic rocks have been differentiated into at least 13 flows, each of different composition, erupting from the Mount Taylor stratovolcano (Lipman and Moench, 1972). These rock types include silicic basalt, pyroxene basalt, plagioclase basalt, andesite, rhyolite, trachyte, rhyolitic tuff, and volcanic conglomerate. More detail is shown on the map by Lipman and others, 1979. The Tertiary basalt flows erupted from hundreds of vents in the Mount Taylor volcanic field (Luedke and Smith, 1978).

DISTRIBUTION AND THICKNESS OF COAL

The coal in both the Crevasse Canyon and Menefee Formations is subbituminous in rank and tends to be thin and discontinuous. The Gibson Coal Member of the Crevasse Canyon Formation contains the greatest amount of known coal of the three coal-bearing zones. It also contains the thickest coal bed outcrop, which is traceable for several miles in Rincon-cada Canyon, T. 11 N., R. 8 W., and has a thickness of as much as 2 m (7 ft) (Hunt, 1936, locality 204). The Dilco Coal Member of the Crevasse Canyon Formation has a few thin coal beds that have a thickness of a little more than 0.6 m (2 ft) at several locations. The Cleary Coal member at the base of the Menefee Formation has a few thin coal beds. More information on the coal resources of the Grants 30′ x 60′ quadrangle can be found in Dillinger, 1989.

STRUCTURAL FEATURES

Most of the faults west of R. 3 W. in the quadrangle are normal faults trending northeast and dipping about 85° (Hunt, 1936). They tend to be subparallel and are most numerous where folding is greatest. The age of these faults and associated folds is middle Tertiary (Hunt, 1936). The amount of displacement along individual faults shown on the map ranges from about 15 m (50 ft) to about 230 m (755 ft) (Hunt, 1936). The major system of faults east of R. 3 W. occurs in an elongate northeast-trending belt, which is marked by abundant, parallel block faulting with downthrown sides mostly to the west of major faults. The amount of dip in each fault varies considerably, and the amount of displacement ranges from 155 m (509 ft) to 1,065 m (3,494 ft) (Hunt, 1936). Very little folding is associated with this fault belt, in contrast to faults to the west. The age of this eastern faulting is thought to be late Miocene to Pleistocene (Hunt, 1938).

The main fold in the Grants 30′ x 60′ quadrangle is a broad syncline that plunges northward under Mount Taylor. The structural relief under Mount Taylor is at least 455 m (1,500 ft) for 16 km (10 mi) on each side of the axis (Hunt, 1938). There are several minor folds and domes throughout the map area that have not been included on this map. Most of the sedimentary rocks are relatively flat lying.

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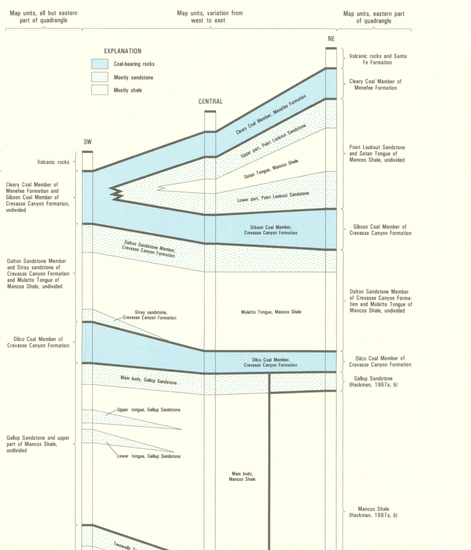

DIAGRAMMATIC SECTION SHOWING STRATIGRAPHIC RELATIONSHIPS OF CRETACEOUS FORMATIONS AND UNITS MAPPED

GEOLOGIC MAP OF THE GRANTS 30′ × 60′ QUADRANGLE, WEST-CENTRAL NEW MEXICO

By
Jean K. Dillinger

1990

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