

007216

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Vangorda Ore Processing Guidelines

This memo serves to summarise results since November 1990.

1.0 Vangorda Cap Material (Sometimes called Vangorda Refractory)

- 1.1 Screen at 0.75 inch (As screen is at an angle use a 1.0 inch aperture). Reject the undersize 50% by weight.
- 1.2 Oversize to be blended before milling. Maximum 25% Vangorda and 75% Faro.
- 1.3 Feed to milling plant must also contain max. 0.20% Copper. (Copper acts as the activator for zinc in the lead circuit.)
- 1.4 If unscreened, blend 5% Vangorda max., 95% Faro. (10% has been shown to be no good). Again the guideline is also that below 0.20% copper can be sent to mill. Above 0.20% copper will give a bulk concentrate.

Note A: It is likely that any unscreened material at even 5% blend is actually activating zinc in the Pb circuit. The results may look good, but the Vangorda refractory is known to activate zinc in Pb flotation.

B: Cyanide consumption is higher with Vangorda.

2.0 Vangorda G Material

- 2.1 This can run to 100% provided.
 - a. Feed to milling plant contains max. 0.20% copper.
 - b. Vangorda screened refractory can be blended with Vangorda G at a maximum 25% refractory and below 0.20% copper.

Reference: Attached are selected results from several months of testwork chosen to summarize the above conclusions.

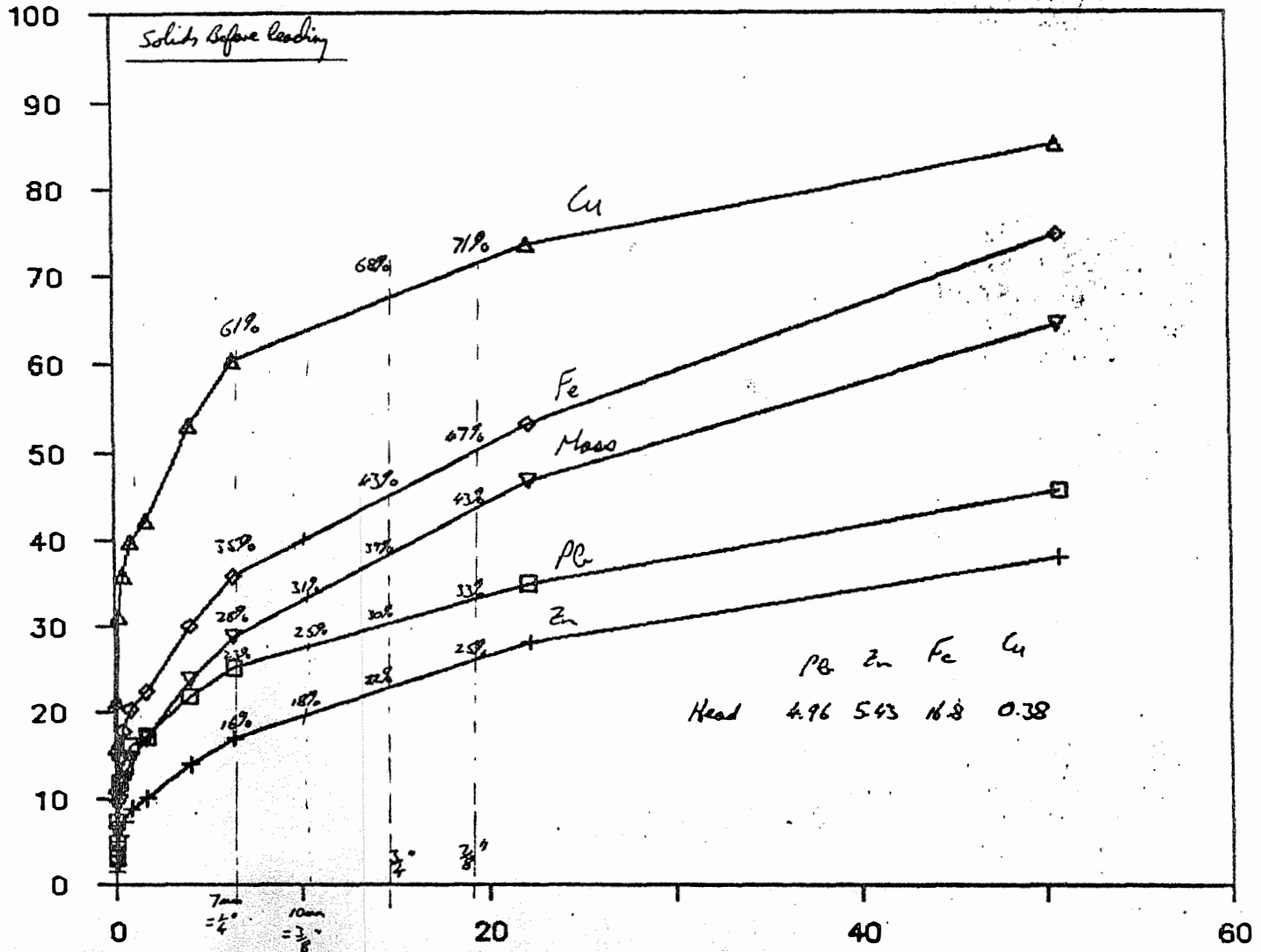
1. Leach by size analysis, these results indicated screening was a possible route.
2. Various blends of Vangorda (screened) refractory.
3. Various blends of Vangorda G.
4. Graph summarising blend, grade and recovery optimum 25% Vangorda plus 0.75 inch screened.

REFRACTORY

VANGORDA LEACH RUBBLE FEED MATERIAL

CUMMULATIVE METAL DISTRIBUTION

CUMMULATIVE % UNDERSIZE DISTRIBUTION



□ LEAD

+ ZINC

◇ IRON

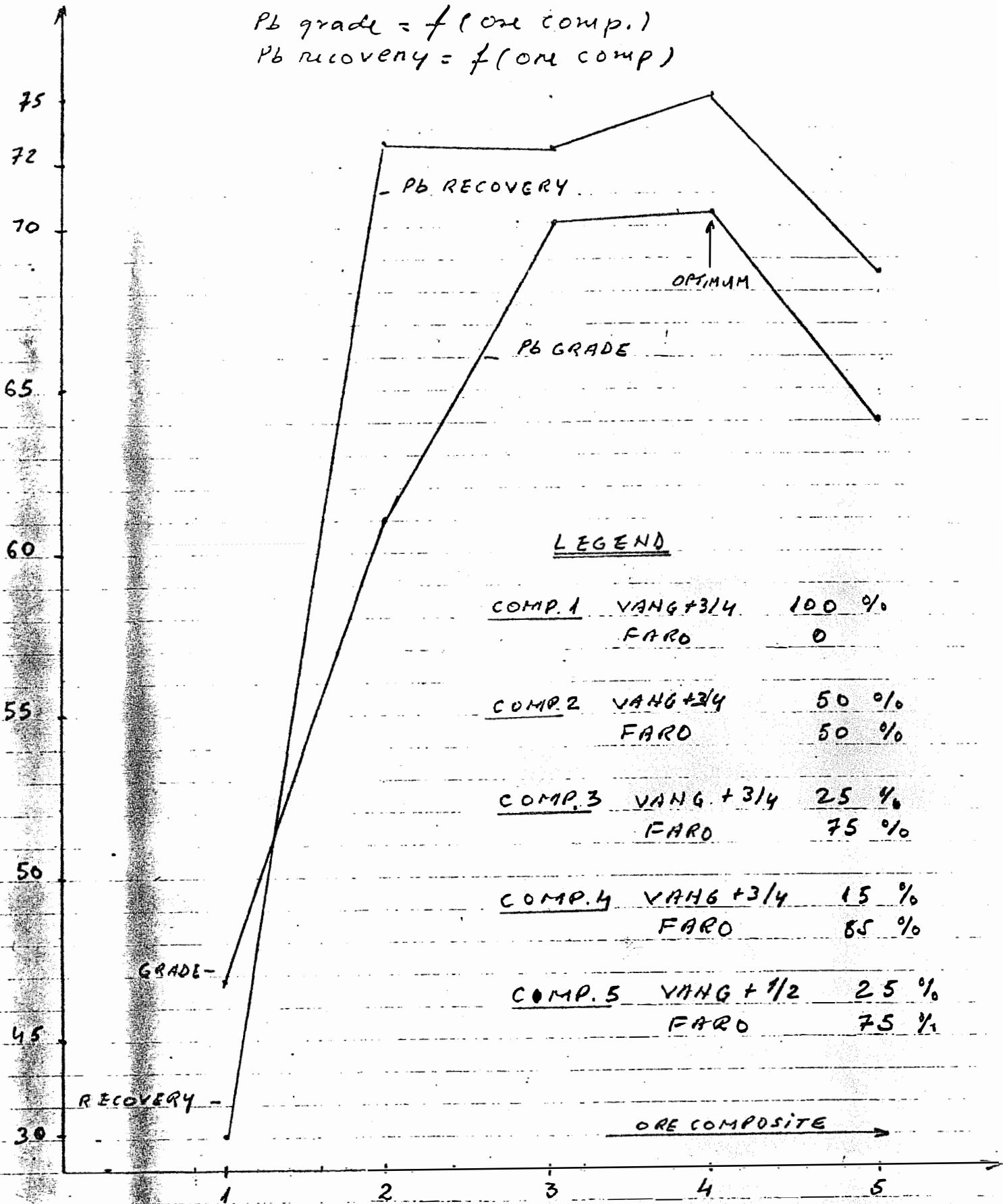
△ COPPER

▽ MASS

SIZE (mm)

Pb GRADE & RECOVERY VS. ORE COMPOSITE

Pb grade = f(ore comp.)
 Pb recovery = f(ore comp.)



LEGEND

<u>COMP. 1</u>	VANG + 3/4	100 %
	FARO	0
<u>COMP. 2</u>	VANG + 2/4	50 %
	FARO	50 %
<u>COMP. 3</u>	VANG + 3/4	25 %
	FARO	75 %
<u>COMP. 4</u>	VANG + 3/4	15 %
	FARO	85 %
<u>COMP. 5</u>	VANG + 1/2	25 %
	FARO	75 %

1. Good Pb grade and recovery.
2. Copper grade in flotation feed is 0.19%.
3. Good zinc rougher concentrate of 46%.
4. High Cu grade in Pb conc. (Needs more nuch in Pb cleaner flotation for copper depression.)

TEST D56

TO DO A STANDARD FLOTATION TEST WITH
50% PARO ORE AND 50% VANGORDA #3/4 STOCKPILE NOV. 10, 1990

P R O D U C T	W E I G H T		A S S A Y S				% D I S T R I B U T I O N				M E T A L U N I T S			
	g	%	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu
Pb Cl Conc	77.99	3.90	63.50	7.64	5.98	0.96	92.40	6.24	0.94	19.72	247.65	29.30	23.32	3.74
Pb 2nd Cl Sc Con	5.96	0.29	15.10	23.90	18.90	4.71	1.46	1.44	0.22	7.22	4.39	6.90	5.48	1.37
Pb 2nd Cl Tls	11.40	0.57	3.48	17.90	28.30	3.99	0.66	2.14	0.65	11.97	1.99	10.20	16.13	2.27
Pb 1st Cl Tls	72.21	3.61	1.25	18.30	29.10	0.94	1.50	13.83	4.25	17.87	4.51	65.06	105.05	3.39
Zn Rgh Conc	125.63	6.23	0.87	46.00	12.90	0.25	1.92	60.47	3.28	8.28	5.46	298.98	81.01	1.57
Zn Scav Conc	63.09	3.15	1.43	14.70	27.80	0.28	1.50	9.69	3.54	4.64	4.50	46.31	87.57	0.93
Final Tails	1643.83	92.19	0.39	0.36	26.20	0.07	10.66	6.19	87.11	30.31	32.05	29.59	2153.39	5.75
Calc Head Feed	2000.00	99.99	3.01	4.73	24.72	0.19	100.00	100.00	99.99	100.01	300.53	477.74	2471.94	18.97

1. Bulk flotation 46.99% Pb and 21.21% Zn
2. Copper in feed was 0.27%
3. Low Pb recovery

TEST D200 FLOTATION TEST ON VANGORDA SCREEN FEED #3/4(JULY 5, 1991)														
P R O D U C T	W E I G H T		A S S A Y S				% D I S T R I B U T I O N				M E T A L U N I T S			
	g	%	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu
Pb Conc.	41.09	2.05	46.90	21.20	5.14	1.59	29.98	9.74	0.46	12.17	96.15	43.46	10.54	3.24
Pb 2nd Cln Tls	46.42	2.32	29.90	30.20	8.47	2.18	20.91	15.70	0.36	19.01	67.05	70.06	19.65	5.06
Pb 1st Cln Tls	213.32	10.67	9.79	25.20	19.90	1.00	29.24	60.27	9.31	40.08	93.79	268.88	212.33	10.67
Pb Scav Tls	1699.18	84.96	0.75	0.75	24.00	0.09	19.87	14.28	89.37	28.74	63.72	63.72	2039.04	7.65
Calc Head Feed	2000.00	100.00	3.21	4.46	22.92	0.27	100.00	99.99	100.00	100.00	320.71	446.12	2281.56	26.62

1. Blends of 15% and 25% Vangorda
2. Top test shows good flotation 70.40% Pb concentrate and 75.21% recovery
3. Bottom test also good flotation 70.20% Pb concentrate and 72.46% recovery
4. Copper in both cases below 0.20%

TEST D201 PLOTATION TEST ON 35% PARO (JUNE 27, 1991) AND 15% VANGORDA +3/4 SCREEN FEED (JULY 5, 1991)														
P R O D U C T	W E I G H T		A S S A Y S				% D I S T R I B U T I O N				M E T A L U N I T S			
	g	%	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu
Pb Conc.	62.62	3.13	70.40	3.37	4.42	1.05	75.21	2.64	0.54	18.92	220.35	12.11	13.33	3.29
Pb 2nd Cln Tls	9.72	0.44	16.80	14.40	22.50	5.09	2.52	1.39	0.39	12.99	7.39	6.34	3.90	2.24
Pb 1st Cln Tls	98.38	4.92	2.67	12.80	30.90	1.16	4.48	13.75	5.98	32.83	13.14	62.98	152.03	5.71
Zn Rgh Conc	136.06	6.90	1.00	45.50	13.10	0.21	2.32	67.55	3.51	8.22	6.86	399.40	99.08	1.43
Zn Scav Conc	74.25	3.71	1.95	12.00	30.70	0.18	2.47	9.72	4.48	3.95	7.23	44.52	113.90	9.67
Final Tails	1619.97	81.00	0.47	0.28	26.70	0.05	12.99	4.95	35.16	23.29	38.67	22.68	2162.70	4.05
Calc Head Feed	2000.00	100.00	2.93	4.58	25.41	0.17	99.99	99.99	100.00	99.99	292.98	458.03	2541.44	17.39

TEST D202 PLOTATION TEST ON 75% PARO (JUNE 27, 1991) AND 25% VANGORDA SCREEN FEED +3/4 (JULY, 5 1991)														
P R O D U C T	W E I G H T		A S S A Y S				% D I S T R I B U T I O N				M E T A L U N I T S			
	g	%	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu
Pb Conc.	61.65	3.08	70.20	4.66	3.65	1.22	72.46	3.14	0.45	21.52	216.22	14.35	11.24	3.76
Pb 2nd Cln Tls	9.03	0.45	20.90	18.20	17.60	4.94	3.15	1.79	0.32	12.71	9.41	8.19	7.92	2.22
Pb 1st Cln Tls	92.03	4.60	2.68	24.60	24.30	1.13	4.13	24.75	4.52	29.77	12.33	113.16	111.78	5.20
Zn Rgh Conc	113.63	5.68	1.44	44.20	13.60	0.24	2.74	54.92	3.12	7.78	8.18	251.06	77.25	1.36
Zn Scav Conc	83.49	4.17	2.11	10.00	34.00	0.20	2.95	9.12	5.73	4.75	8.80	41.70	141.78	9.93
Final Tails	1640.17	82.01	0.53	0.35	25.90	0.05	14.57	6.28	85.85	23.47	43.47	28.70	2124.06	4.16
Calc Head Feed	2000.00	99.99	2.98	4.57	24.74	0.17	100.00	100.00	99.99	100.00	298.41	457.16	2474.03	17.47

1. Blend is 50% Vangorda refractory screened.
2. Copper is 0.31%.
3. Zinc at 9.54% is unacceptable.
4. Good depressant in laboratory cleaner flotation, but lots of zinc from rougher flotation.

TEST D203 P R O D U C T	FLOTATION TEST ON 50% PARO (JUNE 27, 1991) AND 50% VANGORDA SCREEN +3/4 (JULY 5, 1991)		A S S A Y S				% D I S T R I B U T I O N				M E T A L U N I T S			
	W E I G H T		Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu
	g	%												
Pb Conc.	74.14	3.71	61.20	8.54	6.30	2.40	72.77	7.04	0.95	43.41	227.85	31.68	23.37	8.90
Pb 2nd Cln Tls	22.29	1.11	15.40	27.50	16.40	3.26	5.48	6.78	0.74	17.66	17.09	30.53	18.20	3.62
Pb 1st Cln Tls	193.27	9.16	1.87	26.90	23.90	0.30	5.49	54.72	3.86	13.41	17.13	246.40	218.92	2.75
Zn Rgh Conc	93.23	4.66	1.80	22.20	25.60	0.19	2.69	22.98	4.83	4.34	8.39	103.45	119.30	0.39
Zn Scav Conc	109.50	5.42	1.09	2.54	41.10	0.10	1.90	3.09	9.11	2.63	5.92	13.92	225.23	0.55
Final Tails	1517.57	75.88	0.49	0.32	24.60	0.05	11.67	5.39	75.52	13.49	36.42	24.20	1866.65	3.79
Calc Head Feed	2090.00	100.00	3.12	4.50	24.71	0.21	100.00	100.00	100.01	99.99	312.00	450.25	2471.67	20.50

1. Blend is 25% VanGorder.
 2. Copper in feed is 0.20%.
 3. Zinc in final concentrate is still high.

TEST 0204 FLOTATION FEED ON 75% FARGO (JUNE 27, 1991) AND 25% VANGORDER #1/2 SCREEN FEED (JULY 5, 1991)

PRODUCT WEIGHT ASSAYS % Pb Zn Cu Fe Pb Zn Cu Fe
 R B T A L U N I T S

PRODUCT	Wt %	Pb	Zn	Cu	Fe	Pb	Zn	Cu	Fe
Pb Conc.	59.89	2.99	63.60	7.38	5.79	2.43	68.81	4.96	0.63
Pb 2nd Cln Tls	15.32	0.77	15.70	26.70	16.20	4.07	4.63	4.63	0.51
Pb 1st Cln Tls	122.86	6.14	2.29	27.60	23.88	0.44	6.07	38.12	5.94
Zn Rsh Conc	106.72	5.24	1.92	33.30	21.40	0.26	3.69	40.00	4.64
Zn Scav Conc	72.56	3.63	1.32	6.33	39.60	0.15	1.73	5.17	3.84
Final Tails	1622.65	81.12	0.66	0.30	25.00	0.06	16.37	7.12	32.42
Calc Head Feed	2000.00	100.00	2.78	4.45	24.61	0.20	108.00	100.00	100.00

19.90 2431.00 444.53 277.55 45.43 24.47 45.43 31.64 2028.25 4.87

1. Top test shows copper at 0.21% and high zinc in final concentrate. Blend is 25% Vangorda.
2. Second test shows 5% Vangorda blend. Good flotation.
3. 100% Vangorda and 0.34% copper. Bulk flotation.

TEST D210 FLOTATION TEST ON 75% PARC (JUNE 27, 91) AND 25% VANGORDA COMBINED SCREEN FEED STOCKPILE #1 (JULY 5, 91)

P R O D U C T	W E I G H T		A S S A Y S				% D I S T R I B U T I O N				M E T A L U N I T S			
	g	%	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu
Pb Conc	53.69	2.68	55.70	15.70	5.16	2.45	49.91	9.58	0.58	31.89	149.29	42.08	13.33	6.57
Pb 2nd Cl Tls	71.30	3.56	17.30	37.80	9.72	2.15	20.59	30.97	1.44	37.14	61.59	134.57	34.60	7.65
Pb 1st Cl Tls	159.33	7.96	3.00	25.50	24.40	0.37	7.98	46.71	3.11	14.32	23.88	202.98	194.22	2.95
Pb Scav Tls	1715.98	85.79	0.75	0.64	25.10	0.04	21.51	12.64	89.87	16.65	64.34	54.91	2153.33	3.43
Calc Head Feed	2000.00	100.00	2.99	4.35	23.96	0.21	99.99	100.00	100.00	100.00	299.09	434.54	2395.98	20.60

TEST D211 FLOTATION TEST ON 95% PARC (JUNE 27, 91) AND 5% VANGORDA COMBINED SCREEN FEED STOCKPILE #1 (JULY 5, 91)

P R O D U C T	W E I G H T		A S S A Y S				% D I S T R I B U T I O N				M E T A L U N I T S			
	g	%	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu
Pb Cleaner Conc.	56.33	2.82	73.70	3.38	3.31	0.38	72.57	2.09	0.37	6.17	207.93	9.53	9.33	1.07
Pb 2nd Cln Tls	10.13	0.51	21.70	14.10	20.59	4.34	3.87	1.59	0.41	12.75	11.07	7.19	10.46	2.21
Pb 1st Cln Tls	90.87	4.54	2.99	12.80	31.60	2.10	4.74	12.74	5.68	54.99	13.57	58.11	143.46	9.53
Zn Rgh Conc	153.32	7.67	1.15	43.10	14.50	0.19	3.08	72.47	4.40	3.42	8.92	330.58	111.22	1.46
Zn Scav Conc	130.76	6.54	1.65	5.38	31.10	0.11	3.77	7.71	8.05	4.15	10.79	35.19	203.39	0.72
Final Tails	1558.59	77.93	0.44	0.20	28.30	0.03	11.97	3.42	81.09	13.50	34.29	15.59	2049.56	2.34
Calc Head Feed	2000.00	100.01	2.96	4.56	25.27	0.17	100.00	100.01	100.00	99.98	296.37	456.19	2527.42	17.33

TEST D212 FLOTATION TEST ON 100% VANGORDA COMBINED SCREEN FEED STOCKPILE #1 (JULY 5, 91)

P R O D U C T	W E I G H T		A S S A Y S				% D I S T R I B U T I O N				M E T A L U N I T S			
	g	%	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu	Pb	Zn	Fe	Cu
Pb Rgh Conc	156.17	7.81	26.50	23.10	12.20	2.74	59.38	50.73	4.22	63.84	206.97	180.41	95.28	21.40
Zn Ro/Scav Conc	139.58	6.98	3.93	20.10	21.70	0.76	7.87	39.45	6.71	15.81	27.43	140.30	151.47	5.30
Final Tls	1704.25	85.21	1.34	0.41	23.60	0.08	32.76	9.82	89.07	20.35	114.18	34.94	2010.96	6.82
Calc Head Feed	2000.00	100.00	3.49	3.56	22.58	0.34	100.01	100.00	100.00	100.00	348.58	355.65	2257.71	33.52