DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

OPEN-FILE REPORT
75-258

Base from U.S. Geological Survey, 1963

Geology mapped in 1970-74

SCALE 1:24000

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
DATUM IS MEA SEA LEVEL

UTM GRID AND 1963 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

QUADRANGLE LOCATION

U.S. Geological Survey
OPEN FILE REPORT
This map is preliminary and has not been edited or reviewed for conformity with Geological Survey standards or nomenclature.

GEOLOGIC MAP OF THE CHURCH ROCK QUADRANGLE, McKINLEY COUNTY, NEW MEXICO

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CORRELATION OF MAP UNITS

Qd, Qal, Qt, Qoa	Holocene; Pleistocene?	QUATERNARY
UNCONFORMITY		
Keda, Kmm, Keda, Kmm, Kedi, Kg, Kgl, Km, Km, Kgl, Km, Kdt, Kmw, Kf	Upper Cretaceous; Upper and Lower(?) Cretaceous	CRETACEOUS
UNCONFORMITY		
Jm, Jmr, Jes, Jmr, Jes, Js, Jt, Jeu, Jem, Jef	Upper Jurassic	JURASSIC
UNCONFORMITY		
Rco, Rpu, Rpp	Upper Triassic	TRIASSIC

DESCRIPTION OF MAP UNITS

Qd EOLIAN DEPOSITS (HOLOCENE)--Unconsolidated deposits of wind-blown sand and silt

Qal ALLUVIUM AND COLLUVIUM (HOLOCENE)--Unconsolidated deposits of silt, sand, and gravel in stream valleys, on flood plains, and on upslope areas adjacent to bedrock outcrops; includes alluvial fan deposits

Qt TALUS AND LANDSLIDE DEPOSITS, AND SLUMP BLOCKS (HOLOCENE AND PLEISTOCENE?)

Qoa OLDER ALLUVIAL AND EOLIAN DEPOSITS (HOLOCENE AND PLEISTOCENE?)--Grayish-orange to yellowish-gray unconsolidated to partially consolidated silt, sand, and gravel which forms terrace and blanket deposits above modern valley flood plains, and within dissected piedmont alluvial plains, fans, and pediments

CREVASSE CANYON FORMATION (UPPER CRETACEOUS):

Keda Dalton Sandstone Member--Yellowish-gray to light-gray fine- to medium-grained silty moderately well sorted calcareous quartzose sandstone. Divisible into two tongues by an upper bed of the Mulatto Tongue (Kmm) of the Mancos Shale; upper tongue 110 feet (33 m) thick (incomplete); lower tongue 15-20 feet (5-6 m) thick

Kedl Dilco Coal Member--Dark- to light-gray, brown, and yellowish-brown carbonaceous shale and siltstone interbedded with lignite. Upper part is fine-grained sandstone, interbedded siltstone, shale, lignite, and minor amounts of low-grade coal; grades downward into basal 30-60 feet (9-18 m) of yellowish-brown to reddish-brown coarse- to very coarse-grained angular to subangular poorly sorted trough crossbedded carbonaceous feldspathic slightly calcareous sandstone. Contact with overlying Mulatto Tongue (Kmm) of Mancos Shale sharp. Thickness 160-240 feet (49-73 m)

MANCOS SHALE (UPPER CRETACEOUS):

Kmm Mulatto Tongue--Gray to brownish-gray silty shale interbedded with thin beds of gray to yellowish-gray fine-grained silty moderately well sorted calcareous sandstone; contains numerous limestone concretions. Tongue is split into an upper and a lower part by the Dalton Sandstone Member (Keda) of the Crevasse Canyon Formation. Upper part 10-15 feet (3-5 m) thick; lower part 45-65 feet (14-20 m) thick

Km Main body--Dark-olive-gray friable silty shale; locally contains indistinct beds of yellowish-brown calcareous thin-bedded to laminated sandy siltstone. Upper 200 feet (61 m) intertongues with the lower beds (Kgl) of the Gallup Sandstone. Contains indistinct beds of fossiliferous silty sandstone equivalent to the Juana Lopez Member of the Mancos Shale as mapped in adjacent quadrangles to the east. Basal contact with the Twowells Tongue of the Dakota Sandstone sharp. Thickness 500-680 feet (152-207 m)

Fossiliferous limestone bed--Poorly exposed. Equivalent in age to an upper part of the Greenhorn Limestone (W. A. Cobban, oral commun., April 1975)

Kmw Whitewater Arroyo Tongue--Yellowish-brown to yellowish-gray fossiliferous shale; locally contains thin beds of yellowish-brown sandy siltstone and sandy limestone. Upper and lower contacts gradational. Thickness 20-80 feet (6-24 m)

GALLUP SANDSTONE (UPPER CRETACEOUS):

Kg Main body--Yellowish-brown fine- to medium-grained moderately well sorted low-angle crossbedded siliceous micaceous sandstone. Upper contact sharp and marked by a thin ledge of coarse- to very coarse-grained ferruginous sandstone; lower contact gradational with the Mancos Shale. Thickness 35-70 feet (11-21 m)

Kgl Lower beds--Yellowish-brown well-sorted finely laminated to low-angle crossbedded to massive flat parallel-bedded siltstone, silty sandstone, and fine- to medium-grained sandstone. Three beds are present in the quadrangle and are interbedded with tongues of the uppermost part of the main body (Km) of Mancos Shale. The lowermost of the lower beds is laterally the most persistent. The upper two beds are tongues of the main body of the Gallup Sandstone and thin progressively eastward to pinchout. Upper contacts with Mancos tongues sharp; lower contacts gradational through a transition zone approximately 10-15 feet (3-4.5 m) thick. Thickness of individual beds ranges from 0.6-60 feet 0-18 m)

DAKOTA SANDSTONE (UPPER AND LOWER? CRETACEOUS):

Kdt Twowells Tongue--Yellowish-brown to buff medium- to fine-grained well-sorted siliceous sandstone; contains several thin lenticular beds of silty shale in the lower one third. Thins from east to west in the quadrangle; thickness 20-25 feet (6-8 m)

Kd Main body--Yellowish-brown to buff fine- to medium-grained well-sorted massive to thin-bedded planar and trough crossbedded siliceous sandstone; locally contains beds of pink and white sandstone; thin-bedded black and dark-gray carbonaceous shale at base and interbedded locally, contains lignite and plant remains; locally is slightly calcareous. To the west, grades laterally into the Whitewater Arroyo Tongue of the Mancos Shale. Contact with the underlying Morrison Formation unconformable and sharp. Thickness 50-120 feet (15-37 m)
Uranium ore occurs in basal Dakota sands in four small uranium mines, none of which are now in operation

MORRISON FORMATION (UPPER JURASSIC):

Jm Brushy Basin and Westwater Canyon Members--Sandstones in these members are altered to white, yellowish-brown, and light-grayish-white where in contact with overlying lignite and carbonaceous shale of the Dakota Sandstone. Two uranium mines, neither of which is not in operation, in the Westwater Canyon Member are within the quadrangle. Upper and lower contacts sharp and unconformable. Total thickness of the two members 130-311 feet (40-95 m)
Brushy Basin Member--Greenish- to purplish-gray sandy siltstone, clayey siltstone, and minor occurrences of thin beds and laminations of claystone. Also contains lenticular beds of yellowish-brown, pink, and white fine- to coarse-grained poorly sorted feldspathic sandstone similar in composition and bedding structure to the underlying Westwater Canyon Member; intertongues with the Westwater Canyon. Brushy Basin is truncated from the vicinity of White Rock Mesa westward by pre-Dakota erosion. Thickness 0-85 feet (0-26 m)
Westwater Canyon Member--Light-red to reddish-orange fine- to very coarse-grained poorly sorted angular to subangular friable fluvially crossbedded feldspathic sandstone and conglomeratic sandstone; commonly contains lenses and partings of silty sandstone and sandy siltstone. Locally contains calcite-cemented concretions. Thickness 130-230 feet (40-70 m)

Jmr Recapture Member--Reddish-brown to brick-red clayey siltstone and sandy siltstone interbedded with white to greenish-white, and yellowish-white fine- to medium-grained well-sorted well-rounded to subrounded sandstone. Siltstone is horizontal parallel bedded. Sandstone ranges from massive to crossbedded. Siltstone decreases in thickness and number of beds from east to west, to pinchout; where siltstones pinch out the sandstone intertongues with the underlying Cow Springs Sandstone and is mapped with it. Upper contact sharp. Thickness 0-100 feet (0-30 m)

Jes COW SPRINGS SANDSTONE (UPPER JURASSIC)--Light-greenish-gray, pale-orange, and light-reddish-brown fine- to medium-grained well-sorted well-rounded friable sandstone, variously crossbedded, massive, and flat parallel bedded. Locally contains partings of reddish-brown silty sandstone in the lower part. Intertongues and interbeds with the Recapture Member of the Morrison Formation; contains a prominent bed, which is considered a lower bed of the Recapture, of dark-reddish-brown sandy siltstone with minor amounts of nodular light-gray to reddish-gray limestone. Lower contact gradational. Thickness 320-420 feet (98-128 m)

Js SUMMERVILLE FORMATION (UPPER JURASSIC)--Reddish-brown to greenish-white very fine- to fine-grained well-sorted rounded to subrounded moderately friable calcareous silty sandstone, variously massive, flat bedded, and crossbedded. Locally contains small-scale load and slump structures. Lower contact gradational. Thickness 40-130 feet (12-40 m)

Jt TODILTO LIMESTONE (UPPER JURASSIC)--Light- to dark-gray unfossiliferous limestone and minor amounts of light-yellowish-gray fine- to very fine-grained highly calcareous laminated to low-angle crossbedded silty sandstone in basal part. Limestone grades downward into sandstone. Upper and lower contacts gradational. Thickness 2-30 feet (0.6-9 m)

ENTRADA SANDSTONE (UPPER JURASSIC):

Jeu Upper sandstone member--Reddish-orange fine- to very fine-grained well-rounded well-sorted friable locally silty sandstone, which exhibits multiple tabular sets of medium- to high-angle crossbeds. Locally contains thin lenticular beds of brick-red sandy siltstone. Thickness 170-225 feet (52-69 m)

Jem Medial siltstone member--Dark- to light-brick-red sandy siltstone, massive, well-indurated, and locally calcareous. Upper contact sharp and conformable; basal part is interbedded with the underlying Iyanbito Member. Thickness 35-65 feet (11-20 m)

Jef Iyanbito Member--Moderate-reddish-orange fine- to medium-grained well-sorted well-rounded friable locally calcareous crossbedded sandstone. Upper part contains several brick-red sandy siltstone lenses similar in lithology to the overlying medial siltstone member. Upper contact gradational; lower contact sharp and unconformable. Thickness 80-140 feet (24-43 m)

CHINLE FORMATION (UPPER TRIASSIC):

Rco Owl Rock Member--Purplish-white to greenish-gray mottled, cherty nodular limestone and light- to dark-reddish-brown to light-purple clayey siltstone in a flat-bedded alternating relationship. Beds are 1-3 feet (0.3-1 m) thick. Thickness 15-30 feet (5-9 m)

Petrified Forest Member:

Rcpu Upper part--Dark- to light-purplish-gray and reddish-gray bentonitic siltstone. Contains several thin medium- to dark-greenish-gray and dark-purplish-gray fine- to coarse-grained poorly sorted micaceous sandstone beds. Base not exposed. Thickness 775 feet (236 m)

Rcpp Sandstone bed at Perea--Thickness 15-30 feet (5-9 m)

CONTACT

FAULT--Showing vertical dip and estimated amount of displacement in feet (where measured). Dashed where inferred; dotted where concealed. U, upthrown side; D, downthrown side

MONOCLINAL FLEXURES--Showing upper and lower fold axes. Arrows indicate direction of dip; longer arrow indicates flatter dip. Dashed where inferred

ANTICLINE--Showing trace of axial plane. Dashed where inferred

STRIKE AND DIP OF BEDS

STRIKE OF VERTICAL JOINTS

URANIUM MINE OR PROSPECT

Adit

Shaft

Pit

LIMESTONE QUARRY--Mined primarily for road metal