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REPORT

ON

OTTER CREEK

ATLIN MINING DIVISION, BC  
BRITISH COLUMBIA

FOR

ATLIN PLACERS LTD. (N.P.L.)

BY

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25 OCTOBER 1946

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## OTTER CREEK GOLD PLACERS

### ATLIN DISTRICT - BRITISH COLUMBIA

#### LOCATION:

The gold placer deposits discussed herein are located in the Atlin Mining Division, B.C. Canada about 30 miles south of latitude 60 N. which is the B.C.-Yukon boundary. See Exh. "A". Otter, Wright and other roughly parallel streams flow approximately north into Surprise Lake, which is about 1 mile wide, 16 miles long, and lies east and west in this vicinity. Pine Creek, the outlet of Surprise Lake, flows about 12 miles west into Atlin Lake, elev. 2200, which is one of several long & narrow lakes forming the headwaters of the Yukon River. The district is about 50 miles inland from the summit of the coastal range. Other and nearby creeks are from 8 to 15 miles in extreme length and rise in the rocky hills to the south where the peaks range from 6200' to 6900' elevation.

#### CLIMATE:

The climate is sub-arctic but there is no permafrost in the known gold bearing gravels. The open water season during which hydraulic operations can be conducted usually extends from the middle of May to early October. The summers are lovely and mild with moderate rainfall. The freezeup occurs in October and snow can be expected anytime after October 1st. Total snow on the ground at any time during the winter may vary from a few inches to several feet. Winter temperatures are continuously below freezing and extremes of -50° or colder may occur for periods of a week or more.

#### TRANSPORTATION:

Common carrier service is operated throughout the year as follows:

Juneau to Whitehorse by airlines,

Seattle and Vancouver, B.C. to Skagway by ocean steamer,

Skagway, Alaska to Carcross (60 miles) and Whitehorse, Y.T. (110 miles) by White Pass R.R.

Seattle-Vancouver to Whitehorse by air-lines (PAA & CPA respectively)

Carcross, Whitehorse & Juneau to Atlin by local airlines, non-scheduled and charter flights.

During the summer months, from early in June to early October, the W.P. & Y.R. operates a common carrier service by lake steamer from the rail station of Carcross via Tagish Lake to Taku, thence over a short rail portage to Atlin Lake, thence by lake steamer to Atlin. There is a good gravel road from Atlin to the camp on Otter Creek, a distance of about 15 miles. This road is closed by snow at times during the winter and is unsuitable for freighting during the spring breakup. It is expected that a connecting road will soon be built running north from Atlin along the east side of the lake to the Alaskan Highway. Secondary dirt roads continue up Otter Creek to Wright Creek and other places in the vicinity. Except during the summer months, passengers are dependent on

air transportation into and from Atlin. During the winter overland freighting with tractor and sleds is practical from Carcross to Atlin.

COMMUNICATIONS:

The Canadian Government maintains a regular telegraph office at Atlin which provides service to all points, and there is a privately owned single wire telephone line from Atlin to the Otter Creek camp.

POWER:

There is a small privately owned hydro-electric plant (Northern Resources Ltd) at the lower end of Surprise Lake which had 750 KW surplus power available for sale in 1942. Interests of Discovery Mining and Power Co., Ltd., an early company, include a power plant site on Pine Creek below the Surprise Lake dam, water rights and a short ditch with capacity of 30,000 sec. ft. At last report these interests were under option to a resident of Atlin. The Walter W. Johnson Company has had preliminary surveys made and determined that a 2000 HP hydro plant could be built for a reasonable cost on Pine Creek about 7 miles from the Otter operations.

OWNERSHIP AND CONTROL OF PROPERTIES:

Placer mining rights, located in general as shown on the attached plan, are held as leases duly granted under the laws of British Columbia to the Cie. Francaise des Mines d'Or du Canada, a French corporation with head office at Paris which was licensed to do business in B.C. on 15 August 1928. To keep the 19 leases in good standing it is necessary to perform annual assessment work to the value of \$250.00 on each lease and record same with the Gold Commissioner (ex-officio Mining Recorder) for the district at Atlin, by the annual renewal date. A maximum of 8 leases can be consolidated or grouped so that work performed on one or more will apply to the entire group. Annual rental of \$30.00 per lease (except #785 at \$25.00) and recording fees of \$2.50 per lease amount to \$612.50. Following is a list of the leases owned:

<u>Recorded Number</u>	<u>Name</u>	<u>Creek</u>	<u>Location Date</u>
361	Martin	Otter	Aug. 7, 1925
362	Lynx	"	Aug. 7, 1925
363	Bear	"	Aug. 7, 1925
381	Fox	"	Oct. 4, 1925
404	Crown	"	Mar. 14, 1926
626	Fisher	"	July 26, 1926
627	Paris	"	Sept 30, 1926
643	Louise	Wright	Feb. 1, 1929
653	Casino	Union	Nov. 22, 1929
655	Fontainbleu	"	Nov. 22, 1929
654	Versailles	Quartz	Nov. 22, 1929
656	Le Louvre	Union	Nov. 22, 1929
710	City of Paris	Wright	Apr. 14, 1934
752	Toronto	Otter	Nov. 20, 1934
785	Beaver	"	June 13, 1935
822	Queen	Wright	Aug. 19, 1935

The foregoing 16 leases have been selected for wartime exemption from assessment work and rental payments under the Free Miner's Exemption Act. Benefits of this Act cease on 6 Dec. 46.

<u>Recorded Number</u>	<u>Name</u>	<u>Creek</u>	<u>Location Date</u>
855	Bank of Canada	Otter	May 22, 1936
856	" " England	"	May 22, 1936
857	" " France	"	May 22, 1936

Note: In addition to 100% ownership of the above interests the French Co. also owns an undivided 1/3 interest in the Arctic & Lindberg claims on Wright Creek. All of the above noted leases are presently in good standing.

By the terms of a lease and option agreement dated 9 May 1939, Walter W. Johnson Co. acquired complete rights to prospect, develop, mine and purchase all of the holdings and assets of the French Co. This agreement was modified in 1940, and assigned to Atlin Placers, Ltd., (N.P.L.) a Canadian company incorporated in B.C., which was formed to take over all of the rights and obligations of the Walter W. Johnson Co. in this property and proceed with examination work. Atlin Placers Ltd. has an authorized capital of 100,000 shares of 50¢ par value, of which 75,002 have been issued and are outstanding. The Walter W. Johnson Co. later acquired and now owns all of these shares except 2 qualifying shares held by directors. During the war contacts could not be established with the owners, the property could not be developed and it was impossible for the lessees to comply with the terms of the agreement. However the leases and water rights were maintained in good standing by Atlin Placers Ltd. and the necessary recordings made and fees paid. In 1946, contact with the French Co. having been re-established, a new agreement was made between the French Co. and Atlin Placers, Ltd., dated 1 July 1946 which modified the original agreement of 1939. The assets of the French Co. are still technically under control of the Canadian Alien Property Custodian but action has been initiated to secure return to the owners. The principal terms of the current agreement are:

Purchase price \$350,000 less \$15,000 paid prior to 1946; \$3,500.00 paid 1946. Balance payable from royalty of 10% on production; minimum royalty to be \$10,000.00 in 1948 and \$20,000 for each year thereafter; entire purchase price to be paid by 15 Dec. 1957. Lessor receives 1/3 of any premium on increase in price of gold over \$35.00 per oz. less any direct taxes assessed on premium.

Lessor to survey ditch system in 1946, order material required for repair and for construction of 2500 discharge flume and ship during winter 1946-47. Hydraulicking of till and mining operation to commence in season 1948.

All payments to be in U.S. funds. Agreement can be assigned with written consent of lessor; can be cancelled on 30 days notice by lessee; can be cancelled by lessor for default only on written notice and 60 day period of grace for lessee to correct deficiencies. Agreement has usual terms re conduct of operations, mechanics liens, insurances, maintaining leases and water rights good standing, records, etc. Improvements to real estate become property of lessor, equipment and tools remain property of lessee.

WATER RIGHTS:

Following is a list of water rights held by the French Co:

<u>Recorded number</u>	<u>Quantity</u>	<u>Creek</u>	<u>Date of Grant</u>
CL-9361	20 c.f.s.	Union	Dec. 30, 1927
CL-4465 (WL-112)	28 "	Otter	July 1, 1908
WL-7	4 "	Snake	Aug. 5, 1911
WL-8	11 "	Wright	Aug. 5, 1911

Permit #416 over crown land is appurtenant to CL-9361.

In addition, the Co. holds the necessary permits for ditches, etc. Annual renewal fees on the above amount to \$133.50, payable to the Dept. of Lands and Water Rights Branch at Victoria, B.C. on or before 31 December of each year.

MINER'S CERTIFICATE:

In order to locate and/or hold any interest in mining property in B.C., Free Miner's Certificate is required. The certificates must be renewed on or before 31 May to continue the rights in good standing. The fees are:

Individual	-	\$ 10.00 per annum
French Co.	-	100.00 " "
Atlin Placers, Ltd.	-	50.00 " "

PHYSICAL ASSETS - FRENCH CO.

In connection with hydraulic mining operations, the French Co. constructed a ditch system with appurtenant structures, and a primary dam to create a storage reservoir in Otter Creek.

The locations of the ditches is shown on Exh. B, attached hereto. The principal sections are constituted about as follows:

WRIGHT CREEK - WRIGHT CREEK

Approximately 3700' of economy #36 galv. iron flume on timber frame and supports - orig. capy. 19.8 sec. ft @ 7.8"/sec. Approximately 110 ft of ditch.

WRIGHT CREEK - OTTER CREEK

- 6 wood flumes - 36" wide x 40" high total 734'
- 1 flume - economy #36 - 120'
- 1 tunnel (no gravel) about 100'
- 1 pipe line - 18" " 70'
- Ditch - 9000'
- Waste gates, etc. -

OTTER CREEK DITCH - (Below dam to penstock #1)

- 9 wood flumes - 54" wide x 30" high - total 1704'
- Pressure box, intakes, etc.
- Ditch - about 6200'
- Pipe line - steel - 28" to 24" dia. - 1/2 mi.

Most of the water system has not been in use for 6 seasons and all wooden structures will have to be rebuilt, including dam gates and intakes. Extensive sections of flume have been damaged or destroyed by snow and rock slides, and the tunnel is partly filled in. It would probably be desirable and economical to use a bulldozer and small shovel extensively for construction of ditch to replace flume, to excavate side hill benches to avoid trestle work under flumes, converting the tunnel into an open cut, and restoring line and grade in the ditches. It will also be necessary to reinforce some of the dams with earth fill. The pipe lines are reported in good shape, but will have to be relaid.

Below the penstocks in Otter Creek there is an extensive pipe line system with giants for hydraulicking. It is estimated that the capacity of the ditches and maximum head at the penstocks for hydraulicking in Otter Creek was as follows:

From Snake Creek		4 c.f.s. at 290' head
" Wright "	11	" " " "
" Union "	20	" " " "
" Otter "	28	" " 100' "

During dry periods it is estimated that 750 mi. is available from Otter Creek.

Other assets of the French Co. include a camp on Otter Creek with small shop buildings, mess and some cabins, (the large bunkhouse burned in March 1940 and some miscellaneous equipment and tools. Assets acquired by Atlin Placers Ltd. include a model 71 gas driven Keystone drill complete with tools, several hundred feet of casing and some spare parts; a Union drill with 5" casing and tools; some shaft sinking equipment including hoist and motor driven sinking pump, and other items (Air-compressor, diesel engine, generator and auto sold). The buildings are probably only in fair condition but are useable. The drills and powered equipment are in good shape. As of 1939 the French Company asserted that their investment in the property was about \$200,000. This amount probably includes any operating losses which had been incurred to that time.

GEOLOGY:

The drainage system and gravel deposits of the Atlin District are typical examples of glaciated areas, characterized by numerous finger lakes and extensive morainal deposits. The Otter Creek area has probably been subjected to glacial action at least three times which has resulted in a complex sequence of gravel deposition, glacial movement and stream action. These processes may have been further complicated by general land movement and faulting.

It appears that the last large glacier was in the Surprise Lake-Pine Creek depression and, as it flowed downstream, truncated the side valleys perhaps to bedrock as far out as the first projecting rock hills. Concentrations of placer gold on and near bedrock in the ancient channels were therefore carried away. Stream courses have changed during the several periods as evidenced by buried benches which have been found, and it is quite possible that the principal drainage channels may have undergone major changes. All of the Otter Creek gravels in the lower part of the valley contain some values which must have come from several sources. Reconcentrations must have occurred at various times and probably at several horizons.

It is likely that Surprise Lake was formed by a large terminal moraine which blocked the Pine Creek valley at the present western end of the lake.



At about the same time lateral moraines were left along the south side of the lake centered about  $3/4$  mile and more from the present shoreline. The depth of till decreases upstream (south) to practically nothing at two miles. Streams have cut into this material forming in general a low rounded surface relief with average surface grade of about 4.7% in lower Otter. Present courses therefore may or may not follow ancient bedrock channels. Above the storage dam on Otter, located about  $2\frac{1}{2}$  miles from the lake, the creek valley is flat and swampy to the forks of the creek. The left (or right limit fork) converges into a short canyon section about 1 mile above the forks. Early ground sluicing operations in this canyon produced about \$80,000 in very coarse gold from 300 lin ft. of creek channel.

The bedrock on Otter Creek and upper Wright Creek is classed by the Canadian Geological Survey as actinolite schist and serpentine. A schistose-granite contact extends generally SE from the north shore of Surprise Lake commencing about 2-3 miles east of the mouth of Otter Creek (see Exhibit "B").

A complete section of gravels has been exposed from top of glacial till to bedrock in Otter Creek commencing at a point about  $\frac{1}{2}$  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  $3/4$  mi. from the lake and discharges into it about  $\frac{1}{2}$  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 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 using 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 out in the present creek bed, see dwgs. 1 & 2. ~~Add benches.~~

Dwg. #1 attached hereto is a map on which is shown the principal physical features of lower Otter Creek, location of worked areas, and various prospect shafts and drill holes. Dwg. #2 is a map of a larger area marked to show prospecting results and dwg. #3 shows longitudinal and transverse sections principally of the drifted area. Map #3 was prepared from early data and should be considered only in connection with comments which follow later.

#### HISTORY OF MINING OPERATIONS:

Following is a brief history of mining on the creek as compiled from various sources which cannot all be confirmed but are believed to be generally correct:

The first mining in Otter Creek was started about 5- $\frac{1}{2}$  miles from Surprise Lake in the year 1901. Individual operators first panned, later rooked and then ground sluiced and were conducting small hydraulic operations by about 1905. This type of operation was carried on for a number of years in the upper end of the creek and was successful in a moderate way. It is reported that later a syndicate was formed which hydraulicked the high bench about 5500' from the lake and recovered about \$110,000, (presumably Au @ \$20.67).

Prospecting in the surface gravels near the mouth of Otter Creek led J. Maluin, a French engineer, to believe that bedrock gravel on lower Otter would prove payable. French interests financed ground sluicing and hydraulic operation which was conducted for a number of seasons in the lower reaches of the existing Otter Creek surface channel. Depth to bedrock was unknown during all this period and the mining operations never reached bedrock or disclosed any pay ground with important values. Recovery is not known but it is believed that values recovered at times may not even have paid operating expenses, which were not high. Maluin later concluded that the ancient creek channel into the lake was located about  $\frac{1}{2}$  mile easterly along the shore so operations were shifted to this point. Again the depth to bedrock and tenor of the gravel was unknown. The Cie. Francasi des Mines d'Or du Canada was formed in 1928. From available information it appears that this company conducted all work in the ancient channel as well as part of the preceding work in the recent channel. Their hydraulic operations, and much of the drifting was supervised by J. B. Moran, an experienced minor in this district and on these types of operations. Hydraulicking in the ancient channel was carried on for several years without reaching bedrock or developing any good values.

The French Co. states that their hydraulic operations over a period of 4 seasons produced 2250 oz. Au (810 fine) from an estimated 600,000 C.Y. mined, which is an average value of 10.6¢ per C.Y. for Au @ \$35.00. It is believed that most if not all this work was done in the gravels overlying the ancient channel.

It is reported that sometime prior to 1932 a shaft and drill hole total 75' deep, located about 1000' from the lake, was put down from the bottom of the out to a depth of 30' below lake level without reaching bedrock. Recover of same fine gold is reported. (Later information indicated that the bedrock channel at this point may be about 54' below lake level).

In 1932 a shaft known as the "Strand" was sunk in the bottom of the cut at a point about 2200' from the lake. Solid bedrock was encountered at depth at an elevation of about 26" above lake level, showing values of about \$1.00 per c.y. (Au @ \$20.67). It was later determined that the Strand shaft was bedrocked on the right limit rim. Drifting ground was discovered at the bottom of the shaft which resulted in development of the Strand level.

In 1934 the "Incline" shaft was sunk from the bottom of the hydraulic cut at the upstream face. (See dwg. #3). This shaft encountered the real trough in bedrock for the first time and recovery from the shaft showed \$17.48 per C.Y. (Au. @ \$35.00) (462 C.Y. - 285 oz. at 810 fine) Values in bedrock at this point were very good, probably as good or better than any subsequently located. Other prospecting conducted at this time under the face of the hydraulic cut disclose a higher pay horizon in the gravel above bedrock known as the Moran level. At this point, about 2000' from the lake, the floor of the levels were respectively about 4 and 9 m above bedrock, as shown on Dwg. #3.

Intermittent hydraulic operations carried on during these and later years to lower the drainage grade in the cut are said to have produced up to 35¢ per C.Y., but this recovery included values concentrated on the floor of the cut by previous sluicing and also local concentrations from small bench remnants uncovered in the rims. 20,000 C.Y. washed in 1942 near the lower end of the Creek produced 24.5¢ per C.Y.

The longitudinal section on Dwg. #3 shows that the Moran and Suoboda pay horizons are above the floor of the hydraulic cut. Values recovered from hydraulicking this area did not show the enrichment which would be expected if the high drift values extended downstream. Though some increase in values was noted, it therefore appears that the downstream limit of these horizons was located just below the drifted area. Drifting downstream from the incline shaft on the Strand and bedrock levels indicated that at least the Strand level values do not continue for any distance, and downstream operation in bedrock had to be discontinued in pay values on account of excessive water.

Extensive drifting operations were conducted from 1935 to 1939 inclusive on bedrock, Strand and Moran levels, mostly by laymen. Another higher pay horizon known on the Suoboda level was also found. The extent of drift mining is shown on Dwgs. 1 & 2. It is believed that production records kept by the French Co. and laymen are quite reliable, and total production has been checked from official records in the Gold Commissioner's office at Atlin.

The following summary by levels to 1939 inclusive is believed to be nearly correct. (Au @ \$35.00)

Level	C.Y.	Au: Value \$ per C.Y.	Approx. Total-\$	Au. Value Per Sq. ft.
Suoboda	2947	2.06	6,000	.572
Moran	7740	7.25	56,000	2.01
Strand	13137	8.75	115,000	2.43
BR	4485	4.63	21,000	1.29
			<u>\$198,000</u>	<u>1.94</u>
	28309	\$ 7.00		Col. 6.30

*Handwritten signature and date*

Partial reports show the following (Cf. Lowry)

<u>Year</u>	<u>Level</u>	<u>C.Y.</u>	<u>Au. Value</u> <u>\$ Per C.Y.</u>	
1935	Strand	545	10.10	5500
10/35 to 6/37	"	4694	12.00	56320
1938	"	1743	12.10	21100
<u>1939 (part)</u>	"	951	6.95	6610
1936	Moran	510	4.50	2350
1936	"	2885	9.35	27000
1939 (8)	"	154	9.42	1450
	BR	<u>3619</u>	<u>5.82</u>	<u>21130</u>
	Total	15101	9.34	141410
1941	Moran	1060	1.70	1800

The French Co. reported the following results from drift operations conducted by laymen - Strand & Moran levels:

(Au @ \$35.00)	<u>1936</u>	<u>1937</u>	<u>1938</u>	<u>3 yrs.</u>
No men employed (over 12 mos.)	14	18	12	
C.Y. handled	4550	6540	4628	15718
Au recovered - oz.	1300	3428	1760	6488
Production	35000	93800	48000	176800
Au value oz. - C.Y.	0.285	0.524	0.38	
" " \$ per C.Y.	7.29	14.32	10.35	12.28
" " per oz.	26.80	27.40	27.30	27.20
" indicated fineness	765	782	780	

Total Production 1939-43 incl. (from Gold Commissioner) \$35,000.

Season 1941 - Laymen sluiced on lower Otter near lake  
3000 C.Y. - 130.75 oz. - \$3,922.53 - 49.0¢ per C.Y.

In 1941 the Moran level was connected with the incline but caved in glacial mud and barren gravel. Cleaned out Moran portal and drifted upstream parallel to old works - made wages & expenses.

1060 C.Y. - 61.55 oz. - \$ 1,804.08 \$1.71 per C.Y.

An abstract from the official records showing gold produced and sold by the French Co. and their laymen was secured through courtesy of the Gold Commission at Atlin, Mr. N. F. Glassey:

1926	\$9,500.00
27	Nil
28	Nil
29	5,219.72
1930	10,158.99 (reported from 250000)
31	3,940.00
32	11,791.58
33	6,815.14
34	13,941.51
35	28,371.68
36	38,855.00
37	97,183.00
1938	<u>49,896.00</u>
Total	275,672.62

1939-1943 incl. - approx. \$33,000.

Comparison of these figures with those shown on the foregoing page is of interest in verifying the field reports from various sources.

During the period 1934-38 inclusive practically all production resulted from drift mining.

Total gold sold per official record - \$228,000.

Total drift production from above incl. 1939 - \$198,000.

Total drift production 1936-38 incl. only - \$177,000.

It is reported that hydraulic mining operations during part of this period which advanced the face of cut upstream from the incline level and continued upstream for some distance in the till were conducted at a loss, costs averaging about \$18,000 per season and production about \$16,000. It therefore appears that the summary of production by drift levels totalling \$198,000 through 1939 is substantiated by official records. Yardage was measured as actual volume in place.

All drifts were about 7½' high. They were advanced in front of the sets but heavy and extensive timbering was required. Boulders were picked out and left in the drifts, and are estimated to have been 35% of volume in place. Drifted material was hauled to the drift entrance in small cars and then dumped into the sluice box. Water had to be pumped from the Strand and BR levels; maximum volume estimated as a 3" stream under low head. The miners were experienced and, as conditions were in general favorable, mined the paystreaks out to the limit of workable pay or beyond, and also took out a few high grade pockets located below the floor levels some of which averaged over \$25.00 per C.Y. Intensive searches were made for additional pay ground up until the winter of 1942-43 but no more could be located so the tracks and pumps were pulled out and the drifts abandoned and they have since caved in. The drift miners lost money during the last few years of mining. All of the drift levels showed a steady decrease in values toward the upstream ends.

The average grade of bedrock for 1000' of drift is about 2.7% and the grade of the higher drifting levels was flatter than the bedrock grade so they all gradually converged toward bedrock at the upper end. The Strand and bedrock levels are very close together at the upper end, the Moran level is not much higher, and it is thought that the Suoboda is very close to the Moran at the upstream end of drifting. It is therefore likely that all of the intermediate pay horizons found in the drifted area will be found merged on bedrock a short distance upstream from the upper limit of drifting. The steady and marked decrease in values toward the upper end of the drifts indicates that whatever bedrock pay concentration continues upstream will not be substantially enriched by the addition of the high values found in the upper levels downstream.

The pay horizons in the drifts are not characterized by the presence of well defined "false" bedrock planes, but by tenuous layers of sandy gravel overlaying a thin deposit, 1"-2", of tight clay or silt locally called hardpan.

#### PROSPECTING PRIOR TO 1939:

About one half mile above the Strand shaft on the RL another shaft known as the Bethard (Berthard) was sunk about 100' without reaching bedrock. It is reported that some gold was recovered from the excavated material. A smaller

shaft was sunk on the LL near the creek at a level about 50' below the collar of the Bethard to a depth of 40' and drilled 15' further. Ten feet of sand was found in the bottom of the drill hole but bedrock was not located. Sampling showed some gold in the gravel but very little in the sand.

It is said that a shaft located about a mile above the Strand shaft reached bedrock near the rim. Apparently the values were not encouraging. J. E. Moran put down two drill holes in the same general area, both of which struck boulders at 74' and were abandoned without locating bedrock. Some values were reported from the bottom of the drill holes.

Further up Otter a party named Baker did some drilling about which nothing is known.

A few holes were drilled by a group called Northern Goldfields Co. in 1933 on the right fork of Otter a short distance above the forks. Results are unknown but it is believed the depth to bedrock was about 100'.

#### RECENT PROSPECTING:

The Walter W. Johnson Co., after negotiating an agreement with the French Co., started field prospecting in May 1939. At this time most of the drift levels were open and being worked in various places. Extensive sampling was done on these levels by extending the drifts, putting in shafts and raises between levels to estimate values in the intermediate gravels, and securing <sup>accurate</sup> amount data on the mining results. This information is recorded on Dwg. #2. Same surface sampling was also done.

In Aug. 1939 the "Main" or "Dorflinger" shaft was started on the RL about 6000' upstream from the incline shaft at the lower end of the drift mine. This shaft was sunk to locate bedrock in the bottom of the channel by drifting from the bottom of the shaft if necessary, and to accurately sample the gravel. Trouble was encountered at about 75' when quicksand and clay with some fine gravel appeared under considerable water pressure. Boulders appeared in the quicksand at about 86' but gravel was reached at about 93'. Quicksand under heavy water pressure was again encountered at about 99' and the timbering could not be held so the shaft was bottomed at 103'. The upper level of quicksand was fairly effectively sealed off with quick setting oil well cement piped into the silt around the shaft. A drill hole sunk in the bottom of the shaft bedrocked on what appears to be the RL rim at 24', or a total depth of 127'. The shaft was abandoned and allowed to fill with water on 28 Nov. 1939. Sampling results are shown on Dwg. #2. Material from below 55' was frozen in the dump and could not be washed.

Prospect drilling was commenced about 20 Oct. 1939 using a Union Drill with 6-3/8" OD shoe and 4-7/8" ID casing. 5 holes were drilled on line 1, one hole on line 2 and 8 holes on line 3 by 22 Apr. 1940. Locations and results are shown on Dwg. #3. The preceding work was done by Clarence Dorflinger and Dick Plumb, driller, both experienced men. In March 1940, direction of work was transferred to Atlin Placers, Ltd. (the Co. which had been formed to prospect and develop the property) and handled from its New York office with Mahlon Mill a former Newmont engineer, in charge of field work.

As it was evident that a heavier drill would be required to satisfactorily prospect the deep and heavy gravel, a Keystone 71 had been acquired and drilling was continued with this machine using a 7 1/2" shoe and 6" ID casing. Five holes were drilled on line A, followed by 3 more holes on line 3 and an "Extra" hole

about 385' downstream from that line. Drilling was temporarily suspended in mid-July 1940. Drilling results are summarized on Exh. "C". All of the deep drill holes encountered boulders which made the drilling very difficult. Two holes were lost on this account at depths of 87' and 97' and boulders had to be blasted in several holes.

During the summer of 1940 extensive surface sampling was done by Dorflinger in the glacial till at various places as indicated on Dwg. #2. Drilling with the Keystone with Plumb in charge was resumed in September 1940 and continued until weather conditions forced a shutdown late in October. This work was on line 4 located about 3500' upstream from the dam or 2.8 miles above the incline shaft. Data is shown on Dwg. #2 and Exh. "C".

The drill line locations were selected with the object of locating the upstream extension of the ancient channel, determine depth to bedrock, and to develop preliminary information on values and their distribution for large blocks of ground, as it was recognized that the work would be expensive. Line 3 was also located to take advantage of a deep transverse side hill cut which had been washed out by a break in the main ditch on the hillside above.

All work was suspended during the war. In Sept.-Oct. 1945 Dorflinger drilled 3 more holes on line 4 to complete the section. No field work was done in 1946.

Geophysical Explorations, Ltd. of Toronto was engaged in 1939 to make a number of bedrock profiles by a geophysical method of electrical resistivity. The results were very unsatisfactory and practically useless, apparently because the extremely varied character of the gravel deposits (ranging from quicksand to large boulders) and the presence of much live water produced indeterminate readings.

The cost of prospecting work during this period was in excess of \$60,000.

CHARACTER OF GOLD:

Following is a description of various gold samples:

<u>Location</u>	<u>Size of Sample</u>	<u>Color</u>	<u>Average Size of Particle</u>	<u>Shape of Particle</u>
Glacial till	Several oz.	Bright yellowish to light	Med. to fine	flattish ragged
Suoboda	" "	Dull brassy to pyrite	Coarse	rounded to flat
Moran BR	" "	Dull brassy to pyrite	"	Shotty
	" "	Med. dark greenish yellow	Mostly +8 to +20	Partly round
Lower pit #10 <sup>0</sup>	14.5 gms.	Silky golden to reddish	Med. to fine	flat-ragge
Do - #11	6.5 "	Dull brassy	" "	" partly round
Strand Check shaft	Several oz.	Dull toward brassy	Very coarse	Partly round
L-1H2 (Gravel)	460 mg.	Yellowish	Medium	Flattish-ragge
Shaft-hole 2	Several grms.	Darker than hole 2	Say 70% to 20 m.	" "
L-1-H5 (BR)	1960 mg.	light color	say 70% to 20 m.	" "
L1-H6 (BR)	201 mg.	" "	mostly -20	" "
WVJ Shaft	6' to 325'	Dull toward brassy	Coarse	Shotty

<u>Location</u>	<u>Size of Sample</u>	<u>Color</u>	<u>Avg. Size of Particle</u>	<u>Shape of Particle</u>
WWJ Shaft	32.5' to 36.5'	Mixed colors-darker	Fine to med.	Flattish ragged
" "	473 mg.	Mixed-mostly dark	Fine	
Line 6	----	Greenish yellow		

It will be noted that there is considerable variation in the character of gold recovered from the several horizons where pay has been found. Some general observations can be made, though there are some apparent inconsistencies. Gold recovered from the glacial till is generally bright, with very little coarse gold, mostly  $\pm$  30 and  $\pm$  20 mesh, and in flat but not flaky particles. This type of gold should be recovered without difficulty in a properly designed washing plant. Gold from the drifting levels is generally more oxidized, darker in color, coarse and rough. Its recovery should be easy. The gold samples from the Suoboda and bedrock levels are quite different from the others, being more brassy in appearance. Both are coarse and somewhat rounded and of a type easily saved in proper washing plants. Only a moderate amount of black sand is reported.

Samples of gold assayed by Abbot Hanks of San Francisco show the following:

<u>Sample Location</u>	<u>Fineness</u>
BR	777 $\frac{1}{2}$
Suoboda	832 $\frac{1}{2}$
Till	757 $\frac{1}{2}$

Production records quoted above indicate an average of about 778 (27.20) for 1936-38 incl. Drill calculations were based on 0.09¢ per mg. which is equivalent to 800 fine.

It does not appear that there is a well defined generic relationship between the gold from the various drift levels and the bottom of the bedrock channel, and it is evident that the gold originates from several sources. The driller reported a similarity in the gold from bedrock on line 6 and drift bedrock. Values found in the intermediate drift levels and the horizons are probably reconcentrations from glacial deposits and erosion during intermediate glacial periods when the lower end of the bedrock channel was blocked with gravel. In general, gold found in the upper glacial till is brighter and less oxidized than that found in the deeper gravels. It is not known whether any experiments have been made with amalgamation.

COMMENTS ON DRILL RESULTS:

The indicated bedrock profile plotted in Dwg. #1 shows a grade of 16.7% for 330 feet from the upper end of drifts to the deepest hole on line A, where the average grade through 1000' of drift is 2.7%. This is a very steep rise. The question arises as to whether the deeper holes in this line actually did reach bedrock. There is some reason to believe that large serpentine boulders similar to bedrock, may have been mistaken for true bedrock. There are also other possibilities: (a) a sharp transverse break does actually occur in bedrock similar to one found in Boulder Creek which is opposite Otter across the lake; (b) the deep bedrock channel bends sharply to the east (or west) just above the drifted area. Only further prospecting can answer this question.

It is believed that the other bedrock profiles obtained from drilling are



correct as the work was done by reliable and experienced men.

A study of the drill logs shows that the rise of core in the casing after driving was generally normal. Exceptions occurred in places where water pressure forced quicksand and some fine materials into the pipe causing excessive cores, and when boulders were encountered which caused deficient cores. Only the recognized normal and usual minor adjustments were made in account of core variations when calculating drill hole values.

In many cases the measured volume after pumping and washing off slimes was low. The question as to whether the core was actually obtained or whether it was forced out of the casing when drilling has been given a great deal of study. It seems probable that in general the drilled material was baled out but the slimes were so fine that they were floated off during the thorough washing process before measurement of volume and that therefore the method used for calculating drill hole values without adjustment for measured volume was sound and correct. It does not appear that values were often associated with very fine material but where they were it is probable that the gold particles would settle in the casing and be recovered from a lower level. It appears that this occurred in drill holes which passed through the floor of former hydraulic cuts. If values were associated with layers of boulders, which is believed to be a usual condition on this creek, drill recoveries undoubtedly undervalue the ground. This condition has been found in many placer deposits.

Drilling on line A, about 400' upstream from the drifted area, failed to show a continuation of values either in the upper gravels or on bedrock. Three out of 5 drill holes showed nil and the other two showed some concentration on bedrock with an average value of about 21.6% for 98' to 126' of depth. However, as mentioned above, it is believed that these drill holes may not have reached bedrock, so check drilling is desirable.

The single drill hole designated Line 3 - Extra, located 2100' upstream from line A, showed an average value of 77.5% for 83' depth (location of pay horizon unknown but believed to be near BK), indicating the presence of bedrock pay at this point. It should be noted that the hole was drilled in the bottom of a surface channel and that there is an additional 75' of till nearby on both sides, so that the average value for total depth over a workable width of cut would be reduced to about half the drill hole value. *0274/83*

Line #3, 385' further upstreams, has 9 completed drill holes of which all but one apparently reached bedrock and the line indicates a definite bedrock channel. Again at this point there is an additional 70' of glacial till nearby. Two holes, #6a and 7 show good values, 72.0% and 50.4% for depths of 108' and 113.5' respectively. In these two holes there was a very marked difference in the distribution of values; Hole #7 showed all values in the lower 2', whereas in #6a, only 35' west, about 80% of the values were recovered from 44 to 53.5', which was on end just below the floor of a former hydraulic cut. Hole 6a was a check hole drilled 5' from a previous hole lost at 87.5' in boulders. The first hole showed the same concentration at 45-50', but also showed same values around 75' which were not found in the check hole. Holes 5 and 8, 35' distant each way in line 3, showed values of only 13.7% and 8.9% respectively, so that side extensions of neither upper or lower pay horizons were found. Other holes in this line show values under 13% per C.Y. except Hole #1 which showed 29.8 for only 14.6 feet. Reference to the x-sec on Dwg. #2 will show the relation between drill holes on this line and surface features. It will be noted that the bottom of the ancient channel at holes 6 & 7 is under the RL bank of the hydraulic workings; the shallow bedrock at hole #1 evidently continues upward to the nearby bedrock bench exposed in the LL. *026* *018* *1005* *1003*

Drill line #1, located 1000' further upstream, consisted of 5 holes all of which reached bedrock at depths ranging from 78' to 98'. The deepest hole, #1, is apparently in the center of the bedrock channel and showed a value of 17.6% with gold concentrated above bedrock. 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 cut floor at about 29', and about 60% in a pay horizon at about 50' which does not appear in the other holes. Hole #3, is located 35' west of #1, showed an average value of 25.2% for 89' with minor pay horizons at about 19' and 75', and a principal concentration on and just above bedrock. Hole #4, 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, #5, located 35' 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 cut. \$2.80 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 depth 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 111.5' deep. The results were very irregular, 3 holes showing nil and the other 5 indicating 12.0% to 43.1% per C.Y. with concentrations mostly close to or on bedrock.

The prospect drilling completed to date shows that a concentration of values exists in a narrow bedrock channel from at least a point below line 3 to line 2, a distance of 2500', and that there are irregular intermediate pay horizons. Further prospecting is necessary to determine whether a primary pay channel exists between the upper end of drift works and line #3 and how far upstream from line 2. It is possible that pay channels may extend from near the upper end of driftings: (a) to the southeast toward Wright Cr. thence back into Otter, or (b) To the southwest around the western side of the exposed bedrock point opposite line 3. It is probable that remnants of bedrock benches will be found along the buried channels on which there will be concentration of values.

Attention is called to the general direction of the pay streak drifted on the Moran level. As could be expected, it appears that the location of the stream channel shifted considerably through the various cycles of changes in elevation, glaciation and erosion. Little is known of the extent and character of these changes and it is easily possible that conditions were such that buried pay channels exist which bear no relation to present surface topography or known bedrock channels.

#### VALUATION:

It is assumed that drifted areas were excavated 7 1/2' high, 1 C.Y. of drift material = 3.6 sq. ft. bedrock on any level. The area of drifts and average values are estimated as follows, using total yardage and recovery figures

*Av 35*

reported on the preceding page:

Level	C.Y.	Av. Value per C.Y.	Recovery	Sq. Ft.	Av. Value per Sq. Ft.
Suoboda	2,947	\$2.06	\$8,000.	10,610	\$0.57
Moran	7,740	7.25	56,000.	27,860	2.01
Strand	13,137	8.75	115,000.	47,290	2.43
Bedrock	4,485	4.63	21,000.	16,150	1.29
Total -	28,309	\$7.00	\$198,000.	101,910	\$1.94

(3.6)

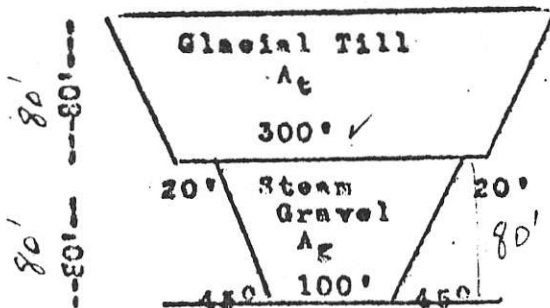
Total for superimposed sections 6.30

	Length of Drifted Area	Average Width	% Drifted for 100' x 800'	Av. Width of Level
Suoboda	300'	35'	13.3	160'
Moran	450'	62'	35.0	162'
			for 100' x 1200'	
Strand	900'	62.5'	39.4	122'
Bedrock	670'	28.3'	13.5	100'

The production information shown above, plus data obtained from miners and prospecting in the drifts is all that is available for estimating the residual values in the block of ground defined by the approximate upper and lower limits of the drifted area. The extent and tenor of pay horizons in this area can therefore only be estimated.

It appears that the channel on bedrock is about 100' wide and that both rims slope upwards at an angle of about 45°.

The section shown below is therefore assumed to be the average condition for a length of 1200' which is 200' more than the extreme length of drifted area.



$A_t = 1127$  C.Y. per lin. ft. of channel - Say 1200 C.Y.

$A_g = 533$  C.Y. per lin. ft. of channel - Say 600 C.Y.

From the average widths of drifted areas shown above it will be noted that the mined areas represent from about 9% to 39% of the total areas of the respective planes.

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It will be assumed that the plane of each of the drifted levels extends from rim to rim and is therefore 100' or more in width:

Bedrock level:- Av. value of drifted material: \$4.65 per C.Y., \$1.29 per sq. ft.

Prospecting drifts at the upper end of old works indicates continuation of values of the order of \$4.00 per C.Y. The miners reported about \$1.00 per sq. ft. (3.60 per C.Y.) at the upper end of the downstream drift. The bedrock values seem to be concentrated in narrow channels, as it can be expected that definitely lower values will be found in the unmined area and it is believed that it would be reasonable to assume a value of 70¢ per sq. ft.

Est. of residual value:-

$$(120,000-16000) \times 0.70 = 104,000 \times 0.70 = \$72,800.$$

Strand Level:- Av. value of drifted material: \$8.75 per C.Y., \$2.43 per sq. ft.

Short prospect drifts produced about \$4.00 per C.Y. Values appear to be fairly widely distributed on this level, so it is assumed that unmined ground will average \$1.50 per sq. ft.

Est. of residual value:-

$$(122 \times 1200 - 47,000) \times 1.50 = (146,400 - 47,300) \times 1.50 = \$148,600.$$

Moran Level:- Av. value of drifted material: \$7.25 per C.Y., \$2.01 per sq. ft.

It appears that the pay streak on this level does not parallel the two lower levels, but follows a diagonal course which may or may not swing back over the ancient channel. Extensive prospecting was done on this level by the miners without locating extensions of drifting ground. A conservative estimate is therefore indicated for the unmined area, say \$1.00 per sq. ft. The lower 400' of this level has also been removed by hydraulicking. '029

Est. of residual value:-

$$(152 \times 800 - 27,800) \times 1.00 = (121,600 - 27,800) \times 1 = \$93,800.$$

Suoboda Level:- Av. value of drifted material: \$2.06 per C.Y., \$0.57 per sq. ft.

Values in this level were marginal or below drifting requirements so it has not been mined to any extent. A prospect drift indicates an average value of about \$1.40 per C.Y. or 59¢ per sq. ft. The downstream 400' of this level has also been remined.

Est. of residual value:-

$$(160 \times 800 - 10,600) \times 0.30 = (128,000 - 10,600) \times 0.30 = 117,400 \times 0.30 = \$35,200.$$

Information from prospecting between levels and in the overlying gravels indicates that values exist in the entire section which are estimated at say \$1.00 per sq. ft. for the entire area, over a depth of 35' for the downstream 400' and 50' for the upstream 800'. (66.8¢ and 54.0¢ per C.Y.)

$$180 \times 1200 \times 1.00 = \$216,000.$$

SUMMARY OF DRIFTED AREA

Length - 1200'  
 Depth - 50' for 400' long 80' for 800' long  
 Total C.Y. - 640,000 less 28,000, remined by drifting = 612,000

Value	BR			Column Value	
				Sq. Ft.	C.Y.
		\$ 72,800.	7 1/2'	1.70	2.52
	Strand	148,600.	7 1/2'	1.50 ✓	8.40
	Moran	93,800	7 1/2'	1.00 ✓	3.60
	Suoboda	36,200.	7 1/2'	.30 ✓	1.08
	Gravel	<u>216,000.</u>	50'	<u>1.00 ✓</u>	<u>.54</u>
		\$566,400.		4.50	1.62

Av. value per lin ft. = ~~347.200.~~ 472.  
 " " " C.Y. (No till) = 92.5%

Glacial till overburden remaining 700 lin ft. at 1200 C.Y. per ft. = 840,000 C.Y.  
 Est. value - 15¢ per C.Y. = \$126,000.

Block from upper end of drifted to Extra Hole-2000' long.

The only data on this area is drill line A. Prospecting results from this line are negative and further work will have to be done to determine whether there is a bedrock or other pay channel through this block and where it is located. In view of the fact that rim rock is reported in the bottom of the present creek channel only 200' southwest of this line, it would appear advisable to continue prospecting to the northeast, which is toward higher ground. If a channel is found there, the total depth of gravel may easily be 200'. It is probable that there is a pay channel extending upstream to line 3, but present information does not warrant assignment of any value to this area.

DRILL LINE NO. 3 *Row - 1702*

From drill hole results, the average value on this line is 30.8¢ per C.Y. for 280' width and average depth of 70.8' or \$225 per lin ft. of channel containing 730 C.Y. To this should be added 500 C.Y. of glacial till per foot of channel, which will have to be remined. Yardage of till will increase downstream where the hydraulic out is narrower.

The Extra Hole about 400' downstream shows a value of 77.5¢ per C.Y., better than any hole on line 3. This hole is certainly a good indication that there is a pay channel at this point with as good or better values than indicated in line 3. Presence of a workable width of pay has not been determined.

DRILL LINE NO. 1 - 1000' from line 3. *Row PS - 1702 Zone*

From drill hole results (with no adjustment for the single high valued hole) the average value of the section is 70.5¢ per C.Y. for 175' width and average depth of 86.2', or \$395 per lin ft. of channel containing 560 C.Y. To this should be added 380 C.Y. per ft. for glacial till and slope gravel.

1699 - Tina

DRILL LINE NO. 2 - 1400' upstream from line 1

Prospect information on this line is not adequate for valuation purposes as hole #3 did not reach bedrock at 97' and showed only traces of values; and in the prospect shaft with drill hole on the bottom, values were determined for only the upper 55.3' of the total depth of 127'. Average value was 21.9¢ for 55.3'.

<u>SUMMARY</u>	<u>From Extra Hole to line 3 - 400'</u>	<u>Line 3 to Line 1 - 1000'</u>
Gravel - C.Y.	292,000	645,000
Till - C.Y.	200,000	440,000
Value-Total-\$	90,500	310,000
Av. Value-¢/C.Y.) Gravel only }	31.0¢ or better	48.0¢

For all of this area the estimated value of glacial till is 15¢ per C.Y. which is based on reported recovery from the hydraulic operations.

Particular attention is directed to the fact that coarse gold similar to that found in the drifts was recovered from only one drill hole. Coarse gold is a characteristic of the pay gravels of this vicinity and is also normally present in placer deposits containing a large percentage of boulders such as found in Otter Cr. Experience in a number of places where coarse gold was present has demonstrated that true average values are not determined by drilling and that such ground is therefore often grossly undervalued. Shafts or caissons are the only satisfactory methods of prospecting. The deep shaft in Otter Creek was sunk because this condition was recognized, but it was unfortunately apparently not located in the channel and extremely difficult ground was encountered so the results are inconclusive. It is likewise unfortunate that the shaft over #2 hole in line 1 could not be sunk to bedrock. However, all evidence supports the belief that values in the older gravels are principally in the form of coarse gold and that drill recoveries are not representative.

Screen analyses were made of two large samples of drift gold from different levels and of the gold (1960 mg.) recovered from hole 5 on line 1. For the drift samples the percent retained on each screen was the same within 1% which is a remarkable coincidence. About 37% of the drift gold was in particles over 8¢ or about 72 mg.

The drill hole sample was deficient in the larger sizes to such an extent that the indicated correction factor for total weight is about 2 to 1 if the drift sample is considered representative of the entire creek.

A similar comparison between gold from hole 5 line 1 and that recovered from other drill holes and the deep shaft indicates a greater deficiency of the larger particles in the other holes. Screened samples from surface prospecting in the face of cuts also show a much higher percentage of coarse gold than the drill holes.

In estimating the value of the drilled ground it is therefore considered proper to apply an overall adjustment factor to the values indicated by drilling of at least two to one. On this basis the average value of deep channel gravels (based on present information) for 1.5 million C.Y. in a block of ground extending upstream from hole "Extra" for a distance of about 2400' would be: (a) about

60% if the influence of the high valued hole on line 1 is eliminated; or (b) about 95% if this hole is included in the calculations at full value. This area overlain by say 1.0 million C.Y. of glacial till estimated at 15% per C.Y. Actual values in this deposit of boulders, gravel and glacial silt may easily exceed this estimate. Additional field data is necessary to confirm or disprove the above theory and secure a more accurate estimate. The overall adjustment factor is not applicable to valuation of the drifted area.

#### PROPOSED OPERATING PLAN:

It is evident that prospecting results to date will hardly warrant development of ground above the drifted area because (a) no pay channel has been discovered which connects with the lower end of values indicated by drilling and (b) the present indicated value of the drilled block is too low for profitable mining of an isolated area. The following plan therefore covers only the drifted area, but can be easily extended in whatever direction a pay channel appears.

Any plan for mining the drifted area and upstream must take into account certain important factors including the following:

- (a) All available water should be utilized for hydraulic mining from the surface to the lowest possible sluice grade. Information on water supply is meagre, but it may be possible to hydraulic most of the glacial till which can be handled easily as demonstrated by previous operations. Use of mechanical aids should materially increase water duty. Grade limitations will permit removal of some of the lower gravel if sufficient water is available. If the spring freshet water is fully utilized it is estimated that about 1/2 million C.Y. could be removed per season.
- (b) The channel gravels should by all means be mined rim to rim in a dry out to assure disclosure of side hill benches and possible change in the direction of pay horizons and to permit easy and thorough cleaning of bedrock.
- (c) On account of the limited amount of available water and the high percentage of boulders in the channel gravels, a mechanical operation is indicated for mining gravel below the hydraulic grade.
- (d) The units of equipment must be large enough to easily handle the material.
- (e) The scale of operation must be large enough to effectively utilize the equipment.

Surprise Lake affords unlimited room for tailings disposal within a convenient distance, which is a very favorable condition. Initially at least the operation does not warrant construction of a power plant. Availability of power from the existing private plant should be determined. Whatever electric power is secured should be supplemented by diesel or gas engine powered units. More accurate data should be secured on water supply for hydraulic mining, so the operation can be planned to utilize all available water and thus reduce mechanical operations to a minimum. Following is a brief outline of a plan which will meet the above conditions and needs and yet be flexible so changes can be made to suit conditions:

1. Rehabilitate the water supply system and relay distribution pipe lines.
2. Construct a hydraulic discharge flume upstream from the lake to the face of hydraulic cut over the drifted area. The discharge end should be above water level and the grade should be just sufficient to give good flow characteristics. The flume should be lined with steel plates. Riffles should be installed at the upper end and perhaps an undercurrent at another point.
3. As flume efficiency will be improved if the larger rocks are kept out, a dragline unit rated at say 3 C.Y. with a special rock bucket should be used at the face of hydraulic cut to remove and stack large rocks. It is possible that the number and size of rocks will be low enough to permit use of a heavy tractor with dozer instead of the dragline.
4. Construct a road about 2000' long on a very flat grade from the lake to the point where the grade intersects bedrock, which will be downstream from the incline shaft. Excavation will range from nil to about 45' in depth. The road should be wide and smooth for truck operation.
5. Construct a fixed washing plant at lake shore with facilities for removing boulders and rocks, and arranged for dump trucks to unload without delay.
6. Mine all bank material with heavy duty diesel shovel of suitable size, not less than 3- $\frac{1}{2}$  C.Y. capacity and perhaps larger.
7. Load all excavated material, boulders included, in large trucks, at least 15 C.Y., and haul to the washing plant at the lake.
8. Use a D-8 tractor with dozer for cleaning bedrock, building roads and utility purposes.
9. A small open bedrock drain will be necessary along the road. It will probably be advisable to set up hydraulic giants for washing down the rimrock.
10. A low head pumping unit using lake water will be needed for the washing plant, and it may be necessary to supply auxiliary water at times for the main hydraulic flume and also the bedrock flume if much glacial silt is encountered in the lower gravels.
11. Construct necessary camp buildings and shops and install necessary repair facilities and shop equipment.

The proposed mechanical plant should handle 2400 C.Y. per 2-shift day if equipped for the capacity of a 3- $\frac{1}{2}$  C.Y. shovel, and proportionately more for larger units. The operating season should be from 120-140 days per year, so capacity with 3- $\frac{1}{2}$  shovel would be about 300,000 C.Y. per season. Required stripping capacity is in the ratio of about 1.5 to 1 so water would be required to handle about 450,000 C.Y. per season, or 3750 C.Y. per 24 hr. day. This would require at least an average of 1300 mi. On the above basis this block would be mined out in 2 full seasons of operation.

Advantages of the proposed plan include:





	Brought Forw.	603,500.
Operating expense - gravel - 612,000 C.Y. @ .50	-	306,000.
" " - till - 804,000 @ .13	-	109,200.
Bal		<u>415,200.</u>
		\$188,300.
Less - miscel. taxes, fees, head office & gen.exp.	51,300.	
" - interest on income notes - 3 yrs.	81,000.	<u>132,300.</u>
Net profit before depreciation, amortization, depletion & income taxes		\$ 56,000.
Depreciation & amortization - est. 12% for 2 yrs.		\$120,000.
Profit before depletion		Nil
Balance available for repayment of investment		\$ 56,000.

SUMMARY:

Based on available data, the estimate given above does not indicate that Otter Creek is a proven mining proposition at this time as mining of the most favorably situated ground would be completed in 2 seasons of operation without returning any important part of initial investment, though it should pay 6% interest charges thereon.

Furthermore, the existence of a workable paystreak from the upper end of drifting to below line 3 has not been established. However, it is probable that such a pay channel does exist and that its average value as well as the value of the prospected ground continuing upstream will justify mining operations on a long term basis at a fair profit.

Continuation of prospecting is therefore indicated to determine the potentialities of the property. At least two plans for prospecting could be followed: (a) continue drilling only with perhaps some check shafts and (b) conduct hydraulic operations at the same time to utilize all available water. Each of these is discussed below.

- (a) Prospecting only. This work should be commenced as early as possible in the 1947 season, using both drills if possible. The first objective should be locations and value of the pay channel below drill line 3. Other desirable and important data would be obtained from say 2 carefully placed holes in the drifted area and 2 just below the incline shaft to ascertain whether much higher values than estimated above are present outside of the scotal drifts; a shaft at a suitable location to secure a reliable adjustment factor for coarse gold.
- (b) Prospect and hydraulic mine concurrently? M. Maluin, the French Co. engineer, who had many years experience in this district, and others have expressed the opinion that the most satisfactory and economical way to prospect this ground is by carrying on actual mining operations. This method offers some interesting possibilities. Its adoption would naturally be based on the belief that satisfactory workable values exist on Otter Creek but it will take some time to determine how the entire property can be mined to the best advantage. In the meantime all work which can be done will certainly benefit future operations. With this in mind the following plan could be followed:

Rehabilitate the water supply systems, construct a steel lined hydraulic tank flume on the lowest practical grade from the lake to the present face of out over the drifted area, use a minimum of powered equipment and utilize all available water for hydraulicing. The discharge flume would no doubt be flatter

than the present surface grade of the cut so it would be possible to wash materia on the cut floor which contains a concentration of values as past experience indicates. The grade of this flume would permit mining most of the remainder of the Suoboda and Moron levels and rim rock benches which would be exposed. Average values could be estimated at 35¢ per C.Y. for probably 3 years operation.

Dead work should be completed in 1947. Two large bulldozers should handle the work though a 1- $\frac{1}{2}$  C.Y. dragline would be useful. Some work would have to be done in the camp. It is estimated (without details) that the investment required would be about \$125,000.00 of which about one-third would be mobile powered equipment. A very rough estimate follows:

Production:- 1,100,000 C.Y. @ 35¢	\$385,000.	
Less-marketing, royalty, direct tax	48,000.	
Net production	\$337,000.	
Direct operating cost - 1,100,000 C.Y. @ 15¢	165,000.	
Indirect	45,000.	
Interest - \$120,000 - 3 yrs. - 6%	22,000.	\$232,000.
Balance		105,000.
Less - concurrent prospecting costs -		40,000.
Profit before depreciation, etc.		\$ 65,000.
Depreciation & amortization		36,000.
Balance		29,000.
Depletion		10,000.
Net taxable income		\$ 19,000.

The above estimate indicates that a reasonably satisfactory cash position would result after 3 years operation.

#### Comments on the above.

Plan (a), prospecting only, contemplates an expenditure solely for the purpose of ascertaining whether Otter Creek is or is not a workable property. It should be recognized the results may still be inconclusive after extensive work during the 1947 season. Development would be delayed at least 1 year. The Company should be prepared to expend at least \$50,000.00 in this work. If this plan is followed it will be necessary to promptly arrange a modification of lease terms with the French Co.

Plan (b), combined small scale mining and prospecting, will comply with terms of the lease, will give adequate time for prospecting and in itself will furnish much information, and, in the event that the property is finally reject will probably cost little more than adequate prospecting. It has the great advantage of starting development at the earliest possible date and demonstrating good faith by performance under terms of the lease.

#### CONCLUSIONS:

Otter Creek contains large deposits of gold bearing gravels. The materia is difficult to handle and must be mined by large scale combined hydraulic and mechanical methods. The results of prospecting to date are inconclusive. The character of both gravels and gold is such that values indicated by prospecting to date are probably 50% or less than actual values. Conditions are favorable for discovery of satisfactory pay values.

Additional prospecting is justified either as per plans outlined on the foregoing page or other plans. Surveys should be made to improve the maps. It does not appear that immediate investment in a large scale operating plant is justified by prospecting results to date.

If it is decided to only prospect in 1947 it will be necessary to immediately secure a modification of lease terms from the French Co.

No maps showing claim boundaries have been located in the files. If these are not found it is recommended that copies be secured from the Mining Recorded at Atlin. It will no doubt be necessary to locate additional claims adjoining present holdings, particularly to the east of Otter Creek beginning near the upper end of the drifted area, to protect areas on which prospecting will be desirable.

#### WRIGHT CREEK:

Little is known about Wright Cr. and no prospecting has been done. Small scale mining operations conducted on the upper part of the creek over a period of years have produced in excess of \$50,000 and some very coarse gold has been found, the largest nugget weighing about 44 oz. It is reasonable to expect that gold bearing gravels exist on the lower part of the creek and that the gravel is deep. There is a possibility that upper Wright Cr. may have flowed into Otter Creek at some time. At least some prospecting should be done on this creek before considering any termination of the French Co. lease.

Leases on other creeks are held for water rights and nothing is known of values except that presence of some coarse gold has been reported on Union Creek. As and when Otter Creek is developed, it is quite possible that profitable small scale operations will be developed on other streams in the vicinity.

San Francisco  
25 Oct. 46  
A. F. D.