Mr. Murphy

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FROM: D. K. Tester

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DKT/NB

Copies to G. Krummei
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LUTWYCHE

The accompanying memorandum from Mr. G. Krummei summarizes the current ore reserve situation at the Lutwyche deposit. In addition, he presents conclusions reached from a recently completed comparative sampling programme carried out in particular sections of veining exposed on 13 Level.

The most significant conclusion drawn is that veins containing selvedge-type cassiterite and wolframite mineralization need a closer sampling density than was used originally i.e. channel samples spaced at intervals of 2 feet 6 inches. An examination of Table 2 of Mr. Krummei's memorandum shows that groove sampling and chip sampling give comparable results. In groove sampling, the interval between each sample point was 6 inches: in chip sampling, chips about 1 inch diameter were taken on a diamond pattern over the full width of the vein, each chip approximately 6 inches from its nearest neighbours. Thus, in these two cases the sampling density was increased. In both cases the assay values for the section of vein samples are comparable and are approximately double the value indicated by channel sampling.

The majority of the veining exposed by 13 Level development has selvedge type mineralization; the exception is the "Old Battery" type veins, where the cassiterite and minor wolframite occur as scattered discrete specks, blebs and masses within the quartz vein. Table 3 shows that the three sample methods (channel, groove and chip) give comparable results.

The question then arises
"What effect could this have to the overall ore reserve situation."

There will be no change to the tonnages quoted by Mr. Krummei in Table 1. As previously stated, the majority of the veining exposed by development on and above 13 Level contains selvedge type mineralization as do most of the veins intersected by surface and underground diamond drill holes. Hence, I suggest that the grade figures quoted in the ore reserve statement could be modified along the following lines:

1. Grade of selvedge-type veins (Hanging Wall Vein) to be doubled.

2. Grade of veins with scattered mineralization (Old Battery Type Vein) remains unchanged.

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3. Grade derived mainly from diamond drill intersections, which are random samples, remain unchanged (Pay Vein).

Thus, the ore reserves could read as follows:-

Classification	Vein	Tonnages	Grade (over 48") % C.M.
Indicated ore	H.W.	75,000	1.34
" "	O.B.T.	1,200	1.04
Inferred ore	H.W.	244,000	1.34
" "	O.B.T.	46,800	0.87
" "	Pay.	182,000	0.75
TOTAL		549,600	1.10
Potential "Ore"	New Vein	220,000	*
		769,600	

* Insufficient density of intersections to allow a reliable estimate.

During the course of the exploration programme, and at different times, Mr. Krummei and I made independent ore reserve estimates, using availabe drill hole intersections which constitute random samples of the veins. In each case, the principles adopted were the same as those used by Mr. A. A. C. Mason in his ore reserve estimate, dated 20 January, 1968, with one major modification. Mr. Krummei and I included all drill hole vein intersections which we considered to be of minable width including the low to very low grade intersections. Mr. Krummei's reserve grade was 0.91% C.M. while the figure I arrived at (with fewer intersections and differing correlations) was 1.13% C.M. While Mr. Krummei's grade is low, I consider that these compare favourably with the "amended" grade shown in the above table (1.10% C.M.).

The general conclusion is that the probability of Lutwyche being an economic proposition has been enhanced greatly by this reappraisal. Further exploration, chiefly by development, and, to a lesser extent by diamond drilling will be required preferably at a higher level of the Aberfoyle Mine, say at or above No. 8 Level.

D. K. Tester

Mr. [illegible]

D. K. Tester.
FROM: G. Krummei.

6/2/70
GK/JD

LUTWYCHE COMPARATIVE SAMPLING.

As a result of exploratory work between April 1968 and September 1969 the total ore reserve tonnage at the Lutwyche prospect was increased from 340,000 tons to 769,600 tons. A breakdown of the latest figures is given below:-

TABLE I

Classification	Vein	Tonnage	GRADE * %Sn	%Wo_3	%CM	Ratio Sn:Wo_3
Indicated Ore	H.W.V	75,000	0.18	0.49	0.67	1: 2.7
"	O.B.T.V	1,200	0.86	0.18	1.04	4.8 :1
Inferred Ore	H.W.V	244,000	0.18	0.49	0.67	1: 2.7
"	O.B.T.V	46,800	0.72	0.15	0.87	4.8 :1
"	P.V	182,600	o.45	0.30	0.75	1.5 :1
Potential Ore	N.V	220,000	LOW GRADE			
TOTAL		769,600				

* Calculated from channel samples and drill hole samples.

The attendant grade figures were obtained from assays of channel samples collected at 2½' intervals along the strike length of the Hanging Wall Vein and the Old Battery Type Vein. These results were much lower than those obtained from diamond drill core samples.

To check the results of the original channel sampling a programme of comparative sampling was initiated over selected parts of the Hangingwall and Old Battery Type Veins. The weighted results of the various methods are given below:-

TABLE 2

Hangingwall Vein: (selected area only).

	%Sn	%Wo_3	%cm 48"	Ratio Sn:Wo_3	Ratio Method: channel
Channel samples	0.03	2.04	2.07	1: 68	1
Reptd. Composite	0.05	2.91	2.95	1: 58	1.4
Groove Samples	0.05	4.91	4.96	1: 98	2.4
Chip Samples	0.05	4.57	4.62	1: 92	2.2
Vein Photos	Wolfram only		-	- -	2.1
Bulk Sample	0.05	3.20	3.25	1: 64	1.56

TABLE 3

Old Battery Type Vein: (Selected area only).

	%Sn	% WO_3	% CM 48	Ratio Sn:WO_3	Ratio Method: channel
Channel samples	0.34	0;42	0.76	1: 1.24	1
Repeated Composites	0.36	0.34	0.70	1: 0.95	0.92
Groove samples	0.22	0.65	0.87	1: 2.95	1.14
Chip samples	0.47	0.57	1.04	1: 1.22	1.37
Bulk sample	NOT TAKEN.				

POSSIBLE SOURCES OF ERROR.

1) Personal error of sampler: several employees were engaged on different phrases of the project and this would appear to minimize one source of systematic error.

2) Laboratory errors and errors due to sample Mixing: Acceptable repeatability of values suggests that errors due to faulty operator technique are minimal. However, the comparatively lower wolfram values in the bulk sample for the Hangingwall Vein can be shown to be due to the mixing technique and grade computation technique employed.

CONCLUSIONS:

1) Visual examination of the results of the comparative sampling programme shows an increase in combined metal grade values in vein areas tested by closely spaced groove sampling, chip sampling and bulk sampling over the values obtained by more widely spaced channel sampling.

2) The degree of upgrading appears to be related to the type and distribution of the Sn/WO_3 mineralization throughout the veins sampled. The factor ranges from 1.14 - 2.4. It is high where selvedge - type mineralization is present. (e.g. Hanging Wall Vein area sampled). A lower factor applies where mineralization is distributed randomly throughout the whole vein area exposed. (e.g. Old Battery Type Vein).

3) Channel sampling at widely spaced intervals may not have been an expedient choice of method of assessing the grades of veins with a distribution of mineralization such as that encountered at the Lutwyche Prospect. Groove sampling at closer intervals may give a more accurate representation of the grade of the vein material.

G. KRUMMEI.