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To: JOHN HUGHES

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KILBORN

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September 22, 1987

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Panour Inc.
Royal Trust Tower
Suite 1902
Toronto-Dominion Centre
Toronto, Ontario
M5K 1N1

Attention: Mrs. Diane Webb,
Administrative Assistant to the Chairman

Reference: Metallurgical Reviews & Future Testwork

Dear Diane:

We are enclosing a very brief review of metallurgical testwork carried out by the various laboratories on Vangorda, Grum and Cirque ores. Also included is recommended future testwork that should be carried out to prepare for maximum economic exploitation of these ore bodies to coincide with long range production plans.

It does not appear at this juncture that specific serious metallurgical problems will surface in the treatment of Vangorda ores, although it is imperative that the metallurgy must be optimized.

There is an apparent contradiction between the previous pilot plant work on Grum by Kerr Addison in 1977 and the bench scale work that was done in 1982 at Kamloops. The contradiction involves the percentage of difficult to treat ores as estimated by Dr. Carson of Noranda and the Anvil exploration office. Dr. Carson estimated that there would be less than 5 percent of the difficult ore while the Anvil people estimated 86 percent difficult ores.

For the above reasons we have recommended that an experienced base metal metallurgist such as Dick Coleman (formerly of Noranda) be retained to sort out these problems and establish the metallurgy to be attained on the Grum ores.

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The testwork carried out on the Cirque ores established that satisfactory lead and zinc metallurgy is achievable although lead concentrate grades are low because of mineralogical problems. Recovery of silver to lead concentrate is generally poor and is due to the multiphase distribution and submicroscopic occurrence of the silver. Future testwork must concentrate on recovery of silver and optimization of lead and zinc metallurgy.

Considerable laboratory testwork is being carried out in the Faro laboratories. We would recommend that a monthly summary of all metallurgical testwork be forwarded to the Curragh Toronto office for filing in the library.

Yours very truly,

KILBORN LIMITED

L.S. Bates

L.S. Bates, P.Eng.
Senior Metallurgical Consultant

cc: Marvin Pelley	- Curragh, Toronto	(w/encl)
Kurt Forgaard	- Curragh, Whitehorse	(w/encl)
Bill Scheduling	- Curragh, Faro	(w/encl)
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LSE/tm

METALLOGICAL REVIEW OF VANGORDA

GRIM AND CIRQUE TESTWORK

REVIEW OF VANGORDA METALLURGY

The most significant testwork was carried out at Kamloops Research and Assay Laboratory (KRAL) during the period 1979, 1980 and 1982.

K.R.A.L. Report KM050 File V-6 summarizes the results of the work done during this period on the three major ore types G, E, & A.

Following is the predicted metallurgical results by ore type:

Ore Type Concentrates	Assays						% Distribution			
	Pb	Zn	Au	Ag	Hg	Cu	Pb	Zn	Au	Ag
G	55	--	2.0	800	93	0.02	84	--	45	75
	--	52	0.5	65	360	0.01	--	85	--	--
E	50	--	5.5	485	45	0.03	78	--	40	50
	--	50	1.9	65	167	0.01	--	82	--	--
A	45	--	3.0	500	27	0.70	83	--	25	65
	--	51	0.8	45	198	0.16	--	83	--	--

The above results were achieved using in general the standard reagent pattern and flowsheet in effect in 1981-1982 in the Anvil Concentrator. The mercury and arsenic assays used above in g/tonne are taken from locked cycle tests reported in KRAL Report KM050.

Recommended Future Testwork

Since the re-opening of the Faro Concentrator by Curragh, improvements have been made in the metallurgical treatment of the Faro ores. These improvements must be translated into predicted performance of the concentrator when treating Vangorda ores. To do this an intensive program of Faro laboratory testwork must be carried out as samples of the Vangorda ore become available.

In Addition, testwork should be carried out at Lakefield Research to:

1. Maximize grade and recovery of lead and zinc from all types of ore.
2. Maximize recovery of gold and silver from all types of ore.
3. Establish the mercury content of all zinc concentrates, with specific attention to G type ore.

Previous mercury contents reported in concentrates are open to suspicion due to reported problems in chemical analysis. If these chemical analysis problems have been overcome, it would be prudent to have the Kamloops laboratory re-assay the concentrates produced in 1980-1982 if these samples are still retained by that laboratory.

REVIEW OF GRUM METALLURGY

Extensive testwork was carried out at Lakefield during 1975 to 1977 on Grum ores. The Grum deposit was then owned by Noranda. Twelve ore types were tested by Lakefield, general overall metallurgical parameters were established by bench scale testing and a bulk sample from underground at Grum was piloted at Lakefield. This bulk sample was predominantly main sulphide zone ore and was not truly representative of all ore types.

The Noranda Milling Committee in their report G-29, December 1977 acknowledged the overall non-representative nature of the bulk sample, but on the basis of bench scale studies of all ore types the committee predicted the metallurgical response of the massive sulphide and average composite of Grum ores to be as follows:

Ore Type Concentrate	Assays						% Distribution			
	Pb	Zn	AU	Ag	Hg	As	Pb	Zn	AU	Ag
Massive Sulphide	62	10	4.4	840	--	--	77	--	33	72
	2.5	56	--	--	--	--	--	81	--	--
Average	62	8	4.7	870	90	0.1	80	--	33	72
	2.0	56	--	--	650	<0.1	--	84	--	--

The Lakefield work confirmed the microscopic work of Dr. Carson of Noranda, which indicated that a very fine grind was required to liberate the contained minerals. The regrind feed to both lead and zinc circuits must be 95 percent passing 20 micrometers for the lead circuit and 85-90 percent passing 20 micrometers for the zinc circuit.

In Dr. Carson's report (G-5) "Geological and Mineralogical Investigation of the Metallurgy of the Grum Orebody, 1977" it is concluded that "the main metallurgical problems encountered with Grum ores are oxidation and galena-sphalerite middlings. Both probably occur in serious proportions in only a small portion (<5%) of the orebody. (oxidation causes metal losses to the tailings; galena-sphalerite middlings result in zinc contamination of lead concentrates)." The ores classified as "B"-type ores by Dr. Carson have both strong oxidation and serious middling problems.

Drill core from the 1981 drilling program at Grum was categorized by the Anvil exploration department into the four major ore types G, E and DC and A and metallurgical testwork was carried out by K.R.A.L. and reported in (G-4) KMO60 in May, 1982. According to Greg Jilsen of the Curragh Whitehorse Office, - The "B"-type ores classified by Dr. Carson are equivalent to the BCD and A types of the Anvil classification. Furthermore it is estimated by Mr. Jilsen that these types of ores constitute 45 to 50 percent of the Grum open pit reserves.

The K.R.A.L. report concludes that it is extremely difficult to produce saleable grade concentrates from the bulk of the Grum ores tested. Acceptable metallurgy was achieved on E type ore only and this type ore is estimated by KRAL to be only 12 percent of the total open pit reserves.

The type A ore tested by KRAL and estimated to contain 41 percent of the open pit reserves is described as a banded quartzite with graphite and sulphides sandwiched between quartz layers. The metallurgical response on this ore was completely negative at KRAL.

Recommended Future Testwork

In spite of the apparent success of the Kerr Addison pilot plant and mineralogical evaluation of the entire Grum ore body, it appears that serious metallurgical problems still require resolution. It is recommended that an experienced base metal metallurgist such as Dick Coleman, formerly of Noranda, be immediately retained by Curragh to direct the attack on this apparently very serious problem with Grum ores. It is also recommended that Lakefield Research be used for the metallurgical and mineralogical testwork.

CIRQUE METALLURGY

As a result of testwork carried out on the two types of Cirque ore by KRAL, and Sachtleben of Germany, the predicted metallurgical performance to be expected at Cirque is as follows:

<u>Ore Type</u>	<u>Assays</u>		<u>% Distribution</u>	
	<u>Pb</u>	<u>Zn</u>	<u>Pb</u>	<u>Zn</u>
High Barite	60	--	70	--
	--	57	--	90
Low Barite	45	--	70	--
	--	56	--	85

The silver contents of the two types of ores are in the order of 36 g per tonne for high barite and 73 g per tonne for low barite. The distribution of the silver in products is approximately 8 percent to lead concentrate, 37 percent to zinc concentrate and the remaining 55 percent in tailings.

A pyrite flotation will recover most of the tailings silver in a concentrate. Leaching testwork on the pyrite concentrate yielded only 10-20% extraction of total silver. Leaching of a roasted pyrite concentrate yielded 27-35% extraction of total silver. Autoclave leaching of a pyrite concentrate yielded up to 95.5 percent of the contained silver.

Recommended Future Testwork

Bench scale testwork should be done on Cirque ores to optimize reagent suites to be used, the compatibility of the two ores should be determined by test work and a pilot test campaign should be initiated. All of the above should be started as soon as samples become available.

Silver recovery studies should be carried out to optimize recovery of this metal.

Studies should also be initiated on production of suitable barite concentrates for sale as drilling mud or for chemical grade application.

The Lakefield facilities should be used for all of the above testwork.

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October 19, 1987

Famour Inc.
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Suite 1902
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Attention: Mrs. Diane Webb
Administrative Assistant to the Chairman

Reference: Grum Metallurgy

Dear Diane:

We are enclosing a letter report by Mr. R.L. Coleman, Consultant, Mineral Processing, concerning the above subject.

It is quite evident that the metallurgical testwork carried out at Kamloops in 1982 on Grum deposit samples is of little or no value. First of all, 70 percent of the material tested was below the 4 percent cut-off grade in Pb + Zn and should be classed as waste. Secondly it is not clear that the samples treated were refrigerated up to the time that testwork was carried out. If not, serious oxidation of the high sulphide samples could occur, adversely affecting the metallurgical response.

The most meaningful work on Grum samples was carried out by Lakesfield and Dr. Carson of Noranda. This work indicated that there should be no difficulty in producing satisfactory concentrate grades and recoveries on material grading greater than 4 percent combined lead zinc.

Existing concerns relative to Grum ore metallurgy appears to be confined to the A type ores which are graphitic quartzite ores. Greg Jilsen of Curragh has advised Kilborn that all existing geological data on Grum has been re-examined and Type A ores constitute 45 to 50 percent of the Grum open pit reserves.

Dr. Carson's reference to graphite is as follows: "Graphite does not appear to be a problem within the massive sulphide ores. It could, however, present problems locally due to hanging wall dilution or dilution from graphitic phyllite lenses within the quartz - sericite - chlorite ores (P ores)". Dr. Carson estimates that 45 percent of the Grum open pit reserves are P type ores.

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Faro metallurgy is adversely affected when treating type A ores, and to date Faro mill personnel have succeeded in attaining acceptable metallurgy by blending. This would appear to be an impractical approach in treatment of Grum ore unless a much improved treatment scheme is developed for the high percentage of A ores which must be treated.

Greg Jilsen also advises that galena-sphalerite mineralization in A type ores is coarse grained and should not require fine grinding for liberation. This is contrary to the approach taken by Kamloops. Dr. Carson also states that most galena and most sphalerite occur in coarse grains in P type ores.

After due consideration of all of the above comments the following immediate action is recommended:

1. The current drilling program at Grum should be concentrated on obtaining metallurgical samples especially of A type ore.
2. All diamond drill core selected for metallurgical testing must be refrigerated until testwork is initiated. (This also applies to core from Vangorda.)
3. The major metallurgical testwork effort should be done at Lakefield Research. Local testwork can also be done but it is unlikely that the facilities and personnel are available at Faro for a concerted attack. Most of Faro's effort must be concentrated on current metallurgical control.

Yours very truly,

KILBORN LIMITED



L.S. Bates, P.Eng.
Senior Metallurgical Consultant

LSE/tm

cc: Marvin Pelley	- Curragh, Toronto	(w/encl)
Kurt Forgaard	- Curragh, Whitehorse	(w/encl)
Bill Scheduling	- Curragh, Faro	(w/encl)
Jack Mitchell	- Kilborn, Toronto	(w/encl)

October 13, 1987

Mr. L.S. Bates
Senior Metallurgical Consultant
Kilborn Limited
2200 Lake Shore Blvd. West
Toronto, Ontario
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Reference: Metallurgy of Grum Deposit

Dear Mr. Bates:

I have reviewed the available mineralogical and metallurgical reports from your files on the Grum deposit. The most significant reports appear to be a report by Dr. Carson of Noranda Exploration (G5), a summary of a Lakefield Research pilot plant testing (G29) and a Metallurgical Response of Grum Ore by Kamloops Research and Assay Laboratory (G4). Comments on these reports (having made some study of others on file) are summarized below:

Doctor Carson visited the Grum site, had extensive discussions with the resident geologists, studied the geology, explored the underground works, took numerous samples and conducted mineralogical analyses. He had been asked to do so because there were a number of puzzling factors detected in the metallurgical research by Lakefield research. As a result of his work representative bulk samples from the deposit could be selected for a pilot plant test at Lakefield.

Dave Carson detected that the deposit was highly disrupted by folding and faulting. In general the mineralization is relatively fine grained although perhaps not as fine as that of a similar deposit at Brunswick. Fine intergrowths of galena and sphalerite and clean pyrite were evident. There were zones of strong oxidation amounting to approximately 3% of the total and zones of extreme fine grained structure again amounting to 5% of total. His consultations with the metallurgical research people permitted them to develop and predict favourable mineral processing techniques for 88 to 92% of the deposit.

The early Lakefield (and Mattagami) metallurgical research ran into considerable difficulty but after Dr. Carson got involved the results showed favourably. The laboratory results did not always predict or confirm the successful pilot plant tests. This was probably due to sample oxidation, scale of operation, circulating loads, improper grind, reagent concentration, etc. - all factors which are recognized problems in the laboratory.

The significant Lakefield pilot plant tests were conducted on material with average grades of 5.7% Pb and 9.8% Zn - only one of 12 types tested (G4) assayed low at 1.49% Pb and 3.4% Zn. The results of these pilot plant tests were studied and predictions made by a Noranda milling committee. Metallurgical results for average ores should be:

	<u>Analyses</u>						<u>Recoveries</u>			
	<u>Au</u>	<u>Ag</u>	<u>Pb</u>	<u>Zn</u>	<u>Hg</u>	<u>As</u>	<u>Au</u>	<u>Ag</u>	<u>Pb</u>	<u>Zn</u>
Mill Feed	.025	2	4	8	100	0.3				
Lead Conc.	.15	28	62	8	90	0.1	33	72	80	
Zinc Conc.			2.0	56	650	<0.1				84
Tailings			0.7	1.0						

The Kamloops research was conducted much later than the Lakefield and would appear to have been done on quite different material. Their work was done on 4 different materials which showed average results as shown below:

Kamloops Results

<u>Percent of Deposit</u>	<u>Ore Type</u>	<u>Head% *</u>		<u>Concentrate %</u>		<u>Tailing % *</u>		<u>Recovery %</u>	
		<u>Pb</u>	<u>Zn</u>	<u>Pb</u>	<u>Zn</u>	<u>Pb</u>	<u>Zn</u>	<u>Pb</u>	<u>Zn</u>
12	G	4.6	7.0	55	58	0.2	0.3	87	80
		6.3	9.1			0.6	1.0		
16	E	1.6	2.6	42	50	0.3	0.7	80	69
		5.4	6.6			0.6	1.6		
29	DC	1.2	1.7	26	38	.16	1.1	83	77
41	A	1.4	2.1	25	51	0.20	0.45	77	72

*Range

My comments and comparisons of the presented reports are shown below:

1. The close association and consultation of the mineralogist, the research personnel and the operating metallurgists as depicted in the Lakefield pilot plant work was highly rewarding.
2. The two research groups appear to have done tests on quite different zones of the deposit.
3. All involved indicate fine grinding, fine regrinding, delicate reagent balance, and oxidation; close control will be required for satisfactory results.

4. Research on material grading greater than 4% combined lead zinc should yield satisfactory concentrate grades and metal recoveries.
5. Both laboratory groups show similar tailing assays for similar head analyses material.
6. The Kamloops work was not as complete as the Lakefield programs.
7. 70% of the Kamloops research was conducted on material of less than 4% combined Pb Zn and this material showed the poorest results. Is this ore?
8. The Kamloops report mentions crushing of samples preparatory to laboratory testing. The significance of this comment arises as to when it was done and the time delay involved. With this type of high sulphide ore no crushing should be done prior to the actual tests and/or the crushed product should be refrigerated until used.

Similarly diamond drill core possibly should be refrigerated if it is to be used for metallurgical research.

9. Along similar veins all the Lakefield research was conducted with this refrigeration in mind. In addition the bulk samples for the pilot plant were shipped in plastic lined, sealed drums without crushing, and mixing only occurred as required for production.
10. In the various research reports available the possible use of a lime circuit instead of a soda ash-lime circuit was suggested. In past research and operation with this combination of reagents on similar ores the tests have shown favourable reactions on lead and on zinc in the laboratory and in the field at first. However with time and the use of recycle solutions in practice the metallurgy depreciated drastically. Thus any additional research recommended should be aware of these potential effects.
11. There appears to be some differences of opinion between geological, mineable and millable mineral inventory or reserves. Selective mining may be a strong prerequisite.

Thank you for asking for my comments.

Yours very truly,



R.L. Coleman,
Consultant
Mineral Processing

RLC/tm