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SUGGESTED PROCEDURE FOR SAMPLING & EVALUATION

ALLUVIAL TESTING, RINGAROOMA DISTRICT

by

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SUGGESTED PROCEDURE FOR SAMPLING AND EVALUATION ALLUVIAL TESTING, RUNGAROONA DISTRICT

by

J. H. BASTIGAN

GENERAL

Some attention has been given to sampling and valuation procedures of alluvial deposits with a view to choosing a suitable technique to be used during the preliminary scout boring programme in our Ringarooma permit.

In the past, sampling and evaluation in boring campaigns in this district have generally been unsatisfactory in several respects. Most boring has been designed to test for, or improve reserves of sluicing properties, and the logging, sampling and recovery of concentrates from samples has often been left to the drilling crews and tin dressers without adequate supervision. The emphasis on dressing the sample was to recover the sizings of tin which could be recovered by sluicing, and in this respect the procedure was probably quite adequate for an operating hydraulic mine. With testing for possible dredging properties however, it is essential that all fines are recovered and a full analysis of core and dressed concentrates be made.

Reference can be made to the Government programme of boring on the Scotia - Lochaber leads to show inadequacies of sampling and assaying techniques. Some 855 bores averaging 91 feet in depth and totalling 78,153 feet, were put down between 1935 and 1944. The bore logs are poor, and no record of the individual horizons at which cassiterite is concentrated was taken. Nor is the sampling and evaluation technique described and this leaves it open to doubt whether core volumes were measured properly or all tails were checked for fines lost in panning. The evaluation of the boring and final report was not written until 1955, this being done by an officer of the Mines Department who had not been engaged on the boring programme.

In contrast, the techniques employed recently by the Dorset Tin Dredging are systematic and sound.

PURPOSE AND REQUIREMENTS OF A SUITABLE PROCEDURE

The sampling and evaluation procedure should be so designed as to give full information concerning all factors which would influence mining and treatment of alluvial ground. This would include:-

(1.) Sampling at regular intervals to determine horizons at which tin is located, as the possibility always exists of choosing an arbitrary false bottom in the alluvial section above which mining might be economic, even were the full depth of ground to true bottom unpayable.

(2.) As accurate as possible measurement of core volume. The core volume is sometimes liable to considerable variation from the theoretical volume of the pipe of known length and diameter, even when the diameter of the cutting shoe at varying stages of wear is known.

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Recovered core can be either excess or deficient as compared with the theoretical volume. In driving pipe with a cutting shoe, excess core can arise from running ground (particularly in loose, wet sand and gravel), whereby material from outside of the bore hole section is drawn into the hole especially by the sucking action of the pump. Other factors leading to excess core are the apparent increase in volume of bored compacted strata due to agitation during drilling and pumping. Deficient cores may arise through large boulders being pushed aside by the shoe or forcing underlying material aside during boring.

There are two methods of measuring core volumes -

(a) the discharged volume can be measured on delivery of the pumped material of the sample to a suitable measuring container. The material is shaken firmly to compact, though there is no means of knowing whether compaction varies from the material in situ.

(b) the pipe volume is measured by lowering the sand pump to the upper surface of material in the tubes prior to and after pumping of the sample, and measuring the difference in length of the column. The calculated volume may vary from the discharged volume of the sample. The pipe volume is liable to be greater than the discharged volume in fine clayey or silty material, and less in running sand.

In practice, it is common not to pump to the bottom of the pipe, but to leave several inches on bottom as a packer to prevent the influx of material from below and outside the pipe. In evaluation, the greater of the two core volumes is taken to prevent, as far as possible, over-estimation of values of the ground.

(3.) Screening of recovered core to give an estimate of the proportion of larger fraction which could influence treatment, e.g. in dredging, the +$\frac{3}{8}$ oversize is discharged through the stone chute, leaving less volume to pass over the jigs.

(4.) Washing of the undersize fraction from screening to determine the proportion of heavy mineral concentrate and the economic minerals. For example, besides cassiterite and possibly gold, it is important to know the proportion of other "black sand" constituents such as "iron oxides", sapphires, rubies, topaz, zircon, plecnaste, monazite, etc., which, if they bulk largely, could influence the number of jigs required in dredging, as well as forming possible economic by products.

(5.) Cleaning up and screening cassiterite to give a proper evaluation of the chief economic minerals, the probable proportion of recoverable cassiterite, and also information on plant design.

(6.) Full recording of all relevant data on a bore record sheet.

SUGGESTED PROCEDURE FOR 5" OR 6" SCOUT HOLES

Sample Interval.

It is suggested that sample intervals should relate to 5' or 10' drives, the former interval in shallower holes (<100') and the latter in deeper holes. Where coarser or obviously tin bearing strata is encountered in deeper holes, the interval can be reduced to 5'.

However, in all holes, if the boring tubes are of suitable length, the sample interval might be more conveniently taken as the tube length unit or multiples of this. Some discretion in sample interval should also be allowed when a considerable section obviously has no, or poor values.

Concentration.

As the 5" holes will not result in samples of large volumes, the concentration procedure can be quite simple, and essentially similar to the hand panning technique we have been using at the present time for surface samples, and such as is used at Dorset for 5" boring. The preliminary concentration can be effected in the field at a site on water close to the bore holes, but final clean-up and analysis would best be done in a central field office.

Requirements.

(a) A number of robust measuring buckets into which the pump could be discharged directly, e.g. 4 gallon drums.

(b) A drum to catch slimes spilt when discharging sample.

(c) Two drums for breaking down of sample and holding tails from panning.

(d) A small 3/8 screen.

(e) A small measuring box, e.g. ¼ cubic foot.

(f) Prospecting dishes, 2 large and 1 small for washing, drying and cleaning up concentrates.

(g) A 12' or 15' sluice box with corduroy cloth bottom.

(h) Cellophane envelopes for retaining concentrates.

(i) A set of balance scales measuring in grains.

(j) A set of screens for sizing.

(k) A small pump to supply water at pressure.

(l) Recording sheets.

Technique.

The procedure suggested is to sample at accurately measured bore footage, and to deliver pumped material directly to a measuring bucket or to a short length of inclined troughing fed into the measuring bucket.

The bucket (and troughing if installed) should be placed in a drum to catch slimes and other spoil which may spill. These spillings are not added to the sample but are accumulated throughout the whole bore length and later concentrated, and the heavy mineral fractions averaged over the complete hole, (added to the weighted and averaged figures for the individual sample lengths).

The sample in the measuring bucket is tapped and shaken to consolidate firmly, and the pumped volume of core measured by reference to graduations on the measuring bucket or by scaling to a straight edge placed across the top of the bucket. The pipe volume could also be taken, but in our initial scouting this is not considered essential.

The sample is now ready for washing. It is transferred from the measuring bucket and washed over a ¼ screen into a water-filled drum. The oversize is measured and the undersize mixed and broken down in the drum. The material is then panned over another water-filled drum which retains all tailings.

The concentrate is retained and dried. The tailings for all individual samples of the bore hole are retained and passed in bulk over a sluice box lined with corduroy cloth to recover all cassiterite fines and other heavy minerals lost in panning. These form a mat on the corduroy cloth, which can be recovered by shaking out or washing the cloth.

The accumulated spilled slimes over the full bore depth are treated as with the individual samples, being panned, and the tails bulked with those of the individual samples for passing over corduroy cloth.

At this stage, there are for each bore hole -

(1) Panned concentrates from a number of individual samples of known volume.

(2) Panned concentrates from bulked spilled slimes of known volume.

(3) A concentrate from the bulked tails of individual samples and spilled slimes.

All concentrates are dried, packaged, labelled and taken to a central field office for final clean up, analysis and recording. It is possible that Dorset Tin may be able to do our final clean up and analysis, but if their staff cannot do this conveniently, we could do this quite adequately.

In the final clean up and analysis, the cassiterite in each sample of rough concentrate is cleaned to an analysis of approximately 70% Sn (the clean up depending on the know how of an experienced practical tin dresser). This fraction is weighed and the tin value calculated from the core volume of the original sample.

The cassiterite of each individual sample is screened to show the proportions of +50, +100 and -100, and this is sufficient for all practical purposes. However, when all individual samples are weighed and screened to this degree, they can be bulked and a fuller screening and point obtained, showing sizings over the range +16 to -200 mesh. A chemical analysis of tin from the bulk concentrate can be obtained as a check to the mechanical methods.

The other heavy mineral fractions of the samples can also be analysed, recording the proportions of gold by colours (usually visible in screening of cassiterite fraction) and other minerals by grain count.

The panned concentrates from the individual samples give sufficient information about the horizons at which tin is concentrated in the alluvial section. After clean up, the values are weighted and averaged over the complete bore depth (or in some cases, over the interval above a false bottom level) and corrections made from the values shown in the bulked spilled slimes and bulked tail concentrate.

A full record is entered on a bore record sheet, and a suggested design for this is attached. This design is provisional only, and prepared for scout testing. If a proving programme should be undertaken in any area, modifications could be made to allow for the type of alluvial ground, type of boring plant and sampling and evaluation practice.

Departures from Standard Technique.

If sections of obviously barren strata, such as clay seams or finer types of "drift" are encountered, panning could perhaps be dispensed with, the broken down material being passed directly over the sluice box with corduroy cloth lining.

COMMENTS ON OTHER TECHNIQUES

The above suggested technique is believed to be the most convenient for our scout boring programme, and with modifications for any proving; we might do with 5" or 6" boring plants.

Where proving of pebble or shingle beds is involved, holes of large diameter give more reliable evaluation of such tin bearing ground. Dorset Tin has used a 16" Conrad plant for testing, and as large core volumes are recovered, a small pilot plant was installed to facilitate concentrating, as hand washing of large volumes is tedious and time consuming. In this pilot plant the cores are fed directly to a semicylindrical drum and measured, and then passed to a small hopper in which several jets of water puddles and breaksdown the material. From here the spoil is fed to a small revolving ¾ screen, washed by jets and agitated slightly by baffles. The oversize is measured and the undersize passes to a small two hutch jig. Most tin and heavy minerals are recovered from the spigot of the jig, and the jig tails are passed over a sluice box lined with corduroy cloth to recover fines. Clean up and evaluation practice is as in the method suggested for our testing.

In the past, some methods employed by Austral Malay have been designed to give quick evaluation in the field. Time cutting procedures include the use of ½ cubic feet core measuring boxes allowing rapid computation of yardage, as 1 box of ½ cubic feet capacity is approximately 0.01 cubic yards. A further time cutting device was the use of the Valentine Beam Scale which, if the cleaned cassiterite fraction from a ½ cubic feet box is placed on the pan of the balance, the value of the sample in katis (1.33 lbs.) per yard can be read directly off a graduated beam by moving a weight suspended by a thread along the beam.

In experienced hands, the accuracy of this method is surprisingly good compared with duplicate samples tested by balance scales. However, as a full analysis of samples and heavy mineral concentrate is desirable, it is not recommended that this procedure be used.

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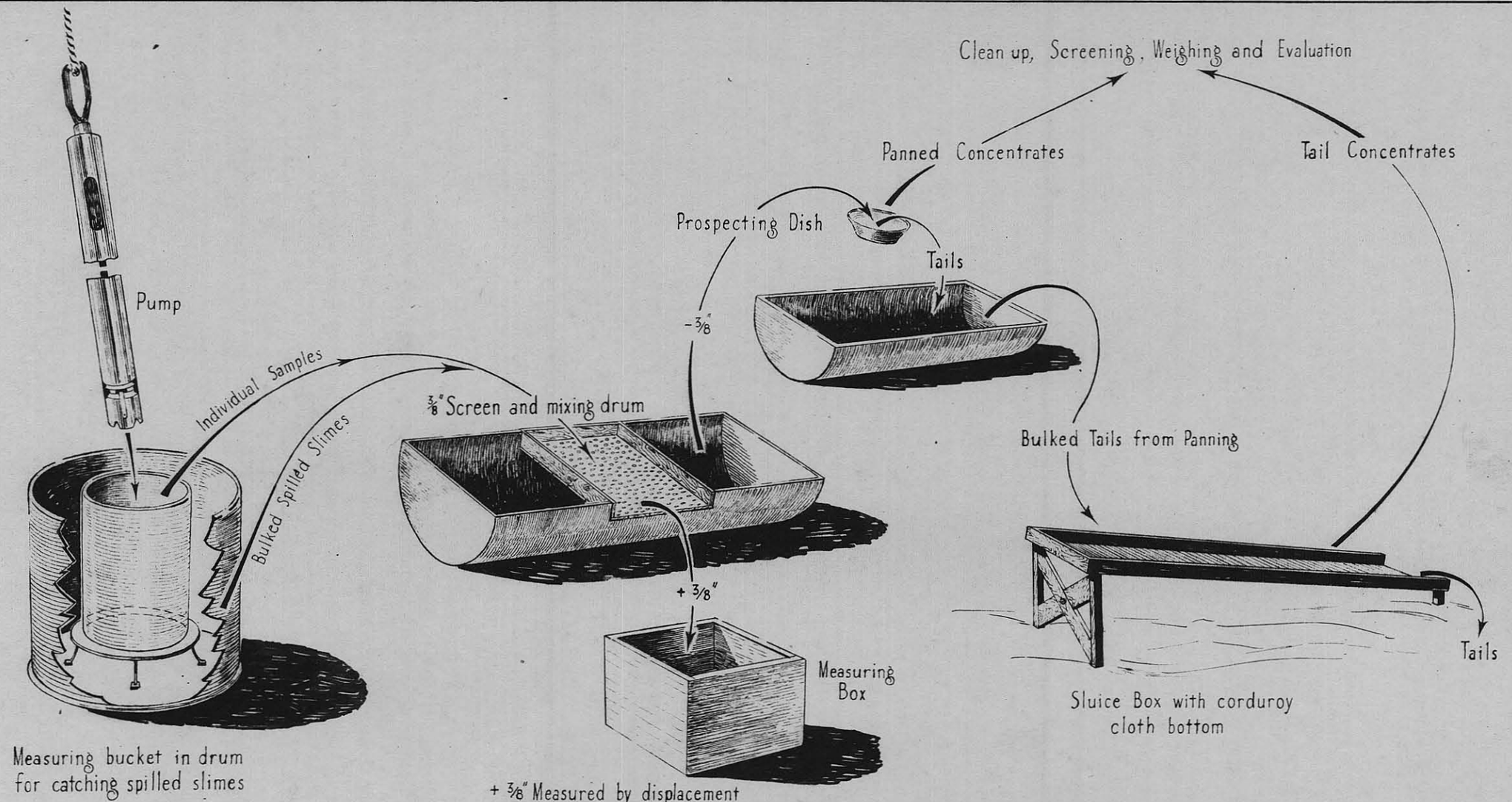
Geologist

14th March, 1958.



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SKETCH ILLUSTRATING PROVISIONAL LAYOUT FOR SAMPLING AND CONCENTRATING TECHNIQUE FOR SCOUT BORING OF ALLUVIALS FOR TIN, RINGAROOMA DISTRICT

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