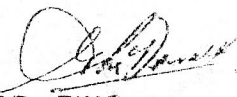


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An investigation of 
THE RECOVERY OF LEAD, ZINC
AND SILVER

from DY Ore samples
submitted by

CURRAGH RESOURCES

Progress Report No. 1

Project No. L.R. 4835

NOTE:

This report refers to the samples as received.

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LAKEFIELD RESEARCH
A DIVISION OF FALCONBRIDGE LIMITED
September 2, 1992

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ABSTRACT

Flotation testwork was conducted on samples of Curragh Resources DY ore deposit using the flowsheet and reagent scheme developed for treatment of the Grum orebody.

The results of the single locked cycle test performed on ore from drill hole 05 are summarized in Table No. 1.

TABLE NO. 1 :
Locked Cycle Test Results

Test No.	Product	Weight %	Assays, %, g/t			% Distribution		
			Pb	Zn	Ag	Pb	Zn	Ag
7	Pb 4th Cleaner Conc	7.12	60.1	10.9	1077	87.4	7.0	81.1
	Zn 4th Cleaner Conc	17.71	1.11	57.2	43.6	4.0	90.8	8.1
	Zn Combined Tail	75.17	0.56	0.33	13.6	8.6	2.3	10.8
	Head (calc.)	100.00	4.89	11.2	94.7	100.0	100.0	100.0

The results of the testwork confirmed that the Grum flowsheet and reagent scheme are suitable for processing of the DY ore, but with the following modifications:

- Lime is not a suitable pH modifier. Sodium carbonate provided much higher galena flotation rates.
- Lead regrinding requirements are lower than for the Grum ore.

Impurity and size analyses of the locked cycle test lead and zinc concentrate samples were completed.

INTRODUCTION

Metallurgical testwork was carried out on DY ore samples based on the testwork proposal and cost estimate issued on May 21, 1992.

The results of the testwork were discussed with Mr. Godfrey McDonald as the testwork proceeded.

LAKEFIELD RESEARCH

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DISCUSSION

1. Description of Samples Used in the Testwork

Core samples of DY ore from two drill holes were received at Lakefield Research on July 10, 1992 (LR No. 9239989). The following samples were received:

Hole 05 : 65333 - 65348 (39 kg)

Hole 07 : 65172 - 65176 (11 kg)

Each sample was crushed to minus 10 mesh and three ore composites were prepared, as detailed in Table No. 2.

TABLE NO. 2 :
Composite Preparation

Composite Number	Hole No.	Sample Number	Interval, m			Weight Used kg
			From	To	Length	
DY05-01	05	65333	588.2	588.5	0.3	0.8
		65334	588.5	590.0	1.5	3.8
		65335	590.0	590.5	0.5	1.3
		65336	590.5	591.6	1.1	2.8
		65337	591.6	592.2	0.6	1.5
		65338	592.2	592.7	0.5	1.3
		65340	595.0	595.5	0.5	1.3
		65341	595.5	595.8	0.3	0.8
		65342	595.8	596.5	0.7	1.8
		65343	596.5	597.1	0.6	1.5
		65344	597.1	597.7	0.6	1.5
		65345	597.7	598.0	0.3	0.8
		65346	598.0	599.2	1.2	3.1
		65347	599.2	599.8	0.6	1.5
		65348	599.8	601.5	1.7	4.3
		Total	-	-	11.0	28.0
DY07-01	07	65172	595.5	596.0	0.5	1.2
		65173	596.0	596.5	0.5	1.2
		65174	596.5	597.2	0.7	1.6
		65175	597.2	598.2	1.0	2.3
		65176	598.2	599.8	1.6	3.7
				Total	595.5	599.8
DY05-02	05	65339	592.7	595.0	2.3	2.1
		DY05-01			11.0	11.9
				Total	588.2	601.5

Composites DY05-01 and DY05-02 were different in that DY05-02 contained 15% of Sample 65339, a low grade ore sample containing carbonaceous phyllite.

The drill logs and geologists' description indicated the following:

- The 05 core contains minor barite and little massive pyritic ore, typical of the B Zone. Sulphide minerals include pyrite, pyrrhotite, sphalerite, and galena. The grade of this hole is higher than the average of the zone, but the ore is otherwise considered representative.
- The 07 ore is carbonaceous quartzite, considerably lower grade than the 05 ore.
- Average work index is about 9 (metric).
- The ore has been on surface for 1.2 years (1 summer only) and is not noticeably oxidized.

The head assays obtained on the Composites are shown in Table No. 3.

TABLE NO. 3 :
Head Assays

Composite / Sample No.	Assays, %, g/t						
	Pb	Zn	Fe	S	Cg	Ag	Au
DY05-01	6.00	13.3	14.8	22.4	0.12	112	0.88
65339	0.22	0.17	4.20	3.64	1.11	5.9	0.13
DY05-02*	5.13	11.3	13.2	19.6	0.27	96.1	0.77
DY07-01**	3.06	4.10	-	-	-	49.2	-

* by calculation; **calculated heads.

2. Flotation of DY05 Ore

2.1. Preliminary Flotation Tests with Lime in the Lead Circuit

A preliminary flotation test was conducted on the DY05-01 composite under the basic conditions used in previous testwork on Grum ore (Project No. LR 4237, Progress Report No. 4, Test No. 12). In this test, lime was used in the lead circuit and primary grind and Pb regrind times were 35 minutes and 30 minutes respectively. The regrind consisted of single stage grinding of the Pb rougher concentrate. The results of Test No. 1 are summarized in Table No. 4.

TABLE NO. 4 :
Results of the Preliminary Test on Composite DY05-01

Test No.	Product	Weight %	Assays, %, g/t			% Distribution		
			Pb	Zn	Ag	Pb	Zn	Ag
1	Pb 4th Cleaner Conc	3.04	59.5	9.64	1545	29.2	2.3	36.2
	Pb 1st Cleaner Conc	9.08	43.6	15.4	901	63.8	10.8	63.1
	Pb Rougher Conc	21.88	27.0	20.8	529	95.2	35.0	89.2
	Pb Rougher Tail	78.12	0.38	10.8	17.9	4.8	65.0	10.8
	Zn Rougher Feed	87.25	1.52	12.3	37.1	21.3	82.6	24.9
	Zn Cleaner Conc	15.86	1.76	55.6	51.2	4.5	68.0	6.3
	Zn Rougher Conc	29.60	3.03	34.9	69.1	14.4	79.6	15.8
	Zn Rougher Tail	57.65	0.74	0.68	20.6	6.9	3.0	9.2
	Head (calc.)	100.00	6.20	13.0	130	100.0	100.0	100.0

The results showed the following:

- Lead and silver recoveries were low, less than 36% in the Pb 4th cleaner and less than 80% in the Pb 1st cleaner + cleaner scavenger concentrates. The reasons for the poor results were overgrinding of the rougher concentrate ($K_{80} = 14 \mu\text{m}$) and poor flotation kinetics with lime as the pH modifier. Concentrate grade was about 60% Pb.
- Zinc recovery was 68% in the Zn 4th cleaner and 78% in the Zn 1st cleaner + cleaner scavenger concentrates. Concentrate grade was 55.6% Zn.
- Grind fineness was $K_{80} = 49 \mu\text{m}$, or 94.3% -200 mesh.

It should be noted that slow flotation rates with lime were not likely due to oxidation during storage, as oxidation seemed quite limited.

2.2. Batch Flotation Tests Using Na_2CO_3

The following changes were made in the test procedure:

- Na_2CO_3 was used as the pH modifier in the lead circuit.
- Collector additions were increased in the lead circuit.

- The lead regrind time was reduced from 30 minutes to 20 minutes.

Using these conditions (regrind $K_{80} = 21 \mu\text{m}$) lead metallurgy improved significantly (Table 5). Lead recoveries were increased to over 75% with a 65.8% Pb concentrate grade in Test No. 3. Silver recoveries were 69-80%. Lead recoveries in the Pb 1st cleaner + cleaner scavenger concentrates were 89-92%.

TABLE NO. 5:
Effect of Na_2CO_3 and Coarser Regrinding

Test No.	Product	Weight %	Assays, %, g/t			% Distribution		
			Pb	Zn	Ag	Pb	Zn	Ag
3	Pb 4th Cleaner Conc	6.45	65.8	9.70	1179	74.6	4.8	69.4
	Pb 1st Cleaner Conc	11.30	45.9	15.4	816	91.2	13.4	84.3
	Pb Rougher Conc	25.05	21.4	19.6	393	94.5	37.8	89.9
	Pb Rougher Tail	74.95	0.42	10.8	14.8	5.5	62.2	10.1
	Zn Rougher Feed	86.55	0.50	12.4	17.6	7.6	82.5	13.9
	Zn Cleaner Conc	18.10	0.74	55.7	36.6	2.4	77.5	6.1
	Zn Rougher Conc	27.37	0.81	38.4	34.4	3.9	80.8	8.6
	Zn Rougher Tail	59.18	0.35	0.37	9.80	3.6	1.7	5.3
	Head (calc.)	100.00	5.69	13.0	109	100.0	100.0	100.0
6	Pb 4th Cleaner Conc	8.29	59.4	13.4	1054	85.6	8.1	80.1
	Pb 1st Cleaner Conc	11.42	46.1	16.3	800	91.6	13.6	83.9
	Pb Rougher Conc	-	-	-	-	-	-	-
	Pb Rougher Tail	-	-	-	-	-	-	-
	Zn Rougher Feed	87.45	0.48	13.2	18.0	7.3	84.1	14.4
	Zn Cleaner Conc	18.08	0.64	59.6	33.3	2.0	78.7	5.5
	Zn Rougher Conc	28.41	0.79	39.9	34.2	3.9	82.9	8.9
	Zn Rougher Tail	59.04	0.33	0.28	10.2	3.4	1.2	5.5
	Head (calc.)	100.00	5.75	13.7	109	100.0	100.0	100.0

2.3. Effect of Carbonaceous Phyllite

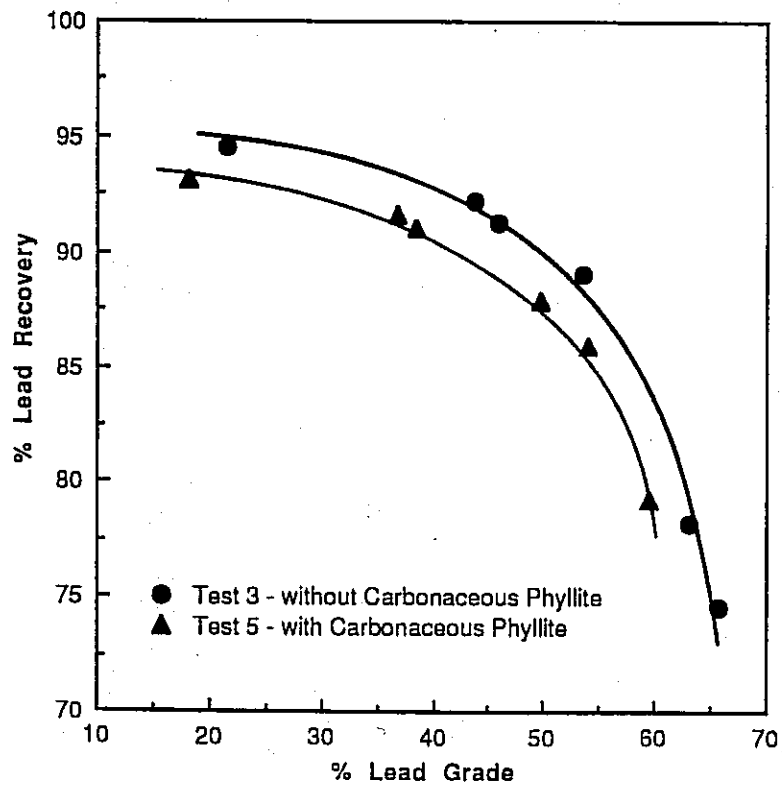
In Test 5, a batch flotation test was carried out on Composite DY05-02, which included the carbonaceous phyllite ore. The test results, shown in Table No. 6 and illustrated in Figure No. 1, showed the following:

- The carbonaceous phyllite in the ore resulted in lower lead recovery in the cleaner circuit. Selectivity towards zinc was not affected. The final concentrate may have been contaminated with carbon to a certain extent, as the froths were noticeably blacker than in tests without the carbonaceous sample.
- Zinc and silver metallurgy was essentially unaffected by the carbonaceous phyllite in the sample.

TABLE NO. 6 :
Effect of Carbonaceous Phyllite in the Ore

Test No.	Product	Weight %	Assays, %, g/t			% Distribution		
			Pb	Zn	Ag	Pb	Zn	Ag
5	Pb 4th Cleaner Conc	6.54	59.5	11.7	1040	79.2	6.9	72.8
	Pb 1st Cleaner Conc	11.60	38.5	15.6	675	91.0	16.4	83.8
	Pb Rougher Conc	21.24	21.5	18.1	385	93.1	34.7	87.4
	Pb Rougher Tail	78.76	0.43	9.19	14.9	6.9	65.3	12.6
	Zn Rougher Feed	87.01	0.47	10.3	16.3	8.3	80.8	15.2
	Zn Cleaner Conc	13.93	0.62	58.9	36.2	1.8	74.0	5.4
	Zn Rougher Conc	22.97	0.80	38.0	34.8	3.7	78.9	8.6
	Zn Rougher Tail	64.04	0.35	0.34	9.70	4.6	2.0	6.6
	Head (calc.)	100.00	4.91	11.1	93.4	100.0	100.0	100.0

FIGURE NO. 1
Effect of Carbonaceous Phyllite Ore on lead Flotation



2.4. Locked Cycle Testwork on Composite DY05-02 Ore

A single locked cycle test was conducted on Composite DY05-02 ore (i.e. including the carbonaceous phyllite sample 65339) using the Grum flowsheet shown in Figure No. 2. Test conditions and results are summarized in Table No. 7.

TABLE NO. 7 :
Conditions and Results of the Locked Cycle Test

A. Conditions : Pb Circuit

Test No.	Reagent Additions, g/t						
	Primary Grind	Pb Rougher	Pb Ro Conc Regrind	Pb 1st Cl + Cl Scav	Pb 2nd Cleaner	Pb 3rd Cleaner	Pb 4th Cleaner
7	Na ₂ CO ₃ =1500 SD200/CN =200 317/3418A =16 (35 minutes)	317/3418A =45 MIBC=24	Na ₂ CO ₃ =200 SD200/CN =150 317/3418A =16 (20 minutes)	317/3418A =5 MIBC=6	SD200/CN =50 MIBC=4	SD200/CN =50 MIBC=2	SD200/CN =50 MIBC=2

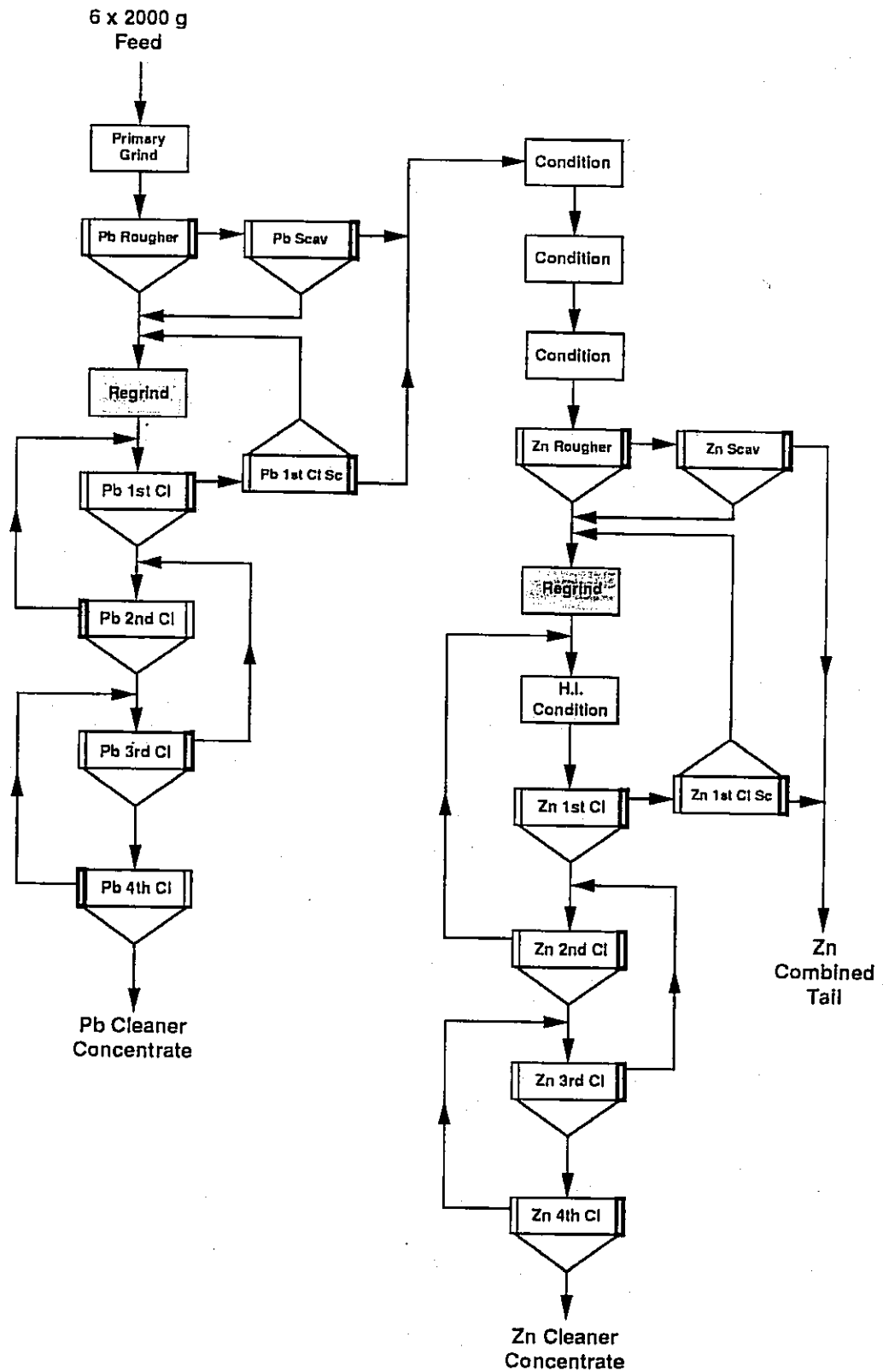
A. Conditions : Zn Circuit

Test No.	Reagent Additions, g/t						
	Zn Rougher	Zn Ro Conc Regrind	H.I. Condition	Zn 1st Cl + Cl Scav	Zn 2nd Cleaner	Zn 3rd Cleaner	Zn 4th Cleaner
7	Ca(OH) ₂ =2000 CuSO ₄ =1000 A343=90 DF1012=7.5	Ca(OH) ₂ =750 CuSO ₄ =100 SD200=100 (30 minutes)	A343=60 DF1012=5	A343=30 DF1012=7.5	Ca(OH) ₂ =200 A343=5 DF1012=2.5	Ca(OH) ₂ =200 A343=5 DF1012=2.5	Ca(OH) ₂ =200

B. Results

Test No.	Product	Weight %	Assays, %, g/t			% Distribution		
			Pb	Zn	Ag	Pb	Zn	Ag
7	Pb 4th Cleaner Conc	7.12	60.1	10.9	1077	87.4	7.0	81.1
	Zn 4th Cleaner Conc	17.71	1.11	57.2	43.6	4.0	90.8	8.1
	Zn Combined Tail	75.17	0.56	0.33	13.6	8.6	2.3	10.8
	Head (calc.)	100.00	4.89	11.2	94.7	100.0	100.0	100.0

FIGURE NO. 2
Locked Cycle Flowsheet



Lead recovery was 87% with a concentrate grade of 60% Pb. Silver grade and recovery in the lead concentrate were 1077 g/t and 81% respectively. The lead concentrate was 80% passing 12 μm .

Zinc recovery was 91% and concentrate grade was 57% Zn, and the Pb assay of the zinc concentrate was 1.1%.

The zinc concentrate fineness was $K_{80} = 19 \mu\text{m}$.

2.5. Smelter Impurity Analyses

Impurity analyses performed on the lead and zinc concentrates (combined cycles E + F) are shown in Table No. 8.

TABLE NO. 8 :
Concentrate Analyses

Element		Assays %, g/t	
		Pb Cl Conc	Zn Cl Conc
Lead	Pb	61.21	1.17
Zinc	Zn	10.2	55.9
Copper	Cu	0.26	0.13
Iron	Fe	3.82	4.95
Nickel	Ni	0.013	0.008
Bismuth	Bi	<0.01	<0.01
Cadmium	Cd	0.012	0.059
Cobalt	Co	0.0012	0.002
Chromium	Cr	0.021	0.019
Barium	Ba	0.12	0.13
Arsenic	As	0.095	0.023
Antimony	Sb	0.29	0.008
Tin	Sn	<0.005	0.016
Germanium	Ge	<0.001	<0.001
Manganese	Mn	0.014	0.051
Mercury	Hg	0.004	0.038
Selenium	Se	<0.05	<0.05
Tellurium	Te	<0.02	<0.02
Gold	Au	5.18	0.45
Silver	Ag	1065	42.1
Carbon	C	1.15	0.45
Silicon	SiO ₂	2.31	1.00
Aluminum	Al ₂ O ₃	0.56	0.25
Calcium	CaO	0.25	0.74
Magnesium	MgO	0.11	0.31
Fluorine	F	0.01	0.03
Chlorine	Cl	0.0043	0.0016
Sulphur	S	18.6	28.0
Insoluble		3.10	1.36

3. Flotation of DY07 Ore

The DY07 ore (Composite DY07-01) was considerably lower grade than the DY05 ore. Two tests were conducted, one with lime and fine Pb regrinding (i.e. 30 minutes) and the other with carbonate and a 20 minute lead regrind (as for DY05-01 ore). The results, shown in Table No. 9, showed the following:

TABLE NO. 9 :
Results of Flotation on DY07 Ore

Test No.	Product	Weight %	Assays, %, g/t			% Distribution		
			Pb	Zn	Ag	Pb	Zn	Ag
2	Pb 4th Cleaner Conc	2.71	39.9	4.61	452	34.8	3.0	23.8
	Pb 1st Cleaner Conc	8.88	26.6	6.55	319	76.0	13.9	55.1
	Pb Rougher Conc	19.28	14.6	7.82	201	90.8	36.2	75.5
	Pb Rougher Tail	80.72	0.35	3.30	15.6	9.2	63.8	24.5
	Zn Rougher Feed	89.27	0.67	3.80	22.5	19.3	81.3	39.0
	Zn Cleaner Conc	5.87	1.40	52.0	94.1	2.6	73.2	10.7
	Zn Rougher Conc	15.68	2.18	20.9	80.9	11.0	78.7	24.7
	Zn Rougher Tail	73.59	0.35	0.15	10.0	8.3	2.6	14.3
	Head (calc.)	100.00	3.10	4.17	51.4	100.0	100.0	100.0
4	Pb 4th Cleaner Conc	3.97	63.2	5.89	769	83.1	5.8	64.9
	Pb 1st Cleaner Conc	7.57	35.2	7.04	464	88.2	13.2	74.6
	Pb Rougher Conc	19.09	14.3	7.40	200	90.5	35.1	81.2
	Pb Rougher Tail	80.91	0.35	3.24	10.9	9.5	64.9	18.8
	Zn Rougher Feed	90.91	0.37	3.71	12.4	11.2	83.6	23.9
	Zn Cleaner Conc	5.87	0.93	52.2	60.8	1.8	76.1	7.6
	Zn Rougher Conc	24.18	0.51	13.4	26.3	4.1	80.3	13.5
	Zn Rougher Tail	66.73	0.32	0.20	7.30	7.1	3.3	10.4
	Head (calc.)	100.00	3.02	4.03	47.0	100.0	100.0	100.0

- Metallurgical results in each of the tests were similar to those for DY05 ore in that the use of carbonate resulted in greatly improved lead and silver flotation kinetics and metallurgy.

4. Conclusions

1. The basic flowsheet developed for the Grum ore is suitable for treatment of the DY ore. Single stage regrinding of the lead rougher concentrate to $K_{80} = 21 \mu\text{m}$ yielded lead product grades of over 60% Pb. Regrinding of the DY lead concentrate required less power than did the Grum concentrate.
2. The reagent scheme developed for the Grum ore has to be modified for the DY ore. Substitution of sodium carbonate for lime is required to obtain good galena flotation. Oxidation of the ore since drilling may have contributed to this to a limited extent.
3. Primary grinding requirements of the DY ore were roughly similar to those for the Grum ores.
4. The metallurgical response of Hole 07 ore was similar to that of the 05 ore, but lead and silver recoveries were a bit lower due to the lower head grades.

p. 13 is Details of Tests - Title only

DETAILS OF TESTS

TEST NO. 1

Purpose: To use the conditions of Test 12 (LR 4237, Progress Report No. 4) on Composite DY05-01.

Procedure: As indicated below.

Feed: 2000 grams of minus 10 mesh DY05-01 composite.

Grind: 35 minutes at 65% solids in the lab ball mill.

Conditions:

Stage	Reagents Added, g/t				Time, minutes			pH
	Ca(OH) ₂	SD200 NaCN*	A317 3418A**	MIBC	Grind	Cond	Froth	
Grind	700	200	8	-	35	-	-	-
Pb Rougher	-	-	40	20	-	1	3	9.5
	-	-	5	5	-	1	2.5	-
Pb Conc Re grind	150	150	8	-	30	-	-	-
Pb 1st Cleaner	-	-	-	10	-	1	6	9.7
Pb 1st Cleaner Scav	-	-	2.5	-	-	1	2	-
Pb 2nd Cleaner	-	50	-	2	-	1	2	9.4
	-	-	2.5	-	-	1	1	-
Pb 3rd Cleaner	-	50	-	2	-	1	2	-
	-	-	1	-	-	1	1	-
Pb 4th Cleaner	-	25	-	-	-	1	1	-
	-	-	-	-	-	1	2.5	-

*SD200/NaCN = 1:1

**A317/3418A = 1:1

Conditions: Combined Pb Ro Tail + Pb 1st Cl Scav Tail

Stage	Reagents, Added, g/t					Time, minutes			pH
	Ca(OH) ₂	CuSO ₄	A343	DF1012	SD200	Grind	Cond	Froth	
Zinc Circuit:									
Condition	2000	-	-	-	-	-	5	-	12.3
Condition	-	1000	-	-	-	-	5	-	-
Zn Rougher	-	-	40	2.5	-	-	3	4	12.1
	-	-	20	-	-	-	1	2	11.9
	-	-	-	-	-	-	1	-	-
Zn Conc Re grind*	750	100	-	-	100	30	-	-	-
H.I. Conditioning	-	-	25	5	-	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	3	11.8
	-	-	10	-	-	-	1	2	-
Zn 1st Cleaner Scav	-	-	10	-	-	-	1	1.5	11.5
Zn 2nd Cleaner	200	-	-	-	-	-	-	6	11.9
	-	-	5	-	-	-	1	2	-
Zn 3rd Cleaner	200	-	5	-	-	-	1	5	11.9
	-	-	5	-	-	-	1	1	-
Zn 4th Cleaner	200	-	5	-	-	-	1	4	12.0
	-	-	5	-	-	-	1	-	-

*pebble mill

Test No. 1

Product	Weight		Assays, %, g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl. Conc.	59.1	3.04	59.5	9.64	1545	29.2	2.3	36.2
2. Pb 4th Cl. Tail	21.4	1.10	53.4	13.9	894	9.5	1.2	7.6
3. Pb 3rd Cl. Tail	42.2	2.17	41.6	16.5	663	14.6	2.8	11.1
4. Pb 2nd Cl. Tail	53.9	2.77	23.7	21.4	384	10.6	4.6	8.2
5. Pb 1st Cl.Sc Conc	57.3	2.94	28.6	22.9	479	13.6	5.2	10.9
6a. Pb 1st Cl Sc Tail (to Zn Ro)	177.6	9.13	11.2	25.1	201	16.5	17.7	14.2
6b. Pb 1st Cl Sc Tail (Sample)	14.2	0.73	11.2	25.1	201	1.3	1.4	1.1
7. Zn Cl Conc	308.7	15.86	1.76	55.6	51.2	4.5	68.0	6.3
8. Zn 4th Cl Tail	24.5	1.26	5.71	29.7	123	1.2	2.9	1.2
9. Zn 3rd Cl Tail	37.2	1.91	5.16	27.6	108	1.6	4.1	1.6
10. Zn 2nd Cl Tail	38.5	1.98	5.74	11.5	107	1.8	1.8	1.6
11. Zn 1st Cl Sc Conc	13.9	0.71	5.32	18.2	105	0.6	1.0	0.6
12. Zn 1st Cl Sc Tail	153.2	7.87	3.74	3.12	74.3	4.7	1.9	4.5
13. Zn Ro Tail	1121.9	57.65	0.74	0.68	20.6	6.9	3.0	9.2
Head Calc.	1946.0	100.00	6.20	13.0	130	100.0	100.0	100.0

Combined Products

Products 1+2 (Pb 3rd Cl Conc)	4.14	57.9	10.8	1372	38.6	3.4	43.8
Products 1-3 (Pb 2nd Cl Conc)	6.31	52.3	12.7	1128	53.2	6.2	54.9
Products 1-4 (Pb 1st Cl Conc)	9.08	43.6	15.4	901	63.8	10.8	63.1
Products 1-5 (Pb 1st Cl + Cl Scav Conc)	12.02	39.9	17.2	798	77.4	16.0	73.9
Products 1-6 (Pb Ro Conc)	21.88	27.0	20.8	529	95.2	35.0	89.2
Pb Ro Tail	78.12	0.38	10.8	17.9	4.8	65.0	10.8
Products 6a-6b (Pb 1st Cl Scav Tail)	9.86	11.2	25.1	201	17.8	19.1	15.3
Products 7-13 (Zn Ro Feed)	87.25	1.52	12.3	37.1	21.3	82.6	24.9
Products 7-8 (Zn 3rd Cl Conc)	17.12	2.05	53.7	56.5	5.7	70.9	7.5
Products 7-9 (Zn 2nd Cl Conc)	19.03	2.36	51.1	61.7	7.3	75.0	9.1
Products 7-10 (Zn 1st Cl Conc)	21.01	2.68	47.3	66.0	9.1	76.7	10.7
Products 7-10 (Zn 1st Cl+Cl Scav Concs)	21.73	2.77	46.4	67.3	9.7	77.7	11.3
Products 7-12 (Zn Ro Conc)	29.60	3.03	34.9	69.1	14.4	79.6	15.8
Products 12+13 (Zn Tails)	65.52	1.10	0.97	27.1	11.6	4.9	13.7
Products 6a +12 +13 (Comb Tails)	66.25	1.21	1.24	29.0	13.0	6.3	14.8

Product: Test No. 1 - 35 Minute Rod Mill Grind Product

Microns	Mesh	Weight Grams	% Weight		
			Ind.	Cum.	Passing
208	65	0.0	0.0	0.0	100.0
147	100	0.1	0.2	0.2	99.8
104	150	0.6	1.1	1.3	98.7
74	200	2.3	4.4	5.7	94.3
53	270	5.0	9.5	15.3	84.7
38	400	9.1	17.4	32.6	67.4
-38	-400	35.3	67.4	100.0	-
	Total	52.4	100.0	-	-

K80

49 μ m

TEST NO. 2

Purpose: To repeat the conditions of Test 1 on Composite DY07-01.

Procedure: As indicated below.

Feed: 2000 grams of minus 10 mesh DY07-01 composite.

Grind: 35 minutes at 65% solids in the lab ball mill.

Conditions:

Stage	Reagents Added, g/t				Time, minutes			pH
	Ca(OH) ₂	SD200 NaCN	A317 3418A	MIBC	Grind	Cond	Froth	
Grind	700	200	8	-	35	-	-	-
Pb Rougher	-	-	40	20	-	1	3	10.5
Pb Conc Re grind	-	-	5	5	-	1	3	-
Pb 1st Cleaner	150	150	8	-	30	-	-	-
	-	-	-	10	-	1	4	-
Pb 1st Cleaner Scav	-	-	2.5	-	-	1	1	-
Pb 2nd Cleaner	-	-	2.5	2	-	1	1	-
	-	50	-	2	-	1	3	9.8
Pb 3rd Cleaner	-	-	2.5	-	-	1	1	-
	-	50	-	2	-	1	3	-
Pb 4th Cleaner	-	-	1	-	-	1	1	-
	-	25	-	-	-	1	3	-

Conditions: Combined Pb Ro Tail + Pb 1st CI Scav Tail

Stage	Reagents, Added, g/t					Time, minutes			pH
	Ca(OH) ₂	CuSO ₄	A343	DF1012	SD200	Grind	Cond	Froth	
Zinc Circuit:									
Condition	2000	-	-	-	-	-	5	-	12.3
Condition	-	1000	-	-	-	-	5	-	-
Zn Rougher	-	-	40	2.5	-	-	3	-	12.1
	-	-	20	-	-	-	-	-	-
Zn Conc Re grind	750	100	-	-	100	30	-	-	-
H.I. Conditioning	-	-	25	5	-	-	15	-	-
Zn 1st Cleaner	-	-	10	-	-	-	-	3	11.6
	-	-	10	2.5	-	-	1	2	-
Zn 1st Cleaner Scav	-	-	10	-	-	-	1	-	-
Zn 2nd Cleaner	200	-	-	-	-	-	1	5	11.9
Zn 3rd Cleaner	200	-	-	-	-	-	1	4	11.9
Zn 4th Cleaner	200	-	-	-	-	-	1	3	12.0

Test No. 2

Product	Weight		Assays, %, g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl. Conc.	53.6	2.71	39.9	4.61	452	34.8	3.0	23.8
2. Pb 4th Cl. Tail	21.6	1.09	37.1	6.25	439	13.0	1.6	9.3
3. Pb 3rd Cl. Tail	27.9	1.41	28.8	6.68	339	13.1	2.3	9.3
4. Pb 2nd Cl. Tail	72.7	3.67	12.8	8.02	177	15.1	7.1	12.6
5. Pb 1st Cl.Sc Conc	21.3	1.08	10.8	12.3	221	3.7	3.2	4.6
6a. Pb 1st Cl Sc Tail (to Zn Ro)	169.3	8.55	3.67	8.52	87.4	10.1	17.5	14.5
6b. Pb 1st Cl Sc Tail (Sample)	15.3	0.77	3.67	8.52	87.4	0.9	1.6	1.3
7. Zn Cl Conc	116.2	5.87	1.4	52	94.1	2.6	73.2	10.7
8. Zn 4th Cl Tail	7.0	0.35	7.01	17.8	155	0.8	1.5	1.1
9. Zn 3rd Cl Tail	11.3	0.57	6.89	9.4	146	1.3	1.3	1.6
10. Zn 2nd Cl Tail	28.8	1.45	4.42	3.6	105	2.1	1.3	3.0
11. Zn 1st Cl Sc Conc	8.4	0.42	5.9	3.91	142	0.8	0.4	1.2
12. Zn 1st Cl Sc Tail	138.8	7.01	1.52	0.63	52.2	3.4	1.1	7.1
13. Zn Ro Tail	1457.2	73.59	0.35	0.15	10	8.3	2.6	14.3
Head Calc.	1980.1	100.00	3.10	4.17	51.4	100.0	100.0	100.0

Combined Products

Products 1+2 (Pb 3rd Cl Conc)	3.80	39.1	5.08	448	47.8	4.6	33.1
Products 1-3 (Pb 2nd Cl Conc)	5.21	36.3	5.51	419	60.9	6.9	42.4
Products 1-4 (Pb 1st Cl Conc)	8.88	26.6	6.55	319	76.0	13.9	55.1
Products 1-5 (Pb 1st Cl + Cl Scav Conc)	9.95	24.9	7.17	308	79.8	17.1	59.7
Products 1-6 (Pb Ro Conc)	19.28	14.6	7.82	201	90.8	36.2	75.5
Pb Ro Tail	80.72	0.35	3.30	15.6	9.2	63.8	24.5
Products 6a-6b (Pb 1st Cl Scav Tail)	9.32	3.67	8.52	87.4	11.0	19.0	15.9
Products 7-13 (Zn Ro Feed)	89.27	0.67	3.80	22.5	19.3	81.3	39.0
Products 7-8 (Zn 3rd Cl Conc)	6.22	1.72	50.1	97.5	3.4	74.7	11.8
Products 7-9 (Zn 2nd Cl Conc)	6.79	2.15	46.6	102	4.7	76.0	13.4
Products 7-10 (Zn 1st Cl Conc)	8.25	2.55	39.1	102	6.8	77.2	16.4
Products 7-10 (Zn 1st Cl+Cl Scav Concs)	8.67	2.72	37.3	104	7.6	77.6	17.6
Products 7-12 (Zn Ro Conc)	15.68	2.18	20.9	80.9	11.0	78.7	24.7
Products 12+13 (Zn Tails)	80.60	0.45	0.19	13.7	11.7	3.7	21.4
Products 6a +12 +13 (Comb Tails)	81.37	0.48	0.27	14.4	12.6	5.3	22.8

TEST NO. 3

Purpose: To repeat Test 1 on DY05-01 composite, but substitute soda ash for lime, increase collector in the grind and Pb regrind and decrease Pb regrinding time to improve recovery.

Procedure: As indicated below.

Feed: 2000 grams of minus 10 mesh DY05-01 composite.

Grind: 35 minutes at 65% solids in the lab ball mill.

Conditions:

Stage	Reagents Added, g/t				Time, minutes			pH
	Na ₂ CO ₃	SD200 NaCN	A317 3418A	MIBC	Grind	Cond	Froth	
Grind	1500	200	16	-	35	-	-	-
Pb Rougher	-	-	40	20	-	1	4	9.9
	-	-	5	6	-	1	1	-
Pb Conc Re grind	200	150	16	-	20	-	-	-
Pb 1st Cleaner	-	-	-	-	-	1	4	9.9
Pb 1st Cleaner Scav	-	-	-	4	-	1	1	-
Pb 2nd Cleaner	-	50	-	2	-	1	2	-
	-	-	-	2	-	1	1	-
Pb 3rd Cleaner	-	50	-	-	-	1	3	9.5
Pb 4th Cleaner	-	25	-	-	-	1	2	-
	-	-	-	2	-	1	1	-

Conditions: Combined Pb Ro Tail + Pb 1st Cl Scav Tail

Stage	Reagents, Added, g/t					Time, minutes			pH
	Ca(OH) ₂	CuSO ₄	A343	DF1012	SD200	Grind	Cond	Froth	
Zinc Circuit:									
Condition	2000	-	-	-	-	-	5	-	12.2
Condition	-	1000	-	-	-	-	5	-	12.0
Zn Rougher	-	-	40	2.5	-	-	3	5	-
	-	-	20	-	-	-	-	2	-
Zn Conc Re grind	750	100	-	-	100	30	-	-	-
H.I. Conditioning	-	-	50	5	-	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	4	11.6
	-	-	10	-	-	-	1	3	-
Zn 1st Cleaner Scav	-	-	10	-	-	-	1	1.5	-
Zn 2nd Cleaner	200	-	-	-	-	-	1	5	11.7
	-	-	5	2.5	-	-	1	2	-
Zn 3rd Cleaner	200	-	5	-	-	-	1	4	11.7
	-	-	-	-	-	-	1	2	-
Zn 4th Cleaner	200	-	7.5	-	-	-	1	4	11.8

Test No. 3

Product	Weight		Assays, %, g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl. Conc.	126.5	6.45	65.8	9.7	1179	74.6	4.8	69.4
2. Pb 4th Cl. Tail	11.9	0.61	33.7	19.3	515	3.6	0.9	2.9
3. Pb 3rd Cl. Tail	47.5	2.42	25.4	23.4	445	10.8	4.4	9.8
4. Pb 2nd Cl. Tail	35.8	1.82	6.69	23.9	130	2.1	3.4	2.2
5. Pb 1st Cl.Sc Conc	14.2	0.72	8.01	28.2	208	1.0	1.6	1.4
6a. Pb 1st Cl Sc Tail (to Zn Ro)	227.7	11.60	1	22.8	35.6	2.0	20.3	3.8
6b. Pb 1st Cl Sc Tail (Sample)	28.0	1.43	1	22.8	35.6	0.3	2.5	0.5
7. Zn Cl Conc	355.1	18.10	0.74	55.7	36.6	2.4	77.5	6.1
8. Zn 4th Cl Tail	10.4	0.53	1.65	17.5	61.1	0.2	0.7	0.3
9. Zn 3rd Cl Tail	21.3	1.09	1.56	14.2	57.5	0.3	1.2	0.6
10. Zn 2nd Cl Tail	23.9	1.22	1.42	7.09	40.3	0.3	0.7	0.4
11. Zn 1st Cl Sc Conc	7.9	0.40	1.63	7.66	55.8	0.1	0.2	0.2
12. Zn 1st Cl Sc Tail	118.4	6.03	0.65	1.25	18.8	0.7	0.6	1.0
13. Zn Ro Tail	1161.3	59.18	0.35	0.37	9.8	3.6	1.7	5.3
Head Calc.	1962.2	100.00	5.69	13.0	109	100.0	100.0	100.0

Combined Products

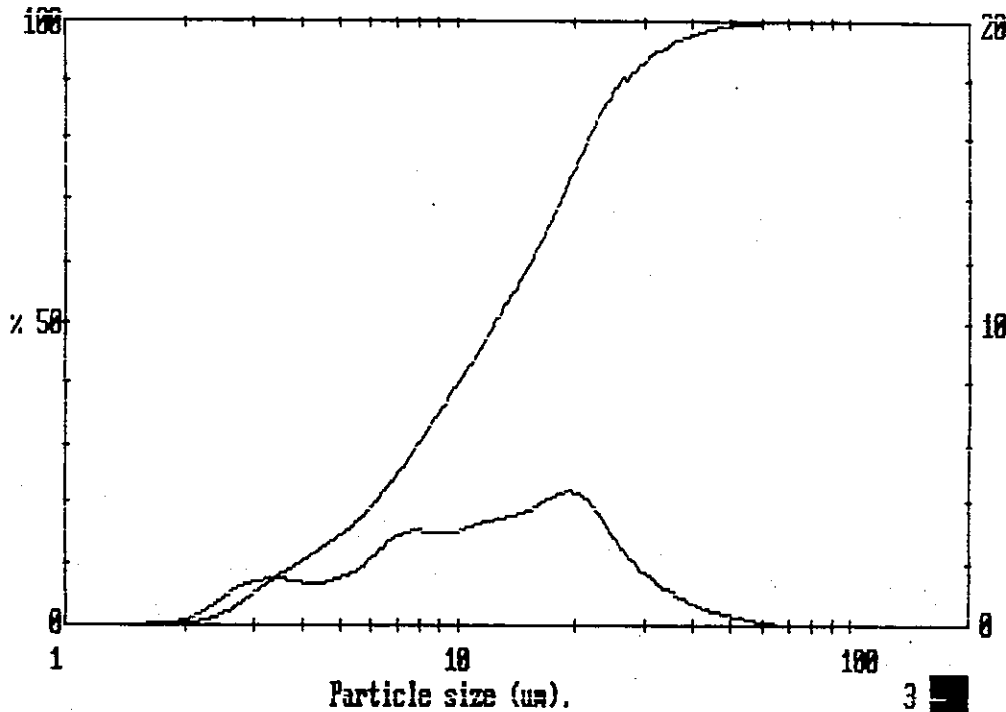
Products 1+2 (Pb 3rd Cl Conc)	7.05	63.0	10.5	1121	78.2	5.7	72.3
Products 1-3 (Pb 2nd Cl Conc)	9.47	53.4	13.8	949	89.0	10.1	82.1
Products 1-4 (Pb 1st Cl Conc)	11.30	45.9	15.4	816	91.2	13.4	84.3
Products 1-5 (Pb 1st Cl + Cl Scav Conc)	12.02	43.6	16.2	780	92.2	15.0	85.6
Products 1-6 (Pb Ro Conc)	25.05	21.4	19.6	393	94.5	37.8	89.9
Pb Ro Tail	74.95	0.42	10.8	14.8	5.5	62.2	10.1
Products 6a-6b (Pb 1st Cl Scav Tail)	13.03	1.00	22.8	35.6	2.3	22.8	4.2
Products 7-13 (Zn Ro Feed)	86.55	0.50	12.4	17.6	7.6	82.5	13.9
Products 7-8 (Zn 3rd Cl Conc)	18.63	0.77	54.6	37.3	2.5	78.2	6.3
Products 7-9 (Zn 2nd Cl Conc)	19.71	0.81	52.4	38.4	2.8	79.4	6.9
Products 7-10 (Zn 1st Cl Conc)	20.93	0.85	49.8	38.5	3.1	80.0	7.4
Products 7-10 (Zn 1st Cl+Cl Scav Concs)	21.33	0.86	49.0	38.8	3.2	80.3	7.6
Products 7-12 (Zn Ro Conc)	27.37	0.81	38.4	34.4	3.9	80.8	8.6
Products 12+13 (Zn Tails)	65.22	0.38	0.45	10.6	4.3	2.3	6.3
Products 6a +12 +13 (Comb Tails)	66.64	0.39	0.93	11.2	4.6	4.8	6.8

High Size	Under %	High Size	Under %	High Size	Under %	High Size	Under %	High Size	Under %	High Size	Under %	Span
118	100	53.3	99.6	24.0	85.7	10.8	43.3	4.84	14.2	2.18	0.7	D[4,3]
110	100	49.5	99.3	22.3	82.1	10.0	40.1	4.50	12.8	2.03	0.4	14.43µm
102	100	46.1	98.9	20.7	77.9	9.31	37.0	4.19	11.4	1.88	0.3	
95.2	100	42.8	98.4	19.3	73.6	8.66	34.0	3.89	10.1	1.75	0.2	D[3,2]
88.6	100	39.8	97.8	17.9	69.2	8.05	30.8	3.62	8.6	1.63	0.1	8.65µm
82.4	100	37.0	97.0	16.7	65.0	7.49	27.7	3.37	7.1	1.51	0.1	
76.6	100	34.4	96.0	15.5	61.1	6.97	24.6	3.13	5.7	1.41	0.1	D[V,0.9]
71.2	100	32.0	94.7	14.4	57.3	6.48	21.8	2.91	4.3	1.31	0.1	26.71µm
66.2	100	29.8	93.1	13.4	53.7	5.02	19.4	2.71	3.0	1.22	0.0	
61.6	99.9	27.7	91.2	12.5	50.1	5.60	17.4	2.52	2.0			D[V,0.1]
57.3	99.8	25.8	88.7	11.6	46.7	5.21	15.7	2.34	1.2			3.88µm

Source = :Sample Beam length = 2.2 mm Model indp
 Log. Diff. = 2.652
 Focal length = 63 mm Obscuration = 0.2460 Volume Conc. = 0.0370%
 Presentation = pil Volume distribution Sp. S.A 0.6936 #2/cc.

2699 pil 1#00429 **ALARMS SET D **
 Pb Rougher Conc #3a
 10 ml NaIPP,PS 520 ml/min 5min sonic 0000007953

MALVERN Series 2600 SB.08 Master Mode 28 Aug 1992 11:53 am



2699 pil 1#00429 **ALARMS SET D **
 Pb Rougher Conc #3a
 18 ml NaIPP,PS 520 ml/min 5min sonic 0000007953

MALVERN Series 2600 SB.08 Master Mode 28 Aug 1992 11:53 am

Particle diameters		Volume percentiles		Distribution Moments.			
D(4,3)	14.43 µm	D[V,10]	3.88	Distbn	Mean	Stan.Dev.	Skewness
D(4,2)	11.17 µm	D[V,20]	6.13				
D(4,1)	8.52 µm	D[V,30]	7.90				
D(4,0)	6.51 µm	D[V,40]	9.98				
		D[V,50]	12.43	Volume	14.43	9.70	1.32
D(3,2)	8.65 µm	D[V,60]	15.18	Surface	8.65	7.07	1.90
D(3,1)	6.54 µm	D[V,70]	18.15	Length	4.95	4.28	2.86
D(3,0)	4.99 µm	D[V,80]	21.46	Number	2.91	2.44	3.32
		D[V,90]	26.71				
D(2,1)	4.95 µm	D[V,99]	46.57				
D(2,0)	3.79 µm			Source = :Sample			
D(1,0)	2.91 µm	Span	1.84				
		Unif.	0.60				

2699 pil 1#00429 **ALARMS SET D **
 Pb Rougher Conc #3a
 10 ml NaIPP,PS 520 ml/min 5min sonic 0000007953

TEST NO. 4

Purpose: To repeat the conditions of Test 3 on DY07-01 composite.

Procedure: As indicated below.

Feed: 2000 grams of minus 10 mesh DY07-01 composite.

Grind: 35 minutes at 65% solids in the lab ball mill.

Conditions:

Stage	Reagents Added, g/t				Time, minutes			pH
	Na ₂ CO ₃	SD200 NaCN	A317 3418A	MIBC	Grind	Cond	Froth	
Grind	1500	200	16	-	35	-	-	-
Pb Rougher	-	-	40	20	-	1	5	9.9
	-	-	5	6	-	1	-	-
Pb Ro Conc Re grind	200	150	16	-	15	-	-	-
Pb 1st Cleaner	-	-	-	-	-	-	2.5	9.9
	-	-	5	4	-	1	1	-
Pb 1st Cleaner Scav	-	-	5	2	-	1	1	-
Pb 2nd Cleaner	-	50	-	2	-	1	2	-
	-	-	1	2	-	1	1	-
Pb 3rd Cleaner	-	50	-	2	-	1	3	-
Pb 4th Cleaner	-	50	-	2	-	1	2.5	-

Conditions: Combined Pb Ro Tail + Pb 1st Cl Scav Tail

Stage	Reagents, Added, g/t					Time, minutes			pH
	Ca(OH) ₂	CuSO ₄	A343	DF1012	SD200	Grind	Cond	Froth	
Zinc Circuit:									
Condition	1000	-	-	-	-	-	5	-	-
Condition	-	1000	-	-	-	-	5	-	11.0
Zn Rougher	-	-	40	25	-	-	3	5	-
	-	-	20	-	-	-	-	2	-
Zn Conc Re grind	750	100	-	-	100	20	-	-	-
H.I. Conditioning	-	-	25	5	-	-	15	-	-
Zn 1st Cleaner	-	-	-	6	-	-	-	3	11.5
	-	-	-	4	-	-	1	2	-
Zn 1st Cleaner Scav	-	-	5	4	-	-	1	1	-
Zn 2nd Cleaner	150	-	-	-	-	-	1	3	11.6
	-	-	-	4	-	-	1	1	-
Zn 3rd Cleaner	150	-	-	-	-	-	1	2	11.5
	-	-	-	4	-	-	1	1	-
Zn 4th Cleaner	100	-	-	2	-	-	1	2	-
	-	-	1	2	-	-	1	1	-

Test No. 4

Product	Weight		Assays, %, g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl. Conc.	78.6	3.97	63.2	5.89	768.5	83.1	5.8	64.9
2. Pb 4th Cl. Tail	14.3	0.72	14.3	12.7	378.4	3.4	2.3	5.8
3. Pb 3rd Cl. Tail	12.0	0.61	4	10.1	160.4	0.8	1.5	2.1
4. Pb 2nd Cl. Tail	45.0	2.27	1.14	6.44	39	0.9	3.6	1.9
5. Pb 1st Cl.Sc Conc	17.1	0.86	1.81	8.96	61.6	0.5	1.9	1.1
6a. Pb 1st Cl Sc Tail (to Zn Ro)	198.0	10.00	0.51	7.53	23.8	1.7	18.7	5.1
6b. Pb 1st Cl Sc Tail (Sample)	13.0	0.66	0.51	7.53	23.8	0.1	1.2	0.3
7. Zn Cl Conc	116.3	5.87	0.93	52.2	60.8	1.8	76.1	7.6
8. Zn 4th Cl Tail	5.7	0.29	1.14	9.12	40.1	0.1	0.7	0.2
9. Zn 3rd Cl Tail	15.6	0.79	0.79	5.43	33.4	0.2	1.1	0.6
10. Zn 2nd Cl Tail	53.9	2.72	0.51	1.76	23	0.5	1.2	1.3
11. Zn 1st Cl Sc Conc	43.0	2.17	0.6	1.38	31.1	0.4	0.7	1.4
12. Zn 1st Cl Sc Tail	244.2	12.33	0.27	0.2	9	1.1	0.6	2.4
13. Zn Ro Tail	1321.4	66.73	0.32	0.2	7.3	7.1	3.3	10.4
Head Calc.	1980.1	100.00	3.02	4.03	47.0	100.0	100.0	100.0

Combined Products

Products 1+2 (Pb 3rd Cl Conc)	4.69	55.7	6.94	708	86.5	8.1	70.7
Products 1-3 (Pb 2nd Cl Conc)	5.30	49.8	7.30	646	87.3	9.6	72.8
Products 1-4 (Pb 1st Cl Conc)	7.57	35.2	7.04	464	88.2	13.2	74.6
Products 1-5 (Pb 1st Cl + Cl Scav Conc)	8.43	31.8	7.24	422	88.7	15.1	75.8
Products 1-6 (Pb Ro Conc)	19.09	14.3	7.40	200	90.5	35.1	81.2
Pb Ro Tail	80.91	0.35	3.24	10.9	9.5	64.9	18.8
Products 6a-6b (Pb 1st Cl Scav Tail)	10.66	0.51	7.53	23.8	1.8	19.9	5.4
Products 7-13 (Zn Ro Feed)	90.91	0.37	3.71	12.4	11.2	83.6	23.9
Products 7-8 (Zn 3rd Cl Conc)	6.16	0.94	50.2	59.8	1.9	76.7	7.8
Products 7-9 (Zn 2nd Cl Conc)	6.95	0.92	45.1	56.8	2.1	77.8	8.4
Products 7-10 (Zn 1st Cl Conc)	9.67	0.81	32.9	47.3	2.6	79.0	9.7
Products 7-10 (Zn 1st Cl+Cl Scav Concs)	11.84	0.77	27.1	44.3	3.0	79.7	11.2
Products 7-12 (Zn Ro Conc)	24.18	0.51	13.4	26.3	4.1	80.3	13.5
Products 12+13 (Zn Tails)	79.07	0.31	0.20	7.57	8.2	3.9	12.7
Products 6a +12 +13 (Comb Tails)	79.72	0.31	0.26	7.70	8.3	5.1	13.1

TEST NO. 5

Purpose: To repeat Test 3, but use composite DY05-02.

Procedure: As indicated below.

Feed: 2000 grams of minus 10 mesh DY05-02 composite (DY05-01/65339, 85/15).

Grind: 35 minutes at 65% solids in the lab ball mill.

Conditions:

Stage	Reagents Added, g/t				Time, minutes			pH
	Na ₂ CO ₃	SD200 NaCN	A317 3418A	MIBC	Grind	Cond	Froth	
Grind	1500	200	16	-	35	-	-	-
Pb Rougher	-	-	40	20	-	-	5	8.9
	-	-	5	4	-	1	2	-
Pb Ro Conc Re grind	200	150	16	-	20	-	-	-
Pb 1st Cleaner	-	-	-	4	-	-	3.5	8.9
	-	-	2.5	2	-	1	1	-
Pb 1st Cleaner Scav	-	-	2.5	2	-	1	2	-
Pb 2nd Cleaner	-	50	-	2	-	1	5	-
Pb 3rd Cleaner	-	50	-	2	-	1	4	-
Pb 4th Cleaner	-	50	-	-	-	1	3	-

Conditions: Combined Pb Ro Tail + Pb 1st Cl Scav Tail

Stage	Reagents, Added, g/t					Time, minutes			pH
	Ca(OH) ₂	CuSO ₄	A343	DF1012	SD200	Grind	Cond	Froth	
Zinc Circuit:									
Condition	2000	-	-	-	-	-	5	-	11.0
Condition	-	1000	-	-	-	-	5	-	-
Zn Rougher	-	-	40	2.5	-	-	3	4	10.7
	-	-	10	-	-	-	1	2	-
Zn Conc Re grind	750	100	-	-	100	30	-	-	-
H.I. Conditioning	-	-	50	5	-	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	2	10.6
	-	-	10	-	-	-	1	2	-
	-	-	10	5	-	-	1	1	-
Zn 1st Cleaner Scav	-	-	10	2.5	-	-	1	1	-
Zn 2nd Cleaner	200	-	-	-	-	-	1	5	10.6
Zn 3rd Cleaner	200	-	-	-	-	-	1	4	10.7
Zn 4th Cleaner	150	-	-	-	-	-	1	4	10.9

Test No. 5

Product	Weight		Assays, %, g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl. Conc.	130.2	6.54	59.5	11.7	1040	79.2	6.9	72.8
2. Pb 4th Cl. Tail	25.0	1.25	26.1	20	454	6.7	2.3	6.1
3. Pb 3rd Cl. Tail	17.7	0.89	11	19.3	181	2.0	1.5	1.7
4. Pb 2nd Cl. Tail	58.3	2.93	5.25	21.4	103	3.1	5.7	3.2
5. Pb 1st Cl.Sc Conc	12.2	0.61	4.56	24.6	113	0.6	1.4	0.7
6a. Pb 1st Cl Sc Tail (to Zn Ro)	164.3	8.25	0.84	20.8	29.8	1.4	15.5	2.6
6b. Pb 1st Cl Sc Tail (Sample)	15.4	0.77	0.84	20.8	29.8	0.1	1.5	0.2
7. Zn Cl Conc	277.5	13.93	0.62	58.9	36.2	1.8	74.0	5.4
8. Zn 4th Cl Tail	8.0	0.40	1.65	25.9	59.3	0.1	0.9	0.3
9. Zn 3rd Cl Tail	14.7	0.74	1.63	20.7	54.6	0.2	1.4	0.4
10. Zn 2nd Cl Tail	24.6	1.23	1.53	10.7	48.6	0.4	1.2	0.6
11. Zn 1st Cl Sc Conc	11.4	0.57	2	10.7	45.4	0.2	0.6	0.3
12. Zn 1st Cl Sc Tail	121.5	6.10	0.78	1.4	23.8	1.0	0.8	1.6
13. Zn Ro Tail	1275.8	64.04	0.35	0.34	9.7	4.6	2.0	6.6
Head Calc.	1992.3	100.00	4.91	11.1	93.4	100.0	100.0	100.0

Combined Products

Products 1+2 (Pb 3rd Cl Conc)	7.79	54.1	13.0	946	85.9	9.2	78.9
Products 1-3 (Pb 2nd Cl Conc)	8.68	49.7	13.7	867	87.9	10.7	80.6
Products 1-4 (Pb 1st Cl Conc)	11.60	38.5	15.6	675	91.0	16.4	83.8
Products 1-5 (Pb 1st Cl + Cl Scav Conc)	12.22	36.8	16.1	646	91.6	17.7	84.5
Products 1-6 (Pb Ro Conc)	21.24	21.5	18.1	385	93.1	34.7	87.4
Pb Ro Tail	78.76	0.43	9.19	14.9	6.9	65.3	12.6
Products 6a-6b (Pb 1st Cl Scav Tail)	9.02	0.84	20.8	29.8	1.5	16.9	2.9
Products 7-13 (Zn Ro Feed)	87.01	0.47	10.3	16.3	8.3	80.8	15.2
Products 7-8 (Zn 3rd Cl Conc)	14.33	0.65	58.0	36.8	1.9	75.0	5.7
Products 7-9 (Zn 2nd Cl Conc)	15.07	0.70	56.2	37.7	2.1	76.3	6.1
Products 7-10 (Zn 1st Cl Conc)	16.30	0.76	52.7	38.5	2.5	77.5	6.7
Products 7-10 (Zn 1st Cl+Cl Scav Concs)	16.87	0.80	51.3	38.8	2.8	78.1	7.0
Products 7-12 (Zn Ro Conc)	22.97	0.80	38.0	34.8	3.7	78.9	8.6
Products 12+13 (Zn Tails)	70.14	0.39	0.43	10.9	5.5	2.7	8.2
Products 6a +12 +13 (Comb Tails)	70.91	0.39	0.65	11.1	5.7	4.2	8.4

TEST NO. 6

Purpose: To perform a pre-cycle test on DY05-01 Composite ore.

Procedure: As for Test No. 3.

Feed: 2000 grams of minus 10 mesh DY05-01 composite.

Grind: 35 minutes at 65% solids in the lab ball mill.

Conditions:

Stage	Reagents Added, g/t				Time, minutes			pH
	Na ₂ CO ₃	SD200 NaCN	A317 3418A	MIBC	Grind	Cond	Froth	
Grind	1500	200	16	-	35	-	-	-
Pb Rougher	-	-	40	20	-	1	4	10.1
	-	-	5	6	-	1	1	-
Pb Conc Re grind	200	150	16	-	20	-	-	9.9
Pb 1st Cleaner	-	-	-	-	-	1	3.5	-
Pb 1st Cleaner Scav	-	-	-	4	-	1	1	-
Pb 2nd Cleaner	-	50	-	2	-	1	2	9.4
	-	-	-	2	-	1	1	-
Pb 3rd Cleaner	-	50	-	2	-	1	3	9.4
Pb 4th Cleaner	-	25	-	-	-	1	2	9.4
	-	-	-	2	-	1	1	-

Conditions: Combined Pb Ro Tail + Pb 1st Cl Scav Tail

Stage	Reagents, Added, g/t					Time, minutes			pH
	Ca(OH) ₂	CuSO ₄	A343	DF1012	SD200	Grind	Cond	Froth	
Zinc Circuit:									
Condition	2000	-	-	-	-	-	5	-	12.1
Condition	-	1000	-	-	-	-	5	-	12.0
Zn Rougher	-	-	40	2.5	-	-	3	5	-
	-	-	20	2.5	-	-	1	2	-
	-	-	10	2.5	-	-	1	2	-
Zn Conc Re grind	750	100	-	-	100	30	-	-	-
H.I. Conditioning	-	-	60	10	-	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	4	11.6
	-	-	10	2.5	-	-	1	3	-
Zn 1st Cleaner Scav	-	-	10	-	-	-	1	2	-
Zn 2nd Cleaner	200	-	-	2.5	-	-	1	5	11.7
	-	-	5	-	-	-	1	2	-
Zn 3rd Cleaner	200	-	5	-	-	-	1	4	11.7
	-	-	-	-	-	-	1	2	-
Zn 4th Cleaner	200	-	7.5	-	-	-	1	4	-

Test No. 6

Product	Weight		Assays, %, g/t			% Distribution		
	g	%	Pb	Zn	Ag	Pb	Zn	Ag
1. Pb Cl. Conc.	164.5	8.29	59.4	13.4	1054	85.6	8.1	80.1
2. Pb 4th Cl. Tail	7.0	0.35	21	20.3	303	1.3	0.5	1.0
3. Pb 3rd Cl. Tail	19.4	0.98	16	23	83.7	2.7	1.6	0.8
4. Pb 2nd Cl. Tail	35.8	1.80	6.33	25	120	2.0	3.3	2.0
5. Pb 1st Cl.Sc Conc	22.4	1.13	5.64	28.7	165	1.1	2.4	1.7
6. Zn Cl Conc	358.8	18.08	0.64	59.6	33.3	2.0	78.7	5.5
7. Zn 4th Cl Tail	15.7	0.79	1.51	29.3	59.6	0.2	1.7	0.4
8. Zn 3rd Cl Tail	16.0	0.81	1.62	16.8	57.2	0.2	1.0	0.4
9. Zn 2nd Cl Tail	17.9	0.90	1.67	8.12	54.9	0.3	0.5	0.5
10. Zn 1st Cl Sc Conc	18.6	0.94	1.71	5.87	52.7	0.3	0.4	0.5
11. Zn 1st Cl Sc Tail	136.9	6.90	0.75	1.12	25.8	0.9	0.6	1.6
12. Zn Ro Tail	1171.7	59.04	0.33	0.28	10.2	3.4	1.2	5.5
Head Calc.	1984.7	100.00	5.75	13.7	109	100.0	100.0	100.0

Combined Products

Products 1+2 (Pb 3rd Cl Conc)	8.64	57.8	13.7	1023	86.9	8.6	81.1
Products 1-3 (Pb 2nd Cl Conc)	9.62	53.6	14.6	928	89.6	10.3	81.9
Products 1-4 (Pb 1st Cl Conc)	11.42	46.1	16.3	800	91.6	13.6	83.9
Products 1-5 (Pb 1st Cl+Cl Scav Concs)	12.55	42.5	17.4	743	92.7	15.9	85.6
Products 6-12 (Zn Ro Feed)	87.45	0.48	13.2	18.0	7.3	84.1	14.4
Products 6-7 (Zn 3rd Cl Conc)	18.87	0.68	58.3	34.4	2.2	80.4	6.0
Products 6-8 (Zn 2nd Cl Conc)	19.68	0.72	56.6	35.3	2.4	81.4	6.4
Products 6-9 (Zn 1st Cl Conc)	20.58	0.76	54.5	36.2	2.7	81.9	6.8
Products 6-10 (Zn 1st Cl+Cl Scav Concs)	21.51	0.80	52.4	36.9	3.0	82.3	7.3
Products 6-11 (Zn Ro Conc)	28.41	0.79	39.9	34.2	3.9	82.9	8.9
Products 11+12 (Zn Tails)	65.93	0.37	0.37	11.8	4.3	1.8	7.2

TEST NO. 7

Purpose: To perform a locked cycle test on Composite DY05-02 using the conditions of Test 5.

Procedure: As indicated below.

Feed: 6 x 2000 grams of minus 10 mesh DY05-02 (DY05-01/65339, 85:15 ratio).

Grind: 35 minutes at 65% solids in the lab ball mill.

Conditions:

Stage	Reagents Added, g/t				Time, minutes			pH
	Na ₂ CO ₃	SD200 NaCN	A317 3418A	MIBC	Grind	Cond	Froth	
Grind	1500	200	16	-	35	-	-	-
Pb Rougher	-	-	40	20	-	1	4	9.5
	-	-	5	4	-	1	1	-
Pb Ro Conc Re grind	200	150	16	-	20	-	-	-
Pb 1st Cleaner	-	-	-	-	-	-	3	9.5
	-	-	2.5	4	-	1	1	-
Pb 1st Cleaner Scav	-	-	2.5	2	-	1	1.5	-
Pb 2nd Cleaner	-	50	-	2	-	1	2	-
	-	-	-	2	-	1	1	-
Pb 3rd Cleaner	-	50	-	2	-	1	2	9.3
Pb 4th Cleaner	-	50	-	-	-	1	2	9.2
	-	-	-	2	-	1	1	-

Conditions: Combined Pb Ro Tail + Pb 1st CI Scav Tail

Stage	Reagents, Added, g/t					Time, minutes			pH
	Ca(OH) ₂	CuSO ₄	A343	DF1012	SD200	Grind	Cond	Froth	
Zinc Circuit:									
Condition	2000	-	-	-	-	-	5	-	11.0
Condition	-	1000	-	-	-	-	5	-	-
Zn Rougher	-	-	60	2.5	-	-	3	4	10.7
	-	-	20	2.5	-	-	1	2	-
	-	-	10	2.5	-	-	1	2	-
Zn Conc Re grind	750	100	-	-	100	30	-	-	-
H.I. Conditioning	-	-	60	5	-	-	15	-	-
Zn 1st Cleaner	-	-	-	-	-	-	-	4	10.6
	-	-	10	2.5	-	-	1	2	-
	-	-	10	2.5	-	-	1	2	-
Zn 1st Cleaner Scav	-	-	10	2.5	-	-	1	2	-
Zn 2nd Cleaner	200	-	-	-	-	-	1	4	10.7
	-	-	5	2.5	-	-	1	2	-
Zn 3rd Cleaner	200	-	-	-	-	-	1	4	10.7
	-	-	5	2.5	-	-	1	2	-
Zn 4th Cleaner	200	-	-	-	-	-	1	4	10.7

Test No. 7

Product	Weight		Assays,%g/t				% Distribution			
	g	%	Pb	Zn	Ag	Au	Pb	Zn	Ag	Au
1 Pb Cl Conc A	126.4	1.06	61.2	11.4	1079	-	13.2	1.1	12.2	-
2 Pb Cl Conc B	126.5	1.06	60.8	10.7	1097	-	13.1	1.0	12.4	-
3 Pb Cl Conc C	114.0	0.95	62.4	10.3	1155	-	12.2	0.9	11.8	-
4 Pb Cl Conc D	131.0	1.10	60.3	10.7	1091	-	13.5	1.1	12.8	-
5 Pb Cl Conc E	137.5	1.15	60.6	10.6	1088	-	14.2	1.1	13.4	-
6 Pb Cl Conc F	136.9	1.14	59.5	11.2	1066	-	13.9	1.1	13.0	-
7 Pb 4th Cl Tail F	39.7	0.33	35.3	16.6	551	-	2.4	0.5	2.0	-
8 Pb 3rd Cl Tail F	45.3	0.38	26.6	18.9	386	-	2.1	0.6	1.6	-
9 Pb 2nd Cl Tail F	84.4	0.71	16.1	21.9	219	-	2.3	1.4	1.7	-
10 Pb 1st Cl Scav Conc F	45.4	0.38	12.4	23.7	204	-	1.0	0.8	0.8	-
11 Zn Cl Conc A	288.6	2.41	0.66	58.9	32.2	-	0.3	12.7	0.8	-
12 Zn Cl Conc B	327.0	2.73	0.91	56.7	37.1	-	0.5	13.9	1.1	-
13 Zn Cl Conc C	328.1	2.74	1.04	58.5	42.3	-	0.6	14.4	1.2	-
14 Zn Cl Conc D	332.6	2.78	1.02	57.7	41.8	-	0.6	14.4	1.2	-
15 Zn Cl Conc E	337.0	2.82	1.02	57.3	42.7	-	0.6	14.5	1.3	-
16 Zn Cl Conc F	343.2	2.87	1.2	57.1	44.4	-	0.7	14.7	1.4	-
17 Zn 4th Cl Tail F	100.6	0.84	2.13	35.8	60.8	-	0.4	2.7	0.5	-
18 Zn 3rd Cl Tail F	48.4	0.40	3.42	13.6	77.1	-	0.3	0.5	0.3	-
19 Zn 2nd Cl Tail F	67.3	0.56	3.66	8.05	78.5	-	0.4	0.4	0.5	-
20 Zn 1st Cl Scav Conc F	26.6	0.22	4.01	4.56	80.3	-	0.2	0.1	0.2	-
21 Zn 1st Cl Scav Tail A	109.3	0.91	0.73	1.02	21.1	-	0.1	0.1	0.2	-
22 Zn 1st Cl Scav Tail B	140.7	1.18	1.07	1.07	27.9	-	0.3	0.1	0.4	-
23 Zn 1st Cl Scav Tail C	161.3	1.35	1.74	1.15	39.2	-	0.5	0.1	0.6	-
24 Zn 1st Cl Scav Tail D	171.3	1.43	2.07	1.39	44.1	-	0.6	0.2	0.7	-
25 Zn 1st Cl Scav Tail E	146.2	1.22	1.69	1.17	38.7	-	0.4	0.1	0.5	-
26 Zn 1st Cl Scav Tail F	159.6	1.33	2.4	1.22	48.4	-	0.7	0.1	0.7	-
27 Zn Rougher Tail A	1274.5	10.66	0.32	0.2	8.9	-	0.7	0.2	1.0	-
28 Zn Rougher Tail B	1320.0	11.04	0.36	0.23	9.5	-	0.8	0.2	1.1	-
29 Zn Rougher Tail C	1324.7	11.08	0.4	0.24	10.4	-	0.9	0.2	1.2	-
30 Zn Rougher Tail D	1307.5	10.93	0.38	0.24	10.2	-	0.8	0.2	1.2	-
31 Zn Rougher Tail E	1321.6	11.05	0.37	0.23	9.5	-	0.8	0.2	1.1	-
32 Zn Rougher Tail F	1335.0	11.16	0.4	0.24	10.7	-	0.9	0.2	1.3	-
Head (calc)	11958.2	100.00	4.89	11.2	93.6	-	100.0	100.0	100.0	-

Combined Products

Comb Pb Conc 1 to 6	6.46	60.8	10.8	1095	-	80.2	6.3	75.5	-
Comb Pb Cl Tails 7 to 10	1.80	21.1	20.7	312	-	7.7	3.3	6.0	-
Comb Zn Cl Conc 11 to 16	16.36	0.98	57.7	40.3	-	3.3	84.6	7.0	-
Comb Zn Cl Tails 17 to 20	2.03	3.02	20.3	71.1	-	1.3	3.7	1.5	-
Comb Zn Cl Scav Tails 21 to 26	7.43	1.68	1.18	37.7	-	2.6	0.8	3.0	-
Comb Zn Rougher Tails 27 to 32	65.92	0.37	0.23	9.87	-	5.0	1.4	7.0	-

Projected Results Cycles E, F

Pb Cleaner Conc	7.12	60.1	10.9	1077	-	87.4	7.0	81.1	-
Zn Cleaner Conc	17.71	1.11	57.2	43.6	-	4.0	90.8	8.1	-
Overall Tail	75.17	0.56	0.33	13.6	-	8.6	2.3	10.8	-
Head(calc)	100.00	4.89	11.2	94.7	-	100.0	100.0	100.0	-

Product: Test No. 7 Pb Cl Conc E+F

S.G.- 6.00

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
21.9 μ	0.44	0.9	0.9	99.1
17.0	1.75	3.5	4.4	95.6
11.9	8.94	17.9	22.3	77.7
8.3	12.67	25.3	47.6	52.4
6.3	4.88	9.8	57.4	42.6
-6.3	21.32	42.6	100.0	-
Total	50.00	100.0	-	-

K80

12 μ m

Product: Test No. 7 Zn Cl Conc E+F

S.G.- 4.12

Mesh	Weight Grams	% Weight		
		Ind.	Cum.	Passing
27.6 μ	3.48	7.0	7.0	93.0
21.4	3.86	7.7	14.7	85.3
14.9	7.78	15.6	30.2	69.8
10.3	9.14	18.3	48.5	51.5
7.9	3.76	7.5	56.0	44.0
-7.9	21.98	44.0	100.0	-
Total	50.00	100.0	-	-

K80

19 μ m