REPORT

MAYO MINING DISTRICT

YUKON TERR. CANADA

by

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GENERAL

REPORT ON

MAYO MINING DISTRICT

LOCATION:

The Mayo Mining District, Yukon Territory, Dominion of Canada, is reached by steamer from Vancouver, B. C. to Skagway, Alaska (about three days), thence from Skagway by railroad 110 miles to the town of Whitehorse, Y.T., the end of the railroad; thence, in the summer months, via"sternwheeler" river boats carrying freight and passengers down the Yukon to the mouth of the Stewart River, a distance of about 325 miles, and up the Stewart 185 miles to the town of Mayo. Planes are available from either Skagway or Whitehorse, whereby the time taken up by river steamer transport may be greatly shortened, as flying time from Whitehorse to Mayo is 2.5 hours and from Skagway about 1 hour longer. From Mayo to Keno City, the mining town of the district, is 40 miles by auto over fair road. All the principal mines now have roads built to them.

The Mayo Mining District takes its name from the town of Mayo, situated on the upper Stewart River. The town of Mayo has been the shipping point for supplies of the miners working the gold placers of the district since 1898.

EARLY HISTORY:

A discovery was made some 25 years ago on Galena Creek at the west base of Galena Hill on the flat, and according to D. D. Cairnes - Geo. Surv. Canada, Sum. Rept. 1915, pages 27 - 29: "The Galena Creek vein is believed to have been discovered and staked by W. H. McWhorter and partner about the year 1906, but the claim was afterward allowed to lapse. The deposit was relocated in 1912 or 1913 by Mr. McWhorter who gave a lay on the ground to Jack Alverson and Grant Hoffman. The layers did the first real development on the property, and proved it to be of importance. They shipped 59 tons of ore to the smelter at Trail, B. C., the smelter returns for which amounted to $269. a ton in gold, silver, and lead, the gold being very low, but the lead amounting to 45%. In the spring of 1914 the property was acquired by Thomas Aitken and Henry Munroe, Mr. Aitken being the principal owner. During the winter of 1914 - 15 these owners shipped 1,180 tons of ore to San Francisco. The smelter returns for this shipment, according to a statement kindly furnished by Mr. Aitken,included $3. a ton in gold, and for about half of the ore, 39% lead and 280 ozs. of silver per ton, and for the other half 23% lead and 260 ozs. silver per ton."

Mayo General Report - Cont'd

Silver-lead ores were discovered on Keno Hill, adjacent to Galena Hill, in July, 1919 by L. Beauvet. Almost immediately the Yukon Gold Co. Ltd. secured options of purchase on the original claims and during the winter of 1919-20 prospected their holdings and secured options on a number of other claims. In 1920 a subsidiary company, Keno Hill, Ltd., was formed to operate the original group. The Yukon Gold Co. Ltd., acquired the Sadie-Friendship Group and in 1921 the Sadie-Friendship vein was discovered and the Treadwell Yukon Co. Ltd. secured a group on the northern extension of the same vein. About that time the Yukon Gold Co. turned over all its holdings in the camp to its subsidiary, Keno Hill, Ltd., and since that time Keno Hill, Ltd. has been practically inactive.

So successful was the Treadwell Yukon Co. Ltd. in their operation, that they erected a 100 ton mill which was put into operation in January,1925.

In 1921, staking was done on Galena Hill proper, but it was not until1923 that float was found which led to the discovery of an ore body, since shown by the mining of 1924-5, to be of importance. The Silver King on Galena Creek (original discovery of 1906) was closed down from 1916 until about this time when further prospecting was prosecuted thereon. In 1925 another vein was exposed by ground sluicing up on Galena Hill proper and was further prospected by an open cut. This property (Elsa Group) and the Arctic-Mastiff group were acquired by Treadwell Yukon Co. and operations were prosecuted until silver prices hit bottom and even then for some time thereafter high grade ore was shipped from the Elsa Group.

The Treadwell Yukon Co. had purchased many other properties between 1925 and 1929: The Silver King: Webfoot (adjoining "Silver King): Lucky Queen Group and Mathole (both on Keno Hill) and also operated a lease on the Sadie-Friendship from Keno Hill, Ltd.

With the fall of silver late in 1929 and early 1930, the options on Webfoot and that on the Arctic-Mastiff Group were dropped and all other properties operated until the fall of 1932 when all work was shut down except on the Silver King (Galena Hill) which was not closed down until April, 1934.

TRANSPORTATION:

Hauling at present is largely confined to the winter months when snowfall smooths out inequalities and it is possible to haul with sleds. Although much preliminary work has been accomplished, many branch roads must be built. The local government has been of much assistance, but the population is small and income possible for road building is limited, so that individual mines must themselves build the branches.The main road of some 40 miles in length

Mayo General Report - Cont'd.

from Mayo to Keno is fairly well laid out, has good grades and even at present can be said to be a fair average mountain mining road. It is not properly drained by ditches on the supper side and necessary culverts are lacking.

Starting with an expensive installation of "Cats" pulling 4 or 5 laden sleds with an average of 60 tons to one train, Treadwell Yukon Co. finding this method very expensive, abandoned it in favour of Moreland ten ton trucks, costing $9,000. each laid down at Mayo.

This step is said to have cut transport costs in half.

At present a fairly well established cost of hauling is approximately $5.00 per ton from most of the Mines to Keno City (distance, say, six miles) and $10.00 per ton from Keno City to Mayo (40 miles), because in the last few years local contractors have appeared.

In my opinion, this cost can again be much reduced by use of Ford semi-trailers hauling ten tons or more.

Local retail price is $.80 per gallon for gasoline, though only $.18 at Skagway.

In nearly all the properties a road cost of $10,000 to $15,000. should be listed as part of legitimate road expenditure.

Fortunately, most of the terrain is on gentle slopes and grades so that rock work is non-existent.

From now on, more and more hauling all the year will be the rule, requiring more and more gravelled and drained roads - a necessary cost to be reckoned with by local operators.

Passengers may readily go to the mining district by mail stage from Mayo to Keno City or by means of For Hire autos at Mayo.

By far the most satisfactory time saver for passengers in getting to the district is to take an airplane at Whitehorse for Mayo (time 2.5 hours. fare $100.), thus saving some four days in the summer months by river. This is still more necessary in winter months when passengers going "outside" must spend some ten days on sleighs drawn by "Cats" on the government road from Mayo to Whitehorse.

Freight transport is confined to May, June, July, August, September and October, when rivers are unfrozen and river steamers may go down the Stewart River to the Yukon, and up the latter to railhead at Whitehorse. These steamers are part of the transport system of the White Pass and Yukon Railroad. The railroad itself, 110 miles long, starts at Whitehorse and end at Skagway, the port of entry in Alaska, in American Territory.

Mayo General Report - Cont'd

The total item of freight transport from Mayo to Kellogg, Idaho; Trail, B.C. or A.S & R. Co. at San Francisco, according to White Pass Agents comes to $52.00 per ton, but to date I was unable to get itemized costs "out".

A. River steamer - Mayo to Whitehorse.
B. Railroad - Whitehorse to Skagway.
C. Ocean Freight - Skagway to Vancouver or coast points.

So, for the present at least, I am taking $32.00 as cost from Mayo to coast smelters.

In the event, however, that pig lead was accumulated at Mayo to the amount of, say, 3,000 tons, it is likely that an alternative routing with accompanying costs as per the following tabulation could be accomplished.

	Per Ton
1. Steamer Frt. down Yukon (1800 m.) to St. Michaels	$12.00
2. Transfer at St. Michaels to Ocean Steamers	1.00
3. Ocean frt. to Europe or Japan	7.00
Total charge per ton pig lead	$20.00

This, of course, is $12.00 per ton better than the present routing over the White Pass railroad into Skagway. Doubtless, it would be a matter of negotiation to ascertain if it be feasible. However, steamers are now laid up on the ways on the Yukon which, with barges, formerly took 3,000 tons as a load.

It was said locally that much this same cost ($20.00) could be obtained by shipment down Yukon to Nenana, thence over U.S.government railroad to Anchorage and from there by ocean steamer to European or Asiatic (particularly Japanese) ports.

At all events, as regards pig lead shipment, three alternative routes are possible. All these, of course, must be used in the six summer months to the end of October, when the rivers begin to freeze.

Calculations involving freights have all been made on the basis of $32.00 (on ore - at present) from Mayo to Vancouver, Seattle or San Francisco.

POWER:

Only a few small gasoline hoists are in use in the district.

The Treadwell Yukon Co. has two engines in its power plant at Wernecke - the settlement at the Company's principal former operation some three miles north of Keno City. One is a Fairbanks Morse Y type semi-Diesel; the other is a Busch Sulzer full Diesel.

Mayo General Report - Cont'd

Fuel oil for these, laid down at the mines, costs 38¢ per gallon and power cost from the Company's bath, according to various of its local men, whom I interviewed, was $.07 per k.w. hour.

Having conceived the idea that any considerable amount of power would be best derived from producer gas from the unlimited supply of nearby timber, I was glad to have this corroborated by the engineer, Mr. Schellenger, representing Keno Hill, Ltd., a former large producer, which is shut down at present. This man had gone into the matter extensively and believed, as I do also, that power from producer gas from local pine and spruce timber would cost 2¢ per k.w. hour.

Hydro-electric sites are available also, one such being feasible at the mouth of Mayo Lake, some 16 miles distant. However, the amount of possible power is not large, installation, like most of its kind, would be expensive, and winter troubles due to the excessively low temperatures might cause delays and expense.

A few miles distant from the locality is the valley of the McQuesten River, here some eight or ten miles wide and 30 long and covered with fairly heavy growth of somewhat scrubby pine and spruce. Some central point on the river would be a logical plant site, so that timber, if desired, could be rafted to the plant. Also a small saw mill could be installed. Sawed lumber could be turned out at $15.00 per M., which now retails at Mayo for $60. per M.

For the purpose of this and subsidiary reports, I have calculated on power at 7¢ per k.w. hour. Gasoline engines would serve all purposes and at all events only small amounts of power will be used for a year or so.

WATER:

The country is well watered though annual precipitation is only 12 inches.

Timber, moss and tundra conserve the sources and almost any gulch has a creek.

Two or three of the mines had water troubles. One, at 200 ft., pumped 40 gallons per minute which, with limited gear at hand, closed the mine down.

Another, at 600 feet, had to pump 260 gallons. This, however, made a good mill supply and was so used, though a 2400 foot drain tunnel was later driven, eliminating pumping except for the mill supply.

It is quite probable that most of the mines will have some water to pump, though practically all are from 1,000 to 2,000 feet up on the hills above nearby creek drainages.

Mayo General Report - Cont'd.

Costs due to pumping are not thought in any way likely to become serious.

One mine, depth 600 feet, on one of the near hills is still in frozen ground.

A logical custom mill site or one for a group of mines is at present on Christal Lake, about one mile below Keno City, where water supply would be assured.

TIMBER:

There is an abundant growth of pine, spruce and fir timber in nearly all the area for mine timber or for steam purposes. Ample supply for lumber can be obtained with little sorting. Cordwood is contracted for at $5.00 to $6.00 cut and piled in the woods.

LABOR CONDITIONS:

Prevailing wages for ordinary labor is $4.50 and board for eight hours, which makes a total cost roughly $6.00 per day, miners receiving $5.00 and board. Shift bosses receive $6.00 and board; foremen $7.00 and board; hoisting engineers, mechanics and the like $8.00 to $10.00 and board; truck drivers $8.00 and board.

At present there are very few miners among the 250 inhabitants of the semi-dormant settlement at Keno City, but any number can readily be secured from Vancouver or the Pacific Coast settlements.

There have been no labor troubles and under Canadian laws, there is little labor trouble to be apprehended.

CLIMATE:

In summer months, the days being long and with 15 to 20 hours sunlight or daylight, vegetables grow with rapidity. Carrots, beets, turnips, potatoes, celery, parsnips, cabbage, cauliflower and others are raised at Mayo, Keno and the vicinity.

Beginning about October 15th to November 1st, there is usually some snowfall and the weather rapidly turns colder. There are often stretches of a week at a time when the thermometer is 30 to 50 degrees below zero and in general, it may be termed severe winter weather for some four months or more.

However, operations of all kinds are little hindered by the weather, providing only that water supply for milling operations is properly provided for and provision made for preventing water pipes from freezing. As a matter of fact, all possible ore hauling is done in the winter months. In the spring, roads give trouble by alternate thawing and freezing, but much of such trouble would be avoided by properly drained roads, which has rarely been done. Road expense should be considered as an important item in large operations.

Mayo General Report - Cont'd

I think it a fair statement to summarize climatic conditions by stating that the climate is dry - annual precipitation being only 12 inches, and that the winters, though long and severe, are ameliorated by the fact that there is little or no wind and consequently no heavy drifts. Finally, climatic conditions add in only a small degree to operating costs and that year around operations have been and now are being prosecuted without other than occasional road troubles in spring.

TOPOGRAPHY:

Hills have been somewhat glaciated and are rounded with gently sloping sides. Topography is not usually such as to furnish feasible tunnel sites.

GEOLOGY:

This has been covered by various reports of geologists of the Canadian Department of Mines, in particular that of 1920, pub. #1869, Geological Survey of Canada, Ottawa, by W. E. Cockfield, "Silver Lead Deposits of Keno Hill Area, Yukon Territory, Canada".

Quoting from the author - "By far the greater part of the area is floored by chrystalline schists of the Yukon group, which are thought to be Pre-Cambrian .....consisting of Gneissoid quartzites, quartz mica schists, mica schists, graphite schists, hornblende schists and chrystalline limestone."

"These schists are cut at some localities by later igneous rocks - chiefly greenstone and granite"....."The greenstones are intruded as sills ... they range ....from diorite to diabase". "Quartz porphry and granite porphry occur as dikes and sills -- and in general are thought to be apophyses of a large granite mass ... underlying the district."

ORE BODIES:

Also quoting from the above authority:

"The ore bodies are found in fissure veins and are bound up with faulting, two systems of which are recognized." (Later authorities state fault fissures). "The galena occurs usually fairly pure, i.e. free from mixture of gangue minerals. In such cases it assays from 200 to 500 ozs. Ag. per ton, but in places it goes much higher, reaching 2,000 ozs. In such cases, it usually contains freibergite (a silver-bearing tetrahedrite). The lead usually averages 60%. These values, it must be understood, are for samples of the ore shoots and are not for the full width of the vein."

From report of 1929 - Canadian Department of Mines, Ottawa - The Mining Industry of the Yukon, 1929, by W. E. Cockfield:

Mayo General Report - Cont'd

"Treadwell Yukon Co. Ltd. has also pursued operations on the Ladue and also on the Sadie, owned by Keno Hill, Ltd."

"It has also pursued a campaign of developing likely looking prospects.. with marked success ... Lucky Queen, Silver King, Arctic and Elsa, all with exception of Lucky Queen, being on Galena Hill. On Sadie and Ladue work has been much extended. A drainage tunnel of over 3,000 feet has been driven. The vein has a maximum thickness of 70 feet ....But probable average is 7 to 8 ft."

"Mineralization is a siderite gangue with galena, freibergite and zinc blende."

"On the Ladue Group, there are two main ore shoots with ... lengths of 150 and 500 feet, but practically terminate at 400 ft. level." (Same grade since found on 600 level, according to the mine superintendent I interviewed in Vancouver, B.C. - Draper.)

"On Sadie and Friendship, there main ore shoots of 125, 175 and 200 foot lengths .. much faulting in evidence."

My own concept of the matter of geology and ore is as follows:

The occurrence of the ore is in fault fissures dipping at 70 to 80 degrees in country rock of schist or gneissoid quartzite whose bedding planes dip at 20 to 30 degrees.

Greenstone, diorite, rhyolite and other acid base dike rocks are intruded between or cutting bedding planes. They seem to have had little, if any, influence on ore deposits.

There has been some post mineral faulting, but not usually enough to interfere with mining economics.

Noteworthy is the large number of places in the camp where ore in small widths of 8 to 12 inches can be found, carrying 40 to 200 ozs. Ag. Veins are usually large, though on the surface not apparently so. Development on these small widths at surface almost invariably show stoping widths of 4 to 10 feet and many of which have widened in bulges of 40, 50, up to 70 feet of mill ore, carrying 35 to 80 ozs. Ag with 6% Pb.

The word "bonanzas" may be here applied as describing these bulges.

Typical ore occurrences are successive lenses of 50 to 150 feet in length separated by pinches or lesser grade of, say, 50 feet along the vein, the whole constituting a series of recurrent lenses in lengths of 1,000 feet along the vein.

Mayo General Report - Cont'd

PROSPECTING AND RESULTS.
HISTORY OF PRODUCTION:

Most of the terrain is covered with wash to a depth of from six to twenty feet, and is frozen most of the year. Considerable prospecting is done in the spring when, by damming up rivulets resulting from the thawing snow banks, the accumulated water, released in a mass, cuts a rough channel, the process being called "booming". This has been of much help in places where conditions are suitable.

Being frozen, the galena and gray copper, in the vicinity of the veins is in many cases, unoxidized.

Trenching is commonly used for prospecting, but one is struck with the apparent lack of this development and the fact remains that only a very small fraction of the area has had anything like systematic trenching.

There are some significant reasons why this has not been done. In the first place, even if a prospector succeeded in disclosing a vein and an ore shoot, he was immediately confronted with the necessity of paying out some $60 to $90 per ton to pay for mining, sacks, truck haul, steamer and railroad transportation and other accruing charges.

Add to this the fact that he was obliged to wait some three months or longer before receiving returns. It is apparent that not many prospectors could do anything.

On this account I am firmly of the belief that this matter of relatively inexpensive surface prospecting offers large opportunities.

If, therefore, the prospector succeeded in disclosing ore, almost automatically it was brought to the attention of the local manager of Treadwell Yukon Co. Ltd., who would then ship the ore in the name of the company and through its channels. This accounts for all ore being routed to the smelter at Kellogg, Idaho, which is owned by the Bradley interests.

In a number of such cases, after good ore was disclosed, Mr. Wernecke, the local manager for Treadwell Yukon Co., made an offer for the claims on which such ore was disclosed and with few exceptions the offer was taken at once by the prospectors. Price range for these properties is illustrated in the following tabulation.

1. Bought originally by Yukon Gold Co. for $40,000. the SADIE produced $3,500,000 under lease to Treadwell Yukon.

2. LUCKY QUEEN: Bought for $65,000. - 10% down on strength of showing in open cut showing good ore. Produced to date $4,290,000. The mine superintendent states the mine looks better now than ever before, at 200' depth.

Mayo General Report - Cont'd.

3. SILVER KING: Following production of a few hundred tons from a 100' shaft in 1914-15, vein faulted and no effort made to pick it up. Was shut down and after ten years was purchased by Mr. Wernecke for $25,000 spot cash. The production to date has been all from shipping ore, which disclosed also a wide vein of mill ore. Production has been about $1,000,000.

4. ELSA GROUP: Following the shipment of some 215 tons of 300 oz. ore from a shallow shaft on the Elsa claim, the vein faulted and with some development being prosecuted to pick it up, Mr. Wernecke purchased it in 1927 for $150,000. (10% down and total in 18 months) and shipments of crude ore for the next ensuing year or two, show smelter returns of $539,000. from 2,471 tons shipped.

The Elsa development also showed a wide vein and, it is said, some 30,000 tons of mill ore, which, together with some 50,000 tons also said to be in sight in the Silver King, a mile lower down in the valley, warrants the erection of a 350 ton mill for the two mines, and which step may be taken in 1935. Grade of mill ore said to be 80 ozs. Ag and 7% Pb.

5. WEBFOOT: This mine, after some small production, was purchased for $320,000. by Mr. Wernecke. It adjoined the Silver King which, then producing and showing large width of mill ore, exposed as usual with current development, probably accounts for the high price offered.

A first payment of $32,000. was made and a second of $32,000. but a third, coming due when silver began to slump in price, the owner refused to extend payment and the mine reverted to him. Mr. Wernecke then tore down all the buildings, moved 14,000 tons of mill ore onto his own ground adjoining and quit production. As per official Recorder's office records at Mayo, $228,200. smelter returns is shown from 1,600 tons of crude shipping ore produced therefrom.

In passing, this owner was interviewed at Keno City and was desirous of making a deal "on any reasonable terms", but he stated readily that Wernecke had left the 200 foot shaft and other workings "in bad shape".

This one enterprise seems to have been the only one where the acquisition of the property by Mr. Wernecke and its subsequent operation was not attended by highly enhanced profitable results.

6. CORAL-WIGWAM: On this large group of 17 claims with four shallow shafts, some high grade ore having been encountered. Mr. Wernecke offered $125,000. for three claims of the group, namely, Coral, Pasco, and Arnold, with the usual 10% down. Negotiations were not concluded due to the drop in silver and lead. Some three months ago, a new vein

Mayo General Report - Cont'd.

6. and high grade ore were found on the Arnold claim.

7. GOLD QUEEN - GOLD FLAT GROUP: An offer of $100,000 was made by Mr. Wernecke for the Gold Queen on the strength of showing of high grade in one open cut. Papers having been drawn up for that amount, owners asked $150,000., which caused the offer to be withdrawn, particularly as fraction owners nearby raised their price to $30,000.

8. ARCTIC - MASTIFF (Bermingham-Settlemier) GROUP: Owners tookout above their 100' level, one ore body 50 feet wide - all of direct shipping ore - $361,000. smelter returns from 2,100 tons shipped.

The ore body, that is to say, shipping ore, featheredout at 100' level which showed by crosscutting, 70' in width of mill ore carrying 30 ozs. Ag. and a few percent lead.

Mr. Wernecke offered $200,000. for this property and paid down 10%, sank a 200 foot shaft and encountered 40 gallons of water per minute. With inadequate pumps this work was very expensive, but he crosscut for the vein - here in a faulted zone - found it at 260 foot and then abandoned the enterprise after making the second payment as silver had by that time (1931) hit bottom. Probably also, the faulted vein found in crosscut showed moderate values only.

Meanwhile, the owners have found high grade on the surface several hundred feet distant and are now sinking a new shaft.

TREADWELL YUKON OPERATIONS:

These were centered at the Ladue, purchased for $260,000., and the Sadie-Friendship, operated under 50-50 agreement with Keno Hill, Ltd. These being highly profitable, a drainage tunnel 3,000 feet long was run tapping the vein at 600' and relieving a pumping expense. A mill was built (100 tons capacity - later tuned up to 125) and a town sprang up, which was called Wernecke.

The Keno Hill, Ltd. owning ground on Keno Hill, originally very productive, had closed operations in 1923 after making over one million net profit, according to their representative's statement, (Mr. Schellenger) and then leased to Treadwell. Under Treadwell's regime, Schellenger states that Keno Hill's profit was between $2,500,000. and $5,000,000. making a total of $3,500,000.net. In addition, a parallel vein - Lucky Queen - about 3,000 feet distant was opened up. Treadwell acquired it and made another large profit.

Thus, Treadwell's profits were somewhat as follows:

From operations on Ladue Group	$2,500,000.
From operations on Lucky Queen	2,250,000.
For'd	$4,750,000.

Mayo General Report - Cont'd.

	For'd $	4,750,000.
From operations on Silver King)		
" " " Webfoot)		500,000.
" " " Elsa)		
From 50-50 Agreement on Sadie-Friendship		1,250,000.
Total Approx.	$	6,500,000.

It is interesting to note the statistics of production, some of which data I compiled from the records of the official government Recorder at Mayo.

This gentleman, by the way, is my authority for the statement that total production aggregates $23,000,000. to date (net smelter returns).

The production listed following covers the claims under the Treadwell operations on Keno and on Galena Hill.

Keno Hill Claims		Tons		Net Smelter Returns
Ladue		5,956	$	993,694.55
Bluestone	milled (crude?)	90,000		3,322,110.89
Lucky Queen				4,291,704.38
Sadie				3,500,000.00
Friendship		353		59,169.93
Galena Hill Claims				
Silver King		5,000 (est.)		1,000,000.00
Elsa		2,471		539,393.00
Webfoot		1,612		228,020.00
Total Smelter Returns (Approx.)			$	13,934,592.75

The tabulation shown elsewhere, shows production to date (as compiled for me by local agent of White Pass and Yukon Railroad at Mayo) of 72,000 tons, almost equally divided between:

Crude smelting ore	37,769.75 tons
Concentrate	34,976.25 tons

All concentrate was produced from the Treadwell mill, which apparently made a point of treating no custom ore.

Most of the production was made with silver at 65¢ maximum, shading on down until operations ceased in 1932.

The mill ran about five years - from 1925 to 1930.

Mayo General Report - Cont'd

It is reported that Treadwell operations will again start in 1935 and included in their plans is the erection of a 350 ton mill to treat large amounts of mill ore blocked out in the Silver King and Elsa claims on Galena Hill - tonnage reported at 80,000 tons content 80 ozs. Ag.

Milling practise was very simple. From ore bins through gyratory (without intermediary reduction) to Hardinge Ball Mill. This latter was closed circuit with Dorr Classifier. The outgoing product without conditioning, to now somewhat ante-dated flotation cells. Flotation tails over two tables, whose product ran over a cleaner table. These tables were added later to catch some metallic silver escaping from some oxidised ores.

The ore shows remarkable amenity to treatment, extraction on long periods being 95% or thereabouts and in the last several months of operation, 97% and finally 98.5% or thereabouts. Criticism of lack of attempt to jig out coarse lead from these ores, though obvious, is hardly called for in the light of these high extractions. As a matter of fact, with such ideal conditions of a siderite gangue, 6% Pb as galena with silver in grey copper in the galena and only very small amounts of pyrite and zinc, a very high extraction should be made.

A rather dirty concentrate was made (60% Pb - 5% Zn) evidently for the sake of getting most of the silver.

GENERAL ASSAY VALUES:

The Canadian Government maintains an assayer at Keno City and all assays, in order to foster the mining industry, are made free of charge. This official, Mr. W. C. Sime, I found to be careful, well balanced and conscientious. At my request, he prepared the following tabulation, selecting at random three assays results shown on his books, as indicative of tenor of ore prevailing at the various mines or claims.

From their grade, it is clear that most of them are taken from streaks of smelting ore proper rather than as trench samples across a stoping width. Probably most of them represent widths of from 6 to 12 inches.

His tabulution follows:

GALENA HILL

	No.	Au ozs.	Ag Ozs.	% Pb.
Bermingham and Settlemeier Group	1	—	114.0	51.4 galena
	2.	—	154.0	60.0 "
	3.	—	128.0	49.0 "

Mayo General Report - Cont'd

	No.	Au Ozs.	Ag Ozs.	% Pb.	
Lone Star M.C.	1	—	150.0	72.0	Galena
	2	—	136.0	75.0	"
	3	—	132.0	67.0	"
Vancouver M.C.	1	—	146.0	7.1	Qtz. and Pbs
	2	—	141.0	7.6	" " "
	3	—	590.0	6.3	Freibergite
Cub M.C.	1	—	200.00	46.0	Galena
	2	—	193.0	72.6	"
	3	—	1100.0	6.0	Freibergite
Bunny M.C.	1	—	194.0	69.5	Galena
	2	—	216.0	61.2	"
	3	—	928.0	33.8	" and Freibergite
Gambler M C.	1	—	141.0	54.2	Galena
	2	—	200.0	67.8	"
	3	—	106.0	72.4	"
Croesus M.C.	1	—	508.0	14.6	Pbs. & Siderite
	2	—	275.0	19.6	" "
	3	—	90.0	41.8	Galena
Scotty M.C.	1	—	290.0	46.4	Galena
	2	—	185.0	75.3	"
	3	—	173.0	62.7	"
Lucky Queen M.C.	1	—	279.0	74.0	Galena
	2	—	145.0	66.3	"
	3	—	2781.0	60.0	" & Argentite
Nabob M.C.	1	—	143.0	83.3	Galena
	2	—	428.0	79.6	"
	3	—	276.0	81.8	"
Silver Basin M.C.	1	—	195.0	44.2	Galena
	2	0.8	1.6	—	Quartz
	3	1.4	19.8	—	Porphyry
King M.C.	1	1.0	35.0	9.4	Quartz
	2	0.8	117.0	22.8	" & Galena
	3	6.0	58.0	—	Arsenopyrite
Stone M.C.	1	—	210.0	64.5	Galena
	2	—	445.0	58.6	"
	3	—	127.0	10.8	Siderite

Mayo General Report - Cont'd.

	No.	Au Ozs.	Ag ozs.	% Pb.
BUNKER HILL:				
Homestake Group	1	—	87.0	7.4 Iron Ox.
	2	—	145.0	61.4 Galena
	3	—	2378.0	— Freibergite
SOURDOUGH HILL:				
Whipsaw M.C.	1	—	153.0	84.0 Galena
	2	—	192.0	72.2 "
	3	—	2632.0	21.2 Freibergite
LOOK-OUT MOUNTAIN				
	1	—	153.0	70.6 Cerussite
	2	—	212.0	70.5 Galena
	3	—	332.0	59.5 Cerussite
MOUNT CAMERON				
	1.	—	43.0	82.0 Galena
	2	—	56.0	70.0 "
	3	—	37.0	50.5 "
RAMBLER HILL				
	1	—	57.0	75.5 Galena
	2	—	79.0	80.1 "
	3	—	66.0	75.2 "
PYRAMID HILL				
	1	—	45.0	63.6 Galena
	2	—	50.0	71.8 "
	3	—	14.0	31.4 PbS & Stibnite
DUBLIN GULCH				
	1	2.8	1.8	— Scorodite
	2	4.2	7.0	— "
	3	0.88	2.32	— "
DUNCAN HILL				
	1	—	57.0	68.67 Galena
	2	—	66.0	72.64 "
	3	—	54.0	65.82 "

Mayo General Report - Cont'd

ORE SHIPMENTS:

I quote the following from the Recorder's records, Mayo, Y.T. taken by me October 17th, 1934, as example of completeness of records made available for my scrutiny. (This is only a partial list.)

LUCKY QUEEN

Time	Tons(2000#)	Ozs.Ag	Lbs.Pb	Amt.Realized (Smelter Rtns.)
Dec.31,'24-Dec.31,'25	983 Crude	261,010		$ 174,880.
Dec.31,'25-Dec.31,'26				
Dec.31,'26-Dec.31,'27				
Dec.31,'27-Dec.31,'28	4,700 (Con)	453,271	4,854,000 (51.6%)	
	1,449 Crude	653,121	1,618,950 (56%)	486,710.11
Dec.31,'28-Dec.31,'29	1,713 Crude	798,534	1,618,938	519,482.85
Dec.31,'29-Dec.31,'30	33,852 Milling & Crude	948,690	999,994	

1930 Shipments listed as follows:

	Metal	Ozs.or Lbs.	Amt. Realized	
	Au ozs.	69.347	$ 1,386.94	
	Ag ozs.	948,690.	341,381.54	
	Cu lbs.	29,294.	2,809.89	
	Pb "	999,994.	51,205.64	396,784.01
1931	Milling and Crude Ore - 47,115 tons			
	Au ozs.	246.98	$ 4,922.64	
	Ag ozs.	3,749, 039.10	1,119,681.76	
	Pb lbs.	4,663,814.	193,213.42	1,317,817.82
1932	Milling and Crude Ore --- 36,586 tons			
	Au ozs	228.023	$ 4,560.46	
	Ag ozs	2,917,030	799,677.51	
	Pb lbs.	3,859,712	122,042.06	926,280.03
1933	Mill Ore Concts. - 15,293.2 (Tons) ? (Probably includes crude ore for direct shipment)			
	Au ozs	66.64	1,707.72)	
	Ag ozs	967,029.	368,326.56)	
	Pb lbs.	1,498,394.	66,386.14)	469,749.56
	Crude Ore		)	
	Au ozs.	4.470	99.49)	
	Ag ozs	66,290.	24,350.39)	
	Pb lbs.	198,509.	8,879.26)	
			Total Smelter Returns	$ 4,291,704.38

(Note: Purchased for $65,000. by Wernecke on terms - 10% down.)

Mayo General Report - Cont'd.

STONE GROUP - Owner Matt Butyer

	Tons -2000#	Ag Ozs.	Pb Lbs.	Amt. Realized (Smelter Returns)
1924	19.1345	5,460.60		$ 4,312.02
1925	2.109	553.		357.40
1926	58.451	5,603.61		2,608.42
		Total Returns		$ 7,277.84

ARCTIC-MASTIFF GROUP

Bermingham-Settlemeier Owners.

1925	28.371	4,532.82	3,013.36	$ 5,259.39
1926	1,373.69	189,749.	1,544,416.	250,654.32
1927	450.91	68,382.9	468,038.	67,851.73
1928	255.26	40,785.6	246,659.	37,347.94
		Total Returns		$ 361,113.38

BUNNY

1930	32.816	5,309.	35,551	$ 5,345.74
	23.98	4,829.	19,136	3,647.88
		Total Returns		$ 8,993.62

Ladue - Friendship - Bluestone (T.Y.Co. Excluding Sadie)

LADUE

1922	55.25	10,200.	39,830	$ 7,747.01
1923	3,884.61	722,429.	1,929,525	527,591.98
1924	764.43	741,626.	2,380,502	426,359.50
1932	1,272.00	104,414.	978,090	31,996.06
	5,956.27	1,578,669.	5,327,947	$ 993,694.55

SADIE

$ 3,500,000.00

FRIENDSHIP

1923	353.	84,801	195,562	59,169.93

Mayo General Report - Cont'd.

		Tons-200#	Ag. Ozs.	Pb Lbs.	Amt. Realized (Smelter Returns)
BLUESTONE					
1925	(Conct)	20,983.	751,404	1,247,042.	$ 654,255.77
	(Crude)	—	32,848	154,450	36,924.79
1926	(Mill)	44,097	1,635,733	2,806,556	1,227,798.58
	(Crude)	—	40,968	216,220	43,598.09
1927		25,345	1,274,747	2,496,486)	
	(Crude)	—	22,132	127,685)	893,641.96
1928	(Conct)	1,146.3	527,197	1,212,325)	
	(Crude)	93.3	24,843	65,609)	431,331.33
1929	(Crude)	98.53	50,551	117,443	34,560.37
	Total Ladue, Friendship, Bluestone (excluding Sadie)				$ 4,374,975.37
ELSA					
1933	(Crude)	2,471.25	1,206,909		$ 463,906.60
	(Au ozs)	248.27			8,026.94
	(Pb Lbs.)			1,565,734	67,964.80
	Total Elsa				$ 539,893.34

			Au ozs	Ag ozs	Pb Lbs	
WEBFOOT						
1928	(Crude)	36.63	2.546	14,052		8,750.63
1930	" (?)	1,567.4	96.	417,735	1,188,306	214,935.88
1931		(?)		10,975	25,252	3,278.12
1932	Mined in '31 (?)			2,987	1,097	1,055.53
	Total Webfoot					$ 228,020.16

Mayo General Report - Cont'd.

The following is a statement of ore and concentrate shipped from Mayo, Y.T. during the years 1922 to 1934 inclusive, compiled by Mr. J. A. Fairborn, Agent White Pass & Yukon Route R.R. at Mayo, Yukon Territory. (In tons of 2,000 lbs.)

Year	Ore	Concentrate
1922	3,153	—
1923	8,560	—
1924	4,083	—
1925	1,182.5	1,419.5
1926	3,411.75	2,952.5
1927	1,516.5	2,933.25
1928	3,186.75	3,936.75
1929	2,965.5	5,643.5
1930	3,043.75	6,956.5
1931	498.75	4,960.75
1932	231.5	4,370.75
1933	3,021.25	1,750.75
1934	2,915.5	52.
	37,769.75	34,976.25

MINING:

Mining with machine drills has only been done at three or four properties of the Treadwell Yukon Co., and Keno Hill, Ltd. Mr. Schellenger, of Keno Hill, Ltd. furnished the following data on development cost - 1928 at Sadie Mine on 200, 300 and 400 levels - total footage - 1,708 feet.

Development Costs (Drifts)	Per Ft.	Stoping Cost Tons		Per Ton
Labor	$ 3.65			
Mucking	5.36	21,335		$ 5.08
Tramming	7.32	15,446		5.47
Explosives	2.76	2,115		9.46
Timbering	8.15	569		11.11
Air	1.98			
Sharpening	1.13	37,465	Avg.	5.57
General Expense	2.19			
General Expense - Gen.	2.66			
	$ 35.20			

Having seen the district, mines and conditions, I can say that total costs with proper management would be high at $18. per foot.

Such costs for drifting exposed to me what I believe to be gross negligence in management, for every one of the items quoted is, in my opinion, inexcusable. Locally, I heard, on all sides criticism of prevailing extra-

vagant Management and can well believe them.

The narrow veins are mined mostly by shrinkage stopes. Wider ones with pillars and filled cribs and sometimes filling at stratagic points. Still greater widths necessitated square sets, most of which were filled.

Round timber cut nearby is used. Walls are usually good and the ground is not heavy, so that no unusual problems are met with.

MILLING:

The former superintendent of milling operations agreed to prepare for me, cost and other details, which I have not yet received. Examination of some detailed records covering milling of 45,000 tons showed the cost as follows : Sadie ore:

Milling Cost	Per Ton Milled	
Labor	$ .85	
Supplies	.33	
Sacks and sacking	.59	
Materials	.08	
Power	1.24	(Reported at 7¢ per k.w.hr)
Repairs	.09	
General	.56	
Total	$ 3.74	

CONCLUSIONS:

It is highly significant that almost without exception, development has shown unusual widths of high grade mill ore, aside from the accompanying four inch to two foot widths (up to 12 feet) (12 in one case) of high grade direct shipping crude ore.

My contention is that in this large area, where some eight or ten properties have already been proven to be phenomenally profitable in spite of heavy transportation and pioneering costs, that they constitute only a fraction of the ultimate possibilities of the camp as a whole.

I wish to emphasize the fact that these eight or ten are in no way selected properties, that they have not been discovered by means of predominant outcrops or unusually rich float, or geological conditions, any of which factors might lead one to conclude that they might be better than average discoveries.

Mayo General Report - Cont'd

On the contrary, all outcrops almost without exception are covered by wash. High grade can be found on very many of the present located claims and it is certain that a very large number of veins and ore bodies will be found of equal or better values and extent than those already discovered.

A considerable number of veins have been disclosed even in the limited trenching and surface pits heretofore done. Some, in fact nearly all, are worthy of some considerable amount of development, even though they have not been opened up immediately in an ore body.

As in any mining camp, it is unlikely that all the veins disclosed will develop ore bodies like those described heretofore and there will undoubtedly be the usual number of exceptions to the general rule, complications due to vein faulting, water to be handled and the various other tribulations encountered in mining. On the other hand, the magnitude of ore bodies, number and continuity of veins, their large widths, are very impressive, also the large number of separated spots at which high grade float may be found at least in small amounts, is illuminating and prophetic. The float rarely occurs in large amounts except in the immediate vicinity of the vein and only then in bottoms of surface trenches near the vein. It has already been remarked what small amounts of surface exploration has been done.

It is my belief that here is a mining camp of the first magnitude and importance in an almost virgin state of richness and productivity. It offers very unusual opportunities for legitimate mining investment and these are many and varied and can be inaugurated on any scale desired from trenching favorable prospects, extraction of ore on a small scale basis up to more ambitious plans involving treatment plants and large scale development of mines.

Respectfully,

Marshall D. Draper

November 24th, 1934