New Mexico Geological Society

Downloaded from: https://nmgs.nmt.edu/publications/guidebooks/10

Uranium deposits in the Datil Mountains--Bear Mountains region, New Mexico

Anonymous

1959, pp. 135-143. https://doi.org/10.56577/FFC-10.135

in:

West-Central New Mexico, Weir, J. E., Jr.; Baltz, E. H.; [eds.], New Mexico Geological Society 10 th Annual Fall Field Conference Guidebook, p. https://doi.org/10.56577/FFC-10

This is one of many related papers that were included in the 1959 NMGS Fall Field Conference Guidebook.

Annual NMGS Fall Field Conference Guidebooks

Every fall since 1950, the New Mexico Geological Society (NMGS) has held an annual Fall Field Conference that explores some region of New Mexico (or surrounding states). Always well attended, these conferences provide a guidebook to participants. Besides detailed road logs, the guidebooks contain many well written, edited, and peer-reviewed geoscience papers. These books have set the national standard for geologic guidebooks and are an essential geologic reference for anyone working in or around New Mexico.

Free Downloads

NMGS has decided to make peer-reviewed papers from our Fall Field Conference guidebooks available for free download. This is in keeping with our mission of promoting interest, research, and cooperation regarding geology in New Mexico. However, guidebook sales represent a significant proportion of our operating budget. Therefore, only *research papers* are available for download. *Road logs*, *mini-papers*, and other selected content are available only in print for recent guidebooks.

Copyright Information

Publications of the New Mexico Geological Society, printed and electronic, are protected by the copyright laws of the United States. No material from the NMGS website, or printed and electronic publications, may be reprinted or redistributed without NMGS permission. Contact us for permission to reprint portions of any of our publications.

One printed copy of any materials from the NMGS website or our print and electronic publications may be made for individual use without our permission. Teachers and students may make unlimited copies for educational use. Any other use of these materials requires explicit permission.

This page is intentionally left blank to maintain order of facing pages.

URANIUM DEPOSITS IN THE DATIL MOUNTAINS - BEAR MOUNTAINS REGION, NEW MEXICO

INTRODUCTION

Small deposits of uranium occur in rocks of Cretaceous and Tertiary ages in a belt more than 40 miles long on the north side of the Datil, Gallinas, and Bear Mountains in Catron and Socorro Counties, N. Mex. (fig. 1). Most of the deposits are small, but in some the concentration of uranium and vanadium is relatively high. Development of the deposits has been hampered by problems of ownership of mineral rights and lack of mill facilities.

Brief summaries of the results of uranium investigations in this region were presented by Griggs (1954, p. 1-5) and by Bachman, Baltz, and Griggs (1957). The present paper is taken mainly from the report of Bachman, Baltz, and Griggs (1957), and is a brief description of the mode of occurrence of some of the deposits rather than a comprehensive summary of all of the deposits in this region.

GENERAL STRATIGRAPHY

Sedimentary rocks of Permian, Triassic, Cretaceous, and Tertiary ages crop out in the northern parts of the Datil, Gallinas, and Bear Mountains. The San Andres limestone of Permian age, the Chinle formation of Late Triassic age, and the Dakota sandstone and Mancos shale of Late Cretaceous age crop out near the northern end of the Bear Mountains (fig. 1). Rocks of the Mesaverde group of Late Cretaceous age are exposed in a broad area north of the Datil and Gallinas Mountains. The Baca formation of Eocene(?) age crops out north and west of the Bear Mountains and on the north edge of the Datil Mountains.

The Datil formation of Miocene(?) age consists mainly of latitic to rhyolitic tuff and comprises most of the Datil and Gallinas Mountains; it crops out also on the north side of the Bear Mountains, and forms the hills rising above the Plains of San Augustin. Basalt of Tertiary and Quaternary ages is present at many places. Lithology and stratigraphy of these volcanic rocks is described elsewhere in this guidebook by M. E. Willard.

Poorly consolidated sediments and volcanic rocks assigned to the Santa Fe group of Miocene, Pliocene, and Pleistocene ages are present west of the Bear Mountains. Extensive alluvial deposits of Quaternary age underlie the Plains of San Augustin.

URANIUM DEPOSITS

At the time of the investigation (1953 and 1954), all known deposits of uranium were in the Baca formation and Point Lookout(?) sandstone of the Mesaverde group. Radioactivity slightly above background occurs at places in the Datil formation and claims have been staked in these volcanic rocks. However, in most cases the anomalous radioactivity is the result of the mass-effect of disseminated uranium and is not indicative of concentrated deposits.

The uranium deposits which were examined are all in sandstone or in shale intercalated in sandstone, and are similar to many uranium deposits in sandstone on other parts of the Colorado Plateau. Where uranium is present it is usually associated with carbonaceous material. A uranium-bearing mineral (probably tyuyamunite or carnotite) was observed in some deposits but at many places no uranmium minerals are visible although the rocks are radioactive. At such places the uranium minerals probably are disseminated to such an extent that they cannot be discerned by the unaided eye, or the uranium minerals are obscured by the more dominant coloration of iron compounds and other minerals with which uranium minerals are associated. Vanadium is associated with the uranium in many of the deposits.

Most of the deposits examined are in two widely separated areas—in the drainage of Jaralosa Canyon west of the Bear Mountains, and in the upper drainage of Alamosa Creek northwest of the Datil Mountains. The Jaralosa Canyon area was examined only by reconnaissance, but the upper Alamosa Creek area was studied in more detail.

JARALOSA CANYON AREA

All of the uranium deposits examined in the Jaralosa Canyon area are in rocks of the Baca formation. The Baca in this area is reported by Wilpolt, and others (1946) to be nearly 700 feet thick. It consists of conglomerate, sandstone, and shale which are predominantly red or purple. Most of the conglomerates and sandstones are arkosic, many contain carbonaceous material, and some contain fragments of volcanic rocks. According to Wilpolt, and others (1951) the Baca formation is probably Eocene in age.

The prospects examined were mostly small open pits or bulldozed cuts in the Baca formation. Uranium minerals are disseminated in the lenticular sandstones or concentrated in carbonaceous material. At places, the more highly mineralized rock is purplish. This color may be caused by vanadium compounds. None of the prospects were examined in detail but all seemed to be more or less lenticular as are stream channel sandstones of the Baca formation.

Carbonaceous rocks of the undifferentiated Mesaverde group were examined in the Jaralosa Canyon area, and radioactivity slightly above background was detected at a few places. Analyses of rock samples indicate that the radioactive material is not uranium.

Radioactivity slightly above background also was detected in volcanic rocks of the Datil formation at several localities. Analyses of rock samples of the Datil show that minor amounts of uranium are present at places in these rocks. Analyses of rock samples (nos. 29-35) of the Mesaverde group, Baca formation, and Datil formation collected in the Jaralosa Creek area are given in table 1 and localities sampled are shown on figure 1.

UPPER ALAMOSA CREEK AREA

Uranium deposits occur in rocks of Cretaceous and Tertiary ages in the upper drainage of Alamosa Creek northwest of the Datil Mountains. Three groups of prospects are located in T. 2 N., R. 10 W. and T. 2 N., R. 11 W., near the headquarters of the McPhaul Ranch about 19 miles northwest of the town of Datil (fig. 2). These three deposits were studied in detail and other prospects were examined briefly by Bachman, Baltz, and Griggs (1957).

STRATIGRAPHY

Rocks of Cretaceous age in the upper Alamosa Creek area first were mapped as the Chamiso formation and those of Tertiary age were mapped as the Datil formation by Winchester (1920, pl. 5). Bachman, Baltz, and Griggs (1957) assigned the Cretaceous rocks of the area to the Mesaverde group and separated them into the Crevasse Canyon formation and overlying Point Lookout(?) sandstone in accordance with the revised nomenclature of Cretaceous rocks of this region proposed by Dane, Wanek,

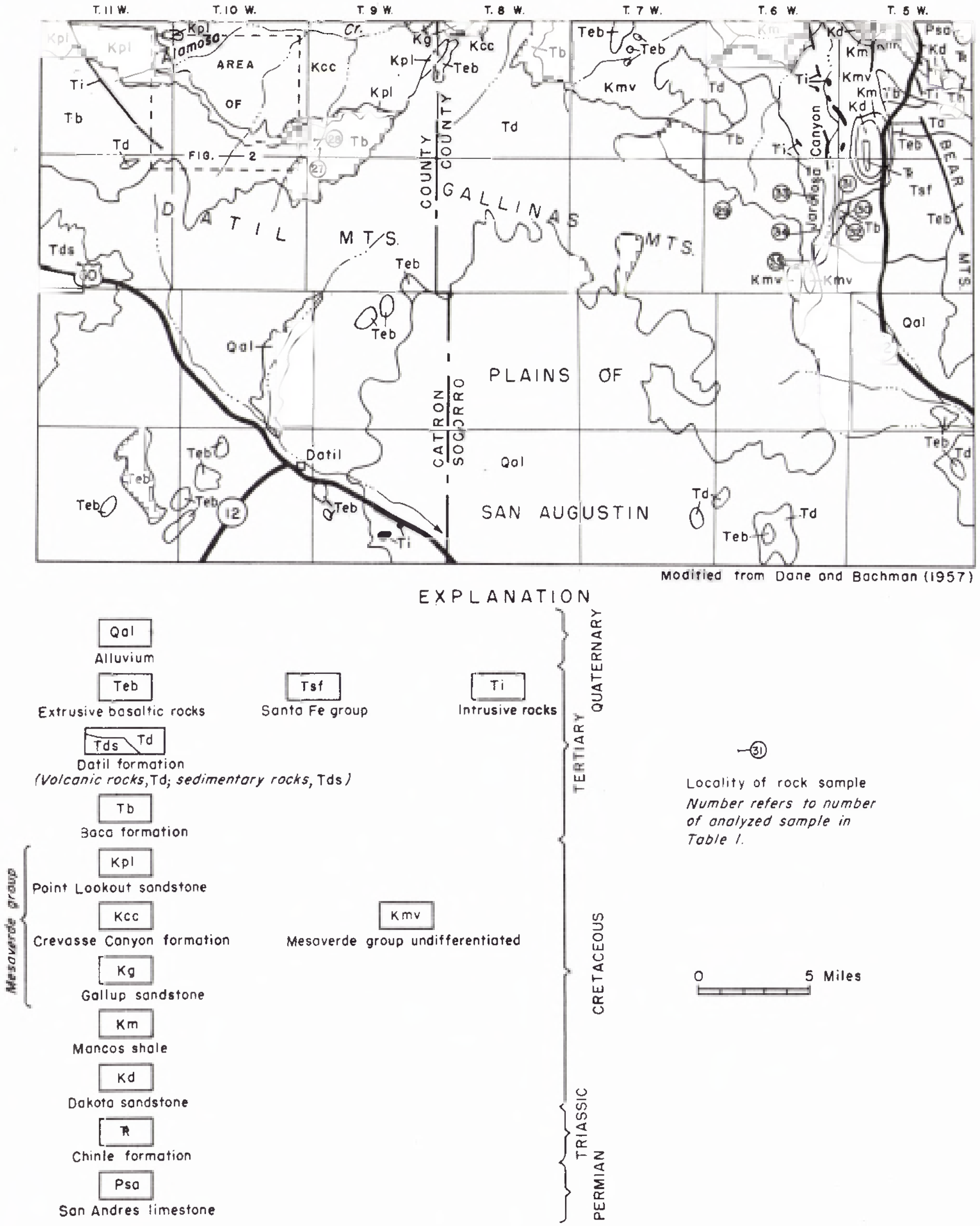

FIGURE 1.- GEOLOGIC MAP OF PARTS OF CATRON AND SOCORRO COUNTIES SHOWING LOCALITIES EXAMINED FOR URANIUM

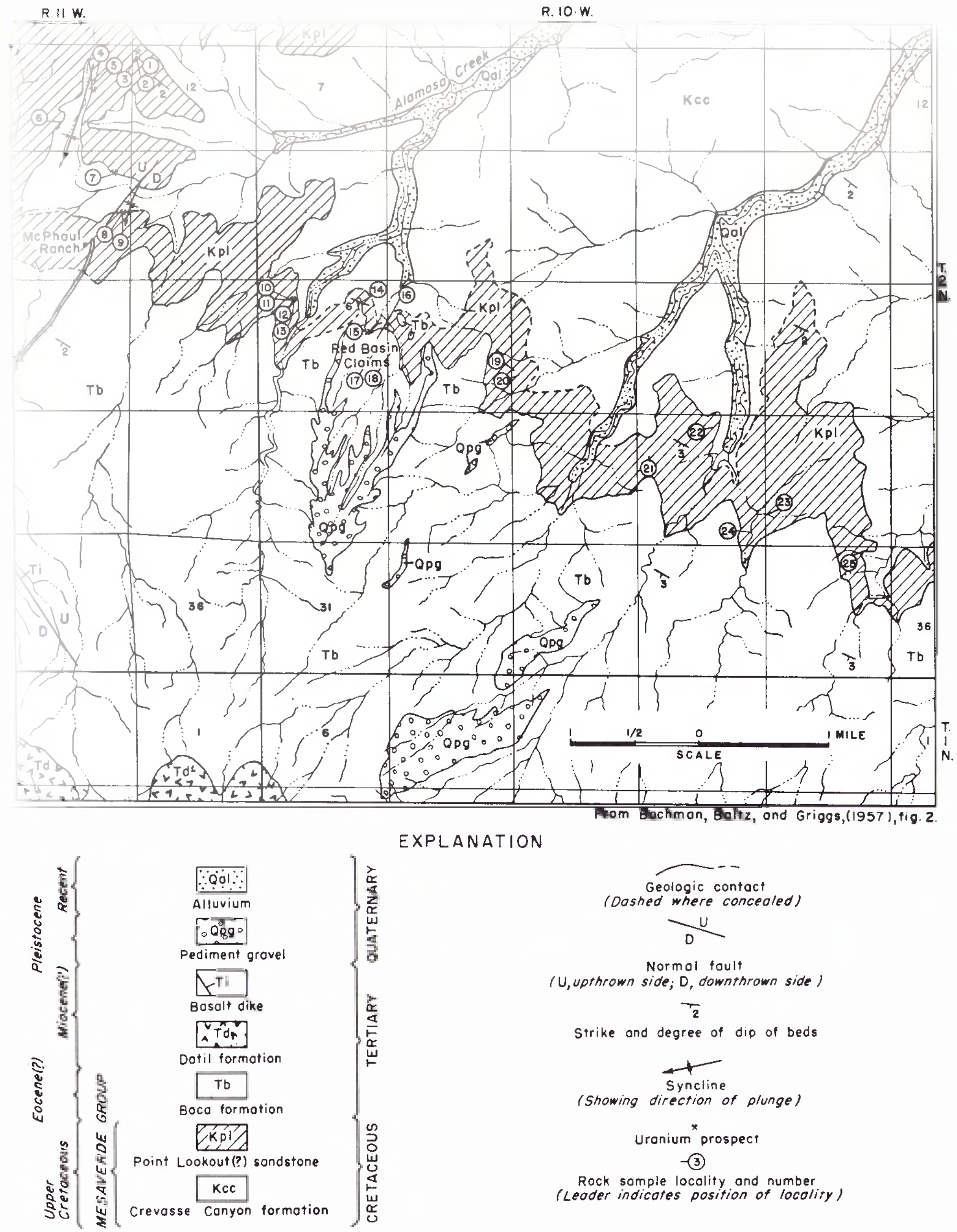

FIGURE 2.- GEOLOGIC MAP OF PART OF UPPER ALAMOSA CREEK AREA

and Reeside (1957, p. 181-196). Tertiary rocks were divided into the Baca formation and overlying Datil formation in accordance with the changes in nomenclature by Wilpolt, and others (1946).

Crevasse Canyon formation

The Crevasse Canyon formation crops out across the northern part of the area mapped (fig. 2). The formation consists of alternating sandstone and shale. The sandstone beds are light gray, weather to buff and reddish-tan, and vary from thin-bedded to massive. They are commonly lenticular and individual beds are not persistent for more than one to three miles. Cross-lamination is common. The sandstones are relatively clean, well-sorted, and composed chiefly of fine- to medium-grained, subround to round quartz. The shales are gray, greenish-gray, or black and are commonly carbonaceous. Carbonized fossil wood is common in many beds, ranging in size from tiny fragments to small twigs and logs. Thin coal beds are present at places. No uranium deposits were observed in these rocks.

Point Lookout (?) sandstone

The Point Lookout(?) sandstone crops out south of the Crevasse Canyon formation in an irregular but continuous northwest-trending band. The Point Lookout(?) forms the cap rock of several buttes, mesas, and cuestas which are the physiographically highest features in the northern part of the area. The sandstone is composed of fine- to coarse-grained sub-round to round quartz and a small amount of dark minerals. In the northeast corner of T. 2 N., R. 11 W., and in the northwest corner of T. 2 N., R. 10 W., the Point Lookout(?) forms two massive sandstone ledges separated by a thin shale bed and attains a maximum thickness of about 100 feet. In the map area the Point Lookout(?) thins toward the south and southeast, and in secs. 18, 19, and 20, T. 2 N., R. 10 W., it interfingers with shale beds and splits into several smaller sandstone tongues. Bedding in the Point Lookout(?) sandstone is highly irregular at places in the southernmost exposures but becomes more regular to the northeast. Intraformational channels, lenses of carbonaceous shale, and fossil logs are common in the lower part of the formation but much less common in higher beds. The Point Lookout(?) sandstone of the map area is believed to have been deposited as beach and near-shore marine deposits. Rapid southwestward thinning and interfingering with beds of the Crevasse Canyon formation may indicate that the depositional edge of the Point Lookout(?) is not far to the southwest of the present area of outcrop.

In the east-central part of sec. 19, T. 2 N., R. 10 W., the thinned Point Lookout(?) sandstone is overlain by a thin sequence of olive- to greenish-gray siltstone, fine sandstone, and shale. Lithology of these beds is believed to indicate marine origin. In this area the upper beds of the Point Lookout(?) are overlain with angular unconformity by beds assigned to the Baca formation.

Baca formation

The Baca formation crops out in a northwest-trending band south of the Point Lookout(?) sandstone and on the northern slope of the Datil Mountains. In the area mapped (fig. 2) the Baca formation consists of sandstone, siltstone, and shale. Most of the sandstones are lenticular, cross-laminated, and friable. The dark red color of many of the siltstone and shale beds is one of the most distinctive characteristics of the formation. In the eastern part of T. 1 N., R. 10 W. a channel-fill at the base of the formation is composed of coarse conglomerate, and a pebble conglomerate occurs near the top of the formation.

In Tps. 1 and 2 N., R. 11 W. the Baca formation is estimated to be 1,500 feet thick.

Sandstone beds are tan to salmon-pink, medium- to coarse-grained, and are composed of angular to subangular fragments. Fresh feldspar fragments, mica flakes, and dark minerals make up a high percentage of the rocks. The shale and siltstone beds are mostly salmon-pink to dark red with only a few interbeds of gray shale. Carbonaceous material is locally abundant in association with the gray shale interbeds or as detritus in sandstone lenses but is sparse elsewhere in the formation.

At places in the area of figure 2 a sequence of light gray to tan lenticular, channel sandstones and interbedded carbonaceous shale occurs beneath typical pink and red Baca beds and above the Point Lookout(?) sandstone and associated shale beds. This sequence ranges in thickness from 0 to 100 feet. The sandstones are medium-grained and contain much well rounded quartz. They differ from sandstone of the Point Lookout(?) in that they are coarser grained, contain a higher percentage of angular fragments and heavy minerals, are more friable, and are highly lenticular. The sandstones differ from overlying beds of the Baca formation mainly in color. Shale beds in this portion of the stratigraphic section are mostly gray with only a few dark red lenses. The channel sandstone sequence rests with erosional unconformity on the Point Lookout(?) sandstone, and, in the canyon north of the Red Basin claims (SW¼ NW¼ sec. 20, T. 2 N., R. 10 W.), an angular unconformity of about 10 degrees is clearly observable between the white channel sandstone and shale and sandstones of the Point Lookout(?). The channel sandstone sequence appears to be conformable with overlying pink beds of the Baca formation and thus is believed to represent a local basal sequence of the Baca composed in part of reworked Mesaverde sediments.

The Baca formation in the Rio Grande valley is believed to be of Eocene age (Wilpolt, and others, 1951). In the Datil Mountains no fossil evidence has been found.

Datil formation

The Datil formation forms most of the Datil Mountains mass and crops out in the southern part of the area of figure 2. It consists of gray to purple tuff, gray to tan welded tuff, and other pyrolclastics. In places the welded tuff forms prominent cliffs. The composition of the Datil formation ranges from rhyolite to quartz latite and may include some material as mafic as andesite.

In the area of figure 2 the contact of the Datil formation with the underlying Baca formation is sharp at most places and was chosen at the base of the lowest volcanic material. In the area of figure 2 the Datil formation rests with apparent structural conformity on the Baca formation. About 10 miles to the east the Datil formation rests unconformably on the Mesaverde group. The top of the Datil formation is eroded but the thickness of rocks preserved may be as much as 1,500 feet. Vents from which some of the pyroclastics of the Datil formation were extruded are present in the higher parts of the Datil Mountains south of the area of figure 2. Their presence is indicated at several places by chaotic bedding inclined steeply away from all sides of a central area. The extrusive centers form hills above the general topographic level of the Datil Mountains. The eroded remnant of one of these centers is well displayed in the NW¼ T. 1 N.,

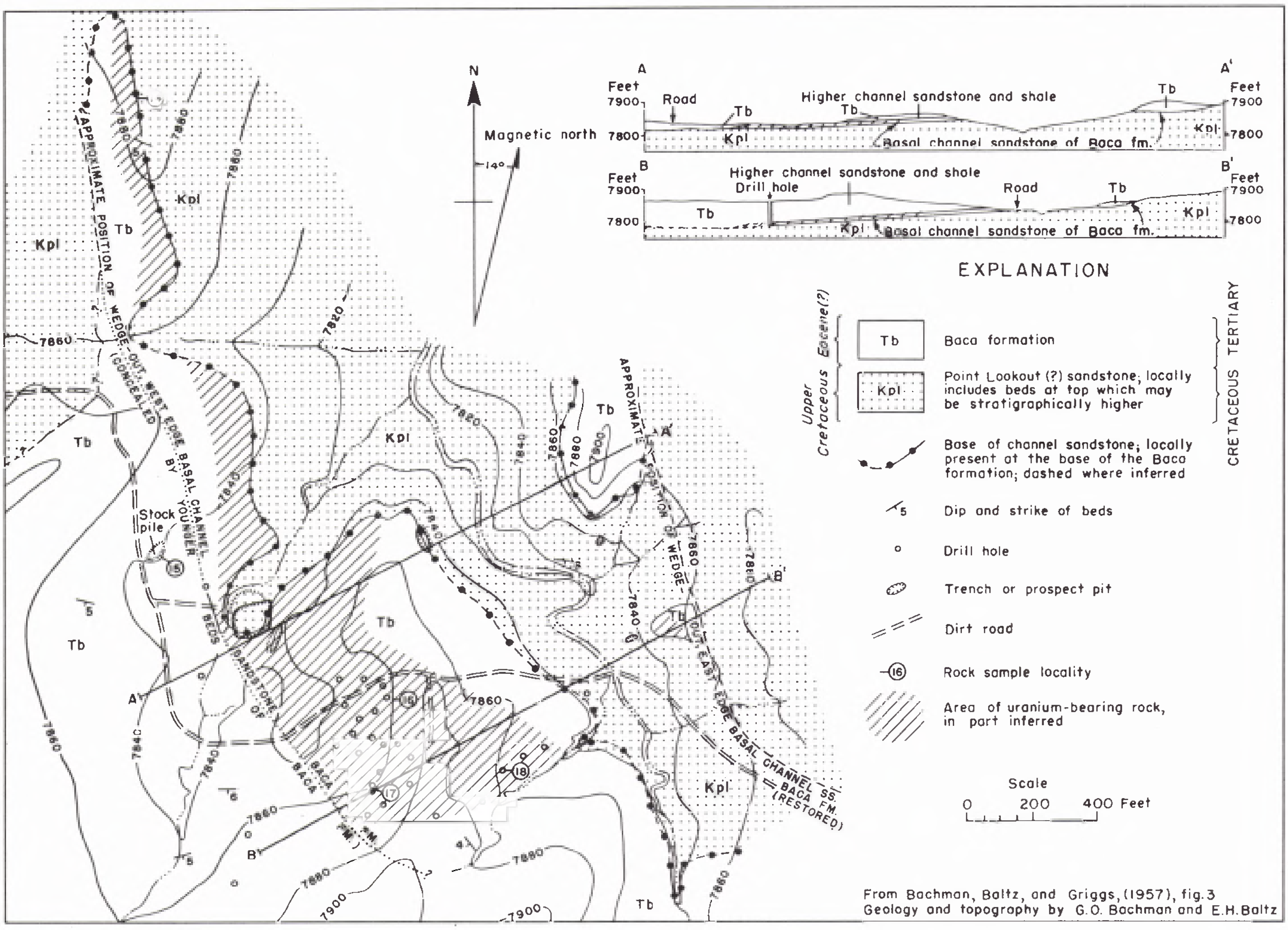

FIGURE 3.—GEOLOGIC AND TOPOGRAPHIC MAP OF RED BASIN CLAIMS, NE 1/4 SEC. 19 AND NW 1/4 SEC. 20, T. 2 N., R. 10 W.

R. 11 W. Some of the centers of volcanic activity in the Datil Mountains are alined in a broad east-trending band.

Pediment gravel and alluvium

Pediment gravel of Quarternary age is present on the summits of hills in the south part of the map area. The gravel is on remnants of a conspicuous topographic surface which slopes to the north from the Datil Mountains. The gravel consists of quartzite pebbles reworked from the Baca formation and pebbles and boulders of volcanic rock which have been reworked from the Datil formation.

Alluvial sand, silt, and clay deposits of Quaternary age are present in arroyo bottoms and along the valley flats of larger streams.

GEOLOGIC STRUCTURE

The regional dip of the upper Alamosa Creek area ranges from 1 to 6 degrees to the southwest and averages about 3 degrees. At places the axes of gentle folds trend roughly parallel to the direction of regional dip. Several synclines are in the vicinity of uranium deposits.

A few normal faults are present; however, their displacements do not exceed 50 to 100 feet. A conspicuous basaltic dike nearly 20 feet wide has been intruded along a nearly vertical fault which cuts Baca and Mesaverde rocks in T. 2 N., R. 11 W. The dike is younger than the Baca formation and therefore of Tertiary or Quaternary age.

RED BASIN CLAIMS

The Red Basin claims are in the NE¼ sec. 19 and the NW¼ sec. 20, T. 2 N., R. 10 W. A plane table map of this area is shown in figure 3. Uranium occurs at the base of a light gray sandstone which is believed to be the basal sandstone of the Baca formation at this locality. It rests on the Point Lookout(?) sandstone with angular unconformity in the northeastern part of the area of figure 3. The sandstone is light gray, except where mineralized, and is fine- to medium-grained. It is composed chiefly of quartz grains which are thought to be reworked from sandstones of the Mesaverde group. Some mica flakes and rock fragments are present in the sandstone. Where mineralized, the sandstone is dark gray to brown and much ferruginous material is disseminated with the uranium. Some of the darker color is thought to be caused by stain from vanadium minerals. Detrital carbonaceous material was noted in association with the uranium.

The basal sandstone of the Baca formation in the vicinity of the Red Basin claims wedges out to the west and also to the east. It seems to have been deposited in a northwesterly trending ancient stream channel cut in rocks of the underlying Point Lookout(?) sandstone. It is overlain by other lenticular sandstone and shale beds which also appear to fill the ancient stream channel. At the large prospect pit near the center of the area of figure 3 the western edge of the basal sandstone is confined between gray carbonaceous shale of the Point Lookout(?) below and a gray carbonaceous shale in the Baca formation above. South of the main prospect pit the basal sandstone is covered by higher Baca beds and the position of the west edge is inferred on the basis of cuttings from drill holes in the vicinity. The rocks have been tilted to the southwest so that the southwest edge of the basal channel sandstone, which contains the mineral deposits, is now topographically lower than the northeast edge.

The relationships observed here seem to indicate that the basal sandstone of the Baca formation was an aquifer confined between overlying and underlying shales. Uranium probably was precipitated from circulating ground water in a reducing environment caused by carbonaceous material in the sandstone and in the confining shale beds. The concentration of uranium-vanadium minerals in the downdip edge of the channel may have resulted from gravitational separation of the more highly mineral-charged water, or the aquifer may not have been full of water. No radioactivity was detected in rocks above and below the basal sandstone.

No attempt was made to determine the average grade and the tonnage of uranium-bearing rocks at the Red Basin claims. The area of uranium-bearing rocks is shown in figure 3. Uranium content of samples collected from the claims ranges from 0.012 to 1.05 percent and vanadium oxide from 0.0 to 0.37 percent. A sample of ore from the stock pile contained 2.31 percent uranium and 1.64 percent vanadium oxide. Anaylses of samples (nos. 14-18) collected at the Red Basin claims and at localities east and west of here are given in table 1. An additional body of uranium-bearing rock is reported to have been discovered by drilling south of the area of figure 3.

ADIT, IN S½NE¼ SEC. 14, T. 2 N., R. 11 W.

A study was made of the geologic features exposed in an adit about 500 yeards northeast of the McPhaul Ranch headquarters (fig. 4). Equivalent uranium content was estimated on the basis of Geiger counter readings. Uranuim is concentrated in a ferruginous zone which ranges from a fraction of an inch to about three inches thick. The ferruginous zone is in sandstone at the contact of the Point Lookout(?) sandstone with underlying shale of the Crevasse Canyon formation, and it represents the lower level of free ground-water movement within the sandstone bed. Radioactivity decreases rapidly downward into the relatively impermeable shale.

Within the ferruginous zone radioactivity is greatest in and near carbonaceous material. This relationship was observed especially in the vicinity of carbonized fossil logs and in carbonaceous clay which has been compressed into space formerly occupied by logs. There is no indication that radioactive material is especially concentrated in or near joints. However, there is a suggestion that greater radioactivity occurs at some places where planes of cross-bedding in the Point Lookout(?) sandstone intercept the contact with shale of the Crevasse Canyon formation.

The adit is situated within a small, shallow syncline (fig. 2) about 150 feet west of the axis of the syncline. A normal fault having 10 to 20 feet of displacement is located about 150 feet west of the adit. The syncline lies on the downthrown (eastern) side of the fault and drag has slightly accentuated dips along the west limb of the syncline. No evidence could be found which associated the

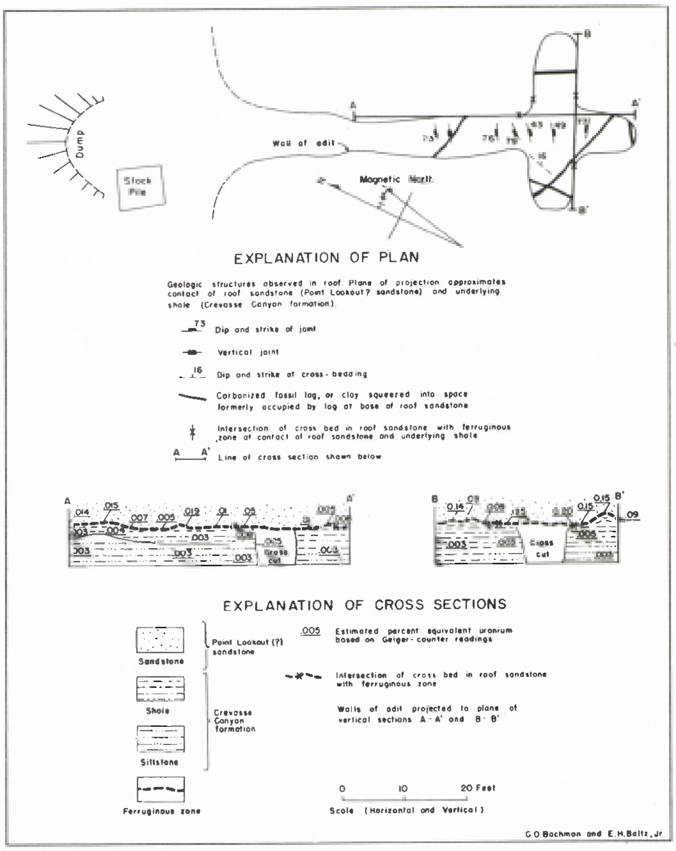

Figure 4.– PLAN AND CROSS SECTIONS OF ADIT S ½, NE ¼, Sec. 14, T. 2 N., R. 11 W.

uranium mineralization directly with the fault. The minor syncline seems to have served as a trough down which uranium-bearing solutions circulated in permeable sandstone of the Point Lookout(?) above impermeable shale of the Crevasse Canyon formation. Analyses of samples (nos. 8-9) collected here are given in table 1.

EXPOSURE IN E½ SEC. 11, T. 2 N., R. 11 W.

Geologic features were examined in detail at a prospect in the E½ sec. 11, T. 2 N., R. 11 W. (fig. 5). The prospect is located on a west-facing cliff of sandstone immediately below the top of a mesa. Workings consist of a nearly vertical face more than 100 feet long and 5 to 12 feet high. The sandstone, in the upper part of the Point Lookout(?) sandstone, is strongly cross-bedded and contains a zone of clay beds, or "stringers". Thin lenses of carbonaceous shale and compacted carbonized fossil logs occur in the zone of clay beds and along bedding planes in the sandstone.

Estimates of percentage of equivalent uranium were based on Geiger counter readings. Highest radioactivity occurs in lenses of carbonaceous material. A yellow uranium mineral was observed on the weathered portion of several lenses of carbonaceous shale and carbonized fossil logs. Radioactivity slightly above background was detected at places in the sandstone. Uranium of possible economic value (0.1 percent or greater) is very limited, and is restricted entirely to thin discontinuous lenses of carbonaceous material. A grab sample (no. 4) of gray carbonaceous sandy shale collected at this locality contains 0.33 percent uranium and 0.76 percent vanadium oxide. A grab sample

TABLE 1. – ANALYSES OF ROCK SAMPLES (from Table 1, Bachman, Baltz, and Griggs, 1957).

Sample number	Location sec., T., R.	Equivalent uranium (percent)	Chemical uranium (percent)	Chemical V_2O_5 (percent)	Description
1	12-2N-11W	0.015	0.004	0.34	Channel sample of the lower 1 foot of a 5-foot bed of bluish-gray shale in the Point Lookout(?) sandstone exposed in a bulldozer pit.
2	12-2N-11W	.13	.14	.28	Channel sample of the upper 2 feet of a sandstone bed containing carbonaceous material in the Point Lookout(?) sandstone. Exposed in the bottom of a bulldozer pit.
3	12-2N-11W	.10	.009	.322	Channel sample of a 1-foot bed of carbonaceous, thinly bedded sandstone in the Point Lookout(?) sandstone. Exposed in a bulldozer pit.
4	11-2N-11W	.36	.33	.76	Grab sample of gray sandy shale containing carbonaceous material in the Point Lookout(?) sandstone.
5	11-2N-11W	.10	.061	.12	Grab sample of the upper 3 feet of a poorly exposed bed of white sandstone in the Point Lookout(?) sandstone.
6	11-2N-11W	.074	.004	-	Channel sample of a lens, 1 foot thick, of carbonaceous sandstone in the Point Lookout(?) sandstone.
7	14-2N-11W	.062	..056	-	Selected sample of the lower three inches of carbonaceous sandstone in the Point Lookout(?) sandstone.
8	14-2N-11W	.056	.042	-	Selected sample of the lower 1 inch of a sandstone bed resting on black shale in the Point Lookout(?) sandstone.
9	14-2N-11W	0.003	0.0017	-	Grab sample of the upper 2 feet of black shale immediately below sample 8.
10	19-2N-10W	.016	.022	-	Grab sample of the lower 8 inches of a sandstone in the Point Lookout(?) sandstone. The sandstone contains shale pellets.
11	19-2N-10W	.051	.019	-	Selected sample of the lower 2 inches of a sandstone in the Point Lookout(?) sandstone.
12	19-2N-10W	.025	.004	-	Limonite deposited along the bedding plane immediately below sample 13.
13	19-2N-10W	.005	.002	-	Grab sample of the upper 1 foot of black shale underlying sample 14.
14	19-2N-10W	.040	.012	-	Grab sample of the lower 1 foot of an 18-foot bed of Baca sandstone, Red Basin claims. Pebbles and clay pellets are present in the base of the sandstone.
15	19-2N-10W	1.6	2.31	1.64	Grab sample from a stock pile of ore at Red Basin claims.
16	19-2N-10W	.19	.27	.37	Drill cuttings from the depth 47.5-50.0 feet in a drill hole in the Baca formation, Red Basin claims.
17	19-2N-10W	.71	1.05	.21	Drill cuttings from the depth 67.5-70.0 feet in a drill hole in the Baca formation, Red Basin claims.

TABLE 1. – ANALYSES OF ROCK SAMPLES - (Continued)

Sample number	Location sec., T., R.	Equivalent uranium (percent)	Chemical uranium (percent)	Chemical V_2O_5 (percent)	Description
18	20-2N-10W	0.25	0.40	0.32	Drill cuttings from the depth 36-37 feet in a drill hole in the Baca formation, Red Basin claims.
19	20 or 21-2N-10W	.081	.12	-	Drill cuttings from the depth 20-22.5 feet in a drill hole in the Point Lookout(?) sandstone.
20	21-2N-10W	.004	.002	-	Grab sample of Point Lookout(?) sandstone containing pieces of carbonized wood.
21	27-2N-10W	.013	.011	-	Grab sample of the lower 6 inches of a sandstone bed in the Point Lookout(?) sandstone.
22	27-2N-10W	.10	.14	.005	Grab sample of a 4-to 6-inch thick mineralized zone in the Point Lookout(?) sandstone.
23	27-2N-10W	.095	.017	-	Selected sample of the lower 1 inch of a sandstone bed in the Point Lookout(?) sandstone. The sample includes a crust of limonite deposited along the bedding plane between the sandstone and underlying shale. The limonite contains a yellow uranium mineral.
24	27-2N-10W	.023	.026	-	Grab sample of the lower 4 inches of a sandstone in the Point Lookout(?) sandstone. The sandstone rests on black shale.
25	35-2N-10W	.009	.005	.14	Grab sample of the lower 3 inches of a sandstone in the Point Lookout(?) sandstone. The sandstone rests on black shale.
26	22-3N-16W	.044	.053	.1	Grab sample of a 3-inch bed of gray sandy shale containing carbonaceous material in the Mesaverde group.
27	31-2N-9W	0.025	0.029	0.074	Grab sample of a 3-to 6-inch thick black sandstone within a thick bed of massive gray sandstone in the Baca formation.
28	30-2N-9W	.054	.026	.1	Grab sample of the lower 3 inches of a sandstone bed in the Mesaverde group. The sandstone rests on gray shale.
29	8-1N-6W	.004	.001	-	Grab sample of rhyolitic tuff of the Datil formation.
30	18-1N-5W	.14	.26	.1	Grab sample of a 2-foot bed of white sandstone about 50 feet above the base of the Baca formation.
31	NW¼ 18-1N-5W	.001	-	-	Channel sample of a 30-inch thick bed of coal at an abandoned coal mine in the Mesaverde group.
32	18-1N-5W	.63	.31	.1	Channel sample of a 2-foot thick mineralized zone in light gray carbonaceous sandstone of the Baca formation.
33	13-1N-6W	2.0	3.27	9.21	Channel sample of a 1-foot thick mineralized zone in light gray sandstone of the Baca formation. The sample contains a yellow uranium mineral.
34	24-1N-6W	.24	.19	2.98	Grab sample of a 2-foot thick mineralized zone in light gray carbonaceous sandstone of the Baca formation.
35	35-1N-6W	.13	.036	.1	Grab sample of a 1-foot thick mineralized zone in a carbonaceous sandstone bed of the Baca formation.

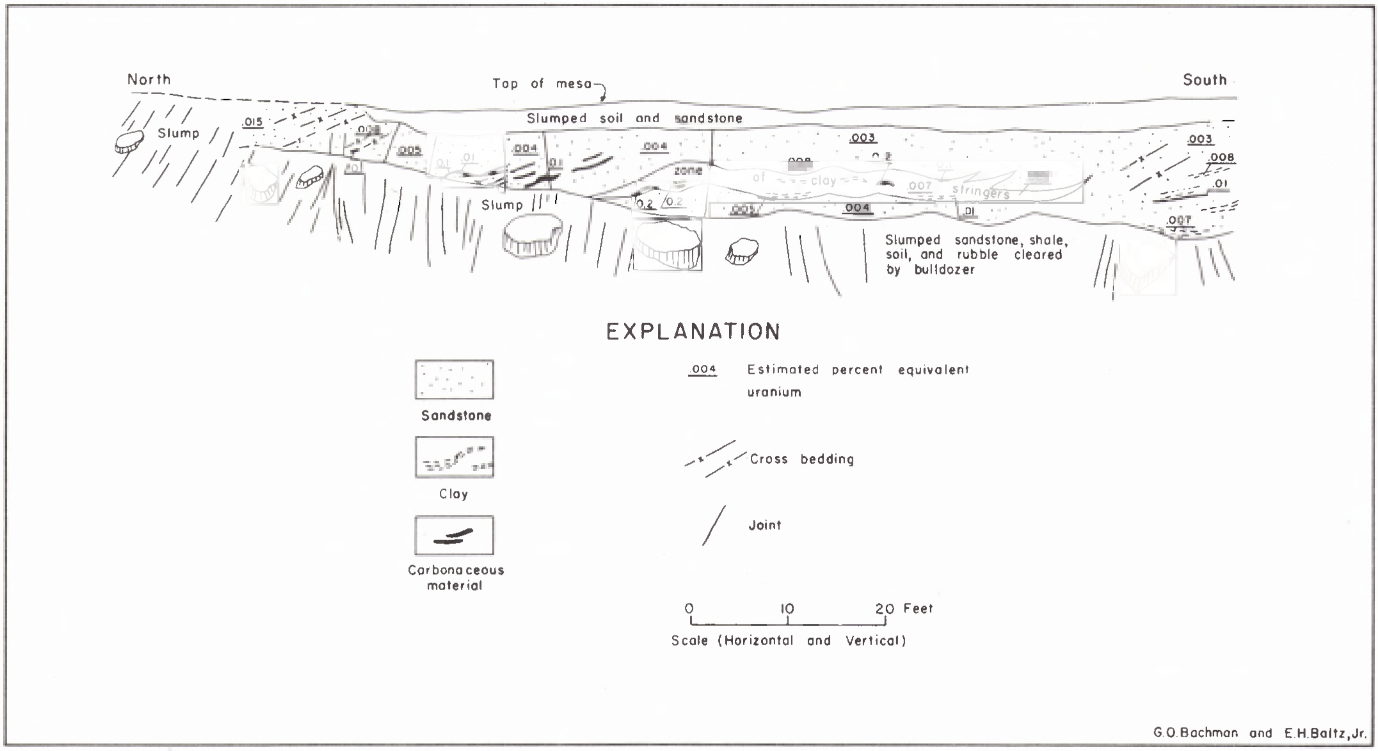

FIGURE 5.—DIAGRAM OF EXPOSURE IN E ½, SEC. 11, T. 2 N., R. 11 W., SHOWING RELATIONSHIP OF URANIUM CONCENTRATION TO SEDIMENTARY STRUCTURES IN UPPER PART OF POINT LOOKOUT (?) SANDSTONE

(no. 5) of sandstone contains 0.061 percent uranium and 0.12 percent vanadium oxide.

The axis of a minor north-trending syncline is in the canyon immediately west of this locality (fig. 2). This syncline may have influenced circulation of uranium-bearing solutions through the Point Lookout (?) sandstone.

Other prospect pits on this mesa were examined and the relationships observed were similar to those described above. Analyses of samples (nos. 1.7) collected in this area are shown in table 1.

CONCLUSIONS

The features observed in the uranium deposits studied in the upper Alamosa Creek area indicate a relationship of the deposits to ground-water movements as influenced by structure and stratigraphy. Structural troughs, porosity and permeability changes, and the presence of carbonaceous material all seem to have been important factors in the concentration of uranium in all of the deposits examined. These relationships may be of value in future prospecting, and in drilling and other physical exploration in the region.

Not enough detailed evidence has been obtained in this region to provide a satisfactory explanation for the ultimate source of the uranium. It is doubtful that the uranium is syngenetic because of its relation to limonite crusts and other distinctly epigenetic features. It is possible, of course, that uranium in a disseminated state was deposited syngenetically with the sediments. The uranium could have been concentrated in the more permeable sandstones while connate fluids were being expelled from the shales during the process of compaction. However, examination of the shales adjacent to the uranium deposits indicates that these rocks contain little or no radioacitve material and thus do not appear to be likely source rocks.

A clue to the source of the uranium may lie in the presence of traces of uranium in volcanic rocks of the Datil formation. North of the Gallinas Mountains (fig. 1) the Datil formation truncates the Baca formation and rests with angular unconformity on rocks of the Mesaverde group which dip south under the Tertiary rocks. Prior to late Tertiary and Quaternary erosion these stratigraphic relations may have obtained in a large area north of the Datil and Gallinas Mountains. Griggs (1954, p. 5) has suggested that descending meteoric waters may have leached radioactive material from tuffaceous rocks of the Datil formation and deposited it in underlying rocks.

The presence of eruptive centers of the Datil formation in areas only a few miles from some of the deposits may point to a possible hydrothermal origin of the uranium. Ascending solutions could have been injected into the ground-water system to mineralize not only the Point Lookout (?) sandstone and Baca formation, but also the Datil formation. Thus the Datil formation might be a host rock rather than a source rock, with the difference in concentration of uranium in sedimentary and volcanic rocks being a function of the amounts of carbonaceous material in the two types of rocks.

The uranium might have been derived from a combination of any of the above sources or from some other source, or the source may not have been the same for all deposits. At any rate, some relationships of the uranium depostis to volcanic rocks is suggested and futher prospecting near the volcanic rocks appears to be warranted.

Other problems yet to be solved are the reasons for disequilibrium of values of equivalent uranium and chemical uranium of many of the samples analyzed, and the relationship, if any, of vanadium and uranium.

REFERENCES CITED

Bachman, G. O., Baltz, E. H., and Griggs, R. L., 1957, Reconnaissance of geology and uranium occurrences of the upper Alamosa Creek valley, Catron County, New Mexico: U S. Geol. Survey Trace Elements Inv. Rept. 521.

Dane, C. H., and Bachman, G. O., 1957, Preliminary geologic map of the northwestern part of New Mexico: U. S. Geol. Survey Misc. Geol. Inv. Map I-224.

Dane, C. H., Wanek, A. A., and Reeside, J. B., Jr., 1957, Reinterpretation of section of Cretaceous rocks in Alamosa Creek valley area, Catron and Socorro Counties, New Mexico: Am Assoc. Petroleum Geologists Bull., v. 41, p. 181-196.

Griggs, R. L., 1954, A reconnaissance for uranium in New Mexico, 1953: U. S. Geol. Survey Circ. 354, 9 p.

Wilpolt, R. H., MacAlpin, A. J., Bates, R. L., and Vorbe, Georges, 1946, Geologic map and stratigraphic sections of Paleozoic rocks of Joyita Hills, Los Pinos Mountains, and northern Chupadera Mesa, Valencia, Torrance, and Socorro Counties, New Mexico: U. S. Geol. Survey Oil and Gas Inv. Prelim. Map 61.

Wilpolt, R. H., and Wanek, A. A., 1951, Geology of the region from Socorro and San Antonio east to Chupadera Mesa, Socorro County, New Mexico: U. S. Geol. Survey Oil and Gas Inv. Map OM 121.

Winchester, D. E., 1920, Geology of the Alamosa Creek valley, Socorro County, New Mexico, with special reference to the occurrence of oil and gas: U. S. Geol. Survey Bull. 716, pt. II, p. 1-15 (1921).