

REPORT ON JUALIN MINE Kx 112-17

PE-112-15

Location: The Jualin Mine is located on Johnson Creek at a distance of 4 miles from the north shore of Berners Bay which empties into Lynn Canal, some forty miles north of Juneau, the Capital of Alaska.

Summary History: The Jualin was discovered by Frank Cook, local prospector, in 1895, and firstly operated by the Jualin Mining Company of Boonville, Indiana. A milling plant consisting of 10 stamps, with a daily capacity of 30 tons, was erected on the property as soon as development started and operations were carried on intermittently during the summer months of: 1896 to 1901, and 1905 to 1908. The mine was closed down, after a depth of 210 feet had been reached, due to numerous difficulties consequent to poor equipment and lack of adequate power which prevented the handling of pumping, mining and milling at the same time.

In 1912 a Belgian Group secured an option to purchase the property and equipment thereon. Important surfact improvements were made to provide the property with sufficient power equipment, buildings, etc. In 1914 the main shaft of the mine was put in shape and sinking resumed. As difficulty was encountered on account of the inflow of surface waters, sinking was stopped at a depth of 325 feet below the main adit level, while mining operations were carried on at the 310 level.

A drainage and haulage tunnel, size 7' x 8' and known as the Berners Tunnel, was then started at a point 7800' south of the mine. This work was eventually discontinued at 5000' (distance actually driven) as a result of the War. The effect of the War made it impractical for the Belgian Group to achieve the original plans and therefore a new Company, known as the "Southeastern Alaska Mining Corporation" has been formed to complete development and operate the properties.

The past operations of the Jualin Mine resulted in a production of 74,624 tons of ore of a gross value of \$881,785.

Accessibility: Taking Seattle, Washington, as a base, the property is approximately 900 miles distance, or three days by steamer. It is reached by several lines of steamships which pass the property three or four times per week in summer and about twice per week in winter. A wharf has been constructed at the mouth of Berners River, and connects the tunnel with tide water by a tramway line 2 miles long, which makes transportation easy and economical.

Property: The property consists of 34 adjacent claims covering an area of about 700 acres. The title of the Jualin property and locations are vested in the name of the Southeastern Alaska Mining Corporation.

The old Treadwell Group of mines, the Alaska Juneau Mine and other properties of great possibilities are located in the Juneau Region; a large number of auriferous lodes are massed in Berners Bay - a comparatively small area - and on account of the favorable topographic conditions make that region an attractive mining field.

CLIMATE AND VEGETATION

No official climatologic data concerning the Berners Bay region are available but the records for Juneau and Skagway will serve to give a general idea of climatic conditions. As shown by the subjoined table, which was furnished by the courtesy of the Weather Bureau, the total precipitation is considerably less at Skagway than at Juneau. Although Berners Bay is approximately midway between these two cities, the climatic conditions seem to be closely similar to those obtaining at Juneau.

Climatologic data for Juneau and Skagway, Alaska.

Taken over a period of 10 Years by
Alaska Stations.

Mean Maximum Temperature	Juneau	48.3
	Skagway	47.2
Mean Minimum Temperature	Juneau	36.4
	Skagway	33.3
Mean Temperature	Juneau	42.4
	Skagway	40.3
Maximum Temperature	Juneau	88
	Skagway	94
Minimum Temperature	Juneau	- 10
	Skagway	- 21
Mean Precipitation (inches)	Juneau	81.12
	Skagway	22.80
Mean Snowfall (inches)	Juneau	110.5
	Skagway	42.1
Average Number of Days with Precipitation,	Juneau	200
	Skagway	85

The foregoing statistics show the climate is temperate, the southeastern coast being bathed by warm currents of the Pacific.

All the physic conditions in way of transportation, development, climate, power, mining, etc. are favorable for economic all-year operations.

The region is well forested with spruce and hemlock. The timber line (the limit of erect tree growth) reaches 2,500 feet above sea level along Lynn Canal but stands several hundred feet lower on the mountains flanking Berners River on the west. As a rule the timber forms open stands, and the largest and finest trees attain a diameter of several feet. The undergrowth is rank and luxuriant and in many places forms impenetrable thickets.

INTRODUCTION

THE BERNERS BAY REGION, ALASKA

The Berners Bay region, which takes its name from a sheet of water 4 miles wide indenting the northeast side of Lynn Canal, is situated 45 miles northwest of Juneau, the capital of Alaska. The areal extent is approximately 50 square miles. The region is easily reached by water from Juneau.

The head of the Bay is marked by extensive tidal flats formed by the distributaries of Berners River, which enters from the north, and by other large streams of glacial origin, which enter from the east and northeast. Harbors are not common in the Bay, but a bight known locally as the Jualin Cove affords safe anchorage for large craft.

The Berners Bay region is characterized by abrupt topographic relief. The northern part consists of a rugged assemblage of precipitous peaks which rise steeply from the shore of Lynn Canal to heights of 5,000 feet. The most notable of these form a group known as Lions Head Mountain, whose serrate profile is said to show, when seen from Chatham Strait, a resemblance to a couchant lion. Toward the south the altitudes become lower and the profiles of the mountains become smoother and rounder, until near the tip of the peninsula the low hills scarcely attain an altitude of 500 feet.

The streams on the peninsula are short, but on account of the heavy rainfall they carry relatively large volumes of water. Johnson and Sherman Creeks are the largest, and they are also the most important because of the fact that most of the properties are located in their drainage areas.

Johnson Creek heads in an amphitheater of ideal symmetry lying under the shadow of Lions Head Mountain and flows southeastward through a U-shaped valley, emptying into Berners River near the head of the tidal flats of the Bay. Its total length is only 4 miles.

The Berners Bay region forms the northwestern extremity of the long zone of auriferous mineralization on the mainland of southeastern Alaska known as the Juneau Gold Belt. This belt has a total length of 100 miles and extends southeastward to Windham Bay, 60 miles southeast of Juneau. A large number of prospects are scattered along the gold belt, but at two localities, Juneau and Berners Bay, there is a marked clustering of properties or of potentially productive orebodies.

Topography: Lions Head Mountain, which has an elevation of 5400 feet, rises $2\frac{1}{2}$ miles due north of the Jualin. This mountain has several glaciers on the side of the Jualin basin; its form is that of an amphitheater, the two wings extending from the summit reach on the south side almost to Berners Bay, enclosing the mine and forming a drainage area from which power is obtained. Johnson Creek, which starts in Lions Head Mountain, has an elevation of practically 750 feet where it passes the Jualin. The entire basin is extremely rugged except where glaciation has rounded all and smoothed some of the higher points.

Geology: The Jualin Mine is located in an intrusive mass of diorite, locally known as the Jualin Diorite. This formation intrudes into a sedimentary formation consisting mainly of slates and graywackes, and occupies the area to the south and west of the Jualin diorite. These sedimentary rocks are of the oldest formation in the region locally known as the Berners formation. It consists of slates in beds of great width, interstratified with graywackes, greenstones of volcanic origin, and schists, also green quartz porphyry schists of igneous origin. The schistosity trends N. W. and S. E. and is almost vertical.

The Jualin, Comet and Kensington Mines, the two latter adjacent to the Jualin Mines, are all situated in the Jualin Diorite, or in the contact of the sedimentary formation with the diorite. This is a massive granular rock, showing plagioclase, hornblende and biotite. At the Jualin Mine the diorite is fine-grained and blocky so that it ~~xxxx~~ resembles a granodiorite. Secondary minerals, such as epidote, calcite and chlorite, are everywhere present along the veins, due to alteration by the mineralizing solutions. On the footwalls of these veins in the Jualin Mine, the diorite has been altered to a schist from the movement and pressure along fault planes. The Jualin diorite is younger than the Berners formation which it intrudes.

Ore Bodies and Character of Ore: There are a great number of veins and outcrops of ore occurring within this diorite intrusion, or along or near the contact of the enclosing formations. While many of these have promising but undeveloped surface showings, reference will only be made to those on which mining or development work has been carried on.

The orebodies are all auriferous or gold deposits and can be divided in two distinct classes:

(1) Those contained in well marked fissures filled with quartz of an average thickness from five to ten feet. The gold occurring both free and associated with sulphides, about 85% of the values being in free gold, and 15% associated with sulphides. The Jualin veins, numbers 1, 2 and 3, are of this type and the only ones that have been operated so far.

(2) The second type which distinguishes itself from the other, occurs along the intrusive bodies of diorite.

All the orebodies are of primary origin, and the character of mineralization is such as to give assurance to continuity of value and size to a depth below the limit of profitable mining.

The orebodies strike N. W. and dip to the N. E. at an angle averaging about 70 degrees.

The following excerpt is taken from the report of the United States Geological Survey (Bulletin 446, by Adolph Knoff (1911):

"The continuity of the ore deposits in depth is a matter of the highest practical interest. It is dependent on two factors - the persistence of the fissuring and the character or quality of the mineralization. As shown by the microscopic study of the vein-forming processes, the quality of the mineralization is such as to assure its maintenance to a depth which is below the limit of profitable mining. This conclusion is enforced by both theoretical and practical considerations. The Kensington lode outcrops at an altitude of 2,800 feet; the Treadwell, which outcrops, near sea level, has been proven to a depth of 1,700 feet without diminution of its values. This gives a known vertical range of practically 4,500 feet, through which the auriferous solutions were capable of precipitating gold in the Juneau Gold Belt. The probabilities are that this is a minimum estimate.

"On the whole, the downward persistence of fissuring would seem to be proven by the deep-seated origin of the vein-forming solutions, as shown by the alterations that they were able to effect in the wall rocks. The orebodies will doubtless show variations in size along the dip and strike, but the character of the diorite country rock is favorable to their continuity in depth. The conclusion that the ore deposits are of deep-seated origin and due to the ascent of the thermal waters is ultimately based on empirical generalizations and is independent of any speculative conceptions as to the magmatic origin of those solutions. It therefore rests upon a firmer foundation and lends assurance to the belief that the ore deposits will, as a rule, persist downward below the limits of profitable extraction without essential change of values."

Veins of the Jualin Mine and ore values: Three parallel veins, outcropping at an elevation of 800 to 850 feet, have been mined in part; one of them to a depth of 400 feet.

No. 1 Ore Body is from 1 to 20 feet wide, averaging 7 feet.
Value \$11. to \$15. per ton.

No. 2 Ore Body is from 6 inches to 4 feet wide, averaging 3 feet.
Value \$15. to \$25. per ton.

No. 3 Ore Body is from 1 to 7 feet wide, averaging 5 feet.
Value \$10. per ton.

The average value of ore as shown by mill records is \$11.80 per ton. This is considerably higher than the average in the southern portion of the Juneau Gold Belt. In one of the Jualin veins ore was extracted which ran \$30. a ton over a width of 7 feet. A series of faults occur throughout the Jualin and neighboring properties, all formed subsequent to the orebodies. Their stratigraphical throw range from 10 to 43 feet, and are of no hindrance to mining operations, or have no influences on values, but they have seriously affected the progress of development in depth, on account of surface waters which seeped through.

This situation was responsible for the starting of the Berners Main Adit Tunnel, to do away with water trouble, and cut the ore bodies at a lower horizon.

All of the last work done at the Jualin property has been in the driving of this main tunnel which is now in 5,000 feet, with about 2,500 feet to go to reach the Jualin orebody.

Past production and operations: Past production of the Jualin Mine, shown from the mill records, amounts to 74,624 tons of a gross value of \$881.785. These operations were conducted in a small size old type milling plant, under grass root and expensive conditions, but were profitable to the depths reached.

Summary Statement Showing Total Production of the
Mine in Tonnage and Value of Ore.

GROUPS	Tonnage Milled	Average Value Per Ton	Gross Value of Tonnage	RECOVERY		% Per Ton
				Total Recovery	Average Per Ton	
Boonville Group	48,933	\$11.50	\$572,729.	\$474.640	\$9.70	84.3 %
Belgian Group	25,691	\$12.03	\$309,056	\$277,833	\$10.81	89.9 %
	74,624	\$11.81	\$881.785	\$752,473	\$10.08	85.3 %

Cost of mining and milling were \$5.70 per ton, during summer operations, and about \$8.00 during winter, averaging \$6.50. Taking into consideration the mining methods which prevailed at the time, coupled with the pumping charges, etc., in comparison with the economic mining methods which will be available when the Berners Tunnel is completed, it is estimated that ore can be developed, mined and milled at the Jualin Mine for \$4.50 per ton, and less with increasing tonnage.

Past Development:Equipment

A Power House was located on what is known as the Jualin Mill Site, at a distance of 2 miles from tide-water.

In order to develop an efficient power system, a dam was put in at the present camp site of Jualin, on Johnson Creek; from this a flume line 3' x 2' and 4,3000 feet in length was run, on a gradient of 4/10th of 1 foot to the hundred, to a point 570 feet above the proposed power site and ended in a pen-stock 9 x 9 x 10 feet; from this pen-stock the power house was connected with 3,800 feet of hydraulic piping grading in size from 24" to 14" where it enters the power house.

The power house is a "T" shaped frame building, 2 stories high, having practically 4,000 feet of floor space. The machinery installed in this plant comprises a 2,250 foot Ingersoll Air Compressor connected with a Pelton Water Wheel, complete electrical installation, and four Semi-Diesel 150 H. P. certical type oil engines as auxiliaries for winter use. This power plant has a total capacity of 1,000 H. P. during summer and 700 H. P. during winter.

An old saw-mill was also put in working order and some million and a half feet of lumber cut.

A telephone system was installed connecting the property from the wharf to the different offices and residences throughout the mine. A wireless station was erected and a Marconi outfit installed which gave the property direct communication, at any time, with the outside.

Buildings

- Upper Camp: Mine foreman's house.
 Mine bunkhouse capable of housing 150 men, with oil feeding heating system, boths, lavatories and general assembly room.
 Drying room with boths, lavatories, etc.
 Office building and warehouse.
 Boarding house 24' x 80' and complete cooking equipment.
 Manager's and Director's residence.
 Powder house for 25 tons of powder.
- Lower Camp: Three workmen's cottages.
 (Tunnel) A fully equipped blacksmith's shop with oil furnace, air drill sharpener, etc.
 Boarding house.
 Auxiliary Bunkhouse for 220 men.
 Dry room fully equipped.
 Commissary.
 One large wooden oil tank of 80,000 gallone capacity.
 Two houses for the storage of oil.
 One stable and barn, for the housing of 16 head of stock.

Powder house for priming.
 Powder house for the storing of explosives.
 Wharf: One warehouse
 Small barn
 One large wooden tank of 80,000 gallons capacity.

Development Work

The sinking of the front shaft was continued to a depth of 325 feet below the main adit, and a new level was opened up at 310 feet. Veins Nos. 2 and 3 were located by cross-cut. No. 2 vein was opened up and stoped, and gave the best results ever obtained in the mine, ore grading very high in some sections (see assay sheet page 35).

During the stage of these operations exploration was carried also on the 160 foot level in an attempt to locate No. 1 vein. It was struck some 40 feet N. E. from orebody No. 2.

A cross-cut, driven N. E. on Vein No. 1 drift, struck a body of quartz (No. 5 on the plan) at some 100 feet distance. This body of quartz is 6 feet wide, has well defined walls and runs along the N. W. line of orebody No. 3. This vein warrants further development and it might prove to be the extension of Vein No. 2 some 540 feet distant.

Ledge No. 4 was also struck on the 160 foot level. Some development work was made there and excellent results were obtained.

A flat diamond drill hole was put in a N. E. direction in an attempt to pick up No. 1 vein on the 310 foot level. This hole struck a body of quartz 5 feet wide at a distance of 125 feet. This was a short time before the shutting down of the mine. The face of this ledge is spectacular, being heavily mineralized and peppered with free gold.

Berners Tunnel Development: Soon after the Belgian Group entered the property it was decided to drive a main tunnel, from a point on the Thomas No. 1 Lode Claim to connect with the front shaft at the mine, for the purpose of draining the mine workings and to serve as a main haulage for ore to a mill to be erected at the Undine Mill Site, near the portal of the Berners Tunnel. Therefore, and with the economic development of the mine in view, a 7' x 8' tunnel was started and driven a distance of 5,000 feet, leaving about 2,500 feet yet to be driven before reaching the Jualin orebodies. This tunnel, when completed, will tap the Jualin orebody in the south shaft section at 500 feet below the surface and at the Jualin mine, 250 feet below the bottom of the shaft. The tunnel will not only drain off the surface water from this mine, but also from the Comet and other adjacent mines of the Kensington, if extended further than the Jualin, and at the same time will serve as a general working level and transportation system for all these orebodies in depth.

Berners Tunnel Prospects: Two zones heavily mineralized with iron sulphides carrying gold values were encountered in course of driving the tunnel. At a distance of 3,200 feet from the portal, a ledge of quartz 7 feet wide was struck, heavily mineralized with iron and copper sulphides. It is intended to make development on this ledge to determine its commercial value.

At 5,000 feet, distance now driven, the tunnel enters in the diorite section which underlays the best prospecting ground of the Jualin property, and it is most likely that new orebodies will be found besides the known veins and outcrops referred to in this report.

Past mill practice and recovery: The old mill burned down during past operations, it was equipped with two batteries of 5 stamps weighing 750 lbs. each. The milling practice used was the following: The mine ore went to a 1" grizzly, and the over-size to a 2 D. gates giratory crusher delivering a product of about $1\frac{1}{4}$ " to the stamp bin; stamps discharged through 35 mesh screens on two amalgamating plates 49" x 132" each; the tailings from plates were retreated on Isbell vanners. This practice gave around 90% of extraction of which 75%, 10% and 5%, respectively, from amalgamation plates, concentrates and inside amalgamation. The ore for the most part is silicious with fine grained diorite as gangue. This method can be largely improved by equipping the mine with an up to date plant, and the percentage of extraction raised to 95%.

Expenditures: Cash disbursements made in connection with the Jualin Mine by the Belgian Group amounted to about \$900,00 for equipment, development, option payments, etc.

The following is an estimate of value of the development work, now finished and paid for, as well as the equipment on hand which will be used in all future operations:

Main Adit Tunnel and development	\$ 252,000.
Power plant, compressors, etc.	227,500.
Mining equipment and material on hand	25,000.
Surface buildings, Upper and Lower Camps	61,700
	<u>\$ 566,200.</u>

As aforesaid the actual amount of money expended for purchase, prospecting, etc. on the Jualin Mine, is larger than \$566,200, but is not considered herein as a future asset. The equipment of power, buildings, etc. have been figured at a depreciated value although they are all in good condition. Therefore the amount of \$566,200 can be taken as a minimum.

Surface prospecting during 1928: During the early days of the Jualin operations, a shaft was sunk, at a depth of about 50 feet on a quartz outcrop laying on the shear zone, 650 feet southeast from the Main Adit of the Mine. Survey shows that this ledge is in line with Vein No. 3 of the Mine, and the character of the walls and quartz are similar. The ore taken from this shaft in the early days, resulted

in a small production of \$5,000 which is better than \$20. per ton.

Surface work was made in this section during the summer of 1928 in order to strip the shear zone by cross-trenching.

At 66 feet distance in a westerly direction, a quartz ledge of 9 feet wide was uncovered carrying gold values. The mineralized zone, in which this ledge was found, is 49 feet wide which is shown by the diorite foot wall encountered.

This work adds an important section to future Jualin operations and should prove to be very valuable when the extension of the Berners Tunnel will reach the section, as it shows the southern extension of the Jualin orebodies.

Program of further Development: The outcrops of the south shaft are located at a distance of 2,500 feet N. W. from the actual face of the Berners Tunnel, which tunnel will intersect the ledges at a vertical depth of 515 feet.

Raising will be started from the tunnel level to the surface, and the veins opened up and developed for operations. While this is being done the property will be equipped, as a starter, with a concentrating plant of a daily capacity of 125 - 150 tons.

The south-shaft workings will then be extended to connect them with the Jualin, and the Jualin orebodies will be opened up and developed.

Later on, a central shaft will be sunk to open up further the orebodies at depth, below the Berners tunnel level.

Ore to be developed when the Tunnel reaches the South-Shaft and Jualin sections: There is every mark that further development in the section above the 310 foot level (old workings) will disclose an additional tonnage of ore.

With the distinctive features of geology and mineralization as they exist at the Jualin Mine, it can confidently be looked forward that the results, already obtained in the past and those which are now anticipated from further development above the 310 foot level, will be likewise as profitable with depth, and increased progressively as the other orebodies are opened up.

No particular reference nor tentative estimates are made in this paragraph as to "Possible Ore" from the lateral section of the known outcrops and are under the Berners tunnel, but the conditions are such as to be confident of remarkable results with systematic development.

Estimates of probable ore above the Berners Tunnel are 200,000 tons at a gross value of \$11.80 per ton. These estimates are applicable to the veins of the south shaft section and orebodies Nos.

1 and 2 at the Jualin Mine, and do not include Nos. 3, 4 and 6. There is every reason to believe that a large tonnage of ore will come from No. 1 with further development from the 310 foot level on up to the Main Adit (old workings). The vein has already been struck at the 160 foot level as indicated hereabove. No. 1 is the strongest fissure vein ever found on the adit level and from which the old Jualin Mine Company (Boonville Group) secured the largest tonnage to supply the mill. The stoping width of this orebody, from the Jualin Adit up to close to surface, was 7 feet over a length of 500 feet.

In the Anderson Raise, located at the northern end of No. 1 vein on the Jualin upper adit level, there remains a full face of quartz over 10 feet wide where development work has still to be done and which very likely will disclose another very important addition to ore reserves above the Berners Tunnel.

Estimated operating profits per ton of ore milled: When the Berners Tunnel will be completed the operating costs will not exceed \$4.25 per ton, based upon a milling capacity of 250 tons per day, which should leave the following gross profit:

Gross value of ore per ton, based on past production ..	\$ 11.80
Loss in extraction, 5%69
	<hr/> 11.11
Operating costs	4.25
	<hr/>
Gross profit	\$ 6.86

Diana and Falls Claims: (Held under option) Negotiations have been under way to acquire under option the Diana and Falls property which is contiguous to the Jualin Mine.

As a result of surface work accomplished during the summer of 1928, to prove the southern extension of the Jualin orebodies down to the South-Shaft section, it became evident that the acquisition of the Diana and Falls Claims would be most important. In fact, the shear zone, which has been proven down to the south-shaft section as aforesaid, strikes S. E. towards the Diana Claim, the side line of which is only 650 feet distant from the south-shaft.

This situation has made it advisable to tie up the Diana-Falls Claims in order to ascertain their value and to operate them in conjunction with the Jualin orebodies.

The negotiations to option these properties have not been successfully concluded.

The Diana and Falls Lode Claims are contiguous on the northeast to the Cover and Undine Mining Claims and on the southwest to the Contact No. 1 and Contact No. 2 claims of the Jualin property.

Geology The area is underlain by Jualin diorite in contact with the sedimentary formation.

Orebody of the Diana: The ledge, as exposed in the Diana Lode Mining Claim, lays in the contact between the two formations. It strikes N. W. and dips to the N. E. at an angle which will average about 70°. The filling material is composed of schistose gangue and quartz heavily mineralized with copper sulphides carrying gold values.

Past work: In the early days a test shaft was sunk on the lode to a depth of 55 feet on the right bank of Johnson Creek. The lode has been exposed from the top to the bottom of the shaft where it enters the hanging wall side. It has been impractical to cross-cut to the hanging wall due to its proximity to the Creek.

Value of ore: The average of the assay returns of sampling in the shaft is \$10.40 per ton.

Plan of development: The Berners Tunnel will afford an easy access to the Diana Ledge for development and operations. A 900 foot crosscut can be driven, from the tunnel level, which would tap the orebody at 475 feet below the surface. A raise will be made, from the cross-cut level to the surface, for development and ventilation; and then the orebody will be further opened up for operations.

The Diana Lode will be opened up and operated simultaneously with the south-shaft and Jualin orebodies.

Estimates of Expenditures: The estimates of expenditures to put the Jualin Mine on an operating basis are the following:

New wooden pipe to replace the old flume line, repairs to the hydraulic pipe line, to power-plant, road, tramway, buildings, etc.	\$ 25,000.
Equipment of boarding house, blacksmith shop, battery locomotives, cars, telephones, wireless, lighting, assay office, mining equipment, etc.	20,000.
Completion of Berners Tunnel and Jualin Development	125,000.
Development of Diana and Falls Claims	40,000.
Milling Plant	50,000.
Administration	15,000.
Reserve for contingencies	<u>20,000.</u>
	\$ 295,000.

Time required to put the Mine on an operating basis of 125 - 150 tons per day. The plan is to complete the driving of the Berners Tunnel to the south-shaft ledges, a distance of 2,500 feet. When the south-shaft section is reached by the tunnel, the ledges in this section will be opened up and operated, and drifting will continue, on the strike of the shear zone, to reach and develop the Jualin orebodies.

In the meantime, a crosscut 900 feet long will be driven to tap the Diana Lode.

All of the foregoing should require about 10 months, so that the mine should be on a self-sustaining basis inside of 12 months from the time of starting, and operating with a capacity of a milling plant of 125 - 150 tons per day.

Probable gross profits per year after first stage of operations: It is fully expected, at the end of the first stage of operations, viz, about three years, that the orebodies will be sufficiently opened up to warrant a substantial addition to the first milling plant, so that the capacity could be raised to 250 tons per day. This should result in the following gross profit:

Extraction: 85,000 Tons at \$11 net	\$935,000.
Less operating costs of Mining and Milling, and general expense, 85,000 tons at \$4.25	<u>361,250.</u>
Probable Gross Profit Per Year	\$573,750.

C O N C L U S I O N

The results already obtained with past operations in the Jualin Mine and neighboring properties, and the excellent geologic features of the ground underlaid by the diorite, for persistence of fissuring and mineralization to great depth, make the whole field a most attractive one for development and further exploration.

It is through unavoidable circumstances, for which the War and ensuing general disturbances in economical conditions have been responsible, that the valuable orebodies, laying in the northwestern section of the Berners Bay region, have not been operated further. This remains to be done by the completion of the BERNERS MAIN ADIT TUNNEL and the sequent development of the orebodies.

Furthermore, the immediate use of equipment on hand, such as Hydraulic Power Plant, Auxiliary Oil Engines, Buildings, Mining Equipment, Electrical Equipment, etc., and the use of the Berners Tunnel which has already been driven a distance of 5,000 feet, and all paid for, are most important assets in order to reach rapidly a productive stage.

Furthermore, the existing conditions of the known outcrops and the prospecting done outside the known vein system of the Jualin Zone, bear great strength to the belief that further development and exploration will open up new large bodies of ore.

SOUTHEASTERN ALASKA MINING CORPORATION.

— January 15th, 1929.

HISTORY OF PRODUCTION FROM JUALIN MINE

Yield of Gold as shown by Bank Statements and Smelter Returns.

Periods	Value of Gold Bullion and Concentrates	Remarks
1896	\$ 25,511.27	Boonville Group - Most of the stoping during this period was made by hand drilling above the Adit level of the Mine, the largest tonnage coming from Nos. 1 and 3 veins. Operations were carried on only during summer months. Sinking was resumed in 1901, but due to insufficient equipment, the Mine was closed down after the water level was reached, 70 feet below the Adit level.
1897	78,480.22	
1898	45,769.39	
1899	49,292.27	
1900	81,476.64	
1901	<u>46,741.00</u>	
	\$ 327,270.79	
1905	\$ 74,428.61	The Mine was reopened in 1904 by the Boonville Group and some equipment provided for pumping, but trouble was encountered as workings were extended down to the 160' and 210' levels on account of the inflow of surface waters which could not be handled with the equipment on hand. This hampered considerably development work. The Company not being financially strong enough to provide for new power installation and equipment, the Mine was closed in 1906. The production during 1907-8 was gained through a lease and cleaning up the old stopes above the Adit level.
1906	50,891.79	
1907-8	<u>22,049.66</u>	
	\$ 147,370.06	
1915	\$ 19,090.46	The Mine was optioned to the Belgian Group in 1912 and surface improvements and installations were made as described in the foregoing pages of this report. Due to the water trouble experienced in past operations, it was decided to drive the Berners Tunnel to drain off surface waters; this tunnel was advanced only 1,700 feet when stopped on account of the World War breaking out. Because of financial conditions brought about by the War and the ensuing need of money, No. 2 vein at the Mine was opened up at the 310' level and stoped. During a small part of 1915 and 1916, the yield came from ore gained in development work. Afterwards, over \$200,000 were ex-
1916	72,051.47	
1917	<u>186,691.07</u>	
	\$ 277,833.00	
Total	\$ 752,473.85	

tracted by stoping. Further development was checked by continuous water difficulties, and also by the result of the U. S. A. entering the war.

These remarkable results obtained at the 310' level under these difficult conditions give great promise for the future, more so when it is taken into consideration that this production was obtained in developing only a very small section of the property. In fact, the whole production has come from a very small area on the property, development having only been carried on in the past within an area of about 4 acres, and vein No. 2 operated down to a depth of 310 feet below the Adit level.

A S S A Y S H E E TOrebody No. 2Raise No. 1From 310' to 160' Level
Stoped SectionSouth FaceNorth Face

No.	Width	Value per Ton in Dollars.	No.	Width	Value per Ton in Dollars.
1	3'	\$ 21.40	1	1'	\$ 8.20
2	2'	4.20	2	1'	49.90
3	3'	8.40	3	3'	16.80
4	3'	14.20	4	3'	30.60
5	2'6"	22.90	5	5'	19.60
6	2'6"	20.40	6	3'6"	23.10
7	2'	11.00	7	3'4"	16.30
8	2'6"	27.70	8	2'6"	11.40
9	4'	93.60	9	2'5"	8.00
10	2'	11.00	10	3'	18.80
11	1'	16.90	11	2'8"	176.10
12	2'4"	12.00	12	3'	24.40
13	2'6"	55.50	13	2'8"	76.10
14	3'3"	20.30	14	3'6"	19.90
15	4'	8.60	15	3'2"	29.90
16	3'	78.10	16	4'	44.00
17	3'	439.70	17	2'	44.10
18	2'	3.70	18	8"	6.00
19	1'6"	28.00	19	2'	89.00
20	4'	3.40	20	4'	35.70
21	4'	19.90	21	4'	4.80
22	4'	4.00	22	4'	33.30
23	4'	22.40	23	4'	17.30
24	2'6"	218.00	24	3'4"	35.80

Average
WidthAverage Value
per Ton

2'9"

\$ 48.55

Average
WidthAverage Value
per Ton

2'11"

\$ 34.80

Average North and South FaceWidthValue per Ton

2'10"

\$ 41.65

A S S A Y S H E E TOrebody No. 2Raise No. 2From 310' to 160' Level
Stoped Section

<u>South Face</u>			<u>North Face</u>		
No.	Width	Value per Ton in Dollars	No.	Width	Value per Ton in Dollars
1	1'	\$ 5.00	1	1'2"	\$ 4.00
2	1'8"	3.90	2	1'4"	2.90
3	1'6"	8.10	3	2'8"	12.00
4	2'6"	8.60	4	2'	9.40
5	4'	2.00	5	2'	3.10
6	2'	124.60	6	1'	201.50
7	2'	14.80	7	1'4"	18.00
8	2'	4.50	8	3'	1.40
9	3'	10.00	9	1'6"	515.20
10	2'6"	20.20	10	1'6"	19.00
11	3'	13.00	11	2'	31.20
12	2'	75.30	12	1'	11.40
13	2'6"	24.00	13	2'	35.60
14	2'6"	31.90	14	2'6"	32.20
15	3'	64.00	15	2'6"	522.00
16	2'	457.80	16	2'	81.40
17	2'	615.60	17	1'8"	485.80
18	2'	597.40	18	10"	1,044.60
19	2'	104.80	19	2'	46.40
20	1'8"	368.00	20	2'4"	108.90
21	6"	5.10	21	1'2"	19.00
22	3'6"	2.00	22	3'6"	2.00
23	5'	0.40	23	5'	0.40
24	4'	0.60	24	2'	2.40
25	6"	2.20	25	10"	32.90
26	8"	6.80	26	1'	6.20
27	1'6"	0.70	27	1'	0.80
<hr/>			<hr/>		
Average Width		Average Value per Ton	Average Width		Average Value Per Ton
2'3"		\$ 93.38	1'10½"		\$120.35

Average North and South FaceWidthValue per Ton

2'1"

\$ 106.85

April 4, 1938

Mr. O. Hall,
Consulting Engineer,
Noranda Mines Limited,
Noranda, Quebec, Canada,

Dear Sir,

In accordance with my wire to you of this date there are being sent you herewith such data with regard to the Jualin property at Berners Bay as are available locally. These data include a list of all known published references to the property and also typed copies of such of the published references as are out of print or difficult to obtain. Also included is copy of a printed report on the property that was issued by the Southeastern Alaska Mining Corporation. As nearly as I can learn the date of this report was November 1928. Its authenticity in all respects cannot be vouched for but the report is being sent because it contains valuable illustrations and maps of the workings. Since copies of this report are now difficult to obtain it is requested that the one being sent you be returned to me when you have finished with it.

I regret that U. S. Geological Survey Bulletin No. 446: "Geology of the Berners Bay Region, Alaska", is out of print and no longer available for distribution. It was written by Dr. Adolph Knopf, now professor of physical geology at Yale University, and it contains excellent descriptions of the geologic features of the region, including the veins and ore occurrences on the Jualin property. It is possible that a copy of this excellent bulletin might be consulted at some public library or at the library of some educational institution within your reach, or that a copy might be borrowed from the Canadian Geological Survey at Ottawa.

Mr. O. Hall - 2.

The following replies are given in the order in which the corresponding inquiries appeared in your letter:

History:

Most of this information that is available is contained in the published reports listed or in the typed copies being sent herewith.

Present State of Mine:

As to the extent of the underground workings, see maps opposite pages 14, 24 and 26, and assay map opposite page 36 of the printed report by the South-eastern Alaska Mining Corporation being sent herewith.

As to the ore exposures and probable and possible reserves at the time mining operations ceased we have very little authentic information. As suggested in my wire to you the best source from which to obtain this information would probably be Mr. Horace G. Young, 701 Dominion Bank Building, Toronto, Ont. Mr. Young was manager of the mine for a considerable period that extended nearly up to the time when operations in the shaft workings ceased.

Since receiving your letter I have conferred with Mr. Arthur Riendeau, now mine superintendent for the Alaska Juneau Gold Mining Company, who drove the drainage tunnel at Jualin. He tells me that undeveloped high grade ore exists in the bottom of the 310 Level, especially in the workings on the hanging wall vein. He mentioned \$200 per ton as the value of some of this ore, and recalls that a very large sum was realized from the mining of a small stope on this orebody above the 310 Level. Mr. Riendeau believes that the pumping out of the shaft workings is feasible and that the expense entailed should not be excessive. He also is of the opinion that the reopening of the drainage tunnel would not be attended by unusual difficulty. He states that 450 feet of the portal section of this tunnel is in loose material (Unconsolidated) and that that ground is heavy. He says, however, that the timbering in this section is very heavy and well placed and it is his belief that it should have stood up well. The portal of the tunnel is now covered by a surface slide.

Mr. O. Hall - 3.

According to Mr. Riendeau the drainage tunnel had attained a length of over 5,500 feet at the time work upon it ceased. Near the face of this tunnel a diagonal crosscut was driven to the left for a distance of about 300 feet. This crosscut intercepted a fault from which a heavy flow of water came. This flow practically ceased, however, within a short time and it is thought by him that no trouble would be had from that source. The remainder of the drainage tunnel, with the exception of a short section that is timbered, is in very firm rock which Mr. Riendeau believes not likely to have caved. He thinks it would be perfectly feasible to extend the drainage tunnel to its original objective and that such a program would serve best in reopening the mine for active operation.

Present State of Plant:

Since the receipt of your letter I have conferred with a reliable gas boat operator who visited the Jualin property last summer. He states that much of the equipment at the upper or mine camp has been removed by marauders. The buildings that remain standing, including the large staff house, are in poor condition. The foundations have rotted and the roofs are leaky. He states, however, that two or three of the buildings could be repaired and put in use without a great deal of expense. He did not examine the hydraulic pipeline closely but says that such sections of it as he saw appeared to be in fair condition. The equipment in the power-house building near the portal of the drainage tunnel is largely intact, but the diesel engines are of an obsolete type and probably could not be operated economically. The building, itself, is susceptible of repair and use. Both of the former wharves are gone and the landing of materials and equipment would have to be made by lightering. The horse-tram is entirely out of repair. This tram lead from the wharves to the mine. It is probable that the grade could be brushed out and that by the construction of two short bridges a tractor could be used in transporting equipment to the mine.

Mr. C. Hall - 4.

Water:

The only definite information we have on this subject is contained in the published reports. See especially the accompanying typed extract from U.S.G.S. Bulletins Nos. 662 and 714 at the fifth and second paragraphs, respectively.

Examination:

As suggested in my wire to you it might be advisable to arrange for a preliminary examination by a qualified local person to determine more completely existing conditions at the property. This would include detailed notes on repairs needed to place the tram line in condition for use as a tractor road; an inventory of such equipment as might be employed in pumping and examination work that may still remain on the property; notes on the condition of flumes, pipe-line, etc.; and more definite information as to buildings and materials that remain.

The gas-boat operator referred to above, who visited the property last year, states that there are at the mine trays of diamond drill cores in considerable number. From the firm of lawyers who have for many years represented the Belgian interests locally I have learned that the drilling from which these cores resulted was done by the firm of Lynch Brothers, whose headquarters office is at Seattle, Wash. It might be possible to obtain from this firm the logs of the drilling.

I feel very reluctant about attempting to advise you as to the best program in thoroughly examining the mine. I should be inclined, however, to favor an effort to pump out the workings rather than to depend on diamond drilling.

It would probably be possible to secure the services here of a competent man to take charge of pumping the mine out and of extending the workings. Diamond drill work could probably best be carried on by Lynch Brothers under contract.

Mr. C. Hall - 5.

As was stated in my wire to you snow has already disappeared up to an elevation well above any that would be reached on the Jualin property.

From Juneau the property is reached by gas boat of which suitable ones may be chartered here. I am sending you a topographic map of the Berners Bay region from which you will be able to scale distances as the scale is quite large.

I hope the above data will be helpful to you and I shall be very glad to supply any further information or extend any assistance to you that I can.

Very truly yours,

H. D. Stewart,
Commissioner of Mines.

NORANDA MINES LIMITED

NORANDA, QUEBEC

CABLE ADDRESS "NORANDA"

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DEPARTMENT OF MINES

RECEIVED

March 14, 1938

MAR 22 1938

Mr. B. D. Stewart
Mining Inspector
Juneau, Alaska

JUNEAU, ALASKA

Dear Sir:

Mr. Johnson, Chief Engineer of the Homestake, was here and suggested that I write you for information on the Jualin Mine, some forty miles north of Juneau.

We are anxious to get all the information available on this mine, as we have undertaken to give it an examination as soon as conditions permit.

History: We have various reports, but they do not appear to be very accurate and we would appreciate it if you could sketch the history of the Jualin.

Present State of Mine: We particularly need a description of the mine as it was when it was closed down last. Was all ore exhausted?

Present State of Plant: We would like to know what plant exists and what would have to be done to pump out the mine.

Water: Though the Belgian engineer says there was very little water, one of the U. S. publications speaks of a 300 gallon pumping plant, and also they seem to have abandoned the workings and started a 7,000 foot tunnel. This seems to indicate that the shaft and lower workings struck so much water that they concluded that they would have to have a drainage tunnel to cope with the water.

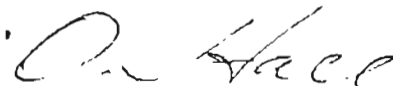
Examination: As you probably know all the conditions at the Jualin, could you outline just what you think should be done to make a fairly thorough examination of this mine. Can it be pumped out? Should we extend the levels, or should we use a diamond drill?

We may work through R. H. Stewart, Consulting Engineer, Vancouver, but we would like to know if there is an engineer or a practical contractor in Juneau who would undertake to pump the mine out and carry on with drifting and perhaps diamond drilling.

Snow: Let us know how the mine is reached from Juneau, how far it is from Berrens Bay, the condition of the road, how much snowfall there is, and how soon snow conditions, etc., would permit an examination of the mine.

In other words, we would appreciate it if you would give us all the help that the scope of your work permits.

Yours truly,



Consulting Engineer

OHall/CJD

The Jualin mine was being developed on a very substantial scale up to the beginning of the European war, when operations were practically discontinued. The effects of the war were especially felt by the Jualin mine because it was being developed by Belgian capitalists. In addition to the 20 claims already held by the company, the Greek Boy property had been added. Since work was resumed under the present management, in July, 1913, an average of about 200 men have been employed. The old Jualin shaft was sunk from 160 to 360 feet, crosscuts and a station were opened on the 300-foot level, and 2,000 feet of a projected 7,500-foot adit was driven. At present 400 horsepower is developed by the company's hydroelectric plant on Johnson Creek. Machinery to develop 800 horsepower additional by the hydroelectric plant and 600 horsepower by Diesel engine, had been ordered and was in transit when operations were resumed. About 20 men are still employed in keeping the mine in condition and in crosscutting to a new orebody discovered by diamond drilling.

On Barrow Bay the principal developments were in the Jualin mine. During the winter of 1914—15 sampling and examination were carried on preparatory to active operations in the spring. The present openings consist of an adit level nearly a mile in length and workings on the 60-foot, 160-foot, and 310-foot levels, aggregating 13,000 feet. Recent development work consists of a number of raises from the 160-foot level and the extension of all the levels. On the 310-foot level the back and intermediate veins have been reached. A new lode called the "unknown vein" has been opened on the 160-foot level, and two raises have been started to explore it. This lode is northeast of the other ore bodies and has not yet been found on the other levels. The stamp mill started early in summer. The failure of adequate water power during winter and dry seasons has necessitated the enlargement of the present hydroelectric plant and also the erection of an emergency power plant, which in October, 1915, was nearing completion. It is $1\frac{1}{2}$ miles below the mine and comprises four oil engines of 150 horsepower each. Fuel for these engines will be piped part way and hauled by wagons the remainder. At this mine 75 men are employed.

JUALIN MINE.

Operations at the Jualin mine were continued during 1916 on the reduced scale that was adopted at the beginning of the European war, owing to its foreign financial backing. However, there was a gradual increase in the extent of operations during the year, the force of 80 men employed at the start being increased to 65 by the latter part of the summer. The work is progressing on the plan of milling only the ore produced in developing the mine. No stoping is done, as the 10-stamp mill is fully supplied by the ore that is taken from the shafts and drifts that are being driven on the lodes. Although the mine is being developed into a larger producer more slowly than was originally planned, the present operations have the advantage of being self-supporting.

According to Knopf¹ the work done prior to 1910 had developed three parallel veins, 75 feet apart, trending N. 40° W. and dipping 80° NE. to 90°. At that time the workings had reached a depth of 200 feet below the adit level, which is 750 feet above the sea.

The later development work has been directed mainly to the two outside veins. The workings have reached a depth of 310 feet below the adit level, and it is planned to extend them as rapidly as possible to 1,000 feet below the adit.

The northeast vein has an average width of about 7½ feet, and the southwest vein of 5 feet, in the developed areas. The horizontal extent of the ore bodies in each vein is about 400 feet.

The mine waters, which were formerly a hindrance to operations, are now fully controlled. They are collected on the 300-foot level and pumped to the surface at the rate of about 500 gallons a minute. The deeper development is planned so that the mine below the 300-foot level will be entirely dry. Control of the water has been achieved by additions to the pumping and power facilities. About 1,200 horsepower is developed by the hydroelectric plant on Johnson Creek in summer. In winter this is reduced to about 100 horsepower, and additional power is developed by internal-combustion engines as required.

The plans for a larger mill are in abeyance pending a fuller development of the mine in depth. The ores in the upper workings are free-milling, so that ordinary amalgamating methods give a high recovery. In neighboring mines the ores change in character with depth, and a high extraction from the deeper ores is best obtained by flotation methods. The continued development of the mine on a moderate scale will give excellent opportunity for investigating the ores and designing the best equipment for their treatment.

¹Knopf, Adolph, Geology of the Berners Bay region, Alaska: U. S. Geol. Survey Bull. 446, p. 45, 1911.

Extract from U.S. Geological Survey bulletin No. 755,
Mineral Resources of Alaska - 1922, pp. 24-25:

"The Jualin mine, at Berners Bay, north of Juneau, which was closed in 1917 because of war conditions, is now under lease to the Jualin Berners Mining Company. This company in 1922 continued the old drainage tunnel and employed some 45 men.

During the last years of operations, 1915 and 1917, the mine milled 25,691 tons of ore with an average recovery of 310.81 a ton, giving an extraction of 91 per cent of the assay value."

JUALIN MINE.

Development work was continued at the Jualin mine, in the Berners Bay district, owned by the Jualin-Alaska Mines Co., but no ore was produced. Fifty-five men were employed--40 at the lower camp and 15 at the upper camp. At the lower camp work was continued on the 7,000-foot tunnel, which when completed will intersect the ore body at depth and will afford natural drainage for the mine. This tunnel is now being driven by three shifts operating two drills, advancing about 15 feet a day, and in September, 1919, had been driven 2,500 feet. If conditions are favorable, the tunnel should be completed by 1921.

The mine, at the upper camp, was pumped dry in 1918, after being flooded for a year and a half, and development and exploration work was continued. A short drift was driven on the 310-foot level, and several other drifts and crosscuts were expected to be completed before 1920. Exploration was carried on chiefly by means of two long drill holes. The first of these started from the southwest side of the property, on the 310-foot level, and was driven horizontally 1,000 feet to the southwest; the second, beginning at the east side of the mine, likewise from the 310-foot level, had been driven horizontally a little north of east about 1,250 feet in September and was to be continued to 1,500 feet. A third drill hole is planned, which will start from the northwest side of the mine and be driven west with a dip of 18° a minimum distance of 1,000 feet. In the lower tunnel drill holes will be driven every 500 feet at right angles to the tunnel on both sides to the limits of the property.

The mine is now well equipped for development and mining operations. A horse tram connects the wharf at Berners Bay with the lower and upper camps, and all three are connected by telephone. A wireless plant also affords communication with Juneau from the upper camp. Power at the upper camp is developed from Johnson Creek, which with an 80-foot head yields 100 horsepower. The water is turned back into the creek, and at the lower camp, under a head of 576 feet, 500 horsepower is developed. For use in winter, four 150-horsepower Pettus semi-Diesel engines have been installed, and these are so adjusted that water may be used in conjunction with the engines when available. A 2,750 cubic foot compressor that used 350 horsepower and will run 26 drills has also been added to the equipment. The stamp mill, which has a capacity of about 30 tons a day, with two amalgamators and two concentrating tables, at the upper camp, suffices for present mining operations, but plans for future operations include the erection of a new mill of greater capacity and the treatment on a large scale of low-grade disseminated ore, as well as the richer ore from the quartz veins.

The character of the mineralization at the Jualin mine and the number and character of the gold-quartz veins, so far as they were known in 1909, have been fully described by Knopf.² In addition to the three quartz veins known at that time, two others lying to the northeast, known as Nos. 4 and 5, have been discovered. The exact significance of these veins is not definitely known, but at present No. 4 is believed to be a different vein from Nos. 1, 2, and 3. Mill practice to date has demonstrated that about 80 per cent of the gold in the quartz veins is free. The remaining 20 per cent is contained with the concentrates, which are chiefly pyrite, with some chalcopyrite and galena.

²Knopf, Adolph, Geology of the Kerner Bay region, Alaska: U. S. Geol. Survey Bull. 446, pp. 44-47, 1911.

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April 28, 1938

Mr. B. D. Stewart
Commissioner of Mines
Juneau, Alaska

Dear Sir:

Before this letter reached you, Mr. John Reid will have called on you; also Mr. Racey and Mr. Hoggatt. They are going to look over the Juelin and also the Kensington and I think possibly Mr. Reid will try to see any other mine open in the Kensington area.

I wish to thank you for sending me complete information and if it has involved expense, let me know what it has involved.

If it is satisfactory to you, I will keep the printed report on the Juelin until John Reid returns. We sent him a French and an English copy and possibly if you mention it he will leave his English copy with you on his way back, but if he does not, I will return your report to you.

Yours truly,



OHall/CJD

Consulting Engineer