

3

NAME OF }
PROPERTY } Carmi Mine

DISTRICT Greenwood

EXAMINED BY E.H.Thurston

DATE 801980

Report by
E.H. Thurston.

CARMI MINE.

SITUATION & TITLE:

West Fork Kettle River, Osceola Mining Division, Yale District, B.C. Fifty miles by a good wagon road from Midway Railway station and town, the terminus of the C.P.R. (B.C. Southern). The stage visits the mine twice a week, and the mail is delivered weekly.

Contracts for 30 of the 50 miles from Midway have been let for the construction of the Midway & Vernon Railway which will pass within a mile of the mine.

The property consists of the Carmi Mineral claim and the B.A. Fraction, aggregate acreage 56, through which the vein runs some 1500 feet. The property is Crown Granted or in fee simple, subject to a yearly tax when idle of 25¢ per acre.

FUEL:

Ample at \$2.00 per cord, delivered.

CLIMATE:

Very good summer, temp. 75 degrees Fahr., Winter 10 deg. During the two winter months, water for milling was pumped up 100 feet as the flume was frozen. Several weeks sleighing can usually be counted on during which the cost of transportation is materially reduced.

LABOR:

Plentiful and skilled. Machine men, carpenters, engineers, amalgamators and blacksmiths, \$4. mines \$3.50 top men \$2.00, underground shift 8 hours.

VEIN:

Strong permanent fissure quartz vein; a possible replacement of a basic intrusive dyke. Country Rock - Gneissic syenite.

Dip - 65 deg. S. Strike - N.E.S.W. Length - Traces by outcrops and workings 3000 feet. Width between walls - 3 to 12 feet.

CHARACTER OF VEIN AND ORE:

The ore lies on the hanging and footwalls of the vein, with an aggregate width of some four feet. The dyke appears in the form of gangue (interspersed with vein matter) between the ore occurrences on each wall.

The vein or ore occurrence carries pyrites with gold and silver values and occasionally an inappreciable quantity of copper, galena and arsenical pyrites, with occasional shoots of zinc blende. The clean pyrites carry mechanically some \$120. in gold and silver, but where reconcentration has taken place in the richer shoots the gold and silver values are very high. The average value of the pay ore, i.e. blue ribbon quartz and pyrites, together with the gangue and bull quartz that are necessarily included in breaking down the ore, is throughout the workings, excluding the reconcentrated richer shoots (which run very high), is from \$7.00 to \$8.00, but with careful blasting should be raised to \$10.00, as the ore occurrence proper of blue ribbon quartz and pyrites has a value of some \$23.00.

The shoots of reconcentrated pyritic ore, and where the pyrites are in the greater proportion (as the shoot in C. Shaft 50 x 120 x 7 feet) average in value (vide 980 tons shipped), \$23.75.

A similar body was found 600 feet W. of C. Shaft, on an extension of the Carmi vein, and surface cuts between C. Shaft and A. Tunnel show the probable existence of other ones.

Throughout the 600 feet of workings on the vein, practically no dead work has been done, and the average of the ore now available is estimated by repeated samplings and mill tests to average some \$9.00 per ton.

The workings and strippings extend from A tunnel 1200 feet W. to C. shaft: from A tunnel, 400 feet W. the vein has been shown to be of the character described; from this point for 400 feet W. the strippings failed to find the vein, until a point 412 feet E. of C. shaft (800 feet W. of A tunnel), the vein was again exposed by open cuts, confirming the character determined by underground workings.

No great effort was made to locate the vein in the intermediate ground, and in the absence of the outcroppings of dyke matter it is believed the vein exists from A to C, but has faulted to the E. on the intermediate ground.

Throughout C shaft (181 feet deep) the vein or ore occurrence averages 5 feet width, as also the two levels, in the E. faces of which the ore occurrence is six feet wide with the appearance of a rich reconcentrated shoot being near; in their W. faces (which are on the boundary of the Carmi property) have faulted into gangue, which by outcrop appears to extend to within a short distance of the shaft on the Butcher Boy (a neighboring property on the extension) where a rich reconcentrated shoot was found.

In A tunnel the ore occurrence averages 5 feet in width and \$10. to \$15.00 in values, and 5 feet wide in face.

In the original prospecting shaft A the ore occurrence goes down some 20 feet, when it is clean cut off by a disturbance probably the case of the river bed.

The proportion between the concentrates and the normal pay ore is about 10-1 (vide milling results).

With careful blasting and sorting, an average of \$10 ore should be obtained, exclusive of the recurrence, regarded by independent and other engineers as mining certainty, of the richer reconcentrated shoots.

A somewhat unusual feature of the Carmi vein is that the large cubes of pyrites (which generally lose their values by purification in crystallization) found in the bull quartz, carry the same gold and silver values as the normal pyrites.

Throughout the Carmi vein the pyrites have invariably carried the same values.

Throughout the development workings of C shaft on the vein, the ore occurrence 2 feet wide on the hanging wall has been left intact in place.

From these workings some 2009 tons of vein matter has been extracted, of which 1626 tons were ore, of which 1326 have by smelting or milling realized a gross value of \$25,340. The proportion of waste to ore is therefore 1626 ore, 373 waste.

The average value of 47 tons concentrates, after amalgamation before concentration, in hand or treated, is \$37.20.

Of the 436 tons of ore milled 16 tons of high value were for experiment, and of the 420, 47 were from the unsorted binned ore (one-third waste) from No. 2 level, 243 from the upper stopes which was too poor to ship, and the 146 from the dump, were without organized sorting, the rock from the workings was dumped. The 420 tons averaged \$9.64 the different classes of ore varying but little in value.

Inflow of water, 25 gallons per minute; during summer months, very little.

In the eastern ore shoots the vein faults S. a foot or two every 20 feet. The whole vein is medium hardness for working, and breaks well.

DEVELOPMENT:

Three shafts - A (prospectors'), 100 feet; B, 55 ft. C (working) 181 feet in depth, respectively.

Tunnels - A, 65 ft. long. Drifts - C shaft No. 1, 100 foot level, 125 ft. long; No. 2, 170 foot level, 100 ft. long.

Stopes - C shaft, 17,000 sq ft.
Open Cuts, etc.

ORE AVAILABLE FOR STOPING:

	Tons	Val. per ton	Gross rec'able val.
C Shaft -			
Above No. 1 level.....	1000	\$10.....	\$ 9,000.00
Between No. 1 and 2.....	2500	8.....	18,000.00
A Tunnel			
Above drift.....	1000	10 to \$15.....	10,000.00
In bin & dump (mostly waste)	400	5.....	2,000.00
Sacked concentrates.....	22½	37.....	700.00
B dump.....	88	5.....	440.00
A dump.....	190	10.....	1,900.00

Ore available.....	5,800.5	\$42,040.00
Already realized.....	1,325	25,340.00
Reserves of "Ore in sight(6,000)		<u>(42,000.00)</u>
		109,280.00
Net value of ore in bin, on dump, & immediately available.....		42,040.00
After deducting mining & treatment costs.....		<u>26,000.00</u>
		\$ 16,040.00

Experiments by Henry Wood, of Denver, Fassett of Spokane, Guess of Greenwood, and St. Paul's Smelting Works, in London, confirmed by subsequent milling and concentrating of the ore, show that a high per cent of the gold and silver values can be extracted by amalgamation and concentration after coarse crushing (30 mesh); and that the quantity of copper present in the ore is insufficient to preclude subsequent leaching with cyanide solution of concentrates, thus practically saving all the values.

REDUCTION OF ORE:

The ore has been successfully treated by milling and amalgamation; and smelting of concentrates. This was in 1905, and subsequent to the shipment of 890 tons of crude ore, which at the smelter realized gross value \$23.75 per ton.

By amalgamation.....	\$4.53 per ton
Concentrates.....	3.61 per ton
In tailings.....	1.50 per ton
Gross value of ore.....	\$9.64 per ton

Bullion ($\frac{1}{2}$ gold, $\frac{1}{2}$ silver) averages \$11.50 per oz. The proportion between returns from amalgamation and those from concentrates will alter in favor of amalgamation, as the above mill results were under the disadvantage that one set of the amalgamating plates were intrinsically defective, failing to amalgamate and thus enriching the concentrates and tailings.

Mr. James C. Colbath, B.Sc. Honor Degree Univ. Cal. M.E. is of opinion that with a 10 inch issue and good plates, a 70 per cent extraction can certainly be obtained by amalgamation before concentration.

In September, 1905, Mr. J.C. Colbath spent a month at the mine making experiments on the concentrates with a view to substituting leaching with cyanide solution for the

costly method of hauling them to be smelted, and thus to save the \$1.70 per ton milled, freight and treatment charges on concentrates.

His experiments were both satisfactory and conclusive, and he proved that with a consumption of 11½ lbs. of cyanide sodium and 60 hours' leaching, and to include middlings by concentrating 7 to 1, a 90 per cent extraction from the ore at a cost of \$6. per ton of concentrates can be obtained.

To emphasize the value of these results, see the following comparison between the treatment of \$9.64 ore in the past with the future method of cyaniding and good amalgamation:

10-1 ore to be concentrates, smelting concentrates	7-1 ore to concentrates, leaching concentrates & middlings
By amalgamation..... \$4.53	By amalgamation..... \$6.75
In Concentrates..... 5.61	In concentrates..... 1.93
Loss in tailings..... 1.50	Loss in tailings..... .96
\$9.64	\$9.64

Cost in smelting 1-10 ton concentrates \$1.74

Cost of cyaniding 1-7 tons concentrates 41¢

An additional profit of \$1.87 per ton treated (including additional extraction 54¢).

PLANT:

POWER: 60 h.p. boiler; 16 h.p. hoist; power drill. Usual blacksmith outfit.

Mill - Five stamps (600 lbs.); gravity battery; 12 x 14 ft. amalgamating silver plate; Tullock self-feeder; 2 stamp steam tomain, 12 x 4 ft. (aggregate) silver plates and self-feeder; Overstrum bumping table; 15 in. rolls; 25 h.p. Corliss engine; 15 h.p. Deke; clean-up revolving pan; assay plant, dynamo Pelton wheel (not installed).

The mill is situated 200 feet distant and 75 feet below collar of C shaft, and is fed with water for milling and concentrating purposes by a 4000 ft. long V Flume capacity 200 cub. ft. per minute. This, with additional expense for enlarging, would furnish 20 h.p. (effective) if Pelton wheel (with penstock) were installed.

Pumps - 50 gals. per minute; Camercon sinker; 50 gals. per minute stationary pump.

IMPROVEMENTS TO PLANT:

Mr. Colbath estimates some \$3000. expenditure is required to effect the necessary improvements, including the installation of cyanide plant (agitating tanks and solution and settling vats, Chilian mill - 3 ton cap. - and centrifugal pump), \$700. Crusher, \$500. Repairs, \$300. Building, \$500. Hand Mill, \$1000. With the above, the output would be 25 tons per 24 hours, and the cost of mining, milling and treatment would be \$4.75 tons, to which should be added a 10 per cent (of heads values) loss in tailing.

RECOMMENDATIONS:

Policy 1. Assuming only \$5000 working capital, the obvious policy is to continue the one followed in the past and make the mine pay for the development (vide policy 2) necessary to command a sale price, with some relation to its value. The existence of the ore available in C shaft and the plant, when improved, is an asset sufficient to follow the above policy, and should, after development, a sale not be considered advisable, then a 20 stamp mill should be installed at A tunnel, equipped with water power and supplemented by steam power (for use during winter two months, and the cost thus reduced by at least \$1 per ton, and an annual revenue of \$25,000 to \$30,000 earned for many years.

Policy 2. with ample working capital, no expenditure need be made on plant, but work confined to vigorous development from A tunnel and C shaft contemporaneously. From a mining point of view, there is little doubt that were a level from A tunnel driven to meet No. 2 level shaft 1200 feet, some \$120,000 would represent the net profit on the ore thus exposed. Such a policy would require the expenditure of \$12,000 to \$14,000 and about one year in time, and hasten materially the returns by sale or dividends.

From the extent and value of the ore exposed, the nature of the ore, the extent and nature of the deposit, and of the surface and underground showings, the many experts who have examined the mine endorse the above, and unhesitatingly commend the Carni Mine as a mine worthy of big expenditure and for wide development.

GENERAL CONCLUSIONS:

The length, breadth and fissure nature of the vein warrants the assumption of its permanence in character and values.

The ore is exceptional in the facility and cheapness with which a high extraction of its values can be obtained by treatment with simple and inexpensive plant. The existence of water for power and milling purposes is a very material factor in reducing the cost of treatment. The existence of unlimited timber in the near vicinity is of great advantage, as is the completion in the immediate future of the railway to the mine.

The situation of the mine on the river level, in healthy and pleasing surroundings, makes for content among miners.

The future of any mine can only be judged by its past, and the past of the district. Here the district has no past, but the conditions and nature of the mine permit of the reasonable assumption that the mine will have the ordinary life with limitations determined by the progressive cost of working at deep levels; and certainly warrants the expenditure as above recommended.

Further any mining operator would be more than justified in bonding the mine (i.e., a progressive option) with the expectation of making a large profit on somewhat the following terms:

Purchase consideration, \$150,000; payable after 30 days, \$15,000; after 90 days, \$15,000; after 120 days \$30,000; after 180 days, \$30,000; after 360 days, \$60,000.

Thus having ample time to develop the mine and determine whether the different payments should be made.

Permission to mill ore and ship concentrates should be given.

A percentage of the returns might be applied towards the purchase consideration.

The estimates of cost of wages, etc., is made from what has been done and therefore can be done. The mine has been brought to the stage at which the financial risk of

mining is reduced to that incidental to and irremovable from all mining.

The mine has the appearance of being a large deposit which, with a little capital, can be extracted at a good margin of profit, and development should show progressively. It to be with skillful management a very valuable property.

CARMI MINE

E. H. Thurston.

SITUATION AND TITLE.

West Fork Kettle River, Osceola Mining Division, Yale District, B. C. Fifty Miles by a good wagon road from Midway Railway station and town, the terminus of the C. P. R. (B. C. Southern). The stage visits the mine twice a week, and the mail is delivered weekly.

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FUEL.

Ample at \$2.00 per cord, delivered.

CLIMATE

Very good summer, temp. 75 deg. Fahr., Winter 10 deg. During the two winter months, water for milling was pumped up 100 feet as the flume was frozen. Several weeks sleighing can usually be counted on during which the cost of transportation is materially reduced.

LABOR.

Plentiful and skilled. Machine men, carpenters, engineers, amalgamators and blacksmiths, \$4. mines, \$3.50, top men \$3.00, underground shift, 8 hours.

VEIN.

Strong permanent fissure quartz vein; a possible replacement of a basic intrusive dyke. Country Rock - Gneissic syenite.

Dip - 65 deg. S. Strike - N.E.S.W. Length - Traces by outcrops and workings 3000 feet. Width between walls - 3 to 12 feet.

CHARACTER OF VEIN AND ORE.

The ore lies on the hanging and footwalls of the vein, with an

aggregate width of some four feet. The dyke appears in the form of gangue (interspersed with vein matter) between the ore occurrences on each wall.

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A similar body was found 600 feet W. of C. shaft, on an extension of the Carmi vein, and surface cuts between C shaft and A tunnel show the probable existence of other ones.

Throughout the 600 feet of workings on the vein, practically no dead work has been done, and the average of the ore now available is estimated by repeated samplings and mill tests to average some \$9.00 per ton.

The workings and strippings extend from A tunnel 1200 feet W. to C shaft: from A tunnel, 400 feet W. the vein has been shown to be of the character described; from this point for 400 feet W. the strippings failed to find the vein, until a point 412 feet E. of C shaft (800 feet W. of A tunnel), the vein was again exposed by open cuts, confirming the character determined by underground workings.

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In A tunnel the ore occurrence averages 5 feet in width and \$10. to \$15.00 in values, and 5 feet wide in face.

In the original prospecting shaft A, the ore occurrence goes down some 20 feet, when it is clean cut off by a disturbance probably the cause of the river bed.

The proportion between the concentrates and the normal pay ore is about 10-1 (vide mill in results).

With careful blasting and sorting, an average of \$10 ore should be obtained, exclusive of the recurrence, regarded by independent and other engineers as a mining certainty, of the richer reconcentrated shoots.

A somewhat unusual feature of the Carmi vein is that the large cubes of pyrites (which generally lose their values by purification in crystallization) found in the bull quartz, carry the same gold and silver values as the normal pyrites.

Throughout the Carmi vein the pyrites have invariably carried the same values.

Throughout the development workings of C shaft on the vein, the ore occurrence 2 feet wide on the hanging wall has been left intact in place.

From these workings some 2009 tons of vein matter has been extracted, of which 1626 tons were ore, of which 1326 have by smelting or milling realized a gross value of \$25,340. The proportion of waste to ore is therefore 1626 ore, 373 waste.

The average value of 47 tons concentrates, after amalgamation before concentration, in hand or treated, is \$37.20.

Of the 436 tons of ore milled 16 tons of high value were for experiment and of the 420, 47 were from the unsorted binned ore (one-third waste) from No. 2 level, 243 from the upper stopes which was too poor to ship, and the 146 from the dump, were without organized sorting, the rock from the workings was dumped. The 420 tons averaged \$9.64, the different classes of ore varying

but little in value.

Inflow of water, 25 gallons per minute; during summer months, very little.

In the eastern ore shoots the vein faults S. a foot or two every 20 feet. The whole vein is of medium hardness for working, and breaks well.

DEVELOPMENT.

Three shafts - A (prospector's), 100 feet; B, 55 feet; C (working) 181 feet in depth, respectively.

Tunnels -A, 85 feet long. Drifts -C shaft No. 1, 100 foot level, 125 feet long; No. 2, 170 foot level, 100 feet long.

Stopes - C shaft, 17,000 cu. ft.

Open Cuts, etc.

ORE AVAILABLE FOR STOPPING

C Shaft -	Tons	Val. per ton	Gross rec'vrable val.
Above No. 1 level.....	1000\$10\$ 9,000.00
Between No. 1 and 2.....	2500 8 18,000.00
A Tunnel			
Above drift.....	1000 10 to \$15 10,000.00
In bin and dump (mostly waste)	400 5 2,000.00
Sacked concentrates.....	22½ 37 700.00
B dump	88 5 440.00
A dump	190 10 1,900.00
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Ore Available	5,200.5		\$ 42,040.00
Already realized.....	1,326		25,340.00
Reserves of "ore in sight" (6,000)			(42,000.00)
<hr/>			
Net value of ore in bin, on dump, and immediated available			\$ 42,040.00
After deducting mining and treatment costs.....			26,000.00
<hr/>			
			\$ 16,040.00

Experiments by Henry Wood, of Denver, Fassett of Spokane, Guess of Greenwood, and St. Paul's Smelting Works, in London, confirmed by subsequent milling and concentrating of the ore, show that a high per cent. of the gold and silver values can be extracted by amalgamation and concentration after coarse crushing (30 mesh); and that the quantity of copper present in the ore is insufficient to preclude subsequent leaching with cyanide solution of concentrates, thus practically saving all the values.

REDUCTION OF ORE

The ore has been successfully treated by milling and amalgamation; and smelting of concentrates. This was in 1905, and subsequent to the shipment

of 890 tons of crude ore, which at the smelter realized gross value \$23.75 per ton.

By amalgamation.....	\$4.53 per ton
Concentrates.....	3.61 per ton
In tailings	1.50 per ton
Gross value of ore.....	\$9.64 per ton

Bullion ($\frac{1}{2}$ gold, $\frac{1}{2}$ silver) averages \$11.50 per oz. The proportion between returns from amalgamation and those from concentrates will alter in favor of amalgamation, as the above mill results were under the disadvantage that one set of the amalgamating plates were intrinsically defective, failing to amalgamate and thus enriching the concentrates and tailings.

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His experiments were both satisfactory and conclusive, and he proved that with a consumption of $11\frac{1}{2}$ lbs. of cyanide sodium and 60 hours' leaching, and to include middings by concentrating 7 to 1, a 90 per cent extraction from the ore at a cost of \$5. per ton of concentrates can be obtained.

To emphasise the value of these results, see the following comparison between the treatment of \$9.64 ore in the past with the future method of cyaniding and good amalgamation:

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Loss in tailings.....1.50	Loss in tailings......96
-----	-----
\$9.64	\$9.64

Cost in smelting 1-10 ton concentrates \$1.74 Cost of cyaniding 1-7 tons concentrates 41 cents
 An additional profit of \$1.87 per ton treated (including additional extraction 54%).

PLANT

POWER - 60 h.p. boiler; 16 h.p. hoise; power deill. Usual blacksmith

outfit.

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The mill is situated 200 feet distant and 75 feet below collar of C shaft, and is fed with water for milling and concentrating purposes by a 4000 ft. long V flume capacity 200 cub. ft. per minute. This, with additional expense for enlarging, would furnish 20 h. p. (effective) if Pelton wheel (with penstock) were installed.

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IMPROVEMENTS TO PLANT.

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RECOMMENDATIONS.

Policy 1. Assuming only \$3000 working capital, the obvious policy is to continue the one followed in the past and make the mine pay for the development (vide policy 2) necessary to command a sale price, with some relation to its value. The existence of the ore available in C shaft and the plant, when improved, is an asset sufficient to follow the above policy, and should, after development, a sale not be considered advisable, than a 20 stamp mill should be installed at A tunnel, equipped with water power and supplemented by steam power (for use during winter two months, and the cost thus reduced by at least \$1 per ton, and an annual revenue of \$25,000 to \$30,000 earned for many years.

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would represent the net profit on the ore thus exposed. Such a policy would require the expenditure of \$12,000 to \$14,000, and about one year in time, and hasten materially the returns by sale or dividends.

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Purchase consideration, \$150,000; payable after 30 days, \$15,000; after 90 days, \$15,000; after 120 days \$30,000; after 180 days, \$30,000; after 360 days, \$60,000.

Thus having ample time to develop the mine and determine whether the different payments should be made.

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Sub Lot 2 of Lot 3638

A. WALLACE

L. 2520

J.C. DALE

L. 796^s

J.C. DALE

L. 482^s

West Fork of Apple River

Sub Lot 1
of
Lot 3638

YOUNGHUSBAND

L. 473^s

R. A. MATHESON'S PRE-EMP

L. 795^s

L. 2360

L. 472^s

CARMI

Scale 20 Chains = 1 Inch

C. H. Shaw B. C. L. S.

MAY Creek

BUTCHER BOY

CARMI

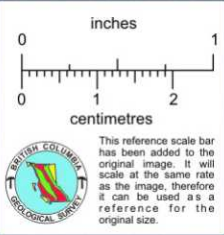
HARTFORD

Line of Lead No. 2

No. 3

No. 6

TAMARAC
FB



This reference scale bar has been added to the original image. It will scale at the same rate as the image, therefore it can be used as a reference for the original size.

Sub Lot 2 of Lot 3638

A. WALLACE

L. 2520

J.C. DALE

J.C. DALE

L. 796^s

L. 482^s

West Fork of Newls River

YOUNGHUSBAND

Sub Lot 1
of
Lot 3638

L. 473^s

Wilkinson
Creek

R. A. MATHESON'S PRE-EMP

L. 795^s

L. 2360

L. 472^s

CARMI

Scale 20 Chains = 1 Inch

C. H. Shaw B. C. L. S.

MAY Creek

BUTCHER BOY

Mill
Power
Here
CARMI

HARTFORD

Line of Lead No 2

No 3

No 6

TAMARAC
FB

