DEPARTMENT OF MINES AND RESOURCES

BUREAU OF MINES

CANADA

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Ottawa, May 2, 1946.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 2046.

Laboratory Tests on Gold Ore from the Squall Lake Property of Wekusko Consolidated Limited, in Northern Manitoba.

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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BUREAU OF MINES
DIVISION OF METALLIC MINERALS

ORE DRESSING AND
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Shipment:

On March 7, 1946, a small shipment of assay rejects from diamond drill cores was received under instructions from G. B. Tribble, Manager, Wekusko Consolidated Limited, Herb Lake, Manitoba, consisting of 3 small sample sacks of rejects from the assay office at the Sherritt Gordon Mines Limited and 42 small paper bags of rejects from the Haileybury Assay Office. The total net weight was 42 pounds.

Mr. Tribble, in his letter to the Department, was especially interested in the gold recovery to be expected by cyanidation.

Location of the Property:

The property of the Wekusko Consolidated Limited from which the samples originated is its Squall Lake property in northern Manitoba.

Sampling and Assaying:

The two parcels of samples were combined and thoroughly mixed. A head sample was cut out on the Jones sampler and the remainder of the ore was bagged for investigative purposes.

The analysis made on the head sample gave the following results:

Gold	-	0.1825 oz./ton
Silver	-	0.04 "
Lead	-	None detected.
Copper	-	" "
Zinc	-	0.08 per cent
Iron	-	4.64 "
Arsenic	-	1.60 "
Sulphur	-	0.83 "
Insolubls	-	76.44 "

As the head sample of the rejects as received gave a screen test of 73 per cent minus 200 mesh, it was not considered to be informative for microscopic examination, as to the mineral associations, and it was suggested to Mr. Tribble that he should forward some pieces of drill core which might be representative of the shipment received for test investigations. Accordingly, on April 4, two boxes of drill core labelled "Hole No. 53" were received and a number of pieces selected for polished sections for microscopic examination for the purpose of determining the character of the ore.

Characteristics of the Ore:

Gangue -

Metallic mineralization is not heavy, and gangue material forms by far the greater portion of the six polished surfaces prepared. It is composed of fine-grained rock which

(Characteristics of the Ore, cont'd) -

varies in colour from light greenish grey to almost black and contains both soft and hard constituents. Under a binocular microscope several specimens of drill core appear to be composed largely of black hornblende and tiny books of dark brown to black mica. Two or three pieces consist entirely of milky white to colourless vitreous quartz; other pieces contain narrow streaks and small patches of a very fine, soft, scaly, light-green mineral thought to be chlorite. Several of the polished surfaces display a schistose texture, which is not so noticeable in unmounted fragments.

Metallic Minerals -

In their approximate order of decreasing abundance the metallic minerals present in the polished sections are arsenopyrite, chalcopyrite, pyrite, pyrrhotite and sphalerite. Arsenopyrite predominates as coarse to fine anhedral and subhedral crystals disseminated unevenly through gangue. Chalcopyrite is comparatively common as small ragged particles in gangue, and small amounts of pyrite and pyrrhotite are visible in one or two sections as occasional small scattered grains. Rare, tiny grains of sphalerite were observed in one section.

No gold was observed in the six polished sections, a not surprising fact in this grade of ore.

Conclusions:

Cyanidation of the ore direct, or cyanidation of the tailing after amalgamation, gave the best results. The overall tailing loss in both cases was the same (0.01 ounce per ton gold), as was the overall percentage of recovery at 94.5.

From the facts established by the results of Tests Nos. 3, 6, 9 and 10, flotation of the ore does not appear

(Conclusions, cont'd) -

to give satisfactory results from the standpoint of low tailing loss and high percentage of extraction.

The tailing from flotation in Tests Nos. 3, 6 and 9 was too high to discard and while in Test No. 10 the residue loss of 0.015 ounce ton gold was lower it was still unsatisfactory.

In view of the values remaining in the flotation tailing in Tests Nos. 3, 6 and 9, no attempt was made to cyanide the flotation concentrate.

The process to be adopted would therefore be a choice between straight cyanidation, and amalgamation followed by cyanidation. A saving in cyanide consumption was shown by the latter procedure. An equal tailing loss was established in the latter case, also, at a considerably coarser grind.

The pregnant solution from cyanide test 2B showed high determinations for both Reducing Power and Sulphocyanate, and it is possible that in cyanidation practice some trouble would be encountered from fouling with the repeated circulation of the solution due to the combinations established by the arsenic in solution and the zinc dust. This might be overcome by discarding certain tonnages of barren solution.

While precipitation of the pregnant solution (Tests Nos. 4 and 5) showed no interference with precipitation, it is to be noted that this solution was from one stage of treatment only.

Cyanide and lime consumption during agitation in the cyanide tests is somewhat above normal.

Test Observations:

In recovering the mercury in Test No. 1, an amount of silver-grey material was observed which at first glance was thought to be floured mercury but was later determined to be micaceous scales.

(Test Observations, cont'd) -

This might account, in part, for the longer time required over normal to filter some of the test products of this ore in the laboratory pressure filters, and might indicate, in practice, the need of extra filtering capacity. Some difficulty might also be expected in settling, due to this micaceous material.

DETAILS OF INVESTIGATIVE TESTS:

Test No. 1.

1,000 grams of ore as received were amalgamated in a jar mill for 1 hour with 7 c.c. mercury, 0.5 gram CaO, 1,000 c.c. H_2O, and 6 small pebbles.

Mercury recovered and sample filtered and assayed.

Results -

Assay heads, oz./ton gold	=	0.1825
Assay tailings, " "	=	0.06
Extraction, per cent gold	=	67.1

Test No. 2.

1,000 grams of ore cyanided at 2 to 1 dilution without grinding (74,0 per cent minus 200 mesh) for 48 hours hours. ("A")

1,000 grams of ore ground to 91.8 per cent minus 200 mesh cyanided as above. ("B")

Results -

		A	B
Assay heads, oz./ton gold	=	0.1825	0.1825
Assay residue, " "	=	0.02	0.0175
Extraction, per cent gold	=	89.05	90.41
NaCN consumed, lb./ton ore	=	0.80	0.80
CaO " " "	=	6.52	7.12
NaCNS, per cent	=	0.0114	0.014
RP (c.c.$KMnO_4$ for 1,000 c.c. solution)	=	112	120

(Continued on next page)

(Details of Investigative Tests, cont'd) -

Infrasizer Test on Cyanide Residue 2B.

Micron Size	Weight, per cent	Assays Oz./ton Au	Assays Per cent Fe	As	S	Distribution, per cent Au	Fe	As	S
+56	13.2	0.04	6.50	5.00	1.24	32.4	18.4	33.02	21.0
-56+40	31.1	0.015	4.70	1.95	0.73	28.5	31.4	30.32	29.1
-40+28	15.4	0.015	3.30	1.42	0.71	14.1	10.9	10.92	14.0
-28+20	11.0	0.015	3.82	1.42	0.67	10.1	9.0	8.00	9.5
-20+14	)								
-14+10	10.5)	0.01	3.75	1.42	0.72	6.4	8.5	7.41	9.7
-10	18.8	0.0075	5.40	1.10	0.69	8.5	21.8	10.33	16.7
Totals	100.0	0.0163	4.65	1.997	0.80	100.0	100.0	100.00	100.0

The inference from the above results would be that fine grinding is necessary to release the gold for cyanidation and if it could be carried into terms of the lower micron sizes, low tailings would result.

This is partially confirmed by the results of Test No. 8.

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Test No. 3.

2,000 grams ore at 73 per cent minus 200 mesh mixed in a jar mill with 1,500 c.c. H_2O and the following flotation reagents:

	Lb./ton
Soda ash - -	1.5
Reagent No. 208 -	0.2
Pot. amyl xanthate -	0.2

Transferred to a flotation cell and added reagents as follows:

	Lb./ton	
Pot. amyl xanthate -	0.2	pH 10.0
$CuSO_4$ -	1.0	(10 mins.)
Pine oil -	0.075	

(Continued on next page)

(Details of Investigative Tests, cont'd) -

Results:

Products	Weight, per cent	Assays Oz./ton: Au	Assays Per cent: Fe	As	S	Distribution, per cent: Au	Fe	As	S
Flot. conc.	7.3	1.60	10.85	11.44	5.69	75.94	16.6	52.6	46.8
Flot. tailing	92.7	0.04	4.30	0.81	0.51	24.06	83.4	47.4	53.2
Totals	100.0	0.154	4.77	1.59	0.88	100.00	100.0	100.0	100.0

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Test No. 4.

500 c.c. of pregnant solution from Test No. 2B was precipitated in a laboratory precipitation unit incorporating de-aeration under vacuum.

0.2 gram $PbNO_3$ and 0.1 gram NaCN were added to the solution and 0.5 gram zinc dust used as a precipitant.

Results -

Assay solution, oz./ton gold = 0.076
Assay barren solution, oz./ton gold = 0.001

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Test No. 5.

500 c.c. of pregnant solution as above, precipitated with 0.2 gram $PbNO_3$ added. For precipitation, 0.55 gram NaOH and 0.3 gram Al dust were used.

Results -

Assay solution, oz./ton gold = 0.076
Assay barren solution, oz./ton gold = 0.006

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Test No. 6.

2,000 grams of ore ground to 89.8 per cent minus 200 mesh in a ball mill and transferred to a flotation cell.

Reagents Added:

To Grinding -		Lb./ton	
Soda ash	=	0.5	
Reagent No. 208	=	0.2	
Pot. amyl xanthate	=	0.2	
To Conditioning -			
Pot. amyl xanthate	-	0.2	pH, 9.6.
$CuSO_4$	-	1.0	(3 mins.)

(Continued on next page)

(Details of Investigative Tests, cont'd) -

To Flotation - Lb./ton

Pine oil - 0.075 (10 mins.)

Results:

Products	Weight, per cent	Assays: Oz./ton: Au	Assays: Per cent: Fe	Assays: Per cent: As	Assays: Per cent: S	Distribution, per cent: Au	Distribution, per cent: Fe	Distribution, per cent: As	Distribution, per cent: S
Flot. conc.	8.5	1.58	9.55	13.93	6.69	88.0	19.2	74.6	62.1
Flot. tailing	91.5	0.02	3.73	0.44	0.38	12.0	80.8	25.4	37.9
Totals	100.0	0.1526	4.22	1.59	0.91	100.0	100.0	100.0	100.0

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Test No. 7.

1,000 grams ore at 73 per cent minus 200 mesh amalgamated as in Test No. 1.

Results -

Assay heads, oz./ton gold = 0.1825
Assay tailing, " " = 0.065
Extraction, per cent gold = 64.4

500 grams of amalgamation tailings ground to 90 per cent minus 200 mesh and cyanided at 2 to 1 dilution for 48 hours.

Results -

Assay amalgamation tailing, oz./ton gold = 0.065
Assay residue, " " = 0.01
Extraction, per cent gold = 84.6
Additional extraction by cyaniding, per cent gold = 30.1
Overall recovery, per cent gold = 94.5
NaCN consumed, lb./ton ore = 0.80
CaO " " " = 6.40

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Test No. 8.

500 grams ore ground to 97 per cent minus 200 mesh and cyanided at 2 to 1 dilution for 48 hours.

Results -

Assay heads, oz./ton gold - = 0.1825
Assay residue, " " - = 0.01
Extraction, per cent gold - = 94.5
NaCN consumed, lb./ton ore - = 1.16
CaO " " " - = 8.72
RP (c.c. $\frac{N}{10}$ $KMnO_4$ for 1,000 c.c. solution) = 138
NaCNS, per cent - - = 0.015

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(Details of Investigative Tests, cont'd) -

Test No. 9.

2,000 grams ore ground to 96.6 per cent minus 200 mesh and transferred to flotation cell.

Reagents Added:

To Grinding -	Lb./ton	
Soda ash	0.2	
Reagent No. 301	0.2	
Reagent No. 208	0.1	
Aerofloat No. 25	0.035	
Barrett No. 4	0.09	
To Conditioning -		
Pot. amyl xanthate	0.10	pH, 9.9.
$CuSO_4$	1.0	(3 mins.)
To Flotation -		
Pine oil	0.05	(11 mins.)

Results:

Products	Weight, per cent	Assays: Oz./ton: Au	Assays: Per cent: Fe	As	S	Distribution per cent: Au	Fe	As	S
Flot. conc.	10.6	1.25	13.68	11.29	5.63	80.0	30.2	76.9	66.9
Flot. tailing	89.4	0.0375	3.75	0.40	0.33	20.0	69.8	23.1	33.1
Totals	100.0	0.166	4.80	1.55	0.89	100.0	100.0	100.0	100.0

Test No. 10.

1,000 grams ore ground to 91.0 per cent minus 200 mesh and amalgamated as in Test No. 1. Filtered.

Results -

Assay heads, oz./ton gold - = 0.1825
Assay amalgamation tailing, oz./ton gold (calc.) = 0.0604
Extraction, per cent gold - = 66.9

Repulped wet cake and transferred to a flotation cell.

Reagents Added:

To Conditioning -		Lb./ton	
Soda ash	=	0.2	
Reagent No. 301	=	0.2	
Aerofloat No. 25	=	0.035	pH, 10.0
Pot. amyl xanthate	=	0.2	(5 mins.)
$CuSO_4$	=	1.0	

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(Details of Investigative Tests, cont'd) -

To Flotation - Lb./ton

Pine oil - 0.05 (11 mins.)

Results:

Products	Weight, per cent	Assays				Distribution, per cent			
		Oz./ton: Au	Per cent: Fe	As	S	Au	Fe	As	S
Flot. conc.	17.8	0.27	10.40	6.71	3.81	79.6	38.5	84.3	76.7
Flot. tailing	82.2	0.015	3.60	0.27	0.25	20.4	61.5	15.7	23.3
Totals	100.0	0.0604	4.81	1.41	0.88	100.0	100.0	100.0	100.0

100 grams of concentrate cyanided at 2½ to 1 dilution for 32 hours and then dilution increased to 5 to 1 for 24 hours.

Total agitation, 56 hours.

Results -

Assay flotation concentrate, oz./ton gold	= 0.27
Assay cyanide residue, " "	= 0.035
Extraction, per cent gold	= 87.0
Overall extraction from flotation and cyaniding, per cent gold	= 69.25
Additional extraction on heads by treatment of amalgamation tailing, per cent gold	= 22.9
Overall recovery, per cent gold	= 89.8
NaCN consumed, lb./ton concentrate	= 5.20
CaO " , " "	= 19.40

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