The Placer Deposits of the Siberia District (German Gulch), Montana

Ronald D. Karvinen
THE PLACER DEPOSITS OF THE SIBERTA DISTRICT
(GERMAN CULCH), MONTANA

By

Ronald D. Karvinen

A Thesis
Submitted to the Department of Geology
in Partial Fulfillment of the
Requirements for a Bachelor of Science Degree
in Geological Engineering

MONTANA SCHOOL OF MINES
Butte, Montana
May 28, 1954
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ABSTRACT

The original concept of this problem was to determine if hidden or buried placers existed past the terminal point of the extensive placering in the Siberia District. Several theories have been advanced for the sudden cessation of these placers. All are plausible, and are both for and against an extended placer. The past history relates that some $15,000,000 in gold has been produced in the area, therefore stressing a practical search for additional gold accumulation.
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INTRODUCTION

This problem, as originally suggested by Mr. Murl H. Gidel of the Anaconda Copper Mining Company and Professor W. S. March, Head of the Geological Department of the Montana School of Mines, was concerned with the drainage pattern of the Siberia District prior to the formation of the rhyolite flows in this area. This problem also entertained the possibility of buried gold placers. This factor is very important in view of the sudden termination of the rich placers that formed in this area. As will be noted later, the presence of such buried placers is geologically possible, but improbable. The stream in German Gulch appears to follow a post-rhyolite fault; therefore, any probability of a pre-rhyolite channel in conjunction with present placers is unlikely. Further elements concerning its existence will be discussed later.

Location

The Siberia District lies in Silver Bow County, 14 miles due west of Butte, Montana, and embraces approximately 20 square miles. The area may be reached by either of two unimproved dirt roads. The first means of access is the dirt road which leaves U.S. Highway 10 S at Silver Bow, Montana and then winds west-southwest 8 miles to the junction of German Gulch, Beefstraght Creek, and Norton Creek. The other road is from Gregson Hot Springs (18 miles west of Butte) and runs 6 miles
nearly due south from Gregson to the junction mentioned above.

The area discussed in this report is in the Deer Lodge National Forest of southwestern Montana. The maximum relief this area expresses is approximately 2000 feet; elevations vary from 6000 to 8000 feet above sea level. The elevations are taken from an old United States Geological Survey Topographic Map of the Dillon Quadrangle. Snow covers this area six months out of the year, making the accessibility of the area, under present road conditions, virtually impossible during the winter months. Clayey road beds cause adverse driving conditions during and immediately after rain storms.

German Gulch is one of the main tributaries which form the Clark Fork River and lies on the western side of the Continental Divide. Burnt Mountain lies due south of German Gulch and is snow capped nearly the year around.

Acknowledgements

Appreciation is hereby expressed for the suggestion of this topic to Messrs. Gidel and March. The latter, accompanied by Mr. R. R. Reid of the Montana School of Mines, also aided field work through advice concerning approach, mapping, etc. Personnel of the Forest Service were very helpful and courteous and assisted greatly in securing maps, photos, and similar data on this district.

Thanks also goes to my brother, Ray Karvinen, for the many times he accompanied me into the field and for the assistance he rendered there.

The typist was Mrs. D. L. Hungerford.
Previous Literature

The author found only one reference to the geology of the Siberia District. This was in a treatise on the "Mining Districts of the Dillon Quadrangle, Montana and Adjacent Areas" by Alexander N. Winchell. This manuscript was published by the U.S.G.S. in 1914 as Bulletin 574. A brief mention is made of German Gulch in a "Centennial Address on Montana and Butte" delivered by Charles S. Warren on July 4, 1876.

Winchell's report was of little value to the author except for the history related therein. No maps accompanied the report and though many rock types were named, their location or outcrop remains a mystery. The lack of accurate basic geological information necessitated much field work not directly related to the problem concerning the placers.

HISTORY AND PAST PRODUCTION

"German Gulch
Gold Discovered 1864
Produced more than
$15,000,000 in gold

Population at one time
1,000"

In the fall of 1864, Ed Alfied and his party were returning to Bannack from Kootenai when, as is still the practice today, the gravels in German Gulch were panned for "color". Immediately, and for 10 years later, these placers were worked by bedrock flumes and hydraulics. After a return of about $5,000,000, the yield became insufficient to warrant this party further work. However, there is noted an influx of Chinese who were content with smaller returns and reworked the gravels two to three times, for a return of nearly $8,000,000. At the time Winchell wrote his

* Forest Service sign near the termination of the placer workings.
article (1914), the Chinese were still there and the time of their departure is still uncertain. It is reported that they numbered 1,000 at one time.

The "mother lode" has been discovered but has proved too low grade for exploitation. At present "booming" operations are being carried on near the Beal mine in the upper reaches of the Gulch.

GEOLoGY

On the maps accompanying this report, the contacts, streams, roads, etc., are based on aerial photographs secured from the Forest Service offices in Missoula, Montana. The major rock types are red rhyolite, white rhyolite, and quartz monzonite.

General Geology

The U.S.G.S. map (1933) of Montana shows that the Boulder batholith extends into the Siberia District as the upturned end of a crude "J". That is, the intrusive projects northwestward into the district. In the cupped portion of the "J" and for many miles northward are volcanic rocks of older Tertiary age. These volcanics are termed as "basalt, andesite, and rhyolite lavas, tuffs, and breccias".

The red rhyolites assume a very irregular southerly termination in the vicinity of German Gulch and apparently overlie what is called white rhyolite. The white rhyolite occurs between the red rhyolite and the quartz monzonite somewhat in the manner of a halo around the quartz monzonite outcrops. This feature will be discussed under "Structure".

Prevalent in the stream channel (up to the red rhyolite) are limy gravels. They are not a limestone (will not react with acid), but are
what appear to be highly silicified limestone, possibly from a contact metamorphic zone; these rocks are too soft to be quartzites. These silicified limestones are seen outcropping near the Beal mine (southwest of the map area). A highly interesting (and maybe profitable) geologic study of the monzonite-limestone contact could be made in the future.

Rock Types

The rocks outcropping in this area are principally white rhyolite, red rhyolite, and quartz monzonite. The placer deposits contain these three rock types plus highly silicified limestone gravels.

The white rhyolites are less resistant to weathering than the red rhyolites and the quartz monzonite, and do not form prominent outcrops. These rhyolites weather white, but are a light grey on fresh surfaces. This rock contains quartz, orthoclase, and biotite phenocrysts in a light-colored groundmass. The quartz phenocrysts increase in size toward the quartz monzonite. Pits which are well developed in portions of the white rhyolite appear to be due to weathering.

The quartz monzonite in this area appears to be an extension of the Boulder batholith. This rock type is comparable to the quartz monzonite in other parts of the batholith.

Red rhyolite occurs throughout the area as prominent cliffs with extensive talus slopes. These talus slopes obscure the contact between the red rhyolite and the underlying white rhyolite. Nearly vertical cliffs and accompanying talus slopes of the red rhyolite indicate that chemical weathering is less effective here than in the pitted white rhyolite. The weathered surface of this rhyolite is brick red, whereas fresh surfaces reveal a reddish purple groundmass with quartz, orthoclase, and biotite phenocrysts.
Structure

Though the contact between the two rhyolites is covered by normal hillside debris and talus, the configuration of the two rhyolites indicates that the contact is relatively flat (though dips as much as $15^\circ$ were noted).

The contact between the quartz monzonite and the white rhyolite is well defined and was traced for nearly two miles. The contact between these two is a definite zone of weakness, as evidenced by a narrow V-shaped depression. The contact is independent of the topographic fractures, and for this reason, the contact is assumed to be vertical or nearly so. This vertical contact suggests that the white rhyolite is intrusive rather than extrusive as indicated by the U.S.G.S. map of 1933.

In no place was the red rhyolite found to be in direct contact with the quartz monzonite.

Faults

Fig. 1 is a diagrammatic sketch showing the author's conception of the faults in the area. The positions of these faults are based on apparent displacement of the quartz monzonite--white rhyolite contact. Evident displacement of the red rhyolite near the placer termination was also used as an indication of possible faults. Exceptionally deep stream valleys with steep walls suggest that the drainage channels are along fault zones. All of the inferred faults on Fig. 1 are younger than the white rhyolite and probably younger than the red rhyolite. This statement is based on the apparent displacement of these bodies. Age relations of the faults to each other could not be definitely surmised.

The larger faults are generally E-W and NE-SW trending. Various smaller faults are probably the subsequent result of the major faulting.
Geologic History

During Laramide or late Cretaceous time, the Boulder batholith was intruded into the older sediments. A remnant of these sediments is the high silicified limestone that outcrops near the Beal mine and is evident as gravels in the placer deposit. The silicification of this limestone indicates rather intense contact metamorphism.

Mineralization in this area followed, the extent of which is yet to be defined.

Whether uplift of the area occurred before or after the formation of the white rhyolite is uncertain; since the placer deposits continue through the white rhyolite, the uplift is probably post-white rhyolite. This uplift subjected the area to erosion, with the weathering of the mineralized area producing the rich placers found here. The vertical contact between the white rhyolite and the quartz monzonite suggests that the white rhyolite came in as an intrusive, i.e., a sill-like body. The quartz monzonite edge could be the outer extent of the initial intrusion or, more likely, the face of a fault plane. In one particular instance the author noted a wedge-shaped protrusion of white rhyolite into what appeared to be a cooling feature or a minor fault tear in the quartz monzonite—therefore proving the white rhyolite to be the younger of the two.

The introduction of the red rhyolite, plus the time of uplift, also introduces the economic question of a buried placer, the latter to be discussed later. The red rhyolites, as far as could be ascertained, are extrusive flows and complete the historical picture of this district.
THE PLACER PROBLEM

The placers of this area are primarily confined to the drainage channel termed German Gulch. They were initiated near the Beal mine; terminate near the junction of German Gulch, Norton Creek, and Beefstraight Creek; and average approximately one hundred and fifty feet in width. Bedrock appears to be at an average depth of fifteen feet.

Approach

The extensive placering of German Gulch ceases abruptly near the red rhyolite contact. Two theories have been advanced to explain this cessation: (1) the formation of the red rhyolite buried the former drainage channel, or (2) in terms of the early portion of an erosion cycle, differential weathering produced a condition prohibitive to placer formation. These two theories will be discussed later.

Noting the past history, the gravels near the contact must have been rather lean and worked by the Chinese. Using this assumption, the author sought evidence for the existence of a previous stream channel for several thousand feet upstream.

A constant observation of the detrital material was maintained for the presence of stream worn gravels in positions separated from or unrelated to the present stream channel.

Any indication of included gravels was sought where the rhyolites were exposed.

The quartz monzonite-rhyolite contact was carefully mapped and observed for any change in its attitude.
An attempt is now being made to prove a fracture pattern similar to the Butte District. This would give an indication which way a pre-existing drainage could have moved if the present streams are along old fault planes.

The ridges of a portion of the red rhyolites have been "walked out" for possible placers similar to those of the Sierra Nevadas (to be described later). The areas worked on will not be noted because of the possibility of oversight by the author.

Reasons For Placer Termination

The possible explanation for the abrupt cessation of the placer deposits is two-fold. The principal problem lies in interpreting the reason why there are no lime or monzonite gravels in the stream channel that is worn through the red rhyolite.

Theory of Buried Placers

One of two conditions may have produced buried placers in the Siberia District. Each is geologically feasible.

If the placer deposits were existent prior to the red rhyolite flows, the possibility of a buried placer is evident. An occurrence of a similar nature is exemplified by some buried stream channels in the Sierra Nevadas.* The Tertiary stream placers in this area were covered by deposits of rhyolitic and andesitic tuffs. The region was then uplifted, subjecting it to erosion. The new stream channels eroded canyons 2,000 to 3,000 feet deep. Fortunately these placers have not been completely eroded away as might be the case in German Gulch.

The second explanation for a buried placer could be as follows: the placers are post red rhyolite and are in the present stream channel but are smaller in size and diluted or completely buried by the heavy influx of talus from the steep valley walls.

Theory of Differential Weathering

This explanation for the cessation of placer deposits evolves from a suggestion by Mr. Reid that the district is yet in the early phases of an erosion cycle. Where the red rhyolite cliffs indicate possible faulting and rejuvenation, a rock type more resistant to weathering, such as this red rhyolite, will produce features similar to rejuvenation. The more resistant red rhyolite prevented the widening of the stream valley in its confines, thus making the formation of placers unlikely.

The absence of lake bed deposits substantiates this theory. Lake bed features would be common if faulting had produced the red rhyolite cliffs.

SUMMARY

The probability of hidden or buried placers in the Sideria District is not wholly dispelled. Further work is needed and will likely be continued by the author. It is obvious, but should be stated, that if the existence of buried placers is not sought, they will not be found. Once found, only the economics of extraction remains a problem.
BIBLIOGRAPHY


