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MINES BRANCH INVESTIGATION REPORT IR 67-59

RECOVERY OF GOLD AND SILVER FROM MOUNT NANSEN MINES LIMITED CARMACKS AREA, YUKON TERRITORY

by

T. F. BERRY

MINERAL PROCESSING DIVISION

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SUMMARY OF RESULTS

The gold-silver ore from Mount Nansen Mines Limited assayed 0.42 oz Au/ton and 29.58 oz Ag/ton.

A barrel amalgamation test showed that there was virtually no free milling gold or silver in the ore.

The results of batch cyanidation tests on the ore ground to 77.6%-200 mesh and agitated at a dilution of 2:1 and a solution strength of 1.0 lb NaCN/ton and 1.0 lb CaO/ton were as follows;

Test No.	Agitation time hr	Extraction %	
		Au	Ag
4	24	82.6	84.2
7	48	82.6	86.8
10	72	83.3	87.4

Flotation, by itself, as a means of concentrating the gold and silver was unsuccessful.

Attempts to recover residual gold and silver from cyanidation residues by flotation were only partially successful in recovering an additional 4.7% of the gold and 5.8% of the silver.

Desliming as a means of pre-concentration was unsuccessful.

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* Technical Officer, Non-ferrous Minerals Section, Mineral Processing Division, Mines Branch, Department of Energy, Mines and Resources, Ottawa, Canada.

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INTRODUCTION

Mr. B.S. Imrie, Exploration Manager, Mount Nansen Mines Limited, 420-475 Howe Street, Vancouver 1, B.C., asked the Mines Branch to conduct an investigation into the recovery of the gold and silver in the ore from their property in the Yukon Territory.

Location of Property

The property from which the sample was taken is 29 air miles due west of Camaracks in the Yukon Territory. It is near Mount Nansen on Webber Creek which runs into Nansen Creek.

Shipment

A drum of lump ore weighing 760 lb. was received at the Mines Branch on May 10, 1965 and a project No. MP-OD-6519 was assigned.

Sampling and Analysis

A selection of hand specimens of the ore was submitted to the Mineral Sciences Division for a mineralogical investigation.

The entire shipment was then crushed to 1/4 inch to facilitate the cutting of an accurate head sample. A semi-quantitative spectrographic analysis, and a chemical analysis was done on the head sample.

The spectrographic analysis did not show any other metals present in economic amounts.

The results of the chemical analysis of the head sample are shown is Table 1.

Table 1

Head Sample Analysis*

Gold (Au)	-	0.42 oz/ton
Silver (Ag)	-	29.58 " "
Iron (Sol Fe)	-	5.83 per cent
Sulphur (tot S)	-	1.38 " "
Insoluble	-	77.70 " "

*Internal Report MS-AC-65-929

Mineralogy of the Ore.

The results of the mineralogical investigation were published in Mines Branch Investigation Report IR65-100 by W. Petruk*, October 19, 1965. Only a summary of the results of that investigation is included in this report.

"A mineralogical study of ore samples from the Mount Nansen deposit in Yukon Territory shows that the ore is composed chiefly of siliceous rock and breccia, and contains minute grains of silver-bearing minerals. The silver-bearing minerals are freieslebenite, acanthite and native silver. Other minerals in the ore are arsenopyrite, pyrite, sphalerite, galena, chalcopyrite, bornite, pyrrhotite, covellite, quartz, pyroxene, rutile, calcite, arsenobismite, scorodite and goethite."

OUTLINE OF INVESTIGATION

1. Barrel amalgamation to determine presence of free gold and silver.
2. Batch cyanidation of ore at different grinds and cyanidation conditions to achieve maximum extraction of the gold and silver.
3. Gravity and flotation consentration of the gold and silver.
4. Gravity concentration, flotation and cyanidation.
5. Cyanidation and flotation of cyanidation residue.
6. Desliming tests.
7. Settling tests.

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*Senior Scientific Officer, Mineralogy Section, Mineral Scienc Division, Mines Branch, Department of Energy, Mines and Resources, Ottawa, Canda.

DETAILS OF INVESTIGATION

Barrel Amalgamation (Test 1)

A 1000 gram sample of -10 mesh ore was ground to about 64%-200 mesh and was amalgamated for 1 hr with 20 ml new mercury and 1.0 lb lime/ton. The amalgam was assayed for gold and the amalgamation residue was assayed for gold and silver, with the following results.

Table 2

Results of Barrel Amalgamation Test

Product	Au mg	Assays oz/ton*		Distribution % (3)	
		Au	Ag	Au	Ag
Amalgam	0.145	0.0042		1.0	4.1
Amalgamation residue	-	0.41	28.37	99.0	95.9
Head	-	0.4142(1)	29.58(2)	100.0	100.0

*Internal Report MS-AC-65-905, 65-1068
(1) Calculated.
(2) Head sample assay.
(3) Calculated by difference.

Straight Cyanidation (Tests 2-25)

A series of cyanidation tests were carried out on samples of the ore under various conditions. The test conditions and the results are shown in Table 3.

Table 3

Results of Straight Cyanidation Tests

Test No	Charge Weight g	Grinding time min	Grinding % -200 mesh	Cyanidation Agitation time hr	Cyanidation Consumed lb/ton ore NaCN	Cyanidation Consumed lb/ton ore CaO	Assays*oz/ton Head Au	Assays*oz/ton Head Ag	Assays*oz/ton Residue Au	Assays*oz/ton Residue Ag	Extraction* % Au	Extraction* % Ag	Remarks
2	1000	15	51.0	24	7.80	15.28	0.42	29.58	0.155	5.90	63.1	80.0	Solution strength at 2:1 dilution, 1.0lbNaCN and 1.0lb CaO/ton
3	"	20	60.1	"	6.36	13.60	"	"	0.073	5.07	82.6	82.9	
4	"	30	77.6	"	6.76	13.60	"	"	0.073	4.08	82.6	84.2	
5	1000	15	51.0	48	6.60	17.96	0.42	29.58	0.080	4.66	81.0	84.2	same as above
6	"	20	60.1	"	6.68	18.04	"	"	0.073	4.15	82.6	86.0	
7	"	30	77.6	"	6.76	18.04	"	"	0.073	3.90	82.6	86.8	
8	1000	15	51.0	72	6.76	19.52	0.42	29.58	0.073	4.40	82.6	85.1	same as above
9	"	20	60.1	"	6.92	19.44	"	"	0.073	4.00	82.6	86.5	
10	"	30	77.6	"	7.08	19.32	"	"	0.070	3.73	83.3	87.4	
11	1000	40	94.5	48	10.00	22.40	0.45	32.46	0.095	4.70	81.1	85.5	same as above
12	"	50	95.5	"	8.20	23.00	"	"	0.085	4.53	83.3	86.0	
13	"	60	98.5	"	8.40	23.20	"	"	0.085	4.31	83.3	86.7	
14	1000	30	77.6	48	5.28	26.80	0.45	32.46	0.15	5.24	66.7	83.8	Solution strength at 2:1 dilution, 2.0lb NaCN and 2.0lb CaO/ton
15	"	40	94.5	"	5.60	26.80	"	"	0.13	4.96	71.1	84.7	
16	"	50	95.5	"	5.28	26.80	"	"	0.12	4.96	73.3	84.7	
17	"	60	98.5	"	7.68	27.20	"	"	0.12	4.78	73.3	85.3	
18	1000	30	77.6	48	5.20	27.76	0.45	32.46	0.14	5.14	68.9	84.2	Solution strength at 2:1 dilution, 4.0 lb NaCN and 4.0 lb CaO/ton
19	"	40	94.5	"	9.28	27.92	"	"	0.125	4.66	72.2	85.6	
20	"	50	95.5	"	5.52	27.82	"	"	0.115	4.49	74.4	86.2	
21	"	60	98.5	"	5.60	27.92	"	"	0.105	4.37	76.7	86.5	
22	1000	30	77.6	72	6.68	29.24	0.45	32.46	0.085	4.02	81.1	87.6	Ground is cyanide 1.0 lb NaCN and 1.0 lb lime/ton ore. Filtered, washed and cyanided at 2:1 dilution at a solution strength of 1.0 lb NaCN and 1.0 lb CaO/ton
23	"	40	94.5	"	6.76	29.24	"	"	0.078	3.90	82.7	88.0	
24	"	50	95.5	"	8.68	27.08	"	"	0.10	5.20	72.8	84.0	
25	"	60	98.5	"	8.84	29.24	"	"	0.093	5.11	79.3	84.6	

* Internal Reports MS-AC-65-1021, 66-550, 66-687, 66-694, 66-772

** Calculated by difference

Test 26

The results of the straight cyanidation tests made it desireable to determine the gold and silver extractions obtained at the different size ranges. Accordingly two 1000 gram samples were ground for 20 minutes and one of these samples was cyanided for 48 hours at a solution strength of 1.0 lb NaCN and 1.0 lb CaO/ton and a dilution of 2:1. The results of this test are shown in Table 4.

Table 4

Calculation of Au - Ag - Extraction from Sized Fractions Test 26

Particle Size	Feed + Res Average Wt %	Head Assays* oz/ton (A)		Head Distn %		Residue Assays* oz/ton (B)		Residue Distn %		Fract Ext * * %	
		Au	Ag	Au	Ag	Au	Ag	Au	Ag	Au	Ag
+ 65 mesh	6.0	0.07	5.52	1.1	1.3	0.06	2.49	2.4	3.2	14.3	54.9
+100 "	15.4	0.13	10.22	5.3	6.1	0.08	3.54	8.3	11.8	38.5	65.4
+150 "	15.6	0.20	15.68	8.3	9.4	0.12	4.39	12.6	14.8	40.0	72.0
+200 "	8.6	0.27	21.33	6.2	7.1	0.145	5.25	8.4	9.7	46.3	75.4
+ 56 mm	2.8	0.385	56.66	2.9	6.1	0.29	11.68	5.4	7.0	24.7	79.4
+ 40 "	11.3	0.29	21.10	8.7	9.2	0.18	5.37	13.6	13.1	38.0	74.6
+ 28 "	7.2	0.342	25.58	6.6	7.1	0.20	5.39	9.7	8.4	41.5	78.9
+ 20 "	5.8	0.39	29.71	6.0	6.6	0.215	5.46	8.4	6.8	44.9	81.6
+ 14 "	4.5	0.50	36.10	6.0	6.3	0.21	5.39	6.3	5.2	58.0	85.1
+ 10 "	3.3	0.54	29.25	4.7	5.0	0.18	4.99	4.0	3.6	66.7	87.3
- 10 "	19.5	0.85	47.65	44.2	35.8	0.16	3.89	20.9	16.4	81.2	91.8
Total	100.0	0.38	25.93	100.0	100.0	0.15	4.64	100.0	100.0	60.5	82.2

*Internal Report MS-AC-67-519

* * $100-\frac{B}{A}$

Gravity and Flotation Concentration (Test 27 and 28)

A 4000 gram sample of -10 mesh ore was concentrated by jigging. The jig tailing was ground to 64.0%-200 mesh and was tabled. The table tailing was floated. A screen and infrasizer analysis was carried out on this flotation tailing.

The operational data and the results of Test 27 are shown in the following tables.

Table 5 -a

Flotation Scheme Test 27

Operation	Reagents	lb/ton feed	Time min	pH
Grinding	-	-	20	
Conditioning	soda ash	4.0		7.9
	copper sulphate	0.5	10	
	Aero Xanthate 301	0.05	3	
	" " 350	0.15		
	Aerofloat 205	0.05		
	" 25	0.075	18	
Flotation*	pine oil	0.090		7.4

*reagents were stage added as needed during flotation.

Table 5-b

Results of Test 27

Product	Weight %	Assays oz/ton*		Distribution %	
		Au	Ag	Au	Ag
Jig conc	1.4	0.55	196.36	2.0	9.8
Table " (1)	1.0	1.17	379.15	3.2	13.5
Flot "	7.7	1.45	208.39	29.9	57.3
" tailing	89.9	0.27	6.03	64.9	19.4
Head (calcd)	100.0	0.374	28.01	100.0	100.0

(1) jig bed added to table feed
* Internal Report M5-AC-65-1076

Table 5-c

Screen and Infrasizer Analysis

Flotation Tailing Test 27

Particle Size	Weight %	Assays oz/ton*		Distribution %	
		Au	Ag	Au	Ag
+65 mesh	1.8	0.090	2.53	0.6	1.0
+100 "	9.1	0.095	3.97	3.2	6.0
+150 "	17.1	0.145	4.93	9.1	14.0
+200 "	8.0	0.190	5.82	5.6	7.7
+56 microns	5.4	0.290	7.69	5.8	6.9
+40 "	12.6	0.235	5.73	10.9	12.0
+28 "	9.5	0.270	5.54	9.5	8.7
+20 "	7.4	0.300	5.36	8.2	6.6
+14 "	5.6	0.345	5.35	7.1	5.0
+10 "	4.0	0.370	5.87	5.4	3.9
-10 "	19.5	0.480	9.12	34.6	28.2
Head (calcd)	100.0	0.271	6.11	100.0	100.0

*Internal Report MS-AC-65-1124

Test 28

A 2000 gram sample of -10 mesh ore was ground to 73.8%-200 mesh and was floated. A 1000 gram head sample was ground to the same fineness and a screen and infrasizer analysis was done on the ground pulp and on the flotation tailing. The following tables show the results which were obtained.

Table 6-a

Flotation Scheme Test 28

Operation	Reagents lb/ton feed								
	Aero Xanthate		Aerofloat		Aero	Pine	Na_2SO_3	Time	PH
	301	350	208	15	404	Oil		Min	
Grind	0.1	-	0.1	0.02	-	-	-	30	6.2
Condition	0.02	-	0.02	-	-	0.02	-	5	-
Float 1	-	-	-	-	-	-	-	6	6.2
Condition	0.02	-	0.02	0.02	-	0.02	-	3	-
Float 2	-	-	-	-	-	-	-	6	5.9
Condition	0.02	-	0.02	0.02	-	0.02	-	3	-
Float 3	-	-	-	-	-	-	-	6	5.6
Condition	-	-	-	-	-	-	1.0	3	5.9
Condition	-	0.05	-	-	0.05	0.02	-	3	-
Float 4	-	-	-	-	-	-	-	6	5.7

Table 6-b

Results of Test 28

Product	Weight %	Assays oz/ton*		Distribution %	
		Au	Ag	Au	Ag
Flot Conc No.1	7.3	1.30	251.06	23.5	63.5
" " No.2	5.6	0.79	45.05	10.9	8.7
" " No.3	4.0	0.64	29.33	6.3	4.1
" " No.4	4.6	0.58	15.32	6.6	2.4
Combined conc	21.5	0.890	106.18	47.3	78.7
Flot tailing	78.5	0.275	7.81	52.7	21.3
Head (calcd)	100.0	0.40	28.86	100.0	100.0

*Internal Report MS-AC-66-109

Table 6-c

Screen & Infrasizer Results Test 28

Particle Size	Flotation Feed					Flotation Tailing				
	Weight %	Assays oz/ton Au	Assays oz/ton Ag	Distribution % Au	Distribution % Ag	Weight %	Assays oz/ton* Au	Assays oz/ton* Ag	Distribution % Au	Distribution % Ag
+65 mesh	0.4	0.355	7.70	4.6	0.1	2.9	0.190	6.18	2.0	2.3
+100 "	4.8					8.0	0.100	4.76	2.9	4.8
+150 "	14.7	0.180	12.59	6.4	6.7	14.2	0.130	6.30	6.8	11.4
+200 "	6.0	0.230	17.70	3.3	3.8	8.3	0.190	8.04	5.8	8.5
+ 56 microns	12.2	0.330	32.67	9.8	14.4	12.9	0.320	11.28	15.1	18.6
+ 40 "	10.3	0.285	21.47	7.1	8.0	12.2	0.260	7.41	11.6	11.5
+ 28 "	11.4	0.340	24.38	9.4	10.1	9.8	0.290	6.77	10.4	8.4
+ 20 "	8.0	0.370	28.03	7.2	8.1	7.6	0.330	6.89	9.2	6.6
+ 14 "	5.5	0.440	33.15	5.9	6.6	4.9	0.370	7.30	6.6	4.5
+ 10 "	4.3	0.510	37.18	5.3	5.8	3.5	0.390	7.60	5.0	3.4
- 10 "	22.4	0.755	44.76	41.0	36.4	15.7	0.430	10.00	24.6	20.0
Head (calcd)	100.0	0.41	27.62	100.0	100.0	100.0	0.270	7.86	100.0	100.0

*Internal Report MS-AC-66-109

Cyanidation followed by Flotation (Test 29)

In all of the foregoing tests between 25% and 40% of the gold and silver remained in the tailing. The screen and infrasizer analyses of the mill products showed that a large proportion of the unrecovered values were concentrated in the -10 micron fraction.

Bulk cyanidation followed by flotation of the cyanidation residue seemed to offer the best prospect of reducing the losses in the disposable tailing.

To test this theory, a 16,000 gram sample of -10 mesh ore was ground to 64.0%-200 mesh and was cyanided in an open agitator for 24 hours at a dilution of 2:1 and a solution strength of 1.0 lb NaCN and 1.0 lb CaO/ton. The pulp was then filtered and washed to remove the soluble gold and silver and excess cyanide.

The cyanidation residue was then repulped and wet-split into eight test samples for flotation.

In Table 7 which follows, the results of these tests are shown with the reagents which were used.

Table 7

Results of Flotation Tests on Cyanidation Residue from Test 29

Test No	Time-min Cond.	Time-min Flot	Reagents lb/ton feed	PH	Product	Weight %	Assays oz/ton * Au	Assays oz/ton * Ag	Distn % Au	Distn % Ag	Feed oz/ton Au	Feed oz/ton Ag	Recovery % Cyanide Au	Recovery % Cyanide Ag	Recovery % Flotation Au	Recovery % Flotation Ag
29-A	18		Cu SO4 -0.50 Z-6 -0.15	11.2	Conc	8.7	0.215	17.99	16.3	28.0	0.352	26.27	67.3	78.8	3.7	5.9
					Tail	91.3	0.105	4.40	83.7	72.0						
		14	Pine oil-0.12	10.5	Head (calcd)	100.0	0.115	5.58	100.0	100.0						
29-B	18		H_2SO_4 $CuSO_4$-0.50 Z-6 -0.20	2.0	Conc	4.7	0.29	31.170	12.0	26.8	0.352	26.27	67.6	79.2	2.7	5.6
					Tail	95.3	0.105	4.195	88.0	73.2						
		9	DF.250-0.10		Head (calcd)	100.0	0.114	5.46	100.0	100.0						
29-C	15		H_2SO_4 $CuSO_4$-0.50 Xanthate 25-0.08	5.2	Conc	4.7	0.29	32.20	12.5	28.4	0.352	26.27	68.8	79.7	3.9	5.8
					Tail	95.3	0.10	4.00	87.5	71.6						
		9	DF250-0.08		Head (calcd)	100.0	0.11	5.33	100.0	100.0						
29-D	15		H_2SO_4 Soda ash-4.0 Cu SO_4-0.50 Xanthate 25-.08 Z-6-0.06	6.5 7.9	Conc	8.2	0.17	17.43	14.4	28.1	0.352	26.27	72.4	80.7	4.0	5.4
					Tail	91.8	0.09	3.98	85.6	71.9						
		9	Pine oil 0.05	7.8	Head (calcd)	100.0	0.097	5.08	100.0	100.0						
29-E	15		H_2SO_4 Soda ash-4.0 $CuSO_4$-0.50 Aero 404-0.15 Aeroflot 242-0.12	6.8 7.9	Conc	8.5	0.175	18.045	15.3	29.3	0.352	26.27	72.4	80.0	4.2	5.9
					Tail	91.5	0.09	4.05	84.7	70.7						
		10	Pine oil -0.08	7.9	Head (calcd)	100.0	0.097	5.24	100.0	100.0						
29-F	16		H_2SO_4 Soda ash 4.0 $CuSO_4$-0.50 Xanthate 301-0.1 Xanthate 208-0.1 Z-6 -0.05 Aeroflot 15-0.06	6.8 7.8	Conc	9.7	0.17	15.78	16.8	29.1	0.352	26.27	72.2	80.0	4.7	5.8
					Tail	90.3	0.09	4.13	83.2	70.9						
		9	Pine oil	7.7	Head (calcd)	100.0	0.098	5.26	100.0	100.0						
29-G	15		H_2SO_4 Soda ash 4.0 $CuSO_4$ 0.5 425-0.20 242-0.05 Z-6-0.05	6.9 7.9	Conc	10.5	0.17	14.51	18.1	29.4	0.352	26.27	72.2	80.3	5.0	5.8
					Tail	89.5	0.09	4.09	81.9	70.6						
		10	Pine oil -0.08		Head (calcd)	100.0	0.098	5.18	100.0	100.0						

Internal Reports MS-AC-66-1039, 66-1098, 67-139

Desliming of Ground Ore

Table 8 shows the results of desliming tests on the ground ore. In each test the ore was ground for 20 minutes (64.1% -200 mesh) and was deslimed in a Wade 7 in. by 3 ft hydroseparator.

Table 8

Results of Desliming Ground Ore

Test No	Product	Weight %	Assays oz/ton*		Distribution %		Rate l/min
			Au	Ag	Au	Ag	
30-A	Underflow	77.3	0.19	23.35	60.4	67.2	0.575
	Overflow	22.7	0.425	38.88	39.6	32.8	
	Head (calcd)	100.0	0.24	26.88	100.0	100.0	
30-B	Underflow	64.6	0.20	22.00	46.5	53.8	1.140
	Overflow	35.4	0.42	34.45	53.5	46.2	
	Head (calcd)	100.0	0.28	26.41	100.0	100.0	
30-C	Underflow	57.5	0.165	21.66	31.5	45.3	1.725
	Overflow	42.5	0.485	35.43	68.5	54.7	
	Head (calcd)	100.0	0.30	27.51	100.0	100.0	
30-D	Underflow	57.7	0.12	19.46	22.6	42.5	2.30
	Overflow	42.3	0.56	35.96	77.4	57.5	
	Head (calcd)	100.0	0.31	26.44	100.0	100.0	

*Internal Report MS-AC-66-984

Settling of Cyanidation Residues (Test 31)

Cyanidation residues from tests ground for the same time were split into fractions for settling rate determination with and without Separan NP-10 added.

Table 9

Results of Settling Tests

Initial Density (I)	Separan NP-10 lb/ton ore	Final Density (F)	Settling Rate (R) ft/hr	Thickener Area $\frac{1.333\ (I-F)}{R}$ ft^2/ton/24 hr
4:1	nil	0.625:1	1.66	2.71
"	0.0125	0. 65:1	2.00	2.79
"	0.020	"	2.50	1.79
"	0.025	"	3.33	1.34
"	0.040	"	2.50	1.79
"	0.080	0. 75:1	5.83	0.74
3:1	nil	0.625:1	0.83	3.81
"	0.0125	0. 59:1	1.45	2.22
"	0.020	0. 58:1	1.66	1.94
"	0.025	"	2.25	1.43
"	0.040	0. 57:1	2.50	1.29
"	0.080	0. 75:1	5.00	0.60
2.1	nil	0. 59:1	0.50	3.76
"	0.0125	"	0.75	2.51
"	0.020	"	0.84	2.24
"	0.025	"	1.00	1.88
"	0.040	0. 58:1	1.25	1.51
"	0.080	0. 67:1	2.27	0.78

CONCLUSIONS

The shipment from Mount Nansen Mines Limited was a highly oxidized siliceous rock and breccia containing a number of fine-grained silver-bearing minerals identified as freieslebenite, acanthite and native silver. No gold bearing minerals were identified.

A conclusion of the mineralogical investigation was that very fine grinding would be required to effect complete liberation. This conclusion was borne out in the test work in which a large proportion of the gold and silver is present in the -10 micron fraction as shown by the results of the analyses of the mill products. (Tables 4, 5-c, 6-c)

The almost complete absence of amalgamable gold and silver coupled with the fine state of sub-division of the gold and silver minerals made straight cyanidation of the ground ore an obvious starting point in this investigation. In Table 2 the results of 25 straight cyanidation tests done under varying conditions are detailed. While no explanation is advanced for certain anomalous results, it appears that with the conditions which prevailed in Tests 4, 7 and 10 (Table 3) in which only the agitation times were changed, the best recoveries of about 83% and 86% of the gold and silver respectively were obtained. In Table 4 is shown the amount of gold and silver extracted in each screen and infrasizer fraction. The extraction of gold and silver increases from the coarse to the fine size range. These results are a measure of the degree of liberation required to obtain the highest recovery. If it were economically possible to grind this ore to all minus 10 microns the recovery of gold and silver might be 81.2% and 91.8% respectively.

The amount of gold and silver remaining in the final tailing was of considerable concern. A series of flotation tests (No. 29 A-G) was done on cyanidation residues in an attempt to find a reagent combination which would concentrate these residual gold and silver minerals. These tests were only partially successful as an additional 4.7% of the gold and 5.8% of the silver (Test 29-G) was recovered. This still left a tailing of 0.09 oz Au/ton and and 4.09 oz Ag/ton.

Flotation by itself as a means of concentrating the gold and silver was unsuccessful.

As may be seen in Table 7 attempts to deslime the ground ore to remove barren material were unsuccessful.

As might be expected with highly oxdized material the settling rate of untreated solids was relatively slow. Tests showed that the settling rate could be increased appreciably by the addition of a settling aid.

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