(COPY) 019034 1048/9W,10E

CANADIAN EXPLORATION LIMITED - VANCOUVER B.C.

22nd. October 1947

Via Air Mail

Mining Research Corp. Ltd.
67 Yonge St. Toronto.

Att'n Mr. H.R. Beckwith

Gentlemen: Unuk River

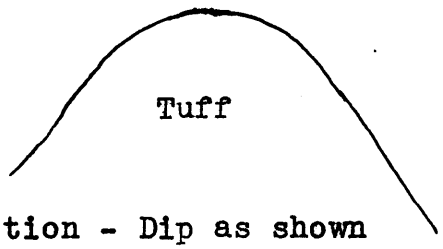
We have your letter addressed to Mr. T.S. Mackay, which has been passed on to us for reply. The following are some of the particulars concerning the property.

The Unuk River claims are situated near the Unuk River about 50 miles north of Stewart B.C.

The rocks are mostly varieties of volcanic tuff. Gold is widely spread over this area and any sample taken in the tuffs for five or six miles will show .02 gold. Near fault zones assays of 1 ounce to 2 ounces may be obtained. In most cases no continuity has been obtained where these high values occur. Considerable barren pyrite is distributed through all the volcanics.

The principal showing on the property occurs in what is known as the North End Workings. In this area a band of tuffs about 150 feet wide had been sheared and has since been resilicified. This shearing is at 45 degrees to the axis of the tuffs and dips 45 degrees. Parallel shears in a length of 100 feet along the axis of the tuff form the basis for the expectation of a mine in this area.

Surface cut assays and diamond drill cores give prospect of obtaining 300 tons per foot at more than half ounce gold per ton. The width of the formation increases with depth as sketch below.

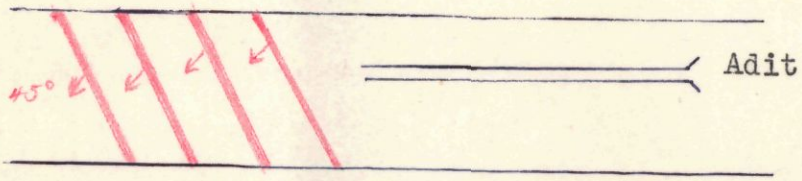


Section - Dip as shown

The ore, even the high grade, is not recognizable visually as the shears have been completely resilicified. For this reason the dip and strike of the ore was not recognized during the period when most of the work was done.

1048008-07

A tunnel was begun to investigate the shears at a depth of about 100 feet. This tunnel has not reached the ore zones. About 250 feet remain to be driven to intersect all the ore bodies. The sketch below indicates the ore occurrences



Width of these zones is 5 - 10 feet

There is also a silver showing about two miles north of this of about 30 ounces per ton 10 feet width, length undetermined, which is worthy of exploration.

The Canadian Exploration Limited had a party on this property during the 1946 season. At that time we were unable to get a plane to deliver passengers or freight via the natural route, i.e. up the Unuk River from Ketchikan owing to difficulty of arranging air travel and customs. Therefore, we had to take the expensive and hazardous trip from Stewart to the property and to drop our supplies from a plane. Hence the amount of work we could accomplish was very little.

Recently arrangements have been made which will facilitate travel to the property via Ketchikan.

If such a property appeals to your clients we should be glad to go into further details. Plans, assay maps and other material data are available for inspection at this office.

Trusting this information may be useful to you, we are,

Yours very truly,

Canadian Exploration Limited

per J.A. MACKENZIE

CANADIAN EXPLORATION LIMITED

U N U K R I V E R E X P L O R A T I O N

November, 1946

F. Whiting

Vancouver, B.C.

TABLE OF CONTENTS

SUMMARY OF OPERATIONS

Camp:

An oil burner and a supply of fuel oil had been sent in to the property but it was decided to use wood instead. Conversion of the wood stove to an oil stove would have been quite a chore, only a third of the oil had landed safely, and the cook preferred to use wood, having had trouble with converted stoves at other camps. Accordingly, a large amount of time was spent providing wood for the stoves during the summer and in building up a reserve sufficient for the winter requirements.

The old blacksmith shop site near the portal was excavated early in the Spring, a rough shelter erected and a forge constructed. When word was received that a crew would spend the Winter at the property, a new shop was built on the knob beside the bunkhouse.

An assay office was built 50 ft. south of the bunkhouse, a 10 x 10 warehouse at the landing at Mackay Lake, a 10 x 10 warehouse on the knob immediately north of the bunkhouse, and a 30 ft. snowshed at the portal of the North End Workings adit.

North End Workings:

A raise was driven 21 ft. to the surface from a point in the adit 174 ft. from the portal and 102 ft. from the face. Surface samples were taken at 9 places, plug shots and new samples at 4 of these.

13 O.C.

The main face was re-sampled and a new line of samples taken 70 ft. to the south-east.

21 O.C.

Cut 21 R was extended 32 ft. north-west through deep overburden, plugged and sampled.

South Bluff:

Five samples were taken and a small amount of reconnaissance was done.

Unuk Gold #1 - #16:

Assessment work consisting of plug shots and sampling was spread as required over iron-stained outcrops at Battleship Knoll, east of Battleship Knoll Lake and on a line of bluffs overhanging Paradise Valley, on claims 8 and 10.

Staking:

Of the Unuk Valley Group, claims 25,26,33,34,45, 36,37 and 38 had been re-staked by T.S. Mackay early in the Spring. Claims 27,28,29,30,31,32 and No. 4 Fraction were re-staked during the Summer and numbers 39 and 40 were staked for the first time covering ground formerly held by A.R. Nichols and associates of Prince Rupert, B.C.

Geological Work:

The area mapped in moderate detail is a strip about one claimlength wide, stretching from the North Bluff Lake to 21 O.C. Special studies were made of the structure at the North End Workings and between 21 and 22 Open Cuts. A general map at 500 ft. to the inch was prepared showing formation correlations, and 200 ft. to the inch maps of the North End Workings and 21 - 22 O.C. vicinities, giving details of faulting.

The area east of the centreline of the claims was crossed by a pace-and-compass traverse and by several days' reconnaissance. Detailed mapping was not undertaken because that area is underlain by one almost homogeneous formation.

Small amounts of time were spent at 13 O.C., South Bluff, and North Bluff. The Unuk Gold Group of claims and particularly Nos. 13,14,15 and 16 were traversed many times but were not actually mapped.

Reconnaissance down Mackay Creek and Ketchum Creek showed that the volcanic formations probably do not intersect the major fault that runs north-east from Shirley Mountain.

Prospecting in the vicinity of Shirley Mountain discovered nothing worth further work. Information on this area is given in the section on areal prospecting.

Wood Supply:

Wood sufficient for one more summer's requirements can be found on the slopes and knobs west and north of the camp. Twisted hemlock trunks up to 15 ft. long with 1 ft. base diameter are fairly common. The last of this used was obtained about 400 yds. from camp.

Wood Supply (Cont.)

For a permanent wood supply, however, it is necessary to go either north-east down Eskay Creek Valley or north-west along the route of the proposed tractor road. Along this new road there is ample timber averaging 14 inches and up to 24 inches in diameter. A haul of over one mile is required.

Personnel

Basic Crew:

1 Foreman - Blacksmith
3 Miners
1 Cook
1 Geological Engineer

In addition, J.A. Mackenzie, Mining Engineer, was in charge of the party up to August 6th. On that date G.M. Christie, B.C.L.S., took over. S. Hunter was survey assistant and assayer from August 6th to September 5th, 1946. T.S. Mackay, part owner of the property, accompanied the party and acted as general adviser and assayer.

The Winter crew working on contract to extend the tunnel at the North End Workings consisted of:

2 Miners
1 Mucker
1 Cook
T.S. Mackay

Tractor Road:

A suitable route for a tractor road from the camp to Mackay Lake, following a distance of 4.6 miles, was staked out by G.M. Christie. The grades and cross-sectional slopes are moderate and very little rock-work would have to be done.

NORTH END WORKINGS

Development:

The open cutting and diamond drilling by the Premier crew was based on the concept of one or more zones striking N 35° E. The alternation of high and low assays in the transverse cuts and in the one longitudinal cut was taken to mean spotty, erratic enrichment without pattern or visible control. The low values found by the adit showed a series of zones running east-west and dipping south. The model that was constructed and study of the assay plans show that the high-assay spots in the cuts can be correlated approximately with drillhole intersections on the basis of parallel zones striking east-west and dipping 45° south.

In an attempt to prove this pattern new open cuts were made on the ridge above the tunnel and among the old cuts. Samples C X 4, 5, 6, 7, 8, 9, 10, 15, 16, and 17, above the tunnel, showed traces of gold mineralization that could be correlated with zones cut by the tunnel. The assays were too low, however, and the cuts too widely spaced to prove the existence of the suspected pattern to the exclusion of others.

A line of samples was cut north from the east end of 35 O.C., seeking extension of the high grade intersection near the bottom of D.D.H. 16. The highest assay obtained was 0.18 oz. Au. - 0.58 oz. Ag. across 4 ft. Surface samples were taken between 45 and 46 O.C.'s; the best assay was 8 ft., 0.08 oz. Au. - 0.52 oz. Ag. At this point in the program J.A. Mackenzie was recalled and it was decided to advance the tunnel during the Winter of 1946-47.

Plug shots opened the rock between 45 and 46 O.C.'s and new sampling in 2 ft. lengths disclosed a 10 ft. zone averaging 0.75 oz. Au. - 1.42 oz. Ag. (1) Plug shots between station 204 and 55 O.C. uncovered 6 feet running 0.36 oz. Au. - 0.34 oz. Ag. These values are considered to fall in the zone intersected at the bottom of D.D.H. 16, and cut by the line of samples north from the east end of 35 O.C. These last two pieces of work are reasonable confirmation for the east-west pattern of zones.

When word was received that the tunnel was to be extended work on these showings was discontinued.

Tunnel Work:

Early in the Summer, a ventilation raise was driven to the surface from a point 174 ft. from the portal and 102 ft. from the face. Samples were taken from the top of bedrock to shoulder

(1) Detail south to north: C X 90 - 2 - 0.46 - 1.34, C X 89 - 2 - 0.72 - 1.56, C X 88 - 2 - 1.38 - 2.29 C X 87 - 2 - 0.80 - 1.70, C X 91 - 2 - 0.40 - 0.14, C X 92 - 2 - Tr - 0.02. Sequence: Sample Number - Sample Length - oz. Au/Ton - Oz Ag/Ton.

height in the tunnel, connecting with the sample line along the east wall. The section from 3 to 6 feet from the surface ran 0.04 oz. Au. - 0.28 oz. Ag. The lowest sample, 4.5 feet connecting with the tunnel sampling ran 0.06 oz. Au. - 0.22 oz. Ag. If the parallel zone theory is correct these two spots fall in to the zone cut by the tunnel 220 feet from the portal and intersected by D.D.H. 22. It is possible that this drillhole did not penetrate the shoot for its angle of intersection with the plane of the shoot is about 19 degrees and the drill may have skidded down the footwall.

At the time the writer left the property the 3-man tunnel crew, having worked nine days and using three cases of powder, had advanced the face 10 feet. At the start the face was 114 feet beyond station S4 in the tunnel. A plug was put in at 110 feet.

The 1-1/2 H.P. Fairbanks-Morse "Z" type engine was set up in the snowshed driving a small fan. The fan pipe was of several types: 100 ft. of 2-1/2" hose, some lengths of collapsible rubberized 10" pipe and a surplus of 3 ft. lengths of 8" stove pipe. Several lengths of stove pipe were set up in the raise which was then sealed with timbers, it being planned to add more lengths to the top as the snow deepened. Concussion from the blasting opened the seams of the pipe, however, and some adjustment would have to be made. This was left to the tunnel crew.

Word was received that by November 10, 1946, the tunnel had been advanced 44 ft. and by November 18th, 50 feet.

#1 OPEN CUT

No work was done at #1 O.C. in the 1946 season. Surface values are concentrated on the floor of one cut, giving assays up to 1 oz. Au. per ton over an area 10 ft. by 30 ft. The deposit is in silicified volcanic rock, adjacent to the contact with argillite. As exposed in other cuts here the contact is barren. Diamond drilling showed spotty values, often of good grade, to a depth of 30 ft. in general parallel to the contact.

Diamond drilling logs describe the host rock as "highly siliceous and generally pyritized and streaked (with pyrite and graphitic material) light to dark altered volcanic (tuff)". Possibly the "graphitic material" is argillaceous fragments or filaments from the adjacent argillite bed. Quartz stringers, calcite, sphalerite, and galena are also found. Much of the surface rock is coarsely brecciated. The D.D.H. logs mention "dense banded tuffs" where the rock should more accurately be called "argillite with minor argillaceous tuff". The contact strikes N 50° E and is approximately vertical.

Further development work does not seem justified.

#13 OPEN CUT

Development:

The Premier workings disclosed encouraging values but no recognizable ore shoot. In an effort to detect the attitude of the ore body the main face in 13 O.C. itself was resampled in 3 ft. lengths, 1 ft. above the floor of the cut and 10 ft. above the floor. It was hoped that the borders of the shoot would be outlined by the assay values. The low line of samples, 2 ft. below the Premier line, duplicated their assays. The high line was barren. This result changed the picture entirely. If the values did not continue to the top of the face, surface projections to guide further trenchings were meaningless.

Before the results of the face sampling were known a long line of samples was taken across a low ridge, 70 ft. south-east of 13 O.C. All samples were barren. In 13 O.C. a 5 ft. sample had assayed 0.10 oz. Au. Our resample ran Tr Au. per ton.

Mineralization:

The gold is associated with copper, lead, zinc and iron sulphides in one-inch veins that dip steeply north. However, in 14 O.C. 100 ft. north, sulphides occur without comparable quantities of gold.

Summary:

The values are concentrated in a 4 ft. by 20 ft. face and a 5 ft. drillhole intersection. Barren open cuts encircle the rich face almost completely and the adit underneath is barren. The most that can be expected here is a shoot plunging moderately to the south, running 0.50 oz. Au. - 1.03 Ag. with a roughly circular cross-section of 5 ft. diameter.

No further development work is recommended.

#21 OPEN CUT

Previous Work:

Open cutting and diamond drilling by the Premier crew had outlined a mineralized zone running N 25° E, dipping 55 - 80° NE, and averaging 0.05 oz. Au. - 4.27 oz. Ag. across 37.5 feet. This zone outcrops in the surface cuts 21K to 21P. In cut 21R, 60 feet north-east on the line of strike, and in cuts further north-east on the same line, no comparable values were found. Drillhole 47 intersected 0.10 oz. Au. 39.20 oz. Ag. over 16.5 feet, or 7.5 feet horizontal, 60 feet north-west of the shoot outcrop in 21F O.C.

Development:

J.A. Mackenzie, in charge of development work, thought that a transverse fault could have offset the shoot to the north-west on the north. Such a fault would run from just south of the D.D.H. 47 intersection to just north of 21F or 21P O.C. Accordingly, using the known attitude of the zone, its surface outcrop was projected north-east from D.D.H. 47, and 21R O.C. was extended north-west 32 feet. In July plug shots in the floor of the cut disclosed a narrow seam of sulphides-galena, sphalerite, pyrite and tetrahedrite - a picked specimen of which ran 0.24 oz. Au. 287.12 oz. Ag. Values in 4-ft. samples were disappointingly low, the maximum being 3.18 oz. Ag. In August the cut was extended a further 13 feet and more sulphides were uncovered. Wide channel samples showed a 3-ft. band assaying 0.05 oz. Au. 32.02 oz. Ag. This high grade band, consisting of sulphides disseminated irregularly through soft sheared white volcanic rock, runs N 38° E and dips steeply north-west. Sulphides were found in the hangingwall and footwall, partly as disseminations in highly siliceous rock but mainly as clusters in the softer, sheared seam. Moderate values were expected for 4.5 feet in the footwall and 4 ft. in the hangingwall, but the assays showed little more than 1 oz. Ag. Gold values are low, 0.06 oz. per ton or less.

Correlation of these values with those in D.D.H. 47 outlines a body at least 110 feet long, averaging 0.07 oz. Au. - 35.62 oz. Ag. across just over 6 feet. If this is considered a continuation of the 21K - 21P zone, the total length is about 300 feet. A projection of 50 feet at each end into unprospected ground would increase the expected length of the shoot to 400 feet.

Geology:

Faulting 1 - Geological reconnaissance could not substantiate the concept of a transverse fault in the position suggested. No fault runs through the creek bed above the collar of D.D.H. 47 as was first expected. East of the line of open cuts the bedrock is covered by deep overburden. West of the cuts up the hillside outcrops are scarce and mapping was inconclusive. 400 feet north-west a fault was discovered by its offsetting of a formation contact but this, projected, heads rather towards the south end of the 21 O.C. workings. 50 feet west of station 275, which is almost directly above the values in D.D.H. 47, an indistinct formation runs about N 45° E, but faulting could not be proved. The host rock in the 21R extension is similar to that in the other 21 open cuts.

In summary then it is not known whether the D.D.H. 47 - 21R extension zone is the offset continuation of the 21K - 21F zone. They may be parallel bodies.

Faulting 2 - A fault striking N 70° E, dipping 60° north-west, cuts off the north end of the 21 open cuts. As exposed in the cuts 21A and 21B, the fault brings a partly siliceous, partly argillaceous volcanic rock into contact with the 21 O.C. host rock. The off-setting is probably to the east on the north side, but owing to heavy overburden no definite information can be given. No values have been disclosed north of 21A O.C., but no open cuts have been put in there.

Faulting 3 - In the centre of 21K O.C. a sheared patch separates low values on the east from moderate values on the west. Correlation of this shearing with a cave in D.D.H. 44 at 83 feet and shearing in D.D.H. 45 at 135 feet gives the attitude N 51° E, 88° SE for a possible fault. The surface trace of this fault would run along the steep face that causes the abrupt eastern termination of each of the cuts.

Shoots - The diamond drill holes show that there are more than one shoot. D.D.H. 47 has two good sections, D.D.H. 46 three low grade, and D.D.H.'s 42 and 44 one fair and one poor. It seems best, therefore, to consider the newly-found D.D.H. 47 - 21R extension band a separate body, rather than a fault-offset continuation of the 21K - 21P band.

Three parallel zones are indicated at the north end of the area by 21R extension - D.D.H. 46 bottom - D.D.H. 47 collar values, D.D.H. 46 centre - D.D.H. 47 bottom, and D.D.H. 46 - D.D.H. 43 intersections. The attitude of the first of these is N 31° E, 75° N.W. The others appear to be roughly parallel to this.

The D.D.H. 46 centre - D.D.H. 47 bottom zone is directly in line with the main shoot "B", outcropping in the cuts 21K to 21P and intersected at depth by D.D.H.'s 42 and 44 (and so is taken to be the northerly continuation, evidence of cross-faulting being lacking). D.D.H. 45 should have cut this shoot near the bottom of the hole. Either the shoot fades out between D.D.H. 44 and D.D.H. 45, or its dip flattens even more, from 78° under 21P O.C. to 55° at D.D.H. 44, to say 40° at D.D.H. 45. To the north shoot B appears to become narrower. In D.D.H. 47 the maximum silver values are 30.46 oz. across 0.5 feet. The increase in gold from 0.04 oz. to 0.10 oz. does not compensate for the disappearance of the richer silver veins. Open Cut 21R is relatively barren and in D.D.H. 46, underneath it, although the shoot is represented by positive assays in the expected position, the grade is very low: 7 feet, 0.04 oz. Au. - 1.31 oz. Ag. It is suggested that the best values lie in the centre of a twisted lens with a maximum width of 37.5 feet, length 250 to 300, depth at least 140 feet, with altitude varying from N 25 E, 55° NE to N 25 E, 80° NE.

If there is no faulting between 21P and 21R open cuts, the new D.D.H. 47 - 21R extension shoot, designated "C" must be considered as occurring in an echelon position, 60 feet north of the "B" shoot. Body "C" is taken to average 5 ft. wide, H.D., and to be at least 110 feet long. How far south it can be projected is a matter of guesswork, for the drillholes 42, 44 and 45 were not long enough to intersect it, and no surface cuts exist. To the north, however, a limit can be given. The cuts 21A, B, C and D were planned to expose the "B" shoot. To the west of this line of open cuts is a draw, through which shoot "C" may well run. If it does so, a projection to the north of 330 feet is possible, before the fault exposed in 21A and B O.C.'s offsets the host rock. Lacking open cuts in the draw, or deeper drill holes between stations 297 and 276, however, only about a 150 ft. length can be assumed.

The third body, "A" is very low grade, but serves as substantiation of the parallel shoot theory. It is outlined by the D.D.H. 46 collar - 41 bottom - 45 collar - 44 collar - D.D.H. 43 intersections. Average assays are only 1 ft., 0.06 oz. Au. - 0.50 oz. Ag. and D.D.H. 42 passes through it without finding any values. Shoot "A" is 50 feet east of shoot "B" and seems to be about 350 feet long. No vertical dimension can be given for no surface cuts expose it unless 21L O.C. does so.

General Notes:

The host rock of the 21 O.C. mineralization is a white, partly chloritized, partly silicified volcanic formation. It shows little brecciation, but some fracturing that was followed by the injection of barren white vein-quartz. Shearing is prominent,

parallel to the length of the zone. Transverse fractures are common, running east-west and dipping moderately south, but no movement took place along them. The gold and silver seem confined to narrow seams of sulphides, mainly galena, sphalerite and tetrahedrite. The enrichment was accompanied by small amounts of white vein-quartz that is commonly vuggy. This suggests low-pressure deposition. The veins assume all attitudes and twist and swell erratically. The thickest vein noticed attained a maximum width of 2". Solid sulphides assay up to 300 oz. per ton and it is these narrow high grade stringers that give the moderate values across stoping widths of otherwise barren rock.

The following description of the formations at 21 O.C. is an amplification of the general remarks on the geology of the claims. It is inserted here to clarify the structural picture since 21 O.C. is, aside from the North End Workings, the most promising showing.

The host rock is an alteration of part of the "B" formation. As mapped west of the North End Workings, the "B" formation is an alternation of siliceous volcanic breccias and soft green flows, approximately andesitic in original composition. Neither of these types is considered a possible equivalent of the 21 O.C. host rock. Between 22 O.C. and 21 O.C. a third type takes the place of one of the soft green flows. It is irregularly soft, greenish to white and rusty-weathering. The principal constituent is probably chlorite. This formation is stratigraphically 600 feet below the top of the "B" formation and is succeeded above and below by hard siliceous breccia. South of 21 O.C. its thickness appears to be approximately 70 feet. Immediately north of station 301 however, at the south end of the 21 O.C. area, this rock type becomes much more widely distributed, covering most of the area from 21T O.C. to 21A O.C. and extending westwards 400 feet. To the east its extent is not known for rock exposures are few there.

Parts of this formation are highly silicified and one of these forms the ridge prospected so extensively by open cuts and drill holes.

The line of cuts and the upper contact of the "B" formation converge, 550 feet separating them at the south end of 21 O.C. and only 200 feet at the north end. The contact is offset by at least one fault but its trace could not be followed into the 21 O.C. zone owing to lack of outcrops. Argillites are found at the top of the slope above 21A and B open cuts.

Sheared grey limy rock is found in one place by the creek that flows past the collar of D.D.H. 47 and past station 275. Otherwise, lime is rare in the country rock though some calcite can be found in veins in the mineralized zones.

Prospecting:

Since the 21 O.C. mineralization is not confined to one stratigraphic position, prospecting for extensions of the zone cannot be guided exactly by reference to the top of the "B" formation. Instead, the special rock type must be sought. Since it is expected that efforts will be made to trace the zone northward beyond the 21A - 21B O.C. fault, the following suggestions are made. Owing either to faulting or to change of strike the top "B" contact swings to the east just north of the 21 O.C. area, and on claims 39 and 40, its trace runs about N 60° E, probably outcropping near the north-east corner of Unuk #40. Immediately below the contact there should be from 50 ft. to 400 ft. of siliceous breccia. Below this, that is on the eastern side, the favourable formation should occur.

It may be noted that sulphide mineralization in this area and in these rocks is very difficult to discover by chipping with a hammer. The sulphide seams are narrow and weather out leaving barely discernable cracks unmarked by oxidation. What iron stains may be left merge with the general rusty appearance of most of the rocks, a reflection of their pyrite content. Plug shots are needed.

Suggestions for development should the present showings be thought worth further work:

A: Surface

1. It might be worthwhile to extend 21R O.C. even further north-west. Small amounts of sulphides were found in the end of the present cut and it is quite possible that further high-grade sections exist. The rock west of the "C" zone is completely unprospected.

2. New cuts at intervals across the draw on the west side of cuts 21C and 21D would prove any northerly extension of the "C" zone.

3. Prospecting with trenches and plug shots might pick up silver mineralization in the virgin ground directly north-east of the 21 O.C. area, on the north side of the fault exposed by cuts 21A and 21 B.

.....

The overburden is deep near the 21 open cuts, and the work suggested above might entail digging through six to ten feet

of overburden. Since the sides of the trenches slough in, a six-foot depth of soil means that a little more than one yard of dirt must be removed to expose each one-foot section of bedrock with the floor of the cut two feet wide. For this reason it might be thought best to continue the development underground.

.....

B: Underground

1. Diamond drilling gives indications of mineralization even if the assays are of doubtful reliability. The southerly extension of the "C" zone might be proved by deepening D.D.H. 45 about 40 feet. The northerly extension could be explored at depth by a new hole collared at any convenient spot between 50 and 100 feet due east of station 276, sent about N 70° W at a fairly low angle, say minus 10 degrees, for about 250 feet.

2. A crosscut could be used to expose the three zones at a moderate depth, followed by drifts along any shoots intersected and possibly by two winzes. A convenient portal location would be at the collar of drillhole 42, beside station 298. With a direction of N 50° W or N 45° W, a crosscut at elevation 3334 feet should meet shoot "A" between 50 and 60 feet, "B" between 100 and 120, and "C" near 200 feet. The following backs would be developed: "A" - 30 feet, "B" - 55 feet, "C" - 60 feet. Most of the drillhole intersections would lie underneath the crosscut.

The advantages of this location are that the crosscut would expose the "B" zone at its best section between D.D.H. 42 and D.D.H. 47, would expose the "C" zone under its widest part and would expose any transverse fault between the end of "B" and the south end of "C". In addition, the zones would be cut at right angles.

3. A drift could be started directly below 21B O.C., heading S 25° W. The site was not examined with such a project in mind but the writer believes that with removal of considerable overburden a good portal site could be found. The disadvantages are these: very shallow backs of less than 20 feet would be developed, a crosscut would be needed to explore the "B" zone, and preliminary trenching would be needed to find the "C" zone and so disclose the best site for the portal. The north end of the "C" zone as at present exposed is 330 feet south of this portal location.

#22 OPEN CUT

Development:

No development work was done at the 22 open cuts.

Geology:

Transverse faults were discovered both north and south of the deposit but these do not seem to be responsible for the termination of the mineralized zone. Between the deposit and the large faults lie the relatively barren cuts 22A,B,C,D and Emma Workings, in the south and, on the north 22G,H and J.

A major fault with a displacement of more than 400 feet to the west on the north side cuts across the ridge 450 feet south of the south end of 22 O.C. Smaller faults are suspected but could not be proved, running north through the Emma Workings.

At the north end an open fracture in the rock face east of the cuts lines up with a topographic break across the ridge. Although the upper "B" contact does not appear to be displaced horizontally here, the contact itself is covered by overburden. A fault there, dipping south, may be responsible for the southerly termination of the north ore shoot between 22K and 22D open cuts.

One hundred feet north of station 314 a fault with strike N 45° W, dip unknown, offset 180 feet to the west on the north side, crosses the ridge, and another, attitude N 55° W, 30° E, offset similarly 50 feet to the west on the north side is found 75 feet further north. This last fault, traced north-east down the slope of the ridge is seen to cut off No. 3 Bluff on the north and, projected, would outcrop south of the lead-zinc showings of 5,9,11 and 12 open cuts. These faults, however, are north of the northern end of the 22 O.C. zone, and so cannot affect, at this point, the search for extensions of the north ore shoot. Only should the ore shoot be traced 300 ft. north would knowledge of these faults become useful.

J.A. Mackenzie favoured jumping the faults and attempting to pick up the zone on the north side of them, being guided by stratigraphic position. Reconnaissance on the top of the ridge did not disclose anything worth plugging, however. The writer sees no immediate possibilities for connecting 21 and 22 O.C.'s, and it is probable that the two zones are not parts of one long body.

Minerals:

Minerals identified in the field are galena, sphalerite, pyrite, tetrahedrite, malachite and azurite. The tetrahedrite is assumed to carry the silver. There is no correlation between high silver and high gold values. The high assays in 22D O.C. go with thin sulphide stringers that run across the shoot. In other cuts the sulphides appear in twisted sheared veinlets of random attitude between siliceous fragments. The mineralization is equivalent to that in the 21 O.C. deposit.

Host Rock:

The host rock is part of the "B" formation, a white, partly silicified, partly chloritized volcanic rock.

Structure:

As at 21 O.C. the host rock does not occupy one stratigraphic position. The line of cuts and the upper "B" contact converge towards the north, being 600 feet apart at the Emma Workings, and 180 feet apart at 22 E O.C.

The enclosing "B" formation strikes N 60° E and dips 60° north-west. As far as is known, this is the general attitude of the host rock. One possibility is worth further discussion however.

In the rock face east of the cuts there is a faint indication of a moderate dip to the south-east. No confirmation of this has been found further south and nothing for 1500 feet to the north. Should there be an anticline, roll, or dome in the formation, so that siliceous breccia was arched over the host rock, erosion has been sufficient to do no more than expose the top of the deposit, for the formation contacts must be hidden near the base of the rock faces east and west of the cuts. Conditions affecting the deposition of ore minerals could change rapidly in the top few feet of the crest of the arch, so that a small vertical movement on a transverse fault could bring to the surface a host horizon much different from the one now found on the opposite side of the fault. That is, if arch and fault exist, outcrops now side by side may have been affected very differently by ore-depositing solutions. Specifically, the difference in grade between open cuts 22K and 22D could be explained by such a structure.

Fifteen hundred feet north-east of 22 O.C., on the top of the ridge, a small fold was noticed in the siliceous "B" breccia. This agrees in strike and stratigraphic position with the suggested fold at 22 O.C. In the intervening claim length, however, no evidence of continuity was found.

In planning prospecting for extension of ore shoots, it was assumed that the faults were later than the mineralization, and so would offset the shoots. There is very little evidence either way. Certainly a large break occurs at the north end of No. 3 Bluff, but no offset part of the bluff has been found. The formations are offset, but there is no evidence that the ore shoots are, for none have been traced clearly to and past any fault. Scattered open cuts and prospect sampling have disclosed no mineralization in the outcrops of the faults. Proof of the age of the faulting is not available at present.

NORTH BLUFF - SOUTH-WEST SECTION

No development work was done at the North Bluff aside from two prospect samples taken just north of station 210.

The gold mineralization is confined to white silicified rock adjacent to the contact with argillite. Pyrite and barren white quartz veins permeate the argillite at the contact. In open cuts 37A, 37B, 37C the gold is assumed to be associated with the galena and sphalerite since 21 O.C. (1) which has galena has gold too, while open cuts 25, 26, 27, and 30, showing similar rock carrying only pyrite, are barren.

An east-west, north-dipping fault between open cut 37 and the collars of drillholes 23 and 21 complicates the structure.

The guide for exploration must continue to be the argillite-volcanic contact. The writer suggests that further work at the showing should consist of:

1. Thorough geological and topographic mapping.
2. Plugshots and samples in the face between and above open cuts 37B and C.
3. An open cut or drill hole to crosscut the 10-foot shoot running south-west from 39 O.C.

(1) - This refers to 21 O.C. at the North Bluff or 20 O.C. workings on the Unuk Gold Group and not the 21 O.C. or silver showing of the Unuk Valley Group. Similarly there are two 22 O.C.'s and two 28 O.C.'s.

GEOLOGY

Introduction:

In the mapping the transit-and-tape surveys made by other companies that had held the property were used as base lines and controls. New open cuts are described by reference to the old adjoining cuts which they supplement.

A substantial part of the geological report will be meaningless to those without intimate knowledge of the topography, the open cuts and the drill holes. Correlations have been explained in detail and to make these intelligible assay plans of the area under discussion have to be consulted.

Brunton-and-tape surveys were used for most of the control, linked to transit survey stations. Where convenient, the maps show individual outcrops in heavy colors and the more obvious correlations in lighter shades. Geological information included on old Premier maps was checked and included in the new maps. J.M. Cummings' report, included in a letter to T.S. Mackay, was used, and acknowledgement is given in the text for quotations from it. His report on microscopic study of the formation was not available.

Mapping was based on rock types, and the correlation across faults of each numbered formation was not attempted, partly because formations seem to be discontinuous.

A large amount of geological information was included in the section on 21 O.C. for the development work was guided by and based upon geological ideas. The detailed geological description of the North End Workings is included with the general discussion of the areal geology because the structure there is indicated by the surrounding formations.

The area surrounding and including the claims is underlain by volcanics and sediments.

Stratigraphy:

A. The uppermost beds studied are a series of argillites, sandstones and conglomerates at least 600 ft. and probably over 2,000 ft. thick. These form the plateau west from the curving trench marked by Coulter Creek and Argillite Creek,

extending at least 2 miles southwest, 4 miles west, and over 6 miles northwest. This includes all the territory from the west side of the claims to the Coast Range batholith and Shirley Mountain in the west and south-west and to the divide between Iskut River and the head-waters of the Ketchum Creek. The lower 500 ft., stratigraphically, is mainly well-bedded argillite. Above that sandstones with many conglomerate members, in beds up to 50 ft. thick, are mixed with minor, thinner argillite horizons. The structure was not worked out except immediately adjacent to the claims. There the bedding shows a strong syncline with axis roughly horizontal and parallel to the lower contact. The deep valley of Coulter Creek cuts almost to the contact so that the lower section of the series on the east limb of the syncline is well exposed. At the top of the slopes coarse sediments appear and since to the west of the axis the plateau keeps the same elevation and the structure consists of further folds, the main body of argillite does not reappear until possibly the vicinity of Mackay Lake is reached, where a dip of 45° to the north-east was noted. This correlation of argillites is tentative only. At the lower contact, beside the claims, the general strike is N 40° E, the dip 60° North-west. In Mackay Creek canyon and in the bed of Argillite Creek, fossils are common, mainly ammonites resembling Monomorella ranging in size from one in. to eight ins. in diameter. No limestone horizons were seen although at Mackay Lake thin seams of creamy lime are intercalated with argillite beds. This lime may be hydrothermal in source, as quartz veins are common in these formations. These sediments were designated the "A" formation.

B. Conformably underlying the argillites is a series of flows, tuffs, breccias and agglomerates with at least two thin argillite members. The volcanic rocks were grouped as the "B" formation and the lower argillite-argillaceous tuff bed was designated "C". Further study in the summer of 1946 showed that the "B" formation is divided into ten parts. These were numbered B1, B2, etc. from top to bottom, a terminology that is clumsy, but necessary for continuity with the Premier work. Only a few of the ten parts are important and in most of the descriptions in this report the names of rock types are used. Not all of the "B" components can be found north and south of the key outcrop area but certain massive members give an approximate correlation throughout the area studied. The total thickness ranges from 700 to 1600 feet.

B1 is a dark green flow, estimated as andesitic to dacitic in composition, varying in texture from aphanitic to fine grained. Ultrabasic crystals give most phacies a speckled appearance. Only at one or two places at the lower contact where the texture was finer than in the interior was quartz found in it. The thickness

ranges from 30 feet at the most southerly outcrop to well over 500 feet at the north end of the claims. The feldspars and the ferromagnesium minerals have been altered, the feldspars in particular being now little more than a soft, pale green amorphous matrix. The thinner southern part of the body is massive; the thicker sections are composed of coarse block lava, or aa. The fragments separate easily in weathering, so large talus slides are formed. West of 21 O.C. this formation covers most of the ridge. Fourteen hundred feet north-west of the North End Workings, on the north-west corner of Unuk Valley #25, minor faulting cuts across the ridge and south of this point the formation is not found. No deposits have been found in this rock although at places pyrite impregnations were sampled.

B2 is a double formation. The upper part, some 20 feet thick, is a fragmental argillaceous mixture, quite unique. It is lumpy, green to black, massive and carries soft angular buff to green fragments in addition to argillaceous matter. The lower part, about 30 feet thick is a well-bedded shale. B2 is not continuous, being found interruptedly from the north-west corner of Unuk Valley #25 to Unuk Valley #39. In some places B1 is in direct contact with B3. The formation occurs in any thickness up to 100 feet. The smallest section seen, that seemed to be composed of the fragmental member exclusively, measured 10 feet. B2 rock outcrops on the slope 100 feet west of the north end of 21 O.C. In the south it appears at the same spot that B1 does.

B3 is a 200 foot bed of volcanic breccia. It forms the main bulk of the long ridge that extends with interruptions from North Bluff Lake to beyond 21 O.C. The bed dips north-west at about 60°. The breccia fragments are angular, quartz-veined, typically grey but commonly pale shades of green, brown and buff, and measure up to one foot across. Silicification has been almost complete in most places and the interstices are filled with white to grey cherty silica. This silicification seems to be a more nearly primary type than that exhibited by the host rock at the North End Workings and the silver showings. The uppermost part of B3 is a reddish-weathering gradational breccia of buff partly-unsilicified volcanic rock in a matrix of argillite. Southwards from the north-west corner of Unuk Valley #25 this gradational phase marks the transition from volcanic deposition to sedimentary deposition, and the parts B1 and B2 are missing. Similarly where B1 and B2 overlie the siliceous volcanic mass of B3 the gradational breccia is missing.

(It is suggested that the volcanic matter was deposited and brecciated and that argillaceous matter was deposited on the top. Shortly thereafter silica-rich water percolated through the breccia, replacing much of the volcanic matter and cementing the

fragments with chert. Those volcanic fragments enclosed in impermeable argillite would not be affected by this silicifying process).

Found at intervals near the centre of B3 or, where B4 is missing, the centre of combined B3 - B5, is a reddish-weathering, well-bedded band up to 60 feet thick. It was not considered sufficiently continuous to merit mapping as a separate formation but is extremely useful for giving attitudes inside the massive unbedded B3. The banding is very fine, suggesting ribbon chert, but in general the rock more closely resembled quartzite. In addition, fragments of this banded rock are cemented by chert.

B4 is a replica of the green speckled flow rock, B1. It is exposed best on the ridge west of the North End Workings. Where B1 and B2 disappear at the zone of faulting, B4 appears on the south and continues along the top and rim of the ridge to the southern extend of the mapped area, beside North Bluff Lake. B4 is not a continuation of B1, however.

B5 is 90 feet of siliceous breccia, similar to B3
B6 is 90 feet of green volcanic similar to B1
B7 is 200 feet of siliceous breccia, extremely cherty.
B8 is 75 feet of green volcanic similar to B1
B9 is a combination of two slightly different beds of siliceous breccia, each about 15 feet thick.
B10 is a general term for a sequence of sheared green agglomerate, green bedded tuff, and some B1 flow material. At one place it exhibits rough columnar jointing. The thickness ranges up to 300 feet.

Although the rock types are found throughout the length of the claims, individual beds could not be traced with any certainty. The above section is exposed on the bluffs directly west of the North End Workings.

In the 1800 ft. block between this vicinity and the Twin Knobs only two of the green flow beds are present: B1 at the top and B10 at the bottom directly above the "C" argillites. Between B1 and B10 occurs 800 feet of massive siliceous breccia.

Along the east side of the Twin Knobs one green flow is found, stratigraphically 400 feet below the top of the formation. Since it is succeeded above and below by siliceous breccia it is the equivalent of the B4 - B6 - B8 vulcanism. The lack of continuity can be attributed to vagaries of deposition. Between the flow

mentioned and the "C" argillite, which is considered the base of the series, a new sequence was determined. Directly under the flow is 300 feet of siliceous breccia. Beneath this is approximately 100 feet of sheared coarse green tuff and agglomerate, then 70 feet of siliceous rock and then 200 feet of sheared green agglomerate. The basal member can be correlated with B10. The central coarse tuff and agglomerate is probably a local variation of the B4 - B6 - B8 extrusions. For the preliminary mapping it was thought best to map rock types, leaving the less obvious correlations for further study.

Along the east side of the 22 O.C. these lower beds could not be mapped, owing to deep overburden. Beside the No. 3 Bluff a thin soft horizon was found enclosed by siliceous breccia. At present a rock entirely different from the more southerly extrusives, it can readily be considered their highly-chloritized equivalent. A detailed discussion of the occurrence and importance of this formation is included with the section on 21 O.C., and the full picture is given by the plans and cross sections.

C. Formation "C" is a 100 foot bed of sheared poorly-bedded argillite and argillaceous tuff. A limy phase outcrops just north of the North End Workings and one Triassic fossil was reported there. Lime is not common however. The bed seems to underlie the "B" formation, but its relations to rocks on the east are not understood.

By the No. 1 Bluff and between the North End Workings and the North Bluff Lake its contact with the agglomerate overlying it on the west is sharp and conformable. On the western side of the North Bluff well-defined bedding shows a dip to the west of about 50° and the siliceous rock forming most of the North Bluff seems to dip west conformably underneath the argillite. At the north tip of North Bluff Lake the argillite outcrops across 200 feet bounded at the eastern edge by a steep face of chloritized green agglomerate. The contact was not well exposed but seemed to dip steeply east. Between stations 279 and 220 the rock east of the argillite is the white highly-siliceous massive Red Bluffs formation described on a following page. The contact dips vertically or steeply east and beside the North End Workings, forty-five degrees east. Between stations 224 and 225 the argillite appears to overlie the exactly similar rock at the south end of No. 1 Bluff. The drill hole sent under this bluff from the west encountered argillite from collar to bottom, suggesting that the argillite dips east at some angle underlying the mass. On the east side of No. 1 Bluff, across Eskay Creek, the same argillite appears to dip east underneath sheared green agglomerate.

The argillite may arch over the No. 1 Bluff or may underlie it. The single line of outcrops north from the No. 1 Bluff is taken to mean a regional monoclinal structure dipping to the west.

Red Bluffs:

Cummings (1) suggests that the silica-rich rock described in this report as the Red Bluffs formation, as well as the host rocks of the developed deposits, is an alteration of the volcanic formations, with the silica content a result of secondary silicification. The writer suggests that the Red Bluffs rock may differ in origin from the host rocks of the 21 O.C., 22 O.C., and North End Workings.

Just south of the North End Workings the flow rocks at the base of the western bluffs, overlying the argillite, show iron-staining from oxidation of their pyrite content, and on examination of fresh surfaces, are seen to have responded to alteration by changing to a soft white coarse-textured chlorite rock. The same solution that caused pyritization and chloritization here must be the same that have been assumed to produce the pyritization and silicification but not the chloritization of the eastern bluff. Thus the same formation acted on by the same solutions must be assumed to have produced on the east side of an anticline a body of silica rock up to 200 feet thick and 2000 feet long and on the west side not over 100 feet away, a thin layer of chlorite. This is unlikely, but must be accepted if the structure is taken as anticlinal.

Objections to the simple anticlinal structure are not confined to variations of alteration. At least 500 feet of agglomerate lies on the east and 1100 feet of flows, tuffs and siliceous breccia on the west. The basal "B" member would have to thicken uniformly along a north-south line from 250 feet to 500 or 1000 feet in a space of 300 feet or less, or all the siliceous breccia horizons would have to thin out within slightly greater distance.

Also the "C" argillite appears in only one line of outcrops running for 10,000 feet along the centre line of the claims occurring across a width of from 20 feet to 200 feet. Since the regional structure is not anticlinal, for a syncline along the claim centre line, a second line of exposures would be needed in the east on the eastern limb of a syncline and conforming dips and horizons for the surrounding rock.

(1) - Cummings, J.M. - Letter to T.S. Mackay, dated August 16th, 1946.

It is easier to assume that the structure along the line of bluffs is not merely a normal anticline. Faulting may have occurred, or an unconformity may be present.

The Red Bluffs formation is the name given to a group of rocks essentially similar in general stratigraphic position, lithology, structure and mode of weathering, but varying in their relations to other formations and not known to be a unit. They had been classified as centres of intense silicification and it is true that many of their characteristics could be explained thus. One other possibility exists, however, and this is discussed later.

From south to north the outcrops are: South Bluff, North Bluff, ridge east of North End Workings, Nos. 1, 3, 4 Bluffs. No. 2 Bluff is not definitely of the same type and No. 5 Bluff was not examined.

Occurrences:

The South Bluff was visited only twice during the summer. Siliceous, iron-stained cliffs overhang Paradise Valley and on the most southerly claims - Unuk Gold #2 and #3 - increase to a face 300 feet high and 1,000 feet long, named the South Bluff. Pyrite is the only common sulphide, occurring mainly in small disseminated grains but also as discontinuous seams. Quartz veins are very abundant; a sample of clean quartz picked from several veins was barren. Above a low-dipping slip, black powdery matter fills the interstices in shattered host rock. A sample ran 0.06 oz. Au per ton.

Just north of the boldest exposure this siliceous rock seems to be capping a thick lower member, presumably the "B" formation breccia.

The North Bluff, although examined in some detail, was not mapped. Almost uniform siliceous pyritized rock forms a knob 100 feet high, 1200 feet long and 500 feet wide. On the east flank are found green volcanics and argillite but the general attitude and structure are not discernible. At one place the argillites seem to dip north-west however. On the west flank of the bluff, prominent westerly dips are seen in the argillite and argillaceous tuff of the "C" formation. On the summit, faint bedding traces dip vertically to steeply west. The north end of the bluff juts into North Bluff Lake. The south end seems to form a plunging nose, cut off beyond 37, 38 and 39 O.C.'s by an east-west fault. The argillites on the west should act as a key formation, giving correlation across this and other faults. As far as is

known, the North Bluff rock is a formation conformably underlying the "C" argillites, and the structure is uniformly westerly dipping. The structural relations to the beds on the east are not known.

To the north and similarly on the east side of the "C" formation, is the long ridge that runs from North Bluff Lake past the east side of the North End Workings. Total length including the minor section between stations 218 and 220 is 2700 feet. The width of the outcrop varies from 30 feet at the ends to 250 feet near the centre. For most of the length the Red Bluffs rock is in direct contact with the argillite. Beside the North End Workings, however, two new interhorizons appear: twenty feet of reddish weathering half-silica, half-chlorite altered volcanic with a sharp contact against the overlying Red Bluffs formation, and up to thirty ft. of chloritized argillite-bearing rock that seems gradational into the underlying argillite and argillaceous tuff. The upper contact of the 20 ft. band dips east. Between stations 218 and 220, in a section separated from the southern part by transverse faulting, the Red Bluffs formation is only 50 ft. thick and the two new horizons are merely a discontinuous 5 ft. reddish-weathering gradational breccia. The contact dips east steeply at the south end by North Bluff Lake, the green agglomerate immediately adjacent on the east dips moderately east. The contact with the "C" argillite is nowhere visible. The "C" formation dips east on the east side of the North End Workings but if a fault or unconformity is present, the Red Bluffs rock need not. The eastern contact of the Red Bluffs outcropping is nowhere visible, but by its plan across relief topography is approximately vertical. The body of the Red Bluffs rock seems to overlie the argillite.

Between stations 220 and 221, Eskay Creek crosses the line of outcrops of the Red Bluffs formation, obscuring a critical section. The "C" argillite runs N 45° E from the North End Workings in a fifty foot band continuous to the north-west tip of No. 1 Bluff where it fades out 200 feet south of the No. 1 Bluff fault. Similar argillites appear midway along the east side of No. 1 Bluff, on the opposite side of Eskay Creek, and continue North-east across the fault. On the Premier maps, these argillites are linked with those on the west side of No. 1 Bluff at the Creek crossing between stations 220 and 221. There is no evidence supporting this, for no argillite outcrops are found along Eskay Creek for the intervening distance of 600 feet. Three alternatives are possible. First: the "C" formation could cross the ridge at the low saddle between stations 222 and 223. Second: the No. 1 Bluff fault, assisted by displacement along the line of Eskay Creek, could offset the formation to the east and south. Third: the argillites could be continuous underneath the bluff in a bowl formed by a shallow syncline or irregularity of the contact.

Objections can be raised to each of these alternatives; they are stated solely that the question should remain open.

The portion of the Red Bluffs formation that forms most of the No. 1 Bluff and its long narrow projection south has a length of 2000 feet, a maximum width of 250 feet. The thickness cannot be given, for the attitude, and indeed the structure, are not known. The south end, beside station 221, is directly in line with the northern section of the bluffs east of the North End Workings, but may be separated from it by a small fault or by argillite, as stated above. In the cuts 10E and 10F, "C" argillite rests on top of the siliceous rock, and it was this, coupled with the assumed creek crossing at stations 220 - 221 that caused earlier workers to consider the No. 1 Bluff an equivalent of the North End Workings - a dome capped by the "C" formation. In the embayment in the bluff between stations 228 and 230, the argillites and the argillite contact dip steeply east, however, and the diamond drillhole intersected argillite throughout, indicating that the argillite may underlie the Red Bluffs rock. On the east side of the bluff no dips were discernible. One objection to the structure being considered anticlinal or synclinal is the lack of argillite between the green volcanics and the tip of the bluff, on the north side of the No. 1 Bluff fault.

No outcrops of the Red Bluffs formation are found between No. 1 Bluff and No. 3 Bluff, 6000 feet north-east. No. 2 Bluff is a small body 400 feet by 100 feet, seemingly succeeded above and below by green volcanics, and best considered a variation of the B3 siliceous breccia. No. 3 Bluff is a 100 feet by 300 feet mass of Red Bluff rock, almost cherty in appearance, carrying heavy segregations of pyrite. It appears to be directly below a chloritized volcanic bed. The nature of the contact is not known but may be gradational. The southern end of the bluff thins and is terminated where a marked shear zone crosses the ridge. The northern end is cut off by the major fault crossing the crest of the ridge just north of 22 O.C. The eastern edge of the bluff is a steep face, the base of which a large talus slide covers. Argillites were not found close to the bluff, but form the bed of Eskay Creek 800 feet east.

No. 4 Bluff was visited only twice. Nothing is known of the formations adjoining it. Faulting across the ridge might have offset the northern end of No. 3 Bluff, to the No. 4 Bluff position. Perhaps further mapping of the argillite horizon will show whether this is possible.

No. 5 Bluff was not examined in the summer of 1946.

Lithology:

In lithology the bluffs are identical. Soft or chloritized areas or bands are non-existent. The rock is white to grey, brittle, pyritized and highly siliceous. Its fracture is conchoidal, especially in the more cherty-textured phases. No internal bedding was seen. Quartz veins are abundant.

The rock could be called a siliceous intrusive or a silicified volcanic, depending on the bluff considered, except for one characteristic. In several places, but especially east of the North End Workings, the rock carries feldspar crystals, absolutely fresh and with sharp crystal faces. Were the rock a product of silicification of volcanic material, originally similar in composition to the agglomerates on the east, such crystals would hardly remain, and at least the edges would have been attacked by the hydrothermal solutions. This phacies resembles a quartz-rich rhyolite. The Red Bluffs formation may be a discontinuous flow. At least, the South, North and No. 1 Bluffs and that body east of the North End Workings may be correlated so. Numbers 2,3,4 and 5 Bluffs, since they lie in different or unknown stratigraphic positions, may not have this source.

Objections to the silicification idea are linked with the problem of the structure of the argillite. The general explanation may be that various formations were silicified locally and that the structure is obscured by faulting along the eastern edge of the argillite.

The correlation of the bluff rocks as one formation is not in opposition to the known partial silicification of the North End, 22 O.C. and 21 O.C. workings, as well as of the many small areas particularly abundant on the Unuk Gold Claims. It seemed reasonable to consider separately areas of partial chloritizations, silicification, and pyritization that are obviously derived from the enclosing volcanic formation, and such a sequence of bluffs of major dimensions whose structure is uniformly not understood. In conformity with the policy of mapping rock types, the bluffs were correlated as one type and the structure is left unexplained.

Agglomerates:

Almost homogeneous sheared coarse green agglomerates cover the claims on the eastern side of the Red Bluff rocks from the North Bluff Lake to the north end of the property. Very few dips were discovered but in the centre of the strip across Eskay Creek Valley from the Twin Knobs, two trustworthy attitudes of N 55° E, 55° N.W. and N 25° E, 50° N.W. were found. At the north end of North Bluff

Lake is distinct bedding N 55° E, 50° N.W. Along the east bank of Eskay Creek, N 35° W, 60° N appears to be the attitude of a contact between coarse agglomerate and fine tuff. Shearing has given these rocks a widespread foliation striking generally N 30° E, with dips from vertical to 45° on either side. The exposures total 2300 feet in width, which, assuming a constant dip of 45° to the north-west, gives a thickness of 1600 feet. Even should folding cause the formation to cover this expanse, the relief demands a minimum thickness of 500 feet. One thin bed of purple, fine grained tuff was found, but could not be traced far enough to show the attitude. At places brighter green serpentinous beds occur with wide gradational contacts with the agglomerates.

The eastern contact and the lower formations dip north-west from a strike of N 35° E. The underlying beds include quartzite, limy quartzite, argillite and volcanic rocks. Conglomerate is missing entirely. These sediments are therefore not the same as those west of the claims, and the regional structure is not anticlinal. Indistinct fossils were found in one bed of brown sandy quartzite.

At the north-eastern corner of the property lies a previously mapped intrusive of porphyry. As no promising deposits have been found in or near the body it was not studied in the summer of 1946 and its relations to the various formations are not known.

Regional Correlations:

The area surrounding the property has not been mapped by the Geological Survey of Canada so the following correlation is based upon lithology and stratigraphy only.

A Formation: Argillite, conglomerate - Nass Formation.

Volcanic Beds: Breccia, tuff, agglomerate, with minor argillite - Bear River Formation.

Sediments in the East: Argillite, limy quartzite, volcanic beds - Bitter Creek Formation.

The age of the rocks is not known definitely but is probably Triassic - Jurassic. The rocks would fall in general into the Hazelton - Skeena complex.

Reference: Memoir 159, Geological Survey of Canada, Bear River and Stewart Map areas, Cassiar District, B.C. - G. Hanson.

Mineralization:

The following list shows the types of mineralization found on or near the property:-

1. Widespread sulphide veins carrying galens, sphalerite, pyrite and some gold. These veins are common in brittle rocks such as are found at the No.'s 1, 2, and 3 bluffs, and open cuts 1, 13 and 37.

2. Tetrahedrite - galena - sphalerite veins with rich silver values, quartz and pyrite.

3. Galena - sphalerite - (pyrite) in rich concentrations without gold or silver.

4. Pyrite (a) disseminated and barren in Red Bluffs rock and other beds.

   (b) concentrated and barren in open cuts 15 O.C. and at 20 O.C.

5. Galena - sphalerite - pyrite - quartz veins at the North End Workings. Not all of these veins carry gold, and gold occurs without sulphides.

6. Gold-bearing siliceous zones, not visible but sharply defined, as postulated at the North End Workings.

7. Chalcopyrite as scattered grains with the sulphides and as massive sheared veins and replacements. (Top claims).

The controls that localized the mineralization are not known. Many areas of silicification and pyritization are found, seemingly with random distribution. The host rocks of the North End Workings, 22 O.C. and 21 O.C. are similar in appearance and differ from the set of deposits to the south: 1, 13 and 37 open cuts, but this could be cause or effect. In each deposit there seem to be peculiar controls, resulting in parallel shoots at the North End Workings and at 21 O.C., and short bodies at the 22 open cut.

Faulting:

As disclosed by tracing the top of the "B" formation there is a general pattern of faults running N 30° W, most dipping north but some dipping south. Offsetting is predominantly to the west on the north side, but some apparent reversals were found. While the strike of the formations is N 50° E this faulting gives

their areal trace on the surface the direction N 35° E. Along many of the breaks the movement seems to have been small but displacements up to 800 feet horizontally were found. Owing to lack of exposures of the faults few details could be given on direction of movement, so it is not known whether the faults are from tension or compression. The age of the faulting is likewise not known, but is probably post-mineralization since no mineralization is found directly related to the faults.

Shearing:

A shearing parallel to N 35° E is evident in the softer rocks, particularly the agglomerates east of Eskay Creek, the softer portions of the North End Workings, 21 O.C. and 22 O.C., and the "C" argillite. The "A" formation argillites and the "B" formation, except for parts of B10, do not show the effects of shearing.

The resultant foliation obscures the dip of the beds and is responsible for the erosion of the hills in a series of long humps elongated parallel to the shearing. The bedding runs at some angle to the foliation. There is no evidence of major movement along the line of shearing, but displacements would not be shown by the formations since their strike is close to N 35° E too.

Geology of North End Workings:

Host Rock - The host rock is apparently a volcanic formation from which alteration and shearing have produced a white to light green or light grey chlorite-rich rock, with abundant quartz veins, sulphide stringers and siliceous parts. Cummings (1) states:

"Even the freshest specimen obtainable in thin section shows relatively fresh to fairly altered phenocrysts of plagioclase in an indeterminate ground mass of secondary quartz, sericite, chlorite, etc. In certain areas silicification has been intense, resulting in the introduction of considerable quartz with the partial replacement and sericitization of phenocrysts, the bleaching or removal of chlorite and the introduction of more or less pyrite -- such altered rock is represented by the greyish rock of the North End Workings and adit, as well as that of O.C. 13, some of the Gray Copper workings and elsewhere. The end product of this type of alteration is the almost entire replacement of the original rock by quartz with more or less pyritization yielding a rock composed of quartz with minor amounts of sericite and more or less pyrite .....

Specifically, the gray rock, best seen in the North End adit and which I suggested to you might have been an intrusive originally, has the same texture as that of the less altered greenish flow rocks to the east and insofar as direct transitions

(1) - Cummings, J.M. - Letter to T.S. Mackay, dated Aug. 16, 1940.

from one to the other were noted on a small scale elsewhere, strongly suggests that the rock was originally the same. The brecciated inclusions of black argillite could best be explained as an intrusive contact, but might also represent a flow breccia. However, whether intrusive or extrusive, the rock is merely a host for mineralization with the same original composition as the extensive series of flows to the east."

In the many open cuts a variety of rock types is shown. The general type is a breccia, soft, sheared, pyritized, partly chloritized and partly silicified. On the borders near the overlying argillite, the breccia is fine-grained, with light grey to buff particles, unsilicified but shot through with white vein quartz, in a black, siliceous and argillaceous matrix. Towards the centre of the body, as at present exposed, the argillaceous matter is lacking, the fragments are coarser and the rock is chloritized in pale shades of green and purple. Many cuts show a uniform green type. Where cut by the raise from the adit the rock is mottled, in places composed of green fragments in a purple matrix, in other places of purple fragments in green matrix. Pyrite is evenly disseminated but occurs in addition with the other sulphides with quartz and as massive pyrite veins throughout the host formation. Although Cummings thought the argillite-volcanic mixture at the borders could be either intrusive contact or flow breccia, the writer prefers to consider it a flow breccia contact since the argillite is predominantly the matrix.

The silicification is of two types:

(1) Vein Quartz. White quartz veins are very common with every attitude, in thickness from a hairline to one foot. Some are barren. Others carry galena, sphalerite, pyrite, chalcopyrite, arsenopyrite and calcite; the best example is the mass of veins called the "X" Zone, which was the focus of the early development work. There was no set order of deposition of the minerals. Much of the quartz is massive but most of the larger veins have a few small vugs. The veins branch and twist; in some, the quartz has been fractured and cemented. In the adit most of the veins are barren and dip north.

(2) Massive Silicification. In places the chlorite rock has been converted to a massive grey silica-rich rock. The color and texture are not changed but the hardness is increased greatly. The work at present being done in the adit is intended to prove whether this silicification is confined to a pattern of zones and is accompanied by gold mineralization.

Mineralization:

The sulphides so far identified at the North End Workings are pyrite, arsenopyrite, chalcopyrite, sphalerite and galena.

Pyrite is by far the commonest. It occurs as fine grains uniformly disseminated throughout the host formation, as clusters of grains, and both massive and disseminated in the quartz veins.

Arsenopyrite is not common. It is found in fine-grained masses with other sulphides and may be associated with the gold.

Sphalerite and galena are common in many thin stringers, often with quartz. Some of these stringers carry gold and silver but most of the massive sulphides are barren. Sphalerite is often coarsely granular. Galena is both fine-grained and coarse-grained. The two occur in approximately equal amounts.

Chalcopyrite was seen as a few small grains with other sulphides in quartz veins.

Calcite forms a few small clusters of large grains, associated with sulphides and vein quartz.

Gold is found in some sulphide veins but many drill hole intersections with heavy sulphide masses were barren. It is suspected that massive silicification was accompanied by gold enrichment.

Silver is of minor value here. Where the gold content is above 0.10 oz. per ton, the silver content is apt to be over 0.50 oz. per ton. Sulphides may carry silver. No concentrations over 13 oz. have been found and in general the silver content of the rock is less than 1 oz. per ton.

"X" Zone:

A concentration of quartz veins carrying all the sulphides extends longitudinally on the ridge, from 35 O.C. to 46 O.C. The width of the mass of veins ranges from one foot to five feet. In the wider parts country rock is enclosed. Good gold values are scattered along the zone but many segments are barren. The body does not persist to depth, for it was not intersected by the diamond drill holes.

Argillite:

Although no large deposits have been found in the argillite it was not impermeable. At the collar of D.D.H. 32, a 1-foot intersection assayed 0.38 oz. Au. - 300 oz. Ag. Such mineralization of the caprock is welcome for it indicates that the main ore

shoots in the volcanic host rock may continue out into the argillite. The lengths of the ore shoots would not then be dependent upon the width of the dome.

Structure:

As far as is known the structure is a dome. The argillite overlying the host formation on the west dips west, that on the east dips east and the two appear to join at the northern end of the ridge beyond the adit portal as the host formation plunges moderately to the north.

The formations of the west bluffs strike N 40° E and dip west at about 60°. The base of the argillite on the east side of the cuts has been traced by drillhole intersections and dips east at about 45°. As far as the host rock and the argillites are concerned the structure is a simple anticline, plunging moderately to the north and at a very low angle to the south and so is in effect a long dome. For anticlinal structure, however, the formations above the argillite on the east and far to the east should be the same as the formations above the argillite on the west and far to the west. Such is not the case. The formations on the west side are a known sequence of soft green flows and tuffs with thicker, persistent beds of massive siliceous volcanic breccia. The east bluffs themselves are a further distinct rock type - very siliceous, massive, white and pyritized - that might be a siliceous replacement of volcanic matter or might be a pyritized rhyolite flow.

A full discussion of the problem is given in the general geological notes. In reference to the North End Workings it is sufficient to state that the host formation, as far as it has been outlined to date, takes the form of a dome.

Parallel Zones:

It is possible to correlate drillhole and surface cut high grade sections in a rough pattern of zones striking N 80 to 90° W and dipping 40 to 45° south. On this basis there may be up to eleven zones outlined by the tunnel, the drillholes and the surface cuts. Of these, the first five, from north to south are not of workable grade. Of the remainder, one may be 10 feet thick, another 14 feet and a third between 6 and 20 feet thick. The intervals between these zones vary from 10 feet to 40 feet. D.D.H. 19 and D.D.H. 32, at opposite ends of the workings, show indications of three smaller zones.

The writer does not consider the zones sufficiently well outlined to give any further figures as to depth, grade, thickness

and spacing, for although the values fit approximately into the stated pattern, many drillholes did not show intersections that would be expected. In addition, other patterns can be suggested into which the values fit equally well. The extension of the tunnel should settle the question.

AREAL PROSPECTING

Aside from the ground now covered by the Unuk Gold and Unuk Valley Groups, the area immediately surrounding does not merit extensive prospecting.

A. Adjacent to the Property:

The line of staking follows the outcrop of the volcanic formations. West of the claims the overlying argillites and conglomerates show no signs of mineralization. To the north and north-east steep slopes, overburden, timber and the canyon of Ketchum Creek make prospecting difficult. In addition, the sediments, assuming a more north-easterly strike, occupy the ground immediately to the north. On the east the top claims held by A.R. Nicolls and associates of Prince Rupert, B.C. extend from the Mackay holdings to the edge of the plateau. Beyond that, timber and deep overburden cover a series of argillites, quartzites, limy quartzites and a few volcanic beds. No worthwhile showings have been found in these formations. To the south the argillites that overlie the volcanics sweep down the valley of Coulter Creek as the structure runs parallel to the contact with the Coast Range batholith. Timber and overburden eliminate that area too.

B. North and West of the Property:

Argillites and coarser mechanical sediments underlie the area north of the property to Mackay Lake and beyond, and are seen in the distance to form the rounded, glacier-capped mountains between the Iskut River and the headwaters of Ketchum Creek.

The only promising part of the country is in the west beside the Coast Range batholith. Many iron-stained outcrops can be seen, several of large dimensions. A sketch map was prepared showing the topography and the sampled and unsampled iron-stained outcrops in the vicinity of Shirley Mountain. Eight samples were taken, all of which were barren. The mineralization was predominantly pyritic but one piece of float carrying galena and sphalerite was found. The samples taken were all from pyrite-bearing greenstones and volcanic rocks. Thick quartz veins were seen above the glaciers west of Shirley Mountain.

The batholith is only partly unroofed. Argillites and greenstones encircle the base of Shirley Mountain and white quartzites were found on the summit. Caprocks of argillite and altered volcanic matter form the arretes and peaks about Melville

Glacier at the headwaters of Harrymel Creek (North Fork of Unuk River).

From the southern end of Shirley Mountain a pronounced topographic break extends northeast forming the valley and canyon of the lower parts of Albino Creek and Mackay Creek and continuing in a straight line across Ketchum Creek and the main branch of the Unuk River some 4 miles north-east. Since the host rocks on the property run just east of north it was thought at first that they might be offset by a fault along this topographic valley. The break is caused by a fault, for pronounced shearing was found in the bed of Mackay Creek and a throw upwards in the north-west side of some 500 feet was marked by the offsetting of a prominent conglomerate bed. Horizontal movement was not proved however. The base of the sediments, traced northwards from west of the 22 - 21 O.C.'s, swings to the east beyond claims #39 and 40 and as far as it was traced, strikes not towards the fault but away from it. Sediments were seen in the valley of Ketchum Creek, a mile south-east of the fault crossing. It is therefore thought improbable that the volcanic formations would be exposed further north-east on the north side of the fault. The ground there is, accordingly, not an obvious place to prospect for a continuation of the mineralized zone.

This major fault does not appear to have been a channel for mineralizing solutions. Along its trace through Mackay Creek canyon only three spots of oxidation were noticed and these were small areas of pyritized argillite. Quartz veins are common everywhere in the argillites. On Shirley Mountain more extensive pyritization of argillite occurred and at one place a spring is depositing a thick blanket of iron oxide. However, areas of iron-staining not visibly related to this fault are quite abundant.

Topographical Names:

Only three new names are used in this report in addition to those on the Premier Maps. The creek that starts west of the camp on the north side of the saddle where Coulter Creek starts, and that runs north on the west side of the claims, finally joining Mackay Creek, was named Argillite Creek. The double-headed knoll due north of No. 1 Bluff was named Twin Knobs. The fault that runs from the top of the ridge just north of 22 O.C. cutting off the north end of No. 3 Bluff was named the Mackenzie Fault.

On the topographic sketch map of the plateau around Mackay Lake, the creek draining the area between Mackay Lake and Shirley Mountain was named Albino Creek. It joins Mackay Creek.

SAMPLING AND ASSAYING

Several types of samples were used. In rough prospecting a sackful of chips was taken from scattered points across a showing, clean quartz fragments were chipped from several veins, or solid sulphides were picked out of a number of veins in an outcrop. At the North End Workings two sets of samples were taken. The first was a two inch by one-half inch line of chips across the surface. Then, if any values above Tr - Tr were found, the rock was opened by plug shots and a channel one inch by two inches or one inch by three inches was cut. At the silver showings, one inch by five inch channel samples were used. In the prospecting near the centre of the Unuk Gold Group fragments were taken from ten foot by five foot areas after fresh rock had been exposed by preliminary chipping. In places, plug shots were required to uncover fresh rock. Had any indications of gold or silver enrichment been found, regular channel samples would have been cut.

In the Assay Office, samples were dried in trays, then reduced to about 1/2 inch by the Dodge crusher. All the particles were reduced to minus 1/2 inch by hammering on the buckboard. The sample was halved and reduced to minus 1/4 inch then split again. If the rock was soft the muller was used to reduce the particle size to minus 50 mesh or less. If the rock was hard, crushing by hammering was continued until the fragments were about 1/8 inch diameter, then the muller was used. Until the 80 mesh screen was broken it was found quicker to complete the grinding to minus 80 mesh with the buckboard and muller. Afterwards, and whenever two men were working, the final reduction was by the hand grinder. Normal fusion and cupellation using 1/2 A.T. of minus 80 mesh pulp was then followed. Silver beads were weighed on the gold balance. **Note:** The balance was in good condition, but some additional weights should be provided if much assaying is to be done. These are detailed in a list included in the report. The balance was left at the property over the winter of 1946-47.

Reliability of the Assays:

The sampling at the North End Workings was intended only as preliminary testing of the parallel zone theory, not as a basis for tonnage and grade calculations of ore shoots. The assaying should be correct to 0.05 oz. Au/ton. Silver values are not important there. The 21R O.C. assays for silver, since they were checked by reassays, should be correct to the nearest 1 oz. Ag/ton.