An Investigation of

THE RECOVERY OF LEAD AND ZINC

from Grum and Cyprus Anvil Samples

submitted by

CYPRUS ANVIL MINING CORPORATION

Progress Report No.5

Project No. L.R. 2176

Note:

This report refers to the samples as received

LAKEFIELD RESEARCH OF CANADA LIMITED
Lakefield, Ontario
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I N D E X

A B S T R A C T

A flotation procedure for treatment of Grum ore (Progress Reports No. 9 and 10 - Project 2027) was tested on Cyprus Anvil ore and on Mixtures of Grum and Cyprus Anvil ores. Flotation tests carried out on Cyprus Anvil ore using the Grum flowsheet indicated the following:

1. The overall metallurgical results were similar to those obtained when using standard Cyprus Anvil procedure.

2. The pyrite flotation in the zinc circuit was more pronounced when using the Grum flowsheet.

3. Test results on the mixture of Cyprus Anvil and Grum ores (50:50 ratio) were similar to those obtained on individual ores.

The stage-regrinding of the lead concentrate was also examined in this testwork. The results indicated that a two-stage lead concentrate regrind improved the overall lead concentrate grade without loss in lead recovery. Coarser primary grinding (75% minus 200 mesh) with mixtures of Cyprus Anvil and Grum ores produced results similar to those with finer primary grinding (90% minus 200 mesh). ???

S U M M A R Y

1. Head Analyses

The head analyses of the Grum and Cyprus Anvil Composite samples used for flotation testwork were as follows:

		Grum Ore Composite	Cyprus Anvil Composite
Copper	(Cu)	0.14	0.18
Lead	(Pb)	4.98	3.15
Zinc	(Zn)	9.13	4.43
Iron	(Fe)	33.10	34.80
Sulphur	(S)	33.90	32.20

A detailed description of Grum and Cyprus Anvil Composites are contained in the section SAMPLE PREPARATION of this report.

2. Flotation Testwork

The testwork was conducted on two ore composites (i.e. Grum and Cyprus Anvil and on a mixture of Grum and Cyprus Anvil ore) to test the developed Grum flowsheet on Cyprus Anvil ore and on a Mixture of Cyprus Anvil and Grum ore. The variables studied included:

a) Effect of primary grind

b) Evaluation of Grum flowsheet on Cyprus Anvil ore

c) Stage re-grinding of lead concentrate

d) Standard tests on refractory Grum samples and a mixture of Grum samples and Cyprus Anvil ore.

Summary - Continued

3. Laboratory Procedure

The Laboratory procedure (Flowsheet - Figure No. 1) described in Pilot Plant Progress Report No. 9 (Kerr Addison Project 2027) was used in this investigation. The procedure consisted of ball mill grinding to 91% minus 200 mesh, with additions of Na_2CO_3 and NaCN, followed by lead flotation with collectors Z-11 and R-242. The lead rougher concentrate was reground and cleaned once, followed by a second regrinding of the cleaner concentrate and recleaning of the reground product in three stages. The combined lead flotation tailing and first cleaner tailing were conditioned with additions of lime and $CuSO_4$ followed by zinc flotation with collectors Z-11 and Z-200. The zinc rougher concentrate was reground followed by four cleaning stages.

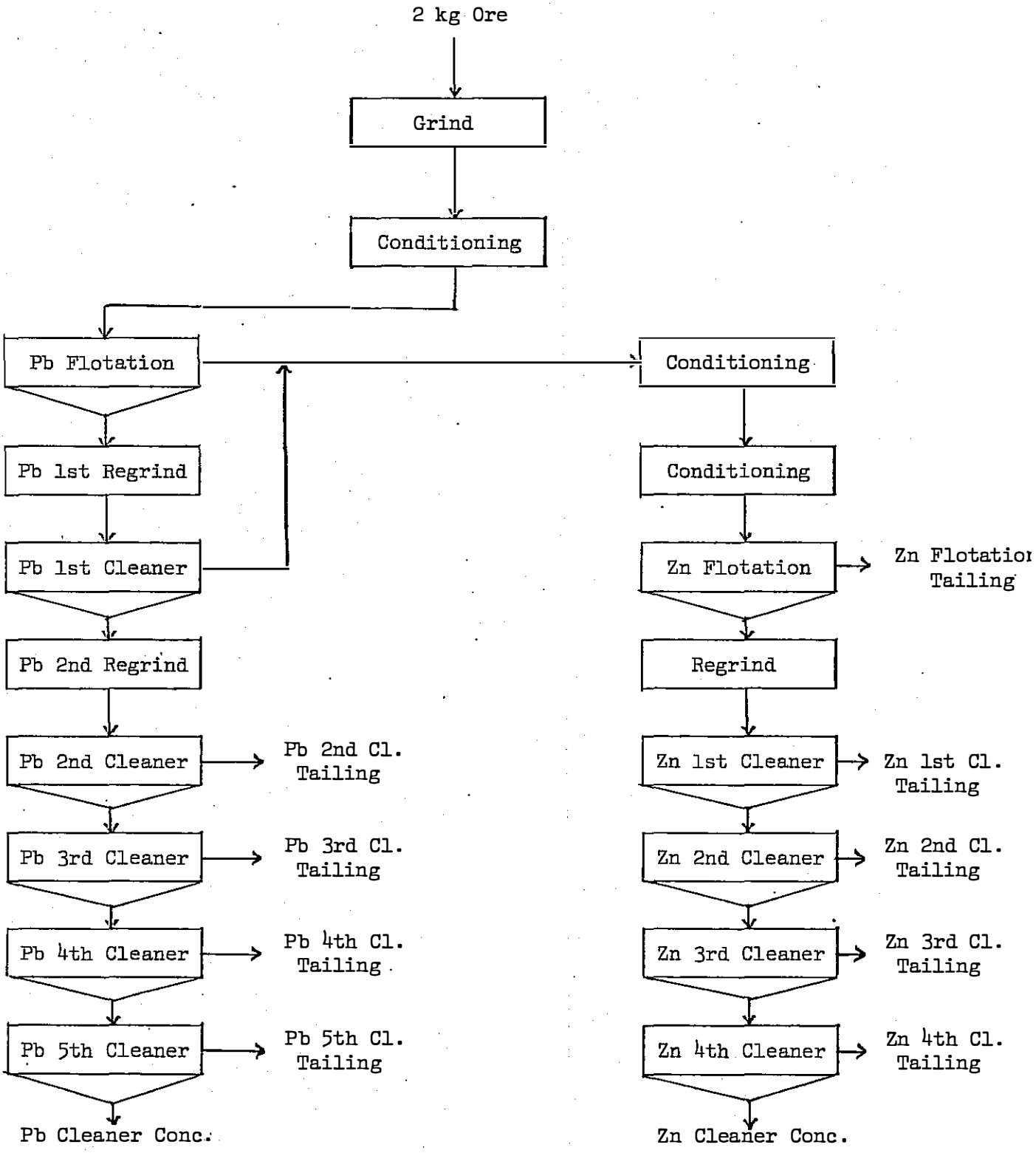
4. Flotation Results

4.1. Evaluation of Grum Flowsheet Using Cyprus Anvil Ore Composite

The basic flowsheet developed for treatment of the Grum ore was used to examine the flotation of Cyprus Anvil ore. Comparative tests were also carried out (test No. 3) using the standard Cyprus Anvil procedure. Typical results obtained in these tests are summarized in Table No. 1 on page 6.

Summary - Continued

Flowsheet



Summary - Continued

4. Flotation Results:

4.1. Evaluation of Grum Flowsheet Using Cyprus Anvil Ore Composite:

Table No. 1 - Comparison of Cyprus Anvil and Grum Procedure Using Cyprus Anvil Ore

Test No.	Primary Grind		Pb Regrind		Flowsheet
	Time, Minutes	% Passing 200 Mesh	Time, Minutes	% Passing 20 µm	
3	20	73.0	20	89	Cyprus Anvil
5	30	88.0	20	-	Cyprus Anvil
6	20	73.0	20 + 40	-	Grum
10	20	73.0	20 + 40	-	Grum

Test No.	Product	Weight %	Assays, %		% Distribution	
			Pb	Zn	Pb	Zn
3	Pb Cleaner Concentrate	3.51	73.1	3.38	86.3	2.8
	Pb 1st Cleaner Conc.	6.80	41.6	6.49	95.2	10.3
	Zn Cleaner Concentrate	7.48	0.48	49.10	1.2	85.4
	Zn Rougher Concentrate	16.74	0.36	22.50	1.9	87.7
	Zn Flotation Tailing	76.46	0.11	0.11	2.9	2.0
5	Pb Cleaner Concentrate	3.76	72.7	3.21	91.8	2.8
	Pb 1st Cleaner Conc.	6.08	46.6	5.91	95.2	8.3
	Zn Cleaner Concentrate	7.92	0.50	48.60	1.3	88.3
	Zn Rougher Concentrate	23.18	0.28	16.90	2.1	90.1
	Zn Flotation Tailing	70.74	0.11	0.10	2.7	1.6
6	Pb Cleaner Concentrate	3.15	76.7	1.61	86.1	1.1
	Pb 1st Cleaner Conc.	7.70	34.8	6.12	95.6	10.5
	Zn Cleaner Concentrate	7.51	0.49	48.5	1.3	79.3
	Zn Rougher Concentrate	48.31	0.15	8.40	2.5	88.3
	Zn Flotation Tailing	43.99	0.12	0.12	1.9	1.2
10	Pb Cleaner Concentrate	3.01	74.9	1.81	81.7	1.3
	Pb 2nd Cleaner Conc.	4.61	54.8	4.31	91.5	4.6
	Zn Cleaner Concentrate	6.04	0.36	52.8	0.8	74.3
	Zn Rougher Concentrate	30.81	0.34	12.9	3.9	92.9
	Zn Flotation Tailing	64.58	0.20	0.17	4.6	2.5

Summary - Continued

4. Flotation Results:

4.1. Evaluation of Grum Flowsheet Using Cyprus Anvil Ore Composite:

The overall metallurgical results using the Grum procedure were similar to those obtained with the Cyprus Anvil procedure with the exception that less zinc was recovered in the final zinc concentrate (tests 6 and 10). It should be pointed out that the high weight recovery in the zinc rougher concentrate (tests 6 and 10) was the result of higher $CuSO_4$ additions, which were commonly used when floating zinc from Grum ore.

4.2. Standard Flotation Test on Grum Composite

The Grum composite was prepared from 14 individual samples that were dried and stored after completion of the pilot plant. The composite was similar to that used for the pilot plant operation and reported in Progress Report 9 (Project 2027 - Kerr Addison). Typical results obtained in these tests are summarized in Table No. 2 below.

Table No. 2 - Standard Test Results on Grum Ore Composite

Test No.	Prim. Grind Min.	Pb Regr. Min.	Product	Weight %	Assays, %		% Distribution	
					Pb	Zn	Pb	Zn
1	30	30	Pb Cleaner Concentrate	6.85	49.6	10.5	73.0	8.0
			Pb 1st Cleaner Conc.	15.51	27.1	12.9	90.2	22.4
			Zn Cleaner Concentrate	11.42	0.59	51.8	1.4	66.0
			Zn Rougher Concentrate	23.63	0.84	27.7	4.2	73.0
			Zn Flotation Tailing	60.86	0.42	0.68	5.6	4.6
2	30	20+40	Pb Cleaner Concentrate	6.49	60.3	7.52	81.3	5.4
			Pb 1st Cleaner Conc.	20.65	21.6	12.20	92.5	27.9
			Zn Cleaner Concentrate	10.27	0.50	51.7	1.1	58.5
			Zn Rougher Concentrate	27.25	0.65	22.8	3.7	68.4
			Zn Flotation Tailing	52.10	0.36	0.65	3.8	3.7

The above metallurgical results were similar to those obtained with the pilot plant sample tested during 1977.

Summary - Continued

4. Flotation Results:

4.3. Standard Flotation Tests on Mixture of Grum Composite and Cyprus Anvil Ore

A series of three tests was conducted on a mixture of Grum Composite and Cyprus Anvil ore (50:50 mixture) to investigate the flotation characteristics of the mixture when using the standard Grum flowsheet. The results and conditions for these tests are summarized in Table No. 3.

Table No. 3 - Standard Test Results on Mixture of Grum and Cyprus Anvil Ore (50:50 Ratio)

Test No.	Primary Grind		Pb Conc. Regrind		Zn Concentrate Regrind Minutes
	Minutes	% Passing 200 Mesh	Minutes	% Passing 20 µm	
7	30	89.4	20 + 40	98.0	30
9	20	76.3	20 + 40	-	30
13	20	76.3	20 + 20	95.0	20

Test No.	Product	Weight %	Assays, %		% Distribution	
			Pb	Zn	Pb	Zn
7	Pb Cleaner Concentrate	4.72	68.6	4.57	85.1	3.2
	Pb 1st Cleaner Conc.	12.27	28.8	10.70	92.8	19.6
	Zn Cleaner Concentrate	8.38	0.51	52.5	1.1	65.9
	Zn Rougher Concentrate	23.80	0.53	21.6	3.3	76.9
	Zn Flotation Tailing	63.93	0.23	0.36	3.9	3.5
9	Pb Cleaner Concentrate	4.67	69.1	4.89	84.8	3.4
	Pb 1st Cleaner Conc.	8.13	42.7	9.06	91.1	10.9
	Zn Cleaner Concentrate	7.05	0.43	55.00	0.7	57.7
	Zn Rougher Concentrate	19.09	0.69	29.2	3.4	83.1
	Zn Flotation Tailing	69.83	0.31	0.45	5.7	4.8
13	Pb Cleaner Concentrate	5.13	63.9	6.80	86.7	5.3
	Pb 1st Cleaner Conc.	8.08	42.6	9.82	91.1	12.1
	Zn Cleaner Concentrate	8.45	0.64	53.5	1.4	68.8
	Zn Rougher Concentrate	17.71	0.73	30.3	3.4	87.9
	Zn Flotation Tailing	74.21	0.28	0.56	5.5	6.3

The results obtained in the above tests fell between those obtained when floating the individual Grum and Cyprus Anvil ores. It is interesting to note that using a coarser grind on the mixture, no significant difference in the overall metallurgical results (tests 9 and 13) were obtained.

Summary - Continued

4. Flotation Results:

4.4. Test Results on Individual Grum Samples and Mixtures of Grum Samples and Cyprus Anvil Ore

Standard tests on several refractory Grum samples (Composite "K", "J" and "B" Sample) and on a mixture of individual Grum samples and Cyprus Anvil ore were conducted to compare the response of Cyprus Anvil ore when mixing with refractory Grum samples. The Grum "K" composite (i.e. K-76, K-81 and K-68 - 1:1:1 ratio). "J" sample and "B" sample are refractory and represented 40 percent of the pilot plant composite. Detailed flotation characteristics of these samples are described in Progress Report No. 10(Project 2027 - Kerr Addison). The test results on individual samples and mixtures of individual samples and Cyprus Anvil ore are compared in Table No. 4 on the following page.

Summary - Continued

4. Flotation Results:

4.4. Test Results on Individual Grum Samples and Mixtures of Grum Samples and Cyprus Anvil Ore:

Table No. 4 - Test Results on Individual Grum Samples and Mixtures of Grum Samples and Cyprus Anvil Ore

Test No.		Product	Weight %	Assays,% Pb	Assays,% Zn	% Dist'n Pb	% Dist'n Zn
15	"K" Composite (1:1:1 ratio)	Pb Cleaner Conc.	8.94	52.5	9.99	83.5	9.0
		Pb 2nd Cl. Conc.	15.57	31.9	12.5	88.5	19.6
		Zn Cleaner Conc.	12.00	1.10	53.0	2.3	64.2
		Zn Rougher Conc.	21.76	1.16	32.3	4.4	70.8
		Zn Flotation Tailing	62.67	0.63	1.50	7.1	9.6
16	"K" Comp. + Cyprus Anvil Ore (1:1 ratio)	Pb Cleaner Conc.	4.87	68.4	4.73	81.6	3.3
		Pb 2nd Cl. Conc.	8.68	42.2	9.22	89.8	11.3
		Zn Cleaner Conc.	7.72	0.74	62.60	1.4	57.7
		Zn Rougher Conc.	16.94	0.82	33.4	3.5	80.5
		Zn Flotation Tailing	74.38	0.37	0.77	6.7	8.2
17	"J" Sample	Pb Cleaner Conc.	8.25	56.3	9.55	74.1	8.5
		Pb 2nd Cl. Conc.	17.66	32.3	13.20	90.7	25.1
		Zn Cleaner Conc.	9.89	1.05	51.50	1.7	54.7
		Zn Rougher Conc.	17.37	1.13	35.2	3.2	65.7
		Zn Flotation Tailing	64.97	0.59	1.32	6.1	9.2
18	"J" Sample + Cyprus Anvil Ore (1:1 ratio)	Pb Cleaner Conc.	5.55	67.2	5.57	83.0	4.5
		Pb 2nd Cl. Conc.	10.01	41.0	10.20	91.3	14.9
		Zn Cleaner Conc.	8.33	0.69	52.2	1.3	63.7
		Zn Rougher Conc.	15.78	0.79	33.0	2.8	76.5
		Zn Flotation Tailing	74.21	0.36	0.79	5.9	8.6
19	"B" Sample	Pb Cleaner Conc.	10.41	52.5	16.4	66.1	11.6
		Pb 2nd Cl. Conc.	21.46	31.8	21.5	82.6	31.3
		Zn Cleaner Conc.	2.29	1.98	46.9	0.5	7.3
		Zn Rougher Conc.	23.51	2.22	33.6	6.2	53.7
		Zn Flotation Tailing	55.03	1.69	4.03	11.2	15.0
20	"B" Sample + Cyprus Anvil Ore (1:1 ratio)	Pb Cleaner Conc.	6.78	61.4	11.0	75.2	7.9
		Pb 2nd Cleaner Conc.	13.34	36.5	17.0	88.0	24.0
		Zn Cleaner Conc.	10.30	1.09	44.8	2.0	48.9
		Zn Rougher Conc.	19.53	1.19	32.3	4.2	66.9
		Zn Flotation Tailing	67.13	0.64	1.28	7.8	9.1

The results on individual Grum samples were poor. Mixing these samples with Cyprus Anvil ore, reasonable concentrates grades and recoveries were obtained. The results were similar to the averages of the individual samples before mixing.

Summary - Continued

4. Flotation Results:

4.5. Evaluation of Stage Lead Concentrate Regrind

A series of six tests was conducted to investigate the effect of stage regrinding of the lead concentrate on the grade and recovery of lead concentrate. Comparative tests on Grum ore, Cyprus Anvil ore and a mixture were carried out. The results and conditions for these tests are summarized in Table No. 5.

Table No. 5 - Effect of Stage Regrinding - Results from Selected Tests

Test No.	Sample	Regrind		Product	Weight	Assays,%		% Dist'n	
		No.of Stages	Time, Minutes		%	Pb	Zn	Pb	Zn
10	Cyprus Anvil	2	20+40	Pb Cleaner Conc.	3.01	74.9	1.81	81.7	1.3
				Pb 1st Cl.Conc.	4.61	54.8	4.31	91.3	4.6
				Zn Cleaner Conc.	6.04	0.36	52.80	0.8	74.3
				Zn Rougher Conc.	30.81	0.31	12.9	3.9	92.9
				Zn Flot. Tailing	64.68	0.20	0.17	4.6	2.5
11	Cyprus Anvil	1	60	Pb Cleaner Conc.	3.06	72.8	2.03	79.8	1.4
				Pb 1st Cl. Conc.	5.68	44.9	5.21	91.4	6.8
				Zn Cleaner Conc.	5.48	0.34	53.8	0.7	67.8
				Zn Rougher Conc.	13.00	0.48	29.5	2.2	88.3
				Zn Flot. Tailing	81.32	0.22	0.26	6.4	4.9
2	Grum	2	20+40	Pb Cleaner Conc.	6.49	60.3	7.52	81.3	5.4
				Pb 1st Cl. Conc.	20.65	21.6	12.20	92.5	27.9
				Zn Cleaner Conc.	10.27	0.50	51.70	1.1	58.5
				Zn Rougher Conc.	27.25	0.65	22.80	3.7	68.4
				Zn Flot. Tailing	52.10	0.36	0.65	3.8	3.7
14	Grum	1	60	Pb Cleaner Conc.	6.85	56.2	9.12	80.6	6.9
				Pb 1st Cl. Conc.	15.12	28.8	12.4	91.2	20.7
				Zn Cleaner Conc.	10.21	0.63	52.8	1.3	59.6
				Zn Rougher Conc.	21.60	0.70	31.1	3.2	74.1
				Zn Flot. Tailing	63.28	0.43	0.73	5.6	5.2
7	Mixture Cyprus Anvil + Grum	2	20+40	Pb Cleaner Conc.	4.72	68.6	4.57	85.1	3.2
				Pb 1st Cl. Conc.	12.27	28.8	10.70	92.8	19.6
				Zn Cleaner Conc.	8.38	0.51	52.5	1.1	65.9
				Zn Rougher Conc.	23.80	0.53	21.60	3.3	76.9
				Zn Flot. Tailing	63.93	0.23	0.36	3.9	3.5
12	Mixture Cyprus Anvil + Grum	1	60	Pb Cleaner Conc.	4.41	69.8	5.30	80.5	3.5
				Pb 1st Cl. Conc.	9.30	37.3	9.65	91.2	13.5
				Zn Cleaner Conc.	8.01	0.38	53.50	0.8	64.9
				Zn Rougher Conc.	20.87	0.56	25.8	3.1	81.7
				Zn Flot. Tailing	69.83	0.31	0.45	5.8	4.8

Summary - Continued

4. Flotation Results:

4.5. Evaluation of Stage Lead Concentrate Regrind:

The two-stage lead concentrate regrind resulted in an increase in the lead concentrate grade and the lead recovery when using Grum ore and a mixture of Grum ore and Cyprus Anvil ore.

5. Conclusions

The testwork carried out on Grum Composite ore and Cyprus Anvil ore indicated the following:

1. The results obtained on Grum composite and individual samples were similar to those obtained in 1977, when using fresh samples.

2. The Grum flowsheet could be successfully applied to Cyprus Anvil ore.

3. The results obtained on the Mixture of Cyprus Anvil ore and Grum Composite were between those obtained on the individual samples.

4. Stage-regrinding of the lead concentrate improved lead metallurgical results on Grum ore and on the mixture of Grum Composite and Cyprus Anvil ore.

5. A coarser primary grind could be applied when treating a mixture of Grum composite and Cyprus Anvil ore.

SAMPLE PREPARATION

1. Grum Pilot Plant Composite

About 18 drums containing 15 different samples (10 tons) were received at Lakefield and given our reference No. 7921860. Each sample was screened on 50.8 mm screen. The plus 50.8 mm fraction was crushed to 10 mesh, and minus 50.8 mm was returned to original drum. The list of samples and the amount used for preparation of pilot plant composite are shown in the table below.

Grum Samples used for Preparation of Pilot Plant Composite

Sample	Weight Received, kg	% Weight for Composition	Weight kg Composited
K-76-1	800	5	6
K-80-1	1000	10	12
K-68-1	900	10	12
J-76	900	15	18
B-5	860	5	6
C-4	660	15	18
FV-4	740	5	6
D-4	800	5	6
G-4	900	15	18
FQ-4	700	5	6
A-2	800	5	6
H-3	800	5	6
Total	9860	100	120

About 60 kg pilot plant composite was prepared and riffled into 2 kg charges. Three two kg charges were also removed from each individual sample.

2. Cyprus Anvil Ore

A shipment of approximately 100 kilograms of Cyprus Anvil core samples was received at Lakefield on June 10, 1979 and given our reference No. 7921863. Each core sample (i.e. five feet interval) was crushed to ten mesh and a head sample was removed for assays. The core rejects were combined, mixed and riffled into 2 kg charges for testwork.

The list and assays of the individual samples are shown in the table on the following page.

Sample Preparation - Continued

2. Cyprus Anvil Ore:

Feet	S.G. g/cm³	Assays, %								
		Cu	Pb	Zn	Ag(1)	T.Fe	Mn	Po(2)	Py(3)	S
139.2 - 140	3.40	0.30	2.55	1.69	41.85	-	-	-	-	11.8
140 - 145	4.57	0.24	6.89	6.43	124.17	-	-	-	-	29.9
145 - 150	4.55	0.16	6.76	5.96	111.48	-	-	-	-	29.1
150 - 155	4.68	0.11	7.49	7.62	100.50	-	-	-	-	29.2
155 - 160	4.72	0.17	7.46	6.41	112.16	-	-	-	-	29.5
160 - 165	4.74	0.15	6.39	5.56	90.55	-	-	-	-	31.3
165 - 170	4.58	0.13	7.15	5.98	104.10	-	-	-	-	27.0
170 - 175	4.60	0.09	3.74	3.90	57.62	-	-	-	-	36.5
175 - 180	4.67	0.08	4.70	5.83	34.30	-	-	-	-	33.9
180 - 185	4.78	0.02	3.51	5.72	46.65	-	-	-	-	42.7
180 - 188.5	4.01	0.09	3.47	10.30	52.48	-	-	-	-	29.8
227.5 - 230.0	4.08	0.15	3.36	3.63	29.16	-	-	-	-	35.8
230 - 235	4.09	0.13	0.69	0.46	8.58	-	-	-	-	39.3
235 - 240	4.43	0.24	2.15	3.46	20.58	-	-	-	-	44.5
240 - 245	4.54	0.27	1.19	1.49	10.98	-	-	-	-	45.9
245 - 250	4.46	0.18	1.42	1.93	4.46	42.3	0.36	13.0	72.9	39.8
250 - 255	4.61	0.15	6.50	9.71	44.93	35.6	0.30	9.8	60.4	39.5
255 - 260	4.70	0.16	2.66	4.10	13.03	42.5	0.19	8.9	76.8	44.5
260 - 265	4.36	0.17	5.73	8.92	20.58	32.6	0.10	8.4	58.7	37.7
265 - 270	3.80	0.11	3.87	3.49	78.55	26.2	0.03	2.1	53.3	31.3
270 - 275	3.78	0.11	4.03	8.02	18.18	23.2	0.03	3.8	43.2	29.6
275 - 280	4.16	0.12	4.90	8.41	23.67	30.6	0.18	8.1	53.5	37.6
280 - 285	4.08	0.16	4.96	9.70	12.69	28.5	0.28	10.9	45.2	31.4
285 - 290	4.03	0.19	0.36	3.38	2.06	34.3	0.29	12.4	47.9	32.7
290 - 295	3.75	0.24	0.14	1.20	3.09	29.4	0.18	9.3	46.2	28.7
295 - 300	4.01	0.36	0.065	1.61	2.06	33.0	0.18	8.6	55.0	32.8
300 - 305	3.77	0.62	0.058	0.97	4.12	29.9	0.17	8.6	46.4	29.3
205 - 310	3.98	0.41	0.27	1.53	2.06	35.2	0.25	13.9	54.2	33.0
310 - 315	4.11	0.25	0.13	1.36	2.06	36.1	0.26	12.1	57.0	34.0
315 - 320	4.01	0.43	0.27	1.68	3.77	34.6	0.17	9.4	60.0	34.2
320 - 325	4.30	0.55	0.064	0.87	3.43	38.9	0.15	7.5	74.0	37.5
325 - 330	4.39	0.52	0.016	0.81	2.40	40.8	0.15	8.5	76.3	41.6
330 - 335	4.27	0.18	0.017	1.14	1.03	39.4	0.13	7.6	74.6	40.2
335 - 340	4.43	0.11	0.35	2.41	1.72	39.8	0.11	6.7	75.3	43.3
340 - 345	4.48	0.08	4.69	9.12	9.26	33.4	0.08	6.1	63.2	43.8
345 - 350	4.31	0.027	7.46	12.1	22.30	26.6	0.02	3.2	49.7	36.7
350 - 355	4.33	0.033	5.13	11.0	18.18	28.4	0.02	3.5	54.4	37.4
355 - 360	3.57	0.040	1.45	4.64	7.55	21.2	0.06	5.5	38.3	23.6
360 - 365	3.74	0.059	0.95	3.10	6.86	25.6	0.02	3.9	48.8	28.6
365 - 370	4.70	0.017	2.37	4.96	13.38	38.4	0.01	2.6	79.5	46.2
370 - 375	4.89	0.008	0.94	0.66	6.86	45.3	0.007	2.4	87.3	52.5
375 - 380	4.86	0.008	0.075	0.17	0.69	45.4	0.006	2.8	90.9	52.1
380 - 385	4.86	0.016	0.96	1.82	6.86	44.0	0.01	3.5	86.0	45.1
385 - 390	4.51	0.054	0.78	2.01	17.15	40.0	0.02	5.3	78.7	20.9
390 - 395	3.38	0.11	0.48	1.65	8.92	20.0	0.01	5.0	36.5	18.3
395 - 400	3.35	0.088	2.70	4.22	50.08	15.9	0.03	5.4	26.2	17.3
400 - 401	3.12	0.085	2.95	3.26	78.20	10.2	0.04	7.4	12.2	9.18

(1) g/t, (2) Pyrrhotite, (3) Pyrite

DETAILS OF TESTS

Test No. 1

Purpose: To perform the standard lead and zinc flotation procedure on the newly received Grum ore composite.

Procedure: Grind and float a lead concentrate. Regrind the concentrate and clean four times. Combine the lead rougher and 1st cleaner tailings, condition and float a zinc concentrate. Regrind the zinc concentrate and clean four times.

Feed: 2000 grams minus 10 mesh Grum Composite.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	30	-	-	-
Pb Rougher	-	-	-	10	15	-	-	1	3	9.5
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb Conc. Regr.	500	250	100	-	-	15	30	-	-	-
Pb 1st Cl.	-	-	-	2.5	-	-	-	1	3	9.6
	-	-	-	2.5	-	5	-	1	3	-
Pb 2nd Cl.	150	100	50	-	-	-	-	1	3	9.6
	-	-	-	2.5	-	2.5	-	1	1	-
Pb 3rd Cl.	50	50	25	-	-	-	-	1	3	9.6
Pb 4th Cl.	50	-	25	-	-	-	-	1	2	9.7
Combine lead rougher and 1st cleaner tailings for zinc circuit.										

Stage	Pb Rougher	Pb Regrind	Pb 1st + 2nd Cl.	Pb 3rd + 4th Cl.
Flotation Cell	1000 g D - 1	Rod Mill	500 g D - 1	250 g D - 1
Speed: r.p.m.	1800	-	1200	1000
% Solids	33	-	-	-

Test No. 1 - Continued

Conditions:

Stage	Reagents Added, grams per tonne					Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	Z-11	M-748	DF-250	Grind	Cond.	Froth	
Condition	1250	600	-	-	-	-	3	-	11.2
Zn Rougher	-	-	10	30	10	-	2	3	-
	-	150	5	20	5	-	2	5	-
Zn Conc. Regr.	500	250	-	20	-	15	-	-	-
Zn 1st Cl.	-	-	5	-	-	-	1	3	11.1
	-	-	10	-	2.5	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-		1	2	11.3
	-	-	5	-	2.5	-	1	2	-
Zn 3rd Cl.	250	-	2.5	-	2.5	-	1	3	11.5
Zn 4th Cl.	250	-	-	-	-	-	1	2	11.6

Stage	Zn Rougher	Zn Regrind	Zn Cleaners
Flotation Cell	1000 g D - 1	Pebble Mill	500 g D - 1
Speed: r.p.m.	1800	-	1200

Test No. 1 - Continued

Metallurgical Results

Product	Weight %	Assays, %		% Distribution	
		Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	6.85	49.6	10.5	73.0	8.0
2. Pb 4th Cl. Tail.	1.98	19.5	15.6	8.3	3.4
3. Pb 3rd Cl. Tail.	1.56	13.5	16.5	4.5	2.9
4. Pb 2nd Cl. Tail.	5.12	4.00	14.1	4.4	8.1
5. Zn Cleaner Conc.	11.42	0.59	51.8	1.4	66.0
6. Zn 4th Cl. Tail.	0.86	1.55	18.8	0.3	1.8
7. Zn 3rd Cl. Tail.	1.17	1.60	13.7	0.4	1.8
8. Zn 2nd Cl. Tail.	3.63	1.32	5.41	1.0	2.2
9. Zn 1st Cl. Tail.	6.55	0.79	1.68	1.1	1.2
10. Zn Rougher Tail.	60.86	0.42	0.68	5.6	4.6
Head (Calculated)	100.00	4.65	8.97	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	8.83	42.9	11.6	81.3	11.4
Products 1 to 3	10.39	38.4	12.4	85.8	14.3
Products 1 to 4	15.51	27.1	12.9	90.2	22.4
Products 5 and 6	12.28	0.66	49.5	1.7	67.8
Products 5 to 7	13.45	0.74	46.4	2.1	69.6
Products 5 to 8	17.08	0.86	37.7	3.1	71.8
Products 5 to 9	23.63	0.84	27.7	4.2	73.0
Products 5 to 10	84.49	0.54	8.24	9.8	77.6

Test No. 1 - Continued

Screen Analysis

Zn Rougher Tailing

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 100	0.2	0.2	99.8
150	1.7	1.9	98.1
200	6.4	8.3	91.7
270	7.7	16.0	84.0
400	16.0	32.0	68.0
- 400	68.0	100.0	-
Total	100.0	-	-

30 Minute Grind

+ 65	0.1	0.1	99.9
100	0.3	0.4	99.6
150	1.8	2.2	97.8
200	7.0	9.2	90.8
270	8.7	17.9	82.1
400	17.7	35.6	64.4
- 400	64.4	100.0	-
Total	100.0	-	-

20 Minute Grind

+ 65	0.4	0.4	99.6
100	1.6	2.0	98.0
150	5.4	7.4	92.6
200	12.8	20.2	79.8
270	11.3	31.5	68.5
400	17.4	48.9	51.1
- 400	51.1	100.0	-
Total	100.0	-	-

Test No. 1 - Continued

Screen Analysis

Composite Pb Cleaner Products

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 25.0 µm	9.9	9.9	90.1
19.4	10.4	20.3	79.7
13.5	21.7	42.0	58.0
9.3	18.1	60.1	39.9
7.2	9.6	69.7	30.3
- 7.2	30.3	100.0	-
Total	100.0	-	-

Specific Gravity 4.94

Composite Zn Cleaner Products

+ 200 mesh	0.6	0.6	99.4
270	1.5	2.1	97.9
29.2 µm	15.6	17.7	82.3
22.6	10.8	28.5	71.5
15.8	16.3	44.8	55.2
10.9	14.0	58.8	41.2
8.4	8.2	67.0	33.0
- 8.4	33.0	100.0	-
Total	100.0	-	-

Specific Gravity 3.91

Test No. 2

Purpose: To investigate the effect of two-stage regrinding of the lead rougher concentrate and of adding depressant 1902 to the Zn circuit.

Procedure: Grind and float a lead concentrate. Regrind the concentrate and clean once. Regrind the 1st cleaner concentrate and clean four more times. Combine the lead rougher and 1st cleaner tailings, condition and float a zinc concentrate. Regrind the Zn concentrate and clean four times.

Feed: 2000 grams minus 10 mesh Grum Composite.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	30	-	-	-
Pb Rougher	-	-	-	10	20	-	-	1	3	9.5
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb 1st Regr.	375	250	100	5	-	15	20	-	-	-
Pb 1st Cl.	-	-	-	2.5	-	-	-	1	4	9.5
	-	-	-	2.5	-	5	-	1	4	-
Pb 2nd Regr.	300	150	75	5	-	20	40	-	-	-
Pb 2nd Cl.	-	-	-	2.5	2.5	-	-	1	4	9.3
	-	-	-	2.5	2.5	5	-	1	4	-
Pb 3rd Cl.	150	50	50	-	-	-	-	1	3	9.4
	-	-	-	2.5	2.5	5	-	1	3	-
Pb 4th Cl.	100	50	25	-	-	-	-	1	2	9.4
	-	-	-	-	-	2.5	-	1	2	-
Pb 5th Cl.	50	-	25	-	2.5	-	-	1	3	9.5

Test No. 2 - Continued

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	1902	Z-11	M-748	DF-250	Grind	Cond.	Froth	
Zn Circuit (lead rougher plus 1st cleaner tailings)										
Condition	1250	600	-	-	-	-	-	3	-	11.2
Zn Rougher	-	-	-	10	30	10	-	2	3	-
	-	150	-	10	20	10	-	2	5	-
Zn Conc. Regr.	500	250	-	-	20	-	15	-	-	-
Zn 1st Cl.	-	-	20	5	-	-	-	2	3	11.2
	-	-	-	10	-	2.5	-	1	3	-
Zn 2nd Cl.	250	-	10	-	-	-	-	2	2	11.4
	-	-	-	5	-	-	-	1	2	-
Zn 3rd Cl.	250	-	5	2.5	-	-	-	2	3	11.5
Zn 4th Cl.	250	-	5	-	-	-	-	2	2	11.6

Test No. 2 - Continued

Metallurgical Results

Product	Weight %	Assays, %		% Distribution	
		Pb	Zn	Pb'	Zn
1. Pb Cleaner Conc.	6.49	60.3	7.52	81.3	5.4
2. Pb 5th Cleaner Tail.	0.91	12.5	15.8	2.4	1.6
3. Pb 4th Cleaner Tail.	2.52	6.79	15.3	3.6	4.3
4. Pb 3rd Cleaner Tail.	3.95	2.98	13.7	2.4	6.0
5. Pb 2nd Cleaner Tail.	6.78	2.01	14.2	2.8	10.6
6. Zn Cleaner Conc.	10.27	0.50	51.7	1.1	58.5
7. Zn 4th Cleaner Tail.	0.84	0.98	26.4	0.2	2.4
8. Zn 3rd Cleaner Tail.	1.94	1.06	15.8	0.4	3.4
9. Zn 2nd Cleaner Tail.	4.04	0.94	5.93	0.8	2.6
10. Zn 1st Cleaner Tail.	10.16	0.57	1.33	1.2	1.5
11. Zn Rougher Tailing	52.10	0.36	0.65	3.8	3.7
Head (Calculated)	100.00	4.82	9.07	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	7.40	54.4	8.54	83.7	7.0
Products 1 to 3	9.92	42.3	10.25	87.3	11.3
Products 1 to 4	13.87	31.1	11.2	89.7	17.3
Products 1 to 5	20.65	21.6	12.2	92.5	27.9
Products 6 and 7	11.11	0.54	49.8	1.3	60.9
Products 6 to 8	13.05	0.61	44.7	1.7	64.3
Products 6 to 9	17.09	0.69	35.6	2.5	66.9
Products 6 to 10	27.25	0.65	22.8	3.7	68.4
Products 6 to 11	79.35	0.46	8.26	7.5	72.1

Test No. 2 - Continued

Screen Analysis

Composite Pb Cleaner Products

Particle Size	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 25.0 µm	2.5	2.5	97.5
19.4	1.4	3.9	96.1
13.5	8.0	11.9	88.1
9.3	18.3	30.2	69.8
7.2	14.2	44.4	55.6
- 7.2	55.6	100.0	-
Total	100.0	-	-

Specific Gravity 4.98

Test No. 3

Purpose: To investigate the flotation of lead and zinc from the Cyprus Anvil Drill-Core Composite.

Procedure: As for test No. 1.

Feed: 2000 grams minus 10 mesh Cyprus-Anvil Drill Core Composites.

Grind: 20 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, g/tonne					Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	Grind	Cond.	Froth	
Grind	2500	500	150	25	-	20	-	-	-
Pb Rougher	-	-	-	-	20	-	1	3	9.9
	-	-	-	15	5	-	1	3	-
	-	-	-	10	5	-	1	3	-
Pb Conc. Regr.	1000	250	75	15	-	20	-	-	-
Pb 1st Cl.	-	-	-	5	5	-	1	3	10.2
	-	-	-	5	2.5	-	1	3	-
Pb 2nd Cl.	100	100	50	-	2.5	-	1	2	10.0
	-	-	-	5	2.5	-	1	2	-
Pb 3rd Cl.	100	50	25	-	-	-	1	2	9.9
	-	-	-	2.5	2.5	-	1	1	-
Pb 4th Cl.	50	-	25	-	2.5	-	1	2	9.9
Combine lead rougher and 1st cleaner tailings for zinc flotation									

Stage	Pb Rougher	Pb Regrind	Pb 1st to 3rd Cl.	Pb 4th Cleaner
Flotation Cell	1000 g D - 1	Rod Mill	500 g D - 1	250 g D - 1
Speed: r.p.m.	1800	-	1200	1000
% Solids	33	-	-	-

Test No. 3 - Continued

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	Z-11	M-748	DF-250	1902	Grind	Cond.	Froth	
Condition	1250	-	-	-	-	-	-	2	-	-
	-	750	-	-	-	-	-	3	-	11.4
Zn Rougher	-	-	20	20	20	-	-	1	5	-
	-	-	10	10	10	-	-	1	5	-
Zn Conc. Regr.	750	250	-	20	-	-	20	-	-	-
Condition	-	-	-	-	-	50	-	2	-	11.3
Zn 1st Cl.	-	-	5	-	2.5	-	-	1	3	-
	-	-	5	-	-	-	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	25	-	2	2	11.5
	-	-	5	-	2.5	-	-	1	2	-
Zn 3rd Cl.	250	-	-	-	-	15	-	2	2	11.6
	-	-	2.5	-	2.5	-	-	1	1	-
Zn 4th Cl.	250	-	-	-	-	10	-	2	2	11.6

Stage	Zn Rougher	Zn Regrind	Zn Cleaners
Flotation Cell	1000 g D - 1	Pebble Mill	500 g D - 1
Speed: r.p.m.	1800	-	1200

Test No. 3 - Continued

Metallurgical Results

Product	Weight	Assays, %				% Distribution			
	%	Cu	Pb	Zn	Ag*	Cu	Pb	Zn	Ag
1. Pb Cleaner Conc.	3.51	0.26	73.1	3.38	580.12	4.6	86.3	2.8	67.3
2. Pb 4th Cl. Tail.	0.40	1.11	29.3	8.96	251.67	2.2	3.9	0.8	3.3
3. Pb 3rd Cl. Tail.	0.80	0.87	12.0	10.5	111.57	3.5	3.2	2.0	3.0
4. Pb 2nd Cl. Tail.	2.09	0.44	2.50	9.72	33.11	4.6	1.8	4.7	2.3
5. Zn Cleaner Conc.	7.48	1.35	0.48	49.1	23.67	50.8	1.2	85.4	5.9
6. Zn 4th Cl. Tail.	0.23	2.76	1.57	10.4	41.82	3.2	0.1	0.6	0.3
7. Zn 3rd Cl. Tail.	0.57	0.76	0.66	4.49	22.14	2.2	0.1	0.6	0.4
8. Zn 2nd Cl. Tail.	1.83	0.36	0.35	1.82	19.55	3.3	0.2	0.7	1.2
9. Zn 1st Cl. Tail.	6.63	0.10	0.15	0.29	7.55	3.3	0.3	0.4	1.6
10. Zn Ro. Tailing	76.46	0.058	0.11	0.11	5.83	22.3	2.9	2.0	14.7
Head (Calculated)	100.00	0.20	2.98	4.30	30.26	100.0	100.0	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	3.91	0.35	68.6	3.95	546.52	6.8	90.2	3.6	70.6
Products 1 to 3	4.71	0.44	59.0	5.06	472.65	10.3	93.4	5.6	73.6
Products 1 to 4	6.80	0.44	41.6	6.49	337.56	14.9	95.2	10.3	75.9
Products 5 and 6	7.71	1.39	0.51	47.9	24.22	54.0	1.3	86.0	6.2
Products 5 to 7	8.28	1.35	0.52	45.0	24.07	56.2	1.4	86.6	6.6
Products 5 to 8	10.11	1.17	0.49	37.1	23.25	59.5	1.6	87.3	7.8
Products 5 to 9	16.74	0.75	0.36	22.5	17.04	62.8	1.9	87.7	9.4
Products 5 to 10	93.20	0.18	0.15	4.14	7.84	85.1	4.8	89.7	24.1

* g/t

Test No. 3 - Continued

Screen Analysis

C.A. Composite - 20 Minute Grind

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 65	0.1	0.1	99.9
100	1.9	2.0	98.0
150	8.2	10.2	89.8
200	16.8	27.0	73.0
270	11.9	38.9	61.1
400	16.6	55.5	44.5
- 400	44.5	100.0	-
Total	100.0	-	-

Zn Rougher Tailing

+ 65	0.2	0.2	99.8
100	2.4	2.6	97.4
150	8.6	11.2	88.8
200	17.2	28.4	71.6
270	11.8	40.2	59.8
400	16.3	56.5	43.5
- 400	43.5	100.0	-
Total	100.0	-	-

Test No. 3 - Continued

Screen Analysis

Composite Pb Cleaner Products

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 23.4 µm	7.0	7.0	93.0
18.2	5.0	12.0	88.0
12.7	18.3	30.3	69.7
8.7	21.0	51.3	48.7
6.7	11.8	63.1	36.9
- 6.7	36.9	100.0	-
Total	100.0	-	-

Specific Gravity 5.47

Composite Zn Cleaner Products

+ 200 mesh	0.3	0.3	99.7
270	0.8	1.1	98.9
27.5 µm	13.2	14.3	85.7
21.3	10.8	25.1	74.9
14.9	16.8	41.9	58.1
10.2	14.9	56.8	43.2
7.9	9.0	65.8	34.2
- 7.9	34.2	100.0	-
Total	100.0	-	-

Specific Gravity 4.19

Test No. 4

Purpose: To investigate the effect of adding a portion of the coarse tailing to the cleaner stages to improve selectivity.

Procedure: See flowsheet.

Feed: 2000 grams minus 10 mesh Grum Composite.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	30	-	-	-
Pb Rougher	-	-	-	10	20	-	-	1	3	9.5
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb 1st Regr.	500	250	100	5	-	15	30	-	-	-
Add 10 % of the Pb rougher tailing to cell and cond.								10		
Pb 1st Cl.	-	-	-	2.5	5	-	-	1	4	9.5
	-	-	-	2.5	-	5	-	1	4	-
Pb 2nd Regr.	500	150	75	5	-	15	30	-	-	-
Add 20 % of the Pb rougher tailing to cell and condition								10	-	-
Pb 2nd Cl.	-	-	-	2.5	-	-	-	1	4	9.6
	-	-	-	2.5	-	5	-	1	4	-
Pb 3rd Cl.	100	50	50	-	-	-	-	1	3	9.7
	-	-	-	2.5	-	2.5	-	1	3	-
Pb 4th Cl.	100	50	50	-	-	-	-	1	2	9.7
	-	-	-	-	-	2.5	-	1	2	-
Pb 5th Cl.	50	-	25	-	-	-	-	1	3	9.8
Combine Pb rougher and 1st and 2nd cleaner tailings for Zn flotation.										

Test No. 4 - Continued

Conditions:

Stage	Reagents Added, grams per tonne					Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	Z-11	M-748	DF-250	Grind	Cond.	Froth	
Zn Circuit									
Condition	1250	600	-	-	-	-	3	-	-
Zn Rougher	-	-	10	30	10	-	2	3	11.1
	-	150	10	30	10	-	2	5	-
Zn Conc. Regr.	500	250	-	20	-	30	-	-	-
Deslime Zn tailing and add 20 % of sand fraction to Zn 1st cleaner.									
Condition	-	-	-	-	-	-	10	-	-
Zn 1st Cl.	-	-	5	-	-	-	1	3	11.0
	-	-	5	-	-	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	-	1	2	11.2
	-	-	5	-	-	-	1	2	-
Zn 3rd Cl.	250	-	-	-	-	-	1	2	11.4
	-	-	2.5	-	-	-	1	1	-
Zn 4th Cl.	250	-	-	-	-	-	1	2	11.5

Test No. 4 - Continued

Metallurgical Results

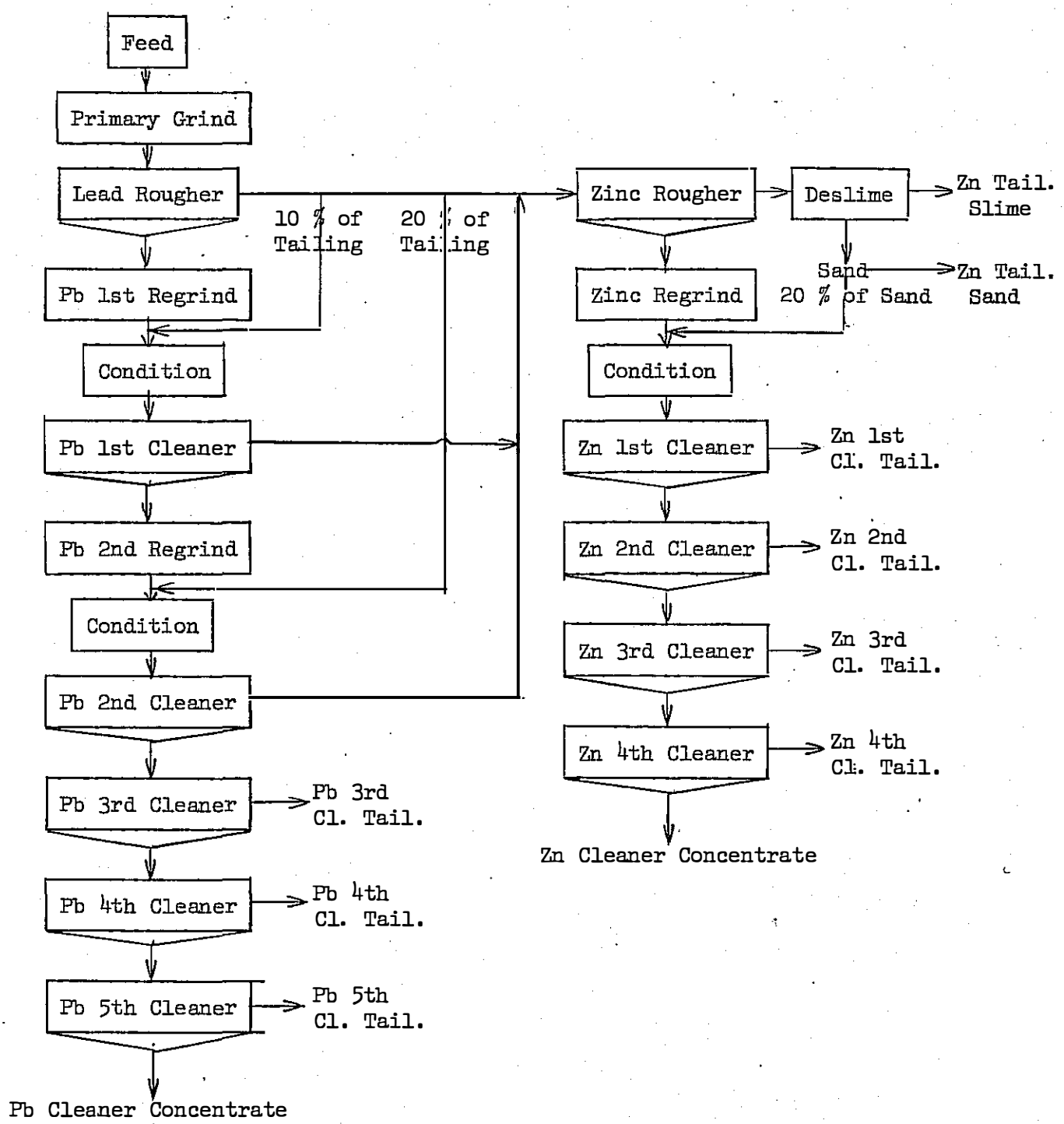
Product	Weight	Assays, %		% Distribution	
	%	Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	7.07	59.3	8.50	86.4	6.7
2. Pb 5th Cleaner Tail.	0.82	9.22	17.3	1.6	1.6
3. Pb 4th Cleaner Tail.	1.63	5.12	17.3	1.7	3.1
4. Pb 3rd Cleaner Tail.	2.75	2.36	14.9	1.3	4.6
5. Zn Clenaer Conc.	11.67	0.54	53.3	1.3	69.1
6. Zn 4th Cleaner Tail.	1.11	1.09	32.3	0.2	4.0
7. Zn 3rd Cleaner Tail.	1.19	1.37	17.6	0.3	2.3
8. Zn 2nd Cleaner Tail.	2.62	1.13	6.80	0.6	2.0
9. Zn 1st Cleaner Tail.	15.80	0.60	1.49	2.0	2.6
10. Zn Tailing Sand	28.21	0.39	0.65	2.3	2.0
11. Zn Tailing Slime	27.13	0.41	0.65	2.3	2.0
Head (Calculated)	100.00	4.85	9.00	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	7.89	54.1	9.42	88.0	8.3
Products 1 to 3	9.52	45.7	10.8	89.7	11.4
Products 1 to 4	12.27	36.0	11.7	91.0	16.0
Products 5 and 6	12.78	0.59	51.5	1.5	73.1
Products 5 to 7	13.97	0.65	48.6	1.8	75.4
Products 5 to 8	16.59	0.73	42.0	2.4	77.4
Products 5 to 9	32.39	0.67	22.2	4.4	80.0
Products 5 to 11	87.73	0.50	8.62	9.0	84.0
Reconstituted Zn Ro. Tail.	62.39	0.40	0.65	5.1	4.5

Test No. 4 - Continued

Flowsheet



Test No. 5

Purpose: To repeat test No. 3, but with a finer primary grind.

Procedure: As for test No. 3.

Feed: 2000 grams minus 10 mesh Cyprus Anvil Drill Core Composite.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, g/tonne					Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	Grind	Cond.	Froth	
Grind	2500	500	150	25	-	30	-	-	-
Pb Rougher	-	-	-	-	20	-	1	3	9.8
	-	-	-	15	5	-	1	3	-
	-	-	-	10	5	-	1	3	-
Pb Conc. Regr.	750	250	75	15	-	20	-	-	-
Pb 1st Cl.	-	-	-	5	2.5	-	1	3	10.0
	-	-	-	5	2.5	-	1	3	-
Pb 2nd Cl.	100	100	50	-	-	-	1	2	-
	-	-	-	5	2.5	-	1	2	-
Pb 3rd Cl.	100	50	25	-	-	-	1	2	9.9
	-	-	-	2.5	2.5	-	1	1	-
Pb 4th Cl.	50	-	25	-	2.5	-	1	2	10.0
Combine lead rougher and 1st cleaner tailings for zinc flotation.									

Test No. 5 - Continued

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	Z-11	M-748	DF-250	1902	Grind	Cond.	Froth	
Condition	1250	-	-	-	-	-	-	3	-	-
	-	600	-	-	-	-	-	3	-	11.3
Zn Rougher	-	-	10	30	20	-	-	1	5	-
	-	150	10	20	10	-	-	1	5	-
Zn Conc. Regr.	750	250	-	20	-	-	20	-	-	-
Condition	-	-	-	-	-	50	-	2	-	11.2
Zn 1st Cl.	-	-	5	-	2.5	-	-	1	3	-
	-	-	5	-	-	-	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	25	-	2	2	-
	-	-	5	-	2.5	-	-	1	2	-
Zn 3rd Cl.	250	-	-	-	-	15	-	2	2	11.4
	-	-	2.5	-	2.5	-	-	1	1	-
Zn 4th Cl.	250	-	-	-	-	10	-	2	2	11.5

Test No. 5 - Continued

Metallurgical Results

Product	Weight	Assays, %,g/t				% Distribution			
	%	Cu	Pb	Zn	Ag	Cu	Pb	Zn	Ag
1. Pb Cleaner Conc.	3.76	0.35	72.7	3.21	589.96	6.4	91.8	2.8	74.1
2. Pb 4th Cleaner Tail.	0.27	1.56	14.6	9.75	153.41	2.0	1.3	0.6	1.4
3. Pb 3rd Cleaner Tail.	0.36	0.91	6.23	11.0	74.96	1.6	0.8	0.9	0.9
4. Pb 2nd Cleaner Tail.	1.69	0.46	2.32	10.2	37.73	3.8	1.3	4.0	2.1
5, Zn Cleaner Conc.	7.92	1.60	0.50	48.6	26.07	61.5	1.3	88.3	6.9
6. Zn 4th Cleaner Tail.	0.30	0.94	0.76	6.00	28.51	1.4	0.1	0.4	0.3
7. Zn 3rd Cleaner Tail.	0.77	0.29	0.40	2.10	15.09	1.1	0.1	0.4	0.4
8. Zn 2nd Cleaner Tail.	2.85	0.16	0.25	0.97	9.60	2.2	0.2	0.6	0.9
9. Zn 1st Cleaner Tail.	11.34	0.058	0.11	0.16	4.20	3.2	0.4	0.4	1.6
10. Zn Rougher Tailing	70.74	0.049	0.11	0.10	4.80	16.8	2.7	1.6	11.5
Head (Calculated)	100.00	0.21	2.98	4.36	29.9	100.0	100.0	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	4.03	0.43	68.8	3.65	560.71	8.4	93.1	3.4	75.5
Products 1 to 3	4.39	0.47	63.7	4.25	520.88	10.0	93.9	4.3	76.4
Products 1 to 4	6.08	0.47	46.6	5.91	386.58	13.8	95.2	8.3	78.5
Products 5 and 6	8.22	1.58	0.51	47.0	26.16	62.9	1.4	88.7	7.2
Products 5 to 7	8.99	1.47	0.50	43.2	25.21	64.0	1.5	89.1	7.6
Products 5 to 8	11.84	1.15	0.44	33.0	21.45	66.2	1.7	89.7	8.4
Products 5 to 9	23.18	0.62	0.28	16.9	13.01	69.4	2.1	90.1	10.0
Products 5 to 10	93.92	0.19	0.15	4.26	6.83	86.2	4.8	91.7	21.5

Test No. 5 - Continued

Screen Analysis

C.A. Composite - 30 Minute Grind

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 65	0.1	0.1	99.9
100	0.3	0.4	99.6
150	2.4	2.8	97.2
200	9.2	12.0	88.0
270	10.1	22.1	77.9
400	19.7	41.8	58.2
- 400	58.2	100.0	-
Total	100.0	-	-

Zn Rougher Tailing

+ 150	3.1	3.1	96.9
200	10.6	13.7	86.3
270	9.7	23.4	76.6
400	17.8	41.2	58.8
- 400	58.8	100.0	-
Total	100.0	-	-

Test No. 6

Purpose: To investigate the effect of using the C.A. coarse primary grind followed by the Grum two stage lead regrinding.

Procedure: As for test No. 2.

Feed: 2000 grams minus 10 mesh Cyprus-Anvil Drill Core Composite.

Grind: 20 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Grind	2500	500	150	25	-	-	20	-	-	-
Pb Rougher	-	-	-	-	20	-	-	1	3	9.9
	-	-	-	15	5	-	-	1	3	-
	-	-	-	10	5	-	-	1	3	-
Pb 1st Regr.	500	250	100	5	-	15	20	-	-	-
Pb 1st Cl.	-	-	-	2.5	2.5	-	-	1	3	9.8
	-	-	-	2.5	-	5	-	1	3	-
Pb 2nd Regr.	400	150	75	5	-	15	40	-	-	-
Pb 2nd Cl.	-	-	-	2.5	-	-	-	1	3	9.8
	-	-	-	2.5	-	5	-	1	3	-
Pb 3rd Cl.	100	50	50	-	-	-	-	1	2	9.8
	-	-	-	2.5	-	5	-	1	2	-
Pb 4th Cl.	100	50	25	-	-	-	-	1	2	9.8
	-	-	-	-	-	2.5	-	1	1	-
Pb 5th Cl.	50	-	25	-	-	-	-	1	2	9.9

Test No. 6 - Continued

Conditions:

Stage	Reagents Added, g/tonne					Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	Z-11	M-748	DF-250	Grind	Cond.	Froth	
Zn Circuit (Lead rougher plus 1st cleaner tailings)									
Condition	1250	500	-	-	-	-	5	-	11.3
Zn Rougher	-	-	10	30	20	-	2	5	-
	-	250	10	20	10	-	2	5	-
Zn Conc. Regr.	750	250	-	20	-	30	-	-	-
Zn 1st Cl.	-	-	5	-	5	-	1	3	11.1
	-	-	5	-	2.5	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	-	1	2	11.3
	-	-	5	-	2.5	-	1	2	-
Zn 3rd Cl.	250	-	-	-	-	-	1	2	11.4
	-	-	2.5	-	-	-	1	1	-
Zn 4th Cl.	250	-	-	-	-	-	1	2	11.5

Test No. 6 - Continued

Metallurgical Results

Product	Weight	Assays, %				% Distribution			
	%	Cu	Pb	Zn	Ag*	Cu	Pb	Zn	Ag
1. Pb Cleaner Conc.	2.94	0.30	79.0	1.32	634.55	4.4	82.9	0.8	64.5
2. Pb 5th Cl. Tail.	0.21	1.10	43.9	5.66	354.81	1.2	3.2	0.3	2.6
3. Pb 4th Cl. Tail.	0.53	1.03	26.0	8.10	237.80	2.7	4.9	0.9	4.4
4. Pb 3rd Cl. Tail.	1.08	0.59	5.90	9.57	68.60	3.2	2.3	2.3	2.6
5. Pb 2nd Cl. Tail.	2.94	0.35	2.17	9.73	30.53	5.2	2.3	6.2	3.0
6. Zn Cleaner Conc.	7.51	1.56	0.49	48.5	24.70	58.6	1.3	79.3	6.4
7. Zn 4th Cl. Tail.	0.17	0.78	0.63	6.31	25.73	0.6	-	0.2	0.2
8. Zn 3rd Cl. Tail.	1.43	0.59	0.51	5.35	22.30	4.2	0.3	1.7	1.1
9. Zn 2nd Cl. Tail.	5.59	0.10	0.12	0.37	6.86	2.8	0.2	0.4	1.3
10. Zn 1st Cl. Tail.	33.61	0.036	0.055	0.92	4.80	6.1	0.7	6.7	5.6
11. Zn Rougher Tail.	43.99	0.050	0.12	0.12	5.49	11.0	1.9	1.2	8.3
Head (Calculated)	100.00	0.20	2.80	4.60	28.93	100.0	100.0	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	3.15	0.35	76.7	1.61	615.90	5.6	86.1	1.1	67.1
Products 1 to 3	3.68	0.45	69.4	2.54	561.45	8.3	91.0	2.0	71.5
Products 1 to 4	4.76	0.48	55.0	4.14	449.62	11.5	93.3	4.3	74.1
Products 1 to 5	7.70	0.43	34.8	6.27	289.61	16.7	95.6	10.5	77.1
Products 6 and 7	7.68	1.54	0.49	47.6	24.72	59.2	1.3	79.5	6.6
Products 6 to 8	9.11	1.39	0.50	40.9	24.34	63.4	1.6	81.2	7.7
Products 6 to 9	14.70	0.90	0.35	25.5	17.70	66.2	1.8	81.6	9.0
Products 6 to 10	48.31	0.30	0.15	8.40	8.72	72.3	2.5	88.3	14.6

* g/t

Test No. 7

Purpose: To investigate the flotation of lead and zinc from a 1:1 mixture of Grum and Cyprus-Anvil ores using the Grum procedure.

Procedure: As for test No. 2.

Feed: 2000 grams of 1:1 mixture of Grum and Cyprus-Anvil - 10 mesh ores.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	30	-	-	-
Pb Rougher	-	-	-	10	20	-	-	1	3	9.7
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb 1st Regr.	500	250	100	5	-	15	20	-	-	-
Pb 1st Cl.	-	-	-	2.5	-	-	-	1	4	9.8
	-	-	-	2.5	-	5	-	1	4	-
Pb 2nd Regr.	350	150	75	5	-	15	40	-	-	-
Pb 2nd Cl.	-	-	-	2.5	-	-	-	1	4	9.6
	-	-	-	2.5	-	5	-	1	4	-
Pb 3rd Cl.	150	100	50	-	-	-	-	1	3	9.7
	-	-	-	2.5	-	2.5	-	1	3	-
Pb 4th Cl.	100	50	25	-	-	-	-	1	2	9.7
	-	-	-	-	-	2.5	-	1	2	-
Pb 5th Cl.	50	-	25	-	-	-	-	1	3	9.8

Test No. 7 - Continued

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	M-748	Z-11	DF-250	1902	Grind	Cond.	Froth	
Zn Circuit (Pb rougher tailing plus Pb 1st cleaner tailing)										
Condition	1250	600	-	-	-	-	-	3	-	11.2
Zn Rougher	-	-	30	10	10	-	-	2	3	-
	-	150	20	10	10	-	-	2	5	-
Zn Conc. Regr.	750	250	20	-	-	-	30	-	-	-
Zn 1st Cl.	-	-	-	5	-	20	-	2	3	11.3
	-	-	-	5	2.5	-	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	10	-	2	2	-
	-	-	-	5	-	-	-	1	2	-
Zn 3rd Cl.	250	-	-	-	-	5	-	2	2	11.5
	-	-	-	2.5	-	-	-	1	1	-
Zn 4th Cl.	250	-	-	-	-	5	-	2	2½	11.6

Test No. 7 - Continued

Metallurgical Results

Product	Weight %	Assays, %				% Distribution			
		Cu	Pb	Zn	Ag*	Cu	Pb	Zn	Ag
1. Pb Cleaner Conc.	4.72	0.35	68.6	4.57	782.73	10.1	85.1	3.2	71.3
2. Pb 5th Cl. Tail.	0.26	0.77	16.0	14.7	199.81	1.2	1.1	0.6	1.0
3. Pb 4th Cl. Tail.	0.91	0.57	11.7	15.8	158.09	3.2	2.6	2.1	2.8
4. Pb 3rd Cl. Tail.	1.71	0.41	3.98	15.0	65.86	4.3	1.8	3.8	2.2
5. Pb 2nd Cl. Tail.	4.67	0.31	1.76	14.1	40.82	8.9	2.2	9.9	3.7
6. Zn Cleaner Conc.	8.38	0.40	0.51	52.5	29.84	20.5	1.1	65.9	4.8
7. Zn 4th Cl. Tail.	0.79	0.66	0.86	25.8	40.82	3.2	0.2	3.1	0.6
8. Zn 3rd Cl. Tail.	1.23	0.61	0.90	13.6	36.36	4.6	0.3	2.5	0.9
9. Zn 2nd Cl. Tail.	3.46	0.55	0.76	7.62	25.04	11.6	0.7	3.9	1.7
10. Zn 1st Cl. Tail.	9.94	0.17	0.40	1.01	13.38	10.3	1.0	1.5	2.6
11. Zn Rougher Tail.	63.93	0.057	0.23	0.36	6.86	22.1	3.9	3.5	8.4
Head (Calculated)	100.00	0.16	3.80	6.68	51.79	100.0	100.0	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	4.98	0.37	65.9	5.10	752.31	11.3	86.2	3.8	72.3
Products 1 to 3	5.89	0.40	57.4	6.75	660.51	14.5	88.8	5.9	75.1
Products 1 to 4	7.60	0.40	45.4	8.61	526.71	18.8	90.6	9.7	77.3
Products 1 to 5	12.27	0.37	28.8	10.70	341.78	27.7	92.8	19.6	81.0
Products 6 and 7	9.17	0.42	0.54	50.2	30.79	23.7	1.3	69.0	5.4
Products 6 to 8	10.40	0.44	0.58	45.9	31.44	28.3	1.6	71.5	6.3
Products 6 to 9	13.86	0.47	0.62	36.3	29.84	39.9	2.3	75.4	8.0
Products 6 to 10	23.80	0.34	0.53	21.6	22.97	50.2	3.3	76.9	10.6
Products 6 to 11	87.73	0.14	0.31	6.12	11.23	72.3	7.2	80.4	19.0

*g/t

Screen Analysis

30 Minute Grind - (1:1 Grum:C.A.)

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 65	0.1	0.1	99.9
100	0.3	0.4	99.6
150	2.1	2.5	97.5
200	8.1	10.6	89.4
270	9.4	20.0	80.0
400	18.7	38.7	61.3
- 400	61.3	100.0	-
Total	100.0	-	-

Test No. 7 - Continued

Screen Analysis

Composite Pb Cleaner Products

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 25.3 µm	1.0	1.0	99.0
19.6	2.4	3.4	96.6
13.7	2.6	6.0	94.0
9.4	7.5	13.5	86.5
7.3	11.9	25.4	74.6
- 7.3	74.6	100.0	-
Total	100.0	-	-

Specific Gravity 4.86

Composite Zn Cleaner Products

+ 270 mesh	0.4	0.4	99.6
28.4 µm	7.7	8.1	91.9
22.1	9.1	17.2	82.8
15.4	17.6	34.8	65.2
10.6	16.6	51.4	48.6
8.2	10.1	61.5	38.5
- 8.2	38.5	100.0	-
Total	100.0	-	-

Specific Gravity 3.98

Test No. 8

Purpose: To repeat test No. 4 (Carrier Flotation) on a 1:1 mixture but deslime the tailing and add 10 % of the sands to each of the lead 1st and 2nd cleaner tailings.

Procedure: See flowsheet.

Feed: 2000 grams of 1:1 mixture of Grum and Cyprus-Anvil - 10 mesh ores.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	30	-	-	-
Pb Rougher	-	-	-	10	20	-	-	1	3	9.6
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb 1st Regr.	500	250	100	5	-	15	30	-	-	-
Deslime lead rougher tailing and add 200 g of the sand to 1st cleaner.										
Condition	-	-	-	-	-	-	-	10	-	9.7
Pb 1st Cl.	-	-	-	2.5	2.5	-	-	1	4	-
	-	-	-	2.5	-	5	-	1	4	-
Pb 2nd Regr.	500	150	75	5	-	15	30	-	-	-
Add 200 g of the tailing sand and condition.							-	10	-	-
Pb 2nd Cl.	-	-	-	2.5	-	-	-	1	4	9.8
	-	-	-	2.5	-	5	-	1	4	-
Pb 3rd Cl.	100	50	50	-	-	-	-	1	3	9.8
	-	-	-	2.5	-	2.5	-	1	3	-
Pb 4th Cl.	100	50	50	-	-	-	-	1	2	9.8
	-	-	-	-	-	2.5	-	1	2	-
Pb 5th Cl.	50	-	25	-	-	-	-	1	3	9.9

Test No. 8 - Continued

Conditions:

Stage	Reagents Added, grams per tonne					Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	M-748	Z-11	DF-250	Grind	Cond.	Froth	
Zn Circuit (combined Pb rougher, 1st and 2nd cleaner tailings)									
Condition	1250	600	-	-	-	-	3	-	11.1
Zn Rougher	-	-	30	10	10	-	2	3	-
	-	150	20	10	10	-	2	5	-
Zn Conc. Regr.	500	150	-	20	-	30	-	-	-
Deslime Zn tailing and add 20 % of sand fraction to Zn 1st cleaner.									
Condition	-	-	-	-	-	-	10	-	11.0
Zn 1st Cl.	-	-	-	2.5	-	-	1	3	-
	-	-	-	2.5	-	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	-	1	2	11.2
	-	-	-	2.5	-	-	1	2	-
Zn 3rd Cl.	250	-	-	-	-	-	1	2	11.4
	-	-	-	1.3	-	-	1	1	-
Zn 4th Cl.	250	-	-	-	-	-	1	2	11.5

Test No. 8 - Continued

Metallurgical Results

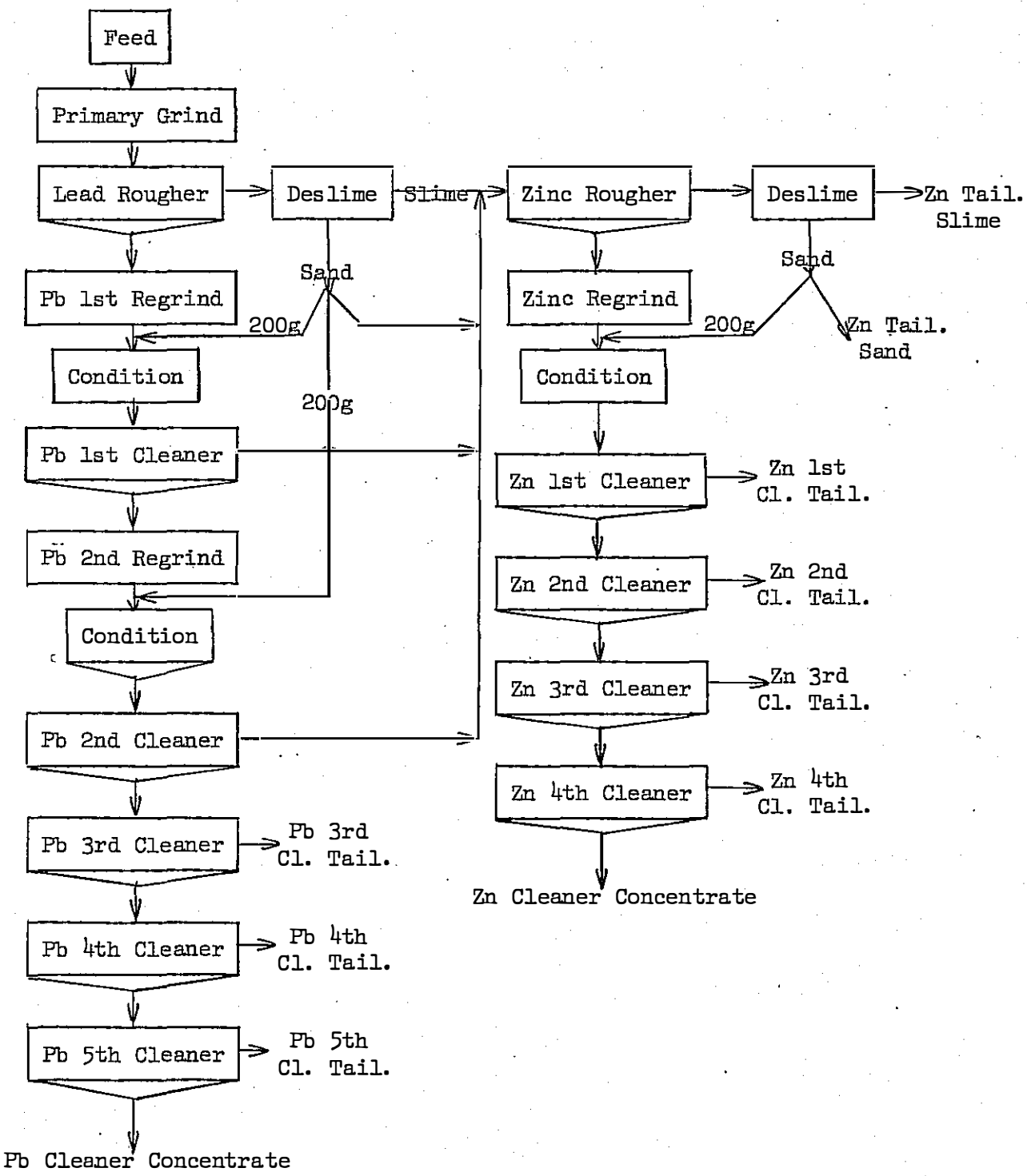
Product	Weight %	Assays, %		% Distribution	
		Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	4.83	69.2	4.68	87.0	3.4
2. Pb 5th Cleaner Tail.	0.33	14.9	16.0	1.3	0.8
3. Pb 4th Cleaner Tail.	0.84	9.01	15.6	2.0	2.0
4. Pb 3rd Cleaner Tail.	1.78	3.18	13.7	1.5	3.7
5. Zn Cleaner Conc.	8.87	0.42	52.7	1.0	70.1
6. Zn 4th Cleaner Tail.	1.41	0.84	32.4	0.3	6.9
7. Zn 3rd Cleaner Tail.	1.86	0.96	13.4	0.5	3.7
8. Zn 2nd Cleaner Tail.	3.86	0.73	4.77	0.7	2.8
9. Zn 1st Cleaner Tail.	17.84	0.39	1.20	1.8	3.1
10. Zn Flot. Tail. Sand	25.59	0.21	0.34	1.4	1.3
11. Zn Flot. Tail. Slime	32.79	0.31	0.45	2.5	2.2
Head (Calculated)	100.00	3.84	6.67	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	5.16	65.7	5.40	88.3	4.2
Products 1 to 3	6.00	57.8	6.83	90.3	6.2
Products 1 to 4	7.78	45.3	8.40	91.8	9.9
Products 5 and 6	10.28	0.48	49.9	1.3	77.0
Products 5 to 7	12.14	0.55	44.3	1.8	80.7
Products 5 to 8	16.00	0.60	34.8	2.5	83.5
Products 5 to 9	33.84	0.49	17.1	4.3	86.6
Products 5 to 11	92.22	0.35	6.52	8.2	90.1
Reconstituted Tailing	68.38	0.26	0.39	4.6	4.1

Test No. 8 - Continued

Flowsheet



Test No. 9

Purpose: To repeat test No. 7, but with a coarser primary grind.

Procedure: As for test No. 2, except Pb 2nd cleaner tailing passed to the zinc circuit.

Feed: 2000 grams minus 10 mesh 1:1 mixture Grum and C.A. samples.

Grind: 20 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	20	-	-	-
Pb Rougher	-	-	-	10	20	-	-	1	3	9.8
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb 1st Regr.	500	250	100	5	-	15	20	-	-	-
Pb 1st Cl.	-	-	-	2.5	2.5	-	-	1	4	9.8
	-	-	-	2.5	-	5	-	1	4	-
Pb 2nd Regr.	350	150	75	5	-	20	40	-	-	-
Pb 2nd Cl.	-	-	-	2.5	2.5	-	-	1	4	9.7
	-	-	-	2.5	-	5	-	1	4	-
Pb 3rd Cl.	150	100	50	-	-	-	-	1	3	9.8
	-	-	-	2.5	-	2.5	-	1	3	-
Pb 4th Cl.	100	50	25	-	-	-	-	1	2	9.8
	-	-	-	-	-	2.5	-	1	2	-
Pb 5th Cl.	100	-	25	-	-	-	-	1	3	9.9

Test No. 9 - Continued

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	M-748	Z-11	MIBC	1902	Grind	Cond.	Froth	
Zn Circuit (Pb rougher and 1st and 2nd Pb cleaner tailings)										
Condition	1250	600	-	-	-	-	-	5	-	11.2
Zn Rougher	-	-	30	10	20	-	-	2	3	-
	-	150	20	10	10	-	-	2	5	-
Zn Conc. Regr.	750	200	20	-	-	-	30	-	-	-
Zn 1st Cl.	-	-	-	5	-	20	-	2	3	11.2
	-	-	-	5	-	-	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	10	-	2	2	11.4
	-	-	-	5	-	-	-	1	2	-
Zn 3rd Cl.	250	-	-	-	-	5	-	2	2	11.5
	-	-	-	-	-	-	-	1	1	-
Zn 4th Cl.	250	-	-	-	-	5	-	2	2½	11.6

Test No. 9 - Continued

Metallurgical Results

Product	Weight	Assays, %		% Distribution	
	%	Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	4.67	69.1	4.89	84.8	3.4
2. Pb 5th Cleaner Tail.	0.45	19.4	14.4	2.3	0.9
3. Pb 4th Cleaner Tail.	0.91	11.1	16.2	2.6	2.2
4. Pb 3rd Cleaner Tail.	2.10	2.64	14.1	1.4	4.4
5. Zn Cleaner Conc.	7.05	0.43	55.0	0.7	57.7
6. Zn 4th Cleaner Tail.	1.17	0.86	40.0	0.3	7.0
7. Zn 3rd Cleaner Tail.	1.93	0.98	30.2	0.5	8.7
8. Zn 2nd Cleaner Tail.	3.40	1.05	14.5	0.9	7.3
9. Zn 1st Cleaner Tail.	5.54	0.70	2.87	1.0	2.4
10. Zn Rougher Tailing	72.78	0.28	0.55	5.5	6.0
Head (Calculated)	100.00	3.80	6.71	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	5.12	64.7	5.72	87.1	4.3
Products 1 to 3	6.03	56.6	7.30	89.7	6.5
Products 1 to 4	8.13	42.7	9.06	91.1	10.9
Products 5 and 6	8.22	0.69	52.9	1.0	64.7
Products 5 to 7	10.15	0.56	48.6	1.5	73.4
Products 5 to 8	13.55	0.68	40.2	2.4	80.7
Products 5 to 9	19.09	0.69	29.2	3.4	83.1
Products 5 to 10	91.87	0.36	6.50	8.9	89.1

I N T R O D U C T I O N

In a telex dated May 11, 1979, Mr. P. Taggart of Cyprus Anvil Mining Corporation requested the testwork on Cyprus Anvil and Grum Composite and mixtures of Grum and Cyprus Anvil ore, to examine the use of Grum flowsheet on Cyprus Anvil ore. The testwork was authorized by Cyprus Anvil Purchase Order No. 88309.

The results were discussed with Mr. I. Muir and Mr. P. Taggart in telephone conversations and during a meeting at Lakefield on July 9, 1979. Summary results were frequently issued by telex.

LAKEFIELD RESEARCH OF CANADA LIMITED

D.M. Wyslouzil, P. Eng.,

Manager.

Investigation by: C.W. Payne

S. Bulatovic, P. Eng.,

Project Metallurgist.

Test No. 9 - Continued

Screen Analysis

20 Minute Grind

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 65	0.2	0.2	99.8
100	1.8	2.0	98.0
150	6.8	8.8	91.2
200	14.8	23.6	76.4
270	11.6	35.2	64.8
400	17.0	52.2	47.8
- 400	47.8	100.0	-
Total	100.0	-	-

Test No. 10

Purpose: To repeat test No. 6, but pass Pb 2nd cleaner tailing to Zn circuit and replace Z-11 with Z-200 in Zn circuit.

Procedure: As for test No. 9.

Feed: 2000 grams minus 10 mesh Cyprus-Anvil Drill Core Composite.

Grind: 20 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	20	-	-	-
Pb Rougher	-	-	-	-	20	-	-	1	3	9.8
	-	-	-	15	5	-	-	1	3	-
	-	-	-	10	5	-	-	1	3	-
Pb 1st Regr.	500	250	100	5	-	15	20	-	-	-
Pb 1st Cl.	-	-	-	2.5	2.5	-	-	1	3	9.8
	-	-	-	2.5	-	5	-	1	3	-
Pb 2nd Regr.	400	150	75	5	-	15	40	-	-	-
Pb 2nd Cl.	-	-	-	2.5	-	-	-	1	3	9.7
	-	-	-	2.5	-	5	-	1	3	-
Pb 3rd Cl.	100	50	50	-	-	-	-	1	2	9.8
	-	-	-	2.5	-	5	-	1	3	-
Pb 4th Cl.	100	50	50	-	-	-	-	1	2	9.8
	-	-	-	-	-	2.5	-	1	2	-
Pb 5th Cl.	50	-	25	-	-	-	-	1	3	9.9

Test No. 10 - Continued

Conditions:

Stage	Reagents Added, grams per tonne					Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	M-748	Z-200	MIBC	Grind	Cond.	Froth	
Zn Circuit (Pb rougher + 1st and 2nd cleaner tailings)									
Condition	1250	500	-	-	-	-	5	-	11.2
Zn Rougher	-	-	30	10	20	-	2	4	-
	-	250	20	10	10	-	2	4	-
Zn Conc. Regr.	750	250	20	-	-	30	-	-	-
Zn 1st Cl.	-	-	-	5	2.5	-	1	3	11.2
	-	-	-	5	-	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	-	1	2	11.5
	-	-	-	5	-	-	1	2	-
Zn 3rd Cl.	250	-	-	-	-	-	1	2	11.6
	-	-	-	2.5	-	-	1	1	-
Zn 4th Cl.	250	-	-	-	-	-	1	2	11.7

Test No. 10 - Continued

Metallurgical Results

Product	Weight %	Assays, %		% Distribution	
		Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	2.79	77.1	1.50	78.0	1.0
2. Pb 5th Cleaner Tail.	0.22	46.5	5.67	3.7	0.3
3. Pb 4th Cleaner Tail.	0.72	27.9	7.81	7.3	1.3
4. Pb 3rd Cleaner Tail.	0.88	7.96	10.0	2.5	2.0
5. Zn Cleaner Conc.	6.04	0.36	52.8	0.8	74.3
6. Zn 4th Cleaner Tail.	1.47	0.65	40.2	0.3	13.8
7. Zn 3rd Cleaner Tail.	0.64	1.27	16.1	0.3	2.4
8. Zn 2nd Cleaner Tail.	2.45	0.79	2.25	0.7	1.3
9. Zn 1st Cleaner Tail.	20.21	0.23	0.23	1.7	1.1
10. Zn Rougher Tailing	64.58	0.20	0.17	4.6	2.5
Head (Calculated)	100.00	2.76	4.30	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	3.01	74.9	1.81	81.7	1.3
Products 1 to 3	3.73	65.8	2.97	89.0	2.6
Products 1 to 4	4.61	54.8	4.31	91.5	4.6
Products 5 and 6	7.51	0.42	50.3	1.1	88.1
Products 5 to 7	8.15	0.48	47.6	1.4	90.5
Products 5 to 8	10.60	0.55	37.2	2.1	91.8
Products 5 to 9	30.81	0.34	12.9	3.9	92.9
Products 5 to 10	95.39	0.25	4.29	8.5	95.4

Test No. 11

Purpose: To investigate the effect of consolidating the two lead regrinds into one 60 minute regrind and of making just one addition of $CuSO_4$.

Procedure: Grind and float a lead concentrate. Regrind the concentrate and clean four times. Combine lead rougher and 1st cleaner tailings, condition and float a Zn concentrate. Regrind the Zn concentrate and clean four times.

Feed: 2000 grams minus 10 mesh Cyprus-Anvil Drill Core Composite.

Grind: 20 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	20	-	-	-
Pb Rougher	-	-	-	-	20	-	-	1	3	9.8
	-	-	-	15	5	-	-	1	3	-
	-	-	-	10	5	-	-	1	3	-
Pb Conc. Regr.	750	250	100	10	-	25	60	-	-	-
Pb 1st Cl.	-	-	-	2.5	-	-	-	1	4	9.9
	-	-	-	2.5	-	5	-	1	4	-
Pb 2nd Cl.	100	50	50	-	-	-	-	1	3	9.9
	-	-	-	2.5	-	2.5	-	1	3	-
Pb 3rd Cl.	100	50	50	-	-	-	-	1	2	9.9
	-	-	-	-	-	2.5	-	1	2	-
Pb 4th Cl.	50	-	25	-	-	-	-	1	3	10.0

Test No. 11 - Continued

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	M-748	Z-11	DF-250	Z-200	Grind	Cond.	Froth	
Zn Circuit (Pb rougher and 1st cleaner tailings)										
Condition	1250	-	-	-	-	-	-	3	-	-
	-	600	-	-	-	-	-	3	-	11.3
Zn Rougher	-	-	30	10	30	-	-	2	5	-
	-	-	20	10	10	-	-	1	3	-
Zn Conc. Regr.	750	200	20	-	-	-	30	-	-	-
Zn 1st Cl.	-	-	-	5	-	-	-	1	3	11.2
	-	-	-	2.5	-	-	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	-	-	1	2	11.5
	-	-	-	2.5	-	2.5	-	1	2	-
Zn 3rd Cl.	250	-	-	-	-	2.5	-	1	3	11.7
Zn 4th Cl.	250	-	-	-	-	-	-	1	2	11.8

Test No. 11 - Continued

Metallurgical Results

Product	Weight %	Assays, %		% Distribution	
		Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	2.77	75.6	1.61	75.0	1.0
2. Pb 4th Cleaner Tail.	0.29	46.0	6.02	4.8	0.4
3. Pb 3rd Cleaner Tail.	0.88	26.2	7.93	8.2	1.6
4. Pb 2nd Cleaner Tail.	1.74	5.38	9.42	3.4	3.8
5. Zn Cleaner Conc.	5.48	0.34	53.8	0.7	67.8
6. Zn 4th Cleaner Tail.	1.24	0.55	42.9	0.2	12.2
7. Zn 3rd Cleaner Tail.	0.86	0.95	19.9	0.3	3.9
8. Zn 2nd Cleaner Tail.	1.41	0.75	7.69	0.4	2.5
9. Zn 1st Cleaner Tail.	4.01	0.46	2.01	0.6	1.9
10. Zn Rougher Tailing	81.32	0.22	0.26	6.4	4.9
Head (Calculated)	100.00	2.79	4.35	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	3.06	72.8	2.03	79.8	1.4
Products 1 to 3	3.94	62.4	3.35	88.0	3.0
Products 1 to 4	5.68	44.9	5.21	91.4	6.8
Products 5 and 6	6.72	0.38	51.8	0.9	80.0
Products 5 to 7	7.58	0.44	48.2	1.2	83.9
Products 5 to 8	8.99	0.49	41.8	1.6	86.4
Products 5 to 9	13.00	0.48	29.5	2.2	88.3
Products 5 to 10	94.32	0.26	4.30	8.6	93.2

Test No. 11 - Continued

Screen Analyses

Composite Pb Cleaner Products

Particle Size	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 22.6 µm	2.2	2.2	97.8
17.5	2.4	4.6	95.4
12.2	4.3	8.9	91.1
8.4	12.2	21.1	78.9
6.5	12.1	33.2	66.8
- 6.5	66.8	100.0	-
Total	100.0	-	-

Specific Gravity 5.61

Test No. 12

Purpose: To investigate the effect of the longer one-stage regrind on the mixture of Grum and Cyprus-Anvil ores.

Procedure: As for test No. 11.

Feed: 2000 grams 1:1 mixture of Grum and C.A. - 10 mesh ores.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	30	-	-	-
Pb Rougher	-	-	-	10	20	-	-	1	3	9.6
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb Conc. Regr.	750	250	100	10	-	25	60	-	-	-
Pb 1st Cl.	-	-	-	2.5	-	-	-	1	5	9.8
	-	-	-	2.5	-	5	-	1	5	-
Pb 2nd Cl.	100	50	50	-	-	-	-	1	4	9.8
	-	-	-	2.5	-	5	-	1	4	-
Pb 3rd Cl.	100	50	50	-	-	-	-	1	3	9.8
	-	-	-	-	-	5	-	1	3	-
Pb 4th Cl.	50	-	25	-	-	2.5	-	1	4	9.9
Pb 5th Cl.	50	-	25	-	-	-	-	1	3	9.9

Test No. 12 - Continued

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	M-749	Z-11	MIBC	Z-200	Grind	Cond.	Froth	
Zn Circuit (Pb rougher + 1st cleaner tailings)										
Condition	1250	-	-	-	-	-	-	3	-	-
	-	750	-	-	-	-	-	3	-	11.0
Zn Rougher	-	-	30	10	30	-	-	2	5	-
	-	-	20	10	10	-	-	1	3	-
Zn Conc. Regr.	750	250	20	-	-	-	30	-	-	-
Zn 1st Cl.	-	-	-	5	5	-	-	1	3	11.1
	-	-	-	2.5	-	-	-	1	3	-
Zn 2nd Cl.	250	-	-	-	2.5	-	-	1	2	11.3
	-	-	-	2.5	-	2.5	-	1	2	-
Zn 3rd Cl.	250	-	-	-	-	2.5	-	1	3½	11.5
Zn 4th Cl.	250	-	-	-	-	-	-	1	3	11.6

Test No. 12 - Continued

Metallurgical Results

Product	Weight %	Assays, %		% Distribution	
		Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	4.41	69.4	5.30	80.5	3.5
2. Pb 5th Cleaner Tail.	0.45	33.8	12.4	4.0	0.8
3. Pb 4th Cleaner Tail.	0.46	19.3	13.9	2.3	1.0
4. Pb 3rd Cleaner Tail.	1.45	7.15	15.2	2.7	3.3
5. Pb 2nd Cleaner Tail.	2.53	2.61	12.8	1.7	4.9
6. Zn Cleaner Conc.	8.01	0.38	53.5	0.8	64.9
7. Zn 4th Cleaner Tail.	1.89	0.80	37.5	0.4	10.7
8. Zn 3rd Cleaner Tail.	1.08	1.06	14.1	0.3	2.3
9. Zn 2nd Cleaner Tail.	2.31	0.77	4.72	0.5	1.7
10. Zn 1st Cleaner Tail.	7.58	0.55	1.79	1.1	2.1
11. Zn Rougher Tailing	69.83	0.31	0.45	5.7	4.8
Head (Calculated)	100.00	3.80	6.60	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	4.86	66.1	5.96	84.5	4.3
Products 1 to 3	5.32	62.1	6.64	86.8	5.3
Products 1 to 4	6.77	50.3	8.48	89.5	8.6
Products 1 to 5	9.30	37.3	9.65	91.2	13.5
Products 6 and 6	9.90	0.46	50.4	1.2	75.6
Products 6 to 8	10.98	0.52	46.9	1.5	77.9
Products 6 to 9	13.29	0.56	39.5	2.0	79.6
Products 6 to 10	20.87	0.56	25.8	3.1	81.7

Test No. 12 - Continued

Screen Analyses

Composite Pb Cleaner Products

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 23.7 µm	0.9	0.9	99.1
18.4	1.6	2.5	97.5
12.8	8.6	11.1	88.9
8.8	20.8	31.9	68.1
6.8	13.4	45.3	54.7
- 6.8	54.7	100.0	-
Total	100.0	-	-

Specific Gravity 5.12

Test No. 13

Purpose: To repeat test No. 9, but decrease the 2nd Pb regrind stage to 20 minutes.

Procedure: As for test No. 9.

Feed: 2000 grams minus 10 mesh 1:1 mixture Grum and C.A. samples.

Grind: 20 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	20	-	-	-
Pb Rougher	-	-	-	10	20	-	-	1	3	9.7
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb 1st Regr.	500	250	100	5	-	15	20	-	-	-
Pb 1st Cl.	-	-	-	2.5	2.5	-	-	1	4	9.7
	-	-	-	2.5	-	5	-	1	4	-
Pb 2nd Regr.	350	150	75	5	-	10	20	-	-	-
Pb 2nd Cl.	-	-	-	2.5	2.5	-	-	1	4	9.6
	-	-	-	2.5	-	5	-	1	4	-
Pb 3rd Cl.	150	100	50	-	-	-	-	1	3	9.8
	-	-	-	2.5	-	2.5	-	1	3	-
Pb 4th Cl.	100	50	25	-	-	-	-	1	2	9.8
	-	-	-	-	-	2.5	-	1	2	-
Pb 5th Cl.	100	-	25	-	-	-	-	1	3	9.9

Test No. 13 - Continued

Conditions:

Stage	Reagents Added, grams per tonne							Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	M-748	Z-11	MIBC	1902	Z-200	Grind	Cond.	Froth	
Zn Circuit (Pb rougher + 1st and 2nd Pb cleaner tailings)											
Condition	1250	-	-	-	-	-	-	-	3	-	-
	-	600	-	-	-	-	-	-	3	-	11.1
Zn Rougher	-	-	30	10	30	-	-	-	2	5	-
	-	-	20	10	10	-	-	-	1	3	-
Zn Conc. Regr.	750	200	20	-	-	-	-	20	-	-	-
Zn 1st Cl.	-	-	-	5	5	20	-	-	2	3	11.1
	-	-	-	5	2.5	-	-	-	1	3	-
Zn 2nd Cl.	250	-	-	-	2.5	10	-	-	2	2	11.3
	-	-	-	5	2.5	-	-	-	1	3	-
Zn 3rd Cl.	250	-	-	-	2.5	5	-	-	2	2	11.4
	-	-	-	2.5	2.5	-	2.5	-	1	2	-
Zn 4th Cl.	250	-	-	-	2.5	5	2.5	-	2	3	11.5

Test No. 13 - Continued

Metallurgical Results

Product	Weight %	Assays, %		% Distribution	
		Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	5.13	63.9	6.86	86.7	5.3
2. Pb 5th Cleaner Tail.	0.41	14.5	15.5	1.6	1.0
3. Pb 4th Cleaner Tail.	0.94	7.24	16.0	1.8	2.3
4. Pb 3rd Cleaner Tail.	1.60	2.32	14.2	1.0	3.5
5. Zn Cleaner Conc.	8.45	0.64	53.5	1.4	68.8
6. Zn 4th Cleaner Tail.	0.68	0.94	34.0	0.2	3.5
7. Zn 3rd Cleaner Tail.	0.82	1.13	22.6	0.2	2.8
8. Zn 2nd Cleaner Tail.	2.13	1.04	14.9	0.6	4.8
9. Zn 1st Cleaner Tail.	5.63	0.67	1.98	1.0	1.7
10. Zn Rougher Tailing	74.21	0.28	0.56	5.5	6.3
Head (Calculated)	100.00	3.78	6.57	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	5.54	60.2	7.50	88.3	6.3
Products 1 to 3	6.48	52.6	8.73	90.1	8.6
Products 1 to 4	8.08	42.6	9.82	91.1	12.1
Products 5 and 6	9.13	0.66	52.1	1.6	72.3
Products 5 to 7	9.95	0.70	49.6	1.8	75.1
Products 5 to 8	12.08	0.76	43.5	2.4	79.9
Products 5 to 9	17.71	0.73	30.3	3.4	81.6
Products 5 to 10	91.92	0.37	6.29	8.9	87.9

Test No. 13 - Continued

Screen Analysis

Composite Pb Cleaner Products

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 23.2 µm	1.8	1.8	98.2
18.0	3.4	5.2	94.8
12.6	12.6	17.8	82.2
8.6	23.7	41.5	58.5
6.7	15.4	56.9	43.1
- 6.7	43.1	100.0	-
Total	100.0	-	-

Specific Gravity 5.45

Test No. 14

Purpose: To investigate the effect of the longer one-stage regrind on the Grum composite alone.

Procedure: As for test No. 11.

Feed: 2000 grams minus 10 mesh Grum composite.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	30	-	-	-
Pb Rougher	-	-	-	10	20	-	-	1	3	9.4
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb Conc. Regr.	750	250	100	10	-	25	60	-	-	-
Pb 1st Cl.	-	-	-	2.5	-	-	-	1	5	9.5
	-	-	-	2.5	-	5	-	1	5	-
Pb 2nd Cl.	100	50	50	-	2.5	-	-	1	4	9.6
	-	-	-	2.5	-	5	-	1	4	-
Pb 3rd Cl.	100	50	50	-	2.5	-	-	1	3	9.6
	-	-	-	-	-	5	-	1	3	-
Pb 4th Cl.	50	-	25	-	2.5	2.5	-	1	4	9.7
Pb 5th Cl.	50	-	25	-	2.5	-	-	1	3	9.8

Test No. 14 - Continued

Conditions:

Stage	Reagents Added, grams per tonne							Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	Z-11	M-748	MIBC	1902	Z-200	Grind	Cond.	Froth	
Zn Circuit (Pb rougher plus 1st cleaner tailing)											
Condition	1250	-	-	-	-	-	-	-	3	-	-
	-	750	-	-	-	-	-	-	3	-	11.1
Zn Rougher	-	-	10	30	20	-	-	-	2	5	-
	-	-	10	20	10	-	-	-	1	3	-
Zn Conc. Regr.	750	250	-	20	-	-	-	30	-	-	-
Zn 1st Cl.	-	-	5	-	5	20	-	-	1	3	11.1
	-	-	10	-	-	-	5	-	1	3	-
Zn 2nd Cl.	250	-	-	-	2.5	10	-	-	2	2	11.3
	-	-	5	-	-	-	2.5	-	1	3	-
Zn 3rd Cl.	250	-	-	-	-	5	-	-	2	2	11.4
	-	-	2.5	-	-	-	2.5	-	1	2	-
Zn 4th Cl.	250	-	-	-	-	5	2.5	-	2	3	11.5

Test No. 14 - Continued

Metallurgical Results

Product	Weight	Assays, %		% Distribution	
	%	Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	6.85	56.2	9.12	80.6	6.9
2. Pb 5th Cleaner Tail.	0.91	20.1	16.4	3.8	1.6
3, Pb 4th Cleaner Tail.	1.48	10.5	16.6	3.3	2.7
4. Pb 3rd Cleaner Tail.	1.98	5.21	16.6	2.2	3.6
5. Pb 2nd Cleaner Tail.	3.90	1.59	13.6	1.3	5.9
6. Zn Cleaner Conc.	10.21	0.63	52.8	1.3	59.6
7. Zn 4th Cleaner Tail.	1.29	0.97	33.4	0.3	4.8
8. Zn 3rd Cleaner Tail.	1.59	1.17	23.0	0.4	4.0
9. Zn 2nd Cleaner Tail.	2.34	0.92	11.0	0.5	2.8
10. Zn 1st Cleaner Tail.	6.17	0.57	4.29	0.7	2.9
11. Zn Rougher Tail.	63.28	0.43	0.73	5.6	5.2
Head (Calculated)	100.00	4.78	9.05	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	7.76	52.0	9.97	84.4	8.5
Products 1 to 3	9.24	45.3	11.0	87.7	11.2
Products 1 to 4	11.22	38.2	12.0	89.9	14.8
Products 1 to 5	15.12	28.8	12.4	91.2	20.7
Products 6 and 7	11.50	0.67	50.6	1.6	64.4
Products 6 to 8	13.09	0.73	47.3	2.0	68.4
Products 6 to 9	15.43	0.76	41.8	2.5	71.2
Products 6 to 10	21.60	0.70	31.1	3.2	74.1

Test No. 14 - Continued

Screen Analyses

Composite Pb Cleaner Products

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 24.7 µm	1.6	1.6	98.4
19.2	4.8	6.4	93.6
13.4	16.8	23.2	76.8
9.2	23.0	46.2	53.8
7.1	13.5	59.7	40.3
- 7.1	40.3	100.0	-
Total	100.0	-	-

Specific Gravity 4.88

Test No. 15

Purpose: To investigate the flotation of lead and zinc from a composite of the "K" samples using the standard Grum procedure.

Procedure: As for test No. 9.

Feed: 2000 grams minus 10 mesh samples K-68; K-76: K-80 in ratio 1:1:1.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	30	-	-	-
Pb Rougher	1000	-	-	10	20	-	-	1	3	8.2-9.4
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb 1st Regr.	750	250	100	5	-	15	20	-	-	-
Pb 1st Cl.	-	-	-	2.5	2.5	-	-	1	4	9.6
	-	-	-	2.5	-	5	-	1	4	-
Pb 2nd Regr.	500	150	75	5	-	20	40	-	-	9.5
Pb 2nd Cl.	-	-	-	2.5	2.5	-	-	1	4	-
	-	-	-	2.5	-	5	-	1	4	-
Pb 3rd Cl.	150	50	50	-	-	-	-	1	3	9.7
	-	-	-	2.5	2.5	5	-	1	3	-
Pb 4th Cl.	100	50	50	-	-	-	-	1	2	9.7
	-	-	-	-	-	2.5	-	1	2	-
Pb 5th Cl.	50	-	25	-	2.5	-	-	1	3	9.8

Test No. 15 - Continued

Conditions:

Stage	Reagents Added, grams per tonne							Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	Z-11	M-748	MIBC	1902	Z-200	Grind	Cond.	Froth	
Zn Circuit (Lead rougher plus 1st and 2nd cleaner tailings)											
Condition	1500	-	-	-	-	-	-	-	3	-	-
	-	750	-	-	-	-	-	-	3	-	11.1
Zn Rougher	-	-	10	30	20	-	-	-	2	5	-
	-	-	10	20	10	-	-	-	1	3	-
Zn Conc. Regr.	750	250	-	20	-	-	-	20	-	-	-
Zn 1st Cl.	-	-	5	-	-	20	-	-	2	3	11.1
	-	-	10	-	2.5	-	-	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	10	-	-	2	2	11.3
	-	-	5	-	-	-	2.5	-	1	3	-
Zn 3rd Cl.	250	-	-	-	-	5	-	-	1	2	11.5
	-	-	2.5	-	-	-	2.5	-	1	2	-
Zn 4th Cl.	250	-	-	-	-	5	2.5	-	1	3	11.6

Test No. 15 - Continued

Metallurgical Results

Product	Weight	Assays, %		% Distribution	
	%	Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	8.94	52.5	9.99	83.5	9.0
2. Pb 5th Cleaner Tail.	1.73	7.98	17.9	2.5	3.1
3. Pb 4th Cleaner Tail.	1.83	4.47	16.6	1.5	3.1
4. Pb 3rd Cleaner Tail.	3.07	1.91	14.1	1.0	4.4
5. Zn Cleaner Conc.	9.55	1.08	55.8	1.8	53.8
6. Zn 4th Cleaner Tail.	2.45	1.17	42.1	0.5	10.4
7. Zn 3rd Cleaner Tail.	1.35	1.73	21.8	0.4	3.0
8. Zn 2nd Cleaner Tail.	2.35	1.55	7.23	0.6	1.8
9. Zn 1st Cleaner Tail.	6.06	1.02	3.00	1.1	1.8
10. Zn Rougher Tailing	62.67	0.63	1.50	7.1	9.6
Head (Calculated)	100.00	5.62	9.90	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	10.67	45.3	11.3	86.0	12.1
Products 1 to 3	12.50	39.3	12.1	87.5	15.2
Products 1 to 4	15.57	31.9	12.5	88.5	19.6
Products 5 and 6	12.00	1.10	53.0	2.3	64.2
Products 5 to 7	13.35	1.16	49.8	2.7	67.2
Products 5 to 8	15.70	1.22	43.5	3.3	69.0
Products 5 to 9	21.76	1.16	32.3	4.4	70.8
Products 5 to 10	84.43	0.77	9.43	11.5	80.4

Test No. 15 - Continued

Screen Analysis

K Composite 30 Minute Grind

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 65	0.1	0.1	99.9
100	0.1	0.2	99.8
150	0.9	1.1	98.9
200	5.6	6.7	93.3
270	6.6	13.3	86.7
400	15.7	29.0	71.0
- 400	71.0	100.0	-
Total	100.0	-	-

Composite Pb Cleaner Products

+ 23.2 µm	2.0	2.0	98.0
18.0	5.0	7.0	93.0
12.6	18.4	25.4	74.6
8.6	24.0	49.4	50.6
6.7	13.3	62.7	37.3
- 6.7	37.3	100.0	-
Total	100.0	-	-

Specific Gravity 5.32

Test No. 16

Purpose: To investigate the flotation of lead and zinc from a 1:1 mixture of "K" composite and C.A. using the Grum procedure.

Procedure: As for test No. 9.

Feed: 2000 grams minus 10 mesh 1:1 mixture "K" composite and Cyprus-Anvil ores.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	30	-	-	-
Pb Rougher	250	-	-	10	20	-	-	1	3	9.2-9.6
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb 1st Regr.	750	250	100	5	-	15	20	-	-	-
Pb 1st Cl.	-	-	-	2.5	2.5	-	-	1	4	9.7
	-	-	-	2.5	-	5	-	1	4	-
Pb 2nd Regr.	500	150	75	5	-	20	40	-	-	-
Pb 2nd Cl.	-	-	-	2.5	2.5	-	-	1	4	9.8
	-	-	-	2.5	-	5	-	1	4	-
Pb 3rd Cl.	150	50	50	-	-	-	-	1	3	9.7
	-	-	-	2.5	2.5	2.5	-	1	3	-
Pb 4th Cl.	100	50	50	-	-	-	-	1	2	9.8
	-	-	-	-	-	2.5	-	1	2	-
Pb 5th Cl.	50	-	25	-	2.5	-	-	1	3	9.9

Test No. 16 - Continued

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	Z-11	M-748	MIBC	Z-200	Grind	Cond.	Froth	
Zn Circuit (Pb rougher plus 1st and 2nd cleaner tailings)										
Condition	1500	-	-	-	-	-	-	3	-	-
	-	750	-	-	-	-	-	3	-	11.1
Zn Rougher	-	-	20	20	20	-	-	2	5	-
	-	-	10	10	10	-	-	1	3	-
Zn Conc. Rege.	750	250	5	10	-	-	20	-	-	-
Zn 1st Cl.	-	-	5	-	-	-	-	2	3	11.2
	-	-	10	-	2.5	2.5	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	-	-	2	2	11.4
	-	-	5	-	-	2.5	-	1	3	-
Zn 3rd Cl.	250	-	-	-	-	-	-	2	2	11.5
	-	-	2.5	-	-	2.5	-	1	2	-
Zn 4th Cl.	250	-	-	-	-	2.5	-	1	3	11.6

Test No. 16 - Continued

Metallurgical Results

Product	Weight %	Assays, %		% Distribution	
		Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	4.87	68.4	4.73	81.6	3.3
2. Pb 5th Cleaner Tail.	0.58	23.4	14.8	3.3	1.2
3. Pb 4th Cleaner Tail.	1.28	10.6	15.6	3.3	2.8
4. Pb 3rd Cleaner Tail.	1.95	3.28	14.6	1.6	4.0
5. Zn Cleaner Conc.	7.72	0.74	52.6	1.4	57.7
6. Zn 4th Cleaner Tail.	1.78	0.87	41.0	0.4	10.4
7. Zn 3rd Cleaner Tail.	1.50	1.03	27.7	0.4	5.9
8. Zn 2nd Cleaner Tail.	1.94	1.02	15.2	0.5	4.2
9. Zn 1st Cleaner Tail.	4.00	0.79	4.00	0.8	2.3
10. Zn Rougher Tailing	74.38	0.37	0.77	6.7	8.2
Head (Calculated)	100.00	4.08	7.03	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	5.45	63.6	5.80	84.9	4.5
Products 1 to 3	6.73	53.5	7.67	88.2	7.3
Products 1 to 4	8.68	42.2	9.22	89.8	11.3
Products 5 and 6	9.50	0.76	50.4	1.8	68.1
Products 5 to 7	11.00	0.80	47.3	2.2	74.0
Products 5 to 8	12.94	0.83	42.5	2.7	78.2
Products 5 to 9	16.94	0.82	33.4	3.5	80.5
Products 5 to 10	91.32	0.45	6.83	10.2	88.7

Test No. 16 - Continued

Screen Analysis

30 Minute Grind

1:1 C.A. : "K" Composite

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 65	0.1	0.1	99.9
100	0.2	0.3	99.7
150	1.6	1.9	98.1
200	7.4	9.3	90.7
270	8.4	17.7	82.3
400	17.7	35.4	64.6
- 400	64.6	100.0	-
Total	100.0	-	-

Composite Pb Cleaner Products

Particle Size	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 21.9 µm	1.8	1.8	98.2
17.0	2.1	3.9	96.1
11.9	5.1	9.0	91.0
8.2	18.4	27.4	72.6
6.3	17.1	44.5	55.5
- 6.3	55.5	100.0	-
Total	100.0	-	-

Specific Gravity 5.66

Test No. 17

Purpose: To investigate the flotation of lead and zinc from sample J-76 using the Grum procedure.

Procedure: As for test No. 9.

Feed: 2000 grams minus 10 mesh sample J-76.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	30	-	-	-
Pb Rougher	-	-	-	10	20	-	-	1	3	9.6
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb 1st Regr.	750	250	100	5	-	15	20	-	-	-
Pb 1st Cl.	-	-	-	2.5	2.5	-	-	1	4	9.8
	-	-	-	2.5	-	-	-	1	4	-
Pb 2nd Regr.	500	150	75	5	-	20	40	-	-	-
Pb 2nd Cl.	-	-	-	2.5	2.5	-	-	1	4	9.8
	-	-	-	2.5	-	5	-	1	4	-
Pb 3rd Cl.	150	50	50	-	-	-	-	1	3	9.8
	-	-	-	2.5	2.5	2.5	-	1	3	-
Pb 4th Cl.	100	50	50	-	-	-	-	1	2	9.7
	-	-	-	-	2.5	2.5	-	1	2	-
Pb 5th Cl.	50	-	25	-	2.5	-	-	1	3	9.8

Test No. 17 - Continued

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	Z-11	M-748	MIBC	Z-200	Grind	Cond.	Froth	
Zn Circuit (Pb rougher plus 1st and 2nd cleaner tailings)										
Condition	1500	-	-	-	-	-	-	3	-	-
	-	750	-	-	-	-	-	3	-	11.3
Zn Rougher	-	-	20	20	20	-	-	2	5	-
	-	-	10	10	10	-	-	1	5	-
Zn Conc. Regr.	750	250	5	10	-	-	20	-	-	-
Zn 1st Cl.	-	-	5	-	-	-	-	1	3	11.2
	-	-	10	-	2.5	5	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	-	-	1	2	11.4
	-	-	5	-	-	2.5	-	1	3	-
Zn 3rd Cl.	250	-	-	-	-	-	-	1	2	11.5
	-	-	2.5	-	-	2.5	-	1	2	-
Zn 4th Cl.	250	-	-	-	-	2.5	-	1	3	11.5

Test No. 17 - Continued

Metallurgical Results

Product	Weight %	Assays, %		% Distribution	
		Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	8.28	56.3	9.55	74.1	8.5
2. Pb 5th Cleaner Tail.	2.30	24.4	16.5	8.9	4.1
3. Pb 4th Cleaner Tail.	2.92	11.2	17.6	5.2	5.5
4. Pb 3rd Cleaner Tail.	4.16	3.83	15.7	2.5	7.0
5. Zn Cleaner Conc.	9.89	1.05	51.5	1.7	54.7
6. Zn 4th Cleaner Tail.	1.13	1.48	35.4	0.3	4.3
7. Zn 3rd Cleaner Tail.	1.10	1.52	24.8	0.3	2.9
8. Zn 2nd Cleaner Tail.	1.88	1.45	15.1	0.4	3.0
9. Zn 1st Cleaner Tail.	3.37	0.95	2.04	0.5	0.8
10. Zn Rougher Tailing	64.97	0.59	1.32	6.1	9.2
Head (Calculated)	100.00	6.29	9.31	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	10.58	49.4	11.1	83.0	12.6
Products 1 to 3	13.50	41.1	12.5	88.2	18.1
Products 1 to 4	17.66	32.3	13.2	90.7	25.1
Products 5 and 6	11.02	1.09	49.8	2.0	59.0
Products 5 to 7	12.12	1.13	47.6	2.3	61.9
Products 5 to 8	14.00	1.18	43.2	2.7	64.9
Products 5 to 9	17.37	1.13	35.2	3.2	65.7
Products 5 to 10	82.34	0.70	8.47	9.3	74.9

Test No. 17 - Continued

Screen Analysis

30 Minute Grind - Sample J-76

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 100	0.3	0.3	99.7
150	1.3	1.6	98.4
200	6.1	7.7	92.3
270	8.2	15.9	84.1
400	17.8	33.7	66.3
- 400	66.3	100.0	-
Total	100.0	-	-

Composite Pb Cleaner Products

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 23.5 µm	1.8	1.8	98.2
18.2	4.1	5.9	94.1
12.7	17.6	23.5	76.5
8.7	24.4	47.9	52.1
6.8	14.0	61.9	38.1
- 6.8	38.1	100.0	-
Total	100.0	-	-

Specific Gravity 5.21

Test No. 18

Purpose: To investigate the flotation of lead and zinc from a 1:1 mixture of J-76 and C.A. using the Grum procedure.

Procedure: As for test No. 9.

Feed: 2000 grams minus 10 mesh 1:1 mixture Grum sample J-76 and C.A.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	30	-	-	-
Pb Rougher	-	-	-	10	20	-	-	1	3	9.7
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb 1st Regr.	750	250	100	5	-	15	20	-	-	-
Pb 1st Cl.	-	-	-	2.5	2.5	-	-	1	4	9.8
	-	-	-	2.5	-	-	-	1	4	-
Pb 2nd Cl.	500	150	75	5	-	20	40	-	-	-
Pb 2nd Regr.	-	-	-	2.5	2.5	-	-	1	4	9.8
	-	-	-	2.5	-	5	-	1	4	-
Pb 3rd Cl.	150	50	50	-	-	-	-	1	3	9.7
	-	-	-	2.5	2.5	2.5	-	1	3	-
Pb 4th Cl.	100	50	50	-	-	-	-	1	2	9.8
	-	-	-	-	2.5	2.5	-	1	2	-
Pb 5th Cl.	50	-	25	-	2.5	-	-	1	3	9.9

Test No. 18 - Continued

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	Z-11	M-748	MIBC	Z-200	Grind	Cond.	Froth	
Zn Circuit (Pb rougher plus 1st and 2nd cleaner tailings)										
Condition	1500	-	-	-	-	-	-	3	-	-
	-	750	-	-	-	-	-	3	-	11.2
Zn Rougher	-	-	20	20	20	-	-	2	5	-
	-	-	10	10	10	-	-	1	5	-
Zn Conc. Regr.	750	250	5	10	-	-	20	-	-	-
Zn 1st Cl.	-	-	5	-	-	-	-	1	3	11.3
	-	-	10	-	2.5	5	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	-	-	1	2	11.5
	-	-	5	-	-	2.5	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	-	-	1	2	11.6
	-	-	2.5	-	-	2.5	-	1	2	-
Zn 4th Cl.	250	-	-	-	-	2.5	-	1	3	11.6

Test No. 18 - Continued

Metallurgical Results

Product	Weight	Assays, %		% Distribution	
	%	Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	5.55	67.2	5.57	82.9	4.5
2. Pb 5th Cleaner Tail.	0.57	22.3	15.7	2.8	1.3
3. Pb 4th Cleaner Tail.	1.61	10.2	16.7	3.7	3.9
4. Pb 3rd Cleaner Tail.	2.28	3.67	15.6	1.9	5.2
5. Zn Cleaner Conc.	8.33	0.69	52.2	1.3	63.7
6. Zn 4th Cleaner Tail.	0.75	1.04	32.5	0.2	3.6
7. Zn 3rd Cleaner Tail.	1.18	1.13	23.5	0.3	4.1
8. Zn 2nd Cleaner Tail.	1.77	1.06	12.9	0.4	3.3
9. Zn 1st Cleaner Tail.	3.75	0.73	3.10	0.6	1.8
10. Zn Rougher Tailing	74.21	0.36	0.79	5.9	8.6
Head (Calculated)	100.00	4.50	6.82	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	6.12	63.0	6.51	85.7	5.8
Products 1 to 3	7.73	52.0	8.64	89.4	9.7
Products 1 to 4	10.01	41.0	10.2	91.3	14.9
Products 5 and 6	9.08	0.72	50.6	1.5	67.3
Products 5 to 7	10.26	0.77	47.5	1.8	71.4
Products 5 to 8	12.03	0.81	42.4	2.2	74.7
Products 5 to 9	15.78	0.79	33.0	2.8	76.5
Products 5 to 10	89.99	0.44	6.45	8.7	85.1

Test No. 18 - Continued

Screen Analysis

30 Minute Grind - 1:1 C.A. : J-76

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 100	0.3	0.3	99.7
150	1.8	2.1	97.9
200	7.7	9.8	90.2
270	9.2	19.0	81.0
400	18.7	37.7	62.3
- 400	62.3	100.0	-
Total	100.0	-	-

Composite Pb Cleaner Products

Particle Size	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 22.0 µm	1.3	1.3	98.7
17.1	2.0	3.3	96.7
11.9	4.8	8.1	91.9
8.2	17.8	25.9	74.1
6.3	17.2	43.1	56.9
- 6.3	56.9	100.0	-
Total	100.0	-	-

Specific Gravity 5.69

Test No. 19

Purpose: To investigate the flotation of lead and zinc from sample B-5 using the Grum procedure.

Procedure: As for test No. 9.

Feed: 2000 grams minus 10 mesh sample B-5.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	30	-	-	-
Pb Rougher	1000	-	-	10	20	-	-	1	3	7.7-9.3
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb 1st Regr.	750	250	100	5	-	15	20	-	-	-
Pb 1st Cl.	-	-	-	2.5	2.5	-	-	1	4	9.5
	-	-	-	2.5	-	5	-	1	4	-
Pb 2nd Regr.	500	150	75	5	-	20	40	-	-	-
Pb 2nd Cl.	-	-	-	2.5	2.5	-	-	1	4	9.7
	-	-	-	2.5	-	5	-	1	4	-
Pb 3rd Cl.	150	50	50	-	-	-	-	1	3	9.8
	-	-	-	2.5	2.5	2.5	-	1	3	-
Pb 4th Cl.	100	50	50	-	-	-	-	1	2	9.8
	-	-	-	-	2.5	2.5	-	1	2	-
Pb 5th Cl.	50	-	25	-	2.5	-	-	1	3	9.9

Test No. 19 - Continued

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	Z-11	M-748	MIBC	Z-200	Grind	Cond.	Froth	
Zn Circuit (Pb rougher plus 1st and 2nd cleaner tailings).										
Condition	1500	-	-	-	-	-	-	3	-	-
	-	750	-	-	-	-	-	3	-	10.8
Zn Rougher	-	-	20	20	-	-	-	2	3	-
	250	250	30	10	10	-	-	1	5	-
Zn Conc. Regr.	1000	250	10	10	-	-	20	-	-	-
Zn 1st Cl.	-	-	5	-	-	-	-	1	3	11.3
	-	-	10	-	2.5	5	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	-	-	1	2	11.5
	-	-	5	-	-	2.5	-	1	3	-
Zn 3rd Cl.	250	-	-	-	-	-	-	1	2	11.6
	-	-	2.5	-	-	2.5	-	1	2	-
Zn 4th Cl.	250	-	-	-	-	2.5	-	1	3	11.7

Test No. 19 - Continued

Metallurgical Results

Product	Weight %	Assays, %		% Distribution	
		Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	10.41	52.5	16.4	66.1	11.6
2. Pb 5th Cleaner Tail.	3.02	23.1	26.5	8.4	5.4
3. Pb 4th Cleaner Tail.	3.23	11.9	27.7	4.6	6.1
4. Pb 3rd Cleaner Tail.	4.80	5.71	25.3	3.5	8.2
5. Zn Cleaner Conc.	2.29	1.98	46.9	0.5	7.3
6. Zn 4th Cleaner Tail.	2.03	2.17	44.7	0.5	6.2
7. Zn 3rd Cleaner Tail.	3.66	2.17	43.2	1.0	10.7
8. Zn 2nd Cleaner Tail.	5.07	2.36	35.7	1.4	12.3
9. Zn 1st Cleaner Tail.	10.46	2.22	24.2	2.8	17.2
10. Zn Rougher Tailing	55.03	1.69	4.03	11.2	15.0
Head (Calculated)	100.00	8.27	14.7	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	13.43	45.9	18.7	74.5	17.0
Products 1 to 3	16.66	39.3	20.4	79.1	23.1
Products 1 to 4	21.46	31.8	21.5	82.6	31.3
Products 5 and 6	4.32	2.07	45.9	1.0	13.5
Products 5 to 7	7.98	2.12	44.6	2.0	24.2
Products 5 to 8	13.05	2.21	41.1	3.4	36.5
Products 5 to 9	23.51	2.22	33.6	6.2	53.7
Products 5 to 10	78.54	1.85	12.9	17.4	68.7

Test No. 19 - Continued

Screen Analysis

Sample B-5 - 30 Minute Grind

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 150	1.6	1.6	98.4
200	7.1	8.7	91.3
270	7.4	16.1	83.9
400	15.7	31.8	68.2
- 400	68.2	100.0	-
Total	100.0	-	-

Composite Pb Cleaner Products

Particle Size	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 23.7 µm	1.8	1.8	98.2
18.4	2.2	4.0	96.0
12.8	8.2	12.2	87.8
8.8	22.8	35.0	65.0
6.8	17.8	52.8	47.2
- 6.8	47.2	100.0	-
Total	100.0	-	-

Specific Gravity 5.23

Test No. 20

Purpose: To investigate the flotation of lead and zinc from 1:1 mixture of a sample of B-5 and Cyprus-Anvil composite using the Grum procedure.

Procedure: As for test No. 9.

Feed: 2000 grams minus 10 mesh 1:1 mixture sample B-5 and C.A. composite.

Grind: 30 minutes at 65 percent solids in the laboratory ball mill.

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	Na_2CO_3	$ZnSO_4$	NaCN	Z-11	MIBC	R-242	Grind	Cond.	Froth	
Primary Grind	2500	500	150	25	-	-	30	-	-	-
Pb Rougher	500	-	-	10	20	-	-	1	3	9.1-9.6
	-	-	-	10	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
	-	-	-	5	10	-	-	1	3	-
Pb 1st Regr.	750	250	100	5	-	15	20	-	-	-
Pb 1st Cl.	-	-	-	2.5	2.5	-	-	1	4	9.8
	-	-	-	2.5	-	5	-	1	4	-
Pb 2nd Regr.	500	150	75	5	-	20	40	-	-	-
Pb 2nd Cl.	-	-	-	2.5	2.5	-	-	1	4	9.8
	-	-	-	2.5	-	5	-	1	4	-
Pb 3rd Cl.	150	50	50	-	-	-	-	1	3	9.8
	-	-	-	2.5	2.5	2.5	-	1	3	-
Pb 4th Cl.	100	50	50	-	-	-	-	1	2	9.7
	-	-	-	-	2.5	2.5	-	1	2	-
Pb 5th Cl.	50	-	25	-	2.5	-	-	1	3	9.8

Test No. 20 - Continued

Conditions:

Stage	Reagents Added, grams per tonne						Time, minutes			pH
	$Ca(OH)_2$	$CuSO_4$	Z-11	M-748	MIBC	Z-200	Grind	Cond.	Froth	
Zn Circuit (Pb rougher plus 1st and 2nd cleaner tailings)										
Condition	1500	-	-	-	-	-	-	3	-	-
	-	750	-	-	-	-	-	3	-	11.2
Zn Rougher	-	-	20	20	20	-	-	2	5	-
	-	-	30	10	10	-	-	1	3	-
Zn Conc. Regr.	1000	250	10	10	-	-	20	-	-	-
Zn 1st Cl.	-	-	5	-	-	-	-	1	3	11.3
	-	-	10	-	2.5	5	-	1	3	-
Zn 2nd Cl.	250	-	-	-	-	-	-	1	2	11.5
	-	-	5	-	-	2.5	-	1	3	-
Zn 3rd Cl.	250	-	-	-	-	-	-	1	2	11.6
	-	-	2.5	-	-	2.5	-	1	2	-
Zn 4th Cl.	250	-	-	-	-	2.5	-	1	3	11.7

Test No. 20 - Continued

Metallurgical Results

Product	Weight %	Assays, %		% Distribution	
		Pb	Zn	Pb	Zn
1. Pb Cleaner Conc.	6.78	61.4	11.0	75.2	7.9
2. Pb 5th Cleaner Tail.	1.46	23.9	22.7	6.3	3.5
3, Pb 4th Cleaner Tail.	1.96	11.7	24.9	4.1	5.2
4. Pb 3rd Cleaner Tail.	3.14	4.20	22.3	2.4	7.4
5. Zn Cleaner Conc.	4.85	0.90	48.8	0.8	25.1
6. Zn 4th Cleaner Tail.	2.49	1.19	44.0	0.5	11.6
7. Zn 3rd Cleaner Tail.	2.96	1.33	38.8	0.7	12.2
8. Zn 2nd Cleaner Tail.	3.91	1.45	27.5	1.0	11.4
9. Zn 1st Cleaner Tail.	5.32	1.20	11.6	1.2	6.6
10. Zn Rougher Tailing	67.13	0.64	1.28	7.8	9.1
Head (Calculated)	100.00	5.54	9.43	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	8.24	54.8	13.1	81.5	11.4
Products 1 to 3	10.20	46.5	15.3	85.6	16.6
Products 1 to 4	13.34	36.5	17.0	88.0	24.0
Products 5 and 6	7.34	1.00	47.2	1.3	36.7
Products 5 to 7	10.30	1.09	44.8	2.0	48.9
Products 5 to 8	14.21	1.19	40.0	3.0	60.3
Products 5 to 9	19.53	1.19	32.3	4.2	66.9
Products 5 to 10	86.66	0.77	8.27	12.0	76.0

Test No. 20 - Continued

Screen Analysis

B-5+C.A., 1:1 - 30 Minute Grind

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 100	0.2	0.2	99.8
150	2.0	2.2	97.8
200	8.2	10.4	89.6
270	8.8	19.2	80.8
400	17.2	36.4	63.6
- 400	63.6	100.0	-
Total	100.0	-	-

Composite Pb Cleaner Products

Particle Size	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 23.3 µm	2.2	2.2	97.8
18.1	2.2	4.4	95.6
12.6	4.2	8.6	91.4
8.7	16.6	25.2	74.8
6.7	18.1	43.3	56.7
- 6.7	56.7	100.0	-
Total	100.0	-	-

Specific Gravity 5.28

LAKEFIELD RESEARCH OF CANADA LIMITED
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