COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES GEOLOGY AND GEOPHYSICS

RECORDS

Record No. 1964/59

Survey of Mineral Resources in Tasmania

Tailing Dumps

by

R.W.L. King

SURVEY OF MINERAL RESOURCES IN TASMANIAN TAILINGS DUMPS

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SURVEY OF MINERAL RESOURCES IN TASMANIAN TAILINGS DUMPS

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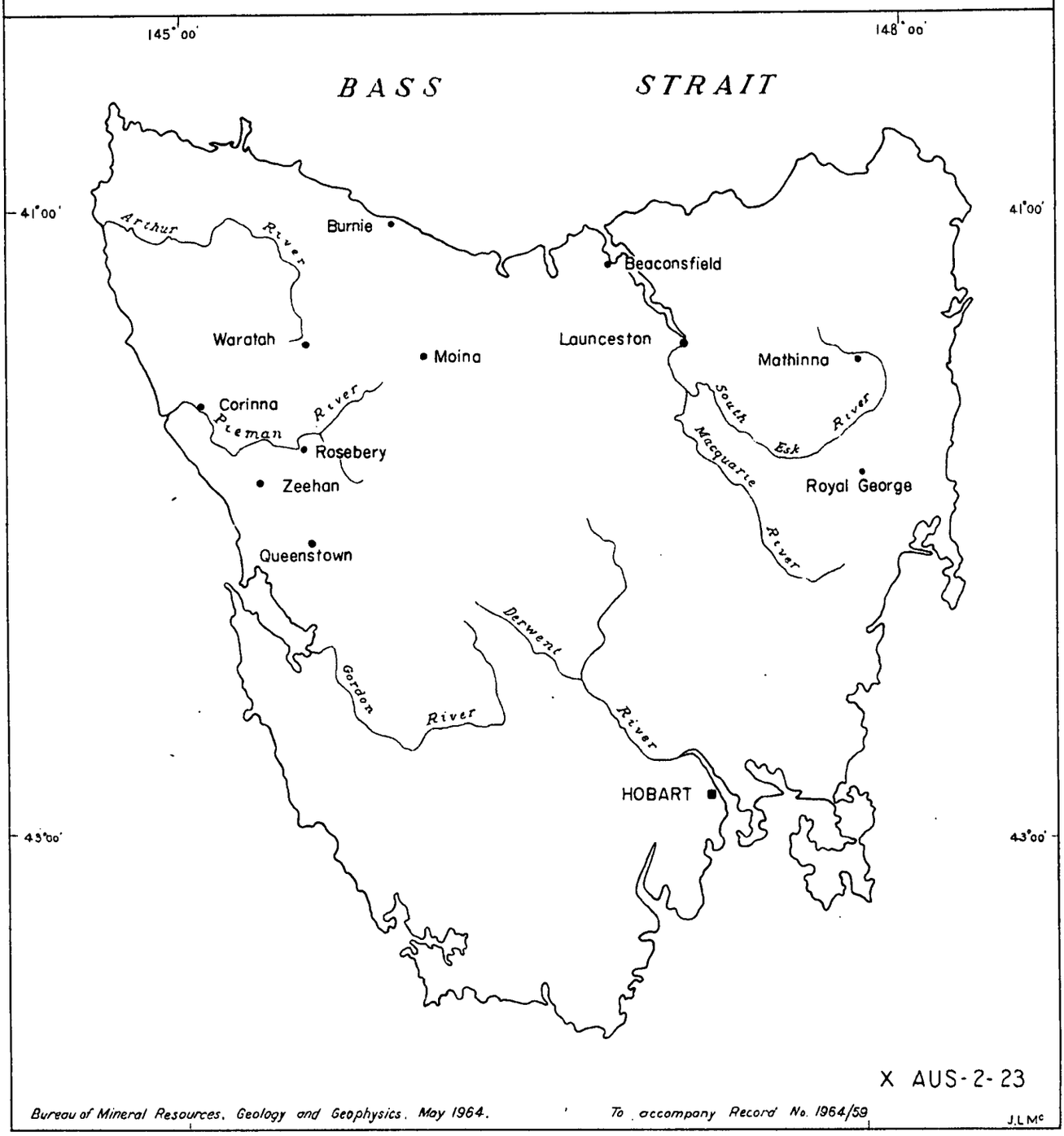

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Bureau of Mineral Resources, Geology and Geophysics. May 1964. To accompany Record No. 1964/59

J.L.Mc

SUMMARY

Sampling and measurement of selected tailings dumps in Tasmania was followed by radioactive, spectrographic and chemical analysis of samples for the less common elements. Certain samples were selected for further examination on the basis of the initial results. However no dumps showed previously unknown significant concentrations of valuable elements, such as to warrant further investigation by the Bureau.

INTRODUCTION

The purpose of the survey was

(i) to disclose possible sources of the less common metals which are coming into prominence for such purposes as structural materials in nuclear engineering, in alloys of superior performance at high temperatures, and for high purity metals and alloys with particular electronic properties;

(ii) to indicate dumps which, by reason of their size and metal content may warrant re-treatment because of factors such as improved mineral dressing techniques, improved metal prices or the presence of metals of newly acquired importance mentioned in (i) above;

(iii) to discover sources of metals which would not in the past have been expected in certain types of deposit, but are now known to be sometimes found in them.

This is the first extension of the survey, initially carried out in N.S.W. It is hoped eventually to cover all States and the Northern Territory in the Survey.

SCOPE OF SURVEY

The deposits selected for sampling were chosen following reference to the Tasmanian Mines Department, examination of general references and discussions with the individual District Inspectors of Mines. Selection was based on size of dump and complexity of mineralization, together with consideration of obtaining a representative cover of dumps in the State.

As in the case of the New South Wales survey, analytical work on samples was carried out by the Australian Mineral Development Laboratories. It included a qualitative assessment of radioactivity, with a detection limit equivalent to 0.002% U_3O_8. The limits of detection of the spectrographic method used are set out in Appendix I. Phosphorous, silicon, aluminium, iron, magnesium, calcium, sodium, potassium and titanium were not sought. Chemical analysis was used for sulphur and selenium, detection limits being sulphur fifty and selenium one parts per million respectively. In the case of samples from Rosebery and Mt. Lyell, selenium analysis was carried out by X-ray fluorescent spectrometry with a lower limit of about 10 parts per million.

METHOD OF SAMPLING

Samples from dumps not associated with operating mines were collected during April 1963. Samples were taken by shovel from a number of places in the eroded surfaces of the dumps.

Areas of dumps were measured by tape and clinometer. Some arbitrary assumptions were made in cases where dumps were very irregular and the time consumed in making a detailed survey could not be justified. A factor of 20 cu. ft. = 1 ton was used in calculation of tonnages. Because the slope and shape of the ground surface beneath the dumps was not known, tonnage estimates are very rough and should be regarded as giving only the general order of size of the dumps.

Dumps associated with operating mines were sampled by the mining companies, who supplied estimates of the tonnages represented by the samples forwarded.

Each sample was about five pounds in weight and was subsequently divided into two roughly equal portions. One portion was used for the standard set of tests while the second was retained for possible mineragraphic examination or other tests if these were warranted by the analytical results and the size of the dump represented by the sample.

RESULTS - BY DEPOSITS

The semi-quantitative spectrographic measurements made on each sample are set out in the following paragraphs, together with a description of the location of the dumps, the samples taken and the tonnages represented by these samples. At the end of this Record, detail sheets set out the complete analytical results for each sample, including elements detected but not determined more closely than within the ranges of major (100-10%), minor (10-1%), heavy trace (1-0.1%), trace (0.1-0.01%)faint trace (0.01-0.001%) and very faint trace (0.001-0.0001%).

The results are set out in the order in which dumps were sampled in April and correspond generally with the various Mines Inspectors Districts.

Launceston Inspector's District

Mathinna

The dumps sampled are located at the old Golden Gate mine, situated on the banks of a creek. This creek is crossed by the main road from Fingal further downstream, and just before the road enters the township. The dumps are reached by turning up the hill to the left at the monument in the main street and bearing right over this hill toward the banks of the creek previously mentioned.

Three samples were taken, the first in the area of dump near the New Golden Gate Main shaft, in which 0.8% arsenic and 0.015% rubidium were measured. The second sample was taken from an area close to the bank of the creek and further downstream. The elements measured in this sample were arsenic 1.2%, rubidium 0.035%, lithium 0.025%, mercury 0.003% and scandium 0.001%. The third sample was again closer to the creek bank but further upstream than the first sample. Arsenic 1%, rubidium 0.07%, lithium 0.035%, mercury 0.007%

and scandium 0.0015% were all measured in this sample.

The dumps were sampled for their gold content by the Tasmanian Mines Department in 1948. Hughes (1948) estimated that there were 321,600 tons of sands and slimes assaying 1.11 dwt. per ton and 112,000 tons of residues from retreatment plants assaying 0.84 dwt. per ton. Sections of the dump could be chosen which averaged over 1.25 dwt. per ton. 350 holes were bored with the Mines Department's hand boring plant.

Royal George

The dumps here are located to the right of the main road as the township is approached from Avoca. They are reached by a road branching to the right just before the Post Office. Sands and slimes are spread out thinly over a large area, and it appears that quantities of the sands have been removed probably for constructional purposes. The first sample represented slimes collected from dumps over the whole area. Elements measured were arsenic 0.6%, tin 0.4%, rubidium 0.15%, lithium 0.04%, silver 0.005%. The sample of sands contained the following measured elements: arsenic 0.5%, tin 0.3%, boron 0.3%, rubidium 0.08%, lithium 0.03% and silver 0.0025%. Traces of radioactivity, described as probably due to potash, were noted. The occurence of radioactive minerals at this mine are discussed by Walpole (1955) and Ostle (1956).

The combined tonnage of sands and slimes was estimated at 17,000. It appeared that at least half this total would be slimes.

Beaconsfield

The sands at Beaconsfield were the subject of a sampling programme for gold, carried out early in 1963 by Clutha Development. The dumps lie on either side of the road to Rowela and Richmond Hill, adjacent to the first creek beyond Beaconsfield. The turn off is to the east from the main street of Beaconsfield. The sands lie to the north of this road, slimes to the south. There is evidence that some of the sands have been retreated. The slimes were estimated at approximately 8000 tons, and the following elements were measured: arsenic 1% manganese 0.8%, zinc 0.3%, copper 0.2%, rubidium 0.03%,

lithium 0.01%, mercury 0.003% and silver 0.0012%. The quantity of sands was not estimated, but is probably well in excess of 20,000 tons. The sands sample was made available by the Launceston Laboratories of the Tasmanian Mines Department. It is a composite sample prepared from duplicates of Clutha's sampling campaign, and contained arsenic 0.8%, zinc 0.4%, manganese 0.3%, copper 0.1%, rubidium 0.015% and lithium 0.01%.

Burnie Inspector's District

Magnet

The mine is reached by following the old tramway formation which branches off to the right from the Waratah - Corinna road, about 1¼ miles from Waratah. The formation is passable for two wheel drive vehicle to within sight of the mine, but the last few bridges in Magnet Creek would require repair before the road could be re-opened right up to the mine. A four wheel drive vehicle could probably ford the creek as required, thus bypassing the unsafe bridges. The mine is approximately 7 miles by road from Waratah.

The dumps are situated adjacent to the creek and form a long narrow strip between the creek and the road which skirts along the hill. The dumps are faced with sandbags and rock walls in order to reduce scouring by run off and to obtain maximum capacity in the restricted area. Only an estimated 10,000 tons of sands and slimes remain. This is much less than would have been expected by mine production figures. The remainder has probably been used as fill and/or washed away by rain.

The first sample was taken from a dump of coarse material (jig tailings perhaps) which was approx. 4 ft. deep estimated at 800 tons and covered a portion only of the main sand dump. Elements measured in this sample were zinc 11% manganese 9%, lead 2.5%, arsenic 0.7%, cadmium 0.3%, silver and rubidium both 0.03%. Sample No. 2 was taken from sands in the area between the mill foundations and the creek, to the south of the coarse dump. Elements measured were zinc 30%, manganese 10%, lead 1%, arsenic 0.8%, cadmium 0.35%, rubidium 0.04%, silver 0.02%. Sample No. 3 was taken from sands and coarse material

exposed in a gulley to the north of the coarse dump. Elements measured in this sample were zinc 30%, manganese 10%, lead 1%, arsenic 0.9%, cadmium 0.4%, rubidium 0.04% and silver 0.015%. The fourth sample was taken from sands in the northernmost gulley through the dump. Elements measured were zinc 40%, manganese 8%, lead 0.8%, arsenic 0.8%, cadmium 0.4%, rubidium 0.035% and silver 0.015%. In this northernmost gulley there were layers of grey coloured slime, up to 8 inches thick. These were sampled separately, with the following results: zinc 30%, manganese 8%, lead 1.5%, arsenic 0.8%, cadmium 0.6%, rubidium 0.05%, silver 0.015%, lithium 0.01% and scandium 0.0015%.

The very high zinc values obtained in samples 2-5 were not confirmed by check analysis. The cadmium values are also high, and of interest in all five samples. Some research into the way in which the zinc and cadmium occur might be warranted. At the time of sampling it was assumed that the slime sample would be much higher in metal values than the others. However this was not supported by the spectrographic analyses. Subsequently the X-ray fluorescent analysis used to check the suspect spectrographic analysis showed that the slime sample was indeed higher in zinc (11.1%) than the other coarser samples which ranged from 6.25% to 7.55%. As might have been expected, the check analysis also gave much lower figures for cadmium than the original spectrographic analysis. Values ranged from 0.038% to 0.077%. See Appendix II.

Cottle (1953) quotes the assay of the dump at that time as being 1.3% lead, 7.3% zinc and 5.3 ozs. of silver per ton. These lead and silver values agree reasonably well with those obtained in the present survey. The zinc values by X-ray fluorescence also agree well with Cottle's figures. As mentioned earlier, the DC arc spectrographic figures for zinc and cadmium are suspect.

Moina

The dump at the Shepherd and Murphy mine is a short distance up Bismuth Creek from the crossing on the Wilmot-Moina road. The only dump of any size is of jig tailings. This is

being carted away for use as a construction material. Approximately 3,500 tons remained at the time of sampling. Elements measured in the sample of this material were rubidium 0.25%, manganese 0.15%, tin 0.12%, tungsten 0.1%, lithium 0.04% and scandium 0.0015%.

Continued use of this material for construction purposes seems to be the best use that can be made of it.

Queenstown Inspector's District

Zeehan Area

Substantial quantities of the larger dumps in this area have been removed, probably to build the Zeehan Airstrip. Blissett (1962) gives production figures and general background information for the old Zeehan mines.

Oonah Mine

A dump near the Oonah mill site, below the main shaft collar, was estimated to contain 600 tons. Elements measured in this dump were zinc 7%, lead 4%, arsenic 0.7%, manganese 0.3%, rubidium 0.1%, silver 0.03%, lithium 0.01% and scandium 0.0025%. The dump is visible from the Trial Harbour road.

Queen Creek below Oonah Mine

The lower of the two dumps on the bank of Queen Creek below the Oonah Mine was estimated at 1000 tons. The sample contained lead 8%, zinc and arsenic 0.8%, manganese 0.3%, tin 0.25%, rubidium 0.1%, silver 0.025%, lithium 0.015%, scandium 0.002%. The higher dump, further upstream, was estimated at 200 tons. Elements measured in this dump sample were lead 4%, arsenic 0.7%, tin 0.25%, zinc 0.1%, rubidium 0.07%, lithium 0.015%, silver 0.01%, scandium 0.002%. These two dumps are just across Queen Creek from the Trial Harbour road.

Zeehan-Western

The main shaft is just to the east of the Corinna road $1\frac{3}{4}$ miles north west of the Post Office. The dumps extend downstream on the south bank of a creek. Most of the dumps have been carted away. The remains are estimated at 15,000 tons. Two samples were taken, one from the lower section of the dumps, closer to the creek, in which the elements measured were manganese 5%, zinc 1.5%, lead 1%, rubidium 0.1%, lithium 0.015%, silver 0.005%, scandium 0.002%. The

second sample was from the upper section of the dumps and the following elements were measured: lead 3.5%, zinc 2.5%, manganese 2%, arsenic 0.8%, copper 0.2%, rubidium 0.1%, silver 0.025%, lithium 0.025%, scandium 0.0025%.

Oceana Mine

The mine is situated 3½ miles south of Zeehan, to the south west of the smelter site. The track to the mine leads out beyond the swimming pool and sports ground in a southerly direction. Tailings sands from treatment of ore mined appear to have been discharged directly into the creek adjacent to the mine. The quantity measured was small (1200 tons) so it seems likely that some was used for underground fill. The following elements were measured: Manganese, lead and zinc each 1%, rubidium 0.015% silver 0.0025%.

Zeehan-Montana

The dumps are located between the Trial Harbour and Corinna roads, just beyond their junction on the outskirts of Zeehan. Most of the material has been removed. The total remaining is estimated at 15,000 tons. It is all coarse, probably jig tailings. The dumps are quite irregular and were sampled in two sections. The first sample covered the south-eastern section and in it the following elements were measured; lead and zinc each 3%, manganese 1%, arsenic 0.5%, tin 0.15%, rubidium 0.1%, lithium 0.012%, silver 0.01%, scandium 0.0015%. The second sample covered the south-western section of the dumps and the elements measured were zinc 5%, manganese 4%, lead 2.5%, rubidium 0.04%, cadmium 0.02%, silver 0.015%, lithium 0.015% and scandium 0.0015%.

Zeehan - Dumps at Golf Links

The dumps situated at the Golf Links to the west of the town may contain material from mines in this general area such as the State Argent Flat mine and the Mt. Zeehan (Tasmania) mine. Once again the dumps consist of coarse material, probably jig tailings, and the greater part of them has been removed presumably for constructional purposes. It is estimated that 17,000 tons remain. Elements measured in the sample were lead 7%, zinc 5%, arsenic 2%, antimony 1%, manganese 0.7%, copper 0.2%, rubidium 0.06%, silver 0.03%, lithium 0.012%, scandium 0.001%.

Samples submitted by Companies.

Mt. Lyell Mining and Railway Co. - Blast Furnace Slag.

This dump is situated adjacent to the smelter and consists of about 6 million tons of blast furnace slag from operations prior to 1923. The company advised that slag from current operations is discharged into the Queen River. Copper content of the slag dump is said to be 0.45%, and on several occasions the slag has been examined with a view to recovering the copper. In 1950-51 the University of Adelaide found that approximately one third of the copper was present as inclusions of sulphides of various compositions. Difficulty was experienced in obtaining a satisfactory grade of concentrate by flotation or gravity concentration methods. The remaining copper could not be concentrated by any of the methods tested, including leaching at atmospheric pressure, and was thought to be present in the slag as some form of (solid) solution.

Analysis of the sample forwarded showed zinc to be present in greater quantities than copper, and that the slag also contained lead. Elements measured were zinc 2%, copper 1%, lead 0.4% and silver 0.0015%. However, it is not a promising material for further research, which might be along the lines of atmospheric pressure leaching for the sulphide copper, or some form of pyrometallurgical process, perhaps a chloridizing roast, designed to be followed by recovery of a number of metals by leaching.

Mt. Lyell Mining and Railway Co. - Mill Tailing

Present practice (which has been followed for many years) is to discharge mill tailings into the Queen River, and thus ultimately into Macquarie Harbour. The rate for ore treatment has been of the order of 1.5 to 2 million tons per year, of which approximately 95% has been discharged as tailing. The sample analysed represents production over a number of weeks from tailings from the copper flotation section - i.e. prior to recovery by flotation (after classification) of a pyrite concentrate. Prior to 1961, when a change in copper flotation practice was made, mill tailing averaged 0.12-0.13% Cu. Results of the analysis do not show significant quantities or any elements likely to be of value. Elements measured were copper 0.1% and rubidium 0.12%.

Electrolytic Zinc Co. of A'sia Ltd., Rosebery - Mill Residue Dam

The sample is said to be representative of the 1,250,000 tons of residue stored in the dam. Elements measured in this sample were zinc 1%, manganese 3%, copper 0.15%, lead 0.8%, arsenic 0.5%, silver 0.005%, rubidium 0.2%. There seems to be little of interest in these tailings.

Electrolytic Zinc Co. of A'sia Ltd. - Rosebery Mill Tailing

Since 1959 the plus 15 micron fraction of the residue has been used for filling in the Rosebery mine, the slime fraction being stored in a second residue dam. (One micron equals 10^{-3} of a millemetre.) About 70% of the mill tailing is used for fill in this way. The second sample supplied by the company was a composite representative of mill tailing before classification for the year ended 26.6.63. Elements measured were zinc 1%, manganese 3%, copper 0.2%, lead 0.5%, arsenic 0.25%, silver 0.007% and rubidium 0.3%. As in the dump sample there was little to suggest research on these tailings would be worthwhile.

RESULTS - ELEMENTS

Gallium, Indium, Germanium

Traces of these elements were found in samples from Mt. Lyell and Rosebery. The highest concentrations of gallium noted were in the very faint trace range only in Mt. Lyell slag and Rosebery tailings. Indium was found at the faint trace level in the Mt. Lyell slag dump only. Germanium at the faint trace level was found in Rosebery tailings only. These three elements were not detected in any of the other Tasmanian samples.

Scandium

This element was detected in small quantities in most samples. The highest value of 0.0025% was detected in samples from the Oonah main shaft dump and the Zeehan-Western dump, upper section.

Silver

The highest silver value of 0.03% (equal to approx. 10 ozs. per ton) was found in two samples from Zeehan (Oonah main shaft and Golf Links dumps) and in the sample of coarse material from Magnet. The

sample from the lower dump in Queen Creek at Zeehan had a value of 0.025% silver. As would be expected these high silver values were found in the samples with higher lead values than others.

Selenium

The dumps at Royal George were higher in selenium than any of the others. However, even these values were low, being only 6 parts per million for the slimes and 2 parts per million for the sands.

Beryllium

Beryllium was present in the very faint trace category (0.001 to 0.0001%) in the Royal George dumps. However higher values were found in the Zeehan Western upper section dump sample (trace range 0.1-0.01%) and the upper dump Queen Creek sample also showed a very faint trace. No beryllium was detected in the Moina tailings.

Cadmium

All samples from Magnet contained cadmium in the heavy trace range, (1-0.1%). The highest value was in the sample of slimes from the northernmost gully - 0.6% with the lowest, 0.3% in the sample of coarse material. However X-ray fluorescent analysis gave a range of only 0.04 to 0.08%.

Lesser concentrationsof cadmium were contained in the Zeehan samples. The highest range was a trace (0.1-0.01%) in the Oonah main shaft and Zeehan Montana south west section samples. Samples from Zeehan Western (both samples), the Oceana mine, the south eastern section of Zeehan Montana and the Golf Links dump all showed values in the faint trace range, 0.01 to 0.001%. None was found in the upper Queen Creek dump sample. The known affinity between zinc and cadmium is illustrated by the fact that higher cadmium values in a given area are found in samples with the higher zinc values.

CONCLUSIONS AND RECOMMENDATIONS

The survey did not reveal any dumps on which further work by the Bureau was justified. Most of the richer dumps were too small in size to warrant any kind of metallurgical investigation.

Where dumps are used for constructional purposes on an organized basis it might be worth while installing some form of simple

gravity concentrator such as the Humphreys spiral or pinched-sluice concentrator in the materials handling system. This might permit a low grade concentrate to be made which could be retreated further at a later stage. However, in most cases, the dumps are only occasionally worked and the plant investment would be unlikely to repay itself under these conditions.

The dumps of below ore grade copper bearing material from Mount Lyell Mining and Railway Co. open cuts, although not sampled ormeasured in this survey, constitute a potential source of copper, and some research work along the lines of bacterial leaching carried out in U.S.A. and Canada might profitably be undertaken by the mining company.

ACKNOWLEDGEMENTS

The assistance of the Tasmanian Mines Department in the execution of the survey is gratefully acknowledged, as is the co-operation of those mining companies who submitted samples and data for inclusion in the survey.

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APPENDIX I

SPECTROGRAPHIC ANALYSIS

Detection-Limit Concentrations of Elements

D.C. Arc Excitation

ELEMENT	Per cent	p.p.m.	ELEMENT	per cent	p.p.m.
Ag	0.00005	0.5	Na	0.00005	0.5
Al	0.0002	2	Nb	0.003	30
As	0.01	100	Nd	0.001	10
Au	0.001	10	Ni	0.0002	2
B	0.001	10	Os	0.005	50
Ba	0.0002	2	P	0.05	500
Be	0.0005	5	Pb	0.0002	2
Bi	0.0005	5	Pd	0.001	10
Ca	0.0002	2	Pr	0.001	10
Cd	0.001	10	Pt	0.01	100
Ce	0.04	400	Rb	0.01	100
Co	0.0002	2	Re	0.01	100
Cr	0.0003	3	Rh	0.001	10
Cs	0.1	1000	Ru	0.001	10
Cu	0.00005	0.5	Sb	0.003	30
Dy	0.001	10	Sc	0.0002	2
Er	0.001	10	Si	0.002	20
Eu	0.001	10	Sm	0.05	500
Fe	0.0005	5	Sn	0.001	10
Ga	0.0003	3	Sr	0.0001	1
Gd	0.02	200	Ta	0.01	100
Ge	0.0005	5	Tb	0.001	10
Hf	0.01	100	Te	0.02	200
Hg	0.01	100	Th	0.01	100
Ho	0.001	10	Ti	0.001	10
In	0.0001	1	Tl	0.005	50
Ir	0.005	50	Tm	0.001	10
K	0.0002	2	U	0.05	500
La	0.001	10	V	0.0005	5
Li	0.01	100	W	0.005	50
Lu	0.001	10	Y	0.001	10
Mg	0.0002	2	Yb	0.001	10
Mn	0.001	10	Zn	0.0025	25
Mo	0.0005	5	Zr	0.002	20

APPENDIX II

A.M.D.L. REPORT AN1240-63

YOUR REFERENCES:	Letter dated 9/8/63, 62/224 Order No. MR 6540 (62/63)
MATERIAL:	Magnet Dump Samples
LOCALITY:	Tasmania
DATE RECEIVED:	13/8/63

ANALYSIS
PER CENT

Sample Mark	Zinc Zn	Cadmium Cd
7	6.40	0.038
8	6.60	0.042
9	6.25	0.040
10	11.1	0.077
11	7.55	0.061

Analysis by X-ray fluorescence.

Analysis by: R.G. Stafford

Officer in Charge, Analytical Section: T.R. Frost

APPENDIX III

SURVEY OF MINERAL RESOURCES IN TAILINGS - DETAILED RESULTS - TASMANIA

Sample Location and Mark	Quantitative Analysis by Emission Spectroscopy - %						Semi-quantitative Analysis by Emission Spectroscopy %	Chem. Analysis		Radio-activity	Tonnage Est. in Dump	Date Sampled
	Major 100-10	Minor 10-1	Heavy Trace 1-0.1	Trace 0.1-0.01	Faint Trace 0.01-0.001	Very Faint Trace 0.001-0.0001		S %	Se ppm.			
Mathinna 1			As	Ba,Cr,Cu,Mn Pb,Rb,Zn	Li,Mo,Ni,V	Ag,B,Bi,Co,Hg Sc,Sr	As 0.8 Rb 0.015	0.015	N.D.	None Detected		
2		As		Ba,Cr,Li,Mn Pb,Rb,Zn	Cu,Hg,Sc, Sr,V	Ag,B,Bi,Co,Ni,Y,Zr	As 1.2 Rb 0.035 Li 0.025 Hg 0.003 Sc 0.001	0.08	1.5		400,000	19/ 4/63
3		As		Ba,Li,Mn,Pb Rb, V, Zn	Cr,Cu,Hg, Sc,Sr	Ag,B,Bi,Co,Ni,Sn,Y, Zr.	As 1 Rb 0.07 Li 0.035 Hg 0.007 Sc 0.0015	0.035	0.5			
Royal George 1			As,Rb, Sn.	B,Bi,Cr,Cu Li,Mn,Pb,Zn	Ag,Ba,Co, Sr,W,Zr	Be,Mo,Ni,Sc,V,Y	As 0.6 Sn 0.4 Rb 0.15 Li 0.04 Ag 0.005	0.63	6	Trace Detected - Probably due to Potash	17,000	19/ 4/63
2			As,B,Sn	Cr,Cu,Li,Mn, Rb,Zn	Ba,Co,Sr, W,Ag,Ni, Pb,Bi	Be,Mo,Se,V,Zr	As 0.5 Sn 0.3 B 0.3 Rb 0.08 Li 0.03 Ag 0.0025	0.08	2			
Beaconsfield 1		As	Cu,Mn,Zn	Ba,Cr,Li,Ni Pb, Rb.	Ag,B,Co,Hg, Sb,Sn,Sr,V, W.	Bi,Sc,Y,Zr	As 1 Mn 0.8 Zn 0.3 Cu 0.2 Rb 0.03 Li 0.01 Hg 0.003 Ag 0.0012	1.36	N.D.		8,000	20/ 4/63
2			As,Cu,Mn, Zn	Ba,Co,Cr,Li Pb,Rb,Sb	B,Ni,V	Ag,Bi,Hg,Sr,Sn,Y,Zr	As 0.8, Zn 0.4,Mn 0.3 Cu 0.1, Rb 0.015 Li 0.01	0.81	N.D.		Rough Est. 20,000 +	Feb.-March 1963
Magnet 1	Zn	Mn,Pb	As,Cd	Ag,Cr,Cu,Rb Sb,Sn	B,Li,Ni,Sr	Ba,Co,Hg,Sc,V	Zn 11,Mn 9, Pb 2.5 As 0.7 Cd 0.3, Ag 0.03, Rb 0.03	3.60	1.5		800	23/ 4/63
2	Mn,Zn	Pb	As,Cd	Ag,Cr,Cu,Rb, Sb,Sn	B,Co,Li,Ni, V	Ba,Sc,Sr,Zr	Zn 30,Mn 10, Pb 1, As 0.8,Cd 0.35 Rb 0.04, Ag 0.02	4.10	N.D.			
3	Mn,Zn	Pb	As,Cd	Ag,Cr,Cu,Ni Rb,Sb,Sn	B,Ba,Co,Li, V	Sc,Sr	Zn 30,Mn 10,Pb 1, As 0.9, Cd 0.4 Rb 0.04, Ag 0.015	3.80	N.D.		10,000	
4	Zn	Mn	As,Cd,Pb	Ag,Cr,Cu,Ni Rb,Sb,Sn	Co,Li,V	B,Ba,Sr	Zn 40, Mn 8, Pb 0.8 As 0.8 Cd 0.4 Rb 0.035, Ag 0.015	6.69	N.D.			
5	Zn	Mn Pb	As,Cd	Ag,B,Cr,Cu, Li,Ni,Rb,Sb, Sn.	Sc,Ba,Co,V	Sr	Zn 30,Mn 8, Pb 1.5,As 0.8, Cd 0.6, Rb 0.05 Ag 0.015,Li 0.01,Sc0.0015	4.50	N.D.			
Moina			Mn,Rb,Sn, W	Ba,Bi,Cr,Li, Mo,Pb,Sb,Zn	B,Co,Cu,Ni, Sc,Sr,Zr.	Ag,Y	Rb 0.25, Mn 0.15, Sn 0.12,W 0.1, Li 0.04, Sc 0.0015	0.32	N.D.		3,500	22/ 4/63
Zeehan-Near Oonah Main Shaft		Pb,Zn	As,Mn,Rb	Ag,B,Cd,Cr, Li,Sb,Sn,V, Cu	Ba,Co,Ni, Sc, W, Zr.	,Bi,Mo,Sr	Zn 7, Pb 4, As 0.7, Mn 0.3, Rb0.1 Ag 0.03, Li 0.01, Sc 0.0025	5.10	0.5		600	26/ 4/63
Zeehan Western Lower Section		Mn,Pb, Zn	Rb	As,B,Ba,Cr Cu,Li,Sb,Sn	Ag,Cd,Co,Ni Sc,V,Zr.	Bi,Sr,Y	Mn 5, Zn 1.5, Pb 1, Rb 0.1, Li 0.015, Ag 0.009,Sc 0.002	0.89	0.5		15,000	27/ 4/63
Zeehan Western Upper Section		Mn,Pb, Zn	As,Cu,Rb	Ag,B,Be,Cr, Li,Sb,Sn,V	Ba,Cd,Co, Mo,Ni,Sc, W, Zr	Bi,Sr,Y	Pb 3.5, Zn 2.5, Mn 2, As 0.8, Cu 0.2, Rb 0.1, Ag 0.025, Li0.025 Sc 0.0025	0.86	1		15,000	27/ 4/63

None detected at limit equivalent to 0.002 % U3 08

SURVEY OF MINERAL RESOURCES IN TAILINGS - DETAILED RESULTS - TASMANIA

Sample Location and Mark	Qualitative Analysis by Emission Spectroscopy - %						Semi-quantitative Analysis by Emission Spectroscopy - %	Chem. Analysis		Radio-activity	Tonnage Est. in Dump	Date Sampled
	Major 100-10	Minor 10-1	Heavy Trace 1-0.1	Trace 0.1 - 0-0.01	Faint Trace 0.01-0.001	Very Faint Trace 0.001-0.0001		S %	Se ppm.			
Zeehan-Oceana Tailings in Creek		Mn,Pb,Zn		Cr,Rb,Sb	Ag,Ba,Cd,Cu, Sn	B,Co,Li,Mo,Ni, V,Sr	Mn 1, Pb 1, Zn 1, Rb 0.015, Ag 0.0025	0.48	N.D.	None detected at limit equivalent to 0.002 % U3 O8	1,200	26/ 4/63
Zeehan-Montana South East Section		Mn,Pb,Zn	As,Rb,Sn	Ag,B,Ba,Cr,Cu Li,Sb,V	Cd,Co,Ni,Se, Sr,W,Zr	Bi,Mo,Y	Pb 3,Zn 3, Mn 1,As 0.5,Sn 0.15 Rb 0.1, Li 0.012,Ag 0.01, Sc 0.0015	2.15	1.5		15,000	27/ 4/63
Zeehan-Montana South West Section		Mn,Pb,Zn		Ag,As,B,Cd,Cr, Cu,Li,Rb,Sb, Sn	Ba,Ni,Sc,V,W	Bi,Co,Mo,Sr,Y, Zr	Zn 5, Mn 4,Pb 2.5,Rb 0.04, Cd 0.02, Ag 0.015, Li 0.015, Sc 0.0015	2.50	1		15,000	27/ 4/63
Zeehan-Dump at Golf Links		As,Pb,Sb, Zn	Cu,Mn	Ag,B,Ba,Cr, Li,Rb,Sn	Bi,Cd,Ni,Sc, V,W,Zr	Co,Mo,Sr,Y	Pb 7,Zn 5, As 2, Sb 1,Mn 0.7, Cu 0.2, Rb 0.06,Ag 0.03, Li 0.012,Sc 0.001	3.55	N.D.		17,000	26/ 4/63
Zeehan Lower Dump in Queen Creek		Pb	As,Mn,Rb Sn, Zn	Ag,B,Ba,Cr,Cu, Li,Sb,V	Ni,Sc,W	Bi,Cd,Co,Mo,Sr, Y,Zr	Pb 8, Zn 0.8, As 0.8, Mn 0.3, Sn 0.25, Rb 0.1,Ag 0.025, Li 0.015, Sc 0.002	2.45	1.5		1,000	27/ 4/63
Zeehan-Upper Dump in Queen Creek		Pb	As,Sn,Zn.	Ag,B,Ba,Cu,Cr, Li,Mn,Rb,Sb,V	Ni,Sc,W,Zr	Be,Bi,Co,Hg,Mo, Sr,Y	Pb 4, As 0.7, Sn 0.25, Zn 0.1, Rb 0.07, Li 0.015, Ag 0.01, Sc 0.002	1.89	1.5		200	27/ 4/63
E.Z. Rosebery (Residue Dam)	Fe,Al,Si	Zn,Mn,Mg, K	Cu,Pb,As,Ca, Ba,Rb,Na	Sb,Ti	Co,Ag,Cd,Bi, Sn,Mo,Ge,Zr, Sr,B	Ni,Be,Ga,Cr,V	Zn 1,Mn 3, Cu 0.15,Pb 0.8, As 0.5, Ag 0.005,Rb 0.2	20.5	* 10		1,250,000	July, 1963
E.Z. Rosebery(Unclassified Tails for year ended 26/6/63	Fe,Al,Si	Zn,Mn,Mg, K,Na	Cu,Pb,As,Ca Ti,Ba,Rb	Sb	Ni,Co,Ag,Cd, Bi,Sn,Mo,Ge, Zr,Sr,V,B	Be,Ga,Cr,Sc	Zn 1, Mn 3,Cu 0.2, Pb 0.5, As 0.25, Ag 0.007, Rb 0.3	20.8	* 10		180,000 Tons/Year 70% used for filling.	1962/63
Mt. Lyell-Queenstown Blast Furnace Slag	Fe,Al,Si	Zn,Ca,Mg, K	Cu,Pb,Ti,Ba Na	Ni,Co,Mo,Sb, Sr,Rb	Ag,Sn,In,Zr Mn, Cr, V, B	Bi,Be,Ga,Sc	Zn 2,Cu 1, Pb 0.4, Ag 0.0015	1.31	* 10		6 million tons	April May 1963
Mt. Lyell Queenstown Mill Tailing	Al,Si	Fe,Mg,K	Cu,Ca,Ti, Ba,Rb,Na	Zn,Co,W,Mo,Zr, Mn	Pb,Ni,Sn,Sr, Cr,V,La	Cd,Bi,B,Y,Sc	Cu 0.1, Rb 0.12	4.12	* 10		None Disch. at 1.75m.t/ yr.	

N.D. = none detected at limit equivalent to 1 ppm. Se

* = less than