PRELIMINARY REPORT ON A URANIUM OCCURRENCE AND REGIONAL GEOLOGY IN THE CHERRY CREEK AREA, GILA COUNTY, ARIZONA

By
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PRELIMINARY REPORT ON A URANIUM OCCURRENCE
AND REGIONAL GEOLOGY IN THE CHERRY CREEK AREA,
GILA COUNTY, ARIZONA

ABSTRACT

The Black Brush uranium claims in the Cherry Creek area, Gila County, Arizona, are approximately 36 miles north of Globe, Arizona. The area is underlain by essentially flat-lying sedimentary rocks of the Precambrian Apache group which have been block faulted and intruded by diabase of possible Tertiary age. Uranium occurs in the upper member of the Dripping Spring quartzite and is associated with sets of fractures which trend N. 20° E. and N. 70° W.

A radiometric traverse of the Black Brush workings indicates that further underground exploration is warranted along these fractures. Several assays of samples from the workings and ore pile were above commercial grade. Surface prospecting along the favorable horizon in the Dripping Spring quartzite should be directed with particular attention to the fracture systems.

Bulldozing of soil- or talus-covered areas of the Dripping Spring quartzite is also recommended along projections of favorable linear trends that appear in the Troy quartzite and are visible on aerial photographs.

INTRODUCTION

A reconnaissance of the Black Brush property was made by geologists of the Atomic Energy Commission in March, 1955. This anomalous area was located by an earlier airborne radiometric survey. The examination consisted of preliminary sampling and surface and underground radiometric traversing.

A subsequent general geologic investigation was undertaken later in the spring of 1955. This included surface reconnaissance geologic mapping of about ten square miles, in which photogeologic information was transferred to an enlarged portion of the McFadden Peak topographic sheet of the Sierra Ancha area (pl. I). Underground mapping and radiometric traverses of the workings on the Black Brush claims also were undertaken. Several thin sections of igneous rocks were examined under
the microscope in order to determine their mineral composition.

The purpose of the study was to determine any relationship of the mineralized area to regional structure and stratigraphy. The writer is indebted to R. J. Schwartz of the Atomic Energy Commission and H. C. Granger of the U. S. Geological Survey for information received and general discussions concerning the region.

Location

The mapped area, about ten square miles, is approximately 36 miles north of Globe, Arizona (fig. 1). This is in the vicinity of the Black Brush mine, which is in Section 4, Township 6 North, Range 14 East, Salt River Meridian, Gila County, Arizona (pl. I).

Topography and Climate

Elevations in the area range from about 3,700 to 7,500 feet. Topographic features at higher elevations consist of flat-topped mountains and steep canyon walls. Lower slopes are moderately rounded and commonly covered with debris from the high canyon walls. The area studied is situated near the transition zone between the Colorado Plateau and the Basin and Range physiographic provinces (1), and characteristics of both provinces are evident in the region.

The climate is semi-arid to arid and vegetation consists mainly of sage, numerous cacti and other desert plants, and several varieties of conifers. Conifers are ample in the higher elevations for use as mining timber.

GEOLOGY

Sedimentary rocks in the area consist of the Scanlan conglomerate, Pioneer formation, Barnes conglomerate, Dripping Spring quartzite, and Mescal limestone of the Apache group of Precambrian age, the Troy quartzite of Cambrian age, and some Tertiary and Quaternary channel fill. Diabase and granite comprise the remaining rock types. More than one stage of faulting has been recognized and recurrent movement on some fault zones is apparent on the lower slopes of Cherry Creek canyon.
INDEX MAP showing location of
CHERRY CREEK AREA
GILA COUNTY, ARIZONA

FIG. 1
Sedimentary Rocks

Most of the sedimentary rocks in the region belong to the Apache group. This group formerly was thought to be of Cambrian age and included the Troy quartzite. More recent work (2) indicates that the Apache group is Precambrian and is overlain unconformably by the Troy which is of Cambrian age.

The oldest sedimentary formation exposed in the area is the Scanlan conglomerate. It is about 20 feet thick and consists of sub-rounded to well-rounded pebbles and boulders of quartz and quartzite in a silicified, granular, arkosic matrix. The contact of the Scanlan conglomerate with the overlying Pioneer formation is somewhat gradational.

The Pioneer formation is about 200 feet thick and is mainly thick-bedded, arkosic quartzite. It is generally purple in color and coarse-grained. Some thin-bedded purple shales are present near the top of the formation and are generally covered by debris from other formations.

The Barnes conglomerate overlies the Pioneer formation. It is about 50 feet thick and consists of smooth, well-rounded pebbles of quartz and quartzite in a silicified, sandy, arkosic matrix. Fractures generally show flat surfaces which cut through the pebbles. The matrix is usually reddish purple in color and pebbles are red, bluish purple, and white.

Overlying the Barnes conglomerate is the Dripping Spring quartzite which is divided into a lower and an upper member. The lower member is about 400 feet of massive, locally cross-bedded, fine-grained, silicified, arkosic siltstone. Fresh surfaces are light-colored, but weathered surfaces show buff, yellow, reddish brown and purple banding. This banding locally gives the massive beds a thin-bedded appearance. The upper member of the formation consists of about 300 feet of fine-grained, predominantly thin-bedded, silicified, arkosic siltstone with a few sandy and shaly beds. Fresh unoxidized surfaces are generally medium to dark gray, primarily due to finely disseminated pyrite. Weathered surfaces are pink to red to orange-brown due to limonite and hematite formed by oxidation of pyrite. The upper member is the favorable horizon for the deposition of uranium except where both upper and lower beds are predominantly massive.

The Mescal limestone overlies the Dripping Spring quartzite and is about 300 feet thick in the Cherry Creek area. It consists of light gray
to buff, dolomitic, thin-bedded limestone containing thin, irregular layers of dark gray chert which stand out on the weathered surface to give a characteristic ribbed appearance. In some places upper beds are thick-bedded algal limestone. Locally a thin basalt sheet is present near the upper contact of the formation. Thin quartzite lenses which resemble the Dripping Spring quartzite are found in places in the upper portion of the formation. The Mescal limestone is the host rock for the asbestos deposits of the region.

Unconformably overlying the Mescal limestone is the Troy quartzite which is about 1,000 feet of cross-bedded, medium- to coarse-grained, massive quartzite. Locally it contains fine-grained beds which are distinguished from the Dripping Spring quartzite by the presence of thin, pebbly lenses. The Troy quartzite is almost white on fresh surfaces, but weathered surfaces may be buff, yellow, rusty, or purple due to iron stain.

Tertiary and Quaternary Debris

An unconsolidated debris-filled channel is present on the lower western slopes of Cherry Creek. This channel is roughly parallel to the present degrading stream which is in hard competent rocks to the east. The debris in the old channel is at least 300 feet thick in places and consists of sub-angular and sub-rounded boulders of all local rock types. Locally along the western extremities of the old channel weathered diabasic material is exposed. The diabase may be in place beneath the channel as local intrusions, or it could represent landslide material from a thick diabase sill above.

Igneous Rocks

Igneous rocks which are exposed in the area include diabase of Tertiary (?) age and granite of Precambrian age. The diabase crops out on the western slope of Cherry Creek along fault slivers and in the form of a thick sill which intrudes the upper member of the Dripping Spring quartzite. The granite is exposed on the lower western slope of Cherry Creek (pl. I and II, sec. C-C').

The granite has been brecciated and silicified but the texture is granitic and rather coarse-grained. Grain sizes range from about 3 mm. to 0.5 cm. It contains about 30 percent quartz, 35 percent microcline, 20 percent oligoclase (An\textsubscript{10-12}), five percent biotite (altered to limonite and sericite), and less than one percent sphene,
epidote and apatite. About ten percent introduced quartz makes up the remainder of the rock. Hematite is conspicuous in some specimens.

The diabase has a typical diabasic texture although it is somewhat variable in grain size and mineral composition. It consists mainly of augite and labradorite with minor amounts of biotite, sphene, apatite, zircon, and magnetite. Alteration minerals include sericite, limonite, chlorite, and clays.

Structure

Major structures in the area are limited to block faulting and related monoclinal and drag folding. The formations are essentially flat-lying, and regional folding is not evident. A peneplane parallel to bedding in the upper part of the Troy quartzite is apparent over the entire region and has been displaced by the faulting. Important minor structures include joint systems which trend N. 70° W. -W. The uranium deposits in the Dripping Spring quartzite are associated with joints trending in these directions.

Faulting of considerable displacement is evident on the lower west slopes of Cherry Creek and trends west of north parallel to the stream channel. Upturned beds along the faults were probably the result of initial monoclinal folding which developed into an east-dipping high-angle reverse fault. Later normal faulting dropped the east block to its present position. A fault north of the Black Brush mine (pl. I), which curves from northwest to west may be the result of the intrusion of the thick diabase sill which uplifted McFadden Horse Mountain. The base of this sill is not exposed in the mapped area, but exposures to the southwest indicate that its thickness is approximately 900 feet. The stratigraphic displacement along the curving fault is about 900 feet, and the erosional surface on top of McFadden Horse Mountain has been uplifted about 900 feet along this fault (pl. II, sec. A-A'). This evidence indicates a relatively late age for the diabase intrusion and the curving fault may represent collapse around the nose of the concordant intrusion. The diabase is not present in the exposures of the sedimentary section of the Apache group east of the fault.

Different authors have suggested that the diabase intrusions range from Middle Cambrian or earlier to Tertiary in age at various localities in southern Arizona. The writer believes that local
structural evidence indicates a Tertiary(?) age for the thick diabase sill which underlies McFadden Horse Mountain and crops out on the western slope of Cherry Creek. The granite is brecciated and silicified and is petrographically similar to the granite of Precambrian age.

The uranium deposits in the area are associated with joint systems which trend N.-N. 20° E. and N. 70° W.-W. Aerial photographs showed no linear trends along outcrops of the Dripping Spring quartzite. Hills which are capped with Troy quartzite, however, showed linear trends in these directions. These features are expressed by topographic breaks or depressions and vegetation alignments. The approximate location of the joints were plotted on a portion of the McFadden Peak topographic sheet which includes portions of Cherry Creek, Reynolds Creek, and Workman Creek (fig. 2). Other linear trends were visible but were not plotted since they are not known to be associated with ore. The fractures apparently are tight in the Dripping Spring quartzite. The Mescal limestone may have been partially dissolved along these fractures causing the overlying Troy quartzite to open up enough for weathering and erosion to have some effect on it. The observation of these linear features in the Troy quartzite may be significant in exploration along projections of the joints where the Dripping Spring quartzite is covered with debris from the overlying formations, or when exploration has advanced to subsurface work beneath the Troy quartzite.

THE BLACK BRUSH MINE

The Black Brush claims are owned by Travis Ellison and others, and are presently leased to the Western Mining and Exploration Company of Phoenix, Arizona. Nearest railroad centers are at Globe and Miami, about 36 miles south of the property.

Geology of the Deposit

Uranium at the Black Brush property occurs in the middle unit of the upper member of the Dripping Spring quartzite. The host rock is fine-grained, fairly thin-bedded and dark gray in color. Weathered surfaces are commonly grayish purple to orange. In the Sierra Ancha area the upper member is everywhere abnormally radioactive. Background radiation of this member registers 0.03 to 0.06 MR/hr in contrast to 0.02 to 0.04 MR/hr for the lower member and 0.01 to 0.015 MR/hr for the Mescal limestone and the diabase (3).
LINEAR PATTERNS
IN THE TROY QUARTZITE

Plotted from aerial photographs on a portion of McFadden Peak topographic sheet.
Numerous fractures are present in the formation in the general mine area. Only those fractures which trend N. 20° E. and N. 70° W., however, cut all of the bedding planes which are exposed in the workings (fig. 3). These persistent fractures are associated with the uranium deposits in the Sierra Ancha area and are apparently one of the controlling factors for uranium deposition at the Black Brush claims. About 60 feet below the workings is the contact of the upper part of the Dripping Spring quartzite and the thick diabase sill which underlies McFadden Horse Mountain. The presence of diabase near uranium deposits has been noted by different geologists in several localities, and the uranium is believed by some to be genetically related to the diabase.

Mineralogy

The mineral assemblage at the Black Brush workings is similar to other deposits in the Dripping Spring quartzite. Uraninite is the main uranium-bearing mineral at the property and it occurs in paper-thin lenses and local disseminations in the quartzite. Secondary uranium minerals are not abundant, but torbernite (CuO₉₂UO₃P₂O₅·12H₂O) has been recognized and bassite (FeO·UO₃·P₂O₅·12H₂O) tentatively identified. Gangue minerals include pyrite, pyrrhotite, chalcopyrite, bornite, marcasite, and galena which occur along fractures and as local disseminations.

Selected samples have assayed as high as 1.75 percent U₃O₈ and several mining width samples assayed above 0.20 percent. One sample from the ore pile indicated that it contains several hundred tons of ore-grade material.

The results of a radiometric traverse of the workings are shown in figure 3. The workings consist of an adit trending N. 20° E. about 60 feet long and a N. 70° W. trending crosscut about 15 feet long at 40 feet from the portal of the drift. Another drift about 60 feet south of this portal is about 15 feet long and is parallel to the crosscut. In the north drift, the ore zone is one to one-and-a-half feet thick and is about one foot from the floor at the portal. North of the crosscut, this zone is about three feet above the floor. The radioactivity decreases rather abruptly north of the crosscut and to the east along the crosscut. In the south drift, the mineralized zone is five feet from the floor. Further exploration along the favorable fractures is warranted.
NOTE: All readings taken in counts per second.
All readings taken on 1.5' thick zone 1' from bottom of drift at portal. North of crosscut zone is 3' above floor.
Many small fractures which do not cut thin-bedded layer at bottom of drift are not shown.

Background for dumps and mine area - 600 cps
Background for formation away from workings - 150 cps.

Precambrian,
Dripping Spring quartzite

GEOLOGIC MAP & RADIOMETRIC TRAVERSE of workings at the BLACK BRUSH CLAIMS

Scale in Feet

Figure 3
CONCLUSIONS

The investigation resulted in recognition of certain structural relationships which have bearing on the age of a thick diabase sill, and surface expressions of joint systems which are related to uranium deposits in the region.

Uranium at the Black Brush mine is associated with fractures which trend N. 20° E. and N. 70° W. in the upper member of the Dripping Spring quartzite. The mineralized zone is one to one-and-a-half feet thick and extends an unknown (probably several feet) distance away from the fractures. A radiometric traverse of the workings indicated that the radioactivity decreased abruptly at a distance of about 40 feet inside the drift, but showed a moderate increase at the face. Further exploration in a N. 20° E. direction and also in a N. 70° W. direction could intersect cross fractures which may be mineralized.

Surface prospecting with the aid of a scintillation instrument is recommended along the favorable horizon in the upper member of the Dripping Spring quartzite and along fractures with the above described trends. Bulldozing of soil- or talus-covered areas of the Dripping Spring quartzite is also recommended in the Cherry Creek area along projections of linear trends (N.-N. 20° E. and N. 70° W.-W.) in the Troy quartzite which are visible on aerial photographs. Further underground and surface exploration would be necessary to evaluate the area more fully for potential uranium production.
REFERENCES


SECTIONS A-A', B-B' & C-C'
OF CHERRY CREEK AREA,
Gila County, Arizona

EXPLANATION
SEDIMENTARY ROCKS

IGNeous ROCKS

Scale is Feet