Present. 35 - 28
Matter 25 - 20
Eng. 40 - 30
75%

GEOLOGY AND PLACERS OF BOULDER CREEK, CASSIAR DISTRICT, B.C.

RONALD G. McEACHERN
Science '41.

TABLE OF CONTENTS

ILLUSTRATION

GEOLOGY AND PLACERS OF BOULDER CREEK, CASSIAR DISTRICT, B.C.

INTRODUCTION

A study of the Boulder Creek placers and the geology of the adjacent area was made, for the B.C. Department of Mines, by Dr. S.S. Holland, assisted by the writer. The writer is indebted to Dr. Holland for valuable advice and instruction in interpreting the observed data.

The object of the work was to locate an area favourable for lode prospecting. Therefore an attempt was made to indicate the possible source of the placers.

Owing to a lack of complete information concerning the placers the purpose of the work was not satisfactorily accomplished. However, the occurence of coarse gold on Shea Creek, the main tributary, does indicate an area that certainly merits prospecting, although it is probable that any lode discoveries would be limited in extent.

No previous geological work had been done on Boulder Creek, but a reconnaissance survey, made by Hansen and

McNaughton (1) in 1935, included the area immediately to the west. Johnson (2) and Kerr (3) studied the bedrock geology and placers of other creeks in the Cassiar district in 1925.

GEOGRAPHY

Location and Means of Access.

Boulder Creek is a tributary of the Turnagain River (locally known as Little Muddy). It rises about four miles west of King Mountain, the highest mountain in that part of the Cassiar district, and flows almost due north nine miles to the river. The Turnagain flows in an easterly direction at the junction, but soon swings north-easterly. It is part of the Mackenzie River drainage, its waters reaching the latter via the Kechika and Liard Rivers. The Continental Divide is about twenty miles west of Boulder Creek.

Boulder Creek is fifty miles east of the trading post on the southern end of Dease Lake. A fair pack trail and a rough winter road connect with the post, but a large amount of freighting and most passenger traffic is by air.

Dease Lake is reached by air from Atlin or by truck from Telegraph Creek. A boat schedule is maintained on the Stikine River between Telegraph Creek and Wrangell, Alaska, during the summer months.

Topography.

Boulder Creek lies in an area of moderate relief between the more rugged regions of the Cassiar batholith to the north and the Hotailuk batholith to the south. The adjacent summits, with the exception of King, are well rounded, dome shaped. The creek is paralleled by two smooth ridges which average about fifty-five hundred feet in elevation. The elevation at the mouth of the creek is about thirty-five hundred feet, and at the source forty-five hundred feet.

The bulk of its water comes from the three main tributaries on the east side. The largest part of the drainage basin lies east of the creek, and the flanking ridge on that side is higher. The east tributaries, Phillipon, Shea, and Jimmie Creeks are three and a half, four and a half, and seven miles respectively from the Turnagain. Shea Creek is the largest. No important tributaries enter from the west.

The lower half of Boulder runs in a canyon that starts at Shea Creek and becomes progressively deeper towards the lower end, where Boulder enters the river valley over a sixty-foot falls. The upper part of the creek occupies a wide U-shaped valley that connects by an open pass with another Turnagain tributary.

The grade through the canyon is much steeper than in the upper valley. The canyon grade is between four and five per cent, the steepest section being about the middle.

The grade above the canyon is a little over one per cent and increases slightly headward. The three main tributaries are all steeper immediately above their mouths than in their middle and upper sections. Shea Creek has a grade of over eleven per cent in the lower part and runs in a narrow canyon. The grade decreases and the canyon widens upstream to within half a mile of the head. From there up the canyon continues to widen, but the grade increases.

Glaciation.

The whole area has been heavily glaciated, both by regional ice-sheets and valley glaciers. Striations high on the ridges have a north-south trend, but no definite evidence gives the direction of movement. However, erratics of volcanic rock found in Boulder Creek are the same as rocks found in place to the south. Similar rocks are not known to occur on the north.

McNaughton and Hansen believe the general ice movement was to the north, disagreeing with Johnson and Kerr on this question. The mountains to the south are higher and more rugged than the mountains to the north, and appear to have made the best gathering ground.

The Turnagain River occupies a wide, steep-sided, U-shaped valley set in an old, more gentle sloping V. A definite angle marks the top of the U-sides, making a distinct line that can be seen up and down the valley. This break is over four hundred feet above the present valley floor. The valley floor is dotted with kettle-hobs and glacial drift ridges. The river meanders through this material and many lakes occupy the kettle-hobs. Soundings proved one of the lakes to be over sixty feet deep, and greater depths are to be expected. Most of the Turnagain tributaries have hanging valleys, and enter the main valley over falls or steep rapids.

The upper valley of Boulder has been heavily glaciated. It is ~~desirably~~ decidedly U-shaped, is crossed by two terminal moraines, and is dotted with drift ridges. The canyon has been cut in the floor of this valley. Remnants of the old valley floor form rock benches along the sides of the upper canyon. These remnants appear downstream over half a mile from the beginning of the canyon, but below that are either obscured by glacial drift or completely removed. Nowhere is there any evidence to indicate that the present stream has not followed the old valley. The lower canyon is sufficiently wide to have entirely engulfed the old floor.

In a widening of the canyon, one and a quarter miles above the falls, is a large accumulation of glacial material. Kettle-hole topography exits at less than one hundred feet above the creek level and well below the projected level of the upper valley floor. Glacial clays and large erratics are encountered below the present creek level in the placer workings. Nowhere else in the canyon was glacial evidence seen. The continuity of the canyon is broken here; ~~as~~ the upper part of the walls intersect the Turnagain valley slopes, and are ~~also~~ further obscured by drift. However, the creek is still in a shallow canyon with walls of irregular height.

On the valley walls above the canyon are numerous terrace levels of water-worked drift. These terraces are found well above the projected level of the upper valley, but do not extend into the upper valley. Similar terraces and accumulations of drift are high on the Turnagain valley sides.

GEOLOGY

On the accompanying geological sketch the rocks of the area are indicated in four units. The combined representation of serpentine and sediments is not a separate unit, but merely indicates these rocks where they are too closely intermingled to be shown individually.

The oldest unit is sedimentary rocks. They are unfossiliferous, and their age is unknown. Probably belonging with these is the greenstone. Only one band of this rock was seen. It follows irregularly the strike and dip of the sediments and in most places contacts them on both sides.

The sediments and greenstone are cut by serpentine which is definitely of intrusion origin. Serpentine and sediments are intruded by dioritic stocks, that are most likely related to the Hotailuh batholith.

Sediments and Greenstone.

These rocks have a general strike east and west, and stand almost vertical. Numerous local variations occur. Except near the head of the creek they are known to be in close proximity with intrusive rocks, and are highly metamorphosed. Limestone and schists, slates, argillites and tuffs make up the bulk of the sediments. The limestones are the most prominent. They are massive, grey crystalline, and vary from ten to fifty feet in thickness. They are indistinguishable from each other, and, although the most persistent, offer no horizon markers. The schists, slates and argillites are dark, fine bedded, grade into each other, and cannot be traced.. Clearage is poor, and does not appear to have a regional trend. Tuffs were noted only locally in the outer portions of the area.

The greenstone band averages over a quarter of a mile in width and stands about vertical. It appears to be interbedded with the sediments and is cut off by serpentine on its eastern end.

Structure.

The sedimentary structure is not known. Owing to the lack of horizon markers, the highly contorted condition of the beds, and the frequent cutting by intrusives, it could not be deciphered.

The limestone beds have offered greater resistance to intrusion than the other sediments. Isolated bands and lenses of limestone are found surrounded by serpentine, and limestone bands extend into the serpentine where all other sediments have been cut off. Diorite and sediments rarely contact; serpentine usually separates them.

Most of the sediments, with the exception of the extreme ends of the basin, appear to be shallow remnants and inclusions underlain by serpentine. The upper three miles of the canyon runs entirely in serpentine, but on the valley walls above the canyon patches of sediments crop out. A similar condition exists on Philipon and Shea Creeks; the proportion of sediments to serpentine is much higher on the walls than in the creek bottoms.

Intrusives.

Serpentine is the most prominent rock in the basin. A wide degree of alteration is presented, but none of the original unaltered basic rock was found. The highest degree of alteration is adjacent to the dionite contacts. There the serpentine is quite pure, and a bright, greasy, yellowish-green colour. It is columnar to fibrous, but no asbestos has been found. Away from the contacts the serpentine is a dull dark green on a fresh fracture, but weathers to a variety of shades of red, brown, green, to black. Large areas of serpentine lie on both sides of the basin and across the Turnagain River.

The dioritic intrusions within the basin are small in area. The largest lies immediately to the east of the main creek and a mile above Shea Creek. It is over a mile long, and averages a quarter of a mile in width. Several small isolated outcrops occur on the west side of the basin. All these bodies are fine textured and light coloured. King Mountain is entirely diorite, and there the typical dioritic texture and colour can be seen, but its marginal phases are identical with the smaller bodies in the basin. Another large stock parallels Boulder Creek on the west. It is about three miles from the creek, and extends from near the Turnagain south for about six miles.

Several areas of bright serpentine, not contacting diorite on the surface, indicate that the diorite may be close to the surface. These bright areas of serpentine, together with the lineation of the known diorite outcrops in the basin, suggest a near surface connection between the two large stocks.

Two narrow dykes cross Shea Creek a mile from its head. They appear to be a fine-grained equivalent of the diorite. No other dykes have been found in the basin, but to the west several similar dykes are closely associated with the diorite.

Numerous small irregular quartz veins occur on the east side of the basin adjacent to Phillipon and Shea Creeks. Several of these are near the dykes on Shea Creek and the diorite body to the south. Veins and dykes are in sedimentary rocks. The veins both follow and cross the bedding, more often the latter as the sediments in which they occur are very highly contorted. Thickness varies from one or two inches to a foot. It varies greatly over very short lengths, and none of the veins are more than a few feet in length.

PLACERS

Nearly all prospecting in the area has been for placer gold. Nothing but the most superficial lode prospecting has been attempted.

Boulder Creek.

Gold was first discovered on Boulder Creek in 1932, when twenty-four ounces were taken out one mile above the falls. The annual output remained the same until the end of 1936. All gold was taken from bedrock between discovery and the falls. Bedrock averaged six to eight feet deep and carried fair values wherever tested.

In the fall of 1936 the most important discovery was made a quarter of a mile upstream from the earlier one. This was in that wide section of the canyon containing glacial material. Here the gold was found on the sides of the creek bottom, a few inches below the ground surface and several feet above the creek level.

Total recovery for the creek was one hundred ounces in 1937, 1200 ounces in 1938 and around 2500 ounces in 1939, the bulk coming from the glacial section.

Most of the 1939 recovery was from the creek bed, but not from bedrock. The gold was concentrated on a "false bedrock" of fine stratified glacial clay lying about fifteen feet below creek level. True bedrock has not been reached. Glacial and stream gravels lie above the clay, also a large number of erratics weighing up to several tons. All the gold was not on this "false bedrock", some being contained in layers of clay much nearer the surface.

Until 1939 all gold taken out came from these upper clays. All work was by hand and attempts made to boom of the gravels were unsuccessful owing to the large boulders. In 1939 a drag-line was operated, but the boulders caused so much trouble that no attempt was made to get below the clay.

Nowhere has bedrock been reached in the canyon above this point. Nothing but "colours" have been found in the surface gravels, nor has any indication of glacial material been encountered. A test shaft a quarter of a mile upstream, sunk twenty-six feet, failed to reach bedrock and was entirely in creek gravels. Just below the mouth of Shea Creek a drill hole failed to reach bedrock at twenty-two feet.

Below the rich ground the canyon walls close in to form a narrow constriction, through which the creek flows over rapids. Apparently an accumulation of boulders has dammed the creek to cause the sudden increase in bedrock depth.

Bedrock is shallow in most places in the upper valley, but the possibility of placers escaping the heavy glacial erosion here is negligible. Rock benches on the side of the canyon have been tested without any favourable results.

Boulder Creek gold is coarse and well rounded. The bulk is contained in pieces ranging from a few cents to a dollar in value. Occasional ounce pieces are found. No flour gold or "dust" is encountered. It has a fineness of 880.

Tributaries.

Extremely coarse gold was discovered on Shea Creek in 1937, and over 100 ounces per year have been recovered since. The lower part of the creek has not been worked, but is known to contain some values. Recovery has been made from the section between one and two miles from the mouth. The upper part has not been thoroughly tested, but some gold has been found further upstream.

There is little gravel on the creek; bedrock is either bare or covered with a thin layer of angular material and glacial boulders.

The gold is very coarse and rough; the bulk of it is contained in pieces ranging from one-tenth of an ounce to ten ounces. A 52-ounce nugget was found in 1937. In spite of the large size of individual pieces the ground is not particularly rich. Considerably finer pieces are recovered, but make up a minor part of the total. Several pieces of quartz veined with gold have been found. The fineness is about 780.

Phillipon and Jimmy Creeks have been well tested, and have yielded nothing but colours.

CONCLUSION

The Shea placers indicate a very close source. Gold of that size could not travel far horizontally.

The possibility of the serpentine carrying quartz veins is small. The serpentine, because of its tendency to weather rapidly by crumbling and flaking, supports less vegetation than the sediments. Veins should be more readily noted in it than in the sediments, but all known veins are in the latter. Eliminating serpentine as a vein carrier reduces the possible source of Shea Creek gold to an even smaller area. The entire outer portion of the creek basin is in serpentine.

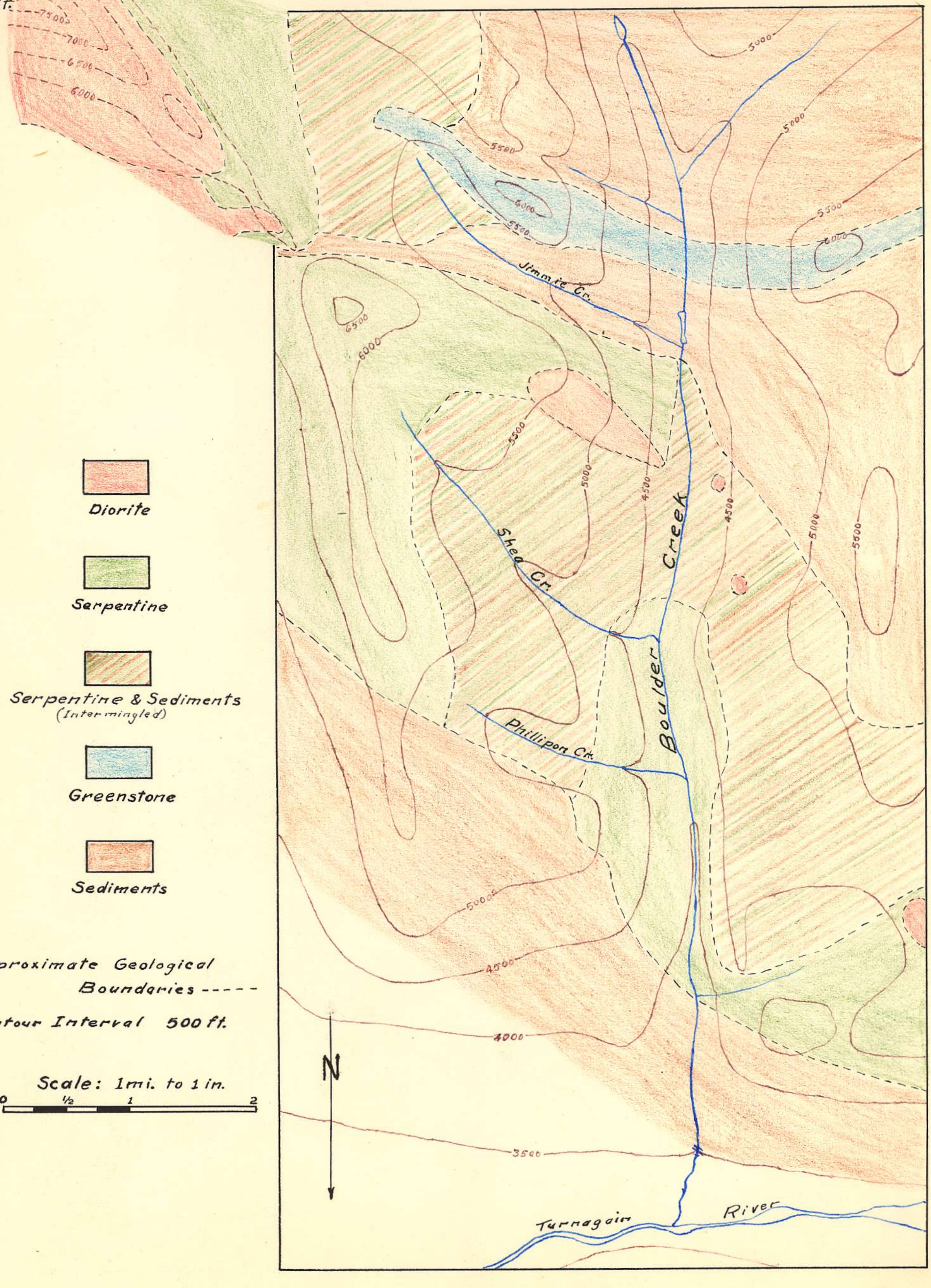
There is a large possibility that the gold bearing veins are completely or nearly completely eroded. Sediments on the creek may be very shallow, but the limited extent of the area and the obvious richness of the vein make it a very attractive place for intensive prospecting.

The source of Boulder gold is much more obscure. The difference in degree of fineness tends to eliminate the possibility of a common source. It is also doubtful that gold as coarse as that on Boulder could have travelled so far.

The rich concentrations in glacial material are difficult to understand. Glacial action usually tends to scatter placers rather than to concentrate them. The occurence of the glacial material itself is difficult to explain. All other evidence indicates that the canyon is the result of post-glacial cutting caused by the ice leaving the Turnagain valley.

Until more information is available, and until the origin of the deposit is better understood, no predictions regarding the source can be made.

SKETCH MAP OF BOULDER CREEK DRAINAGE BASIN



BIBLIOGRAPHY

1) Hanson, O., and McNaughton, D.A.,
"Eogh-McDame Area, Cassiar District, B.C.";
Geol. Surv., Canada. Memoir 194, 1936.

2) Johnson, W.A.,
"Gold Placers of Dease Lake Area, Cassiar District, B.C";
Geol. Surv., Canada, Sum. Rept. 1925, pt. A, pp. 33-74.

3) Kerr, F.A.,
"Dease Lake Area, Cassiar District, B.C.".
Geol.Surv., Canada. Sum. Rept. 1925, pt. A, pp. 75-99.