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# PRELIMINARY GEOLOGIC MAP OF THE REDMAN QUADRANGLE, LOS ANGELES AND KERN COUNTIES, CALIFORNIA

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## INTRODUCTION

The Redman Quadrangle is located in the Antelope Valley region of the western Mojave Desert of Southern California. The Antelope Valley is a small, closed basin, rimmed by the San Gabriel Mountains, the Sawmill-Liebre Mountains, and the Tehachapi Mountains to the south, southwest, and northwest, respectively, and by various buttes and pediments to the north and east. The most notable boundaries, however, are the Garlock Fault to the north, which separates the Mojave province from the Basin and Range province, and the San Andreas Fault to the south, which separates the Transverse Range province (Fig. 1).

The western Mojave province, in which the Antelope Valley Basin lies, is characterized by many deep Cenozoic sedimentary basins that are separated by low hills of Mesozoic granitic and metasedimentary rocks and Tertiary volcanic rocks. These basins, which surface and geophysical observations show to trend northeast (parallel to the Garlock Fault), were depocenters for upper Tertiary and lower Quaternary sediments; many contain more than 3 km of alluvium. During Tertiary time, the area drained southwest into the Pacific Ocean. Tectonic activity along the San Andreas and Garlock faults and the uplifting of the Transverse, Tehachapi, and southern Sierra Nevada ranges reversed this drainage pattern and formed new closed basins in the Mojave Desert. In Quaternary time these basins were occupied by pluvial lakes; one in particular, Lake Thompson, covered about 500 $km^2$ and was perhaps as deep as 20 m. Today Lake Thompson is represented by the playas Buckhorn, Rosamond, and Rogers dry lakes (Thompson, 1929).

## STRATIGRAPHIC UNITS

Local rock units in the area include tuffs, lava flows, and sediments of the Tertiary Tropico Formation, Tertiary fanglomerates, Tertiary intrusive rhyolites and dacites, and deeply weathered Mesozoic granitic rocks. Dibblee (1967) gives excellent background on this subject. Exposed local Quaternary geologic units include sandy alluvium, playa clay, and beach deposits, most of which are late Quaternary in age and related to pluvial Lake Thompson.

Late Quaternary and Holocene drainages into the playas are from the west and south, along the Garlock and San Andreas faults. Much of the surface west of the playas is exposed granitic rocks and fine pediment gravel, cut by well-defined shallow arroyos. The eastern side of Rogers Lake has a gentler slope characterized by several long, low alluvial fans and fan segments, some of which were periodically innundated with fluctuations in Lake Thompson. South of the playas, long channels have supplied sediment to both the former and modern lakes, channels, such as Big Rock Creek and Little Rock Creek, associated with large alluvial fans along the front of the San Gabriel Mountains. Ponti and Burke (1980) and Ponti and others (1981) have characterized the exposed alluvium as late Pleistocene (90,000 ybp) to Holocene (4,000 ybp) medium grained, moderately to well sorted, moderately to well stratified sediments with textural and soil development characteristics that are dominated by the addition of calcium carbonate during groundwater fluctuations of pluvial lake stands.

Other Quaternary and Tertiary units in the area have been described by well data (Dutcher and Worts, 1963; Neal and Motts, 1967; Neal, 1968). These units are principally alluvial fan and channel deposits from the south as the Transverse Range (San Gabriel Mts.) were uplifted, and the north as the Tehachapis shed debris.

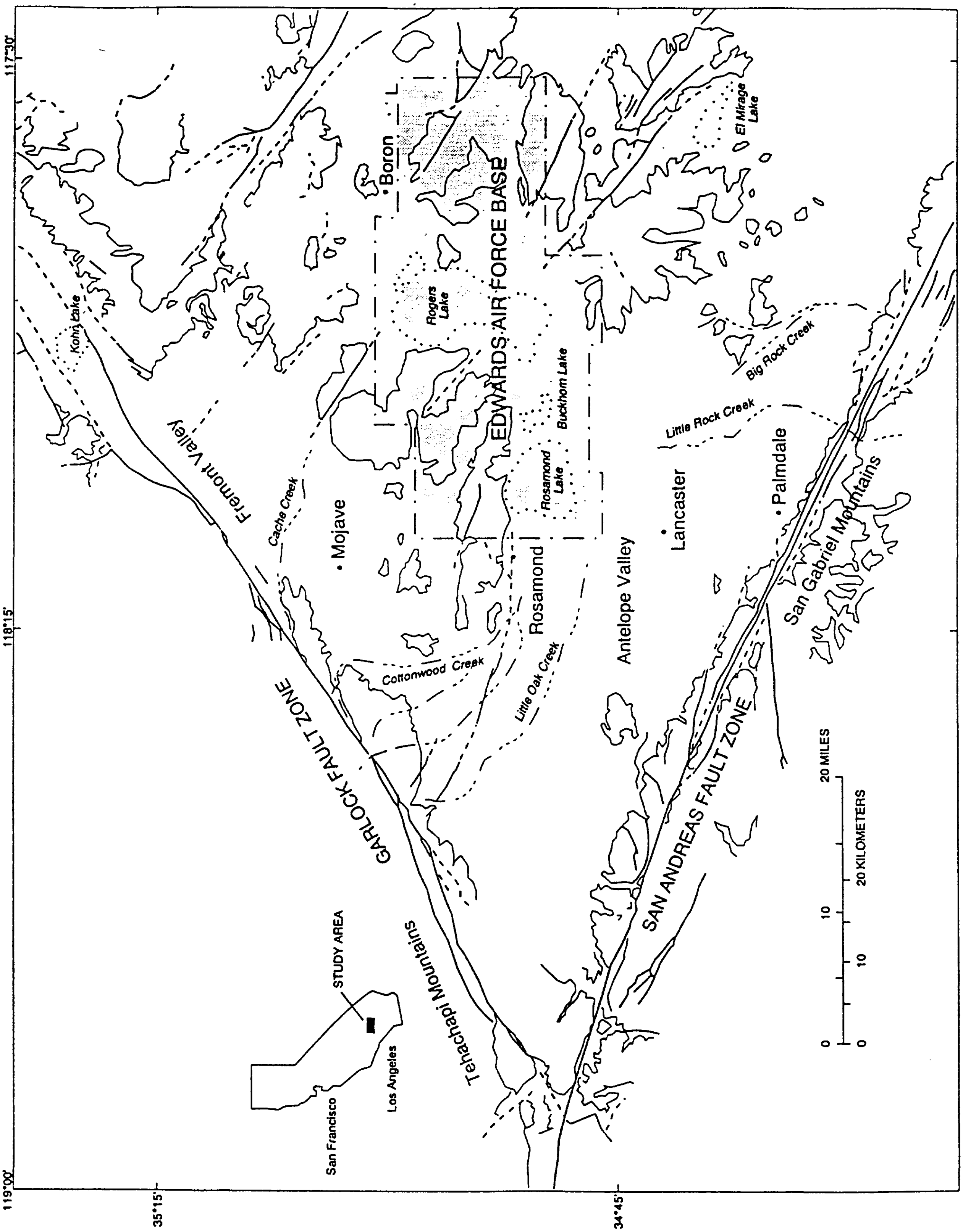


Figure 1. Sketch map showing major features in the western Mojave Desert.

## STRUCTURAL SETTING

Maybey (1960) first recognized the East Antelope Basin from a 40-mgal gravity low and suggested that the steep gravity gradients may be fault controlled. The gravity signature suggests that this is a northeast-trending basin, which is deepest just southwest of Rosamond Lake and shallows to the northeast. Confirmation of this being a fault-bounded basin (at least on the northwest side) has come from gravity data (Morin and others, in press) and also from a series of resistivity anomalies (Zohdy, 1990), as well as subtle surface escarpments, alignment of historical spring discharge mounds trending N30-45E, and steep hydrologic gradients (Ward and others, 1991). The southeast boundary of the basin is less apparent, however, but is definable from field observations and geophysics.

Known and inferred faults in the immediate area trend northwest. Major faults can be recognized from juxtaposed bedrock units and associated with long, linear valleys (with Quaternary and Holocene alluvium) that lead to the playa. Dibblee (1967) considers that several such features may have controlled the development and shape of Rogers Lake; the El Mirage fault and several unnamed faults along the north and south edges of the dry lake define and give the playa its hourglass shape. We consider further that the El Mirage Fault probably extends beneath the central portion of the playa and connects with the Bissell Hills fault.

We consider that a geographic "corridor" in the southern part of Edwards AFB is a geologic fault zone, which we herein informally called the Antelope Valley Fault Zone (AVFZ; Ward and Dixon, 1994; Dixon and Ward, 1994a,b). This corridor trends approximately N30E to N40E, and extends from south of Rosamond Playa to the southwestern part of Rogers Lake, a distance of at least 10 km. Ward and Dixon (1994) and Dixon and Ward (1994a,b) recognize no disturbances of the surface in the AVFZ. This corridor is characterized, however, by several depressions that are former (historically active) spring discharge areas in the Redman Quadrangle (e.g., R10W, T9N, Sec. 23 and 27). These springs (some up to approximately 30 m in diameter) are circular depressed features, containing loamy soil and peat and commonly surrounded by dead mesquite.

## GEOLOGIC UNITS IN THE REDMAN QUADRANGLE

D **Disturbed Ground (Holocene)**-- Surfaces disrupted by construction and development

Qhs **Spring Deposits (Holocene)**--Clusters of spring discharge areas. Dark, loamy material in a collapsed center 5-30 m in diameter, surrounded by remains of mesquite. Considerer to be localized along buried fault traces

Qah **Alluvium (Holocene)**--Sand and silt (and minor fine gravel) in active channels and dry washes. Contains unconsolidated and unsorted granitic sediments; fines often have been reworked by wind into ripples

Qes **Eolian Sand (Holocene and Late Pleistocene)**--Fine to medium and coarse sand composed of feldspar and quartz, principally on the lee of hills marginal to Rogers Lake

Qaf **Fan Alluvium (Late Pleistocene)**--Thin deposits of alluvium in fans on slopes immediately adjacent to pluvial Lake Thompson. Moderately sorted sediment derived principally from local granitic rocks, with minor amounts of volcanic and metamorphic rock fragments. On northwest side of Rogers Lake (north half of quadrangle), deposits are thin (often <1 m) and associated with pediment gravels and exposed, weathered granitic rocks; mapped here as undifferentiated (Qaf). On south side, however (south half of quadrangle), several deposits can be distinguished tentatively by topographic expression and stratigraphic position (older deposits are topographically higher and incised by channels leading to lower, younger fans. Mapped on southeast side of quadrangle as undifferentiated (Qafu) and older to younger (Qaf1-Qaf3) deposits. Undifferentiated units Qaf and Qafu are considered equivalent to Quca of Ponti and Burke (1980) and Ponti and others (1981) -- late Pleistocene (90,000 ybp) to Holocene (4,000 ybp), undifferentiated alluvial sediments around pluvial lake shorelines; medium grained, moderately to well sorted, moderately to well stratified, but with textural and soil development characteristics that are dominated by the addition of calcium carbonate during groundwater fluctuations of pluvial lake stands. Qaf1-3 sediments correspond to Q4-Q5 sediments of Ponti and Burke (1980) and Ponti and others (1981) in age ranges of 90,000-17,000 ybp (Q4-Q5)

Qca **Channel Alluvium (Late Pleistocene)**--Thin deposits of alluvium in channelways leading to pluvial Lake Thompson and Holocene playas. Moderately to well sorted sediment derived principally from Mesozoic and Precambrian igneous and metamorphic rocks in the San Gabriel Mountains and transported along major washes (e.g., Big Rock Creek) associated with large alluvial fans along the mountain front. Mapped as undifferentiated (Qcau) and older to younger (Qca1-Qca3) deposits. Considered equivalent to alluvial fan deposits (Qaf)

Qpc **Playa Deposits (Late Pleistocene)**--Clay and silt of Lake Thompson, thinly stratified on flat floor of Rogers Dry Lake

Qbb **Beach Bar (Late Pleistocene)**--Ridges and hills of sand and gravel along shoreline of Lake Thompson, stratified, with 1-2-cm-thick gravel layers alternating with 1-m-thick sand beds. May have eolian sand cap of <1m

Qcs **Clayey Sand (Late Pleistocene)**--Moderately indurated, cohesive beach deposits, composed of coarse to fine sands, silt, and clay, at margins of Rogers Lake. Deposits are indurated by the desiccation of clays but also contain $CaCO_3$

Qsc **Sandy Clay (Late Pleistocene)**--Stratified, silty clay deposits interbedded with clayey sand deposits (Qcs), but probably transitional between playa clay deposits (Qpc) and clayey sands (Qcs)

Qpg **Pediment Gravel (Pleistocene)**--Grus and thin (undifferentiated) fan alluvium above Rogers Lake. Probably thin remnant of older fan alluvium mostly removed by erosion, exposing weathered surface on bedrock

Tf **Fanglomerate (Tertiary?)**--Poorly sorted granitic detrital clasts in a weakly consolidated matrix of sand derived from plutonic rocks. Composed primarily of quartz monzonite (with blocks up to 2-3 m in diameter), with lessor amounts of leucogranite pebbles and cobbles. Admixtures of dark reddish brown quartz latite and dacite fragments total <2%

Klqm **Quartz Monzonite/Monzodiorite (Cretaceous?)**--Light grayish white, medium grained granitic rocks. Color index 5-10; dark where altered. Composed of quartz, potassic feldspar, plagioclase, biotite (dark where fresh), minor hornblende and sphene (3-4 mm). Surface is weathered to depths of three to ten m (altered gruss) at most exposures

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Contact, dashed where inferred, dotted where concealed.

Fault, dotted where concealed and approximated; bar and ball on downthrown side.

Qhs Hot springs, inactive.

## CORRELATION OF UNITS

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Qah | Qhs | D | | | | | | | Holocene | QUATERNARY |
| Qes | | | | | | | | | Holocene/ Pleistocene | |
| Qaf3 | Qafu | Qaf | Qca3 | Qca | Qsc | Qcs | Qpc | Qbb | Late Pleistocene | |
| Qaf2 | | | Qca2 | | | | | | | |
| Qaf2 | | | Qcal | | | | | | | |
| Qafl | | | | | | | | | | |
| Qpg | | | | | | | | | Pleistocene | |
| Tf | | | | | | | | | | TERTIARY? |
| unconformity | | | | | | | | | | |
| Klqm | | | | | | | | | | CRETACEOUS? |