Summary of southeast New Mexico basement rocks

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1. The development drift on the "vein" failed to indicate mineable reserves of ore;
2. the ore obtained during exploration proved to be very low grade, less than .1% U_3O_8;
3. haulage costs to truck the ore to the Grants milling area would have been high,
4. the ore would have been difficult to process, probably requiring roasting before the uranium could be extracted, and as such may not have been acceptable to the AEC or uranium mill.
5. a large penalty for high carbonate content would have been levied against the ore, since $CaCO_3$ content over 6% greatly reduces the monetary value of any uranium ore.

Over 450 claims for uranium have been filed in Eddy County since the original discovery in Rock Arroyo. However, all of these filings have been made on the strength of the single occurrence of uraniferous hydrocarbon discovered by Price and Pitts. Therefore, although the Rocky Arroyo occurrence is an interesting one, I do not believe that this prospect or the Guadalupe Mountains as a whole are or will be an important uranium producing area. In Lea County the only known occurrence of uranium to date has been the discovery of trace amounts of carnotite in a clay pit near Pearl, 15 miles west of Hobbs by two Lovington prospectors, D.E. Moreland and F.H. Hooper. Moreland and Hooper obtained a state placer prospecting permit for one year on 400 acres in Section 23 and 100 acres in Section 14 T 19 S, R 35E, near the currently drilling Shell No. 1 Hooper wildcat oil well in the hope that commercial uranium ore would exist underground. The hope was based on traces of carnotite found in an old clay pit, once used as a source of drilling mud in the Hobbs field. The clay pit is on patented land in Section 24 and was not leased by Moreland and Hooper.

Extensive tests by Moreland and Hooper in Sections 14 and 23, including one cable tool hole drilled into the red beds in the SE 1/4 have failed to indicate the presence of uranium at any depth.

Specimens from the clay pit (not on Moreland and Hooper's prospecting permit) containing visible specks of carnotite were analyzed by the AEC. They contained .006% U_3O_8, which is far below the minimum grade of acceptat le ore. This occurrence of carnotite in red Tertiary clay is believed to be of minerological importance only and is not regarded as economically significant.

SUMMARY OF SOUTHEAST NEW MEXICO BASEMENT ROCKS

by
Peter T. Flawn

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Geologist, Bureau of Economic Geology, The University of Texas.

Introduction

General remarks. – The information in this paper is taken from a larger report on the basement rocks of Texas and southeast New Mexico now nearing completion and soon to be published by The Bureau of Economic Geology, The University of Texas. The conclusions presented in this paper must be regarded as preliminary because all the data have not yet been processed. The paper also suffers because it attempts to treat the basement geology of an area much smaller than that in which the geological relationships of the major basement discussed herein can be recognized and demonstrated, namely, the whole of the southeast New Mexico, Texas, and southern Oklahoma area. The broad view of basement geology of the entire area has been presented in a progress report (Flawn, 1954) which should be consulted in conjunction with this article, whose principal contribution is a more detailed basement map (fig. 1) than was presented in the progress report.

This study of basement rocks (which is now nearing completion) would have been impossible without the wholehearted cooperation of oil companies and service companies operating in the area of study. These organizations and individuals connected with them generously contributed well samples and geologic data. The list of contributors is long and individual contributions to the project will be separately acknowledged in the final report.

Lithology and Structure of Basement Rocks

Geology of the basement. – Southeast New Mexico constitutes the western margin of the area of the basement rock study. In late Precambrian time the southeast New Mexico area included the western limits of a great granitic stable crustal block which is called the Texas craton (Flawn, 1954). A study of basement rock from sporadic wells west of the area of the craton provides a glimpse of a complex of met-

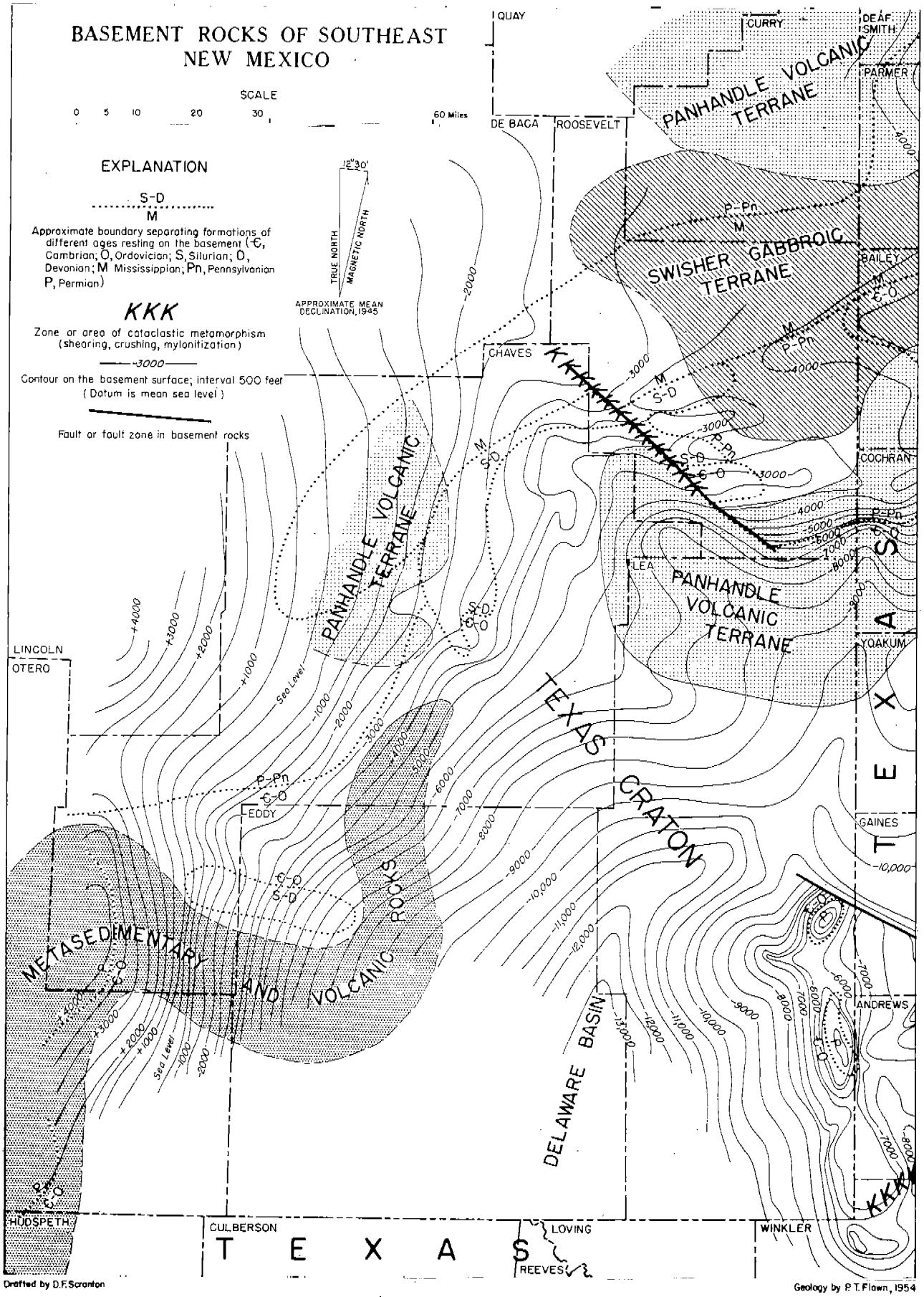

BASEMENT ROCKS OF SOUTHEAST NEW MEXICO
SCALE
0 5 10 20 30 60 Miles
EXPLANATION
S-D
M
Approximate boundary separating formations of different ages resting on the basement (Є, Cambrian; O, Ordovician; S, Silurian; D, Devonian; M Mississippian; Pn, Pennsylvanian P, Permian)
KKK
Zone or area of cataclastic metamorphism (shearing, crushing, mylonitization)
-3000-
Contour on the basement surface; interval 500 feet (Datum is mean sea level)
Fault or fault zone in basement rocks
12°30'
TRUE NORTH
MAGNETIC NORTH
APPROXIMATE MEAN DECLINATION, 1945
QUAY
CURRY
DE BACA
ROOSEVELT
DEAF SMITH
PARMER
PANHANDLE VOLCANIC TERRANE
SWISHER GABBROIC TERRANE
BAILEY
CHAVES
COCHRAN
LEA
YOAKUM
LINCOLN
OTERO
EDDY
GAINES
ANDREWS
HUDSPETH
CULBERSON
LOVING
WINKLER
REEVES
TEXAS CRATON
METASEDIMENTARY AND VOLCANIC ROCKS
DELAWARE BASIN
Sea Level
Drafted by D.F.Scranton
Geology by P.T.Flawn, 1954

Fig. 1

asedimentary, metavolcanic, volcanic, and plutonic rocks which, when viewed in the light of exposed Precambrian rocks farther west and the few available absolute age determinations, suggests an orogenic belt west of the Texas craton in late Precambrian time. The essentially granitic craton takes in parts of Lea, Eddy, Chaves, and Roosevelt counties and extends eastward to central Texas.

In central Chaves county, northern Lea and southern Roosevelt counties, and parts of Curry and Quay counties the basement rocks are volcanic rocks, mostly undeformed and unmetamorphosed rhyolite flows and tuffs. These rocks are much more extensively developed to the east in the Texas Panhandle, and hence the name Panhandle volcanic terrane has been adopted. Petrographic study shows this terrane to be composed mainly of rhyolitic extrusive and pyroclastic rocks with subordinate trachytic and andesitic types and shallow intrusions of rhyloitic and granitic rocks. The rocks of the Panhandle volcanic terrane appear to have been extruded and deposited as a relatively thin mantle on the surface of the older craton which presumable extends beneath the volcanic rocks.

In Roosevelt and southern Curry counties, and extending eastward into Texas, basement rocks are composed largely of gabbro and diabase. Again this terrane is more extensively developed in the southern Texas Panhandle – poor well control makes it difficult to define its limits in New Mexico. The gabbroic rocks appear to be younger than the volcanic rocks of the Panhandle volcanic terrane for gabbro and diabase sills intrude the volcanic section. The gabbroic terrane proper seems to be a great lopolith or stratiform body occupying a major basement sag or syncline, floored by the Panhandle volcanic terrane, which in part coincides with the structural low of the Plainview or Palo Duro basin. The lack of a gravity maximum over these dense gabbroic rocks supports the concept of a relatively thin rootless stratiform body probably originating through a complex of sheet-like intrusions.

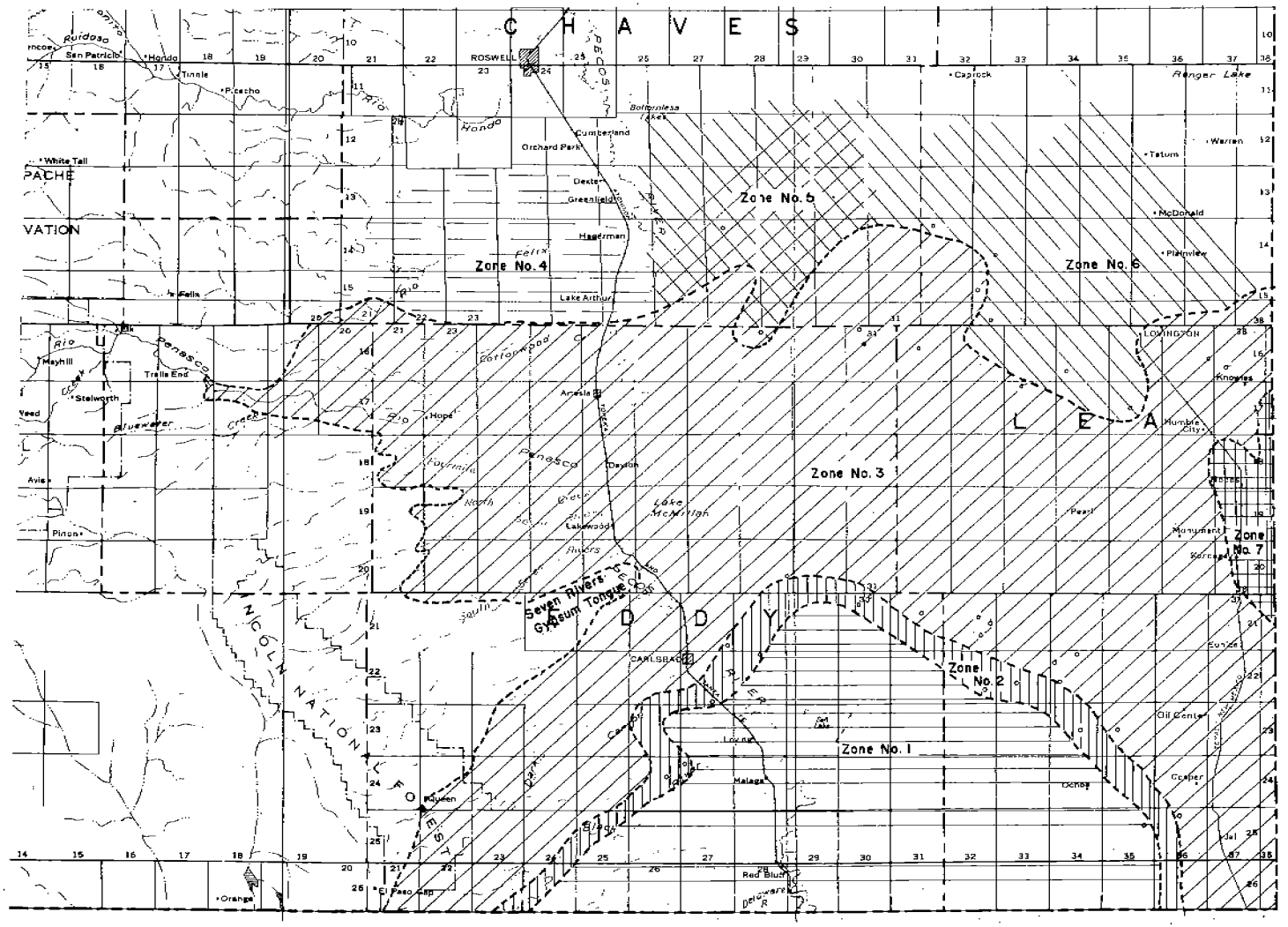
Configuration of the basement surface. – The basement surface in southeast New Mexico rises to the east, north, and west of the Delaware basin where it lies more than 13,000 feet below sea level. On the east the surface rises rapidly on the Central Basin Platform to elevations between -5,000 and -4,000 feet; to the northwest the rise is more or less continuous until in eastern Otero and southwestern Chaves counties the basement surface is more than 4,000 feet above sea level. The contours on the basement surface shown on the map (fig. 1) are based on wells that actually penetrated basement rocks, and no estimated depths from Ellenburger wells are included.

Two major basement faults or fault zones are shown on figure 1. Undoubtedly many other faults that can be recognized in the overlying sedimentary mantle also displace basement rocks, but throughout this project the writer was preoccupied with those major features of the basement that could be developed from a study of basement data. The northwest-trending fault at the north end of the Central basin Platform in Lea County, New Mexico, and Gaines County, Texas, is indicated by abrupt discontinuity in the configuration of the basement surface. The existence of the northwest-trending fault zone in southwestern Roosevelt County is shown by three lines of evidence. It was first suspected when a study of well samples from that area showed a more or less linear zone of cataclastic metamorphism in the basement rocks (crushing, shearing, mylonitization). Contouring on the basement surface indicated a topographic discontinuity along the same zone. Plotting of contacts between formations of different ages resting directly on the basement revealed an offset along the trend.

The map (fig. 1) shows, in addition to the basement geology, the formation resting on the basement. This is the surface that might be seen by an observer looking upward from the basement. A study of the relationships of the formations in contact with basement rocks reveals, to some degree, the Paleozoic history of the Precambrian rocks. Analysis of relationships between the formations resting on the basement in the vicinity of the northwest-trending fault zone in southwestern Roosevelt County, for example, reveals several periods of Paleozoic movement. Post-Ordovician and pre-Silurian (or Devonian) elevation of the northeast side of the fault resulted in a partial stripping of the Cambro-Ordovician cover from the basement rocks. Uplift of the northeast side and partial removal of older Paleozoic rocks again took place prior to deposition of Permo-Pennsylvanian rocks which rest directly on basement on part of the northeast block.

References

Flawn, P.T. (1954) Texas Basement Rocks: A Progress Report: Bull. Amer. Assoc. Petr. Geol., 38, pp. 900-912



LITHO - FACIES MAP SHOWING DISTRIBUTION OF THE CAPITAN - CASTILE FORMATION AND ITS EQUIVALENTS

Zone No. 1	CASTILE ANHYDRITE - SALT FACIES.
Zone No. 2	TRANSITION ZONE BETWEEN CASTILE AND CAPITAN FACIES.
Zone No. 3	AREA IN WHICH CAPITAN MEMBER IS PREDOMINANTLY OF LIMESTONES.
Zone No. 4	AREA IN WHICH CAPITAN FACIES GRADES INTO RED BEDS.
Zone No. 5	AREA IN WHICH CAPITAN MEMBER IS PREDOMINANTLY AN ALTERNATING SERIES OF LIMESTONES & ANHYDRITES WITH OCCASIONAL SALT BEDS.
Zone No. 6	AREA IN WHICH CAPITAN FACIES GRADES FROM LIMESTONES INTO A PREDOMINANTLY ANHYDRITE SECTION.
Zone No. 7	HOBBS ANHYDRITE FACIES OF THE CAPITAN-CASTILE FORMATION.
°	LOCATION OF CRITICAL WELLS USED FOR CONTROL.

H. S. CAVE SEPTEMBER 1954