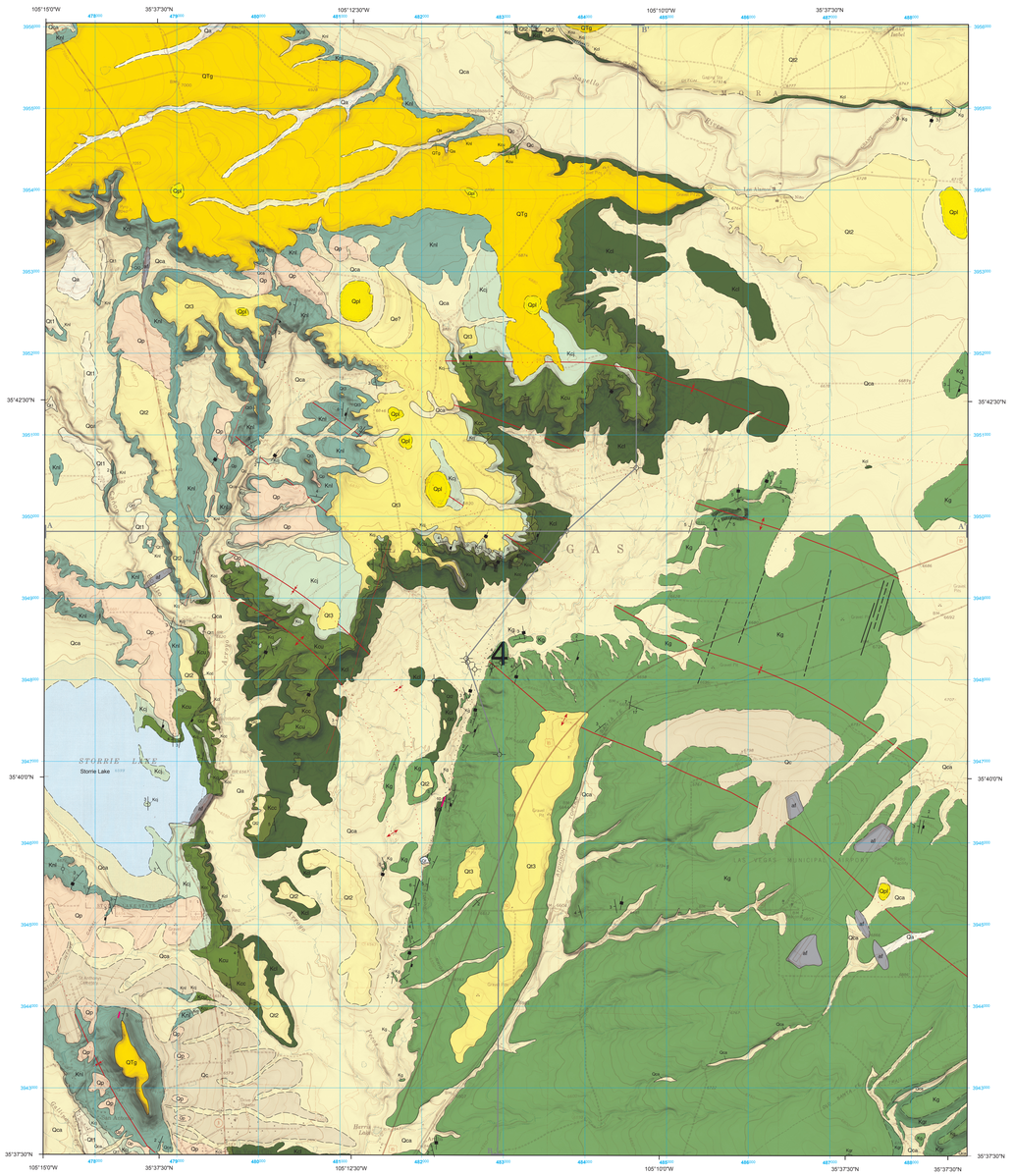
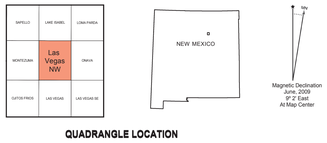


Base map from U.S. Geological Survey 1948, from photographs taken 1946, field checked in 1947, edited in 1948.
Polyconic Projection, 1927 North American datum. Reprojected to UTM projection – zone 13N
1000-meter Universal Transverse Mercator grid, zone 13, shown in red



QUADRANGLE LOCATION

1:24,000

1 0.5 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0.5 0 1 Kilometers

CONTOUR INTERVAL 25 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

New Mexico Bureau of Geology and Mineral Resources
Open-file Map Series
OFGM 78

Geologic map of the Las Vegas NW quadrangle, San Miguel County, New Mexico

May 2003

by
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COMMENTS TO MAP USERS

A geologic map displays information on the distribution, nature, orientation, and age relationships of rock and deposits and the occurrence of structural features. Geologic and fault contacts are irregular surfaces that form boundaries between different types or ages of units. Data depicted on this geologic quadrangle map may be based on any of the following: reconnaissance field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation. Locations of contacts are not surveyed, but are plotted by interpretation of the position of a given contact onto a topographic base map; therefore, the accuracy of contact locations depends on the scale of mapping and the interpretation of the geologist(s). Any enlargement of this map could cause misunderstanding in the detail of mapping and may result in erroneous interpretations. Site-specific conditions should be verified by detailed surface mapping or subsurface exploration. Topographic and cultural changes associated with recent development may not be shown.

Cross sections are constructed based upon the interpretations of the author made from geologic mapping, and available geophysical, and subsurface (drillhole) data. Cross-sections should be used as an aid to understanding the general geologic framework of the map area, and not be the sole source of information for use in locating or designing wells, buildings, roads, or other man-made structures.

The map has not been reviewed according to New Mexico Bureau of Geology and Mineral Resources standards. The contents of the report and map should not be considered final and complete until reviewed and published by the New Mexico Bureau of Geology and Mineral Resources. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the State of New Mexico, or the U.S. Government.

Mapping of this quadrangle was funded by a matching-funds grant from the STATEMAP program of the National Cooperative Geologic Mapping Act, administered by the U.S. Geological Survey, and by the New Mexico Bureau of Geology and Mineral Resources, (Dr. Peter A. Scholle, Director and State Geologist, Dr. J. Michael Timmons, Geologic Mapping Program Manager).

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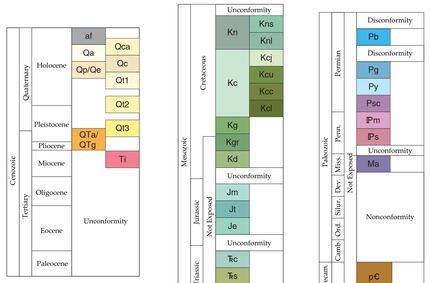
This and other STATEMAP quadrangles are available for free download in both PDF and ArcGIS formats at:

http://geoinfo.nmt.edu



Map Symbols

Geologic Cross Section

Contact: Dashed where inferred, dotted where covered.

Fault: Dashed where inferred, dotted where covered.

Anticline and Syncline: Trace of axial plane showing plunge direction; dashed where approximately located.

Dip and strike of bedding.

Dip of fault or dike.

Fault Joints: Inclined and vertical.

Dip and strike of flow foliation.

FIGURE 1—Bioclastic limestone slabs of Juana Lopez member of the Carlisle Shale along the south side of Storrie Lake near dam. Sangre de Cristo Mountains west of Las Vegas NW quadrangle in distance. View to the west.

FIGURE 2—Pliocene(?) dike (arrow) intruded into Carlisle Shale along New Mexico Highway 3 north of Storrie Lake Dam.

References

Baltz, E. H., 1972, Geologic map and cross-sections of the Gallinas Creek area, Sangre de Cristo Mountains, San Miguel County, New Mexico: U.S. Geological Survey Miscellaneous Geologic Investigations Map I-673, scale 1:24,000.

Baltz, E. H., and O'Neil, M. J., 1986, Geologic map and cross sections of the Sapello River area, Sangre de Cristo Mountains, Mora and San Mignties, New Mexico: U.S. Geological Survey Miscellaneous Investigations Series Map I-1575.

Skotnicki, S., 2003, Geologic map of the Las Vegas 7.5' quadrangle, San Miguel County, New Mexico: New Mexico Bureau of Geology and Mineral Resources, Open File Geological Map, OF-GM 72.

Igneous Rocks

Ti — **Dike (Pliocene?)**—Dark-colored, fine-grained, intermediate-composition: strongly magnetic. Weathers to orange-tan color: spheroidal weathering common. One and one-half meter (5ft) maximum width with narrow adjacent hornfels in wall rock. Dikes trend N.15°E

Sedimentary Rocks

af — **Anthropogenic deposits (modern)**—These constructed deposits comprise small earthen dams and airport and road fill.

Quaternary Deposits

Qa — **Alluvium**—Mud, sand and gravel along stream courses which is moved by normal stream flow or during storm events.

Qca — **Holocene alluvial deposits**—This unit is a composite of alluvium and colluvium. Channel areas commonly contain gravel, sand, silt and clay moved during periods of stream flow. The surrounding lowlands are underlain by fine sand, clay and silt derived from the subcrop or, locally, represent flood plains. The greatest expanse occurs where the bedrock is shale.

Qe — **Eolian deposits**—Fine-grained, wind-blown sand and silt along the eastern flank of playas.

Qpl — **Playa/Lacustrine deposits**—Silt and fine-grained sand on the floors of present-day dry playa lakes. Because the deposits are undissected, the thicknesses and internal characteristics of these deposits are unknown.

Qc — **Colluvium**—Dark-gray silt and clay deposits lying on the Greenhorn Limestone north of airport. Probably derived by weathering of the overlying Carlisle Shale.

Qp — **Pediment gravel**—Reworked gravel, sand, and silt from older terrace deposits. Clasts are dominantly Precambrian granite and quartzite.

Terrace Deposits

Subrounded to well-rounded, moderately sorted clasts similar to those in map unit QTa.

Qt1 — **Middle Pleistocene(?) stream terrace**—Forms flat terraces at levels 9-12 m (30- 40 ft) above arroyo floors.

Qt2 — **Middle Pleistocene(?) stream terrace**—Approximately 30 m (100) ft above Pecos Arroyo.

Qt3 — **Early Pleistocene(?) stream terrace**—Gently southward-sloping basal contact approximately 30 m (180 ft) above Pecos Arroyo. The deposits may represent a paleo-flow direction for Sapello River southward into the headwaters of the Pecos River drainage basin.

Quaternary or Tertiary

QTa — **Alluvial fan of Sapello River (Quaternary or Tertiary)**—Sand, silt, and poorly sorted, well-rounded pebbles to cobbles of white to tan quartzite, fine- to medium-grained amphibolite, foliated diorite/granodiorite, pink, weakly- to moderately-foliated coarse-grained granite, coarse-grained leucogranite, white coarse-grained vein quartz, minor fossiliferous (crinoidal) limestone, brown sandstone, and chert. This unit is at least 9 m (30 ft) thick and strongly cemented by caliche in the upper portion. Deposits are 15-45 m (50-150 ft) above the Sapello River and are extensively mined for sand and gravel along the north side of Sapello River just north of the quadrangle. Elevation of basal contact rises from 2,060 m (6,800 ft) to 2,151 m (7,100 ft) across the map area.

QTg — **Alluvial fan or ancient terrace deposits of Gallina Creek (Quaternary or Tertiary)**—Sand, silt, and poorly sorted, well-rounded pebbles to cobbles of white to tan quartzite, moderately-foliated to coarse-grained alkali feldspar granite and lesser amounts of white coarse-grained vein quartz, minor fossiliferous (crinoidal) limestone, brown sandstone, and chert. This unit is at least 6 m (20 ft) thick with variable amounts of caliche cement. Deposits are 60-76 m (200-250 ft) above Gallina Creek and were mined for sand and gravel.

Cretaceous

Kn — **Niobrara Formation (Upper Cretaceous)**—Medium-gray shale and calcareous shale. Baltz and O'Neil (1986) report that the lower part, about 8 m (26 ft) thick, contains shale, slightly fossiliferous marly claystone, and a few thin beds of gray limestone all of which are paleontologically equivalent to the Fort Hays Limestone Member of the Niobrara. This unit is exposed locally along the south side of Storrie Lake and in slopes along the east side of Gallinas Creek, but was not mapped as a separate unit. Maximum remaining thickness of the shale unit (**Kn**) at the west margin of the quadrangle is about 100 m (330 ft). The upper portion of the formation includes a section of fine-grained sandstone (Baltz, 1972) which is not present in the Las Vegas NW Quadrangle, but shown (**Kns**) on cross section AA'.

Kc — **Carlile Shale (Upper Cretaceous)**—The Carlile Shale is mapped as four members, which from the base upward are, a lower shale member, the Codell sandstone member, an upper shale member, and the Juana Lopez member. A thin section of shale may lie above the Juana Lopez, but was included here in the Niobrara Shale. The total thickness is about 104 m (340 ft).

Kcj — **Juana Lopez Member**—Brown-gray platy bedded, highly fossiliferous to bio-clastic, arenaceous, sparry limestone and interbedded thin bentonite beds and calcareous gray shale. Limestone contains abundant needle-like fragments of Inoceramus shells. Near the top, contains Scaphites whitfieldi and Priocyclus wyomingensis: near the base contains Prionocyclus macombi, and Lopha lugubris (Baltz and O'Neil, 1986). About 5 m (16 ft) thick.

Kcu — **Upper shale member**—Gray shale. The middle portion of section contains four bands of gray septarian limestone concretions. Near the top it contains teeth of the shark Ptychodus. Thickness is 16.7 m (55 ft).

Kg — **Greenhorn Limestone** (Upper Cretaceous)—Alternating beds of dark-gray, argillaceous micrite and medium- to dark-gray calcareous shale. Beds are usually less than 0.45 m (1.5 ft) thick. Weathers light-gray and is a ridge former. Imprints of Inoceramus labiatus are common. The rock weathers into rectangular blocks and plates due to well-developed spaced cleavage approximately perpendicular to bedding. Thickness in oil test borings is 14.8 m (49 ft).

Kcc — **Codell Sandstone member**—Light-olive-gray, rusty-brown-weathering, thin interbeds of siltstone and fine-to medium-grained quartz arenite. The sandstone percentage is greater in the lower and upper thirds of the section. Forms prominent ledges. Contains Prionocyclus hyatti and Scaphites puercoensis (Baltz and O'Neil, 1986) and zones of calcareously cemented concretions at 5, 8 and 16,7 m (16, 27 and 55 feet) above base. Thickness is 18.8 m (62 feet).

Kcl — **Lower shale member**—Gray to dark-gray shale. Upper contact gradational over a few meters with Codell sandstone member. Thickness is about 61 m (200 ft), based on drill data.

Kgr — **Graneros Shale (Upper Cretaceous)**—Dark gray, fissile shale containing subordinate amounts of thin, platy sandstone and siltstone beds (Skotnikii, 2003). Estimated thickness is about 42 m (140 ft) in oil test boring. Only the upper portion of the section is exposed in the southeast corner of the quadrangle.

Subsurface Units

The following descriptions are adapted from Baltz and O'Neil (1986), Baltz (1972) and Skotnicki (2003). The thicknesses are compatible with those penetrated in petroleum exploration tests within the quadrangle area.

Kd — **Dakota Sandstone (Lower? and Upper Cretaceous)**—Upper: Tan and brown, fine- to coarse-grained, thin-bedded sandstone and interbedded thin layers of gray clay shale. Middle: slightly carbonaceous, gray mudstone containing local sandstone lenses. Lower: massive, irregularly bedded to crossbedded, medium- to coarse-grained sandstone. Total thickness approximately 45 m (149 ft).

Jm — **Morrison Formation (Upper Jurassic)**—Upper: Interbedded greenish-gray shale, siltstone, and sandstone; Middle -- buff to pale red, fine- to medium-grained sandstone and interbedded red, purple, and gray shale: Lower -- Thin-bedded red, green, purple and brown mudstone and fine-grained sandstone (lower). Thickness is 138 m (450 ft) at the south side of Sapello River northwest of the quadrangle.

Jt — **Todilto Limestone (Upper Jurassic)**—Gray bituminous, slightly sandy, slightly gypsiferous limestone; locally contains thin beds of sandstone. Bedding is fissile and slightly contorted. Thickness is 0 to 7.6 m (25 ft).

Je — **Entrada Sandstone (Upper Jurassic)**—Buff colored sandstone. Mostly massive, though locally cross-bedded. Thickness 18-23 m (60-75 ft).

Trc — **Chinle Formation (Upper Triassic)**—Upper: Red shale, interbedded thin brown to red sandstone, and a few thin lenses of limestone and limestone pebbles: Middle -- tan, brown, and red sandstone and interbedded thin red shale and limestone-pebble conglomerate: Lower -- red shale, interbedded thin sandstone, and a few thin layers of concretionary limestone (lower). About 320 m (1,040 ft) thick.

Trs — **Santa Rosa Sandstone (Upper Triassic)**—Brown, gray and red sandstones and interbedded red, purple, and green shale. Thickness is 61-122 m (200-400 ft).

Pb — **Bernal Formation (Permian)**—Orange-red to red sandstone and siltstone and interbedded red to purple shale. Thickness is 35-42 m (115-140 ft).

Pg — **Glorieta Sandstone (Lower Permian)**—Yellow to buff orthoquartzitic sandstone. Medial part contains thin shale beds. Thickness is 30-73 m (100-240 ft).

Py — **Yeso Formation (Lower Permian)**—Orange-red to red sandstone, siltstone, shale and thin lenses of gray limestone and gypsum. Thickness is 61-150 m (200-450 ft).

Psc — **Sangre de Cristo Formation (Lower Permian)**—Red, purple, and greenish-gray shale and interbedded arkosic, conglomeratic sandstone and thin beds of unfossiliferous nodular limestone. Maximum thickness is about 394 m (1300 ft).

IPm — **Madera Group (Upper and Middle Pennsylvanian)**—Upper part (Alamitos Formation) -- Red-gray and greenish-gray shale and calcareous limestone, arkosic limestone, nodular limestone, thin to thick marine and non-marine arkosic conglomeratic sandstone with red marly shale and arkose near the base. Fusulinids are late Des Moines through late Virgil age: Lower part (Porvenir Formation) – Gray, thin to massive, fossiliferous marine limestone, interbedded thin to thick dark-gray shale and a minor thick, gray sandstone. Fusulinids are of Atoka and Des Moines age. Total thickness is 274-608 m (820 to 2000 ft).

IPs — **Sandia Formation (Middle and Lower Pennsylvanian)**—Interbedded, gray shale, thin- to massive-bedded, arkosic sandstone and conglomerate and some dark-gray, fossiliferous limestone. Average thickness about 305 m (1000 ft).

Ma — **Arroyo Peñasco Group (Upper and Lower Mississippian)**—Upper part (Terrero Formation) – Gray, sandy limestone, limestone and limestone breccia. Lower part (Espiritu Santo Formation)—Dark-gray limestone, dolomitic limestone and basal conglomeratic sandstone. Total thickness 4.6-34 m (5-110 ft).