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R. L. Kirk, Director, Production Division

May 27, 1953

S. H. Brown, Chief, Process Development Branch, Production Division

WASTE RESIDUE PROGRAM

SYMBOL: PP:AJB:ms

MATERIALS-13 Uv.

This memorandum presents the current status of the Waste Residue Program and advises that a comprehensive sampling program will be conducted on the raffinate cake (AM-7) at St. Louis to accurately determine its uranium content estimated now at about 150,000 lbs. of U₃O₈. Also, permission is requested to initiate informal discussions with representatives of the General Service Administration for the purpose of securing preliminary information on the potential realizations possible from the by-product cobalt, nickel and copper which would be produced in a Waste Residue Recovery Plant.

Our memorandum of May 20, 1953 presented the results of the detailed sampling program which was conducted on the waste residue materials at LOOW and Haist last winter. These data demonstrated that there is appreciably less uranium in these materials than is indicated by S/F records. The difference is sufficient to have a marked effect on waste residue recovery processing economics. It is not possible to determine from the information available what proportion of this difference is a true loss as a result of weathering and what proportion is a "paper" loss. Our preliminary indication of recovery costs, the relative importance of AM-7 and the possibility of weathering losses in its storage make it mandatory that we confirm the uranium content of AM-7 by direct physical inventory methods. The LOOW and Haist data show that a number of the residues contain economically important amounts of cobalt, nickel and copper which may be expected to share the economic burden of uranium recovery.

Since March 1, 1953 the Chemical Construction Corporation, under Contract AT(3001)-1485, has been conducting a development program and engineering studies with the objective of establishing a process for uranium recovery from the various Waste Residues which would be economically and technically sound. Developments to date strongly indicate that, a technically attractive process is being established. This process involves leaching the residues under elevated temperature and pressure (about 450°F and 450 psig) with sulfuric acid. The filtered leach liquor may be precipitated in a number of ways to give a good grade uranium product and marketable copper, cobalt and nickel by-products. Preliminary cost estimates (assuming book value

of ~~AM-7~~ for uranium content) given verbally to Mr. Beyer by Mr. Dasher, Project Engineer for Chemico, indicate costs including transportation

PERIODIC REVIEW
FINAL DETERMINATION
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By: S.H. Brown
Date: 5-10-54

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and amortization, of \$12 to \$25 per lb. of U₃O₈ depending upon the extent of by-product realization. The following tabulation presents our present picture relative to the Waste Residues at the three sites:

	U ₃ O ₈ (pounds)	Co (pounds)	Ni (pounds)	Cu (pounds)
Loonance in case	80000	18825	181024	72431
Haist other cases	18000	19125	100741	41679
St. Louis (AM-7)	44275	22350	148269	550
Total	142275	60300	430034	118660

- NYCO records - possibly low
- Using S/F value for AM-7 through May 1, 1955

On the basis of a cost of \$25 per lb. of U₃O₈ at 87% overall recovery, the gross cost of this project including capital transportation and operating expense will be approximately \$5,750,000. From this gross may be deducted by-product credits for cobalt, nickel and copper. These might possibly be as high as \$3,000,000.

The breakdown is as follows:

Capital Costs	\$2,000,000
Freight and Reclaiming @ \$9.50/wet ton	890,000
Processing Costs @ \$57.00/dry ton	<u>2,860,000</u>
Gross Cost	\$5,750,000

Plant Capacity - 67 dry tons per day - 3 year life
 U₃O₈ produced @ 87% recovery - 280,000 pounds

Due to the lesser amounts of uranium in the Haist and LOON residues the St. Louis AM-7 material has become increasingly important in the waste residue picture. Therefore, in view of our experience with the Haist and LOON residues relative to their uranium content we believe a detailed sampling program must be conducted on AM-7. This has not been done previously because of the conditions which we recognized would be encountered due to the non-homogeneity of the material and the random manner in which it is piled. Despite these problems we must confirm by systematic sampling the uranium content of this material. In addition, the sampling program will provide reliable information relative to the cobalt, nickel and copper content of this material; this is important relative to the economics of a Waste Residue Recovery Plant. In view of Mr. R. S. Brief's experience in sampling the LOON and Haist materials, we plan to assign him this task for the time required to complete a careful sampling program estimated at two weeks. We will initiate the necessary action for arrangements with St. Louis for this sampling work and with NBL for the necessary analytical services.

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We estimate that the cost of the sampling program, including Brief's salary and travelling expenses, the wages of AEC personnel employed at the Robertson Site, tools and sample containers, will not exceed \$2,500. Costs for the NBL analysis should not exceed \$2,000. These costs are believed to be in proper balance with the estimated project costs.

The cobalt, nickel and copper will be recovered, we expect, as two products - a copper oxide and a mixed cobalt-nickel oxide. It is our expectation that these materials can most practically be sold to GSA for stockpile. Since in some cases, these metals are the property of African Metals and in other cases of the Commission, arrangements will eventually be required for equitable compensation to African Metals for their portion of these metals. We might mention that African Metals has expressed approval in principle to an arrangement where they would "share" cost of an operation in which we recovered the uranium and they recovered the elements which they owned. As a first step to setting up such arrangements and to establishing sound estimates of our uranium recovery costs in this undertaking, we request permission for Mr. A. J. Beyer to contact GSA personnel to explore the amount of compensation we could expect in the sale of the copper oxide and cobalt-nickel oxide products. With this information at hand, we would be in a position to initiate exploratory talks with African Metals and to calculate more reliable costs for the Waste Residue operation with respect to by-product credit.

CC: S. H. Brown *nk*