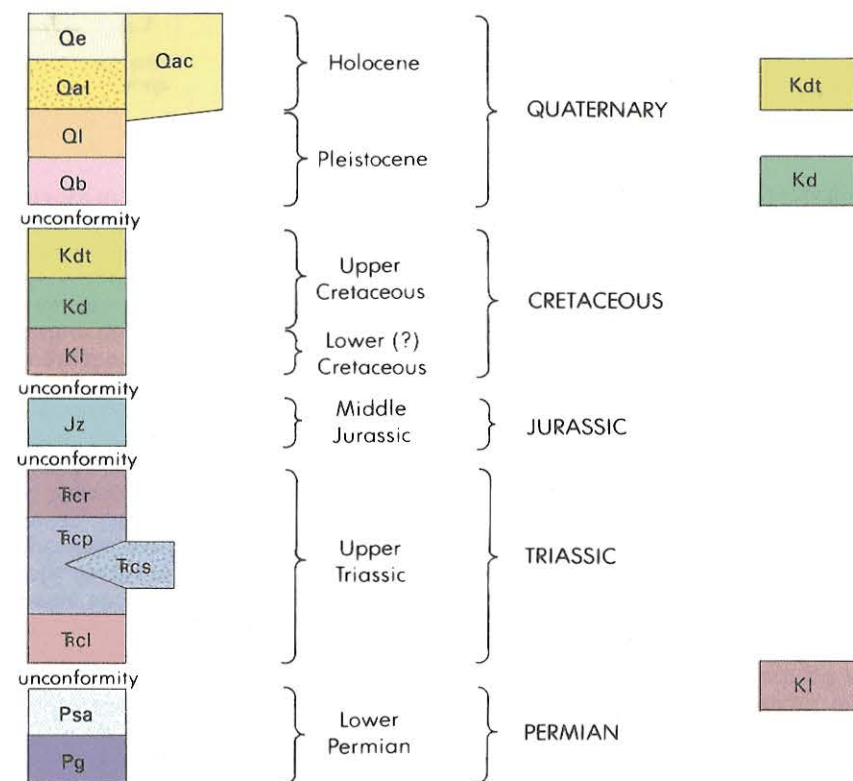


## CORRELATION OF UNITS



## DESCRIPTION OF UNITS

- Qe** **Eolian deposits (Holocene)**—Windblown silt and sand in small dunes and sheets; only the thickest accumulations shown. Entire area is characterized by small deposits oriented in an east-northeast direction; blowouts, with dunes on lee (east-northeast) side, are common in the northern part of the area
- Qal** **Alluvium (Holocene)**—Mainly silt and fine-grained sand in active stream floodplains; includes some eolian and colluvial deposits
- Qac** **Alluvium, colluvium, and eolian deposits (Holocene and Pleistocene)**—Variable mixtures of alluvium and colluvium, small landslide blocks, and small sand dunes, generally stabilized by vegetation, on windward (west-southwest) and leeward sides of cliffs and steep hills. A typical example is the slope west of the visitors center at El Morro National Monument
- Ql** **Landslide deposits (Holocene and Pleistocene)**—Large sandstone landslide blocks, talus, and mudslides; may be partly covered by colluvium and eolian deposits
- Qb** **Basalt flows (Pleistocene)**—Weathered basalt generally covered with soil, alluvium, or sand dunes; forms open grasslands with small outcrops of basalt. Rock is slightly porphyritic olivine tholeiite; ages of 0.788 Ma near Cerro Bandera east of map area and 1.38 Ma several miles southwest of map area reported by Luedke and Smith (1978). Unit includes essentially the same flows as "Qbo" of Maxwell (1986)

### Dakota Sandstone (Upper Cretaceous)

**Twowells Tongue**—Light-gray and light yellowish-gray, fine- to medium-grained sandstone; generally crossbedded; unit is poorly exposed and may not exceed 25 ft in thickness

**Main body**—Sandstone, mudstone and carbonaceous mudstone/shale, and conglomeratic sandstone. Upper part is light-gray to light yellowish-gray, fine- to medium-grained, thinly bedded, locally crossbedded sandstone; low-angle crossbeds in thin tabular sets. Top of unit, and thus upper contact of Kd, not exposed, but may include as much as 20 ft of poorly developed Whitewater Arroyo Tongue of Mancos Shale. Middle part is olive-gray and light- to dark-gray mudstone and shale with fine- to coarse-grained lenticular sandstone beds, which are commonly crossbedded. Lower part consists of medium- to coarse-grained, crossbedded sandstone and conglomeratic sandstone; pebbles in conglomeratic facies are chiefly quartzite and chert and do not exceed 1.25 inches in diameter. Lower part generally a ledge or cliff former, especially the basal 3–25 ft, which are well indurated with silica cement. Lower part is from 0 to 50 ft thick. Absent in those areas where mudstone (middle part) rests on pre-Dakota rocks. Where lower part is absent the Dakota is not a cliff former. Locally gradational into underlying reworked Zuni Sandstone. Thickness of Dakota does not exceed 125 ft

**Reworked deposits of Zuni Sandstone (Lower ? Cretaceous)**—This light-colored sandstone represents fluvial reworking of up to 30 ft of the upper part of the Zuni Sandstone; present at several locations in the region, notably in the southern part of El Morro National Monument and southward. The reworking involves redistribution of the eolian sand, oxidation, addition of some clay and chert grains and pebbles, and introduction of lenses of pebble conglomerate. The top few inches down to 1–2 ft are commonly reworked throughout the region but are not mapped separately; typical examples are found along the trail on top of the mesa above Inscription Rock

**Zuni Sandstone (Middle Jurassic)**—Generally pale yellowish-gray or tan sandstone; however, locally chalk white or pale greenish gray; very well sorted, fine- to medium-size, well-rounded grains largely of quartz; large-scale eolian crossbeds in upper part, smaller crossbeds and flat bedding in lowest part. Conspicuous bleached zone at top; locally contains crosscutting zones of red or greenish-gray staining and large, spheroidal, gray-brown nodules with calcitic cement and introduced organic material. Lowermost part contains red sandstone and thin layers of red sandy mudstone; may be equivalent to the Entrada Sandstone (Anderson, 1983). Lower contact with the Chinle Formation is not exposed. Thickness varies from approximately 200 ft in southeastern part of the quadrangle to as much as 350 ft at El Morro Lookout in sec. 4 T9N R14W

### Chinle Formation (Upper Triassic)

**Rock Point Member**—One small area of outcrop in southeastern part of quadrangle; however, Rock Point is inferred elsewhere under a cover of colluvium, talus, or basalt. Outcrops approximately 1 mi west of northwest corner of map area are composed of alternating red-brown, even-bedded, fine-grained, silty sandstone and chocolate-brown to red, thin-bedded, fine-grained sandstone that grades upward into a friable, well-sorted reddish-brown sandstone and chert-pebble conglomerate (Smith, 1958)

**Petrified Forest Member**—Grayish-red to reddish-brown and variegated purple-red shale, silty shale, and mudstone; locally mottled greenish gray; interbedded reddish-brown siltstone and friable sandstone; limestone-pebble conglomerate at top and a few thin lenses of coarse-grained sandstone near top. Petrified Forest Member mostly covered by basalt or colluvium in map area. Estimated thickness approximately 1,100 ft

**Sonsela Sandstone Member**—Yellowish-gray to grayish-red, fine- to coarse-grained sandstone with granule to pebble conglomerate; medium to thick crossbed sets; thin partings of purple-gray and red siltstone and mudstone. Appears to thin westward; maximum thickness 140 ft

**Lower member**—Grayish-red and reddish-brown sandstone interbedded with reddish-brown siltstone. Contains medium- to coarse-grained, arkosic, micaceous sandstone beds and lenses of pebble conglomerate. Both calcitic- and silicicemented facies present. Forms conspicuous dip slope in northeastern part of quadrangle. May be all or in part correlative with the Lower and Middle Triassic Moenkopi Formation. Thickness 100–150 ft

**San Andres Limestone (Lower Permian)**—Upper part is massive, pinkish-gray, fossiliferous limestone, locally containing productid brachiopods; middle part is yellowish-gray sandstone with calcitic cement, locally grading into sandy dolomitic limestone; lower part is mostly yellowish-gray to gray, thick-bedded, fossiliferous, dolomitic limestone with thin calcareous shale partings and thin sandy limestone lenses. Lower part is generally the thickest of the three. Forms cliffs and dip slopes. Total thickness 115–145 ft

**Glorieta Sandstone (Lower Permian)**—Very pure, well-sorted, white to buff, medium- to coarse-grained quartz sandstone; massively crossbedded; weathers yellow to light brown; well cemented with silica or calcite; forms cliffs, ridges, or dip slopes; approximately 150 ft thick; base not exposed in quadrangle

## MAP SYMBOLS

020



**Bearing of slickensides**—In basal Dakota Sandstone

**Measured-section locality**

(additional symbols on envelope)