

CONTOUR INTERVAL 10 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

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National Cooperative Geologic Mapping Program. Funding for geological

mapping was provided by the U.S. Geological Survey and the New Mexico

Bureau of Geology and Mineral Resources, a division of New Mexico Tech.

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compilation effort as well as the hydrologic investigation underway.

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This draft geologic map was produced from scans of hand-drafted

of the demand for current geologic mapping in this important area.

The final release of this map will be made following peer review and

redrafting in color using NMBGMR cartographic standards. The final

product will be made available on the internet as a PDF file and in a

originals from the author(s). It is being distributed in this form because

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

geologic mapping, compilation of published and unpublished work, and photogeologic interpretation.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

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

necessarily representing the official policies, either expressed or implied, of the State of New Mexico, or

conclusions contained in this document are those of the authors and should not be interpreted as

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

on this geologic quadrangle map may be based on any of the following: reconnaissance field

and cultural changes associated with recent development may not be shown.

the U.S. Government.

Description of map units—Otis Quadrangle
Sediment color was estimated by comparing dry sediment to Munsell Color Chart (Munsell Color, 1994).

Hd-disturbed areas (Holocene)— Disturbance areas consisting of quarries and (or) dump areas that obscure the local geology.

Qal-alluvium (Holocene) Brown (7.5 YR 6/4), silt to sand, well sorted, subangular to subrounded, dominantly quartz with rare lithics, occupies draws and river channels and associated active floodplains. Little to no vegetation. Overlies or is inset into nearly all older units. Thickness 0-2m.

Qaes-alluvial and eolian deposits (Pleistocene (?) to Holocene)-Brown (7.5 YR 6/4), silty clay to silt to sand, well sorted, subangular to subrounded, grains composed of 70% quartz and 30% carbonate and chert. Weak soil development in upper 1.25 m: upper 15 cm of soil is massive silty clay to clayey silt, brown (7.5 YR 5/4), slightly plastic, bioturbated, effervesces strongly, local organic film with granular soil structure; gypsiferous and calcareous concretions decrease in abundance downward to 40 cm; and prismatic structure extends down to 1.25 m. Unit locally weathers into badlands and exhibits piping. Common veneer on nearly all Quaternary deposits in the map area and commonly overlies Qagp2, Qasp2, Prlu and Prv. Thickness ≤10 m.

Qasm1-alluvial sand mainstem (Pleistocene (?) to Holocene)- Light brown (7.5 YR 6/4), silt to fine-lower sand, subrounded to subangular, well sorted, massive, quartzose and lithic grains, scattered pebbles and rare cobbles dispersed within matrix, rare calcic nodules and laminated drapes of dark red mud. Surface nearly always reworked into coppice dunes. Top of unit forms a terrace (T1) 5 m above modern Pecos River and deposit is equivalent to flume sand in Carlsbad. May overlie or be inset into Qagm2. Thickness ≤10m.

Qagp2-alluvial sand and gravel piedmont (Pleistocene)-Pink (7.5 YR 8/3), fine upper-medium lower sand, subangular to rounded, well sorted, with rare grains of coarse sand and pebbles, grains dominated by quartz with lesser lithics. Gravel is matrix-supported to clast-supported and in many cases is well consolidated by calcite cement and conglomeratic. Gravel clast size is <35 cm dia, and grains are composed of quartz, yellow and orange and gray chert, tan siltstone, gray to tan limestones and dolomites, green, pink, and maroon quartzites, and accessory minerals. Clast composition is dominated by carbonates in center of quadrangle (by canal; all locally derived dolomites). Larger clast sizes in central-eastern part of quadrangle are are white to buff carbonates, rare chert, and very rare reddish quartzite. Gravel beds (meter-scale thickness), where exposed, are interbedded w/minor silty sandstone beds (cms thick) and are locally contorted. Sandstones are commonly crossbedded with tangential to planar-tabular foresets < 20 , some sets very low angle, sets in medium to thick beds, pebble stringers at base of crossbed sets, poorly to well developed imbrication. Paleocurrent from imbrication and crossbedding indicate dominantly easterly flow, with subordinate southerly and northeasterly flow directions. Calcrete (≤2-3 m thick): local carbonate nodules, bioturbation and contorted bedding in upper <1 m of unit grades into massive autobrecciated carbonate-rich sand with isolated gravel clasts (~1.5 m thick) overlain by massive to vesicular autobrecciated calcrete in undulose, lenticular beds with internal laminations, pisolitic texture, local cemented sandstones and gravels (~0.5 m thick), and overlain by massive to laminated calcrete with pisolitic texture (upper 0.5 m), and a thin capping veneer of calcrete regolith with angular clasts of calcrete and chert clasts, reverse graded. This unit dominates the Otis Quadrangle and correlates to low bluffs on west side of Pecos River. Grades to Qagm2 and Qasp2. Overlies Prlu in SW corner of quadrangle. Thickness ~≤ 100 m (from cross section).

Qasp2-alluvial sand piedmont (Pleistocene) Brown(7.5 YR 7/3), silt and fine upper to medium lower sand, weakly to moderately consolidated with carbonate cement, matrix subangular to rounded, well sorted with rare grains of coarse sand and pebbles, grains dominated by quartz with lesser lithics. No gravel. Massive. Upper 40 cm is wavy tabular, generally finer than lower, slight organic stain, poorly exposed. Calcrete poorly to well developed (1-2 m thick) and is dominantly brecciated in sand and silt matrix. Unit is lateral fine-grained facies equivalent of Qagp2. Thickness ~≤ 70 m (from cross section).

Qagm2-alluvial gravel mainstem (Pleistocene) Pecos River gravel and sand, medium upper to coarse upper with lesser granules and pebbles (3-6 cm in dia, ave.), moderately sorted, well rounded, moderately to well cemented by calcite. Sand fraction is mostly quartz and chert. Pebbles are composed of red, tan, and gray quartzite, variegated cherts, gray limestone, yellow limestone, yellow siltstone, light grey and yellow dolomite, petrified wood, light tan and gray volcanic porphyry, bull quartz, and schist, yet dominated by locally derived carbonates and siliciclastics. Capped by calcrete (1.5 to 2 m thick), autobrecciated, laminar at top. Forms low mesas along Pecos River valley. Thickness ~≤ 70 m.

Qagdc2 alluvial gravels of Dark Canyon (Pleistocene)- Pink (7.5 YR 8/3) (matrix) and commonly medium gray(GLEY 7/10 Y) (clasts), fine sand to boulder gravel, subangular to rounded, locally-derived clasts of dolomite, limestone, siltstone, and sandstone, tabular to lenticular beds, crossbedded and imbricated, paleocurrent data indicate northeasterly flow. Calcrete cap (1-2 m thick). Correlates to other Qa2 deposits. Thickness >15 m.

Prc-Permian Rustler Formation, Culebra Dolomite Member (Ochoan)- cream to light gray (2.5 Y 7/1, 8/1, 8/2 and 7.5 Y2 8/1), finely crystalline, sugary dolomite and local limestone with distinctive vuggy texture, thin to medium bedded, prominently fractured, and associated with yellow(10 YR 6/6) crossbedded to ripple-laminated sandy dolomite and lesser gypsum. Contorted into local hills and depressions in southeast corner of quadrangle. Overlies Rustler clastics (Prv) with sharp contact. Thickness difficult to determine. Reported thickness of ≤ 12 m (e.g., Hill, 1999).

Prv-Permian Rustler Formation, Virginia Draw Member (Ochoan) Red siltstone to very fine sandstone, well sorted, subrounded to rounded, dominantly quartz, interbedded with green-red claystones in very thin to medium beds. Weathers into badlands. Exposed in southeast corner of map area and base of unit not exposed. Thickness ~75-100 m (from cross section).

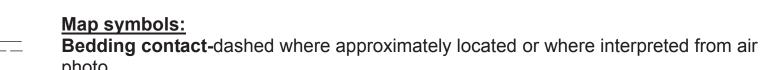
Prlu-Permian Rustler Formation, lower, undifferentiated (Ochoan)—Irregular masses of gypsum, dolomite, and salt in large blocks scattered on surface and outcrops with chaotic bedding orientations. Unit may include blocks of strata from the underlying Salado Formation. Exposed in SE corner of map area. Thickness

Ps-Permian Salado Formation (Ochoan)—In cross section only. Halite and anhydrite with subordinate potash salts, dolmite to silty-sandy dolomite, and claystone to siltstone. Thins to north-northwest, ~300-550 m thick.

Pc-Permian Castille Formation (Ochoan)—In cross section only. Anhydrite and interbedded halite. Thins to south-southeast, ~75-120 m thick.

PI-Permian Delaware Mountain Group, Bell Canyon Formation, Lamar Limestone Member (Ochoan- Guadalupian)—In cross section only. Limestone, siltstone, sandstone and shale. Thins to south-southeast, ~20-55 m thick.

Pd-Permian Delaware Mountain Group, undifferentiated (Guadalupian)—In cross section only. Sandstone, siltstone, and shale with subordinate limestone., >~150 m



Pleistocene bar-and-swale paleocurrent indicators--from air photo interpretation,

Hatchures- indicate depression made by salt removal/collapse and (or) wind deflation

Oil/gas well location used in this study
 (suggested type logs for subsurface stratigraphic picks are logfile numbers 19546, 21649, 40114)

Water well location used in this study

