

RIO ALGOM CORPORATION

Lisbon Mine

LaSal Route
MOAB, UTAH 84532

July 16, 1982

40-8084

PDR-RETURN

TO-396-55

Phone: (801) 259-5904

040080841605

Mr. Harry Pettengill, Section Leader
Operating Facilities Section II
Uranium Recovery Licensing Branch
Division of Waste Management
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Pettengill:

Earlier this year I discussed the possibility of recovering U₃O₈ from a product emanating from Allied Chemical's Metropolis plant. It appeared to us to be a good alternate source of U₃O₈ in addition to the raw ore that we hoist from the underground.

At the time of my conversation with you, it was felt that all that was needed was a letter from us to explain how we would add this material to the process.

I have attached a number of letters and tables that deal with the material and its possible effect on the plant.

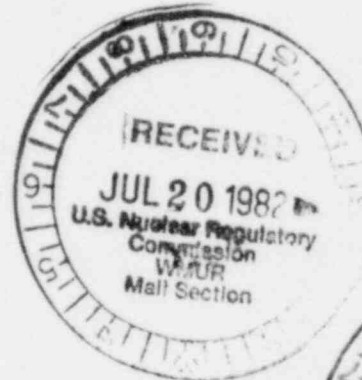
The material is shipped to us by truck in similar barrels to those we use for trucking our concentrate. The material is fine enough to be added to our circuit downstream of both the crushing and grinding sections.

We maintain a pool of mill solution and filter slurry in the "sump" on the sloping floor under the filter section. The drums of F660 solids will be handled in this "sump". Approximately 5 to 10 drum-loads per shift will be slurried at this position in a manner that will minimize all possibility of dry dust escaping into the mill atmosphere.

The slurry will be pumped together with the regular slurry in this sump to the 80 ft. thickener that is situated outside the North wall of the mill building.

There will be no change in our process, chemicals used or operating procedures other than the movement of the drums into and out of the mill and the slurrying of the material.

This action would take place inside the structure of the mill by mill operators and would, therefore, be



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Info only

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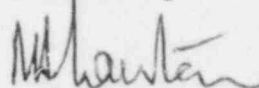
Mr. Harry Pettengill
July 16, 1982
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"monitored" for radiation protection to the same level as all other mill operations.

We would very much appreciate an early reply so we can start moving this material, an operation that would be of benefit to ourselves, Allied Chemical and the country, in that a waste product is being recycled.

Yours very sincerely,



M. D. Lawton
Manager

MDL:jem
Enclosures

cc: File

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**Allied
Chemical**

P.O. Box 430
Metropolis, Illinois 62960
(618) 524-2111

cc K. Heston
N. Madushe
R. A. Henson

0400 8084 1603

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June 29, 1982



Mr. Mervyn D. Lawton
Manager, Lisbon Mine
President, Rio Algom Corporation
Lisbon Mine
LaSal Route
Moab, Utah 84532

Dear Mr. Lawton:

Attached is a condensed version of the information collected when Larry Bruce and I were at the mill in June. You may wish to use part or all of this information in your letter to Mr. Pettengill.

A truckload shipment of this material would be available for delivery to your location upon Nuclear Regulatory Commission approval and upon your request.

If you need assistance or we can be of any help to you, please don't hesitate to call. We will look forward to hearing from you.

Yours very truly,

A handwritten signature in cursive script that reads "M. L. Shepherd".

M. L. Shepherd
Manager-Process Technology

MLS:mt

Attachment

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An  ALLIED Company

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RECOVERY OF URANIUM FROM ALLIED CHEMICAL SOLID WASTE

It is economically feasible and environmentally safe for the Rio Algom uranium mill to recover residual uranium from solid materials currently being disposed of at commercial low level waste disposal sites. This action will produce several environmentally attractive results including:

1. The recovery and recycle of approximately 3,000 pounds of uranium annually, which otherwise would have been produced by additional mining and milling.
2. A reduction of approximately 28,000 cubic feet in the annual volume of low level waste currently being disposed of at the three remaining waste disposal sites.

The Rio Algom mill will receive the dry solid material in 55-gallon drums from the Allied Chemical plant in Metropolis, Illinois via "sole use" vehicles. The drums will be emptied at the mill site by slurrying the material with in-process liquor. The slurried material will enter the mill process at the thickener, downstream of the ball mill circuit. Approximately 10,000 pounds per day of Allied material will be processed through the normal mill circuit. No significant changes are required in the mill process to include this material in normal operations.

Laboratory tests indicate approximately 50% of the uranium contained in the Allied material can be recovered by the existing mill process. The remaining uranium, Radium, Thorium and chemical impurities will discharge into the tailings pond. The calculated impact for the tailings pond is shown in Table I. The maximum increase anticipated for any of the impurities is about 14.5% for Sodium and Th^{230} . This increase is not considered

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significant considering the large quantities of tailings material currently generated at the mill. The Allied material also contains some fluoride which may be dissolved in the milling circuit. Based on the proposed feed rate of 10,000 pounds per day, approximately 3.2 pounds per day of fluoride could be dissolved. This dissolution would produce a calculated concentration of 5 ppm F^- in the tailings pond water; however, the Lisbon ore currently processed at the mill is a high calcium carbonate ore (10-30% $CaCO_3$). It is therefore expected that the soluble fluoride will be precipitated as insoluble CaF_2 . This will result in a minimal impact from soluble fluorides.

TABLE I

ANNUAL AVERAGE IMPURITY CONCENTRATIONS IN TAILINGS POND

<u>IMPURITY</u>	<u>WITHOUT ALLIED MATERIAL</u>	<u>WITH ALLIED MATERIAL</u>
Sodium	0.55%	0.63%
Potassium	0.54%	0.54%
Aluminum	0.70%	0.77%
Iron	0.70%	0.74%
Magnesium	0.70%	0.71%
Titanium	0.10%	0.10%
Manganese	0.09%	0.10%
Lead	0.02%	0.025%
Uranium (Nat.) (Note 1)	80.5 pci/gm	85.9 pci/gm
Ra ²²⁶ * (Note 2)	1150 pci/gm	1161 pci/gm
Th ²³⁰ (Note 2)	1149 pci/gm	1318 pci/gm

Note (1) Based upon processing ore containing 0.2% U₃O₈, and recovery of 50% of the uranium in Allied material.

Note (2) Calculated from measured concentrations of Ra²²⁶ and Th²³⁰ in Rio Algom ore concentrates and assuming the remainder discharges to tailings pond.

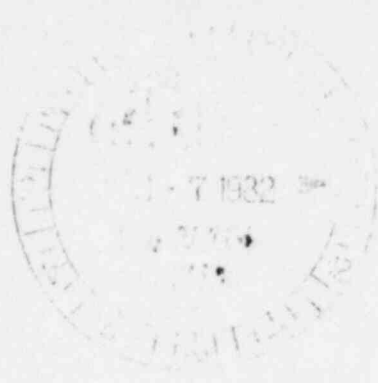


Allied
Chemical

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Chemicals Company
P. O. Box 430
Metropolis, Illinois 62960
(618) 524-2111

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Allied Chemical
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June 2, 1982

Mr. Nello Modesto
Lisbon Mine
LaSal Route
Moab, Utah 84532

Dear Mr. Modesto:

Reference: F-660 Shipments to Rio Algom

We have contacted Mr. Bill Nixon of NRC Licensing and Mr. Harry Pettengill of Mill Licensing. Both agree that our shipment of F-660 solids to you will have a minimal radiological impact.

Mr. Pettengill would like to have a letter from you stating how you would bring this material into the process and the details as to how it may be necessary to change the process; chemicals, raw materials, operating parameters etc.* He indicated that at this time a letter may be all that is necessary.

Mr. Pettengill would also like to have additional information on chemical impurities that may be supplied by our material. I would think a copy of the analysis that I gave to you on my trip would be sufficient.

I have attached an additional copy of the impurity information. Also, I have attached a copy of our radiological evaluation. Other internal correspondence are attached.

If you feel that you need some additional help on preparing such a letter please contact me.

Sincerely,

Marshall Shepherd
Manager - Process Technology

bjs

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F-660 MATERIAL IMPURITY ANALYSISImpurity Analysis

	<u>Percent</u>
U	0.22
V ₂ O ₅	0.09
PO ₄	0.10
Cl	0.015
Mo	0.01
SO ₄	0.14
Fe	4.03
As	<0.02
CO ₃	0.57
Na	8.71
K	0.48
Ti	0.18
Zr	<0.002
Mg	1.19

General Qualitative Analysis

	<u>Percent</u>
Al	~8.0
Mn	1.0
Pb	0.6
Si	0.6
Sr	0.3
Ni	0.2
Cu	0.1
Cr	0.04
Ag	0.04
Ca	>10 Major Constituent

Leach Analysis For Fluoride

A slurry containing 20% F-660 solids in 10% Na₂CO₃ and 1.5% NaHCO₃ was stirred for 3 hours at 185°F. The material was filtered and the filtrate was analyzed for fluorides. The results were as follows:

Soluble Fluoride = 1100 ppm = 0.11%

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ISOTOPIC ANALYSIS

<u>Sample</u>	<u>Spectrum Number</u>	<u>Sample Weight</u>	<u>Date Analyzed</u>
A	7	3.0	7-10-78
B	8	3.0	7-10-78

ISOTOPEuc/g

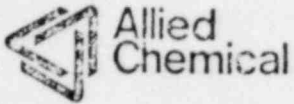
	<u>A</u>	<u>B</u>
U ²³⁵	1.0 E ⁻⁴	1.7 E ⁻⁴
Th ²³⁴	7.1 E ⁻⁴	7.1 E ⁻⁴
Th ²²⁸	<4.5 E ⁻⁴	4.9 E ⁻³
Pa ^{234M}	<3.2 E ⁻³	3.2 E ⁻³
Th ²³¹	<8.4 E ⁻⁵	9.1 E ⁻⁴
Pb ²¹⁴	3.5 E ⁻⁴	5.7 E ⁻⁴
Bi ²¹⁴	2.7 E ⁻⁴	4.4 E ⁻⁴
Pb ²¹²	5.4 E ⁻⁴	5.9 E ⁻⁴
Bi ²¹²	5.6 E ⁻⁴	5.7 E ⁻⁴
Pa ²³¹	2.9 E ⁻⁵	4.9 E ⁻⁵
Th ²³⁰	1.1 E ⁻¹	1.0 E ⁻¹
Ac ²²⁸	7.4 E ⁻⁵	<5.0 E ⁻⁵
Th ²⁰⁸	2.0 E ⁻⁴	2.3 E ⁻⁴

Samples A and B were thirty day composites collected during periods ending 9-5-77 and 10-3-77.

The average surface activity of this material is 3 to 4 mr/hr, and the exposure rate at one meter average 0.5 to 0.8 mr/hr.

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MEMORANDUM

DATE: June 2, 1982

SUBJECT: Rio Algom Recovery of U in F-660 Solids

TO: Mr. M. L. Shepherd

I have discussed the subject proposal with our NRC Licensing Supervisor (Mr. Bill Nixon), and Mr. Charles Peck of Region III, I and E. They see no problem with our proposal, in fact, they encourage re-cycle of recoverable materials.

I contacted Harry Pettengill, Section Leader for Mill Licensing (Ph. (301) 427-4644) today to explain our proposal. He suggested the following:

1. Rio Algom should notify him in writing of the proposal. An evaluation should be made in the letter of:
 - A. Mill process changes (if any) which may be required to process our material.
 - B. What chemical or isotopic impurities will be added to the existing tailings pond feed. He is interested in such things as fluoride, arsenic etc. which could seep from their pond into ground water as a result of processing our material.
2. He indicated permission had been previously granted for similar proposals at other mills, and depending on the potential impacts of items (A) and (B) above, license amendment for the Rio mill may not be required.

A handwritten signature in cursive script that reads 'R. W. Yates'.

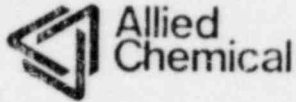
R. W. Yates
Health Physicist

bs

cc: Mr. A. J. Cipolla
Mr. J. E. Honey
Mr. H. C. Roberts

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Allied
Chemical

MEMORANDUM

DATE: May 26, 1982

SUBJECT: Impact of U Recovery Solids on Rio Algom Tailings Pond

TO: Mr. M. L. Shepherd

I have evaluated the potential impact which might occur by shipping our entire annual production (1500 NT) of uranium recovery solids to the Rio Algom mill for their recovery of the uranium contents. My evaluation is based on information from reference sources and our laboratory analyses of uranium, radium, and thorium content of their "yellow cake" product as follows:

1. The Rio Algom mill processes 500 NT/day of ore containing about 0.20% U_3O_8 (0.17% U). The alkaline leach milling circuit is about 93% efficient for recovery of uranium.
2. Our laboratory has analyzed five (5) different lots of Rio Algom product during the period of 1976 through 1979 (See Table I) and found an average concentration of 78.72% U, 516 pci/gm Ra^{226} , and 882 pci/gm Th^{230} .

Using these data we can construct a general materials balance for the mill which indicates:

- A. The ore feed to the mill will contain $5.22 E^{11}$ pci of uranium/day. Most ore bodies contain Ra^{226} and Th^{230} at, or near secular equilibrium. Therefore, the feed would also contain $5.22 E^{11}$ pci each of Ra^{226} and Th^{230} .
- B. Essentially all of the 500 NT/day of solid feed is deposited as slimes and sands in the tailings pond. The solids are slurried with water, and re-cycled mill liquors to form the slurry which is pumped to the pond. This results in essentially all of the radioactivity being deposited in the pond, or in the yellowcake product.
- C. Based upon our analysis of Ra^{226} and Th^{230} in the product, 99.92% of the Ra^{226} and 99.86% of the Th^{230} would go to the tailings pond.

The additional mill processing of our material would account for only 3 days per year of their normal production rate. The additional processing of our material would slightly increase the total radioactivity

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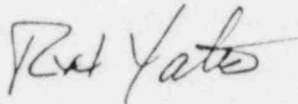
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May 26, 1982

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concentration going into the tailings pond as shown in Table II. The calculated concentration after addition of Allied material is based on our analysis of the uranium recovery solids shown in Table III. The addition of our material would produce less than a 1% increase in uranium and Ra²²⁶ concentration, and less than a 15% increase in the Th²³⁰ concentration in tailings. This is not significant considering the insolubility of the material and the large quantities of tailings currently being generated at the mill.



R. W. Yates
Health Physicist

bjs

cc: Mr. A. J. Cipolla
Mr. J. E. Honey
Mr. H. C. Roberts

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TABLE I

Analysis of Rio Algom Ore Concentrate Product

<u>Date</u>	<u>Lot Number</u>	<u>% U</u>	<u>Ra²²⁶ (pci/gm)</u>	<u>Th²³⁰ (pci/gm)</u>
1976	133	78.53	450	230
1977	145	77.01	790	1800
1977	159	78.64	359	1330
1978	185	79.09	680	637
1979	209	80.34	303	412
Average (5)		78.72	516	882

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Table II

Annual Average Concentration of U (Nat.)

Ra²²⁶, and Th²³⁰ to Tailings Pond

<u>Isotope</u>	<u>Without Allied Material</u>	<u>With Allied Material</u>
U-Natural (pci/gm)	80.5	81.3
Ra ²²⁶ (pci/gm)	1150	1160.7
Th ²³⁰ (pci/gm)	1149	1318

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Table III

Isotopic Content of Allied Chemical

Uranium Recovery Solids

<u>Isotope</u>	<u>Content (pci/gm)</u>
U Natural	1400
Ra ²²⁶	1300
Th ²³⁰	24000

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