Prepared in cooperation
with the
Nevada Bureau of Mines and Geology

OPEN-FILE REPORT
92-177

Base from U.S. Geological Survey, 1:24,000,
Blue Diamond SE, Nevada, 1972

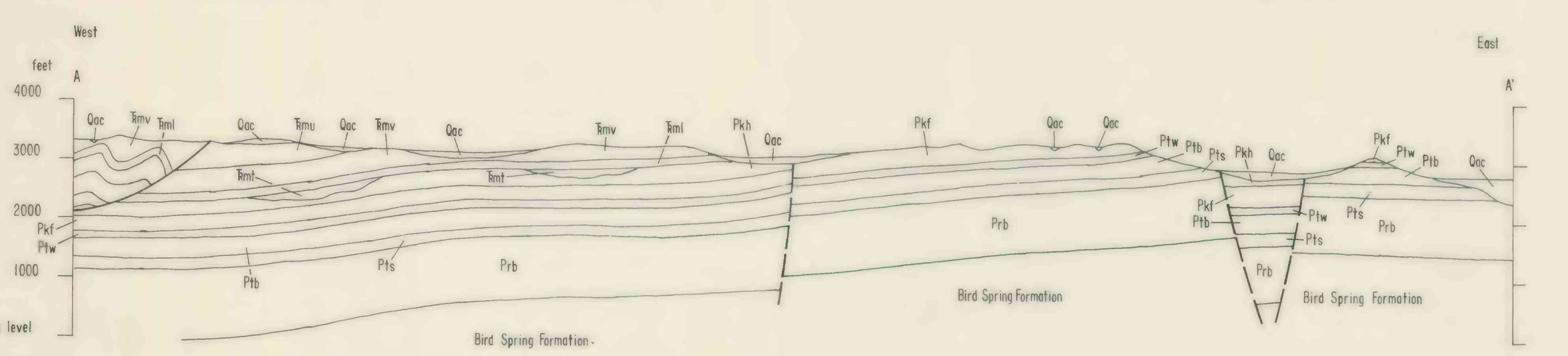
SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

UTM GRID AND 1983 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

QUADRANGLE LOCATION

Geology mapped in 1988 by Cheryl McDonnell-Canan and 1991 by M.D. Carr



BEDROCK GEOLOGIC MAP OF THE BLUE DIAMOND SE 7.5' QUADRANGLE, CLARK COUNTY, NEVADA

By

Michael D. Carr and Cheryl McDonnell-Canan

1992

CORRELATION OF MAP UNITS

Qac — Quaternary

Angular unconformity

Triassic:
- Ŧmu
- Ŧmv
- Ŧml
- Ŧmt

Disconformity

Permian:
- Pkh
- Pkf

Disconformity

- Ptw
- Ptb
- Pts

Disconformity

- Prb

BEDROCK GEOLOGIC MAP OF THE BLUE DIAMOND SE 7.5' QUADRANGLE, CLARK COUNTY, NEVADA

by

Michael D. Carr[1] and Cheryl McDonnell-Canan[2]

INTRODUCTION

The Blue Diamond SE 7.5" quadrangle is situated immediately west of the outskirts of the city of Las Vegas, Nevada, covering the easternmost foothills of the northern Spring Mountains and adjacent parts of Las Vegas Valley (fig. 1). The landscape is dominated by a gently westward-sloping, bedrock-supported plateau in the central, west-central, and northwest parts of the quadrangle. The east face of the plateau is a precipitous escarpment having nearly 200 m of topographic relief. The remainder of the quadrangle covers areas of broad coalescing alluvial fans. Drainage is from the west, originating in the Spring Mountains, and is concentrated in two major washes--Red Rock Wash in the north and Tropicana Wash in the south. Both of these washes pose significant flash flood hazards for the city of Las Vegas. In the east and south parts of the quadrangle, several isolated hills of bedrock protrude through the alluvial cover.

Spurr (1903, fig. 24) presented a geologic section of the Spring Mountains at approximately the latitude of the Blue Diamond SE quadrangle, providing a general stratigraphy of the bedrock plateau in the western part of the quadrangle and inferring the presence of the Bird Spring thrust fault of Hewett (1931) at the east base of Blue Diamond Hill (fig. 1), immediately west of the quadrangle boundary. The area was covered by a geologic map and section by Glock (1929, figs.2 and 3), who further refined the stratigraphy and structure. Glock's mapping also served as the principal source covering the Blue Diamond area for a regional geologic map compilation by Longwell and others (1965). More recently, Burchfiel and others (1974) and Axen (1985) published maps of adjacent parts of the Spring Mountains, which further defined the structural framework of the region.

The bedrock units recognized in the present mapping are, for the most part, correlated with stratigraphy defined on the Colorado Plateau (table 1). Bedrock exposed in the quadrangle consists of Permian and Triassic shallow marine carbonate rocks, fine-grained clastic rocks, and evaporites, as well as non-marine red beds, consisting of shale, sandstone, and sparse conglomerate, all deposited along the western margin of the cratonic platform of ancient North America. These strata are mapped herein as the Permian red beds of Longwell and others (1965) and members of the Toroweap, Kaibab, and Moenkopi Formations (table 1).

The Permian and Triassic strata supporting the plateau in the western part of the quadrangle dip gently westward. The plateau is cut by a set of north-northwestward-striking normal faults. These faults dip both eastward and westward and have throws ranging from a few meters possibly to more than 1000 m. The faults project are probably a southward continuation of northward- to northwestward-striking, steeply dipping faults in the La Madre Mountain area (fig. 1) described by Davis (1973) and Axen (1985). The Permian and Triassic strata forming the isolated bedrock hills elsewhere in the quadrangle are, for the most part, also gently dipping.

Eastward-vergent folding and minor thrust faulting in the Moenkopi Formation along the west edge of the southwest quarter of the quadrangle represents deformation in the lower plate of the Bird Spring thrust fault (fig.1), immediately below the main Bird Spring thrust surface. The style of deformation is best expressed on the hills north of the Blue Diamond road at the west edge of the map. There, the well-bedded Virgin Limestone Member of the Moenkopi Formation is involved in a series of open to closely appressed folds, having axial surfaces that are upright to moderately inclined to the west. Eastward-facing limbs of these folds dip moderately to steeply and locally are steeply overturned toward the east. Dips of the westward-facing limbs are moderate to gentle. Some folds are discontinuous along their hingelines and die out into homoclinal strata within the outcrop area. The westernmost of the anticlines in this series of folds can be traced southward from a nearly upright, open fold at the north edge of the outcrop area, through an eastward-overturned, close fold, to a fold-thrust structure at the south edge of the outcrop area. The easternmost of the folds is an eastward-overturned, reclined frontal anticline in the upper plate of a moderately (40°W.) westward-dipping thrust fault, which placed the Virgin Limestone Member eastward over the upper part of the Moenkopi Formation.

Bedrock exposed at the northwest corner of the map area is more complexly deformed than bedrock in other parts of the quadrangle. In part, this is because of an increase in the density and displacements of faults belonging to the north-northwest striking system of steeply dipping faults. The increased complexity also is due, in part, to folding that predated the formation of the north-northwest-striking fault system. The style of folding in the northwest corner of the map area, although not well exposed, is similar to that in the area north of the Blue Diamond road described above. Better exposures of this style of folding are present farther north in the contiguous bedrock hills in the southwest corner of the Blue Diamond NE 7.5' quadrangle. A series of arguments based on exposures outside the Blue Diamond SE quadrangle can be advanced to suggest that the folding in the northwest corner of the quadrangle and in the hills farther north are genetically related to deformation along the northern continuation of the Bird Spring thrust fault, but there is no evidence from the quadrangle that materially contributes to this interpretation.

Gypsum has been mined from the Woods Ranch Member of the Toroweap Formation nearly everywhere that the member is exposed in the quadrangle. At Blue Diamond Hill immediately west of the quadrangle, economically profitable gypsum deposits have been mined from the Harrisburg Member of the Kaibab Formation in a part of the section not present within the Blue Diamond SE quadrangle. Gravel has been excavated from Quaternary alluvial fan deposits on the outskirts of Las Vegas at the northeast corner of the quadrangle.

The present mapping was done on 1:31,680-scale natural color aerial photographs (U.S. Bureau of Land Management Project N-05 FY76). Data were transferred to scale-stable topographic base materials using a Kern PG-2 plotter.

DESCRIPTION OF MAP UNITS

af — **Artificial fill (Historical)**--unconsolidated mine tailings. Not shown on geologic section or correlation of map units

Qac — **Alluvial and colluvial deposits (Holocene and (or) Pleistocene)**--includes:

- **Modern alluvial and colluvial deposits (Holocene)**--Pink to pale-brown fine sand to cobble gravel in incised active stream channels and on alluvial flats and colluvial surfaces. Calcium carbonate coatings on limestone and dolomite clasts. Stage I and II calcium carbonate soil horizons. Thickness 1 to 5 m
- **Young alluvial deposits (Holocene or Pleistocene)**--Pink to pale-brown and brownish-gray fine sand to cobble gravel forming terraces. Scattered calcrete rubble litters terrace surfaces. Stage II to III calcium carbonate soil horizons. Thickness 1 to 8 m
- **Intermediate alluvial deposits (Pleistocene)**--Pink to brown pebble to cobble gravel forming intermediate aged alluvial fans. Contains clasts of limestone, dolomite, and Aztec Sandstone with moderate desert varnish. Stage IV calcium carbonate soil horizon, 1.5 to 2 m thick, near fan surface. Continuous cover calcrete rubble on fan surface. Thickness 5 to 20 m
- **Older alluvial deposits (Pleistocene)**--Light-gray to pinkish-brown pebble to cobble gravel forming oldest alluvial fans. Stage IV calcium carbonate soil horizon 3 m thick. Continuous cover of calcrete rubble on fan surface. Contains clasts of limestone, dolomite and subordinate Aztec Sandstone. Clasts are strongly etched. Thickness 10 to 50 m

Moenkopi Formation (Triassic)

Ŧmu — **Upper part**--Includes upper red, Shnabkaib, and middle red members, undivided. Upper part is chalk-white through cream, ash-gray, tan, pink-gray, and light-brown interbedded claystone, dolomicrite, shale, siltstone, gypsiferous sediment, and thin limestone. Weathers light gray to grayish white. Thickness 62 m. Lower part is red, reddish-brown, and brown, well-indurated, ripple-marked, well-bedded siltstone, fine-grained sandstone, mudstone, claystone, and thin beds of gypsum. Weathers light reddish-brown. Thickness 30 m

Ŧmv — **Virgin Limestone Member**--Cream, yellow, light-brown, ash-gray to medium-gray interbedded oolitic, stylolitic, algal, stromatolitic, and skeletal limestone, dolomite, gypsum, siltstone, and fine-grained sandstone. Weathers light gray to yellowish brown. Maximum thickness 110 m

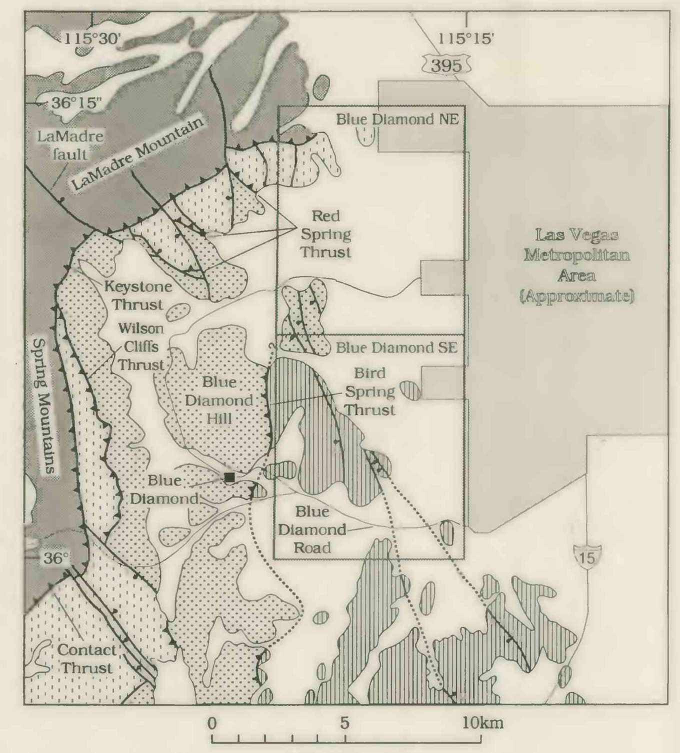
Ŧml — **Lower red member**--Red to reddish brown siltstone, sandstone, limestone, shale, and minor gypsiferous siltstone. Weathers light reddish brown. Maximum thickness 52 m

Ŧmt — **Timpoweap Member**--Dark-gray to reddish-brown pebble to cobble conglomerate. Contains rounded clasts of limestone and cheri derived from Kaibab Limestone as well as clasts of red calcareous sandstone. Weathers medium to reddish gray. Maximum thickness 12 m

Kaibab Formation (Permian)

Pkh — **Harrisburg Member**--Light-gray, tan, and cream dolomicrite and cherty dolomicrite, dolomitic limestone, bedded gypsum, and gypsiferous red beds (shale and claystone) in lowermost part. Weathers light to medium gray. Maximum thickness 75 m

Pkf — **Fossil Mountain Member**--Medium-gray, thick-bedded, massive cherty limestone and cherty dolomitic limestone. Contains fragments of brachiopods, bryozoans, algal mats, and algal limestone. Weathers light gray. Maximum thickness 75 m



EXPLANATION

- Surficial deposits (Quaternary)
- Autochthonous rocks
- Bird Spring thrust plate
- Contact-Wilson Cliffs-Red Spring thrust plate
- Keystone thrust plate

Figure 1. Generalized geologic map of northern Spring Mountains and Las Vegas Valley showing location of Blue Diamond SE 7.5' quadrangle. Modified after Longwell and others (1965).

Toroweap Formation (Permian)

Ptw — **Woods Ranch Member**--Tan, pink, red, and gray interbedded shale, dolomicrite, siltstone, shale, and interbedded impure gypsum. Weathers light reddish gray. Maximum thickness 30 m

Ptb — **Brady Canyon Member**--Gray, pinkish-gray, and lavendar-gray, massive dolomitic limestone and cherty dolomitic limestone. Contains fragments of brachiopods and pelecypods. Weathers light to medium gray. Maximum thickness 67 m

Pts — **Seligman Member**--Buff to red interbedded siltstone, very fine-grained sandstone, and gypsum. Some siltstone and sandstone beds are gypsiferous. Dolomite and dolomitic sandstone present in uppermost part. Weathers light reddish gray. Maximum thickness 60 m

Prb — **Red beds (Permian)**--Pinkish-gray, thick-bedded, prominently cross-bedded sandstone interlayered with reddish sandy shale and fine-grained sandstone. Maximum thickness 305 m

Bird Spring Formation (Permian to Mississippian)--Light- to medium-brownish-gray interbedded micrite, fusulinid limestone, sandy limestone, and dolostone. Also contains sparse intervals of light brown quartz arenite and shale. Chert nodules and layers and silicified fossils common in some intervals. Well bedded; beds range from thin to thick. Depicted only on geologic section; not exposed in Blue Diamond SE quadrangle

Contact

Fault--Dashed where inferred, dotted where inferred beneath alluvial cover. Arrow and number indicate measured dip direction and dip of fault surface. Relative vertical displacement indicated by bar and ball on down-thrown side

Thrust fault--Barbs on upper plate

Axial trace of fold--Dashed where inferred

- **Anticline**
- **Overturned anticline**
- **Syncline**

Strike and dip of beds

- 15 **Inclined**
- 75 **Overturned**

ACKNOWLEDGEMENTS

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Table 1. Stratigraphic nommenclature of bedrock units used in the Blue Diamond SE 7.5' quadrangle.

Unit name	Type area	Reference
Moenkopi Formation	Grand Canyon, Ariz.	Ward (1901)
Upper part*	none	informal usage in this report
Virgin Limestone Member	Washington Co., Utah	Bassler and Reeside (1921)
Lower red member	Zion Nat'l Mon., Utah	Gregory and Williams (1947)
Timpoweap Member	Zion Nat'l Mon., Utah	Gregory and Williams (1947)
Kaibab Formation	Kaibab Plateau, Ariz.	Darton (1910), McKee (1937)
Harrisburg Member	Washington Co., Utah	Bassler and Reeside (1921)
Fossil Mountain Member	Mohave Co., Ariz.	Sorauf (1963)
Toroweap Formation	Grand Canyon, Ariz.	McKee (1937)
Woods Ranch Member	Mohave Co., Ariz.	Sorauf (1963)
Brady Canyon Member	Mohave Co., Ariz.	Sorauf (1963)
Seligman Member	Mohave Co., Ariz.	Sorauf (1963)
Red beds	none	Longwell and others (1965)
Bird Spring Formation	Goodsprings, Nev.	Hewett, 1931

*Includes upper red member of Gregory and Williams (1947), Shnabkaib shale member (Bassler and Reeside, 1921), and middle red member of Gregory and Williams (1947), undivided.