

Paper No. 93-3

Presentation Time: 2:00 PM-2:15 PM

***IMPACT OF SALT DISSOLUTION ON THE
TRANSMISSIVITY OF THE CULEBRA
DOLOMITE MEMBER OF THE RUSTLER
FORMATION, DELAWARE BASIN,
SOUTHEASTERN NEW MEXICO***

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The evaporites of the Permian Ochoan Series in the northern Delaware Basin (New Mexico, USA) gently dip toward the east. The up-dip edge of these rocks occurs in the vicinity of Nash Draw. Nash Draw, in eastern Eddy County, NM, is about 30 km long, 10–15 km wide, as much as 100 m deep, and is internally drained. Within Nash Draw, caves and sinkholes have developed in gypsum beds of the Rustler Formation. At greater depths, halite from the upper Salado Formation has been dissolved, forming a residue that locally contains brine.

Upper Salado halite has dissolved along a wedge projecting east of Livingston Ridge, the eastern margin of Nash Draw. Close-spaced drillholes in some areas of Livingston Ridge reveal two important points: a) upper Salado halite beds thin dramatically by ~ 30–50 m across a lateral distance of ~ 100–500 m, and b) this zone of thinning directly underlies and is mirrored in scale by the escarpment. The Mescalero caliche flexes across this zone along parts of the ridge, indicating dissolution along the escarpment since caliche formed about ~ 0.5 Ma. Core evidence suggests that where Salado dissolution has occurred, the rocks overlying the Salado are strained (leading to larger apertures in existing fractures), fractured, collapsed, and brecciated.

The Culebra Dolomite Member of the Rustler is an ~ 7 m thick fractured pelletal dolomicrite that lies ~ 30 m above the Salado. Hydraulic tests show that the transmissivity of the Culebra varies by over six orders of magnitude over an east-west distance of 10–15 km. Transmissivities are highest within Nash Draw and generally become lower toward the east.

We have evaluated the geologic controls on Culebra transmissivity using linear regression techniques. The log of Culebra transmissivity shows a strong linear relationship with depth. The slope of log transmissivity/depth changes little between regions with and without Salado dissolution, indicating that fracture

apertures are limited by overburden thickness. However, the intercept value increases in areas affected by Salado dissolution. The amount of salt dissolved from the Salado does not appear to be a significant control on Culebra transmissivity.

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