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THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA

RESIDENT ENGINEER'S OFFICE,

HAZELTON, Dec. 22nd. 1924.

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R. F. Tolmie, Esq.,

Deputy Minister of Mines,

Victoria, B. C.

Sir:-

I beg to enclose herewith two carbon copies of my report on the Ennis Gold Mining Company, together with copy of covering letter accompanying the original to the Honourable the Minister of Mines.

I am, Sir,

Yours faithfully,

John D. Galloway

Resident Engineer.



RESIDENT ENGINEER'S OFFICE,

HAZELTON, Dec. 22nd. 1924.

Hon. Wm. Sloan,
Minister of Mines,
Victoria, B. C.

Sir:-

I beg to submit to you herewith my report on the property of the Ennis Gold Mining Company. The Directors of this company made a request for a special report on their property "with a view to criticising the present work and obtaining an opinion as to future operations and prospects of making the mine a success".

I was instructed by the Deputy Minister to re-examine the property when in the Quesnel Division in November, which I did and now have finished my report. I have refrained from any direct criticism of the manager, Mr. D. Ennis, although his plan of operation has not been effectual or successful. I would suggest that this report should be sent to the Directors of the company, as it may assist them in planning future operations. Under separate cover I am sending you a plan which also should be sent with the report.

By this mail I am sending two copies of my report to the Deputy Minister for the Departmental files.

I am, Sir,

Yours faithfully,

John D. Galloway.

Resident Engineer.



THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA.

RESIDENT ENGINEER'S OFFICE

HAZELTON.

REPORT ON

ENNIS GOLD MINING COMPANY

SPANISH CREEK

QUESNEL MINING DIVISION

BRITISH COLUMBIA

Report by

John D. Falloway.

Date

Dec. 22nd. 1924

SUMMARY OF
CONCLUSIONS AND RECOMMENDATIONS.

Conclusions

(1) The Ermis Gold Mining Company's placer property on Spanish creek consists of a number of placer leases which have been partly, but only slightly, worked in former years.

(2) The property is well equipped with a good water system which gives ample ~~water~~ for a long hydraulic season. The annual expense for the up-keep of this water system will be extremely low.

(3) There is a large yardage of gravels on the creek in which the percentage of large boulders is not high. Strata of cemented gravel are practically absent.

(4) The dump is unsatisfactory, as up to the present it has not been possible to get the hydraulic pit down to bed-rock.

(5) A few weeks hydraulicking was done by the company in 1923 and a full season's run obtained in 1924. In this time nearly 1,000,000 cubic yards of gravel was moved and a gold return of about \$2000 recovered from the sluice boxes. The manager considers that most of the gold in the gravel piped off is still in the bottom of the pit, held in the accumulation of boulders lying in the pit. The economical recovery of the total gold in the gravels is not practically feasible without getting a sluice box down low enough to reach bed-rock.

(6) No appreciable testing of the gravels for average values has been done by the company and the records available from previous work on the creek are too indefinite to be relied upon.

(7) It is possible that the ground can be effectively worked by hydraulic methods by bringing in a line of sluice boxes from the North Fork of the Quesnel river on a low grade up Spanish creek.

(8) The property is held under option of purchase, for \$75,000 payable September 30th. 1925.

Recommendations.

(1) Inasmuch as hydraulic operations have so far been a complete failure, financially, it is useless to carry on hydraulic work along the same lines during the season of 1925.

(2) The first requirement for the property is thorough testing to determine average values in the gravels : this testing will also give information regarding the bed-rock levels on the property , which is essential knowledge for the successful operation of the property.

(3) Testing can most economically and efficiently be done by drilling and for this character of ground and the depths to be drilled, a standard Keystone drill should be used. Such drilling if carefully done will give definite information regarding the depths to bed-rock at different points, character of the gravels and average values.

(4) The plan of bringing in a sluice from the North Fork on a low grade should not be carried out until adequate drilling has been done.

(5) Testing of the property is essential in order that the company may decide whether or not the option to purchase should be exercised in 1925.

(6) Unless different arrangements can be made for the purchase of the property , the capital required will be :-
Drilling \$10,000 , purchase price, \$75,000, re-equipment with steel-paved sluice from the river, \$40,000 : total \$125,000. The drilling and re-equipment figures are approximations and may be too high or too low.

(7) As the company now has an investment of about \$40,000 in the property , a further expenditure of \$10,000 for drilling is justified, provided the company can finance future obligations and operations until the property is productive.

GENERAL STATEMENT.

The Ennis Gold Mining Company was organized and incorporated for the purpose of acquiring and operating certain placer leases on Spanish creek, Quesnel Mining Division. The head office of the company is at Kelowna, B. C. , and Mr. D. Ennis is manager in charge of operations at the property. An option to purchase, for the sum of \$75, 000 , payable on September 30th, 1925, is held on eight placer leases, which are owned by Messrs MacDonald, Burns, Lynes, Harris, Henderson, and Robins.

Spanish creek flows into the North fork of Quesnel river , and is distant 8 miles from the town of Likely with which it is connected by an auto-road. Four of the placer leases held by the company extend from the mouth of Spanish creek up-stream taking in the valley of the creek ; the other four leases are on the left bank of the North Fork , one above Spanish creek and the other three below, and all adjoining. The important ground for the present to be worked lies on the leases on Spanish creek.

Spanish creek was worked many years ago, the bed of the present creek having been pretty well worked by the old-timers. Later on deeper ground lying on the right bank of the creek was worked by the Moore Mining Company (now commonly referred to as the McGregor workings) by means of a drift tunnel and incline shafts. The Moore Mining Company holdings were sold to John Hobson and the property was equipped as an hydraulic mine. A pit was started near the mouth of the creek and piping was carried on for one or two seasons, and then stopped. In 1912 the property was acquired by John Hopp and another hydraulic pit started on the right bank of the creek , near the mouth (opposite Hobson's pit) and piping was carried on for one season. After this the ground apparently became vacant until taken up by the present owners, and now under option to the Ennis Mining Company.

When the property was acquired by the Ennis Mining Company nearly all the necessary equipment for running an hydraulic mine was on the ground : this equipment was owned or controlled by the Hobson Estate. By arrangement with the Hobson Estate this ^{now} equipment has ^{now} been secured by the Ennis Mining Company. In addition the company has a small saw-mill for cutting lumber and timbers.

The water records held by the Ennis Mining Company consist of 5000 acre-feet storage on Spanish lake and 33 cubic feet a second water rights on Spanish and Black Bear creeks. Arrangements have also been made whereby the company has the use of the dams on Spanish lake and Spanish creeks, originally constructed by John Hobson.

GEOLOGIC FEATURES.

Spanish creek is a fair-sized stream flowing from Spanish lake into the North fork of the Quesnel river. About a mile up Spanish creek from its mouth (following the windings of the stream) Black Bear creek joins it from the east. Immediately below the mouth of Black Bear creek, Spanish creek flows through a canyon with a rapid descent of about 250 feet in about 800 feet. Below the canyon to its mouth, Spanish creek has a fairly regular grade of about four per cent.

The canyon of Spanish creek is a recent gorge cut through bed-rock: below the canyon the creek flows over gravel that is not very deep to bed-rock. It would seem that this part of the creek follows more or less the rim of a deep channel which lies to the east, or on the right bank of the creek. Evidence for the existence of this channel ~~is~~ follows:- The surface topography suggests a channel, going through east of the canyon of Spanish creek to Black Bear creek, the outcropping of what appear to be rims on the left bank of the North Fork (which stream would cut at right angles the old channel) and the drift workings of the Moore Mining Company.

So far as can be gathered from the available evidence Spanish creek yielded but little gold above the confluence of Black Bear creek. After the bed of the stream had been mined, the Moore Company commenced work on the assumption that there was deeper ground on the right bank of the creek. By means of a drift tunnel, 1500 feet long, and three incline shafts this company found bed-rock deeper than the present creek-bed and carried on mining operations for some time. Gold was obtained but in what amount ~~is~~ cannot be exactly determined. In the Annual Report of the Minister of Mines ^{for 1902}, it is reported that this drifted ground went two ounces to the set: other reports give higher values. An excessive flow of water in these drift workings made operation difficult but it is claimed that the work paid. This company sold out to John Hobson, who opened up the property as an hydraulic mine. In connection with his work, Hobson made an excellent

plan of Spanish creek, showing the Moore Company workings and a number of vertical sections at different points along the creek. A copy of this plan is attached to this report.

As this plan was made at a time when the Moore Company workings could be entered and mapped, it must be assumed that it is substantially correct. From the sections on the plan it is apparent that the Moore Company drift followed along the rim of the presumed deep channel and much deeper ground is shown to the east. The actual depth of the deepest part of this channel ~~is~~ ^{and} position of the other rim (which are shown in the sections) must be considered as assumed and not exact, as no workings reached the centre of the channel and no drifts were driven to the opposite rim. The important information from this plan for the Ennis Mining Company is the depths shown to bed-rock at different points in the Moore Company workings.

The gravels exposed in the bed and banks of Spanish creek are ordinary glacial and post-glacial gravels. They are in large part post-glacial gravels consisting of glacial gravels resorted by stream action. As shown by the Ennis pit the gravels are well stratified and there is an entire absence of slum. Near the top of the right bank of the pit there is a well-defined strata of boulder clay which carries many boulders, but very few of large size. No cemented gravel occurs.

The bed-rock gravels as exposed in the Moore Company workings (cannot be seen now) are described in the 1902 Annual Report as follows:- "The gravel in this old channel is well water-worn and flattened, carries masses of iron pyrites, white iron, pyrrhotite and galena, and seems to be an important and valuable deposit!"

Rim-rock shows in the Ennis pit on the left-hand side and this probably corresponds with the shallow ground worked in the bed of Spanish creek, and it may be the highest point of the rim of the deep channel to the east. The sections on the Hobson plan show the Moore Company workings to be on the rim of this deep channel but it quite possible that these workings are not far from the deepest ground of this channel. No bed-rock is exposed in the bottom

of the Ennis pit and it will be necessary to get down to approximately the level of the Moore workings before bed-rock is reached.

On the east side the Ennis pit has a high bank of gravel up to 150 feet in height with from 50 to 60 feet on the other side. Ahead of the pit there is less overburden until past the McGregor wheel-house, where the ground rises steeply. It is quite possible from the topography of the country that the bed-rock at this ~~point~~ has a similar sharp rise.

No panning or testing of any kind was done by the writer. The gold from the clean-up was not seen but is said to have been comparatively fine, as would be expected, occurring as it ~~does~~ does in gravels lying well above bed-rock.

OPERATIONS.

Work was commenced by the Ennis Gold Mining Company in the late summer of 1923. To begin with much preparatory work was necessary, laying pipe line, repairing the flume and generally getting in shape for piping. Only a short run of two or three weeks piping was obtained before the winter freeze-up. A full season's piping was carried out in 1924, the freeze-up coming early in November.

In commencing work on the property Mr. Ennis decided to open up an hydraulic pit at a point about one-half mile up the creek from its mouth. As previously stated both hydraulic pits previously commenced on the property were within a short distance of the mouth. Mr. Ennis did not expect to be able to get down to the bedrock of the Moore Company's workings with this pit, but intended to take off a large part of the overburden by hydraulicking and then use a drag-line scraper to dig the remaining gravel down to bed-rock. The Ennis pit is situated nearly over the Moore Company's drift tunnel and just below the McGregor wheel-house - the last incline shaft of the Moore Mining Company. At this point Spanish has a semi-circular bend in it with a high bank of gravel projecting out from the general contour of the valley, and forming a ridge. This high ridge of gravel was attacked from both the up-stream and down-stream sides of the semi-circle with monitors and a large cut made right through it. The gravel was carried off by two short sets of sluice-boxes, which carried the gravel into Spanish creek. By confining the stream to one channel by means of logs and brush, the creek carried away the tailings *to the river*.

The water -plant on the property is an excellent one. The water from Spanish lake is regulated by a dam at the outlet: then it flows five miles down Spanish creek to a ^{small} dam at the head of the canyon which diverts the water into a flume, approximately 1000 feet in length. From the penstock at the end of the flume 1000 feet of pipe delivers the water to the monitors at the pit. From 150 to 180 feet of head is obtained and during most of the season there is enough water to run two monitors with eight-inch

nozzles. ~~xxxxxxx~~ The hydraulic work was quite successful from the point of view that a large yardage was moved at a low cost. About 800,000 cubic yards of material has been moved at a cost for actual piping operations, according to the Manager, of about $1\frac{1}{2}$ cents a yard. The piping however has left a large accumulation of boulders in the bottom of the pit and at the head of the sluice-boxes. This condition is largely caused by reason of the pit not being down to bed-rock. A donkey-engine, tackle and stone-boat was rigged up at the lower end of the pit in the fall of 1924 to stack boulders.

In addition to the hydraulic work a small amount of testing of the ground has been commenced by the management. In 1923 a shaft was sunk in gravel to a distance of 18 or 20 feet: on account of water it could not be sunk any deeper. Bed-rock was not struck and it is understood that no exact testing was made for values, the ~~only~~ main information desired being the depth to bed-rock.

After the close of the hydraulic season in 1924 a shaft was started a short distance below the end of the hydraulic pit, and to the east of the old Moore Company tunnel. At the time of visiting the property in November this shaft was down 18 feet six inches and sinking was being continued. A considerable flow of water had been struck and without a power-pump, not much headway could be made. A tunnel was also driven from a point on the North Fork, just above the water level, in a distance of 50 feet. From the end of this tunnel ~~mining~~^{shaft} had just been started and it was intended if possible to put this ^{shaft} down to bed-rock.

ELEVATIONS.

The following figures of elevations are taken from the survey made by ~~Mc~~^{Ennis} Ennis and Sexsmith, supplemented by bedrock depths as given on Hobson's plan.

Hopp sluice 8 feet above river (high water North Fork)

McGregor wheel-house 114 feet six inches above river.

Bed-rock, McGregor wheel-house, 75 feet below surface.

Bed-rock, " " " 39' 6" above river.

Ennis sluice 55' 8" below McGregor wheel-house, surface.

" " 19' 4" above McGregor wheel-house bedrock.

Ennis pit bottom (elevations irregular) 25 to 50 feet above
bed-rock.

Distance river to McGregor wheel-house 2626 feet.

Average grade of flume required starting at river to get bed-rock at McGregor wheel-house = 1.5 per cent.

Average grade of flume required to get bed-rock at Ennis pit cannot be exactly calculated as pitch of bed-rock unknown, but would have to be less than 1.5 % : probably a maximum of 1 %.

The above figures may be assumed to be substantially correct, quite sufficiently so for the purpose of estimating what grade of flume would be required to reach bed-rock. A grade of 1 to 1.5 per cent for a flume to carry off hydraulic tailings is extremely low and it would be quite impossible unless with a flume lined with steel plates. Such a grade would carry water and gravel but a large percentage of the boulders would probably have to be handled by mechanical methods so as not to block the sluice. Before putting in such a flume, if possible, information should be obtained if such a low grade has proved practicable anywhere. The required quality of high-carbon steel plates for paving a flume, or sluice-box, cannot be easily obtained from the usual sources supplying steel plates. As a rule it is necessary to get these plates by a special order from a steel rolling mill.

VALUES.

Not much information is available regarding the average values in the gravel deposits being worked by this company. This question is of course a most important one and one of the first things to be done by this company is to get this information as exactly as possible.

It is known that the drift workings of the Moore Mining Company proved that there was a bed-rock concentration of gold in the deep ground which was rich enough to pay to work as drift diggings. Overlying this bedrock concentration there is a thickness of gravels varying from 60 to 200 feet. Assuming that it may be possible to hydraulic off these gravels down to the Moore Company workings, that is, to bed-rock, then it is obvious that if the only gold content is the concentration on bed-rock, then this streak would have to be very rich to make the proposition pay. Various figures are reported as to the richness of the bed-rock ground, running from 2 to 17 ounces to the set: but much richer ground than this would be necessary to pay to hydraulic off the whole mass of gravels.

There is however some evidence to show that the upper gravels do carry a small gold content, distributed somewhat irregularly through them. A report by John Hobson gives ^{an estimate} ~~xxfigure~~ of 70,000,000 cubic yards of gravel lying above the present bed of Spanish creek with an average gold content of 23 cents a yard. This figure was obtained by means of a limited amount of testing by small pits and therefore cannot be accepted ^{as} being very accurate. According to Mr. Ennis, from 800,000 to 1,000,000 yards of gravel have been removed in the pit he has operated, and from this ground approximately \$2000 has been recovered in the sluice boxes. This gives an average value for the gravel handled of one-fourth to one-fifth of a cent per cubic yard.

The amount of gold recovered from the Ennis pit is however only considered to be a small proportion of the total gold contained in the gravels hydraulicked off. As has been pointed

out , the sluices and pit bottom were not down to bed-rock and a large accumulation of boulders is piled up ahead of the sluices, and under these conditions it would be practically impossible for much gold to get into the boxes. The boulders in the pit bottom form a natural riffle which would collect most of the gold contained in the gravel piped over them. Any estimate of what percentage the gold recovered in the boxes is to the total gold in the gravels cannot be considered as other than a "guess" . Under ordinary conditions the piping off of nearly a million yards of gravel would have given an most excellent test of the gold content of this gravel deposit , but for the above reasons the test is of no value and is uncompleted until such time as the pit bottom is cleaned up to bed-rock.

The shaft and tunnel work which was done by Mr. Ennis this fall may have given some information regarding values in the upper gravels , but the results are not known to the writer.

FUTURE OPERATIONS.

In any hydraulic mine the three essentials are:-

- (1) Sufficient gold in the gravel to pay for operation : (2) Sufficient dump to handle tailings : (3) Ample water supply under a good pressure-head .

A consideration of the property of the Ennis Gold Mining Company from the standpoint of the above factors shows:-

(1) No exact information is available as to the average gold content of the gravels , and all reports, estimates etc. of such values must be classed as guesses based on entirely insufficient data. There is however enough preliminary information to make it quite warranted to thoroughly test the gravels, with the reasonable expectation that pay values will be found.

(2) The dump is unsatisfactory. By bringing in a sluice from the river on a 1 to 1½ per cent grade it may be possible to successfully hydraulic down to bed-rock. From the surface topography it would appear that up-stream from the McGregor wheel-house the bed-rock should rise rapidly and therefore hydraulicking of the gravels above this point be may be quite practicable. More information as to the depth of bed-rock is necessary before this could be assumed. ~~It~~ If hydraulicking is attempted on a low grade, the costs of operation will be higher , so that higher grade gravel is required than with a sluice on a normal grade of four to six per cent.

(3) The property has an excellent water supply, with sufficient pressure-head for hydraulicking. This is a very favourable feature of this property which insures low-cost operation provided that a suitable dump can be provided. The North Fork is a large stream which will take away all tailings when delivered at or near the mouth of Spanish creek. The costs of hydraulicking, as given by Mr. Ennis, of 1½ cents a yard are very low. With a flume running right to the river and handling of all boulders the costs would necessarily be higher. Also something additional must be allowed for overhead, interest, depreciation etc. Under these conditions a cost of from 3 to 5 cents a yard might be

anticipated but even this is quite low and would admit of low grade gravel being handled at a profit.

It is apparent that there is no use in continuing hydraulicking next season as was done this year (1924) . The operations were unsuccessful financially and there is no reason to suppose that handling more gravel under the same conditions would produce any better results. The shaft-work for testing was also unsatisfactory as owing to water it was impossible to make much headway by hand-work , and the ~~work~~ footage cost must necessarily have been high.

The company has spent approximately \$40,000 on the property and has not yet definite information as to the value of the property and how it can be operated at a profit. The season of 1925 should therefore be used to determine by testing the value of the property , in order to decide whether the option to purchase should be exercised and the property bought for \$75,000 next September.

By far the most economical and accurate method of testing the property would be by drilling, preferably with a Keystone standard drill. This drilling would give information as to average values throughout the gravel , as well as the bed-rock concentration, and would also give the depths to bed-rock at different points. Drilling would show whether the ground up-stream from the McGregor wheel-house could be successfully worked even though the ground below the wheel-house is too deep to be hydraulicked.

Testing of the ground could be done by shaft-sinking with the aid of a power-pump to handle the water. This method would be much more costly than Keystone drilling and no greater accuracy of results is obtainable by it.

The writer has no hesitation in recommending this property as being one with considerable possibilities. The first-class water system is a decided asset : the difficulties as to dump can possibly be overcome and the evidence of values , both in the surface gravels and in the bed-rock concentration , is good enough to warrant careful testing. A large yardage of gravel, running into the millions, is available for hydraulicking, provided the average values are high enough.

Notwithstanding these favourable features, it would be most inadvisable to assume that the property is sufficiently proven, and to go ahead with the plan to bring in a long sluice from the river paved with steel plates : more information as to depth of bed-rock and values should be obtained before this expenditure is incurred.

The cost of adequately testing the ground by drilling can only be roughly estimated as the total amount of drilling to be done would be determined to a large extent from the results obtained from the holes drilled in the progress of the work. From \$5000 to \$10,000, exclusive of the cost of the drill would probably be required. Drilling costs would run from \$3 to \$5 a foot.

Drilling could be started early in the spring , and provided the results were favourable , the property could be re-equipped with a flume from the river by next fall with everything in readiness for a full run in the season of 1926. If an arrangement with the owners could be made whereby the option to purchase was extended until 1926, with possibly a small payment in 1925, less capital would be required, as the 1926 clean-up would be available to pay the purchase price : all this is of course contingent on the drilling results being satisfactory.