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LABORATORY SUPPORT FOR SPODUMENE PILOT PLANT TRIALS

Бу

K.D. Atkinson

Mineral Processing Division

MINES BRANCH

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Mines Branch Investigation Report IR 73-65

LABORATORY SUPPORT FOR SPODUMENE PILOT PLANT TRIALS

Ъу

K. D. Atkinson\*

#### SUMMARY

The spodumene pilot plant of Tantalum Mining Corporation of Canada Limited at Bernic Lake, Manitoba, is based on a process developed at the Mines Branch. When expected results were not realized during start-up of this plant, and Mines Branch results were not duplicated in the mine's laboratory, Mr. K. D. Atkinson of the Mineral Processing Division, Mines Branch went to Bernic Lake for the period June 12-29, 1973, to assist with the problem.

The present report covers experiments performed in the mine laboratory in conjunction with the pilot plant operations, and also directly related experiments performed later in Ottawa.

The results of this work demonstrated that the process was workable and satisfactory operation has been obtained with the pilot plant. There remains, however, a demand for continued improvement in overall performance.

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#### INTRODUCTION

Intermittently since 1968 the Industrial Minerals Milling Section has done beneficiation work on spodumene ores for Tantalum Mining Corporation of Canada Limited (TANCO). Several samples have been tested, the most recent being a "Spodumene Table Test Concentrate" (MPD 72/64 and MPD 73/12) prepared December 1, 1972. This represented feed for a pilot circuit at Bernic Lake which commenced operations in late April 1973.

Work on this sample at the Mines Branch outlined a simple but effective flotation process. It was found that stage additions of a single reagent (Armac L-10), at the natural pH of the ground ore in tap water, removed quartz, feldspar, and other minerals to leave a high-grade spodumene product; this is known as reverse flotation. The economic feasibility of this approach appears to be much better than that of flotation systems previously developed.

TANCO's laboratory and pilot plant operation conducted at Bernic Lake mill did not duplicate Mines Branch laboratory results. In response to a request for assistance on the problem, the author spent from 12 to 29 June 1973, at the mine.

In order to accomplish the most in the time available, it was agreed that the author would concentrate on laboratory experiments on pilot plant samples while Messrs. Clyde Lendrum, TANCO's consultant, and John Ambler, Mill Superintendent, would put laboratory findings into plant practice. This procedure would be followed until consistently good results were obtained in TANCO's laboratory after which work would be concentrated on the pilot plant. It was further agreed that Mr. Lendrum would report on the pilot

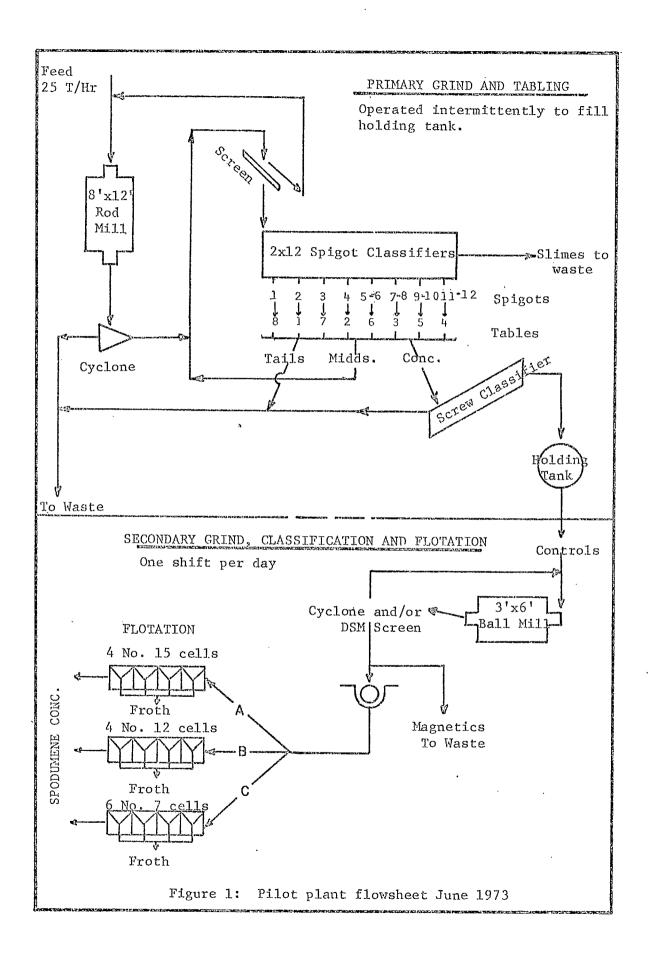
plant operation and the author on the laboratory work for the period covered.

This report also records tests related to the problem but subsequently performed at the Mines Branch.

#### TANCO'S PILOT PLANT OPERATION

Currently, TNACO'S mill operation is for the production of a tantalite table concentrate, and spodumene is recovered on a pilot plant scale (Figure 1). The spodumene pilot plant is housed in an extension of the tantalite plant.

Crushing, grinding, and tabling are done in the tantalite mill to fill a holding tank with deslined material which is withdrawn for further grinding and classification. The material is then passed through a low-intensity magnetic separator and directed to one of three sets of flotation cells as desired. These three sets of flotation cells consist of four No. 15 cells, four No. 12 cells, and six No. 7 cells.



TANCO's assay laboratory is capable of handling Ta, Cd, Sn, Ti,  $\text{Li}_2^0$ ,  $\text{K}_2^0$ ,  $\text{Na}_2^0$ , P,  $\text{Fe}_2^0$ , Ga, Pb, Ce, Ca, Mg and  $\text{SiO}_2$ . Few mine laboratories can achieve this.

### Test Conditions and Equipment

In all laboratory tests performed at Bernic Lake the following equiment and materials were used:

- (1) a Fagergren flotation machine, 1700 rpm, 2500-ml glass bowl;
- (2) untreated Bernic Lake water;
- (3) a 1% solution Armac L-10
  - (a) mixed in Ottawa, March 28, 1973, used as is,
  - (b) mixed in Ottawa, June 12, 1973, used as is,
  - (c) mixed in Bernic Lake, diluted from 4% solution being used on the pilot plant;
- (4) 0.2 to 0.3% magnetic iron present, unless otherwise stated;
- (5) all screen analyses performed dry, on a ro-tap for 10 minutes;
- (6) the pilot plant holding tank was filled intermittently as required; (this caused variations in the feed and rate of use).

### EXPERIMENTAL

Experimental data on all laboratory tests made at the mine are given as Appendix A.

The first three tests were run on pilot plant cell feed which had been filtered and partly dried. At this time, no tabling was being done in the pilot plant, therefore the laboratory work was performed on untreated mill feed rather than table concentrate as at the Mines Branch. Everything floated in all three tests. However, Tests 2 and 3 indicated preferential flotation of the feldspars and silica in the sectioned floats.

The grind was very fine, but this was thought due to not tabling before secondary grinding. Therefore, it was decided to operate the pilot plant on tabled product in order to obtain feed similar to that used in the Ottawa tests.

Samples of pilot plant cell feed were taken in 2500-ml lots for Tests 4, 5, and 6. In Test 4 and 5, again everything floated. Less L-10 was used in Test 5.

It was found that the plant grind was finer than reported screen analyses indicated. In the "rush" for data some material had been lost by decantation of fines prior to screening. With this knowledge, it was decided to run the secondary grind in open circuit.

The grind for Test 6 was similar to that of the Mines Branch, and although less material floated, a concentrate grade of 5.47 Li<sub>2</sub>0 was obtained.

At this time, it was decided to move farther back in the pilot plant circuit and use the feed to the secondary grinding circuit (holding tank discharge) as feed for laboratory work. This material was oven dried at approximately 400°F and ground in a porcelain Abbé mill with cylpebs as media. Much better results were obtained in Test 7 (a), (b), and (c), the grade increasing with increased grinding time.

Test 8 (a), (b), (c), and (d) were run in parallel with Test 7 to see if a fresh grind and/or desliming had any effect on pilot plant cell feed. The fresh grind of only five minutes did not appear to have any effect, but ... the desliming appeared to be beneficial.

Test 7 did not appear to yield a complete picture, so it was decided to do three more tests. These were performed on a second sample taken from the second filling of the holding tank after our arrival. These two samples are quite similar on a size distribution basis (Figure 2).

Tests 7 and 9 were plotted with grind time versus assays of  $\text{Li}_2^{0}$ ,  $\text{Na}_2^{0}$ ,  $\text{K}_2^{0}$ , and recovery of  $\text{Li}_2^{0}$  (Figure 3). Between Test 7 (c) and 9 (a), the graphs show a distinct break for  $\text{Na}_2^{0}$ 4 $\text{K}_2^{0}$ 0 but not  $\text{Li}_2^{0}$ 0. Grinding and float times were the only variables with float time being 7 minutes for Test 7 (c), and  $5\frac{1}{2}$  minutes for Test 9 (a). Therefore, Test 10 was run identically to Test 9 (a) except that float time was increased to 8 minutes.

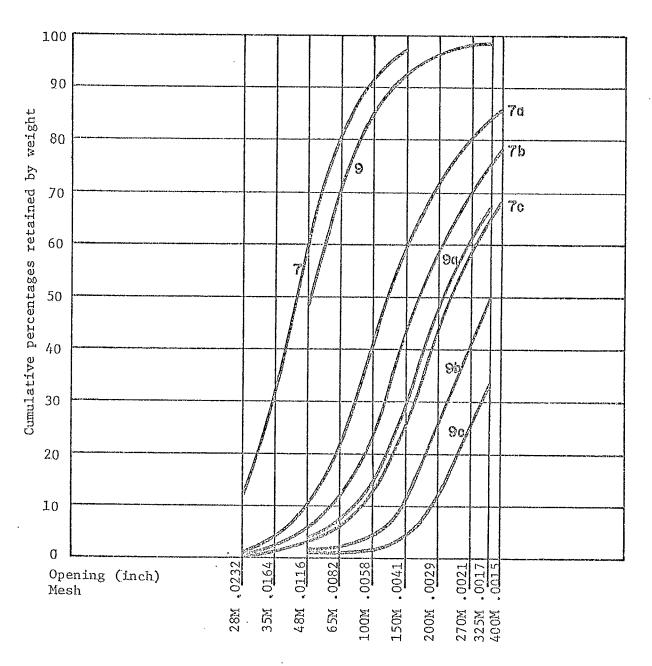
The results of Test 10 conform better to the continuous curves of Figure 3, confirming that too little float time was allowed for Test 9 (a).

A 60-minute laboratory grind yielded flotation results comparable to those desired so a grinding time of 60 minutes was used in subsequent work and the cumulative screen analysis of product between that for Test 7 (b) and that for Test 9 (b) was set as the pilot plant "target" grind.

Test 11 was an attempt to establish the threshold level and to determine the dependency of the float on time.

At this point, Mr. Henry Hartman of the Mines Branch joined the group and the effort was concentrated on the pilot plant with the laboratory being used only where necessary.

Test 12 (a) and (b) were performed to study the effect of No. 7 Denver cells in the pilot plant. Test 12(a) showed that additional material would float from the No. 7 cells concentrate with no additional reagent but also with little upgrading. Test 12(b) was a comparative test on pilot plant cell feed taken at the same time as No. 7 cells concentrate. There was very little difference between the results of these two laboratory tests and the pilot plant results.



LEGEND: 7 - Sample of first holding tank full.

9 - Sample of second holding tank full.

7a - 30-min.grind Test 7a.

7b - 45-min.grind Test 7b.

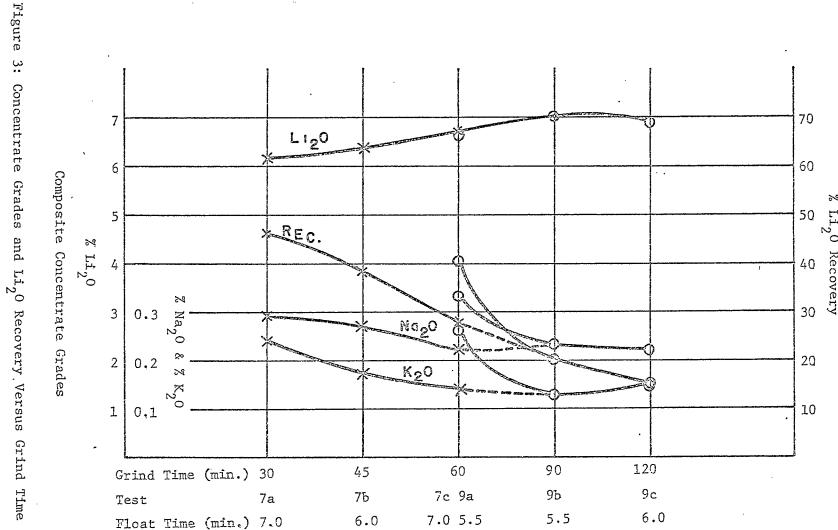
7c - 60-min.grind Test 7c.

9a - 60-min.grind Test 9a.

9b - 90-min.grind Test 9b.

9c - 120-min.grind Test 9c.

Figure 2: Cumulative Logarithmic Diagram of Screen Analyses.



Test 13 was an attempt to oxidize ferrous to ferric iron in the feed to the pilot plant cells by adding commercial Javex, containing 6% sodium hypochlorite. However, due to an excess addition of the Javex nothing floated.

Test 14 was performed in which an undetermined solution of ferrous sulphate was added. Its effect was similar to that in Test 13 in that very little material floated. Further work on the role of Fe++ and Fe+++ after the author's return to the Mines Branch is shown in Appendix B.

The author was soon to return to Ottawa and the laboratory work would be necessarily continued. Mr. Forrest Andrews, mill foreman, did some testing using the established procedure.

Good results had been obtained in the laboratory but not in the pilot plant up to this time. It was thought this may have been because the samples in the laboratory had been oven dried at a high temperature. It was, therefore, decided to try a pilot plant cell feed (Test 15) which was also oven dried. This showed negligible improvement.

It was then decided to try to oxidize ferrous iron by bubbling air overnight into a bucket of holding tank discharge without drying the sample. Good results were obtained by doing this in Test 16. It was next decided to repeat Test 16 and leave out the aeration step. This was done in Test 17, after the author's departure, by Mr. Forrest Andrews. Good results were obtained.

#### COMMENTS

Good results were obtained in TANCO's laboratory on holding tank discharge ground in an Abbé mill before flotation. However, very little beneficiation could be obtained in either the pilot plant or the mill laboratory after secondary grinding and classification in the pilot plant.

A considerable proportion of the original feed was discarded as waste in preparing flotation feed. However, as developing a workable flotation system for spodumene, rather than optimum throughput, was the objective, this was not taken into account.

Mr. Forrest Andrew has followed the author's test procedures and has continued the laboratory work necessary in de-bugging the mill circuit.

This work has been reported in part by Mr. Clyde Lendrum elsewhere.

At the time of the author's return to Ottawa, soluble ferrous iron was considered to have a detrimental effect on the flotation process.

Therefore, additional work was carried out at the Mines Branch and reported in Appendix B.

#### ACKNOWLEDGEMENTS

For information and discussions on work performed, a great deal of assistance has been received from: Messrs. F. Clyde Lendrum, Consultant; C. T. Williams, Manager, and John Ambler, Mill Superintendent, Tantalum Mining Corporation of Canada Limited; R. A. Wyman, Head, and F. H. Hartman, Research Scientist, Industrial Minerals Milling Section, Mineral Processing Division of the Mines Branch.

At Bernic Lake mill Mr. Forrest Andrews, General Mill Foreman, assisted in and performed laboratory work and supervised plant sampling, in addition to his many other duties.

In the Mineral Processing Division of the Mines Branch, G. A. Kent, Chemist, S. T. Lepage, and J. H. Colborne, Technicians, did chemical analyses and heavy liquid separations; P. R. Lachapelle, Technician, performed test work.

DKA:ec

Appendix A

### Tests 1-3 inclusive

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Sample of pilot plant cell feed was pressure filtered and partly dried in oven. Approximately 425 gm weighed for each test. (25 gm for moisture content).

Mesh	% Wt	Am % Wt
<del>-</del>	***	
+ 35	-	
+ 48	0.1	0.1
+ 65	0.3	0.4
+ 100	1.4	1.8
+ 150	7.8	9.6
+ 200	5.7	15.3
+ 325	19.3	34.6
+ 400	6,9	41.5
- 400	58.5	•••

Typical screen analysis of test feed 13 June, 1973. At this time rod mill product to holding tank i.e. no tabling and therefore no desliming prior to secondary grind.

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### MINES BRANCH FLOTATION TEST REPORT

TEST NO 1	SAME	LE: S	PODUME	NE (7	Canco,	Bernic :	Lake, N	anitoba	1) 425	g. R. f	1. feed	DA	TE: 13	June 19	73
OBJECT OF TEST	- <del> </del>						Grin	1.				CI-I	ARGE:		
	float	pilot	plant	cell	feed a	ıs is .		pi	lot pla				STED E	Y: K.D	.A.
OPERATION	1	Time	%	pH		Jnit .				Reag	ents, lb	per ton	<del></del>		
		min	Solids	1		ısed	L-10	(Mine)					_	_	
ROUGHER Float 1		2.0	20	ļ			0.48			·					
2		2.0		ļ			0.48								
3		2.0	<u> </u>	<del> </del>		<del></del>	0.48	ļ						_	
Total		6.0	<b> </b>	<u> </u>			1.44								_
			<del> </del>			<del></del>									
			ļ		_		-								
			<del> </del>	1		<del> </del>	1								
			1	1											
CLEANING															
PRODUCT		W	3.4	% Li2	0	% . Na		% K2	·	% Fe		Z P20		% .	
FRODUCI		9	6 A	ssay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.
Rougher floa	.t	99	.3	_	-	_	-	_		_		_	_		
Rougher Conc			.7	7		-		-	_	-	-	-	-		
·			Contention .	Ĭ											
		1.	. 100												
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		And the control of the last of	A STATE OF THE STA								C). WYC ANT THE TITLE AND THE MANAGEMENT TO ANY THE VIEW CASE OF THE ANY THE VIEW AND THE VIEW A				

REMARKS: All material floated non-slectively, no assays

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## MINES BRANCH FLOTATION TEST REPORT

TEST NO 2	SAME	LE: S	PODUM	ENE (	ranco.	Bernic	Lake, N	anitoba	3) 428 8	g R. f1.	feed	DA	TE: 13 .	June 197	73
							Grind					CI-I.	ARGE:	6813	
OBJECT OF TES	float	pilot	.plan	t cell	. feed a	s is .		· pi	lot pla	ant only		TES	STED B	Y: K.I	D.A
		Time	%			Jnit				Reag	ents, lb	per ton			
OPERATIO	N	1	Solid	s pH	į	sed	L-10	(Ottawa	Mar.	28/73)					
ROUGHER Float	.1 .	2.0	15		1		0.48								
	2	2.0					0.48								
	3	2.0-					0.48	ļ							
Total		6.0	ļ				1.44		<b>2</b>						_
			ļ			· · · · · ·		-	-						
Float	2	0.5		-{			<del>  -</del> -			<del></del> -					
	3	0.5				<del></del>	<del>                                     </del>								
	4	0.5		<del>- </del>			<del>                                     </del>	1		· -					
CLEANING	5	0.5	1				T _								
	6	0.5					_								
Total		3.0													
PRODUC	~	W	! !	% Li2		7 . N		-% K2		% Fe	~~~	Z P20	, <del></del>	%	T
1.000	<u></u>	9	6	Assay	Dist.	Assaý	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.
63	3 3		C	0 / 7	26.01	0.66	FO 10	1 60	E7 00						ĺ
Cleaning f	10at 1		0.5 5.2		36.91 13.85		52.19 14.99	1.62	57.99 15.30	<u> </u>	_	_	_	•	
	3			3.98	10.46		8.07	1.20	7.56		_	_	_		
·	4			4.48	6.20		4.03	1.10			_	-	-		
	5	32	3.5		5.02		3.57	1.20	1	7	_	_	-		
07 1	6			5.45	1.89	• •	1.08 15.47	1.04 1.05	0.86	1	_		_		
Cleaning 1 Rougher co			11	5.46 4.57	24.56	0.63	0.60	0.61	0.35	1	_	_	_		
Rougher co.		distributed (5)		T • J I		0.47		0.02	1 0.33	Prostation of the state of the					
·		1	7		i i	<b>.</b> .			ĺ	74 January 1, 1					
			Transfer of the Park												
·						•									
Heads (Cal	c†d)	10	0.0	3.38	100.00	0.63	100.00	1.41	100.00		E HOURING				
:									L	<u> </u>				<u> </u>	
REMARKS: Che	ck on min	o T-10	11026	uc Ott	- 0270 T 1	Ω							•		

REMARKS: Check on mine L-10 versus Ottawa L-10.

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## MINES BRANCH FLOTATION TEST REPORT

		LODUILL	AE (I	anco, i	Bernic	1		i) 417g	R. ±1.	teed	CH	ARGE:	June 193 6813	73
OBJECT OF TEST: floa	t pilo	t plan	t cel	l feed	as is	Grin	nd: pi	lot plar			TES		Y: K.D.	.A.
OPERATION	Time min	% Solids	pHi	4	Init Ised	L-10	(mine)		Reago	ents, Ib	per ton			
ROUGHER Float 1(a) -	0.5	14		·		0.48								
(b)	0.5					<del> </del>	!							<del> </del>
(c)	0.5	<u> </u>				<del> </del>	-							
(d)	0,5	<u> </u>				<del> </del>								
2 (a)	1.0		,		<u>,, </u>	0.48							_	- <del> </del> -
2 (Ъ)	1.0						<u> </u>	•						<del> </del>
<u>Total</u>	4.0					0.96								
	·													
CLEANING None						-[								-
				_		-							_	_
	l w	7 II o	7 Li2	0	% . N	200	% K	20	% Fe	202	Z P20	<del></del> ) <sub>5</sub>	7.	
PRODUCT	11	11		Dist.		Dist.	1			Dist.			Assay	Dist.
Rougher float 1 (a)	50	.8 2	.28	34.72	0.60	50.52	1.35	56.21	, <u>_</u>			_		
1 (b)			.33	12.68					_	_	_	_		
, 1 (c)			.04	10.16	0.60	8.34	1.16	7.97		-	_	_		
1 (d)			.50	9.05						-	-	_		
2 (a)			.16	26.32				<b>A</b>		<b>!</b> -	_	_		
2 (b) Rougher conc			.55	3.59 3.48			0.88	2	_		l –	_		
		. Participation of the control of th								1				
								-						
		To Limited States												
•		Company of the Compan												
Heads (calc'd)	100	.0 3	.33	100.00	0.60	100.00	1.22	100.00						

### Tests 4-6 inclusive

Samples of pilot plant cell feed were taken as pulp, 2500 ml. for each lab test.

Typical screen analyses of laboratory test feed.

		4 June 1973 Tests 4 & 5		ne 1973 est 6
Mesh		Cum % Wt	% Wt	Cum % Wt
+ 28	***	-		
<del>+</del> 35	<b></b>	-	0.5	0.5
+ 48	0.3	0.3	2.6	3.1
+ 65	0.9	1.2	6.8	9.9
+ 100	4.0	5.2	13.3	23.2
+ 150	8.8	14.0	16.4	39.6
+ 200	12.5	26.5	16.1	55.7
+ 270	8.3	34.8	8.5	64.2
+ 325	12.5	47.3	9.4	73.6
+ 400	6.0	53.3	3.6	77.2
- 400	46.9	-	22.8	-

On 14 June 1973 pilot plot holding tank discharged and refilled with table concentrate (1st tank full). Also an attempt to get coarser secondary grind.

On 15 June 1973 secondary grind run open circuit (cyclone removed).

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## MINES BRANCH FLOTATION TEST REPORT

TEST NO 4 SAMI	LE: S	PODUME	NE (	Tanco,	Bernic	Lake, N	lanitob	a) 536 g	. R. fl	. feed			June 197	73
OBJECT OF TEST: float	pilot	plant	cell	. feed a	s is	Grin	id:				<u> </u>	ARGE:		
				,			pilo	t plant					Y: K.D.	<u> </u>
OPERATION	Time	%	ρH		Jnit	. [	<del></del>	<del></del>	Reag	ents, lb	per ton			<del></del>
OFERMION	mln	Solids			used	<u>L-10</u>	(mine)							_
ROUGHER Float 1 (a) .	1.0	19				0.37		·						<u> </u>
1 (b)	1.0		ļ		·		1							
1 (c)	1.0-		<b></b>			<u> </u>								
1 (d) .	1.0		<del>}</del>				<b></b>							
2 (a)	1.0	ļ	<u> </u>		<del>,</del>	0.37	-							
2 (ъ)	1.0	ļ					<del> </del>							
3 (a)	1.0	ļ <u>.</u>	<u> </u>			0.37	<u> </u>							_
3 (5)	1.0	<b></b>	.											_
Total	8.0		<u> </u>	<del></del>		11.11	ļ							<del> </del>
CLEANING None	ļ	ļ	ļ		<u> </u>		<u> </u>							-
		<b> </b>	<u> </u>				<u> </u>							
	<u> </u>	1	<u> </u>				<u></u>							<u></u>
PRODUCT	W	F4	% Li2	0	% . N		7 K		% Fe	<del></del>	% P20	_ <i></i>	7	
PRODUCT	9	6 A	ssay	Dist.	Assaý	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.
Rougher float 1 (a)	24	.3	2.29	14.19	0.80	31.92	1.47	39.02	_	_	_	_		
1 (b)			3,16	ı	0.69	18.39	1.07		-	<b>!</b>	-	-		
, 1 (c)			4.10				0.83	9.48	_	-	-	_		
1 (d)			4.49	4.31	0.50		0.72	2.96	_	_		_		1
2 <u>(a)</u>			4.61	20.24	0.45		0.64	12.04 6.46	_	_	<u> </u>	_		
2 (b) 3 (a)		23	4.89 5.27	1	0.40	1	0.59	3.92			_	_		1
3 (b)			5.41	5.48	0.54		0.59	2.56		_	_	_		
Rougher conc			5.55	10.81	0.61		0.55	4.59	_	_	_	-		
Pilot Plant Cell Fe	ed	- CHILDRAN	4.05	_	0.58	<u>-</u>	0.86	_	_	_	_	-		
Heads (calc'd)	100	.0	3.92	100.00	0.60	100.00	0.91	100.00	· —	_	-	-		
	A COLUMN TO THE	Tank Commen												
	- Andrian	Contractor PETITION NO.				٠.		Ì					La Company	
•	The second secon	4		·										
DEMA DICE.					<u> </u>			<u> </u>						

REMARKS:

New solution L-10 and table product instead of straight feed.

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## MINES BRANCH FLOTATION TEST REPORT

TEST NO 5 SAMP	LE: SI	PODUME	NE (	Canco,	Bernic	Lake, M	anitoba	1)462 g	R. fl	. feed	DA	TE: 14	June 1	973
OBJECT OF TEST:						Grind			•	*	<u> </u>	ARGE:		
. iloa	pilo	t plan	t all	. feed a	s îs			t plant				STED E	Y: K.D	Α
	Time	%	Ī	-	Init	.1			Reag	ents, Ib	per ton			
OPERATION		Solids	pΗ		ısed	L-10	(mine)							
DOUGHIND TILL I (a)			-				2							
ROUGHER Float 1 (a) .	1.0	17				0.22								
<u></u>	1.0		<del> </del>				-							<del></del> -
1 (c)	1.0		<del> </del>			<del></del>	-	<u>-</u>						
1 (d)	1.0		<del> </del>			<del> </del>	<u> </u>							
2 (a)	1.0	ļ	<del> </del>		<del>,</del>	0.22								
2 (Ъ)	1.0		ļ				<u> </u>	<b></b>						
2 (c)	1.0	ļ	<del>                                     </del>			0.22		ļļ.	<del></del>					
	1.0													
Total	8.0		<u> </u>			0.66	ļ							
CLEANING None							<u> </u>							_
					· — · · · · · · · · · · · · · · · · · ·									
		•	·											
	I W	T	% Li2	0	% . Na	120	-% K2	20	ΖFe	203	Z P20	05	78	
PRODUCT	9/	o A		Dist.	Assaý	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.
			0.7	10.60	0.70	0/ 7/	1 (0	20 (2						
Rougher float 1 (a) 1 (b)		$ \begin{array}{c cccc} 9.1 & 2 \\ 1.7 & 3 \end{array} $	.11	10.60 8.94	0.73 0.67		1.42 1.10	29.43 14.04	_	_			1	
1 (b) 1 (c)		$\begin{bmatrix} 1.7 & 3 \\ 5.6 & 3 \end{bmatrix}$		5.36	0.56	5.54	1.10	10.96	_			_		
1 (d)		4.5 4		4.70	0.56	4.49	0.75	3.67	_	_		_		
2 (a)		7.6 4		28.79		23.06	0.75	22.51	_	_	_	_		
2 (b)		1.3 4		13.74	0.47	9.41	0.60	7.35	_	-	_	-		
3 (a)		8.6 5		11.47		7.84	0.59	5.54		-	-	-		
3 (b)		3.7 5		5.20	0.51	3.36	0.59	2.38	_	_	-	-		
Rougher conc		7.9 5		11.20	0.54	7.57	0.48	4.12	-	_	_	-		
Pilot Plant Cell Fee	ed	_ 4	.14	_	0.54	_	0.83	_	_	_	-	-		
Heads (calc'd)		0.0 4		100.00		100.00		100.00	-	-	-	_		
	and sections.										TO THE PERSON NAMED IN COLUMN			
1	11			*						ĺ	1		B-100	Production of the last of the
•	ìř	16		D I						4				
		To the state of th	· .								Chassed			

REMARKS: As test 4, effect of less L-10, threshold level suggested.

TEST NO 6	SAMPL	E: SPO	ODUME	NE (1	lanco,	Bernic	Lake, M	anitoba	i) 639 g	ξ. R. f	1. feed		TE: 15		73
OBJECT OF TES	T:		_ 7	7 7			Grind	:		7	•	i	ARGE:		
	. Iloat	brror'	prant	cerr	L feed a	as is.		birc	ot plant	<del>,</del>			STED B	Y: K.D	.A
OPERATIO	N	rime	%	ρH		Jnit		· ·	<del></del>	Reag	ents, lb	per ton			
OPERATION		min S	Solids	P''.	<u> </u>	ısed	L-10	(mine)	•						
ROUGHER Float	1 .	2.5	22				0.31								
	2	2.0					0.31								
	3	1.25					0.31								
T	otal	5.75		<u> </u>			0.93								
						· · · · · · · · · · · · · · · · · · ·									
						~~~~	1								
				<del>                                     </del>			-	<b> </b>							<del>- </del>
			·····		_		-			·					-
CLEANING Float	1	3.5		<del> </del>	<del></del>										
	2	3.0		-		<u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>									_
	otal	6.5				<del></del>									
		l wr		<del>!</del> % Li <sub>2</sub>	<u></u>	7 . Na	1.00	7 K2	0	Z Fe	202	% P20	0s	7	
PRODUC	Т	%	il		Dist.	7	Dist.			Assay		Assay	., <u></u>	Assay	Dist.
		4	<u> </u> }		·				<del>}</del>	<del></del>	<del></del>				· · · · · · · · · · · · · · · · · · ·
						1			00 00						
Cleaning 2			.8 1		6.24			2.07	28.23	<b>-</b> .	A COLUMNIA C	_	_		
Cleaning 2	conc.	10	.4 2	.16	5.79	0.73	11.60	1.41	13.55	 -	and the state of t	- -	-		
Cleaning 2 Cleaning 1	conc.	10 37	.4 2 .7 .3	.16 .72	5.79 36.01	0.73 0.55	11.60 31.69	1.41 1.02	13.55 35.41	_	Content of the Artificial Principles		-	And the state of t	
Cleaning 2 Cleaning 1 + 48 Roughe	conc. conc. r conc.	10 37 3	.4 2 .7 3 .8 4	.16 .72 .34	5.79	0.73 0.55 0.55	11.60 31.69 3.19	1.41 1.02 1.10	13.55	- -		1 1			
Cleaning 2 Cleaning 1	conc. conc. r conc. r conc.	10 37 3 33	.4 2 .7 3 .8 4	.16 .72 .34 .60	5.79 36.01 4.23	0.73 0.55 0.55 0.60	11.60 31.69 3.19 30.44	1.41 1.02 1.10	13.55 35.41 3.85 18.96	_ _		1 1			
Cleaning 2 Cleaning 1 + 48 Roughe - 48 Roughe	conc. conc. r conc. r conc. ougher	10 37 3 33	.4 2 .7 3 .8 4 .2 5	.16 .72 .34 .60	5.79 36.01 4.23 47.74	0.73 0.55 0.55 0.60	11.60 31.69 3.19 30.44	1.41 1.02 1.10 .62	13.55 35.41 3.85 18.96	- -		-			
Cleaning 2 Cleaning 1 + 48 Roughe - 48 Roughe Composite R	conc. conc. r conc. r conc. ougher	10 37 3 33	.4 2 .7 3 .8 4 .2 5	.16 .72 .34 .60	5.79 36.01 4.23 47.74	0.73 0.55 0.55 0.60	11.60 31.69 3.19 30.44	1.41 1.02 1.10 .62	13.55 35.41 3.85 18.96	- -					
Cleaning 2 Cleaning 1 + 48 Roughe - 48 Roughe Composite R	conc. conc. r conc. r conc. ougher	10 37 3 33	.4 2 .7 3 .8 4 .2 5	.16 .72 .34 .60	5.79 36.01 4.23 47.74	0.73 0.55 0.55 0.60	11.60 31.69 3.19 30.44	1.41 1.02 1.10 .62	13.55 35.41 3.85 18.96	- -					
Cleaning 2 Cleaning 1 + 48 Roughe - 48 Roughe Composite R	conc. conc. r conc. r conc. ougher	10 37 3 33	.4 2 .7 3 .8 4 .2 5	.16 .72 .34 .60	5.79 36.01 4.23 47.74	0.73 0.55 0.55 0.60	11.60 31.69 3.19 30.44	1.41 1.02 1.10 .62	13.55 35.41 3.85 18.96	- -					
Cleaning 2 Cleaning 1 + 48 Roughe - 48 Roughe Composite R	conc. conc. r conc. r conc. ougher	10 37 3 33	.4 2 .7 3 .8 4 .2 5	.16 .72 .34 .60	5.79 36.01 4.23 47.74	0.73 0.55 0.55 0.60	11.60 31.69 3.19 30.44	1.41 1.02 1.10 .62	13.55 35.41 3.85 18.96	- -					
Cleaning 2 Cleaning 1 + 48 Roughe - 48 Roughe Composite R	conc. conc. r conc. r conc. ougher	10 37 3 33	.4 2 .7 3 .8 4 .2 5	.16 .72 .34 .60	5.79 36.01 4.23 47.74	0.73 0.55 0.55 0.60	11.60 31.69 3.19 30.44	1.41 1.02 1.10 .62	13.55 35.41 3.85 18.96	- -					
Cleaning 2 Cleaning 1 + 48 Roughe - 48 Roughe Composite R	conc. conc. r conc. r conc. ougher c'd)	10 37 3 33 37	.4 2 3 4 5 5 .0 5	.16 .72 .34 .60	5.79 36.01 4.23 47.74	0.73 0.55 0.55 0.60 0.59	11.60 31.69 3.19 30.44 33.63	1.41 1.02 1.10 .62 0.67	13.55 35.41 3.85 18.96 22.81			1 1 1			
Cleaning 2 Cleaning 1 + 48 Roughe - 48 Roughe Composite R conc. (cal	conc. conc. r conc. r conc. ougher c'd)  Cell Fee	10 37 3 33 37	.4 2 3 .7 8 4 .2 5 .0 5	.16 .72 .34 .60 .47	5.79 36.01 4.23 47.74	0.73 0.55 0.55 0.60 0.59	11.60 31.69 3.19 30.44	1.41 1.02 1.10 .62 0.67	13.55 35.41 3.85 18.96						
Cleaning 2 Cleaning 1 + 48 Roughe - 48 Roughe Composite R conc. (cal	conc. conc. r conc. r conc. ougher c'd)  Cell Fee	10 37 3 33 37	.4 2 3 .7 8 4 .2 5 .0 5	.16 .72 .34 .60 .47	5.79 36.01 4.23 47.74 51.97	0.73 0.55 0.55 0.60 0.59	11.60 31.69 3.19 30.44 33.63	1.41 1.02 1.10 .62 0.67	13.55 35.41 3.85 18.96 22.81						

REMARKS: Cyclone out of circuit, coarser grind; another new solution L-10.

### Test 7 (a) - 7 (c) inclusive.

Sample of holding tank discharge (1st tank full) had been dried and saved.

Test samples of 500 gm each were ground in a medium Abbé mill with a 3000-gm charge of cylpebs (1200 gm of  $\frac{1}{2}$  in. and 1800-gm of  $\frac{13}{16}$ ) and 500 ml of mine water. Grind performed at 58 rpm for times indicated; samples then washed in the laboratory cell.

After each test a screen analysis was run by recombining proportional amounts of each product sample.

Test/grind time	7(a)	/30 min.	7(b)	/45 min.	7(c)/	60 min.
Mesh	% Wt	Cum % Wt	% Wt	Cum % Wt.	% Wt.	Cum % Wt
+ 28 + 35	0.6 3.5	0.6 4.1	0.5 1.9	0.5 2.4	0.3	0.3 1.5
+ 48 + 65	6.7 9.8	10.8 20.6	3.3 5.9	5.7 11.6	1.5 2.6	3.0 5.6
+ 100 + 150 + 200	19.1 19.7 12.5	39.7 59.4 71.9	12.1 19.0 15.9	23.7 42.7 58.6	7.0 13.8 17.5	12.6 26.4 43.9
+ 270 + 325	5.9	77.8 84.0	8.0	66.6 75.5	10.3 11.0	54.2 65.2
+ 400	2.9 13.1	86.9 -	3.6 20.9	79 <b>.</b> 1	4.9 29.9	70.1 -

In test 7(a), (b), (c), after grinding, each pulp was allowed to stand for 30, 30, and 10 minutes, respectively, before partly decanting excess wash water.

TEST NO 7 (a) SAME	LE: SPO	DUMENE	(Tanco,	Bernic	Lake, A	lanitoba	a)500 g	. hold	tank dis		TE: 16		73
OBJECT OF TEST:		7 7 7 7			Grino	l: Media	ım Abbé	mill	30 min.	1	ARGE:		
Iloat la	b. grou	nd hold	ing tank.		;e						STED E	Y: K.D	.A.
OPERATION	Time	%	~ H	Unit used		1000	\ 7 - T	<del></del>	ents, lb	per ton			<del>-</del>
	min S					(Ottawa	June .	12//3				_	
ROUGHER Float 1 .	3.0	20		·	0.4		·	·				_	
3	2.0		-	<del></del>	0.4								
Total	7.0				1.2		·	- Andrews					
						1							
		·	· •	<del></del>		}						_	
				<del></del>	-	-							-
CLEANING Float 1	3.0												
2	2.0												
Total	5.0												
PRODUCT	WT	11	Li20	% Na		-% K2	·	% Fe		% P <sub>2</sub> (	<i>-</i>	78	
	%	Ass	ay Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.
Cleaning 2 float		.9 1.4		0.79		1.23	31.65	. –	_	-	_		
Cleaning 2 conc.		5 2.2		0.75		1.03 0.69	18.50 39.82	-	-	-	_		
Cleaning 1 conc. + 48 Rougher conc.		2 3.9 4 6.1		0.58 0.22		0.09	2.71	_	_	_	_		
+150 Rougher conc.	18.	7 6.2	3 29.78	0.32	10.79	0.24	6.45	-	-		_		ĺ
-150 Rougher conc.	1.	. 2 4 . 5	1 1.43	0.48	1.07	0.49	0.87			-		-	
Composite Rougher conc. (calc,d)	29.	.4 6.1	4 46,11	0.29	15.60	0.24	10.03	_		_	_		
Decanted slimes													
(losses)	4.	. 7											
	Description of the control of the co												
	CAST ALL AND ALL ALL ALL ALL ALL ALL ALL ALL ALL AL	- Language - Control of Control o							T-uno ()				
	Parameter Comment	- Defendent of the Control of the Co		-									
approximate a second of the se					,								
Head (Calc,d)	100.	.0   3.9:	1 100.00	0.55	100.00	0.69	100.00						

REMARKS: Sample taken 15 June 1973, holding tank discharge, oven dried (+400°F)

EST NO 7 (b) SAM	PLE: S	PODUM	ENE (	Tanco,	Bernic						. DA	TE: 16	June 19	73
BUECT OF TEST:		3 77	7. <b>2</b>	+7- 1-	. · 1		: mediu	n Abbé :	mill 4	5 min.	1	ARGE:		
float lab	• groun	q nor	aing	tank dis	scnarge							STED E	Y: K.D	.A.
OPERATION	Time	%	ρŀ	-6 E	Jnit .	·		<del>/</del> r	<del></del>	jents, Ib	per ton		<del></del>	<del></del>
	mln	Solid	s	'	used	L_10	(Ottaw	<u>lune</u>	12/73)					
OUGHER Float 1 .	3.0	20				0.4		·	·					
2 .	2.0					0.4	<u> </u>							
3	1.0					0.4	ļ							
Total	6.0		- Con			1.2	-							
	<u> </u>					-							_	
		·	·											
	<del> </del>		_				<u> </u>							
CLEANING Float 1	3.0					<del>-</del>	1							
2	3.0					_								
Total	6.0													
	l w	T II	% L1	20	7.N	a20	7 K	20	% Fe	203	1 % P2	05	78	
PRODUCT	9	6		Dist.		Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist
Cleaning 2 float	19	.3	1.89	9.09	0.90	31.28	1.49	40.59	1 _	_	_	_		
Cleaning 2 conc.	14		2.03	7.19	0.75		1.05	21.06		-	-	_		
Cleaning 1 conc.	42		4.34	45.47	0.50		0.55	32.64	4	-	-	-		
+48 Rougher conc.	53.	4.0	6.30	7.66	0.23		0.21	1.45	5	-	-	-	1	
+150 Rougher conc.	16		6.51	26.30			0.12	2.75	8	-	-	-		
-150 Rougher conc.	_   3	.2    .	5.43	4.29	0.41	2.34	0.34	1.52			] -		•	
Composite rougher conc. (Calc,d)	24	.3	6.33	38.25	0.27	11.66	0.17	5.72	_	_	_	_		
	i i								0					
Decanted slimes	. 4	.3			T. C.	and the second s	Mark Block				TOWER THE STATE OF			
(losses)		CONSTRUCTO		Ì					<b>.</b>					
	and the same of th													
	Talvas rather	- Characterist		40 mary Class						and the contract of the contra				
Heads (Calc,d)	100	.0	4.02	100.00	0.55	100.00	0.70	100.00	_	_	-			

TEST NO 7 (c) SAMPL	E: SP	ODUMEN	E (T	anco,	Bernic :	Lake, M	anitoba	i) 500 g	. Hold	tank dis		TE: 16 J		73
DBJECT OF TEST:						Grind	30. 14	AT 1 =	mill 6	O	ļ	ARGE:		
float lab.	groun	d hold:	ing t	tank di	scharge		Medlu	m Abbe				STED B	Y: K.D.	.A.
055505504	Time	%	рH	1 1	Init				Reag	ents, Ib	per ton			
OPERATION	min į	Solids	pri	i i	sed	L-10	(Ottaw	a June	12/73)					
ROUGHER Float 1	3.5	20	, _, _,			0.4								
2	2.0			1		0.4								
3	1.5-	1				0.4								
Total	7.0				····	1.2		7						
	<u> </u>	1												
		Ť						1						
and the second	1													
						70.10			•					
CLEANING Float 1	2.5	grange												_
2	3.0													
Total	5.5										L			_i
55000107	Wi	7 1 %	Lia	0 .	% . Na	120	% K2	0	Z Fe	203	Z P2		%	
PRODUCT	%	As	say	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist
	67	0 1		7 50	0.95	37.65	1.60	47.49			_			
Cleaning 2 float Cleaning 2 conc.	21.		,51 .05	7.50 6.64	0.69		0.94	18.88	_	-	-	_		
Cleaning 1 conc	47.		.19	57.98	0.41	36.59		30.08	-	_ `	-	-		
+ 48 Rougher conc.	3.		.76	4.36	0.30	1.84		1.65	-	_	-	-		
+ 150 Rougher conc	10.			17.25	0.15	2.89		0.72	_	-	-	-		
- 150 Rougher conc.	4.	2 6	.32	6.27	0.32	2.53	0.20	1.18	-	-	-	-		
Composite Rougher conc.		OTHER DESIGNATION OF THE PERSON OF THE PERSO				- 0.								
(Calc;d)	17.	6   6	.69	27.88	0.22	7.26	0.14	3.55	_		_	-	}	
		b presental	y de la companya de l						Cheropher					
Decanted slimes (losses)	6.	8	ý. N			·								Î
Decamed Stance (1000es)		) THE CANADA	C. Marie	. :			. :							]
,		· establish						. ,	Pyrama Cypin			- A		
	100	provide part	đ			SATURE OF THE PARTY OF THE PART						- Control of the Cont		
Heads (Calc'd)	100.	0 4	.23	100.00	0.52	100.0d	0.70	100.00			_	-		
Heads (Caic d)	11 700	- 86								2 2				

REMARKS: As 7 (a)

### Tests 8(a) - 8(b) inclusive

Samples of pilot plant cell feed were taken as pulp, 2500 ml for each laboratory test.

Typical screen analysis of laboratory test feed.

Mesh	% Wt	Cum % Wt
+ 48	1.9	1.9
<b>-</b> ⊦ 65	4.1	6.0
+ 100	10.3	16.3
+ 150	11.7	28.0
+ 200	13.3	41.3
+ 325	18.1	59.4
- 325	40.7	-

Holding tanks refilled 18 June 1973 (2nd tank full) with table concentrate.

When the samples were taken there was caustic to  $3' \times 6'$  secondary ball mill (pH to 8.5). Open circuit grind.

Time   min  Sc	ant cell % pholids	,	s is Jnit used	0.4	bito.	t plant	Reag	ents, 16	TES	ARGE: STED B		<u>A.</u>
7ime   min   Sc 3.5   2.0   1.0	% ph		Jnit	L-10 0.4 0.4	bito.		Reag	ents, lb		STED B	Y: K.D.	A
3.5 2.0 1.0	olids			0.4	(Ottaw	a June ]		ents, Ib	per ton			
3.5 2.0 1.0	olids		used	0.4	(Ottaw	a June ]	(2/73)			_		
2.0	17			0.4		·						
1.0												
	CASE NA.	eran mass.		101	<u> </u>							
6.5				0.4	)							
, Contraction				1.2					- Land			
					<b>}</b>							
	<del></del>		<del></del>		-					_		-
	an est é				-							-
3.5		<del></del>		1 -					i			
<del></del>				_								
6.5												
WT	% Li	20	7. N	a20	Z K2	0	% Fe	203	Z P20	0 <sub>5</sub>	%	
%	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.
17.0	1 52	6 79	0 91	24 Q4	1 72	33 70	_	_	_	_		
								_	_	_		
								_		_	·	
								_	_	-		
13		•	n :					_				1
7.0	1.6		1					_	_	_		1
			1		i .	: 9				-		
Contact of the Contac	And a second sec											
A Thirteen C.L.	Andreas de la constante de la					·						
and a second	Constitution of the Consti											
Countries		To the state of th										
100.0	4.00	100.00	0.64	100.00	0.91	100.00	<b>-</b> '	-		_		
	7.8 17.8 14.6 47.8 2.7 12.9 4.3 19.9	3.0 6.5 WT % Li <sub>2</sub> % Assay 17.8 1.53 14.6 2.51 47.8 4.67 2.7 3.92 12.9 5.78 4.3 6.62 19.9 5.71	3.0 6.5 WT % Li <sub>2</sub> O % Assay Dist. 17.8 1.53 6.79 14.6 2.51 9.15 47.8 4.67 55.78 2.7 3.92 2.64 12.9 5.78 18.61 4.3 6.62 7.03 19.9 5.71 28.28	3.0 6.5    WT	3.0 6.5	3.0 6.5	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	3.0	3.0   -   -	3.0	3.0

REMARKS: Samples taken 10:30 June 18/73; cyclone out of circuit, caustic added to mill pH 8.5

TEST NO 8 (b) SAMPI	E: SI	PODUME	NE (3	lanco,	Bernic	Lake, N	lanitoba	a) 498	g. R.	fl. feed	DA	TE: 18.	June 19	73
OBJECT OF TEST: float					,	<b>.</b>					CH	ARGE:	6813	
	P = 2.0 C	·				medi	m Abbe	plant mill	plus 5	min.	<del></del>	STED B	Y: K	D.A.
OPERATION	Time	%	рН	,	Jnit		,		Reag	jents, lb	per ton	<del></del>		<del></del>
OT LITTATION	min	Solids	P	j ;	ised	<u>L-10</u>	Ottawa	June 1	2/73)					
ROUGHER Float 1 .	4.0	18		·		0.4								
2	2.0					0.4								
3	1.25					0.4								
Total	7.25					1.2								_
					<del>,</del>									
	· · · · ·						-							
		·				<b>_</b>							-	
					·	<u> </u>				<del></del>				
CLEANING Float 1	3.0						-		<u>-</u>			_		_
2	2.5				<del></del>									_
Total	5.5													_
iotai	W	<u> </u>	L12	0	% . N	300	7 K2	<u> </u>	7 17 6	203	7 P20	) c	7,	
PRODUCT	%	11		Dist.		Dist.	)!		<u> </u>	Dist.	Assay	, <del></del>	1	Dist
			====											
Cleaning 2 float	17. 16.	54	L.92 2.70	8.22 10.69	0.86		1.51 1.20	29.42 21.62	_		_	_	1	
Cleaning 2 conc. Cleaning 1 conc.	51.		4.79	60.00			0.73	41.60	_		_	_		
÷ 48 Rougher conc.	64	16	5.66	1.23	t		0.51	0.50	<b>!</b> _	_	_	-		
+150 Rougher conc.			5.68		5		0.50	5.09	_	_	_	_	1	
-150 Rougher conc.	4.	1.6	5.27	7.14	ľ.		0.34	1.76	_	-	_	_		
Composite Rougher conc.	14.	. 8	.85	21.09	0.48	11.03	0.45	7.35	_	-	-	<b> </b>		
(calc d)										1				1
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	PAGE STATE	and action		,										1
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·			·	-		·					Citation of the Citation of th			
·			NCORTEX											
Heads (calc'd)	100	0 1	1.10	100.00	0.64	100.00	0.90	100.00				_		
Heads (Calc d)	11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1													

REMARKS: As 8(a) + grind for fresh surfaces.

TEST NO 8 (c) SAMPL	E: SPODU	MENE (7	lanco,	Bernic :	Lake, M	lanitoba	1)478 g.	R. fl.	feed	DA	TE: <sub>18</sub> .	June 19	73
OBJECT OF TEST: float	pilot pla	ant cell	Lfeed		Grind			plus 5	min.	f	ARGE:		
					1	mediu	ım Abbé				STED B	Y: K.D	.A
OPERATION	Time %	1 534-1		Jnit _	·	<del>,</del>			ents, lb	per ton			¬
OT ETTATION.	min Sol	ids	•	ısed	L-10	(Ottawa	June ]	L2/73)					
ROUGHER Float 1	2.0 17	7	·		0.4								
2	1.5				0.4								
3	2.0				0.4								
Total	5.5	And a second			1.2		-					_	
			-		-								
The state of the s					-	1 .	, Section 1					_	
					-	1		<u>i</u>					
				······································		-							
CLEANING Float 1	2.0	, and the second			_								
2	1.5		-										-
Total	3.5	<u> </u>											<u> </u>
PRODUCT	WT	% Li2		7 . Na		% K2		% Fe	<del></del>	7 P20	, <i>=</i>	7	1711-2
	%	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.
Cleaning 2 float	47.6	2.29	27.66	0.80	60.19	1.29	70.10	-		-	_		
Cleaning 2 conc.	23.1		26.27		21.14		18.95		-	-	_		
Cleaning 1 conc.	25.8		40.45						_	-	-		
Rougher conc.	3.5	6.34	5.62	0.28	1.55	0.16	0.64	_	_	_	-		
	The state of the s						AL CORPORATE AND A STATE AND A						
•	and the second						aderica .		4				
	A CONTRACTOR OF THE CONTRACTOR									ALL STATES			
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•											,	<u> </u>	
•	Treated in the state of the sta		*				and the						İ
	A Parameter		TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWNS THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE TOWN THE										
	C. Who common		The Breeze			4000					Mary Carlo		
	100.0	3 9/1	100.00	0.63	100.00	0.87	100.00	_		_	_		
Heads (calc'd)	# 100.0 F	1 2.74	570000	, 0.00	TO 2 . CO		, <del>_</del>	•	§ 1			ł	

REMARKS: As 8(a) + grind for fresh surfaces and desliming - washing steps.

. 28 -

TEST NO 8 (d) SAMP	LE: SP	ODUME	NE (2	anco, I	Bernic	Lake, N	anitoba	1) 395 (	g. R. f]	. feed	DA	TE: 18	June 19	73	
OBJECT OF TEST: float	pilot	plant	cell	feed.		Grind	: pilo	t plant	<u> </u>		<u> </u>	ARGE:			
			1			P	lus 5 m	in med	ium Abbé	ents, Ib		TESTED BY: K.D.A.			
OPERATION	Time   mln	% Solids	рH	5	Init sed	L-10	(Ottaw	a June	<del></del>	1011137 113	1,0,101				
ROUGHER Float 1 .	1.5					0.51									
													_		
				_		-							<del></del>		
							·								
														_	
CLEANING None						_								-	
CURWING MODE					<u> </u>										
	Ì								N. Carrier						
PRODUCT	W7	·	Z Li2	O Dist.	Z . Na	120 Dist.	Z K		ASSAV	$20_3$ Dist.	% P <sub>2</sub> ( Assay	, <del></del>	% Assay	Dist.	
	#==								1 22000)		,				
Rougher 1 float + 48 Rougher conc.	15	.7     -5	3.09 5.10			75.17 0.30	1.04 0.50	82.43	-	-	_	-			
+ 150 Rougher conc.	14	.3	5.34	19.24	0.52	12.02	0.51	8.70	-	_		-			
- 150 Rougher conc. Composite Rougher conc. (calc'd)		.5	6.11 5.76				0.39 0.44	8.58 17.58			- -	-			
(caic d)		A COLUMN TO THE PERSON TO THE	j					Tabecturer take		Tagginaces at					
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	Process Day of the	Opula committee of							ar carried and a second	tarque de Colonia					
,	January Company	. A de chartende en commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la commence de la c													
Heads (Calc'd)	100		3.98	100.00	0.62	100.00	0.84	100.00	-			-			

REMARKS: As 8 (a) and 8 (c) effect single addition.

### Tests 9 (a) - 11 inclusive

Sample of holding tank discharge (2nd tank full) was taken on 18 June 1973 at approximately the same time as sample taken for tests 8 (a) to (d). This sample was then dried and saved.

Test samples of 500 gm each were ground in a medium Abbé mill using same conditions as Test 7. Times as indicated.

Screen analyses similar to Test 7 were run on a recombined basis for Test 9 (a), (b) and (c).

Test/grind time mesh	9 (a) <u>% Wt</u>	/60 min. Cum % Wt.	9 (b) % Wt	/90 min. Cum % Wt.	•	)/120 min. Cum % Wt.
+ 48	3.5	G3.5	1.6	1.6	1.0	1.0
+ 65	2.9	Cu <sup>3.5</sup>	0.4	2.0	0.1	1.1
+ 100	7.7	14.1	2,0	4.0	0.3	1.4
+ 150	15.7	29.8	6.7	10.7	2.0	3.4
+ 200	18.4	48.2	15.3	26.0	8.8	12.2
+ 325	18.8	67.0	23.1	49.9	21.5	33.7
- 325	33.0	P-=	50.1	anus,	66.3	***

The magnetic iron was removed with a hard magnet for Test 11 only.

(0.27% wt. mag. Fe).

Size distributions for Tests 10 and 11 should be similar to Test 9 (a).

TEST NO 9(a) SAMPI	E: S	PODUME	NE (I	anco	Bernic :	Lake, M	lanitoba	1) 500g.	hold i	tank dis	DA	TE: 19	June 19	73
OBJECT OF TEST: float								m Abbé			CI-I	ARGE:	6813	
discha	iab. ;	ground	пота	ing tan	.K	GLIM	• media	iii Abbe	111111	JO 111111.	TE	STED E	Y: K.D.	.A.
	<del>^S``</del> Time	%		1	Jnit	. [			Reag	ents, Ib	per ton			
OPERATION		Solids	рН		ısed	L-10	(Ottaw	a June	12/73					
ROUGHER Float 1 .	3.0	20				0.4								
2 .	1.5					0.4								
3	1.0		ļ			0.4			<u> </u>					
Total .	5.5		ļ			1.2								
					<del>,</del>								_	
		1 .			<del></del>	-								
			<u> </u>		<del></del>								-	
	<del></del>				<del> </del>				•					
CLEANING Float 1	2.5													
2	3,0													
Total	5.5	1	<u> </u>											
The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s														
PRODUCT	W	1	% Li2		% Na		% K2		<del></del>	203	Z P20	7 <i>~</i> ~~~~~	7	127
PRODUCT	51	1		O Dist.		120 Dist.	P		% F∈ Asaay			7 <i>~</i> ~~~~~	% Assay	Dist.
	9	6 A	ssay	Dist.	Assaý	Dist.	Assay		Assay			7 <i>~</i> ~~~~~	1	Dist.
PRODUCT Cleaning 2 float Cleaning 2 conc.	51	6 A			Assaý 1.00	Dist. 24.62 16.94	P	31.76 18.03	Assay - -			7 <i>~</i> ~~~~~	1	Dist.
Cleaning 2 float Cleaning 2 conc. Cleaning 1 conc.	9, 15 12 48	.6 A	ssay 2.07 2.04 3.74	8.11 6.25 45.37	1.00 0.88 0.60	Dist. 24.62 16.94 45.75	1.75 1.27 0.76	31.76 18.03 42.73	Assay - -			7 <i>~</i> ~~~~~	1	Dist.
Cleaning 2 float Cleaning 2 conc. Cleaning 1 conc. + 48 Rougher conc.	9, 15, 12, 48, 3	6 A	ssay 2.07 2.04 3.74 5.39	8.11 6.25 45.37 5.45	1.00 0.88 0.60 0.31	Dist. 24.62 16.94 45.75 1.66	1.75 1.27 0.76 0.35	31.76 18.03 42.73 1.38	Assay - - -			7 <i>~</i> ~~~~~	1	Dist.
Cleaning 2 float Cleaning 2 conc. Cleaning 1 conc. + 48 Rougher conc. + 150 Rougher conc.	9, 15 12 48 3	6 A .6 2 .2 2 .2 .4 6 .5 6	2.07 2.04 3.74 5.39 5.91	8.11 6.25 45.37 5.45 23.52	1.00 0.88 0.60 0.31 0.27	Dist.  24.62 16.94 45.75 1.66 5.78	1.75 1.27 0.76 0.35 0.20	31.76 18.03 42.73 1.38 3.15	Assay - - - -		Assay	7 <i>~</i> ~~~~~	1	Dist.
Cleaning 2 float Cleaning 2 conc. Cleaning 1 conc. + 48 Rougher conc. + 150 Rougher conc 150 Rougher conc.	9 15 12 48 3 13 7	6 A .6 2 .2 2 .4 6 .5 6	2.07 2.04 3.74 5.39 5.91 5.22	8.11 6.25 45.37 5.45 23.52 11.30	1.00 0.88 0.60 0.31 0.27 0.46	24.62 16.94 45.75 1.66 5.78 5.25	1.75 1.27 0.76 0.35 0.20 0.35	31.76 18.03 42.73 1.38 3.15 2.95	Asaay - - - - -			7 <i>~</i> ~~~~~	1	Dist.
Cleaning 2 float Cleaning 2 conc. Cleaning 1 conc. + 48 Rougher conc. + 150 Rougher conc 150 Rougher conc. Composite Rougher conc.	9, 15 12 48 3	6 A .6 2 .2 2 .4 6 .5 6	2.07 2.04 3.74 5.39 5.91	8.11 6.25 45.37 5.45 23.52	1.00 0.88 0.60 0.31 0.27	24.62 16.94 45.75 1.66 5.78 5.25	1.75 1.27 0.76 0.35 0.20	31.76 18.03 42.73 1.38 3.15	Asaay - - - - -		Assay	7 <i>~</i> ~~~~~	1	Dist.
Cleaning 2 float Cleaning 2 conc. Cleaning 1 conc. + 48 Rougher conc. + 150 Rougher conc 150 Rougher conc. Composite Rougher conc. (Calc'd)	15 12 48 3 13 7 24	6 A .6 .2 .2 .2 .4 .5 .6 .2 .1 .6	2.07 2.04 3.74 5.39 5.91 5.22	8.11 6.25 45.37 5.45 23.52 11.30	1.00 0.88 0.60 0.31 0.27 0.46	24.62 16.94 45.75 1.66 5.78 5.25	1.75 1.27 0.76 0.35 0.20 0.35	31.76 18.03 42.73 1.38 3.15 2.95	Asaay - - - - -		Assay	7 <i>~</i> ~~~~~	1	Dist.
Cleaning 2 float Cleaning 2 conc. Cleaning 1 conc. + 48 Rougher conc. + 150 Rougher conc 150 Rougher conc. Composite Rougher conc.	15 12 48 3 13 7 24	6 A .6 2 .2 2 .4 6 .5 6	2.07 2.04 3.74 5.39 5.91 5.22	8.11 6.25 45.37 5.45 23.52 11.30	1.00 0.88 0.60 0.31 0.27 0.46	24.62 16.94 45.75 1.66 5.78 5.25	1.75 1.27 0.76 0.35 0.20 0.35	31.76 18.03 42.73 1.38 3.15 2.95	Asaay - - - - -		Assay	7 <i>~</i> ~~~~~	1	Dist.
Cleaning 2 float Cleaning 2 conc. Cleaning 1 conc. + 48 Rougher conc. + 150 Rougher conc 150 Rougher conc. Composite Rougher conc. (Calc'd)	15 12 48 3 13 7 24	6 A .6 .2 .2 .2 .4 .5 .6 .2 .1 .6	2.07 2.04 3.74 5.39 5.91 5.22	8.11 6.25 45.37 5.45 23.52 11.30	1.00 0.88 0.60 0.31 0.27 0.46	24.62 16.94 45.75 1.66 5.78 5.25	1.75 1.27 0.76 0.35 0.20 0.35	31.76 18.03 42.73 1.38 3.15 2.95	Asaay - - - - -		Assay	7 <i>~</i> ~~~~~	1	Dist.
Cleaning 2 float Cleaning 2 conc. Cleaning 1 conc. + 48 Rougher conc. + 150 Rougher conc 150 Rougher conc. Composite Rougher conc. (Calc'd)	15 12 48 3 13 7 24	6 A .6 .2 .2 .2 .4 .5 .6 .2 .1 .6	2.07 2.04 3.74 5.39 5.91 5.22	8.11 6.25 45.37 5.45 23.52 11.30	1.00 0.88 0.60 0.31 0.27 0.46	24.62 16.94 45.75 1.66 5.78 5.25	1.75 1.27 0.76 0.35 0.20 0.35	31.76 18.03 42.73 1.38 3.15 2.95	Asaay - - - - -		Assay	7 <i>~</i> ~~~~~	1	Dist.
Cleaning 2 float Cleaning 2 conc. Cleaning 1 conc. + 48 Rougher conc. + 150 Rougher conc 150 Rougher conc. (Composite Rougher conc. (Calc'd) Decanted slimes (losses)	9, 15, 12, 48, 3, 13, 7, 24,	6 A .6 .2 .2 .2 .4 .5 .2 .1 .8	2.07 2.04 3.74 5.39 5.91 5.22 5.63	8.11 6.25 45.37 5.45 23.52 11.30 40.27	1.00 0.88 0.60 0.31 0.27 0.46 0.33	24.62 16.94 45.75 1.66 5.78 5.25 12.69	1.75 1.27 0.76 0.35 0.20 0.35 0.26	31.76 18.03 42.73 1.38 3.15 2.95 7.48	Asaay		Assay	7 <i>~</i> ~~~~~	1	Dist.
Cleaning 2 float Cleaning 2 conc. Cleaning 1 conc. + 48 Rougher conc. + 150 Rougher conc 150 Rougher conc. Composite Rougher conc. (Calc'd)	15 12 48 3 13 7 24	6 A .6 .2 .2 .2 .4 .5 .2 .1 .8	2.07 2.04 3.74 5.39 5.91 5.22 5.63	8.11 6.25 45.37 5.45 23.52 11.30	1.00 0.88 0.60 0.31 0.27 0.46 0.33	24.62 16.94 45.75 1.66 5.78 5.25	1.75 1.27 0.76 0.35 0.20 0.35 0.26	31.76 18.03 42.73 1.38 3.15 2.95	Asaay		Assay  0.05	7 <i>~</i> ~~~~~	1	Dist.
Cleaning 2 float Cleaning 2 conc. Cleaning 1 conc. + 48 Rougher conc. + 150 Rougher conc 150 Rougher conc. (Composite Rougher conc. (Calc'd) Decanted slimes (losses)	9, 15, 12, 48, 3, 13, 7, 24,	6 A .6 .2 .2 .2 .4 .5 .2 .1 .8	2.07 2.04 3.74 5.39 5.91 5.22 5.63	8.11 6.25 45.37 5.45 23.52 11.30 40.27	1.00 0.88 0.60 0.31 0.27 0.46 0.33	24.62 16.94 45.75 1.66 5.78 5.25 12.69	1.75 1.27 0.76 0.35 0.20 0.35 0.26	31.76 18.03 42.73 1.38 3.15 2.95 7.48	Asaay		Assay  0.05	7 <i>~</i> ~~~~~	1	Dist.

REMARKS: Sample taken at 10:30 June 18/73, holding tank discharge (2nd tank); oven dried (+400 F)

					•			a) 500g.				TE: 19 ARGE:	June 197	73
OBJECT OF TEST: float	lab. g	grind	holdi	ng tank	dis.	Grind	: mediu	m Abbé	mill 9	90 min.	<u> </u>		3Y: K.D.	Δ
	Time	%	7	<del></del>	Jnit	_]			Reag	ents, It	per ton		10.1/	
OPERATION	-	Solids	pH		sed	L-10	(Ottaw	a June	12/73					
ROUGHER Float 1 .	3.0	20				0.4								
. 2	1.5					0.4								
3	1.0				······································	0.4								
Total	5.5		ļ			1.2								
			-		<del>,</del>						<u> </u>			
	······································								t					
														_
CLEANING Float 1	3.0				<del></del>	<del> </del>	<u> </u>				and the last		_	1
2	2.5				<u></u>									- <del> </del>
Total	5.5	·		4										
PRODUCT	W	21	% Li2	0	2 . N		% K		<u> </u>	203	Z P2		78	,
1 NOBOC1	%	A O	ssay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.
Cleaning 2 float	23.	. 4	1.78	9.77	0.94	36.84	1.64	46.96		_	-			
Cleaning 2 conc.	17.		2.38	9.50	0.80	22.80		23.32		-	_	-		
Cleaning 1 conc.	47.		5.44	60.43	0.45	35.71		27.81		1 -	_	-		
+ 48 Rougher conc.	1.		6,08	2.10	0,30	0.74		0.61		_	-	_		
+ 150 Rougher conc.	4.	3 €	7.27	7.08	0.19	•	,	0,46		-	-	1 -		ĺ
- 150 Rougher conc.	6.		7.08	11.13	0.23	2.58	i	0.32		-	<0.01	-	ļ	
Composite Rougher conc	12.	.3	7.02	20.31	0.23	4.64	0.13	1.89			-	-		
(calc'd) Decanted slimes (Losses)	7	4.						***************************************		diam's				
2223300 (20000)	1	THORET E BK							The state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the s	macopor	Ì			ì
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771 (1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	100	.			0.50	700.00	0.01	100.00			et Selection	-		
Heads (calc'd)	100.		4.25	100.00	0.59	100.00	O.ST	100.00	_			<u> </u>	-	
REMARKS: As 9 (a)	4							!		<u> </u>		1		
REMARKS: As 9 (a)										•				

TEST NO 9 (c)   SAMPL	E: SPO	DUMENE (	Panco,	Bernic	Lake, N	anitoba	1)500 g	hold t	ank dis.	DA	TE: 19	June 19	73
OBJECT OF TEST: float 1					<del></del>				120 min	CI-I	ARGE:	6813	
	ab. gre				OI III			<del>.,</del>		TE	STED E	Y: K.D.	A.
OPERATION	rime	% pH		nit ِ	-	<del></del>	<del></del>		ents, lb	per ton		<del></del>	<del></del>
	min S	olids		used	1,-10	COttaw	. June	12/73)					_
ROUGHER Float 1 .	3.5	20			0.4								
	1.5				0.4	-							
	1.0				0.4								_
Total	6.0				1.2	-		<u> </u>					
				<del>,</del>	-	-							
				<del> </del>	-	· -		<del> </del>					
					-l			}					
	3.5				-								
_,	3.0					-							
Total	6.5					<u> </u>		1 977-		[ er 1) /		   %	
PRODUCT	WT %	7 Lig	Dist.	7 . Na		Z K <sub>2</sub> Assay		% Fe	Dist.	Assay		\% Assay	Dist.
	-					<u> </u>							
Cleaning 2 float Cleaning 2 conc.	26.6										_		
Cleaning 1 conc.	47.C	19							_	_	_		
+ 48 Rougher conc.	0.9								<u> </u>	_	-		
+ 150 Rougher conc.	1.5	6.48	2.29			0.12	0.23	_	-	_	-		
- 150 Rougher conc.	7.3	7.08	11.82	0.22			1.17	-	-	-		1	
Composite Rougher conc.	9.7	6.89	15.35	0.22	3.70	0.15	1.77	_	_	<b>–</b>	-		
(calc'd) Decant slimes (losses)	12.2	T Transport	4	And the second second		7E-9274				######################################		and the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of the same of th	
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Heads (calc'd)	100.0	4.39	100.00	- 0.58	100.00	0.81	100.00	-	-	-	_		

REMARKS: As 9 (a)

TEST NO	10	SAME	LE: SP	ODUME	NE (	Tanco,	Bernic	Lake, M	anitoba	i) 500g	hold t	ank dis.	DA'	TE: 21	June 1	973
OBJECT C		\$				<del></del>	· · · · · · · · · · · · · · · · ·					60 min.	CH	ARGE:	6813	
	7 (c) +		and che	ck fo	r tim	ne facto	r.						TES	STED B	Y: K.D	.A.
			Time	%	T	1 1	Jnit	-			Roag	jents, lb	per ton		· · · · · · · · · · · · · · · · · · ·	
OPE	RATION		min		l pH	2	ısed	L-10	(Ottaw	a June	12/73					
ROUGHER	Float	1	4.0	20	i –			0.4			-					
,coouraic	riuat	2	2.0		1			0.4		<u>-</u>	·					
		3	2.0					0.4								
	Total		8.0		1			1.2								
<del></del>	IULAI		0.0		Ì		<del></del>	<del></del>								
· <del></del>					1		<del>,</del>	1								1
					<del> </del>			1	·		<u>-</u>	<del></del>				
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CLEANING					<del> </del>											
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			1				) 77 51		67 77		07 77.	<u></u>	Z P20	<del></del>	7,	
PF	RODUCT		W7 %	12	% Li2		7 . N		% K2	<del> </del>	3		Assay		Assay	Dist
				A	ssay	Dist.	Assay	Dist.	Assay	Dist.	Assay	DISC.	<del> </del>		nasay	10200
Rougher fl	Loat 1 (a	a)	21.	2	1.48	8,42	0.96	30.68		39.54	•	-	0.15	9.73		
_	1 (E		10.	8.8	2.01	5.56	0.90	14,03		14.62		-	0.30	9.49	l	
,	1 (		4.	3.6	2,55	3,38	0.77	5.73	i	8.34		_	0.39	5.88		l
	1 (		2.	. 82	2,49	1.81	0.96	3.93		3.59		_	0.30	2.49		
	2 (a	a)	18.	2.2	3.47	17.47	0.69	19.48		16.92		_	0.46	26.36		
	2 (E	)	9.		4,35	10.91	0.64	9.02		7.80		-	0.52	14.86		
	3 (a	a)	10.	7   .	5.76	16.50	0.49	7.88		5.32		-	0.52	16.97		
	3 (Ŧ	)	6.	9	6.16	11.44	0.36	3.76		2.08		_	0.28	5.93		1
+ 48 Roug	gher cond	2 2	3.	4	6,41	5.81	0.23	1,17			0.08	<u> </u>	0.06	0.62		ł
+ 150 Roug			9.	2	5.96	14.75	0.23	3.20	0.10		0.14	-	0.01	0.28		1
- 150 Roug			2.		6,52		0.33	1.12	0.11	0.29	1.53	_	1.07	7.39		
Composite	Rougher		14.		6.15	24.51	0.25	5.49			0.35		0.19	8.29		
Decanted s		•	3.	8		A-Courage Carlo					MAT WENT COLLEGE	Transfer of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of the contract of th				
Heads (cal	Lc'd)		100.	0	3.73	100.00	0,66	100.00	0.86	100.00	_	-	0.32	100.00		

REMARKS: As 9 (a) + light (one min.) float samples.

TEST NO 11	SAMPL	E: SF	PODUME	NE (T	anco, I	Bernic	Lake, M	anitoba	1) 500	, hold t	ank dis.	DA	TE: 22	June 19	73
OBJECT OF TEST:	time de	epende	encv a	nd th	reshold	level	Grin	d medi	um Abbá	é mill	60 min.	5	ARGE:		
													STED B	Y: K.D	).A.
	-	Tima	%	1	1 (	Init				Reag	ents, Ib	per ton			
OPERATION		1	Solids	pH	<u> </u>	sed	L-10	Ottawa	June	12/73					
ROUGHER	. (	CUM	20					CUM							
Float l	4.0	4.0					0.14	0.14						_	
2	2.0	6.0					0.08	0.20							
3	2.0	8.0		- Charles	200		0.08	0.30	Ç						_
4	2.0 ]	10.0				<del>, , , , , , , , , , , , , , , , , , , </del>	0.12	0.42		Î					
5	1.0 1	1.0		ĺ			0.04	0.46							
		2.0					0.12	0.58							
<u> </u>		3.0					0.08	0.66							
		4.0		1			0,16	0.82							
CLEANING None 9	1.0 ]	5.0		1			0.20	1.02							
110110	_	_		1			0.40	1.42	No ad	ditional	materia	1 recov	rered.		
				1											
		W-	т∥	% Li2	0	% . Na	220	% K2	0	% Fe	203	Z P20	05	%	
PRODUCT		%	13		Dist.		Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.
Rougher float 1		5	5.2	1.91	2,56	1.01	8.12	0.76	5,48	-	_		_		
2		12	3.7	1.53	3.45		15.13		6.41	, ·	_	-	_		
3		11	.2	1.86			16.85		21.94			-	-		
·4			3.1	2.51			15.16		20.29		nathra	-	-		
5			).1 <b> </b>	3.28			8.71		11.20		-	_	-		
6	•		8.0	3.60			8.78		10.03		-	_	-		
/			7.9	4.39	9.00		6.40		7.49			-	_		
0			7.5	5,25 5.88			6.96 5.21		6.90 4.87	4		_	_		
+ 48 Rougher conc.			3.1	6.67		,	0.78		0.17			_			
+ 150 Rougher conc.		41	7	6.62			5.08		3.58	2		_	_		
- 150 Rougher conc.	d.	13	3.1	5.90			2.82		1.64	ě .		_	_		
Composite Rougher c		34	7.9	6.50			8.68		5.39	0.08		<b>-</b>	_		
Heads (calc'd)	,	100	).0	3.87	100.00	0.64	100.00	0,72	100.00	A100-401100			_		
neads (care d).		1					230100	31,2		9					

REMARKS: L-10 added in 0.04 #/T increments (0.5% Solution); iron removed prior to float.

#### Tests 12(a) - 13 inclusive

For each test 2500 ml of pulp was taken; concentrate for 6 Denver No. 7 cells was used for test 12(a) and pilot plant cell feed for 12(b) and 13.

On 25 June 1973 a composite sample of pilot plant cell feed was taken, a screen analysis performed and assays obtained on the fractions. This data should be similar to conditions for tests 12(a) to 13 samples.

M	esh	% Wt.	Cum % Wt.	Li <sub>2</sub> 0	Na <sub>2</sub> 0	к <sub>2</sub> 0
+	48	2.6	2.6	3.17	0.65	1.11
- -	65	10.4	13.0	3.72	0.65	0.95
+	100	10.8	23.8	3,94	0.66	0.99
+	150	18.9	42.7	4.14	0.63	0.80
+	200	17.9	60.6	4.12	0.66	0.84
+	270	8.2	68.8	4.16	0.67	0.90
+	325	9.4	78.2	4.16	0.67	0.89
+	400	2.5	80.7	3.92	0.72	0.95
_	400	19.4		3.88	0.74	0.99

Cyclone and D.S.M. screen closed circuit with 3' x 6' pebble mill.

TEST NO 12(a)	SAME	LE: SP	ODUMENE	(Tanco,	Bernic	Lake, M	anitoba	ı) 339g	Plant c	onc.	DA	TE: 27	June 19	73
OBJECT OF TEST To see if addition	:	oriol m	ould floa	. <del>1-</del>	•	Grin	i: pi	lot pla	nt only	•	1	ARGE:	A: K 1	_,
TO SEE IT AUGILION	lai mat					1			Paga	ents, lb			Y K,I	) <u>. A.</u>
OPERATION		Time	% p		Jnit used			·	Tts au	01115, 10				I
ROUGHER F1	oat 1		12	·		None								
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C( PLATIC			AUGUSTA A						· .				_	
CUEYNING None					· · · · · · · · · · · · · · · · · · ·			<b> </b>				_		
PRODUCT		WT	11		% . N:		% K2		% Fe		% P20		%	1 Tvd
		%	Assa	y Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.
Rougher float 1		55.		52.51	0.63					-	<b></b>	_		
.3		11.		11.86	0.70		0.88 0.97	12.83 4.97		_	_	_		
Rougher conc.		28.	3   5.12	31.45	0.81	32.79	0.86	29.74	-	_	-	_		
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REMARKS: pilot plant conc. (#6 cell); reagent added to mill circuit.

EST NO 12(b) SAM	PLE: SE	PODUMEN	VE (T	anco, l	Bernic	Lake, M	anitoba	1) 440g.	R. fl.	feed	1		une 197	73
DBJECT OF TEST: to	compare	with 1	2(a)			Grind	: pilo	t plant	only.		\$	ARGE:		
												STED E	Y: K.I	).A.
OPERATION	Time	%	pН	P	Init		.,	·	Reage	ents, Ib	per ton			<del></del>
OF ETGATION	min	Solids	,,,,	L L	sed	L-10	(Ottaw	a June	12/73					
ROUGHER Float 1	3.5	16				0.45								
2	3.0					0.45			Ì					
3	2.5			-		0.45								
Total	9.0					1.35	<b>,</b>	9						
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CLEANING None			ļ											_
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PRODUCT	W	11	% Li2		7. N	- 23	7 K2		% Fe	<del></del>	Z P20	, <del>_</del>	%	-1-2
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Rougher float 1	22.	/ 3	.19	16.94	0.85	27.03	1.45	34.20	_	_	_	_		
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3	27.	27	.79	31.52				22.50		-	-	_		
Rougher conc.	9.	5 📗 5	.10	11.48	0.90	12.13	0.90	8.99	-	-	-	_		
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## MINES BRANCH FLOTATION TEST REPORT

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TEST NO 13	<del></del>	LE: S	robumi	EME (	anco,	Bernic :						· · · · · · · · · · · · · · · · · · ·	CI-I	ARGE:	June 19 6813	٠
OBJECT OF T		nroco	nt to	forri	a iron		Grind	: pilot	: plant	grind	onTA		<u>}</u>	<del></del>	Y: K.D	Α.
COUVELC LELL	Jus II on II	,	<del></del>	76111			_}			Roa	gents,	Un ne				
OPERA"	TION	Time min	% Solid	pH		Jnit used	L-io	Ottawa	June		~			hypoch	nlørite	<u> </u>
ROUGHER F	 loat 1 .	_	≈ <sub>15</sub>	,			0.4				20 т					
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REMARKS: Nothing floated - killed everything with excess sodium hypochlorite.

Test 14

A 500 gm sample of holding tank discharge (2nd tank full) was ground for 60 min in medium Abbé mill as per Test 9(a) conditions.

No screen analysis performed.

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### MINES BRANCH FLOTATION TEST REPORT

TEST NO 14 SAN	IPLE: S	PODUME	NE (T	anco,	Bernic	Lake, M	anitob	a) 500g	hold t	ank di	s.	DAT	E: 27	June 1	973
OBJECT OF TEST: eff					<del></del>	:	: mediu					CHA	RGE:	6813	
						St. in Car							TED B	Y: K.	D.A
OPERATION	Time	3	Ha		Jnit	·	<del></del>	·	<del></del>	gents,		7	<del></del>		<del></del>
OT EXAMINITY	mln	Solids		1	usød	L-10	(Ottaw	a June	12/73	ferro	ıs sul	prate	e solut	ion	
ROUGHER Float 1 .	2.5	20				0.4			·		nown	ļ			
2.	2.0					0.4				(pre	pared	by Jo	ohn Amb	1¢r)	
3	1.5	1	<u> </u>	,		0.4						<u> </u>			
Total_	6.0					1.2						ļ			
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	ll w	T II	% Li2(	)	7 . Na	120	% K	·O	ZF	e203	7	P <sub>2</sub> 0	<del></del> 5	%	<del></del>
PRODUCT	9	62		Dist.		Dist.			Assay	Dist	. As	say	Dist.	Assay	Dist.
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	100	ALIGNAPH CO		•									•		
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Rodgiter Frod 2	1.		_	_		_	-	_	_	-		_	_		
3	0.	7	-	· <u>-</u>	_	_		_	-	-		-	-		
Rougher conc.	95.0	0	-	-,		-	_	_	_			-	_		
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	3 8	58	ş		3 3				<b>f</b> .	g.	1	ý.			Ţ

REMARKS: very little floated, no assays, probably excess ferrous iron present.

#### Test 15

A  $500~\mathrm{gm}$  sample of dried pilot plant cell feed from  $26~\mathrm{June}$   $1973~\mathrm{was}$  used with no additional grinding.

Screen analysis was not performed but size distribution should be similar to Test 12(a) to 13.

EST NO 15 SAMI	PLE: S	PODUMEI	NE (T	anco,	Bernic	2				R.fl. f	eed DA	ARGE:	June 19 6813	973
BUECT OF TEST: to fi	loat dr	ied pil	lot pi	lant fe	ed.	Grind	l: pilo	ot plant	t only.		1		Y: F.A	. & K.D
	Time	%		· 1	Jnit	.			Reag	ents, lb	per ton			
OPERATION	£	Solids	рН		ısød	L-10	(Ottav	a June	12/73					
ROUGHER Float 1 .	3.0	20				0.4								
2 .	2.0					0.4	<u> </u>							
Total	5.0	<u> </u>				0.8	<b></b>							
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CLEANING									200					
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PRODUCT	W	15	% Li2		% . N		7 K		% Fe		Z P20		7%	1737-2
		6 A	ssa.y	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.
Rougher float 1	_	- 2	.78	<del></del>	_	-	_	_	·	_	<b>!</b> -	_		
2	-	-    4	.79	. <u>-</u>	-	<b>!</b> –	_	<b>-</b> .	_	_	_	<b> </b>		
Rougher conc.		- 🏥 5	.29	_	0.51	<b>!</b> —	0.36	_	1 -	_	-	-		
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	11	53						n	5	■ **				
	Shedden and Shedden	a land light and the land to t	ŧ.					all the state of t	Transfer of the second	T)				

REMARKS: feed - R. fl. feed. 3:00 P.M. June 26/73 assays Li<sub>2</sub>0 - 3.84, Na<sub>2</sub>0 0.71, K<sub>2</sub>0 1.11

#### Tests 16 - 17 inclusive

For test 16 a bucket of holding tank discharge was collected and bubbled with compressed air overnight. The liquid was decanted in the morning and a 600-gm sample was weighed for flotation feed.

A similar 600-gm sample was used for test 17, but with no aeration. No screen analysis performed.

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### MINES BRANCH FLOTATION TEST REPORT

TEST NO 16 SAN	IPLE: S	PODUMENE	(Tanco	Bernic	Lake, N	[anitob	a) 600-e	wet ho	1d tank	dis DA	TE: 28	June 1	973
OBJECT OF TEST:			•		Grind	: mediu	m Abbé i	mill 6	0 min.	ļ	ARGE:		
float aerated wet hold		<del></del>	ge								STED E	Y:F.A.	& K. D.
OPERATION	Time	%	pH !	Unit used	•	7	j		ents, lb	per ton			
	min	Solids				(Ottaw	a June	<u> 12/73)                                    </u>		_			+
ROUGHER Float 1 .	3.0	≈ 20	·		0.4								
2	2.0	<del>  -</del>		<del></del>	0.4							-	
<u>3</u>	1.5			-	0.4	-							
Total	6.5				1.2							_	
				<del> </del>		1							
		1.											
										497			
						1							
CLEANING Float 1	4.25					<u> </u>							
2	3.0					<u> </u>							_
Total	7,25					<u> </u>							
PRODUCT	W	11	120	7 . N		% K		ZFe	<del></del>	Z P20		7	Dist.
	9/	• Ass	ay Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	DISC.
Cleaning 2 float	13.	V S				5	35.07	-	-	-	-		
Cleaning 2 conc.	12.						20.02	9	_	-	-		
Cleaning 1 conc. + 48 Rougher conc.	48. 4.						40.27		-	_	_		
+ 150 Rougher conc.	18.		•				3.46	5					
- 150 Rougher conc.	3.						0.66		_	_	-		
Composite Rougher conc.			2	*			4.64	-		<u>-</u>	_		
(calc			1										
	1	TOTAL DE A	recovered to the second	Se arrocker	6		a week		N. C.		į	ł	
•	ESPERATE I		4										
•	A CONTRACTOR CONTRACTO			1									
	Name of the last o												
	Sherry val.	- Particular and the second											
	jj			1	100:00				į į				-
Heads (calc'd).	100.	0 1 4.4	1   100.0	0, 0.56	100.00	0.75	100.00		! - [	_	-		1

REMARKS: Holding tank discharge bubbled with air (wet) overnight, decanted liquid and cut 600-gm sample.

TEST NO 17 SA OBJECT OF TEST: flo	MPLE: S					•			mil1 6		CH	ARGE:	6813	
08020. 020 110	at wet 11	·	cank	draciia		OL HIL	· meara	m Mooc	meet 0	· · · · · · · · · · · · · · · · · · ·	TE	STED B	Y: F.A	1.
OPERATION	Time	%	Hg		Jnit			·	Reag	ents, lb	per ton			
OPERATION	mln	Solids	ρ.,		ised	L-10	(Ottaw	a June	12/73					
ROUGHER Float 1	. 3.0	≈ 20		·		0.4		·			1			
2 .	1.5			The state of the s		0.4								_
3	1.5					0.4	ļ							
Total	6.0			-		1.2								
					<del>,</del>		1							
					<del></del>	-								-
			<u>.</u>									<del> </del>	_	+-
		1	· · · · · ·	_	······································		-				_			-
CLEANING None			<del></del>											
									9					
			······································											
55555107	l w	T   9	L12	0	% . Na	<u> 120</u>	% K2	20	% Fe	203	Z P2	05	%	
PRODUCT	9	6 As	say	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist
Rougher float 1	41			19.06				60.87		-	-	_		
	27		.39 .39	30.81	0.63 0.57		0.64 0.51	24.50 14.05		_	<u> </u>	_		
Rougher conc.	10		.74	17.87	0.37	3.0	0.04	0.58		_	_	_		
		A.C.							***					
			4											
		The second												
		O. C.	Î						į					ļ
			and the state of t	•						7				
1 (0.1.11)	- Andrews			100.00	0.50	100.0	0.70			•		1		
Heads (Calc'd)	1100	.00   3	.96	T00.00	0,62	T00.0	0.72	100.00	_	-	_	-		
	Chargo ya	. The state of the	W. P. P. P. C. C.					The state of the s	- Augustan					
٠.	And of Care	P. CONCERNIA	with						Salthe on					
		Haran .	1			Š			Ì					

Appendix B

#### Tests 115-2 to 115-5 and 115-9 to 115-10 inclusive.

These tests show that as the amount of soluble ferrous sulphate is increased, the Li<sub>2</sub>O grade decreases (Figure 4). Therefore the presence of minor amounts of soluble iron is probably detrimental to the grade.

It is also interesting to note that the ratio of plus 150-mesh material to minus 150-mesh material in the concentrates is higher in the better-grade concentrates.

TEST NO 115-2 SA	MPLE	: SPODU	MENE (	Tanco,	Bernic	Lake, 1	lanitob	a) MPD 7	3/12		DA	TE: 11	June 1	973
OBJECT OF TEST: Re	verse	flotati	on of s	podumer	ıė	Grind	mediu	ım Abbé	mill 30	min.	<u></u>	ARGE:		
							· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·			STED E	Y: P.	R.I.
OPERATION	ı	me / %			Jnit used			<del></del>	<del></del>	ents, lb	per ton	<del></del>		<del>.</del>
		ıln Sol	ds		usec	<u>L-10</u>	/(Ottaw	<u>a Marc</u>	h. 28/7	3)			_	-
ROUGHER Float 1		.0 2	0			0.4	-		·					
2		.0				0.4	ļ							
3		.Θ				0.4	ļ						[	
Total Total	8	.0			· · · · · · · · · · · · · · · · · · ·	1.2	-							
					<del>.</del>									
		1		Company of the Compan			<del>                                     </del>							-
			1			1	1							
									·					
CLEANING Float 1	5	.5			<u> </u>									
2		.5	, j				ļ							
Total	10													
PRODUCT		WT	% Liz	<u> </u>	Z.N		Z K2		% Fe		Z P2		%	-,
		%	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist
Cleaning 2 float		13.6	2.26	5,81	1.48	26.38	1.39	52.33	. —		— —	_	į	
Cleaning 2 conc.		21.4		15.17		31.69		21.33	_	_	-	-		
Cleaning 1 conc.		43.1	6.12		•	33.89	f .	20.28	-	-	-	-		
Rougher conc.		21.9	7.04	29.15	0.28	8.04	0.10	6.06	_	-	_	_		
		**************************************						and the same of th	Č.		į			
		77779888	,			Carrier Carrie		-						
		A CONTRACTOR OF THE PROPERTY O												
Heads (calc'd)	,	100.0	5.28	100.00	0.76	100.00	0.36	100.00	-	-	_	-		
	en presente	C.C.C.										ļ		
	. stranger				• •									
•	on on the	de Character			·	WEST-STATE OF THE STATE OF THE								
	1	The state of the s												
		ACT CONTRACTOR												
•	1							1						1

REMARKS: Fagergren all speed 1930 rpm.

# 50 -

TEST NO 115-3 SA	MPLE	: SPODU	MENE (	ranco,	Bernic.	Lake, M	anitob	a) MPD 7	73/12			TE: 16		973
OBJECT OF TEST: Ef	fect o	f solubl	e ferr	ous sul	.phate	Grin	d: AS	115-2			<u> </u>	ARGE:		
												STED E	3Y: P.R	<u>L., </u>
OPERATION	9	me %	1 57		Jnit _	.	7	<del>;</del>		gents, lb				
		in Soli	dsl		teoq	=-	(Ottav	a June	12/73	ferrous	sulpha	te		
ROUGHER Float 1	. 3	.0 20				0.4				0.1				
2		.0		!		0.4								
3		.0		-		0.4	ļ							
Total	10	<u>.0  </u>	·			1.2								
					<del>,,</del>		ļ	ļ						
		<del></del>				<del>- </del>	<del> </del>					<del></del>		
							<del></del>	}		<del></del>				
			<u>t</u>		<del> </del>						<del></del>		_	
CLEANING Float 1	5	.5				<del> </del>								
2	<del>}</del>	.0			·	_	<del> </del>							
	<del></del> }	. 5	<u> </u>				1							
		wr II	% Li <sub>2</sub>	<u> </u>	7 . N	a 2 O	7 K	20	7 17	= <del></del>	7 P2	),-	1 %	
PRODUCT		%				Dist.			<u> </u>	Dist.	5	Dist.	1	Dist.
Cleaning 2 float		6.6	2.01	2.87	1.24	12 22	3,76	46.76	0.4	0 17.53				
Cleaning 2 conc.	THE CONTRACT	12.1	2.42	6.34				26.22		3 10.44		_		
Cleaning 1 conc.	. September 1	54.1	4.24	49.64				24.46		))	2	_		
+150 Rougher conc.	- Created		6.78		0.18	x a	0.06	-	0.0		<b>—</b>	_		
-150 Rougher conc.		-	6.57	1	0.56		0.08		0.4	•	<del>-</del>	-	Í	
Rougher conc.	and and a	27.2	6.99	41.15	0.20	8.12	0.05	2.56	0.1	8 32.51		-		
		Sweethers												
		TRIS THE												
	STATE OF THE PARTY							And September 1	en de la company	e e e e e e e e e e e e e e e e e e e				
Heads (calc'd)	. !!]	100.0	4.62	100.00	.0.66	100.00	0.53	100.00	0.1	5 100.00	_	_		
,	of the state of th	- There					0133	200.00	,	200,00				
	M. S. C.	the carry of												
	and the state of t	and the second	1											
٠.	Table of the state	. Action and the state of the s	·		. 9									1
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# · 51 -

TEST NO 115-4 SAMI	Lake, M	anitoba	1) MOD 7	2712		DA	DATE: 16 July 1973								
OF TECT	·····		2212			1		<u></u>	CH	CHARGE: 6813					
AS 1	.15-3					AS	115-2		TE	TESTED BY: P.R.L.					
05.55.55.611	Time	%		, ,	Jnit				per ton						
OPERATION	i	Solid	s	31-11		L-10	Ottawa	June 1	2/73)		fur	cous su	<u>Lphate</u>	1	
ROUGHER Float 1 .	4.0	20				0.4				3	1	. 0			
2	4.0					0.4									
3	5.0	<u> </u>				0.4									
Total	13.0	<u> </u>	_		<del></del>	1.2			n n					<u> </u>	
		(A)		-								_			
		<u> </u>	<u> </u>	w cumany											
CLEANING Float 1	5.0	-	<del></del>			<del>                                     </del>									
2	4.0	-			<u>.</u>								- <del></del>	_	
Total	9.0	1	1		,										
		, T	% Li2	0	7.N	220	% K2	0	% Fe	209	7 P2	05	78		
PRODUCT	21	!		Dist.	Assaý		Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	
Cleaning 2 float		8.8	2.03	4.03	1.49	19.13	3.82	60.65	0.51	26,43	-	_			
Cleaning 2 conc.		8.6	1.83					16.76	0.16			-			
Cleaning 1 conc.	2	21.2]	2.40	¥		31.55		12.62	0.09		, T	_			
+150 Rougher conc.	Tabulari.	. —	5.18	2	0.23	-	0.06	_	0.09		_	_			
-150 Rougher conc.	100	- 1	6.12		0.50	25.00	0.11	0.07	0.16		-	-		1	
Rougher conc.		51.4	5.84	80.93	0.29	25.98	0.09	9.97	0.15	54.23		-			
•	No make the	A. i percentage						# p t t t t t t t t t t t t t t t t t t							
		THE WASTER	,	Christian				PA DASIG							
Heads (calc'd)	1	0.0	/. /.2	100.00	.0.60	100.00	0.55	100 00	0.16	100.00	CALLES TO SECOND				
neads (care d)			4.43	1.00.00	0.00	700.00	0.00	HOO.00	0.10	TOO.00	inequ				
•	A COLLEGE	4. C.						NAC LANGE CONTRACTOR C			Condition				
	Ħ	- College		The second					THE PERSON NAMED IN COLUMN NAM		ace pro-				
	18													t	
		- Control of the Cont	•			·									

TEST NO 115-5 SAME	LE: SP	ODUMENE	(Tanco,	Bernic	Lake, N	anitob	a) MPD 7	DA	DATE: 17 July 1973					
	115-3	**************************************		•	AS 1			CH.	CHARGE: 6813					
AS .					A WO T	13-2		TES	TESTED BY:P.R.L.					
	Time	%		Unit				Reag	enis. Ib	per ton				
OPERATION .	i i	Solids	<u> </u>	ısed	J.=10	(Ottaw	a June	12/73		fer	rous_sı	lphate		
ROUGHER Float 1 .	4.0	20		·	0.4						5			
2	3.0			,	0.4									
3	4.0	<u> </u>	-		0.4		700							
Total	11.0				1.2	4								
<u> </u>				-,		ļ								
**************************************	<b></b>					<del> </del>					<del> </del>			
	<del> </del>	·	·	<u> </u>	_	1	<del></del>						-	
	<u> </u>	SVA POTE		_ <del></del>		<b> </b>	<b></b>	. 1					-	
CLEANING Float 1	5.0													
2	4.0									ĺ				
Total	9.0													
	WT	% L	% Li <sub>2</sub> 0		7. Na20		20	% Fe	203	Z P20		78		
PRODUCT	%	Assa	y Dist.	Assaý	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist	
Cleaning 2 float	1 77	2 05	F 0F	1 /0	0, 60	2 00			10.01					
Cleaning 2 conc	11.6		5.25 7.01	Ŕ	24.69 32.49		66.33 17.54		18.81	-	_		ļ	
Cleaning 1 conc.	36.1		33.23		32.36	ī.	12.76		12.73	4				
+150 Rougher conc.	-	6.85	-	0.16	-	0.03		0.08	12./5	_	_			
-150 Rougher conc.	- 1	6.87	i -	0.42	] -	0.07	-	0.25	_	_	_			
Rougher conc.	.36.4		54.52		10.47	ž.	3.37		62.22	_	_			
•	Address design				e day.				· ·				ļ	
	200	Table of the control	o paracida		4		1							
Heads (calc'd)	100.0	00 4.52	100.00	0.69	100.00	Q.53	100.00	0.22	100.00	-	-			
•	Wall Comment	144	C. C. C. C. C. C. C. C. C. C. C. C. C. C		Kalenton Kalenton									
•	Caraca News				uri accina	٠.			N. Carlo					
	Control of the Contro	. Constitution of the cons	TOWNS .		riberrange en en en en en en en en en en en en en				Cardwin and Cardwi					
	one de la constante de la cons	NA STANSON	***************************************				Control of the Contro							
٠.	HALL SPORTS	e and the second					The Children		A TANK OF THE PARTY OF THE PART					
REMARKS:	-4		•		<b>*</b>	<u> </u>	<del> </del>		4/					

# 53 '-

TEST NO 115-9   SAME	Lake, M	anitoba	a) MPD 7:		DATE: 23 July 1973										
OBJECT OF TEST:	***************************************				•	c <sub>p</sub>			CH	CHARGE: 6813					
AS	115-3				:	AS.	115-2		TE	STED E	Y: P.R.	L.			
	Time	%		, i	Init	.			Roag	ents, Ib	per ton				
OPERATION	1 1	Solids	рH	บรอด		L-10	(Ottaw	a June	12/73		fer	rous s	sulphate	2	
ROUGHER Float 1 .	4.0	20				0.4				•	1.	5			
2 ·	4.0	al esta				0.4			antite.						
3	3.0			-		0.4									
4	2.0														
Total	13.0					1.2			977.5						
							ļ								
						-		-							
	ļ		<u></u>			<del>- </del>		-						-	
CURANTNO					<del></del>										
CLEANING Float 1	4.0													<del>- </del>	
2 Total	3.5 7.5		<del> </del>											-	
Total	<u> </u>				- BT	0	97 17		7 Fe		る P20		   7		
PRODUCT	W7 %	11	% Li <sub>2</sub> 0 Assay Dist.		7. N.		% K2			Dist.	<u></u>		Assay	Trist	
		AS	say	Diar.	Assay	ه ۱۵ خاله	ASSAY	DISC.	ASSEY	101361	2133119	3200,	1		
Cleaning 2 float	13.	3 2	.35	6:66	1.38	33.95	2.39	72.02	0.33	37.84	_	_			
Cleaning 2 conc.	7.		.26	3.66		17.99		8.09		7.21		_			
Cleaning 1 conc.	11.		.37	5.71	0.91	19.02		8.45	0.08	7.79	_	-		Ì	
Rougher Float 4	1.		.77	0.89		2.05		0.92		1.42	_	-			
+150 Rougher conc.	-    -		.09		0.13	-	0.07	- 1	0.04	-	-	_			
-150 Rougher conc.	i -		.93	_	0.38	-	0.09	- 1	0.10	_	<b>-</b> .	-	ļ		
Rougher conc.	66.	.3   5	.88	83.09	0.22	26.98	0.07	10.52	0.08	45.73	-	-			
•	A CONTRACTOR OF THE CONTRACTOR	A POST	. 407	·. :											
·	1	- Marchael	Lesson	•											
		77-PAGG -	R. Carlotte												
Heads (Calc'd)	100.	0. 4	.69 þ	100.00	0.54	100.00	0.44	100.00	0.11	100.00	_	_			
		- Charles de la constante de l		_											
		A Principal of the Control of the Co	***************************************			-									
	5.6	<b>f</b> }	ę	1		1		; 9		3 8			1		

TEST NO 115-10   SAMPE	LE: SP	ODUMEN	E (Ta	inco, l	Bernic	Lake, M	anitoba	a) MPD 7	DA	DATE: 24 July 1973								
OBJECT OF TEST:	115-3			·		- T	AS 115-2						CHARGE: 6813					
. Alo		·		,		AS	113-2			STED E	Y: P.R	.L.						
OPERATION	Time	%	pH	9	Init		<del></del>	<del></del>		ents, lb	<del></del>	<del></del> ;	1	<del></del> -				
Year	<u>i</u>	Solids		ļu	isod ————	<u>  L-10</u>	(Ottaw	a June	12/73)			us suc	lokate					
ROUGHER Float 1	4.0	20		<u> </u>		0.4	<u> </u>		·		2.0	<u> </u>						
2	4.0		<del></del>			10.4				<del></del>				-				
3 4	3.0			-		0.4							_					
	2.0			-					E.4					_				
Total	13.0	Jan Jan Jan Jan Jan Jan Jan Jan Jan Jan		1	<del>, </del>	1.2	1				<u>i</u>							
A Para Para Para Para Para Para Para Par							· ·							<u> </u>				
			•			<u> </u>												
							ļ		0.00									
CLEANING Float 1	4.0			4														
2	3.5								1148									
Total	7.5								, j					<u> </u>				
PRODUCT	WT	12	% L120				% K2		% Fe <sub>2</sub> O <sub>3</sub>		Z P <sub>2</sub> 0 <sub>5</sub>		%	.,				
	%	As	say D	ist.	Assaý	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.	Assay	Dist.				
Cleaning 2 float	10.	0 2	. 53	5.30	1.32	23.72	2.84	64.35	0,43	31.49	_	_						
Cleaning 2 conc.	3.		.56	2.09						6.57	_	_	Microsoft Control of C					
Cleaning 1 conc.	5.	4 .2.	. 58	2.92	1.69	16.40	0.62	7.59	0.21	8.31	_	-						
Rougher float 4	1.		.05	0.51				n i		3	-	<b>!</b> –						
+150 Rougher conc.	<b>li</b> –		.53	. –	0.18		0.09	_	0.03	-	_	<u> </u>						
-150 Rougher conc. Rougher conc.	79.		.79 .35	- 89.17	0.49	t P	0.14	19.81	0.08	52:40	_	_						
Rougher conc.	/9•	.ر ا	, JJ	09.17	0.51	44.20	0.11	19.01	0.09	J2.40	_							
•	**************************************	3.4	and the second	· State														
•	II GOOK		III	. 9														
	N.C. PROCESS	and beginning .	4					·	,		·							
	n nyang	. Parkenta	containe				•											
		Participation HANGESTON	Constant							Anapara								
	100.	0 4 4.	.77 🖁 1	L00.00	0.55	100.00	0.44	100.00	0.13	100.00				Į				
Heads (Ca1c'd)	11 -00.		· [		į	1		i i	!	1				Į.				

Recovery