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## *Urban geology of Portales*

Robert G. Taylor and William D. Pitt, 1972, pp. 214-215

*in:*  
*East-Central New Mexico*, Kelley, V. C.; Trauger, F. D.; [eds.], New Mexico Geological Society 23<sup>rd</sup> Annual Fall Field Conference Guidebook, 236 p.

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*This is one of many related papers that were included in the 1972 NMGS Fall Field Conference Guidebook.*

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# URBAN GEOLOGY OF PORTALES

by

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## INTRODUCTION

Portales is one of the oldest settlements in North America in the sense that early man established at least a campsite in nearby Blackwater Draw over 11,000 years ago. The Brazos River was then flowing through Portales Valley. It was water also that attracted early settlers to the area because here were bountiful springs that allowed them to water their stock as they moved along the Fort Sumner trail. The first settler, Doak Good, established his ranch at Portales Springs' Caves, in 1881. The town itself was founded in 1898 when the Pecos Valley and Northeastern Railroad was laying track through the region; the nucleus of the town in fact was the construction camp for railroad builders. Today Portales is a farming center. Every year Portales Valley produces a variety of crops, the most important being a large crop of peanuts—about 15 million pounds of peanuts is harvested every year. Crops here are the result mostly of irrigation—although dry-farming also is common. Irrigation water, however, is being depleted at the rate of about one foot of drop in the water-table-level per year. The lenticular Brazos (i.e., ancestral Brazos) stream deposits, Pleistocene to Recent in age, likely will be depleted of commercial irrigation water within 30 years. Portales also is a university town; Eastern New Mexico University was established in 1934; now over 4,000 students matriculate.

Portales is located within the Llano Estacado or Staked Plains subprovince of the Great Plains Province. The Staked Plains actually are a surficial remnant of a vast alluvial plain (not a coalescing alluvial-fan deposit) that extended from the base of the Rocky Mountains to points far east of the Texas Panhandle. The uppermost formation over much of the High Plains is the Pliocene Ogallala Formation. This formation, eroded from the Portales Valley by the incising of the ancestral Brazos River, forms the upper part of the escarpment slope of the "caprock" of much of eastern New Mexico.

The urban geology of the Portales Valley is related basically to two characteristics: its location on the flat surface of the High Plains, and its light rainfall of 17 inches per year for the 49 years of record.

## FOUNDATION STABILITY

*Soil Association.*—Northern and central Portales are underlain by the Amarillo and Clovis soils, which have a loamy surface layer and are hard when dry. They have a sandy clay loam subsoil and are underlain at a depth of 20 to 36 inches or more by soft caliche. Ponds function well on these soils if a core is keyed through the sandy surface layer. Runoff is slow, however, and drifting sands may be a problem. Terraces, waterways, diversions and other small earthen structures generally are difficult to maintain because of wind erosion.

The south edge of town is underlain by the Potter-Mansker soil association; this association consists of shallow to very shallow calcareous, medium-textured or gravelly soils and rock (caliche) outcrops. Metal pipes or lines are subject to corrosion

if buried in some of these soils because of high content of lime; corrosion is especially a problem in those soils where resistance readings are 5,000 ohms or less.

Structures both large and small, require careful site selection because of the gravel rock, high content of lime, rough topographic surface, or hazard of wind and water erosion of top soil. The Portales area is flat to very gently rolling, so that slow runoff is typical. Because the area is flat and dry, mass wasting is no problem in the area. Locally the Potter-Mansker soils are underlain by hard caliche; blasting, in fact, is necessary to excavate some basements.

## MATERIALS

*Aggregate.*—A gravel pit about 3 miles northwest of Portales supplied Roosevelt County and neighboring counties with gravel and road aggregate for many years. Now, however, most of the gravel and sand comes from gravel pits near Fort Sumner. Occasionally a pit is opened locally to supply road ballast.

*Building stone.*—No building stone is quarried in the Portales area unless local use of hard caliche is considered building stone.

## WATER RESOURCES

*Quaternary-Recent.*—Most ground water in the Portales area is derived from the valley fill of the ancestral Brazos River, a river that formerly ran through Portales Valley into Texas until it was beheaded by the Pecos River near Fort Sumner. The fill, Pleistocene to Holocene in age, is about 150 feet maximum thick. The water generally is good in quality except for a narrow strip in the southeastern part of the Portales Valley where the salt content is high, or where the water is contaminated (see below). The Valley fill is underlain by Triassic redbeds of the Dockum Group, which yield only small quantities of water to wells. S. E. Galloway estimates that irrigation water of the valley is being depleted at rapid rate, the ground-water table dropping at the rate of about 1 foot per year. The recharge rate is much less, about ½ inch per year. At the present rate of removal, the recoverable irrigation water in the valley fill will be depleted in 20 to 30 years! Compounding the problem of depleting water supply in the Portales Valley and eastward is the fact that Lubbock, Texas, authorities recently purchased 75,000 acres of water rights near and along the eastern border of New Mexico; future drainage from west Texas wells, as well as present drainage, certainly will contribute to the general depletion of eastern New Mexico water supply.

*Ogallala Formation.*—Only in the area north of the Portales Valley and beyond the limits of the valley fill, are moderate to large yields of ground water obtained from the Ogallala Formation of Tertiary age. The water is of fairly good chemical quality. These wells normally are drilled to the top of the Triassic red beds which occurs generally at depths of less than 500 feet. The water moves in a generally southeastward direc-

tion with an apparent gradient of 10 to 15 feet per mile. The depth to the top of the water table in the Ogallala ranges from about 80 feet in the Melrose area to about 130 feet in southeastern Quay County.

*Pollution potential.*—Studies by Taylor indicate that the Portales Valley locally is being contaminated by urban and rural “activities.” Bacterial contamination by both fecal and non-fecal coliforms have been observed in numerous wells. This type of contamination is indicative of improper disposal of sewage, and of the use of manure for fertilizer. Chemical contamination is indicative of improper nitrate concentrations, which cycle with irrigation practices, have been observed at three and four times the recommended safe limit of 45 Mg NO<sub>3</sub> per liter of water. These impacts of human use, together with the declining water table, strongly suggest increasing con-

tamination for the aquifer of the Portales Valley. It is hoped that continued investigations and appropriate legislation and control will reverse this increase-in-contamination trend. Interstate cooperation will be necessary to alleviate much of the water-table decline.

#### NATURAL-DISASTER POTENTIAL

Portales is located at the edge of the West Texas tornado belt; hence, the area is subject to about 1/10 the number of tornado alerts of either Amarillo or Lubbock. Earthquakes are even more rare in this stable part of the continental interior. Occasionally some streets are flooded during heavy rain storms, but flood danger in this area of normally light rainfall is only slight.