Radioactivity in the
Jo Reynolds Mine,
Clear Creek County, Colorado

Trace Elements Memorandum Report 5
RADIOACTIVITY IN THE JO REYNOLDS MINE
CLEAR CREEK COUNTY, COLORADO

by

Robert U. King

January 1951

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RADIOACTIVITY AT THE JO REYNOLDS MINE,
CLEAR CREEK COUNTY, COLORADO

by

Robert U. King

ABSTRACT

Eight tons of high grade pitchblende ore was sold from the Jo Reynolds mine near Lawson, Clear Creek County, Colo., in 1919. The pitchblende occurs with silver, lead, and zinc in carbonate-quartz veins cutting pre-Cambrian schist, granite gneiss, and granite.

The pitchblende vein exposed in the Elida tunnel is up to 1 foot wide. Botryoidal masses of pitchblende are embedded in a matrix of quartz, siderite, sphalerite, galena, and chalcopyrite. In places a black powdery mineral, tentatively identified as pitchblende, occurs as paper-thin seams and coatings in fractures that cut the vein material.

In the Elida tunnel the vein was abnormally radioactive over an interval of 100 feet. The uranium content of samples collected in this part of the vein ranged from 0.005 to 0.16 percent.

Apparently, the pitchblende recovered in 1919 was from an ore shoot out by the mine workings that are now inaccessible. More detailed geologic and radiometric studies are needed of the inaccessible parts of the mine and the adjoining surface before this pitchblende deposit can be adequately appraised. This would require rehabilitating the mine.
Eight tons of pitchblende ore was reported to have been produced from the Jo Reynolds mine during 1919. This ore contained 72 percent \( \text{U}_3\text{O}_8 \). There are no records to show exactly where this ore was mined, but presumably it came from the lowest levels of the mine.

The Jo Reynolds mine near Lawson, Clear Creek County, Colo., was briefly examined in December 1948 and June 1949 as part of the Trace Elements reconnaissance study of radioactive deposits in the Colorado Front Range. A radiometric traverse of the Elida tunnel, the only accessible underground working at the mine, was made by R. U. King on December 30, 1948. Samples of the vein were collected where abnormal radioactivity was indicated. The dumps and surface area immediately adjacent to the mine were examined for radioactivity on June 28, 1949, by E. P. Beroni and H. C. Granger.

The writer wishes to acknowledge the kindness of Mr. John Shireman of Denver, attorney for the Jo Reynolds Company, who furnished mine maps and notes on the history of the mine.

Location and ownership

The Jo Reynolds mine is in sec. 35, T. 3 S., R. 74 W., near the abandoned mining town of Silver Creek in the Lawson mining district, Clear Creek County, Colo. It is about half a mile southeast of Lawson (fig. 1), and 30 miles west of Denver, and can be reached from Lawson by following a narrow dirt road southeastward from U. S. highway 6 and 40.
FIGURE I.- GENERALIZED GEOLOGIC MAP OF THE LAWSON AREA, CLEAR CREEK COUNTY, COLORADO
The mine is owned by the Jo Reynolds Mining, Milling, Drainage, Tunnel, and Transportation Company, of which Mrs. R. B. Morton of Boston, Mass., is the chief stockholder. At the time of this examination the property was under lease to Mr. Charles O. Parker.

Mine workings

The Jo Reynolds claims were located in 1865, and since that date have been developed by an upper (Daily) tunnel (fig. 2), driven about 1880; a lower (Elida) tunnel, driven during the period 1900 to 1903, nine levels of workings connected to the lower tunnel by an underground (Main) shaft, a second underground (Moore) shaft, and numerous crosscuts. An 80-foot winze near the Main shaft connects the Elida tunnel with sublevel drifts. The Daily tunnel and 1st-level workings are at an altitude of about 9,000 feet; the Elida tunnel is about 500 feet lower. A map of part of the workings is shown in figure 2.

At the time of the writer's visit, the 4,500-foot Elida tunnel was the only accessible part of the mine; the Daily tunnel was caved at the portal; workings above the Elida level were inaccessible, and the winze and 80-foot sublevel drifts were water-filled. After the first examination, caving of the Elida tunnel at a point about 1,000 feet from the portal prevented further geologic study of the mine.

GEOLOGY

The country rocks in the vicinity of the Jo Reynolds mine are of pre-Cambrian age and consist of quartz-biotite schist of the Idaho Springs formation, granite gneiss, and Silver Plume granite
A few pegmatite dikes crop out approximately a mile south of the lower tunnel. These rocks and the general geology of the area have been described by Bastin and Hill and by Spurr and Garry.


ORE DEPOSITS

The silver, lead, and zinc deposits at the Jo Reynolds mine are in northeast-trending carbonate-quartz veins that dip steeply to the northwest. The details of the vein system are not known to the writer but Bastin and Hill state that three veins were worked on the upper levels and only one was worked below the fourth level; the three veins are indicated on figure 2. Most of the workings, including the Main shaft and Elida tunnel, appear to be in what is referred to on figure 2 as the "No. 2 vein." The shape of the second, third, and fourth level workings northeast of the Main shaft suggests that there is a junction of another vein with the "No. 2 vein" between the fourth and fifth levels.
Bastin and Hill state that the silver, lead, and zinc ores obtained from this deposit contain galena, sphalerite, pyrite, chalcopyrite, and gray copper (tetrahedrite) as primary minerals, and polybasite, pearcite, proustite, argentite, native silver, chalcopyrite, and galena as secondary minerals. They report that native silver, as scattered flakes in a talc-like material, occurred as deep as the ninth level. Sphalerite, galena, and native silver have been the most important ore minerals.

The precious-metal content of ore from between the third and ninth levels is estimated by the owners to be 0.1 ounce of gold and 100 ounces of silver per ton. Above the third level, ore containing as much as 1,000 ounces of silver per ton has been found. The total gross value of the metal production from the property is about $1,500,000.

Occurrence of pitchblende

The presence of uranium on the second and third levels of the Jo Reynolds mine was reported as early as 1886 in newspaper accounts. The reports do not mention the uranium mineral found. Pitchblende was later identified in the deposit by Bastin and Hill, who

described the mineral in ore from the Elida tunnel level near the bottom of the Main shaft and about 1,000 feet below the surface. They state that "microscopic examination of polished surfaces showed fragments of pitchblende having characteristic botryoidal forms embedded in a matrix of quartz, siderite, sphalerite, galena, and chalcopyrite."

In 1919, a discovery of pitchblende at the Jo-Reynolds mine is reported / to have yielded 16,000 pounds of uranium ore containing / Guillotte, G. B., Official communication, 1944. / 72 percent U₃O₈. The part of the mine from which this ore was obtained is not recorded, but inasmuch as mining activity at the Jo Reynolds mine was largely confined to the 80-foot sublevel during the period of the discovery, it is presumed that the pitchblende ore body occurred on or near that level.

A black powdery mineral, tentatively identified as pitchblende, was found in the vein in the area sampled. This mineral occurs as paper-thin seams and coatings on minor fractures in the vein material.

In order to obtain additional information about the occurrence of pitchblende in the mine and, if possible, locate further ore, a radiometric traverse was made of the Elida tunnel, using a Beckman model field Geiger-Mueller counter. This traverse showed radio-activity appreciably above normal in the vein 100 to 200 feet southwest of the Main shaft. The radioactivity was strongest near the center of the vein. No significant radioactivity was detected on the dumps and surface areas adjacent to the Jo Reynolds mine.
Sampling

Three channel samples and one grab sample were taken across the radioactive part of the "No. 2 vein" (fig. 2). Sample No. 61 was cut across the vein in the back of the tunnel at a point about 150 feet from the Main shaft. Sample No. 62 was cut across the floor of the tunnel at the same point as No. 61. Sample No. 63 was cut across the vein in the back of the tunnel 30 feet northeast of No. 61. Sample No. 64 is a grab sample of vein material from a stope reported to have been developed during 1946. The sample was taken 50 feet northeast of sample No. 61 and about 100 feet southwest of the Main shaft (fig. 2).

Assay data are tabulated below:

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Length (feet)</th>
<th>Uranium (percent)</th>
<th>Lead (percent)</th>
<th>Zinc (percent)</th>
<th>Silver (ounces per ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>61</td>
<td>1</td>
<td>0.01</td>
<td>1.18</td>
<td>1.79</td>
<td>(1)</td>
</tr>
<tr>
<td>62</td>
<td>2</td>
<td>0.16</td>
<td>0.61</td>
<td>0.65</td>
<td>(1)</td>
</tr>
<tr>
<td>63</td>
<td>1</td>
<td>0.008</td>
<td>1.94</td>
<td>2.04</td>
<td>(1)</td>
</tr>
<tr>
<td>64</td>
<td>Grab</td>
<td>0.005</td>
<td>8.89</td>
<td>11.12</td>
<td>42</td>
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</tbody>
</table>

(1) The silver content is probably less than 3 ounces per ton, but was not determined because its presence was not detected during ordinary chemical analyses for other elements.

CONCLUSIONS

The radiometric examination and sampling of the Jo Reynolds mine failed to show the presence of significant quantities of uranium ore
on the Elida level. It is probable that the ore body which was reported to have yielded 8 tons of high-grade pitchblende ore was out in the lowest mine workings. An adequate evaluation of the pitchblende ore bodies on this property cannot be made unless the inaccessible workings, both above and below the Elida tunnel, are rehabilitated.
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### PART II

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PART II

PLANS FOR GEOLOGIC WORK

Geologic work planned in the vicinity of the Jo-Reynolds mine during 1951 will include: (1) radiometric reconnaissance of all mine dumps and accessible mines; (2) mapping and sampling of as much of the workings of the Jo Reynolds mine as may be made accessible; and (3) supplementing such underground investigation with geologic mapping of the Lawson district at a scale of not less than one inch equals 1,000 feet.

RECOMMENDATIONS FOR PHYSICAL EXPLORATION AT THE JO REYNOLDS MINE

The following physical exploration is recommended at the Jo Reynolds mine: (1) unwatering and retimbering the inaccessible workings, and (2) core drilling of approximately 1,000 feet of hole depending on the information obtained from underground examination. The cost of such rehabilitation has been estimated to be between $5,000 and $10,000.

/ Detailed costs are given in Trace Elements Memorandum Report 215.

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TABLE 1

<table>
<thead>
<tr>
<th>NO.</th>
<th>%U</th>
<th>%Pb</th>
<th>%Zn</th>
<th>%Ag</th>
<th>OZ/TON</th>
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</tr>
<tr>
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<td>2.040</td>
<td>&lt;0.3</td>
<td></td>
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<tr>
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<td>0.610</td>
<td>0.250</td>
<td>&lt;0.3</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>0.010</td>
<td>1.800</td>
<td>1.390</td>
<td>&lt;0.3</td>
<td></td>
</tr>
</tbody>
</table>

FIGURE 2 - MAP OF WORKINGS OF JO REYNOLDS MINE, CLEAR CREEK COUNTY, COLORADO