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AUG 28 1978 *Grum 14*

Copy to - W. James.



The Ralph M. Parsons Company
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FILE

August 25, 1978

Kerr Addison Mines Limited
P. O. Box 91 - Commerce Court West
Toronto, Ontario M5L 1C7, Canada

ATTENTION of Mr. John K. Carrington
Project Manager, Grum Joint Venture

SUBJECT CLEAR Process Tests *re Grum*

Gentlemen:

Following the receipt of individual lead and zinc concentrates samples from Kerr Addison's Grum Project, a bulk concentrate was prepared for bench scale tests by Duval Corporation to permit a rough preliminary evaluation of the CLEAR technology to be made.

Should the ratios of the mix vary appreciably from actual conditions a new flowsheet can be prepared to accommodate the difference. However, it is believed that this material may be treated by the CLEAR Process directly from the ore after grinding without the need for fine grinding and flotation concentration. If this proves to be the case it could result in increased metal recoveries with significant reductions in plant capital costs and continuing maintenance expenses once in operation.

We understand a sample of representative ore has been forwarded to Duval and should this prove amenable to treatment a further report will be prepared and forwarded to you of these test results.

DESCRIPTION OF PROCESS AND TEST WORK

The CLEAR Process of Duval Corporation is a pollution-free hydrometallurgical method of recovering metals from concentrates. Sulphide concentrates can be treated by the Process using methods that avoid the necessity of roasting. Consequently, there is no production of sulfur dioxide. All impurities are recovered as solids and the Process is entirely pollution-free. An additional advantage of the Process is the ability to recover more than one metal from a concentrate containing a mixture of metallic minerals.

*8/29/78
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M.*

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RESULTS

The bulk concentrate sample prepared by Duval Corporation for bench testing had the following analysis and the test work indicated that recoveries close to those listed below can be achieved:

<u>Product</u>	<u>Assay %</u>	<u>Recovery %</u>
Zinc	39.59	99
Lead	18.00	99 ✓
Copper	0.30	71
Cadmium	400ppm	99
Iron	7.00	35
Silver	300ppm	97
Sulfur	29.05	5
Other	5.99	--

All products are produced as refined metals of high purity. Iron is recovered in the form of iron powder, and a part of the sulfur content of the sulphide minerals can be recovered in the form of potassium sulphate -- a product that can be sold as fertilizer. Liquid chlorine is also obtained from the Process as a by-product and it too is marketable.

COST ESTIMATES AND REVENUES

The basis of these estimates assumes a CLEAR plant capable of producing 100 metric tons per day of special high grade zinc. This will require the daily treatment of 255 metric tons of the prepared bulk concentrate. In practice it would be possible to choose other production rates consistent with mining and marketing objectives.

Assuming the assays and recoveries tabulated above, the following metals should be produced, and their annual values at today's market prices will be:-

<u>Product</u>	<u>MTD</u>	<u>*Price(U.S.\$/Lb)</u>	<u>Dollars (U.S.)/Year</u>
Zinc	100.0	\$0.305	\$24,543,000
Lead	45.474	0.31	11,344,000
Copper	0.543	0.63	275,000
Cadmium	0.101	2.25	183,000
Iron	6.252	0.21	1,056,000 —
Silver	0.074	5.22/Tr.Oz.	4,555,000
Chlorine	8.197	0.0675	445,000 —
Potassium Sulfate	20.148	0.102	<u>1,654,000 —</u>
Total Annual Revenue			\$44,055,000

* Source: American Metal Market and The Wall Street Journal

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The approximate capital cost for a completed plant of this size will be in the order of \$33,000,000. This cost includes all materials handling equipment, buildings, casting equipment, and in-plant facilities for a complete CLEAR Process plant. Construction labor, supervision, material costs, equipment costs, etc., are based on average figures from present day experience in the Southwestern area of the United States.

+ includes concentrating facilities - crushing, grinding, flotation

Not included are such items as land costs, off-site facilities, taxes, amortization, contingency, escalation, etc., or any indirect costs which will vary depending on plant location and which should be based on actual conditions.

The estimated annual operating costs are expected to approximate \$13,000,000 based on present day United States prices for operating labor, supervision, reagents, fuel, etc., with power being charged at \$0.025 (U.S.) per kilowatt hour.

Not included in the operating costs are overhead, indirect operating costs, sales charges, taxes, etc., which will vary from location to location.

ENVIRONMENT

The test work conducted confirmed a very important feature of the CLEAR Process - namely, the absence of any form of air or water pollution. Concentrates can be fed in, refined products are produced for sales, inert residue is stock-piled and all other substances are contained in a closed circuit involving regeneration and reuse.

RECOMMENDATIONS

Since this test work has been restricted to one prepared sample and the results obtained are representative of laboratory scale test procedures, it should be pointed out that although the recoveries obtained are encouraging it will be advisable to perform additional laboratory testing, followed by adequate pilot plant testing more closely simulating continuous daily operating conditions prior to contemplating major capital investments.

Such small scale pilot plant testing will provide much of the essential design criteria necessary to engineer and scale-up to a production plant; it would also provide a convenient training center for supervisors and operators and ultimately would become the means for testing process refinements and plant improvements for the commercial sized facility.

We recommend after your review of this report, a visit to Tucson, Arizona, to see both the operating commercial plant and research laboratory facilities, after which it would be possible to discuss your needs with those Duval executives concerned.

Tests being done now on straight ore sample.

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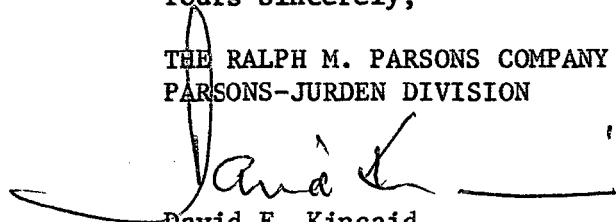
It will be necessary to sign a disclosure agreement prior to visiting the Duval facilities and PARSONS will be most happy to arrange these visits on your behalf and to provide, at the appropriate time, more detailed estimates for your use in obtaining management and financing approvals.

We have appreciated this opportunity to be of service and we look forward to extending our cooperation to you in further exploring the possible application of the CLEAR Process to your needs.

With kindest regards.

Yours sincerely,

THE RALPH M. PARSONS COMPANY
PARSONS-JURDEN DIVISION

A handwritten signature in cursive script, appearing to read "David E. Kincaid", is written over a horizontal line. The signature is positioned above the typed name and title.

David E. Kincaid
Vice President

DEK:ms