

MINERAL EVALUATION  
REPORT

800138

OTTER CREEK  
GOLD PLACER PROPOSAL  
DAN GROUP  
SURPRISE LAKE AREA  
ATLIN GOLD PLACER CAMP

IN

NORTHWESTERN  
BRITISH COLUMBIA  
(ATLIN MINING DIVISION)

FOR

G. WRIGHT Ph. D.  
CYPRESS CONSULTING  
SERVICES INC.  
# 104 - 2001 Beach Ave.  
VANCOUVER, B.C.

BY

MARTIN D. KIERANS P. ENG.

JUNE 1982

59 37' North Latitude  
133 23' West Longitude

JUNE 23, 1982 - VANCOUVER, B.C.

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M.D. Kierans

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SUMMARY

Dan Group, of about 7500 acres (13 claims and fractions), is located on Otter Creek about 19 kms due east of Atlin in northwestern British Columbia. Atlin gold placer camp, in a glaciated area, has, in general, rich and relatively narrow ancient creek gravel placers, usually under unfrozen glacial gravels that vary from 50' to a known maximum of 350' in thickness. A block, drilled in the late 30's, and 2400' long (1702 block) should, from present incomplete and unchecked (but reliable) data, provide a gross return of about 50 million dollars (at \$300US/oz Au). One drill hole in the block gave a value in bedrock in the ounces per C.Y. The high grade and coarse gold found in this drill hole within Dan Group is normal placer mineralization for Atlin Camp.

A \$56,000 surveying, mapping and hammer drilling program is recommended to test ground on both sides of the high grade hole. Depending on results, a block 300' long (150' on both sides of the old drill line) in the ancient channel and pay glacial gravels should be mined this year. If results warrant, the remainder of the 2400' block would be mined next year. Exploration drilling is recommended upstream and downstream from 1702 block.

## MINERAL EVALUATION REPORT

### OTTER CREEK GOLD PLACER PROPOSAL, DAN GROUP, SURPRISE LAKE AREA, ATLIN GOLD PLACER CAMP, BRITISH COLUMBIA

M.D. Kierans

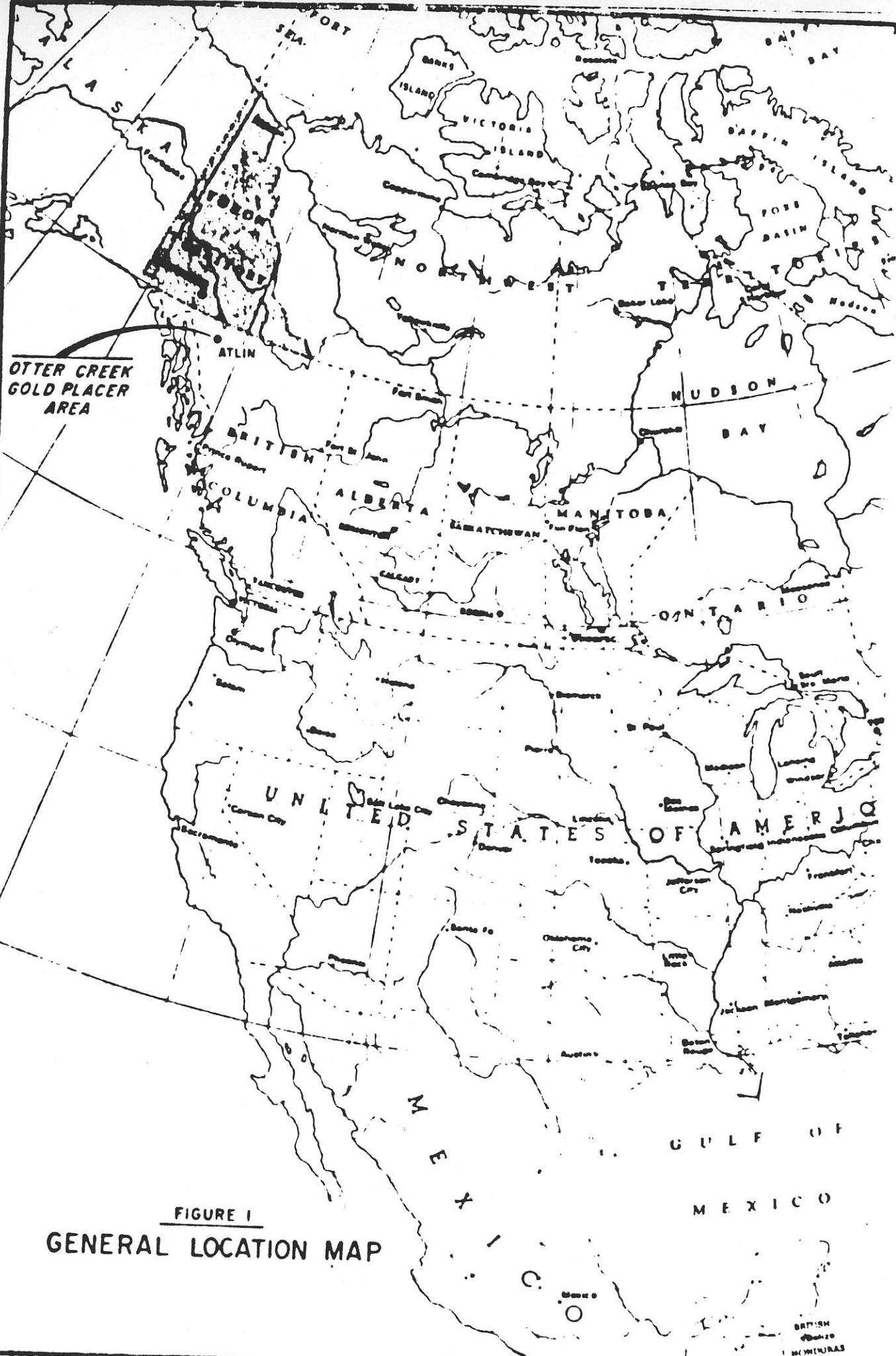
June 24, 1982

#### INTRODUCTION

On June 10, 1982, G. Wright Ph.D., of Cypress Consulting Services Inc., commissioned the writer to prepare a report on the Dan Group of Placer Mining Leases in the lower part of Otter Creek, Atlin Mining Division, in the Atlin Gold Placer Camp of British Columbia. The purpose of the report was to present an independent review of and report on a placer mining proposal written by Dr. Wright on the subject placer mining lease group (see Bibliographic References (10)).

On June 12, 1982, accompanied by G. Wright, Roy Smith of Whitehorse, Y.T., John Graham and Richard Schmitt, both of California, U.S.A., the writer visited the property. The following day, Sunday, June 13, alone at first and later with Roy Smith and G. Wright, I visited and examined gravel exposures on Dan Group in and near lower Otter Creek. I briefly examined the old hydraulic cut which is 2000' or so from Surprise Lake and which is presently mined using tractor with ripper and rubber tired scraper.

During the visit and on return to Vancouver, Dr. Wright and I agreed that although the original proposal did require some modification (but was essentially valid) there was apparently another area of potentially far greater value and importance up the Creek about 4000' south of the old drifted area (see below). I was therefore instructed by Dr. Wright to prepare a brief interim and preliminary report of what is known upstream on Otter Creek from the old drifted area. I did so in a letter dated June 16/82 and as a result I was further instructed by Dr. Wright to present a much more complete report on the new zone (to be called the 1702 zone) which was discussed in that letter. This report is then the response to Dr. Wright's instructions of June 17, 1982.



**FIGURE 1**  
**GENERAL LOCATION MAP**

BRITISH  
 COLUMBIA



## LOCATION AND ACCESS

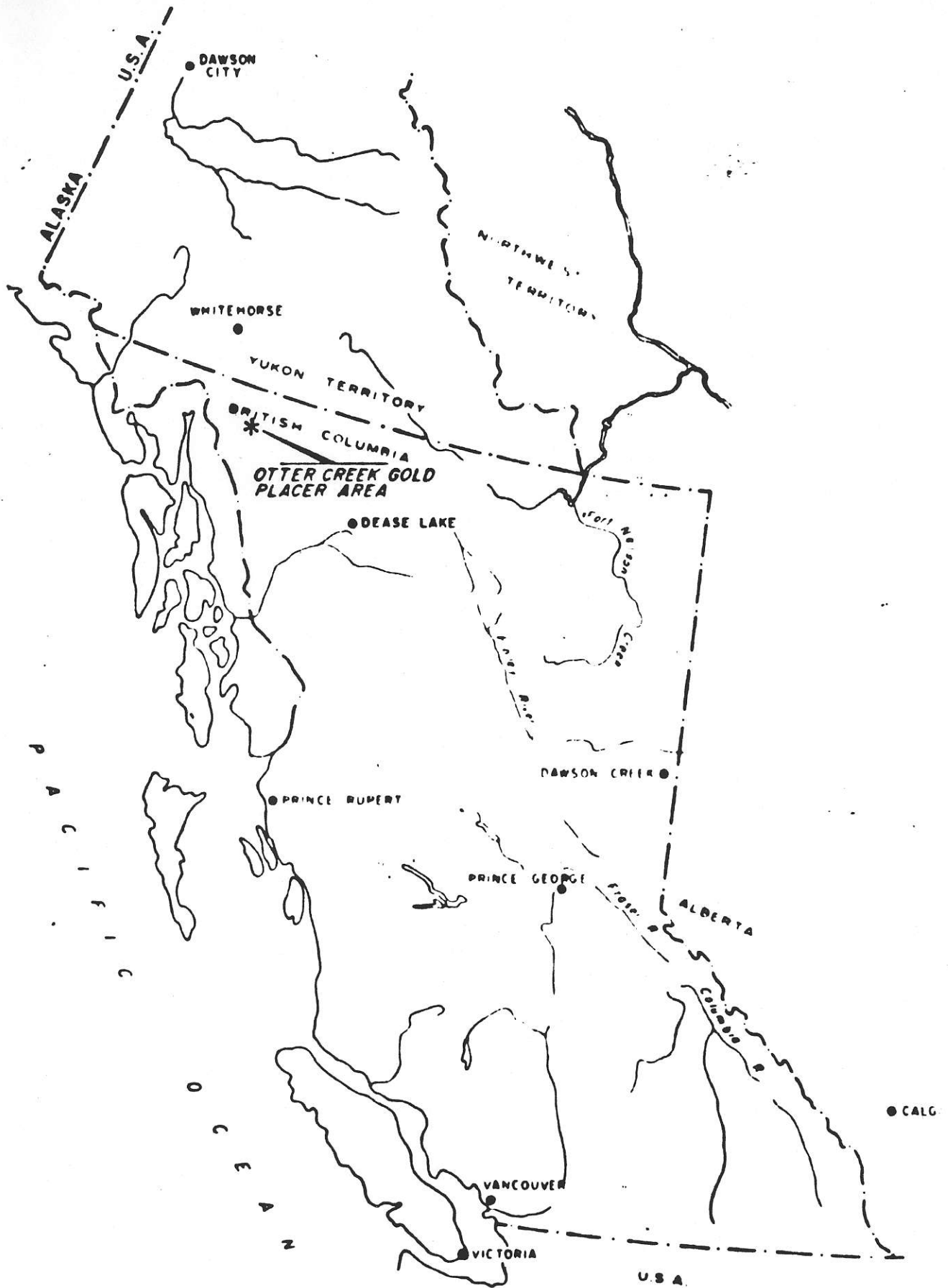
Atlin is located in northwestern British Columbia about 30 miles south of latitude 60° N which is near the B.C.-Yukon boundary. Please see figures 1, 2, and 3 which are location maps for the district at increasing scales. Figure 3 also shows the relative (approx.) size and location of Atlin and Klondike placer fields. "The Klondike" is about 400 square miles in area and the Atlin district (somewhat less well defined) is about  $\frac{1}{4}$  the area of "the Klondike."

The gold placer claim group discussed below is located in the Atlin Mining Division, British Columbia, about 190 kms (114 miles) by highway southeast of Whitehorse, Yukon Territory. It is about 100 kms from Whitehorse to Jakes Corner by paved Alaska highway and about 90 kms (70 miles) by good gravel road due south to Atlin B.C. From Atlin to the claims it is 19 kms eastward by good gravel road to the northern edge of the claim group.

Snake, Otter, Wright, and other roughly parallel streams flow approximately north into Surprise Lake which is about one mile wide and 16 miles long. The lake outlet to the west is Pine Creek, which flows towards Atlin Lake and enters Atlin Lake (the largest lake in B.C.) near Atlin, B.C. at about 2200 feet elevation (see figure 5). Surprise Lake is one of the long narrow lakes which form the headwaters of the Yukon River. See figure 3. The Atlin district is about 50 miles inland from the summit of the coastal range.

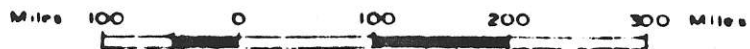
Otter and other nearby creeks are from 8 to 15 miles in length and rise in bare, rocky, rounded hills to the south where the peaks range from 6200' to 6900' elevation a.s.l. The Atlin placer camp trends northeastward and is about 17 miles long by 12 miles wide. Most of the area is drained by McKee and Pine Creeks. The remainder is drained by Fourth of July and two other smaller creeks.

Atlin is the only populated centre in the area and many common supplies and combustibles can be purchased there. Discovery, on Pine Creek, has only a few permanent residents and Halfway is abandoned. In early summer the placer operators move to and live in temporary quarters on their properties near their operating areas. There are operations, widely varying in scale, on most creeks. Many miners live in Atlin and drive to work daily.



### LOCATION MAP

SCALE: 1" = 140 MILES APPROX



Road access to Whitehorse from Atlin is open all year. The Alaska Highway extends from Dawson Creek, B.C. to Whitehorse, Y.T. and beyond to Alaska and is also open all year. It is a major heavy trucking route. Whitehorse is on the White Pass and Yukon Railway Line which extends from Skagway in Alaska to Whitehorse. Skagway is the terminus for several coastal lines. Whitehorse is provided with good daily jet air service, CP Air, from Vancouver, Calgary, Edmonton, and Seattle. Fixed and rotary wing aircraft are available for charter at Whitehorse and Atlin. There is a new airstrip for light aircraft (Twin Otter and down in size) east of Atlin. Freight can reach Atlin by boat to Skagway, rail to Carcross and truck to Atlin. Or the Alaska Highway can be used from Edmonton to Jakes Corner then south to Atlin.

Within the area roads extend to most of the placer creeks. Most roads are open and in good condition. Some roads are private and closed to the general public by the placer operators. At Otter Creek the road to the present placer mining operation east of Otter Creek and about 2000' south from the lake is closed to the general public by the operator but above the present mining site the southern boundary of the Dan claim group can be readily reached by car or truck. Rough roads extend southward along Otter Creek on east and west sides of the Creek. The eastern road ends near the old storage dam. Access on foot on the placer claims is easy as there is much open parkland type vegetation on the claims.

#### PHYSIOGRAPHY AND CLIMATE, ATLIN AREA

The wide valley of Pine Creek separates several mountain masses of the area. Over most of the area the local relief is 2,000 to 2,500 feet. This is greatly exceeded near Atlin Lake where mountains rise to 3,500 feet above the lake level. Maximum relief in the Atlin placer camp is about 4,000 feet. Most of the summits are between 4,500 and 5,000 feet although a few are over 6,000. The higher mountains are generally rounded and bare of timber growth. Cirques have been formed on some northern slopes.

According to Bostock (3) the area is part of the Teslin Plateau, the southernmost part of the Yukon Plateau. Black (2) notes that the only indication of plateau features within the area is a rough concordance of the top of most of the mountains and a considerable width of some of the ridges. Black spent three summers in his study of the Atlin Placer Camp. The

writer has relied heavily on Black's report (2) for this section. Appendix A, a description of the drainage of the area (including Otter Creek) are photocopies of that section of Black's report.

The uplands of Atlin area are part of the Yukon Plateau which is an extensive area eroded during the Tertiary Period to near base level. In the Klondike placer field the result of that long period of erosion was the high level White Channel pay gravels at the base of clean deep quartz gravel deposits up to 200' thick. As at the Klondike so at Atlin a well adjusted, mature drainage system developed. Some peaks were as high as 1,500' above general level; most were only a few hundred feet above general level.

Towards the end of the Tertiary Period, Atlin area, with the surrounding areas, went through a period of uplift. The amount of uplift in the Atlin area is not known but was probably a few hundred feet. At the Klondike the uplift has been estimated at about 700'. Elsewhere, in the Yukon and Alaska, it has been estimated to be as high as 3,000 feet (2). The uplift caused the rivers and creeks to erode rapidly and cut down into the mature surfaces. The streams became entrenched as canyons and cut as much as 200' into the gravel and rock floor of the old valleys. After the uplift and renewed erosion the Ice Age of the Pleistocene began. At Atlin the area has been conspicuously glaciated. Further north the Klondike escaped glaciation and it is this local glaciation with its resulting scouring, gravel and till deposits and other glacial effects, that has most affected Atlin's stream placer deposits.

During an average year measurable precipitation occurs on about 70 days with a total of about 11.5 inches. The average temperature of June, the warmest month, is 51 F and that of January, the coldest, is 2 F. On the average there are 200 frost free days per annum. The town itself misses much of the rain that falls on the surrounding mountains. Precipitation is less towards the eastern part of the camp and vegetation correspondingly more open and parklike to the east of Atlin.

Dailly has described the climate as sub-arctic but there is no permafrost in the known gold-bearing gravels. The open water season during which hydraulic operations and open air sluicing can be carried out usually extends from the middle of May to early October. According to Dailly, "summers are lovely and mild with moderate rainfall." Freezing and snow can be expected after October 1st. The pleasant, though rigorous climate and the majestic mountain and lake scenery at Atlin village itself makes the Atlin an unusually attractive camp.

## GLACIATION

At Atlin placer camp some placer deposits were destroyed by ice movement and others were covered by outwash from the ice and preserved. The distribution of the preglacial placers in the area is partially controlled therefore by glacial or Ice Age events. Black in (2) gave a rather complete account (so far as is known from his surface field work) of these glacial events. The reader is referred to that work for a more complete account of glaciation of Atlin placer camp.

There is good evidence of an extensive ice sheet over the Atlin area but there is little evidence of valley glaciation and it probably was not very effective. It is not clear either here or further north why valleys of these mountainous regions at these high latitudes were not intensely glaciated. No remnants of valley glaciers exist here (unlike near the coast) and at present all snow melts each summer.

Glacial and fluvio-glacial deposits are extensive and in places over 300 feet thick. Glacial erratics are found on ridge tops. The load of rock material carried with the ice and subsequent deposition modified drainage and covered much of the area with fluvio-glacial material. Black speculates that during most of the Ice Age ice was confined to the valleys. Striated outcrops, though scarce, indicate ice movement was parallel to the valleys.

Lee and Stoss topography and other field evidence below 3500 feet elevation shows that ice in Pine, Canon and McKee Creeks moved northeastward. Please see figure 6. That is, the ground first occupied by ice is the lowest. This is an abnormal sequence in mountainous regions where glaciers form near the highest ground and move down. "It is believed that the occupation of the low ground first by the ice resulted in some of the placer deposits being covered by fluvio-glacial material which later protected them from glaciation (2)."

Streams during the Ice Age may have had more than a normal flow of water and carried more detritus. Ice advance disrupted normal drainage by damming streams and tributaries. Moraines and ice may have formed many lakes.

With the wasting of the ice sheet the comparatively thin cover of ice on the uplands disappeared first but valleys remained ice-filled. Ice dams may have formed lakes and swollen streams would have built deltas in these lakes. It is not known with certainty whether or not there were several advances of the

valley ice. Black speculates there was only one advance.

After the ice disappeared this and nearby areas were uplifted (at least 150 feet) and streams rapidly cut through the glacial and fluvio-glacial deposits in the lower parts of their courses. In places the present grade is below preglacial grade.

Otter Creek heads in a broad upland on which there are no cirques and presumably no ice accumulated there. More than 100 feet of cross-bedded and bedded sands accumulated in Lower Otter Valley because the Pine Valley glacier dammed Otter Creek at successively higher points. Presumably the preglacial gravel in the upper part of the valley was protected from glaciation.

It is clear that the glacial period in Atlin area and in Otter Creek Valley was complex. There are three gravel beds above bedrock in Otter Creek which contained mineable placer gold. Otter Creek, swollen by melt water, rapidly cut through its unconsolidated deposits to form its present course. This process did concentrate some low-grade placer gold in gravel of the present creek bed.

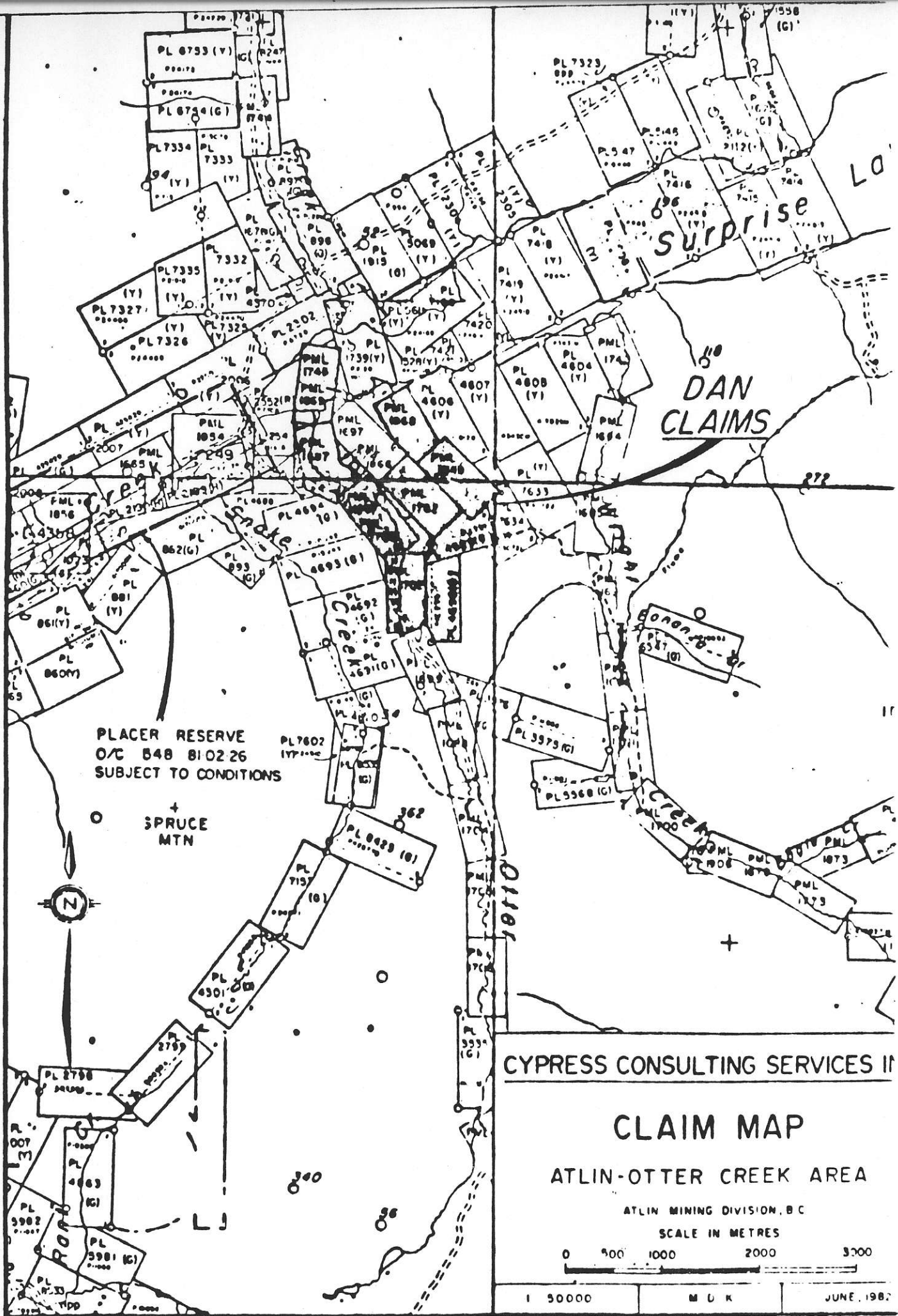
It is interesting to note that Black states that no preglacial gravels have been found in Snake Creek and "it is probable that they have been dispersed...and it is not expected that preglacial gravels occur along its course" (2). However, Proudlock (1976) (9) notes that good gold-bearing preglacial gravels have been, in fact, found and worked on a small scale in a hand-pit east of the creek bed southeast of the PML's of Dan Group.

#### PROPERTY AND OWNERSHIP

The placer mineral leases of Dan Group are listed in Appendix B and shown in Figure 5 (in outline) and Figure 7, 8, and 11.

According to Wright (10) the leases are offered for this project at a cost of \$600,000 of which \$250,000 is to be from production and carry a 10% Gross Raw Gold Royalty.

Present holders, as shown in the Mining Recorders records of Vancouver, as of this date are listed in Appendix B. There are 13 contiguous PLM's and Fractions in Dan Group with an approximate area of 7500 acres. Above (upstream) PML 1697 there are about 6000 linear feet of potential ancient pay



PLACER RESERVE  
O/C 848 810226  
SUBJECT TO CONDITIONS

+  
SPRUCE  
MTN

Surprise

DAN  
CLAIMS

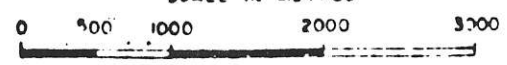
CYPRESS CONSULTING SERVICES INC.

# CLAIM MAP

ATLIN-OTTER CREEK AREA

ATLIN MINING DIVISION, B.C.

SCALE IN METRES



1 50000

M U K

JUNE, 1987

channel in the group. Part of this zone has been drilled by previous owners of the claims. I have been verbally informed that five other placer mineral leases upstream of Dan Group and 4 PML's on Snake Creek can be acquired by right of first refusal. Form 1's of the Placer Mining Act have been acquired. Study of these records indicate a possible ground holding problem which should be settled as soon as possible. It is recommended that a survey of the PML holdings be made as soon as possible.

### HISTORY OF ATLIN GOLD PLACER CAMP

It is reported that gold was discovered in Pine Creek by Miller and McLaren in January 1898. When news of this discovery reached Victoria in August 1898 thousands of prospectors made their way to the new field. That same season most of the other placer creeks were discovered, many leases were applied for, and many claims were recorded.

The shallow, easily worked gravel deposits were soon worked out. The 100 foot claims made tailings disposal difficult and forced many miners to leave the camp. Those who stayed acquired groups of claims and arranged for water supply to work the deposits with greater volume. Dredge operations were unsuccessfully attempted in Pine and Spruce Creek.

Pine Creek gravels were first worked successfully on a large scale. Some hydraulic operations were successful, others not. Production in the camp gradually declined as the shallow ground was worked out until, in 1930, it was only one-tenth as much as in 1898.

After 1930 the increased purchasing power of gold and later devaluation of the dollar caused renewed activity in the camp. At this time production from underground mining of deeply buried placer deposits on Spruce and Otter Creek increased production from the camp and the dollar value of gold recovered in 1936 was as high as some of the best years of the beginning of the century.

After the war production declined gradually. In 1974, when the price of gold started to rise, production in the camp slowly increased. Overall production at Atlin Camp has reached a total in excess of 500,000 ounces of gold. This compares with total overall production of over 10,000,000 from the Klondike in about the same period.



## HISTORY OF OTTER CREEK PLACER OPERATIONS

Gold was discovered in the westerly flowing upper reaches of Otter Creek in 1898 in surface gravels and these were first worked by panning, later rocking, and still later by ground sluicing and hydraulicking until about 1915. These early operations were carried on about 5 1/4 miles from the lake and were moderately successful. It is reported by Dailly that sometime between 1905 and 1916 a high bench 5500' from the lake was hydraulicked and about 5000 ounces of gold recovered. The number of yards processed is not known. This bench should be within or very near the southern boundary of Dan Group and 1702 Block. A large scale hydraulic operation started about 1908, financed by a French company, which worked the lower reaches of the existing Otter Creek channel. This operation never reached bedrock and was not profitable.

This effort was directed by J. Maluin, a French engineer. Later (date is not known--it may have been 1908) he decided that the ancient pay channel was located about 1/4 mile east of the existing Otter Creek channel. Black reports that bedrock was not exposed by hydraulicking until it had been extended a considerable distance southward. One hundred and fifty thousand to 200,000 cubic yards were moved each year until 1916 (2) by washing banks 80 to 120' high. Bedrock was exposed in 1916 and for the two following years recoveries improved. The cut was continued southward but apparently the bedrock was no longer exposed in it, and when the operation was stopped in 1922, only the rim of bedrock was exposed. After 1922, underground work was done until 1928 when a new company was formed (La Cie Francaise des Mines d'Or du Canada) which was organized to start hydraulicking again. In 1929 this company built flumes and ditches to bring water from Union, Wright and Snake Creek (the writer saw some of this work on his visit) and the following year started to hydraulic the present channel of Otter Creek. A pit was started near the mouth of Otter Creek. During the first year of operation (1930) three gold-bearing strata in the glacial till were found which merged upstream into one. Later years (to 1934) were less profitable.

Finally the hydraulic work was stopped and underground work was started in 1934 and continued into 1935. After that leasers (laymen) operated the company's claims till 1941. "It is apparent that...this was the most productive in the history of the creek" (2). Dailly states that during the four years of hydraulicking the gravels processed (600,000 C.Y.) yielded 2250 oz. (810 fine) which is an average value of about \$1.50 at \$300US/oz Au. Dailly believes this work was done in the ancient channel pit but Black states it was on the existing Otter channel pit to the west.

About 1931 a shaft 1000' from the lake on the ancient channel was put down in the bottom of the cut without reaching bedrock. Later information showed that bedrock was 54' below lake level at this point. In 1932 the "Strand" shaft at 2200' from the lake was sunk to rim bedrock on the right limit. Drifting ground was discovered at the bottom of the Strand shaft and the Strand level was developed. In 1934 the "incline" shaft was, according to Dailly, sunk from the bottom of the hydraulic cut at the upstream face. Roy Smith, who mined in the old days as a drift miner, pointed out the collar location of the "incline" shaft to the writer and it was certainly not collared in the pit bottom according to Smith's location. In any case, this shaft found bedrock about 2000' from the lake. Values were very good (over 0.5 oz per C.Y. in 462 C.Y.'s) and were probably as good or better than any gravel subsequently mined. Prospecting in the face of the cut located a higher pay horizon known as the Moran level. Here, 2000' from the lake the pay horizons were 15 feet and 30 feet above bedrock.

Dailly prepared a map with sections showing in detail the underground workings. I have seen this map briefly but it was not available for this report. Extensive drifting operations were conducted from 1935 to 1939 on Bedrock, Strand, and Moran levels by laymen. Another higher pay horizon (Suoboda) was also found. Average mined grade was about 0.20 oz per cubic yard for 28,300 C.Y.'s mined during the period 1935-1939.

Hydraulicking downstream of the underground work did not show the high grade that would be expected if these pay horizons above and in bedrock extended downstream toward the lake. 20,000 C.Y. washed in 1942 averaged only about 0.01 oz/C.Y. Apparently the downstream limit of the underground pay horizons was just below the drifted area. Actual underground work downstream showed no persistence downstream. Bedrock hydraulicking downstream had to be discontinued because of excessive water. Indicated fineness of the underground gold averaged 780.

All drifts were 7½' high. Large boulders were left in the drifts. Water had to be pumped from Strand and Bedrock levels. Some high grade pockets of over one ounce per cubic yard were found on Bedrock level. Intensive searches were made for additional pay streaks until winter of 1942-43. None was located so tracks and pumps were pulled and drifts abandoned. The timbered drifts have since caved in. I did see in the face of the old hydraulic cut (about 2000' from the lake) one of the old, caved, timbered drifts heading south and others above pit floor on the west side of the pit.

Above the Strand shaft on the right limit another shaft

(about 4500' from the lake) was sunk to 100' without reaching bedrock. This should be within Dan Group. Another smaller shaft on the left limit did not find bedrock. This should be on Dan Group. It is said (Dailly) that a shaft located about 7000' from the lake reached rim bedrock. Values were not encouraging. J. Moran drilled some holes there but struck boulders and they were abandoned. Further up Otter Creek a party named Baker did some drilling--results not known. Drilling in 1933 by Northern Goldfields on the right fork of Otter Creek reportedly hit bedrock at 100'.

The Walter W. Johnson Co., after negotiation an agreement with the French Co. started prospecting in May 1939. At this time surveying, mapping and sampling was done. Raises were put in between levels to estimate values in the intermediate underground gravels. Dailly's report states a drawing was prepared showing these results.

In August 1939 the "Main" or "Dorflinger" shaft was started about 8000' from the lake. This location should be south of the southern Dan Group boundary. I saw the shaft collar on my visit. The water level is about 20' down. This shaft was bottomed at 103'. A drill hole from the bottom hit bedrock at 127'. The shaft was abandoned November 1939. Prospect drilling started October 20, 1939 using a Union Churn Drill with 6 3/8 O.D. shoe and 4 7/8 I.D. casing. A little while later a heavier drill using a 7 1/2" shoe and a 6" I.D. casing was used. The drilling results described in later sections were from this last type of machine.

Drilling continued till October 1940. All drilling work was suspended during the war. In 1945 (Sept-Oct) Dorflinger drilled 3 more holes on line 4 to complete the section. No work was done in 1941. In 1939 a resistivity survey was run to determine bedrock profile. Results were useless.

Since 1946 intermittent work was done on the ancient channel pit. Otherwise no work of significance was done until about 1976 when Roy Smith advised the writer he repaired the hydraulic pipe line and did some hydraulicking in the old pit. As a result of this work (although apparently Roy Smith did not profit from it) the present holders of the "Drain" lease have made good profit in gold recovery (actual amount not known) in operations there for the last two or three years. The pit is still operating as seen by the writer this year.

ATLIN PLACER GEOLOGY

Despite Aitken's and Black's extensive field work at Atlin placer field the potential of the camp has not been understood and usually understated. The following account is in no way to be considered the definitive statement on the camp. In fact that would be quite far from the purpose of the report. The Proudlocks' (9) work of 1976 leaves the clear impression that much more work of a general geological nature is required before the definitive statement on Atlin placer geology will be made. The following points will, or should, leave the impression of substantial economic potential for the camp when modern methods and machinery for earth moving and processing of placer gravels are used. What is stated in a general way about "Atlin's" potential importance applies, of course, in particular to the economic potential of Otter Creek.

To emphasize or to illustrate the Atlin camp's importance the following points will be contrasted with the other very well-known placer field of the Yukon Plateau i.e. "The Klondike."

1. The underlying rocks of the Klondike were the relatively homogenous "Klondike Schist" rocks. This stratigraphic unit has not been well dated. Templeman-Kluit ascribes them to some time between Pre-Mesozoic and the Pre-Cambrian. It is mainly a moderately schistose rock unit of relatively low metamorphic grade. Foliation is usually vertical due either to monoclinical or isoclinal planes of foliation. At Atlin camp near the Pine Creek valley and Surprise Lake rocks are much more heterogenous. They range from altered peridotite and alaskite intrusive bodies to limestones. Folded chert, quartzite, greenstone, phyllite, chert breccia, schist, greywacke, amphibolite and limestone breccia underlie the productive creeks. These layered rocks form natural riffles. These rock units range in age from Cretaceous (for the granitoid masses) to Pennsylvanian and Permian for the Cache Creek group (the sedimentary rocks).
2. Klondike creeks were not glaciated. Atlin creeks were glaciated, at least once, and much of the ancient creek channels were covered with Pleistocene gravels from 50' to 350'. In a few places the ancient channels are very near surface. Most Klondike pay gravels were buried under only a thin, (4-15') Black muck layer. Of course there are extensive thick White Channel gravels at high levels in the Klondike. But these do have their own pay channels

at their base. There are no equivalents of White Channel gravel at Atlin camp.

3. Klondike gravels are in permafrost and Atlin gravels are unfrozen.
4. In general, Klondike pay gravels include very few large boulders. At Atlin camp large boulders are common in or near the pay horizons--especially north of Surprise Lake.
5. There are clear indications that Klondike gold is much finer than Atlin gold. The list of the largest placer nuggets found in Cordilleran placers is headed by Atlin nuggets (Appendix C). The largest known Cordilleran nugget is 88 oz and is from Atlin camp. Cleanups in the Klondike show much finer gold than in Atlin. Little or no flour gold is known at Atlin. It is common in the Klondike. This indicates much less transportation and possible younger age for Atlin gold than for Klondike gold.
6. The original mineralization in Atlin rocks may have been of much higher grade than Klondike rock. Gold in the Klondike is considered to have been originally in narrow quartz veins interbedded in the green schists of the Klondike Schist. At Atlin there is some indication that mineralized belts trended northeast (sub-parallel to Pine Creek) on both sides of this valley and that creeks draining south and north into Pine Creek and Surprise Lake cut these high grade gold belts. Considering the heterogeneity of Atlin rocks one could expect a variety of original gold deposition from veins and skarns to porphyry type deposits.
7. The Klondike produced about 10,000,000 ounces over about 85 years of continuous productive activity from a zone about 400 square miles in area. Atlin camp produced about 500,000 ounces from about 200 square miles in the same time frame but with intermittent productive activity.
8. The average grade of Klondike productive gravels has been estimated at about .01 oz/C.Y. This means that about 1 billion C.Y. of gravel was, on average, processed. There is no comparable average grade for Atlin camp gravels. But it is unquestionably higher. Visually the amount of gravels processed at Atlin would appear to be less than 150,000,000 C.Y. This means average production grade could be as high as 0.1 oz/C.Y. for the camp. This calculation involves the adjustment in size of Atlin camp to Klondike size i.e. the Atlin camp production is doubled to an equivalent one million oz Au because it is only half the area of Klondike.

9. How much gold remains to be found at Atlin camp? Assuming half of Klondike production came from the first phase of hand-mining from shallow shafts and small scale hydraulicking and the other half came from large-scale mining using dredging, huge hydraulicking plants on White Channel gravels and later large scale earth-moving systems, then we should expect, by analogy, that only about half of the potential of Atlin camp has been realized. Because the first phase of Atlin camp placer mining consisted of underground drift mining, small-scale hydraulicking and ground sluicing (analogous to the early phase of Klondike mining) then we should expect a further 0.5 million ounces of production (or more) once the large scale earth moving phase (dredging and hydraulicking will not work in today's environment conscious society) is initiated. Certainly tractor type and scraper type or truck and shovel dry mining methods will be more expensive than the old large scale methods but the more pervasive gold content of the glacial waste overburden and higher grades in bedrock and gravel pay streaks will be able to sustain the extra cost--not to mention a higher gold price.
10. North of Surprise Lake placer mining concentrates contained recoverable tungstic oxide material and other valuable heavy minerals including platinum.
11. Though Aitken (1) denied that Atlin pay gravels were from preglacial erosion processes and uplift, Black and Proudlock and Dailly are agreed in ascribing most of the gold content of Atlin Creek to preglacial concentration of gold above bedrock during a long erosional period in the Tertiary. There are, however, rich pay streaks in the overlying glacial tills. These can be readily ascribed to pulsed or intermittent type of uplift and are really not difficult to explain, especially when most of these pay layers are underlain by clay hardpan which clearly is related to a period of dormancy in the overall epeirogenic processes at Atlin camp.
12. The old mining methods could not really take advantage of the high gold content of bedrock at Atlin camp--as was done by dredging in the Klondike creeks. Recently, where larger tractors with rippers have been used at Atlin camp quite remarkable gold recoveries have been made. This is another reason for stating that the potential of Atlin camp is very great in terms of ounces if not in terms of cubic yards of placer material to be moved during mining.

13. Finally (and this is a highly speculative point) Atlin geomorphology is clearly unique and abnormal. The ring-shaped mountain and foliation pattern, with a large acidic intrusive near the core, deserves some consideration and explanation. Whether the ring-shaped pattern of land forms and foliation around the alaskite plug is due to unusual tectonic forces or due to impact by an extra-terrestrial object, deserves study. In any case, either explanation might account for an abnormal concentration of gold and other metals here. Glassy micro-meteorites have been reported from Atlin placer gold concentrates. They have been ascribed to micro-meteorite shower. They could perhaps be explained as micro-remnants of melted terrestrial rock from a large impact crater centered near Surprise Lake.

#### GOLD BEARING GRAVELS OF OTTER CREEK

Bedrock on lower Otter Creek is altered (serpentinized) peridotite and layered sediments, argillite, chert, limestone etc. In the upper part of the creek it is mainly mixed Cache Creek type sediments. Foliation, even in the peridotite, because of fracturing, is conspicuous. This bedrock feature, when frost wedged, forms natural riffles which trap coarse gold to depths of as much as twelve feet. Please see Figure 5 for bedrock patterns in part of Atlin camp. Dailly's (7) account of Lower Otter Creek gravels is most pertinent and repeated here in its entirety:

"A complete section of gravels has been exposed from top of glacial till to bedrock in Otter Creek commencing at a point about 1/4 mile from the lake and extending upstream or south for about 1000'. This section is in the ancient bedrock channel of Otter Creek. The present surface channel swings westward from a point about 3/4 mile from the lake and discharges into it about 1/4 mile west of the old channel.

"The exposed area in the channel is composed of about 80' of older stream gravel overlaid by recent glacial till from 60' to 125' in depth. The average depth of the till is about 80' over the known channel, and becomes deeper away from the channel where more morainal material remains. Bedrock is only slightly decomposed and is eroded into irregular pot holes and narrow channels. At the edge of Surprise Lake the bedrock elevation of Otter Creek is known to be more than 50 below water level

and may be 100' below. Bedrock rises to the south and crosses water level at a point about 2000' from the shoreline thence continues upward on an irregular grade averaging about 4.2% for one mile. The bedrock channel is about 100' wide in the bottom in the lower section of the creek.

"The lower 80' of stream gravel contains a large percentage of coarse material and boulders which are frequently 2-3' in diameter and occasionally up to 5' and rarely larger. It is estimated that in the lower part of the creek that boulders over 4" diameter constitute 1/3 of the gravel and those above one foot constitute about 1/4 of the gravel..

"The deposits which have been worked (by underground drifting) in the zone 2000-3000 feet from the lake contain very little fine sand or glacial silt and only thin layers of a sort of hardpan clay. However, shafts and drilling further upstream disclose the presence of extensive deposits of fine gravel and sand, layers of clay-like material and glacial quicksand both in and well above bedrock. The lower gravels stand up fairly well, but are loose and unconsolidated and have drained easily where exposed.

"The upper 80' or more of glacial till is in general a medium gravel containing a much smaller percentage of small boulders which are generally concentrated near the surface. This material washes nicely and over one-half million yards have been handled easily by hydraulic methods without use of powered equipment for removing boulders.

"Bedrock rims are exposed at various places on both sides of the creek and have been exposed at various places in the hydraulic cuts including a point near where the present creek channel crossed the ancient LL rim about 3700' from the lake. Exposures in the cuts show a dip of about 45° on both sides of the wide channel. The bedrock bench which has been exposed on the LL near drill line #3 is about 100' above creek bedrock and 10' above the bottom of the hydraulic cut in the present creek bed."

In general values found between the four pay levels in the ancient gravel hydraulic cut represent either intermittent or pulsed post glacial uplift or damming of the glacial Otter Creek stream.

In general, also, gold in the glacial material is less bright and more oxidized than gold found at bedrock in the ancient channels. Fineness of gold at various levels is quite variable from 777 in bedrock to 832 in the higher glacial pay horizon.



Upper Otter Creek is quite flat and gradient is lower than in the northern reaches of the creek. At drill line "A" which is about 3000' from the lake or near the northern boundary of "Drain" lease, drilling did not show good gold content in bedrock or glacial till. Gravel depth was between 90'-120'. Line 3 Extra (about 5600' from the lake) shows glacial gravel depth of about 75'. But the single hole is in a depression. Gravel here averages about 125'. About 400' upstream from Line 3 Extra, Line 3 shows gravel depth to bedrock at about 175'. There is a definite bedrock channel here as shown in 9 holes which reached bedrock.

Reference is made by Dailly to old hydraulic workings near Line 3. This is about 6000' from the lake and may be the old hydraulic working reported at 5500' from the lake which gave good results. Drill line #1 which is located about 1000' upstream or 7000' from the lake (and not far from the southern boundary of Dan Group) reached bedrock at depths between 80'-100'. Line #2 about 8000' from the lake and probably outside Dan Group was inconclusive. Bedrock is about 130' deep. Line 4 located above the old dam found bedrock at irregular depths of 40' to 110'. See Figure 8 and 10.

This prospect drilling shows a concentration of values in a narrow bedrock channel presumably east of the existing channel for a distance of from about 5500' from the lake to 8000' from the lake. There are irregular pay horizons within the glacial overburden.

Dailly states that within the glacial horizon, it is easily possible that buried pay channels exist which bear no relation to present surface topography or known bedrock channels. These will be best located during the course of bulk fluvio-glacial overburden gravel mining above known bedrock channels (as at line #1).

The westerly flowing part of Otter Creek was productive. This area will require more attention. Also the long length of creek above Dan Group and above the old dam should be drilled using a tracked large diameter hammer drill. Protection staking will be needed here on the east bank of Otter Creek.

#### POTENTIAL RESERVES LOWER OTTER CREEK

Figure 9 shows the location of Drain Lease (PML 1697) in

Lower Otter Creek. This has been plotted by the writer using information from Form 1, B.C. Placer Mining Act. It shows that the Drifted area is almost certainly within Drain Lease.

In plotting Drain Lease boundaries I used the standard  $\frac{1}{4}$  mile length for the PML. However it is reported by Roy Smith that there is a possibility that the length of Drain Lease is only 2040' which gives Dan claims a correspondingly greater part of the drift-mined area. However, the claim length for Drain Lease as scaled from the claim map of the area is 2640'. So the question of the amount of drifted area under Dan Group PML's is not resolved with present information.

There is a chance that an unknown part of the drifted length of 1200' on the ancient pay channel and higher horizons within the glacial gravels may be on Dan Group ground.

In fact, within Drain Lease there may be as little as 250' of "developed" pay channel ahead of the present pit face. But this potential reserve of pay gravel and bedrock reserves is of little interest to Dan Group holders at present. Presumably if the present holders of Drain Lease decide to mine upstream to the boundary of Drain Lease they will, in effect, prove, at least, several hundred feet of pay channels into Dan Group-- despite negative or inconclusive results on Line "A", 400' south of the boundary and southern limits of the drifted zone. As a matter of interest, it should be noted that Dailly in 1946 made some rather involved (and presumably accurate) calculations which showed that about 600,000 C.Y. of pay material in a block over the drifted area 1200' long was worth about \$15.00 per C.Y. at today's gold prices. This block was covered by a till block of 840,000 C.Y. worth about \$2.00 (\$300USoz Au) per cubic yard. Because some of this block is now gone this reserve block is of only academic interest to Dan Group holders--but might be of considerable interest to Drain Lease holders.

At this point it should be emphasized that there is no conclusive evidence that the ancient pay channel in bedrock and associated pay channels in glacial till do not persist continuously southward into Dan Group. Dailly states that there may have been a flexure or fault in the pay channel zone or drill holes on the negative drill line "A" may have hit a "false" bedrock. This point is important for consideration of potential reserves in Dan Group above Drain Lease. The pay channel must (if it exists) move into Dan Group ground but it may change direction or be offset.

POTENTIAL RESERVES DAN GROUP

Dailly discusses two main potential blocks on Otter Creek in his report. These are indicated (somewhat diagramatically) in Figures 8 and 10.

**Block "A"**

Block "A" is from end of Drifted area (3000' approx. from lake) to line #3 Extra and is 2000' long. The only drill hole on line #3 Extra shows a value of 77.5¢ per C.Y. or about \$8.00 at \$300US/oz Au. This one hole is a very good indication that a pay channel exists of unknown width some distance south to line "A" and south to and beyond line #3. No yardage of "pay" will be assigned to this block but it is certainly prime exploration ground. An idea of the yardage possible is indicated by line #3 (outside the block--400'south). The channel is 280' wide and averages 70' deep. This block "A" is potentially 730 C.Y. X 2000' = 1.5 million C.Y. with about 1.0 million yards of till above the pay channels. Average value in the pay gravels is about \$4.00 per C.Y. at \$300oz/Au. However, I believe (as does Dailly) drill hole values in drilled pay gravel are grossly undervalued in these estimates. A comprehensive 4 1/2" hammer drill hole program is warranted. If careful samples are taken and a method of going deep into bedrock is used (rotary bit) then the values may be much in excess of Dailly's estimates--especially bedrock values.

**Block 1702**

This block extends from line 3 Extra to a line 2400' south of this line. The block includes line 3 and line 1. It is about 1300' from line 3 Extra to line #1. Drill line #3 contained 9 completed holes and indicated a definite bedrock ancient channel on the east side of present Otter Creek. The average value is about \$4.00 as stated above for 70' average depth or 730 C.Y. per lineal foot of channel. To this is added 500 C.Y. per lineal foot of glacial gravels.

The most important line in all the drill hole prospecting is line #1 which is about at the center of block 1702. Five holes were drilled on this line and all reached bedrock at depths from 78' to 98'. The deepest hole, #1, was in the center of the channel and showed about 0.02 oz/C.Y. with gold concentrated above bedrock. Dailly goes on:

"Hole #2, 35' east, is calculated at 66¢ per C.Y. for 84' of depth; approximately 1/3 of the value was found at the level

of a former hydraulic out floor at about 29', and about 60' in a pay horizon at about 60' which does not appear in the other holes. Hole #6, is located 35' west of #1, showed an average value of 25.2¢ for 89' with minor pay values at about 19' and 75', and a principal concentration on and just above bedrock. Hole #5, located 35' further west, produced 1960 mg. of gold in 85' depth, over 90% of which was concentrated in and just above bedrock. This is the only drilled hole which produced coarse gold of a size range comparable to that which characterized drift gold and about 70% was plus 20 mesh. The last hole, #7, located 36' further west, showed only 1.3¢ per C.Y. A check shaft was started over hole #2 and sunk to a depth of 30' where it had to be abandoned on account of silt and water. The bottom of the shaft is just below the bottom of a former hydraulic out. \$2.00 per C.Y. was recovered from 26.5' and the average recovery for 30' was 37.7¢ per C.Y. Prospect shaft #3 was sunk to bedrock on the LL rim, about 80' from hole #7, and showed no values for 16.5'.

"Prospecting on line #2 1100' further upstream was inconclusive. The shaft and drill hole sunk to a total of 127' did not show any values on bedrock, but did show values consistently to 44.3' depth, and it is believed that better values were present in deeper gravels which could not be washed. It is believed that this hole is in the RL rim. Drill hole #3 located 400' west was lost at 97' and only traces of values were found to this depth.

"Drill line #4, located further upstream above the storage dam, consisted of 8 holes ranging from 39' to 111.8' deep. The results were very irregular, 3 holes showing nil and the other 5 indicating 12.0¢ to 46.1¢ per C.Y. with concentrations mostly close to or on bedrock."

It must be pointed out that hole #5 produced a phenomenal 1960 milligrams of gold--90% on or just above bedrock. This result (when adjusted) is in the range of several ounces of gold per C.Y. This extraordinary result proved coarse gold similar to material in underground drifting near the lake. This hole does conclusively prove there is a rich paystreak in an ancient channel which should persist at least 150' north and 150' south of drill hole #5.

At this point I should repeat the points made in my letter to Dr. Wright of June 16:

7. On page 19 of his report Dailly estimates the value of a block of deep channel gravels extending from Line 3 "Extra" for a distance of 2400' south of Line 3 "Extra" at about \$15 per cubic year--at \$300Us/oz Au. The

volume of this ground is estimated by him at 1.5 million cubic yards. He also estimated that this drilled area is overlain by 1.0 million cubic yards of glacial boulders, gravel and till worth about \$2.00 per cubic yard. Dailly adds, "Additional field data is necessary to confirm or disprove the above theory and secure a more accurate estimate." I agree entirely.

8. However, there are two additional positive facts that should be taken into account here. Hole 5 on line 1 showed an extraordinary (phenomenal) gold content of almost 2 grams, over 90% of which was concentrated in and just above bedrock. This was coarse gold comparable to coarse gold from the drifted mined area. This demonstrates almost conclusively the existence of a preglacial bedrock channel there. Secondly, the depth on line 1 to bedrock varied from 78' to 98', the deepest depth being in the center of the bedrock channel. Therefore the depth to bedrock "pay" is not excessive.
9. Dailly points out and it has been the writer's experience elsewhere that in coarse gold pay channels the gold content in drill holes almost always definitely is undervalued. This is not necessarily so in bedrock intersections.
10. Therefore the 2400' block estimated at \$15.00 for the gravel should be increased by 0.5 million yards of bedrock material at an estimated 0.3oz/cu.yd. This represents about 8' av. of bedrock channel that would be ripped by large tractors. Gross value of the above block could be potentially:

(Gold at \$300US/oz)

1.0 million yards of glacial till	@ 2.00	= \$ 2,000,000
1.5 million yards of pay gravel	@ 15.00	= \$22,500,000
0.5 million yards of bedrock	@ 90.00	= \$45,000.000

Gross Value      \$69,500,000

No allowance for \$US/Can is made in this preliminary estimate.

- i. 1.0 million yards can be moved and processed for an estimated \$2.50 per cubic yard.
- ii. 1.5 million yards of pay gravel can be mined and processed for an estimated \$3.50 per cubic yard.
- iii. 0.5 million yards of weathered bedrock can be mined and processed for an estimated \$8.00 per cubic yard.

Mining and processing cost would be about \$14 million total. In round numbers the mining of the block could result in a production profit of about \$55 million (Can) before taxes, depreciation etc.

I would class this Block 1702 in the probable category but drilling, after a transit survey has been made and surface control points established, should be carried out to move this probable block to the proven category.

### Block "C"

The question remains: Is a bulk sample this season necessary? This, as Dailly states in another context "opens interesting possibilities." Calculation can be made using above data and assumptions, that a block across the pay channel, centered at hole #5, 300' long would yield about \$5.0 million gross value of gold. Cost of mining equipment would be less than that. In fact a substantial profit could possibly result. However, before the start of such a project a well defined pay channel, with comparable values to that in the above calculation, should be found using hammer (Becker) drilling at block "C".

A mapping project could possibly locate line #1 and drill hole #5 in the field. It should be attempted and results related to the Becker drill program. Depending on results then Block "C" could be mined this season. The total of 300,000 cubic yards of gravel could be mined and processed in about 2 months.

What is the evidence for assignment of high grade to old bedrock channel placer material? This comes from a variety of sources.

- (a) The actual result of drilling in hole #5, line 1, is indicated to run above 3 ounces/ C.Y.
- (b) Mining in the Nolan Mine on Spruce Creek was very high grade. I estimate from verbal communications with Roy Smith, who mined there, grade in excess of 0.5oz/C.Y. for much of the production.
- (c) Mining in Lower Otter Creek gave an average production grade in bedrock and higher pay gravels of about 0.20 oz/C.Y.
- (d) It is stated (BCDM 1939 Ann. Report) that the best values in Spruce Creek occurred in and on top of decomposed bedrock. Some grades were as high as 1 ounce per cubic yard (p. B 55) in bedrock mining. On the Poker Lease on

Spruce Creek (p. B 54) grade was about 1.6 oz/C.Y. on bedrock for about 20' of channel.

- (e) It is reported that bedrock mining in Drain Lease (which is now being ripped about 10' into bedrock) is very high grade by Roy Smith. It is reported 5000 ounces (mainly from bedrock) were mined in one season's operation.

#### POTENTIAL RESERVES UPPER OTTER CREEK

Sharp and Dudley Davis (Appendix D) estimated about 8,000,000 C.Y. potential for the drilled interval of about 1/4 mile on Otter Creek. Not all of this, of course, is within Dan Group.

Above Dan Group to the westerly flowing part of Otter Creek should be more potential pay channel in the order of double the Sharp-Davis estimate. In this context it should be pointed out that Spruce Creek was mined for 17,000 feet in its middle and upper reaches. Depth of gravels (not paystreak termination) stopped the mining southeastward on Spruce Creek. Obviously more drilling is required here.

#### PROGRAM FOR 1982

The following program is contingent upon early financing arrangements. Assuming this can be arranged within 20 days of this date the following program should be carried out this field season.

1. Protection claims should be staked near the 1702 Block and also protection claims should be staked on east bank upstream on Otter Creek.
2. A transit and stadia traverse should be used to establish the perimeter of Dan claims near Block 1702 and Block "C". Detailed geological mapping should be done near these blocks.
3. A Becker hammer drill program should be carried out near line #1. A truck mounted drill could be used provided a D 8 tractor was used for road making and moves.

4. Control lines for the drilling program should be laid out and picket lines cut on the ground marking these control lines and drill hole locations.
5. The Becker drill program should comprise 2 lines straddling line #1--about 250' on either side of old line (as far as can be established in the field). There should be 5 holes per line with holes 50' apart across the assumed trend of the ancient bedrock channel.
6. About 10 holes of about 120' depth (1200') should be put down.
7. Two holes should be drilled per day (on average). Field drilling time (allowing for breakdowns) should be 7-8 days. About 5-6 days will be needed for sluicing and panning the drill hole samples.
8. It may be necessary to experiment with bit types to determine best recovery. Also, recovery in hard bedrock (rotary bit) must be attempted.
9. A brief report on drill results should be prepared--4 to 5 days. Dependent on this report the mining equipment must be leased or bought or contractors should bid on mining of the material in Block "C", if the drill results indicate this project is feasible.
10. Dependent upon drilling results the PML's on Snake Creek and Upper Otter Creek should be optioned.
11. Some field investigation of the potential of Upper Otter Creek should be carried out.
12. If possible, hammer drilling downstream of Block 1702 should be carried out this season.
13. Because Otter Creek overburden is not frozen the waste stripping could extend into November.
14. It is expected about 60 days will be needed for stripping, mining, and washing of Block "C".
15. Seismic orientation lines may be run over Block "C" when high grade bedrock channel has been located by drilling. If bedrock location as determined by seismic work corresponds with drilled location then more seismic surveying may be done.



### POST 1982 PROGRAM

The remainder of Block 1702 should be mined in 1983. It is expected that the results of Block "C" mining will be profitable. Mining revenue should be used to extend the drilling up and down Otter Creek from Block 1702. Other than that little can be laid out at this time. Certainly there is as much potential for a continuous high grade ancient bedrock channel along Otter Creek as was found for 17,000 feet along Spruce Creek.

### CONCLUSIONS

1. Atlin camp is an excellent camp for discovery of high grade ancient pay channels.
2. Modern mining and sluicing methods of high volume gravel movement and processing should allow profitable mining of bedrock channels and glacial pay channels above the bedrock.
3. Drill hole #5, line 1 is most significant. It more or less proves the existence of pay channels with certainly the grade and (less certainly) the continuity of Spruce Creek-type bedrock pay channels--which ran in the ounces per C.Y.
4. After staking, surveying, and drilling near line 1 dependant on result Block "C" should be mined this year--if time permits.

### RECOMMENDATIONS

It is recommended that the proposed 1982 program above be initiated and completed after adequate financing has been arranged.

### COST ESTIMATE

1. Surveying, mapping, drafting, drill supervision, transportation, salary and field maintenance for


geologist or engineer and helper One month .....	\$10,000
2. Becker hammer drilling 1200 X \$40.00 (includes mobilization).....	48,000
3. Report of drill results .....	3,000
Processing drill results .....	3,000
	<hr/>
Contingency and misc. @ 10%	\$51,000 5,000
	<hr/>
Total	\$56,000

Block "C"

Stripping, mining, and washing 300,000 @ \$3.50 av. ....	\$1,000,000 (approx.)
	<hr/>
	\$1,056,000

Block "C" work is contingent upon favorable drill results.

Respectfully submitted,



M.D. Kierans P.Eng.

CERTIFICATE

I, Martin D. Kierans, of 1503 - 1616 Pendrell Street, Vancouver, B.C. do hereby certify that:

1. I am a Geological Engineer.
2. I am a Resident Member of the Association of Professional Engineers of the Province of British Columbia.
3. I am a graduate in Geological Sciences of the University of British Columbia (M.A. 1952) and McGill University (B.Sc. 1949).
4. I have practiced my profession of Geological Engineer and Mine and Exploration Geologist for 29 years.
5. My knowledge of the property discussed in this report is based on a field visit to lower Otter Creek on June 12 and 13, 1982, review of Dr. Wright's proposal, study of government reports and maps on the area (some listed under Bibliographic References), and various private reports (also listed in References), and verbal communications with Roy Smith of Whitehorse, Y.T., a former long-time resident and placer miner of Atlin, B.C. and G. Wright of Cypress Consultants Inc.
6. I have no interest in the subject claims, Cypress Consulting Services, or Empire Gold Ltd., nor do I expect any.

DATED June 24, 1982 at Vancouver, British Columbia.



M.D. KIERANS P.Eng.

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## APPENDIX A

### DRAINAGE

The principal valleys are those of Pine, Spruce, Otter, McKee, Birch, Boulder, Wright and Ruby Creeks. Pine valley and its northeastward extension, Surprise Lake valley is the major valley and most of the area is drained by Pine Creek and its tributaries. The other major stream is McKee Creek which drains the southwestern part of the area. The lesser streams flow into Fourth of July Creek or directly into Atlin Lake. The flow in most of the creeks in the summer after the snow has melted declines considerably and shortage of water has been one of the greatest deterrents to large-scale hydraulic operations.

Pine Creek heads in Surprise Lake, three-quarters of a mile wide and 15 miles long, the lake provides a nearly uniform flow of water in Pine Creek even in dry summers. For three miles below Surprise Lake, Pine Creek, flows in a drift-filled valley with a gradient of about 30 feet per mile. Below this section, the gradient increases and averages about 80 feet per mile, for 9½ miles to Atlin Lake. Bedrock is exposed in several places and youthful canyons have been cut.

Spruce Creek, the largest tributary of Pine, in its upper reaches also has a gentle gradient, falling about 250 feet in 7 miles or less than 35 feet per mile. Nearer the mouth the gradient increases and is 140 feet per mile for the rest of its length, and for short stretches such as near the mouth of Dominion Creek, is more than 250 feet per mile. Spruce Valley is wide and possibly was formed by a creek that drained a greater area than is drained now by Spruce Creek. In a section of the valley downstream from Dominion Creek, it is entrenched between banks composed mostly of unconsolidated material, more than 100 feet high. There are a few canyons out in bedrock.

Otter Creek, like Spruce Creek, has a gentle gradient below its main fork about 75 feet per mile for  $3\frac{1}{2}$  miles and flows in a flat bottomed valley. Near Surprise Lake, the gradient increases to 235 feet per mile and the creek flows between banks of unconsolidated material more than 100 feet high. The main fork of Otter Creek flows northwestward and turns abruptly to flow northeastward into Otter valley. At the turn, only a broad low pass separates it from Spruce valley and from the topography it appears probably that in pre-Glacial times the main fork of Otter flowed into Spruce Creek and helped to make the valley of that creek larger than that of other creeks of similar size. However, the flow in lower Otter valley may not have been much less than it is now, because it seems probable that Snake and Wright Creeks, in preglacial times, flowed into Otter. The lower part of the Valley may have been entrenched towards the end of the Tertiary period.

When gravel deposits near the mouth of this creek were being hydrauliced the volume of water available was increased by diverting water from Wright and Union Creeks to the east, and from Snake Creek to the west through metal and wooden flumes into Otter Creek.

Wright Creek is one of the smallest of the tributary creeks and flows in a small valley. It has a steep gradient from its head to Surprise Lake and in the lower part of its course is cutting canyons into bedrock.

Ruby Creek is the largest tributary of Pine Creek, north of Surprise Lake. It drains several cirques and steep-walled flat-bottomed valleys. The gradient of its tributaries at the head of the valleys is very high, but from their confluence downstream for  $3\frac{1}{2}$  miles decreases to about

275 feet per mile and the creek flows between banks of rock and unconsolidated material as much as 100 feet high.

Boulder Creek, west of Ruby, is much smaller and has a uniform steep gradient of about 365 feet per mile from the dam just below the main fork to Surprise Lake. In part of the lower section, the creek flows between high banks of unconsolidated material. Deposits in this creek have been worked by hydraulic, but by midsummer and later the flow decreases so that piping is possible for only a few hours a day.

Birch is the smallest of the productive creeks and operations on this creek have also been handicapped by shortage of water. It has a gradient of more than 300 feet per mile and in the lower part of its course is deeply entrenched in unconsolidated material and in bedrock.

McKee Creek, the only creek outside of Pine drainage basin from which any considerable production has come, heads near the source of Spruce Creek, but flows westward directly into Atlin Lake. In its upper reaches down to a dam, the gradient is less than 50 feet per mile. Between the dam, and the mouth of Eldorado Creek a tributary from the south, a distance of about  $2\frac{1}{2}$  miles, the gradient increases to about 250 feet per mile. Below this, for about  $1\frac{1}{2}$  miles the gradient is steep, over 500 feet per mile. The gravel on the valley bottom of this section has been hydraulicked. Below the hydraulicked section the creek flows down the slope of Atlin Lake valley and has a gradient of about 200 feet per mile.



APPENDIX B

The Dan Group comprises the following leases:

<u>Lease No.</u>	<u>Name</u>	<u>Owner</u>
PML 1687	Snoopy	100% Connolly Holdings Ltd.
PML 1702	Rose	" " " "
PML 1703	Joy	" " " "
PML 1745	Lake	" " " "
PML 1782	Dan	" " " "
PML 1849	Randy	" " " "
PML 1866	Lucy	" " " "
PML 1867	Pauline	" " " "
PML 1868	Ford	" " " "
PML 1869	Surprise	" " " "
PL 4688	-	100% Milmac Mines Limited
PL 4689	-	" " " "
PL 4690	-	" " " "

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PML 1697	Drain	100%	J.K. Campbell
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APPENDIX C

Miscellaneous Placer Creek and Rivers in other areas

1. Bob Creek (south of Houston, B.C.)
2. Buck Creek (south of Houston, B.C.)
3. Chilcotin River (west of Williams Lake, B.C.)
4. Jamieson Creek (north of Kamloops, B.C.)
5. Louis Creek (north of Kamloops, B.C.)
6. Mitchell Creek (north of Prince Rupert, B.C.)
7. Peace River (near Ft. St. John, B. C.)
8. Scotch Creek (north of Salmon Arm, B.C.)
9. Sulphurets Creek (north of Prince Rupert, B.C.)
10. Tranquille River (west of Kamloops, B.C.)
11. Unuk River (north of Prince Rupert, B.C.)

## THE NUGGETS

Listed below are a number of the larger nuggets which have been found in the province from 1858 to the present. By necessity this list is incomplete as it is common knowledge that many of the larger nuggets recovered were not recorded, especially by the Chinese miners who were always reluctant to disclose good finds. In most instances the precise weight is given, in cases where the approximate weight is given it is marked with an asterisk.

Weight	Creek	District	Year	Locator
85 oz. 9 dwt.*	Spruce	Atlin	1899	West
73 oz.	Birch	Atlin	1913	
73 oz.*	McDame	Cassiar	1877	Freeman
52 oz. 15 dwt.	Alice Shea	Cassiar	1937	Shea
50 oz. 5 dwt.*	Boulder	Similkameen	1887	Unknown Chinese
50 oz.*	Dease	Cassiar	1875	Unknown
48 oz. 12 dwt.	Pine	Atlin	1925	
47 oz. 13 dwt.	Ruby	Atlin	1931	
46 oz. 5 dwt.	Squaw	Atlin	1936	
45 oz.*	Defot	Cassiar	1878	Unknown
44 oz. 3 dwt.	Spruce	Atlin	1936	Lykergaard
40 oz.*	Dease	Cassiar	1874	Unknown
36 oz. 10 dwt.	Spruce	Atlin	1902	Unknown
36 oz. 5 dwt.	Wild Horse	East Kootenay	1864	Reynolds
32 oz.*	Bridge R.	Fraser		Unknown
31 oz. 1 dwt.	Pine	Atlin	1899	Unknown
30 oz. 1 dwt.	Lightning	Cariboo	1864	Unknown
30 oz.*	Spruce	Atlin		Unknown
28 oz. 15 dwt.	McKee	Atlin	1901	Unknown
25 oz. ½ dwt.	Wright	Atlin	1899	Unknown
24 oz.*	Bear	Similkameen	1886	Unknown
24 oz.*	Germansen	Cmineca	1934	

APPENDIX D

WILLIAM M. SHARP, M.A.Sc., P.Eng.  
CONSULTING GEOLOGICAL ENGINEER  
~~XXXXXXXXXXXXXXXXXXXX~~

3280 Chesterfield Ave., North Vancouver, B.C.  
V7N 3M9

Nov. 5, 1974

Mr. Rutherford Day, Pres.,  
Surprise Resources Ltd., (N.P.L.),  
1115 Southwest 8th Terrace,  
Fort Lauderdale, Florida 33315

Dear Ruddy:

The following estimates of Otter Creek placer reserves are based on churn-drill and underground sample data provided by the old company map-prints #1 and #4. Grade estimates are based on a gold price of \$160 per oz.

A) Probable Reserves

1. Within Drain Lease, over base-line interval 13+00- 25+00:  
(= inc up-stream half of the claim)  
Below pit-floor = (60 x 27 x 400) yds. = 648,000c.y. @ \$12.34 per c.y.
2. Up-stream of Drain Lease @ 25 + 00 - 31 + 00:  
Below pit - floor horizon = (60 x 27 x 200) yds = 324,000 @ \$12.34/c.y.  
Above " " " = (100 x 30 x 200)yds = 600,000 @ \$0.686/c.y.  
Total Probable Reserves = 1,572,000 c.y. @ \$7.90 per c.y.

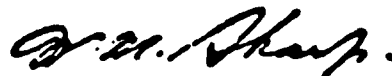
B) Possible Reserves

(Based on gross X-sect. @ 3000 x 0.686 + 1620 x 12.34, for \$4.77/c.y.)  
For channel-interval 31 + 00 - 55 + 00,  
= (1620 x 800)c.y. = 1,296,000c.y. @ \$4.77 per c.y.

SUMMARY

Estimated gross reserves over 13 + 00 - 55 + 00 (0.8 mi.) = 5,068,000c.y.  
The gross-length of the drilled-interval, or area, is about 1 mi.  
For this, Mr. Dudley Davis (Feb., 1974) has estimated a total potential of 8,152,820 c.y. - which, on the basis of the above estimates and the additional length of only superficially-tested ground, appears very reasonable.

Respectfully submitted,



W.M. Sharp, P.Eng.

Grade for 648,000 c.y. within  
Drain Lease A) is 0.07715 oz/c.y.  
for 49,993 ounces

ED

June 24, 1974

Mr. Rutherford Day,  
Director of Companies,  
1118 Southwest 8th Terrace,  
Fort Lauderdale, Florida 33315,  
U.S.A.

Dear Mr. Day:

INTERIM REPORT  
FIELD INVESTIGATIONS, ATLIN, B.C. PROPERTIES  
JUNE 4-12, 1974.

SPRUCE CREEK

Messrs. R. Klimke and E. Kullik of the Weserhutte Company, accompanied by the writer, Mr. Day, and Atlin associates, inspected operations and deposits in this area. The main purpose of this visit was to acquaint the Weserhutte personnel with the physical characteristics of the general section of the local gold bearing placer deposits - thus enabling them to judge the feasibility of excavation by their bucket-wheel equipment. On the basis of their field observations, they concluded that while their equipment could operate efficiently in the overlying predominant sand/silt overburden, it would be unsuited to the excavation of the typical boulder-clays/gravels comprising much of the underlying pay-zone. Also, it would be incapable of excavating the top section of gold-bearing, weathered and/or fractured bedrock.

On the basis of the existing information concerning the Spruce Creek deposits, it appears that a 24 c.y., or larger dipper-shovel would have superior general capabilities. After the initial preparation of the pit, which would include construction of a bedrock-drain, excavation would advance in the up-stream direction. The excavated pay-material would be trucked to either a moveable washing plant or a system of sluice-boxes. A combination back-ho front-end loader unit might also be required for auxiliary load-haul duties, sub-grade excavation, and general pit service.

OTTER CREEK

At Whitehorse, en-route to Atlin, the writer visited Mr. Clive Boyd of General Enterprises Ltd. to discuss stripping a mining situations relating to the Atlin deposits. At the same time a list of General Enterprises' excavating equipment was compiled.

Subsequently, Messrs. Day, Sharp, and Connolly visited Mr. Boyd for a fuller discussion of possible contract work by General Enterprises. In the course of these talks Mr. Boyd indicated that his company would probably employ '621' or '631' motor-scrappers, push-loaded by Cat. D-9 units.

At Atlin, Messrs. Klimke and Kullik inspected the deposits exposed in the banks of Otter Creek (vic. of 1973 sta. 35+00) and in the walls of the old hydraulic pit on the Drain Lease. From this, they concluded that the exposed material could be rapidly excavated and moved by bucket-wheel, and that it might handle pay-material in the floor of the pit unless the latter contained a significantly larger proportion of boulders or unusual water problems arose. In any event, it was agreed that any specific mining plan should be based on evidence obtained by systematic drill-testing and sampling.

The following is a preliminary mining estimate based on Composite Cross-Section A-B (old print #4), and applying to a currently-developed section of Lower Otter pit between old base-line stations '15' and '30' (old print #1), and including the previously-mined volumes (drifts).

Gross pay-vol.	= 500 yds. x avg. 1800 c.y. per lin.-yd.	= 900,000
Strip-Vol:	= 500 yds. x avg. 3000 c.y.	= 1,500,000
Pay-value, per column value, @ \$150/oz.		= \$10.30 per
Estimated stripping cost (1975)		= \$ 0.75 per
" mining cost ( " )		= \$ 1.50 per
Unit costs:		
Stripping	3000 x \$0.75 =	\$2250
Mining	1800 x \$1.50 =	\$2700
Total		\$4950
Gross mining cost =	\$4950 / 1800	= \$2.75 per c.y.
Washing & miscell.	= 0.50	\$3.25 per c.y.

For above 500-yard length only,  
gross profit before royalties & taxes \$7.05 per c.y.

Following discussions with McLeod White, who had personal experience with the former mining operations, the writer re-establish his 1973 base-line stations, and made a detailed magnetometer survey of the upper half of the Drain Lease pit-floor. Some anomalous areas were delineated; however, these showed no correspondence with the assumed bedrock channel. The results probably reflect erratic runs of black-sand at relatively shallow depths within the total pay-section, and also the possible removal of deep-channel black sands during the period of drift-mining.

WRIGHT CREEK

Wash-outs at the Otter Creek bridge precluded an actual visit to Wright Creek exploration sites. However, Mr. A. Mattson provided extra information concerning the old churn-drill and drift exploration. Also, future work was discussed on the basis of the total results to date. Mr. Mattson advised that the main shaft was sunk at a point closely down-stream of a steeply dipping bedrock-rim (or step) - which fact suggests that the principal Wright Creek channel is cut, or joined by a deeper transverse channel. The latter may actually be the principal bedrock structure (gold trap) within this interval of the creek. This possibility could be readily tested via additional drill holes.

Respectfully submitted,

W. M. Sharp  
W. M. Sharp, P. Eng.

NOTE: For a 500 yd section only (incl. old drift area)  
a gross profit of \$2.07/yd<sup>3</sup> (at \$120 gold) is estimated  
For \$120 gold a gross profit of over \$301 yd<sup>3</sup> is indicated  
for 900,000 yd<sup>3</sup>; is a total of \$18,000,000.  
Present claims extends for, say, 20,000 ft in the  
above basin this would indicate over \$200,000,000.00.  
G.W.

*[Handwritten signature]*