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A DISSEMINATED LEAD PROSPECT IN NORTHERN BOISE COUNTY, IDAHO

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Foreword

Boise County, Idaho, had been long and favorably known as a producer of the precious metals, especially placer gold, but it contains comparatively few base-metal mines, in part because in the past most of the prospectors in the county have been primarily interested in the precious metals. The abundance of placer gravel and the belief held by prospectors in Idaho that granitic rock was unlikely to contain valuable deposits of base metal operated to retard search for such deposits. Most of the lode deposits that have been worked in the county, however, contain more or less lead and zinc,1/ and interest in these metals is increasing. In recent years a few deposits have been opened up primarily for their lead and zinc content. Among these is one known as the Disseminated Lead prospect, in the northern part of the county. This deposit is of interest both because it is one of those opened in response to the present demand for lead and because it differs from the common type of lead deposit in that the valuable sulphides are widely distributed through the rock instead of being confined within comparatively narrow lateral limits in a vein or shear zone. It is believed to be of Miocene age which is also of interest in view of the prevalent belief that most of the lead deposits in Idaho are related to the Idaho batholith and hence of Cretaceous or at most Eecene age. The deposit is so low grade that large scaled operations and very careful planning would be necessary in order to offer any hope of profitable exploration. It was visited in the course of a tour of mining districts in southcentral Idaho undertaken at the suggestion of the Idaho Bureau of Mines and Geology late in the summer of 1926, and the results of the brief examination then made are given in the present report.

1/ Campbell, Stewart, Twenty-seventh annual report of the mining industry of Idaho, for the year 1925, pp. 86-92, 1926.

Location and means of access.

The Disseminated Lead prospect is on the west side of Big Hole Creek about a mile above its confluence with the South Fork of Payette River. It is nearly 6 miles in an air line west of Lowman, the nearest settlement. There is a foot trail form the prospect down Big Hole Creek and over the spur at the east side of the mouth of the creek to a cable ferry across the South Fork of Payette River. From the opposite end of the ferry a short, steep trail leads to the highway along the north side of the river canyon. The prospect is also reached by a pack-horse trail from Grimes Pass. The highway is suitable for travel by automobile to the towns in the vicinity, and Boise can be reached by any one of several routes. The distance to Boise by way of Alder Creek and Placerville is 70 miles. Another route, probably equally advantageous, goes through Centerville and Idaho City. On this route the terminus of the Inter-mountain Railway is reached at New Centerville, about 25 miles from the ferry. A branch of the Oregon Short Line can be reached by following the South Fork to its confluence with Payette River at Banks, about 26 miles from the ferry.

Acknowledgments.

In the examination of this prospect the writer had the able assistance of Mr. Charles H. Behre. Messrs. Willis Brassey and John Blum, of Placerville, acted as guides and contributed valuable data on the history of the property.

History and development.

The presence of mineralized rock on Big Hole Creek has long been known. A prospector searching for gold drove what is now termed the Vernon tunnel about 50 years ago. This tunnel is about 70 feet long and still remains the principal development on the property. Nothing further was done until 1925, when John Blum discovered the presence of sulphide ore carrying promising amounts of lead and silver. Mr. Blum, with Willis Brassey, and others, located a number of claims. Later, Robert N. Bell, of Boise, bonded the claims of Blum and Brassey and located others. A number of shallow cuts have been made on the property, but the Vernon tunnel, already mentioned, is the only working in which any depth has been attained.

Topography.

This part of Boise County is mountainous, but the relief is not as great as it is farther north or east. The country is a rolling upland with summits 7,500 feet above sea level, into which have been cut the narrow canyons of the South Fork of Payette River and its tributaries. The altitude at the mouth of Big hole Creek is 3,400 feet. The zone of metallization on the west slope of the valley is first encountered perhaps 200 feet above the Creek, at an altitude of about 4,600 feet, and it extends to the ridge crest, some 600 or 700 feet higher. Much of the canyon of the South Fork is cut in

rock and contains little detrital material. Here and there along it, as at Garden Valley, the canyon widens and is floored with alluvium. All but the smallest of the tributaries contain detrital deposits, especially near their heads. On big Hole Creek near the prospect there are alluvial flats of considerable size. All the gravel in this region is reported to contain more or less gold.

The swift flowing south Fork of the Payette and its tributaries in their deep canyons are in striking contrast to the gravel-floored streams of the Boise Basin, with their wide valleys and low gradients. The Boise Basin lies just over the divide to the southwest. It is one of the oldest and most famous placer districts in Idaho, whereas little placer mining has yet been done on the South Fork of the Payette to its tributaries near Big Hole Creek. This contrast probably results rather from any difference in the gold content of the bedrock in the two regions. Obviously the topographic differences reflect differences in physiographic history, but just what these are constitutes an interesting problem which can be solved only by an intensive study of a large area based on better topographic maps than are now available.

General Geology

The whole of Boise County is underlain by granite rock generally considered to be a part of the Idaho batholith and to have been intruded in Cretaceous or early Tertiary time. The granitic rock is out by dikes of various kinds, and in places Tertiary and later rocks, both volcanic and sedimentary, rest on its eroded surface. No Tertiary strata are known anywhere in the vicinity of Big Hole Creek. No pre-Tertiary sedimentary rocks have yet been mapped in Boise County, but small amounts of highly metamorphosed rock of sedimentary origin probably occur as included blocks in the granitic rocks, as pebbles of schist and quartzite are sparsely distributed in the gravel in some of the stream valleys. Such pebbles were noted in the gravel along Big Hole Creek. Data on the general geology of the region and on the age relations of the rocks and lodes are based largely on Ballard's1/ report on Boise Basin.

The granitic rock in Boise Basin is largely true granite, but in places it has the composition of granodiorite. Throughout this region, except in some of the canyons, the granitic rock is so markedly weathered that outcrops of fairly fresh rock are rare. On Big Hole Creek at and near the Disseminated Lead prospect the rock is so much altered by weathering and hydrotheraml agencies that precise determination is difficult, but it is believed to be granodiorite. It is a rather coarse grained granitic rock with abundant quartz and sparse altered biotites. The feldspar is filled with sericited and other decomposition products but appears to be in large part a plagioclase with the appropriate composition of andesine.

Ballard, S.M., Geology and gold resources of Boise Basin, Boise County, Idaho: Idaho Bureau of Mines and Geology Bull.9, p 19, 1924.

The property lies in the northeastern continuation of what Ballard 1/ and others have termed the principal porphyry belt in Boise Basin. This belt contains many of the lode mines in that famous district and is generally credited with being one of the principal sources of its placer gold. The dike rocks in the porphyry belt include pegmatitie, diorite porphyry, aplite, rhyolite porphyry, and diabase, with minor amounts of other calcic rock.

The pegmatitic dikes and some of the others may have been formed shortly after the intrusion of the granitic rocks. Other dikes followed at intervals during the Tertiary a some of these made their way to the surface and produced lava flows. In the mineralized zones both the dike rocks and the granitic rocks are somewhat bleached and softened by hydrothermal action. On Big Hole Creek on and near the Disseminated Lead Property there are a number of pink porphyry dikes, some of which are 150 to 200 feet wide, and small silicic dikes of various types. The pink porphyry is much altered but appears to have been composed essentially of quartz, biotite, and feldspar, largely oligoclase. It is probably a quartz monzonite porphyry. A fine-grained light-colored quartz porphyry locally termed rhyolite is found on microscopic examination to contain considerable plagioclase and is probably a quartz latite. This rock is much finer grained than the more abundant pink porphyry but is very similar in composition. These pink and light colored porphyries resemble rocks in Custer and Lemhi counties which cut lava believed to be of Miocene age. In the Vernon tunnel there are two kersantite dikes each about 15 feet wide, and similar calacic dikes are present elsewhere, but they are smaller and less common than the silicic dikes. Near the portal of the Vernon tunnel a dike about 5 feet wide crops out. This is a rather light-gray felsitic rock with prominent pink phenocrysts of albite-oligoclase.

1/ Ballard, S.M., Geology and gold resources of Boise Basin, Boise County, Idaho: Idaho Bur. Mines and Geology Bull. 9, pp. 20-24, 40-43, 1924.
Lindgren, Waldemar, Mining districts of the Idaho Basin and Boise Ridge, Idaho: U.S. Geol. Survey Eighteenth Ann. Report, pt.3, pp 617-744, 1898.
Jones, E.L., Lode mining in the Quartzburg and Grimes Pass porphyry belt, Boise Basin, Idaho: U.S. Geol. Survey Bull. 640, pp.83-111, 1916.
Nye, Robert, The Boise Basin mining district: Min. and Sci. Press, sol. 81, p. 400, Oct. 6, 1900.
Hastings, J.B., The Boise Basin in Idaho: Eng. and Min. Jour., vol.58, p. 56, 1894.

Mineralization.

The area of mineralized ground on the Disseminated Lead property as indicated by exposures in the several small cuts is roughly 500 to 600 feet in diameter and lies on the west side of the main fork of Big Hole Creek. Galena ore is reported to have been found at intervals along the ridge west of Big Hole Creek, from the property to the river, a distance of about a mile.

The mineralized area on the Disseminated Lead ground appears to be bounded on the north side by a large dike of pink porphyry although some ore is reported to have been found on the far side of this dike. On the south the mineralized rock fades out without any definite boundary. Little evidence of mineralization is present in the lower 200 feet of the slope down to Big Hole Creek, and mineralization apparently did not extend west of the ridge crest at this place.

On the property the sulphides occur in numerous small and irregular quartz veins, mostly a few inches in maximum dimension, and disseminated through the altered granite and to a less extent the silicic dike rock without visible vein quartz. There are all gradations between the two modes of occurrence. Most of the veins strike N. 28 degree 40 degree E. and dip from the vertical to 50 degree W.

The sulphides named in order of abundance, are galena, sphalerite, pyrite, and chalcopyrite. Galena is in general much more abundant than the others. In the veins the only gangue mineral noted was quartz. Samples of the mineralized granodiorite in the Vernon tunnel and in a cut nearby are said to have assayed 2 per cent of lead, 2 per cent of zinc, and $4 to $5 to the ton in silver. Some assays higher than this have been obtained, and inspection indicates that the average ore would not be expected to carry so large a proportion of zinc, but taken as a whole the mineralized mass is distinctly of low grade.

By the rock alteration which accompanied mineralization the fieldspars were sericitized, and the biotite was bleached and chloritized. Small irregular aggregates of epidote and of calcite are found in places. Chlorite of two kinds occurs - one the common light-colored variety formed by the decomposition of biotitie, the other a bright-green pleochroic variety with high index of refraction. The bright-green varieties evidently high in iron and was formed along minor fractures in the rock as a result of the hydrothermal action that produced mineralization. It appears to be more common in the granodiorite carrying sulphides than elsewhere. The dikes are almost as much hydrothermally altered exposures they do to contain as much sulphide. In places in the silicic porphyries sulphide is present along fracture planes, but it does not appear to spread so far into the rock away from visible fractures as in the coarser-grained granodiorite. No sulphide was noted in the calcic rocks seen and an assay of the kersantite in the Vernon tunnel is reported to have shown that its metallic content is negligible.

The effects of surficial oxidation on the metallic minerals are negligible. There has been sufficient rusting of the pyrite to give outcrops a somewhat reddish appearance and incipient oxidation of other

sulphides has taken place at the surface, but even these minor results of weathering disappear almost completely at a depth of a few feet or less. There is almost no evidence of leaching.

Origin.

The only difference between the Disseminated Lead deposit and others in Boise County is one of structural detail. It so happened that the mineralizing solution that contributed to the Disseminated Lead deposit spread widely through the country rock, but in other respects the deposit does not appear to differ materially from those lode deposits in Boise Basin grouped by Ballard 1/ as "fissure veins related to the Miocene regional shearing." He states that this class includes nearly or quite all the deposits in that region containing galena, chalcopyrite, and sphalerite and describes these deposits as irregular chimneys and lenses of quartz. These quartz bodies occur at the intersections of fissures in granite with silicic dikes and vary greatly in size. The sheared country rock associated with them shows intense hydrothermal alteration which in places extends many feet into both walls. Bunches of calcite are present in places. Pyrite is widely distributed in the fissures. Other sulphides generally those of lead and zinc, are irregularly distributed and also grouped in tabular shoots. Bodies of this type that traverse silicic dikes commonly form stockworks made up of quartz deposited in countless seams in the dike rock, with but little evidence of crushing in the rock between the seams. In Boise Basin such stockworks do not persist far into the granitic rock, but on Big Creek both the silicic dikes and the granodiorite test by them are mineralized in this fashion. Indeed, the valuable sulphides appear to be more abundant and widespread in the granodiorite than in the silicic dikes. In both places the calcic rocks, although altered, have a negligible metallic content. Ballard believes that the deposits in the Boise Basin of the type referred to above follow shear zones developed during the Miocene epoch and are later than all the dikes of the porphyry zones in the region. They are so universally associated with the porphyry dikes, however, as to suggest that there is some genetic relation between the dikes and the ore deposits. The character of the mineralization and the alteration strongly suggests a magmatic source for the mineralizing solutions. The form and limits of individual deposits depend in large measure on the character of the country rock and the extent and character of the fracturing and shearing it had undergone prior to the advent of the mineralizing solutions.

The mineralization of the Disseminated Lead Property cannot be assigned to any of the geologic periods from the data obtained during this examination, but it is confidently believed to be essentially the same age as that which produced the lead deposits in Boise Basin. That is according to Ballard, the deposit is of Miocene age.

It is interesting to note that there is a certain amount of similarity between the deposit here described and the disseminated copper deposits. Both have resulted from hydrothermal action, and both consist of sulphides disseminated through large masses of rock, forming low-grade ore bodies. In both, intrusive igneous rocks believed to be genetically related to the mineralization are themselves hydrothermally altered, with the deposition

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1/ Ballard, S.M., op. cit., pp 41-42.

of metallic sulphides. One striking difference is that in most of the disseminated deposits the ore has resulted from superego enrichment, whereas the ore at the Disseminated Lead is not thus enriched.

Operating conditions.

In general conditions governing the costs and ease of developing the Disseminated Lead property are favorable. Shipments in or out could be made over good dirt roads, and the distance from railroads (about 27 miles) and from supply points are, for Idaho, comparatively short. Power and timber could be readily obtained.

It would be necessary to build a road down Big Hole Creek, a bridge across the South Fork of the Payette, and a grade from the north end of the bridge to the highway. As the deposit is of low grade it can be worked successfully only on a large scale. Careful planning of plant, mining operations, waste disposal, and living quarters would be necessary.