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SUMMARY REPORT

on the

RADIOACTIVE BLACK SANDS IN MALLOY AND VOWELL CREEKS

BUGABOO AREA

British Columbia

Vancouver, B.C.

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J. Black, Ph.D., P.Eng.

Consulting Geologist

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INTRODUCTION

The property and its history has been described briefly in a summary report during 1974. The material in that report is not repeated here.

Since that time a mineralogical study has been made and concentrates produced by Hazen Research. This report considers these results and the feasibility of production from the property.

MINERALOGY

The most important minerals occur in very small amounts and generally in very small particles. They have been difficult to identify and some uncertainties still exist.

This is a unique suite of minerals inasmuch as analyses show that most of the minerals are impure and comprise some molecules from the other minerals in the suite in addition to their own main components. Two such minerals (urano) thorite and (columbian) rutile have not previously been described.

A group of four minerals, euxenite, monazite, rutile and thorite, contain practically all the uranium and the bulk of the columbium and thorium in the gravel.

The minerals, allanite, apatite and epidote contain the bulk of the rare earths present in the gravel.

Two other minerals of possible value are magnetite and ilmenite or more correctly titano-hematite. This mineral is impure and contains appreciable amounts of thorium, columbium and rare earths. However, the addition of ilmenite to concentrates of non-metallic minerals would reduce the grade significantly It would appear, therefore, that the thorium, columbium and rare earth components of ilmenite can not be recovered.

Zircon is present to a much lesser extent than previously reported. Much of the zirconium oxide present is now known to be locked up in magnetite, ilmenite and other minerals and therefore can not be recovered. It appears impractical to attempt to recover the zircon separately.

SAMPLE

The head sample was a composite of 20 samples made in 1969. This sample assays in percentage, U_3O_8 - 0.011; Fe 4.1; TiO_2 - 0.85; P_2O_5 - 0.145 and Cb_2O_5 - 0.07. This agrees closely with the grade calculated from 19 separate samples. One result is missing. It only varies markedly in iron. However, this does not change the values calculated.

This sample weighs 113.5 lbs, is a field concentrate and was produced from 1036 lbs of raw gravel. Therefore the U_3O_8 content of the gravel is .0012% or 0.024 lbs per ton or 0.035 lbs/yard.

LABORATORY PROCEDURE

A very prolonged recovery process was used, largely in order to obtain clean concentrates for identification of minerals. This involved screening, tabling, grinding of oversize and retabling. This was followed by magnetic and electrostatic separation of the metallics and rutile and separation of the non-metallics in a series of heavy liquids.

RECOVERIES

Most of the uranium is in four minerals that have been identified. It is estimated that 90% of it can be recovered.

Some of the thorium and columbium are in ilmenite and to a lesser extent in the other group of non-metallics and will not be recovered. It is estimated that 75% of these two elements can be recovered.

Most of the rare earths are in the allanite etc. concentrate. Some is in the ilmenite and some is in the uranium etc. concentrate. The estimated recovery of the rare earths is only 50%.

It is estimated that 80% of both magnetite and ilmenite will be recovered.

VALUES

Uranium	U_3O_8	.035 lbs/yard	
	loss 10%	.0035	
		.0315 = @ \$30/lb =	\$0.94
Thorium (About the same as U_3O_8)	ThO_2	.035 lbs/yard	
	loss 25%	.009	
		.026 lbs @ \$2/lb =	\$0.05

Columbium Cb_2O_5 .007% = 0.14 lbs/ton or .20 lbs/yard
Loss 25% .05
.15 lbs @ \$2.00 lb
= \$0.30

Rare earths grade 0.008% = 0.16 lbs/ton or 0.232 lbs/yard
Loss 50% 0.116
0.116 lbs @ \$2.00 lb
= \$0.23

Magnetite

Magnetite comprises 2/3 of concentrate which is 6.3% so magnetite is about 4.2% of feed (field concentrate)

In 100 lbs = 4.5 lbs magnetite

In 113.5 lbs= 4.76 lbs magnetite (total magnetite in field concentrate treated)

113.5 lbs was produced from 1036 lbs of raw gravel

in 1 ton $\frac{2000}{1036}$ x 4.76 or 9.2 lbs magnetite

in 1 yd $\frac{2900}{2000}$ x 9.2 = 13.3 lbs magnetite

Recover 80% of 13.3 lbs = 10.6 lbs at 1.5¢ = 0.16

Ilmenite about 1/4 of magnetite $\frac{13.3}{4}$ = 3.3 lbs

Loss 20%......................0.8

2.5 lbs at 3¢

= 0.07

Total $1.75/yard

Dredging and recovery costs tentative 1.25/yard

NET POSSIBLE $0.50/yard

On a medium sized operation of 5,000 yards per day the net is $2,500.00 per day

PROPOSED FLOW SHEET

It is now possible to propose a flow sheet to yield four products.

The heavy liquids method used is costly and slow and is not applicable in a large commercial operation.

Inasmuch as the important elements are present in each of several minerals, it is necessary to recover concentrates that are groups of minerals rather than individual minerals.

The rare earths are mostly in allanite, apatite and epidote These are physically related to titanite, clinozoisite and chloritoid, a concentrate of these six minerals would probably contain enough rare earths to be marketed.

Likewise, thorite, monazite, and euxenite have similar physical properties and these probably plus zircon would concentrate together on spirals. To such a concentrate could be added rutile after it is removed electrostatically from the metallics.

The metallics that is magnetite and ilmenite plus rutile would tend to separate from the non-metallics on a spiral or table.

In 1969 it was found that during long continued panning, some of the lighter particles of the heavy minerals were lost. I believe that it is necessary to emphasize that in order to get the recoveries mentioned above it will be necessary to produce large concentrates with a considerable proportion of valueless minerals. This will add to the freight costs to ship the concentrates. This must be balanced against the added values from more complete recovery.

It would appear that some combination of screens, fine grinding, tables and spirals could produce most of the minerals as required. Magnets and electrostatic belts would also be required.

RESERVES

These have not been recalculated or changed. It would appear an increase is possible. However, it is necessary to get fairly precise figures on dredging and recovery costs and on prices for the products before a new cut-off figure can be determined.

CONCLUSIONS

1. The grade of the gravel is close to that previously established.

2. The recovery, especially of U_3O_8 , the most important component, is higher than previously expected.

3. The net figure per yard indicates this can now be a viable operation.

RECOMMENDATIONS

1. That a flow sheet be developed to provide bulk concentrates and cost estimates made.

2. That samples of concentrates be forwarded to potential customers to determine marketability and prices.

3. That capital and operating cost for dredge and recovery plant be determined.

4. That reserves be recalculated using new data.

5. That a feasibility report be made.

Respectfully submitted,

James Black, Ph.D. P.Eng.,

June 2nd, 1976