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O T T A W A

August 22, 1945.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1921.

Preliminary Tests on a Sample of Gold Ore from
Sapawe, in the Rainy River District, Ontario.

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Note:

This report relates essentially to the samples as received. It shall not, nor any correspondence connected therewith, be used in part or in full as publicity or advertising matter for the sale of shares in any promotion.

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Sapawe, in the Rainy River District, Ontario.

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Shipment:

A sample of ore, weighing 170 pounds and contained in three bags, was received on July 5, 1945. The sample was submitted by Henry A. Holleyoak, 27 West Goodell, Ecorse, 18, Michigan, U.S.A.

Location of Property:

This ore sample is said to have originated from Claim No. FF-3417. This claim is located at a point about 125 miles east of Fort Francis and 4 miles north of Hematite railway station, in the Rainy River district of Ontario.

(Location of Property, cont'd) -

This sample was stated to be a channel cut across a quartz vein approximately 6 feet in width, taken 4 feet below the surface exposure of the vein. At this point the vein is exposed for 30 feet and is then covered with overburden but outcrops again 400 to 500 feet distant.

Purpose of Test:

The sample was forwarded to determine its mineral content and also to conduct test work for the purpose of establishing the most suitable method of milling ore of this character.

Sampling and Assaying:

The sample submitted was assayed and reported as follows:

Gold	-	3.26 oz./ton
Silver	-	0.64 "
Iron	-	1.43 per cent
Sulphur	-	0.20 "
Insoluble	-	96.65 "
Lead	-	None detected.
Zinc	-	Trace.

Results of Experimental Tests:

Preliminary examination of the ore showed that it was practically all quartz, with some free gold and a small amount of sulphides. This indicated that cyanidation after removal and amalgamation of coarse gold probably would be the most suitable treatment to obtain maximum recovery. Test work showed that by this method 98 per cent or more of the gold can be extracted. 70 per cent of the values was recovered by amalgamation of a jig concentrate.

Conclusions:

As some of the gold is extremely fine, fine-grinding of the ore, 80 to 90 per cent finer than 200 mesh, will be

(Conclusions, cont'd) -

needed to liberate it.

A jig or other concentrating device should be installed between the ball mill and classifier to remove coarse gold and coarse sulphides. These should be finely ground, amalgamated, and the residues then sent on to rejoin the main body of pulp for further treatment by cyanidation. In the cyanide tailings produced in these tests, about 66 per cent of the refractory gold was associated with free or exposed sulphides, while the remainder is enclosed in gangue or in fine sulphides wholly enclosed in gangue.

Characteristics of the Ore:

Six polished sections were prepared and examined microscopically for the purpose of determining the character of the ore.

Gangue -

In the polished sections gangue is composed essentially of milky white quartz which encloses small patches of soft light greenish rock. The quartz is transected by a few sinuous, hairlike fractures and exhibits some small local reddish-brown stains of iron oxides. In one or two of the hand specimens examined, the quartz carries a small amount of carbonate (calcite) and the rock material shows a schistose structure.

Metallic Minerals -

Metallic mineralization is sparse and that pictured in the photomicrograph, Figure 1, is much heavier than in the average field of the microscope. Pyrite predominates, as medium coarse to fine subhedral crystals and grains disseminated unevenly through gangue. It contains small inclusions and veinlets of gangue and, in places, is closely associated with other metallics. Chalcopyrite is comparatively common,

(Characteristics of the Ore, cont'd) -

as small scattered grains which are often intimately admixed with the other sulphides. Small quantities of sphalerite and galena are present in two or three sections as small irregular grains which are usually associated with each other or with other sulphides. "Limonite" and covellite are visible in negligible amounts; the former is represented by occasional small local stains in gangue, the latter by rare tiny particles in chalcopyrite.

Small grains of native gold are relatively abundant in the polished surfaces, well over one hundred being observed and measured. The results of this work are tabulated below. The gold associated with metallics is against, or interlocked with, a grain of sulphide, usually pyrite. Only a few tiny particles entirely within pyrite were observed and, of these, only one appears to be surrounded by apparently dense sulphide. See Figure I.

TABLE I. - Grain Sizes and Modes of Occurrence of Native Gold.

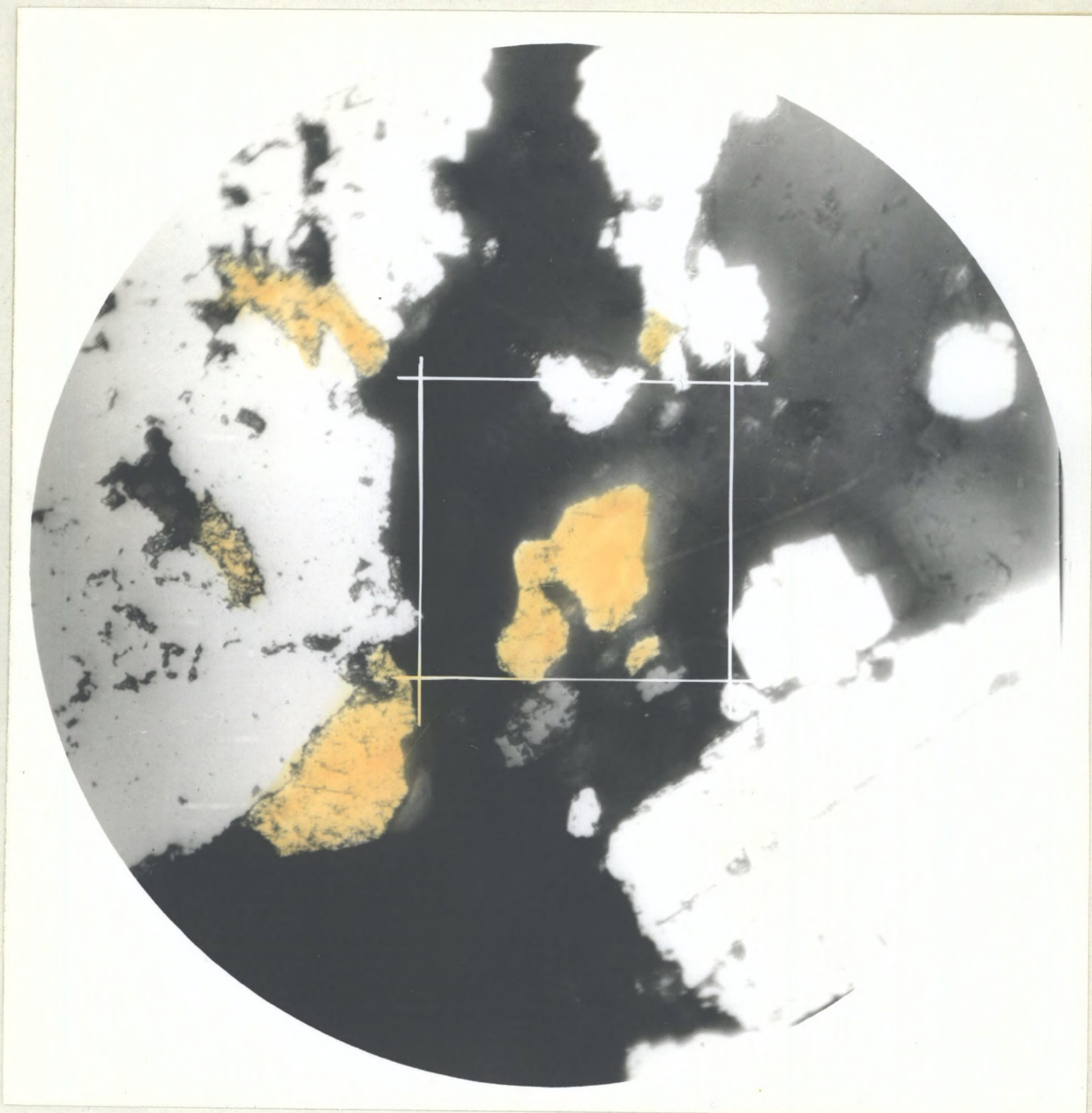
Tyler Screen Sizes	: Alone in : : gangue, : : per cent :	: Associated : : with metallics, : : per cent :	: Totals, : : per : : cent :
+280 mesh	: 3.1	:	: 3.1
-280 +400 "	: 5.1	:	: 5.1
-400 +560 "	: 21.0	: 1.3	: 22.3
-560 +800 "	: 24.2	: 2.1	: 26.3
-800 +1100 "	: 15.2	: 2.3	: 17.5
-1100 +1600 "	: 16.2	: 6.1	: 22.3
-1600 +2300 "	: 2.1	: 1.0	: 3.1
-2300	: 0.3	:	: 0.3
	: 87.2	: 12.8	: 100.0

In examining hand samples under the binocular microscope, however, a particle of gold was observed which appeared to be somewhat larger (at least +200 mesh in size) than any seen in the polished sections.

(Continued on next page)

(Characteristics of the Ore, cont'd) -

Figure 1.



PHOTOMICROGRAPH OF POLISHED SECTION SHOWING GRAIN SIZE
AND MODES OF OCCURRENCE OF NATIVE GOLD IN SAMPLE.

Gold - yellow.
Pyrite - white to light grey.
Sphalerite - medium grey.
Gangue and pits - grey to black.
Magnification, X600.

DETAILS OF INVESTIGATION:

Tests Nos. 1 to 4. - Straight Cyanidation.

Samples of the ore, dry-crushed to -14 mesh, were ground in cyanide solution till about 34 per cent of the ore was finer than 200 mesh.

The samples were agitated for periods of 24, 48, 72 and 96 hours, after which a screen analysis was made on each tailing sample. During the agitation periods, the cyanide was kept at approximately 1.0 pound per ton and protective alkalinity was maintained with lime.

Screen Analysis of the Cyanide Tailings.

<u>Mesh Size</u>	<u>Weight, : per cent</u>	<u>:Assay, : Au : oz./ton</u>	<u>:Distribution: of gold, : per cent</u>	<u>:Extraction, : per cent</u>
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24-Hour Cyanide Tailing -

+48	: 6.22	0.36	13.12	
-48 +65	: 12.52	0.33	24.20	
-65 +100	: 17.34	0.27	27.43	
-100 +150	: 18.20	0.195	20.79	
-150 +200	: 11.64	0.095	6.48	
-200	: 34.08	0.04	7.98	

<u>Average tailing</u>	<u>:100.00</u>	<u>0.171</u>	<u>100.00</u>	<u>94.75</u>
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48-Hour Cyanide Tailing -

+48	: 6.80	0.275	12.02	
-48 +65	: 13.50	0.30	26.83	
-65 +100	: 17.20	0.23	26.21	
-100 +150	: 16.12	0.17	18.15	
-150 +200	: 13.42	0.09	8.00	
-200	: 33.16	0.04	8.79	

<u>Average tailing</u>	<u>100.00</u>	<u>0.151</u>	<u>100.00</u>	<u>95.37</u>
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72-Hour Cyanide Tailing -

+48	: 6.18	0.25	11.71	
-48 +65	: 12.90	0.23	22.50	
-65 +100	: 17.16	0.22	28.63	
-100 +150	: 19.38	0.15	22.04	
-150 +200	: 9.80	0.08	5.94	
-200	: 34.58	0.035	9.18	

<u>Average tailing</u>	<u>:100.00</u>	<u>0.132</u>	<u>100.00</u>	<u>95.95</u>
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(Continued on next page)

(Details of Investigation, cont'd) -

Screen Analysis of the Cyanide Tailings (cont'd) -

Mesh Size:	Weight, : per cent	Assay, : Au : oz./ton	Distribution: of gold, : per cent	Extraction, : per cent
<u>96-Hour Cyanide Tailing -</u>				
+48 :	5.36	0.24	10.74	
-48 +65 :	12.12	0.23	23.27	
-65 +100 :	17.64	0.20	29.45	
-100 +150 :	17.94	0.14	20.97	
-150 +200 :	13.04	0.065	7.08	
-200 :	33.90	0.03	8.49	
:				
Average :				
tailing :	100.00	0.120	100.00	96.32

A small sample of the 96-hour cyanide tailing was treated on the superpanner and two pieces of free gold were found. One of these would be somewhere between 280 and 400 mesh in size, while the other would be between 150 and 200 mesh. This indicates the necessity of removing coarse free gold by jig or blankets from the ball mill discharge.

All four of the above screen analyses show that fine grinding of the ore will be necessary to expose the fine gold to the cyanide solution.

Summary of Tests Nos. 1 to 4.

(Assay of feed sample, 3.26 Au oz./ton.)

Test No.:	:Tailing:		: Assay,:		: Extraction,:		: Reagents Consumed:		: Final Titration,	
	oz./ton:	cent	Au :	per	lb./ton ore	cent	NaCN :	CaO :	NaCN :	CaO
1	0.171	94.75	0.56	1.11	0.96	0.06				
2	0.151	95.37	0.62	1.28	0.92	0.08				
3	0.132	95.95	0.64	1.42	1.04	0.12				
4	0.120	96.32	0.64	1.72	1.04	0.12				

Test No. 5.

A sample of the ore at -14 mesh was treated in a small jig to remove coarse gold and sulphides. In this operation the ratio of concentration was 500:1. The jig concen-

(Details of Investigation, cont'd) -

trate was amalgamated with mercury and the amalgamation tailing was then reunited with the jig tailing. Seventy per cent of the gold was recovered by this amalgamation. This tailing mixture was reground in cyanide solution 60 to 65 per cent finer than 200 mesh and agitated for 48 hours. The cyanide tailing assayed 0.045 ounce per ton in gold, for a total extraction of 98.62 per cent. Confirmatory tests showed that there was no need to agitate longer than 48 hours after removing coarse gold and it may be possible that a somewhat shorter period would suffice.

To determine the association of the gold remaining in the tailing after cyanidation, a sample of this cyanide tailing was treated with dilute hydrochloric acid to decompose carbonates, after which it was recyanided for 48 hours. This did not result in any additional extraction. Another sample of cyanide residue was then treated with aqua regia and this treatment extracted two-thirds of the refractory gold, leaving a residue assaying 0.015 ounce gold per ton. This indicates that all but 0.015 ounce of gold per ton of the 0.045 ounce remaining after cyanidation is present in sulphides.

Comments:

Care should be taken in interpreting the results of this investigation if applied to the ore body when developed to a point where actual milling operations are warranted.

The lowest tailing obtained was 0.045 ounce per ton. This figure, in conjunction with a feed assay of 3.26 ounces, shows a recovery of 98.62 per cent. Should the orebody prove of lower value with the same percentage of fine gold and gold associated with sulphides as in this present sample, recovery

(Comments, cont'd) -

would be very much lower.

A small mill, employing amalgamation only, would prove inefficient, recovering only about 70 per cent. Such a mill would consist of either a stamp mill with amalgamating plates, or a ball mill, followed by a jig or a concentrating table to recover sulphides and gold. This concentrate would then be reground in an amalgamating ball and the amalgam recovered.

Should the quantity of developed ore warrant it, a complete cyanidation plant is indicated, with concentration and regrinding of the concentrates incorporated in the circuit.

It is recommended that when development work has progressed to a point where the orebody is well defined, a representative sample of the ore be sent for further investigation. The results obtained in this investigation, therefore, can apply only to this present sample.

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