State Department of Geology and Mineral Industries

1069 State Office Building
Portland 1, Oregon

PIKE CREEK CARNOTITE GROUP

Harney County

Owners: Dewey M. and Alma M. Quier, Burns, Oregon: C. P. and Gladys M. Woodle, Corbett, Oregon; Beulah Rhoads, Burns, Oregon.

Location: Secs. 17 and 20, T. 34 S., R. 34 E., Harney County. The claims are confined mostly to a narrow zone along Pike Creek approximately 3 miles south of Alvord Ranch.

General geology: The general stratigraphic sequence in this area of Steens Mountain consists of a series of northwesterly dipping Tertiary volcanics. These are best exposed on the east face of the range and were first named and described by Fuller (1931) and later by Williams (1953). On the basis of their investigations this series has been divided into four major formations as follows (oldest to youngest): (1) Alvord Creek formation, acidic tuffs and tuffaceous sediments with some leaves; (2) Pike Creek volcanic series, rhyolitic and dacitic flows and tuffs; (3) Steens Mountain volcanic series, basalts and andesites with subordinate dacites and rhyolites; and (4) Steens basalt, cliff-forming flows of olivine basalt.

The age of the volcanics is based largely on the fossil floras found within the Alvord Creek beds near the base of the exposed section and these have been variously dated from upper Miocene to lower Pliocene (Fuller, 1931 and Axelrod, 1944). Unfortunately fossil leaf dating has not reached the accuracy or dependability of vertebrate dating, but the apparent stratigraphic similarity of the Steens Mountain section to the Owyhee section to the northeast (Porter, 1953) would tend to show the age of the Alvord Creek beds to be Mascall-Payette equivalent (upper Miocene). Farther to the south in the Pueblo Mountains area Fuller shows that the Steens basalts dip conformably beneath the Thousand Creek beds which contain a large mammalian fauna of middle Pliocene age (Wood, et al, 1941). This places the age of the Steens Mountain volcanics, therefore, between upper Miocene and middle Pliocene.

The elevation of the range began after the eruption of the Steens basalts and probably even after the Thousand Creek beds were laid down. This would place the time of uplift in the middle or late Pliocene or earliest Pleistocene. The east face of Steens Mountain is much steeper than the west side and shows the typical geomorphic features identified with basin and range fault-block mountains (faceted spurs and hot springs, etc.). Smith (1927) considered the major uplift along the east side of the range to be due to large-scale thrust faulting by compressional forces, but a rebuttal by Fuller and Waters (1929) clearly showed that these are normal faults produced by tensional stresses.

Geology and mineralogy of the deposit: The area showing the greatest radioactive anomaly is confined to a fairly narrow shear zone in acid lavas of the Pike Creek volcanic series and is exposed in a narrow canyon approximately one-half mile upstream from where Pike Creek debouches onto its alluvial fan on the west side of Alvord basin. Williams divides the Pike Creek series into five members based on the dominant lithology of each, and the mineralized fault zone appears to be within his "lower laminated rhyolite" where it is exposed in the creek bed. The fracture zone is approximately 6-10 feet wide, strikes N. 30° E. and dips about 60° E. The country rock is a hydrothermally(?) altered pinkish-gray brecciated and silicified rhyolite made up predominantly of a "mat" of very poorly sorted angular fragments of felsitic rhyolite up to 1 inch (most of which show well-developed flow banding) in a dense siliceous aphanitic groundmass. The radioactive mineralization is confined almost entirely to a fairly narrow "selvage" bordering the fracture surfaces of the rock within the fault zone and is especially concentrated along the footwall side. These surfaces have been stained a deep dull red color which grades imperceptibly downward into the unaltered rock within a distance of one-half to three-quarters of an inch. A slab of the rhyolite approximately three inches wide and one-half inch thick was cut from the rock normal to the plane of the mineralized fracture surface. This in turn was split into equal portions; each approximately 1½ inches wide; one from the upper half of the slab which included the "high count" mineralized zone and one from the lower half which showed a much lower count. Chemical analyses from these two portions showed 0.36 percent U_3O_8 from the upper half and 0.04 percent U_3O_8 from the lower half.

An attempt was made to concentrate the radioactive material along the fracture zones by crushing and panning but with little success, since all of the material seemed to have almost the same specific gravity. A check on the Geiger counter showed that, if anything, the "lights," after panning, were slightly more radioactive than the "heavies." It is interesting to note that the water in which the material was panned also showed a trace of radioactivity (approximately 0.015 percent U_3O_8 on the radioassayer) even after standing overnight. Under the microscope both the "lights" and the "heavies" were found to be composed almost entirely of chalcedony with a minor amount of very finely disseminated magnetite. No minerals of high relief could be discerned and no radioactive opaques could be identified with certainty.

Conclusions: The last visit by anyone from the Department (Dole and Wagner, 8/12/55) showed that no pitting or development work of any kind has been done on the shear zone. A trail, however, was bulldozed up one of the spurs on the north side of Pike Creek to an elevation approximately 300 feet above the stream bed. None of the rhyolitic material examined along this trail showed any abnormal count and no development work was in evidence at the top where the trail ended. In the shear zone itself no more than 50-60 feet of mineralized rock is visible and even this is exposed only on the south side of the creek.

The very dense nature of the rhyolite would seem to preclude the possibility of the mineralizing fluids being able to impregnate the country rock for any appreciable distance. This is strikingly shown in the rapid drop in U_3O_8 content with distance from the mineralized fracture surface. It is very likely that the U_3O_8 content of the outermost one-fourth inch of rock nearest the mineralized surface may in some cases be as high as .5 to 1.0 percent U_3O_8 (or perhaps even higher on the basis of some scintillator readings taken on the best looking material!), but the far greater volume of very low-grade material with which the "high grade" is intimately associated and which must be mined along with it would almost certainly result in an overall average U_3O_8 content considerably less than the minimum acceptable.

If, however, the fracture system became more closely spaced with depth (although there does not appear to be any surface indication to this effect) it is possible that a larger volume of rock might become sufficiently mineralized to be accepted as commercial grade ore. Another avenue that may be worth investigating is the possible presence of mineralized tuffaceous interbeds which are known to exist both above and below the rhyolite member. Because of their greater relative porosity and permeability, the chances of their being more completely impregnated by the ore solutions are much greater than with the much denser rhyolites except in those areas where the latter have become brecciated due to movement along a fault zone.

The extent to which the tuffs could be impregnated by the ore solutions would depend largely on whether the silicification of the country rock occurred before, during, or after deposition of the radioactive material. Since the radioactive minerals in the brecciated rhyolite cannot be discerned it is impossible to determine the relationships in this rock between the time of silicification and uranitization. If the silicification of the country rock was prior to the precipitation of the radioactive material, then the type of host rock would have little, if any, bearing on the mode of deposition of the uranium. On the other hand, if silicification of the host rock was contemporaneous with or after uranitization then the porosity and permeability of the host rock might become a critical factor in determining the possible volume of ore deposition. The evidence at the Pike Creek locality would indicate that silicification of the breccia occurred before very much uranium had a chance to be deposited. This is based on the observation that the zone of uranitization is very narrow compared to the zone of silicification. If introduced silica had not rendered the breccia relatively impermeable to later solutions working up along the fault fractures, then the uranium-bearing material would have had a chance to become more widely disseminated throughout the entire shear zone. If this reasoning with respect to the origin of the uranium in the rhyolite breccia is valid, then it is reasonable to assume that the tuffs in this vicinity would, where intersected by the mineralized fault zone, also be highly silicified and therefore relatively impervious.

<u>Report by</u>: R. E. Corcoran and N. S. Wagner

<u>Visited</u>: July 15, 1955 by N. S. Wagner; July 27, 1955 by R. E. Corcoran;
August 12, 1955 by N. S. Wagner and H. M. Dole.

<u>References</u>:

Fuller, R. E. (1931), The geomorphology and volcanic sequence of Steens Mountain in southeastern Oregon: Univ. Wash. Pub. in Geology, vol. 3, no. 1, pp. 1-130, 1931.

Axelrod, D. I. (1944), The Alvord Creek flora: Pliocene floras of California and Oregon, edited by Ralph W. Chaney with contributions by Ralph W. Chaney, Carlton Condit, and D. I. Axelrod: Carnegie Institution of Wash. Pub. 553, pp. 225-262, 1944.

Fuller, R. E. and Waters, A. C. (1929), The nature and origin of the horst and graben structure of southern Oregon: Jour. Geology, vol. 37, pp. 204-238, 1929.

Porter, P. W. (1953), Geology of the Lower Sucker Creek area, Mitchell Butte quadrangle, Oregon: M.S. Thesis, Univ. of Oreg., 1953.

References (cont.):

Smith, W. D. (1927), Contributions to the geology of southeastern Oregon (Steens and Pueblo Mts.): Jour. Geology, vol. 36, pp. 422-440, 1927.

Williams, H. W. and Compton, R. R. (1953), Quicksilver deposits of Steens Mountain and Pueblo Mountains, southeast Oregon: U. S. Geol. Survey Bull. 995-B, pp. 19-76, 1953.

Wood, H. E., et al (1941), Nomenclature and correlation of the North American continental Tertiary: Geol. Soc. Amer. Bull, vol. 52, pp. 1-48, 1941.