Wyoming Highway Department

Mr. Frank W. Osterwald
Geologist
University of Wyoming
Laramie, Wyoming

Cheyenne, Wyoming
March 17, 1950

De ar Sir:-

I am enclosing a letter from our Maintenance Engineer, Mr. C. C. Lusby of Casper, in answer to our recent correspondence in regard to material taken from the old Silver Cliff Mine dump at Lusk.

I would suggest you get in touch with Ed Colligan, our Maintenance Foreman in Lusk, as he would know more about what was taken from the dump than anyone in the Department.

If I can be of more help to you please feel free to write.

Very truly yours,

G. T. Shrum

G. T. Shrum
Assistant Maintenance & Equipment Engineer

Encl.

GTS/gs

CASPER, WYO.
FEB. 13, 50.

MR. G.T.SHRUM;

DEAR SIR,

IN REGARD TO OLD SILVER CLIFF MINE AT LUSK HAVE THE FOLLOWING TO REPORT;

SOME MATERIAL WAS PURCHASED FROM MRS. HALE WHILE MR. PHILLIPS WAS IN LUSK. IT SEEMS THEY TOOK LITTLE IF ANY FROM THE MINE DUMP BUT WORKED THE LOOSE ROCK LYING ON THE HILL SIDE. IT WAS USED IN A SLEW LYING BETWEEN THE HILL AND C & NW RAILROAD AND COVERED WITH ABOUT TWO FEET OF DIRT.

I AM INFORMED THAT THE SHAFTS ARE STILL OPEN AND CAN BE INSPECTED.

YOURS TRULY,
C.C.LUSBY.

March 13, 1950

NOTES ON THE GEOLOGY AT SILVER CLIFF MINE, LUSK, WYOMING

Introduction

The Silver Cliff mine is located in a hill approximately 150' high adjacent to the western city limits of the town of Lusk, Wyoming. The mine was opened about 1880, and worked for silver and copper on a small scale, according to local residents and to S. H. Ball 1/. According to anonymous reports in the Geological Survey of Wyoming files, about $33,000 worth of radium was produced prior to 1920. In the early part of the 1920's, an attempt was made to market "radium pills" made from uranium-bearing minerals at the mine.

H. G. Fisk and B. W. Brown of the Natural Resources Research Institute at the University of Wyoming, accompanied the writer during the examination.

In addition to numerous small pits, the workings consist of a tunnel which trends approximately N 30° E, with a portal at each end of the hill. The tunnel connects with a shaft approximately 30 feet deep located at the crest of the hill. The Tunnel is approximately 320 feet long, inclusive of open cuts at both portals. The tunnel is badly caved and inaccessible between the shaft and the southwestern portal. The tunnel is connected to the northeastern portal by a raise of approximately 8 feet, located 35 feet from the portal. Several small winzes and crosscuts are located throughout the mine, and one stope 20 feet northeast of the shaft is accessible, though dangerous due to loose rock at the roof and to broken stulls. The stope is approximately 20 feet high by 15 feet long by 6 feet wide, and dips approximately 60° southeast. There are no surface structures and only small dumps. A dump 25 feet long by 10 feet wide by 15 feet thick is located at the northeastern portal, and consists largely of uranophane quartzite ore. The source of the ore on the dump is probably the adjacent open cut.

Most of the deposit is owned by Mrs. Jamesetta Hale of Lusk, except the portion north of the fence shown on the sketch (fig. 1), The portion not owned

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1/ S. H. Ball, "Copper Deposits of the Hartville Uplift", U.S.G.S. Bull. 315, 1907, PP. 93 - 107

by Mrs. Hale includes the area around the northeast portal. Mrs. Hale acquired the property through homestead laws, apparently after the original owners had lost title in some manner. According to Mrs. Hale, who reports a conversation with a nephew of the original owner, the shaft is 285 feet deep, and connects with deeper workings containing tracks and ore-cars. The nephew reported to Mrs. Hale that the mine was wrecked intentionally and that he cut the cable to drop the bucket. Evidence of deeper workings is not visible at the bottom of the shaft, nor are there extensive dumps, though Mrs. Hale reports she sold two dumps of 600 tons total 1/ to the Wyoming Highway Department 2/. According to Mr. J. Gordon Watt, Attorney at Law in Lusk, the northern part of the property is in litigation.

General Geology and Structure

Silver Cliff hill is capped by horizontal beds of quartzite and quarts conglomerate, which belong to the Guernsey formation (Mississippian). Locally the beds dip up to 10° northwest. Pre-Cambrian rocks underly the sediments, and consist of hematite-mica schist, biotite-schist, and chlorite schist with layers of epidote-bearing rocks which are probably calciferous. Occasionally the mica schists show clots of muscovite up to 1/2 inch in diameter which resemble altered kyanite metacrysts. The schists have strong foliation which strikes between N 15° E and 35° E, and dips 55° to 65° southeast. Biotite schists show strong lineation which plunges N 25° W, 45° SE. Drag fold axes in schist are parallel to lineation. Cross-joints are locally well developed on the northwest flank of the hill and dip about 5° NW northwest.

Silver Cliff hill is cut by a fault which strikes between N 20° E and 30° E and which is upthrown on the east side. A gouge zone 5 to 20 feet wide marks the trace of the fault across the hill. As seen from the creek valley just north of

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1/ In letter addressed to B. W. Brown, H. G. Fisk, and F. W. Osterwald

2/ G. T. Shrum, Wyoming Highway Department, in letter, February 27, 1950, reports that agency has no record of the sale.

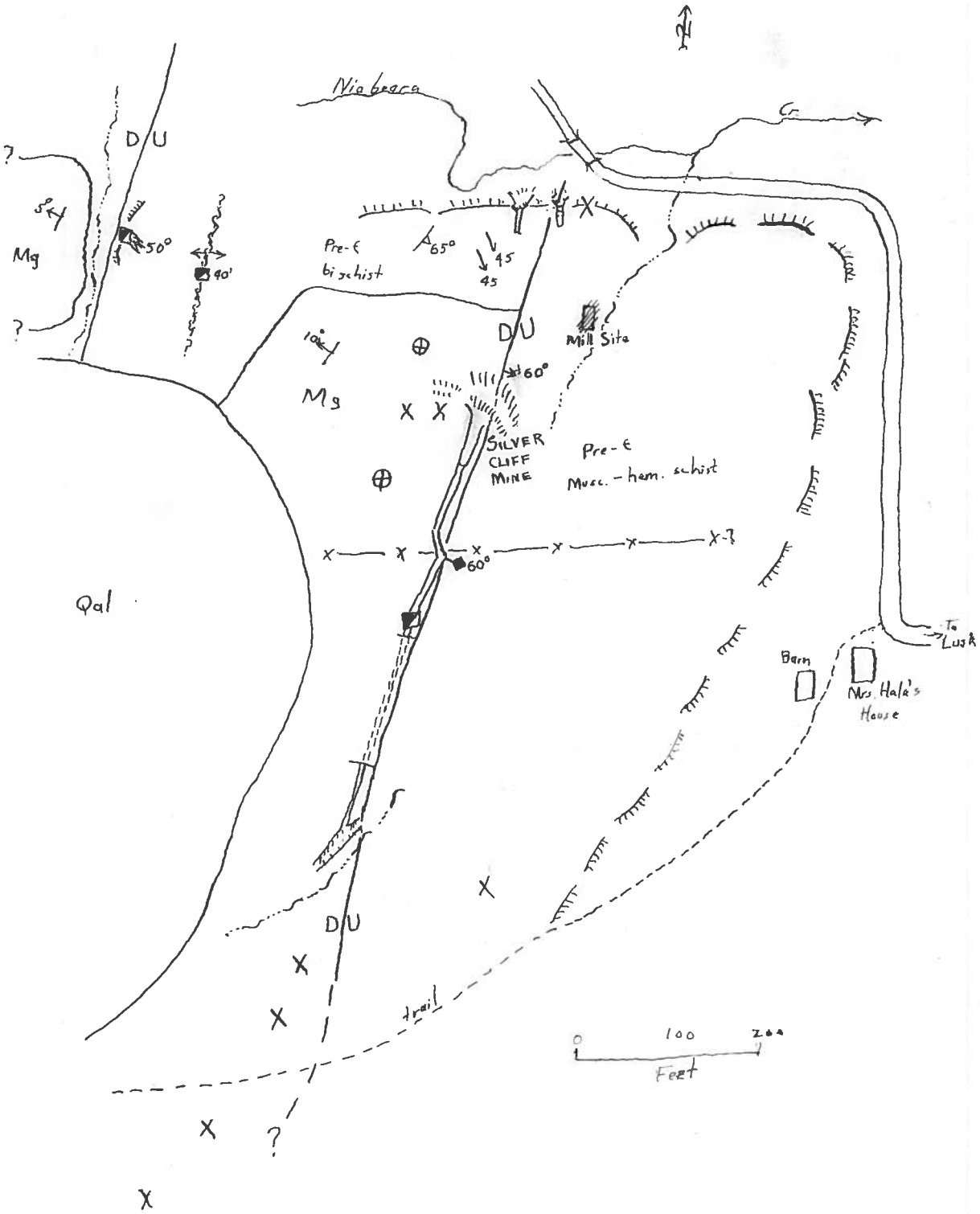
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Fig. 1

the hill, the dip of the fault plane is about 60° southeast. Hematite-muscovite-quartz chlorite schists predominate in the pre-Cambrian of the hanging wall, and biotite schists in the footwall. Many subsidiary fractures occur in the Guernsey formation in the footwall of the fault. Displacement along the fault is about 35 feet, as shown by the apparent distance between the offset ends of the base of the Guernsey along the fault plane. Slickensides and müllion structure in the tunnel suggest that movement was directly up the dip of the fault plane. The general structural relations are shown in the sketched cross-section (fig. 2).

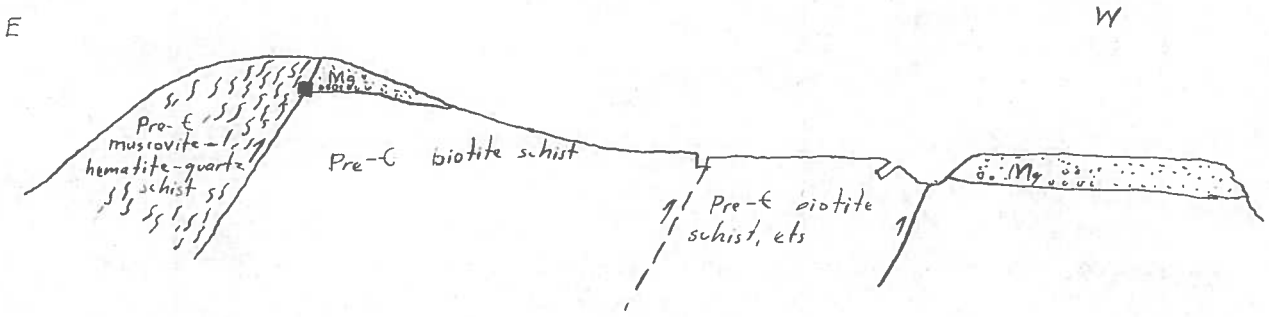

Fig. 2 East-west cross-section through Silver Cliff hill.

A North-South cross-section of the vicinity is sketched in fig. 3.

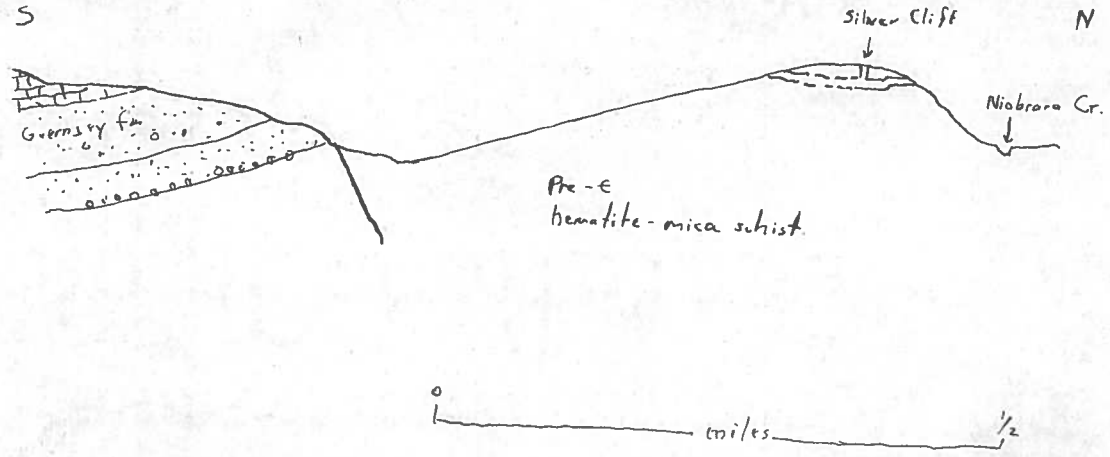

Fig. 3

As shown in the sketch (fig. 3 E-W), a fault dips approximately 60° N. The pre-Cambrian of Silver Cliff hill forms the hanging wall and has moved up. The relationship of this fault to the fracture in which the mine is located is not known.

Ore Occurrence

Mineralization is directly related to the fracture system. Manganite and hematite occur in small amount along the gouge zone. Numerous small masses of malachite with lesser chalcocite and azurite, occur in quartzite near the footwall of the fault. These masses consist of malachite with a lesser amount of chalcocite at the core, and are usually less than 18 inches in diameter. The masses are usually of an ellipsiodal shape and are elongated in the plane of the fractures in which they occur. In some cases the core of the copper masses is highly radioactive. Mineralization is restricted to a 10 inch zone parallel to bedding, approximately 8 feet below the top of the west wall of the open cut at the southeastern portal. Copper minerals and a small amount of uranophane occur along fractures and occasionally in small masses throughout the rock. Uranophane on fractures in this locality gives approximately 18,000 clicks per minute (7.50 mr./hr) beta and gamma with the Geiger Counter. Radioactive black mineral, probably pitchblende, associated with copper minerals gives approximately 40,000 counts per minute (16.5 mr./hr.) beta and gamma. Copper and uranium minerals occur in tight quartzite below a quartz conglomerate with pebbles up to 1/2 inch by 2 inches. Rarely the conglomerate contains a slight amount of malachite and chrysocolla. Radioactivity dies out rapidly south of the open cut and no radioactivity minerals occur in a row of small pits to the south across the trail (fig. 1).

Uranophane occurs along joints in quartzite at the open cut adjacent to the northeast portal. The mineral is restricted to a bed approximately 2 feet thick. This type of ore was found in place nowhere else on the property. A few nebulous areas of malachite and chrysocolla and radioactive black material occur in the west face of the open cut. Hanging wall schist contains epidote, brochantite, cuprite, and other minerals in the east wall of the cut. There is a dump of uranophane quartzite ore 25 feet long by 10 feet wide by 15 feet thick at this portal.

A lens of buff colored medium-grained micaceous material 1 foot thick occurs in

the northeast end of the small stope referred to above. The lens is surrounded by gouge on both sides, though best developed on the hanging wall. Material from the gouge zone is highly radioactive, and contains a mixture of limonite, malachite, chrsocolla and probably chalcocite and pitchblende. A maroon colored mineral which may be hematite is also present. All these minerals occur in a matrix of quartzite debris. Adjacent to the base of the lens on the footwall side is one foot of slabby quartzite which is radioactive. The remainder of the quartzite is more massive, and is barren.

A small cross-cut about 7 feet by 5 feet by 4 feet has been driven into the wall about 12 feet northeast of the shaft. A tight, uniform grained quartzite bed 4 feet thick is exposed in the east wall of this cross-cut. The quartzite bed contains a considerable amount of green and black minerals and is highly radioactive between two vertical limonite partings which trend northeast and which are about 5 feet apart. The floor, roof and remainder of the walls of the cross-cut are not radioactive. A light gray, fine-grained mineral occurs as a coating on fracture surfaces in the walls of the cross cut. This mineral fluoresces a bright yellow-green, and is radioactive.

Two small pits have been dug a few feet west of the northeast portal. Specimens of uranophane quartzite ore are present on the dump from the largest pit but none is exposed in place. The other pit is small (2 feet by 4 feet by 1 foot deep) and is very recent. The small pit exposes a reddish brown quartzite. The area in the vicinity of the pit is rather strongly radioactive, however, the quartzite is barren.

A shaft approximately 40 feet deep in a nearly vertical shear zone in schist occurs about 400 feet west of the crest of the Silver Cliff hill. A 20 foot incline has been opened approximately 75 feet northwest of the shaft, in schist along the east bank of a small gulch. These workings are shown in figure 2. The Guernsey formation west of the gulch is apparently faulted down against schist. Schist at

these two prospects is heavily iron stained, probably by weathering of pyrite. According to Mrs. Hale, ore was taken from these workings which ran $18.00 per ton in gold. This was probably a picked sample, as the rocks in the workings are not heavily mineralized.

Mrs. Hale exhibited a specimen of tufa and reported that the rock occurred on the southwest portion of her land. The tufa contained scattered minute yellow specks of radioactive minerals. It was not observed in place, and the age is not known, though it is probably Tertiary. Miocene rocks are exposed in that locality.

Ball 1/ reported that malachite, chrysocolla, and chalcocite occur in schist along the fault plane, and that native silver occurred along fracture planes in the schist. This type of ore occurence was not seen by the writer, and may suggest the presence of inaccessible workings. F. L. Hess 2/ however, reports that the silver and copper were mined from footwall quartzite.

Conclusions

In any evaluation of the property for possible production of uranium oxides the following factors must be considered.

1. Copper and uranium mineralization is limited to tight, even-grained quartzite beds in the Guernsey formation. No radioactive minerals are known to occur in pre-Cambrian schist.

2. Radioactivity is limited to a zone within a few feet of the Silver Cliff fault, and is related to subsidiary fracturing associated with the fault.

3. Rich uranophane quartzite ore, (av. about 1% U_3O_8, according to B. W. Brown) is exposed in place only in the open cut at the northeast portal.

4. Radioactive minerals are absent in the pits on the southwest end of Silver Cliff hill and from the slope further southwest.

It is my opinion that the ore is too restricted stratigraphically, and

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1/ Ball, S. H., op. cit., p. 104

2/ Larsen, E. S., Hess, F. L, and Schaller, W. T. "Uranium Minerals from Lusk, Wyo." Amer. Mineral., vol. 11, no. 6, 1926, p. 156

too restricted in a zone close to the Silver Cliff fault, for any large scale production of uranium oxides at the present time. The geology at the mine is interesting from the standpoint of mineralogy and ore occurrence.

Respectfully submitted,

Frank W. Osterwald

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Property examined 9, 10 February, 1950
Report dated 13 March 1950