

**FINAL REPORT
EXPLORATION LICENCE 27/90
CORINNA, TASMANIA**

including results for the period
22nd March, 1993 to 22nd March, 1994

BY

C.H.C.SHANNON

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CORINNA CLAYS PARTNERSHIP

**(South Raeburn Pty. Ltd & C.H.C. Shannon)
319 Brisbane St West Launceston 7250**

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Introduction

The report from the consultant John Clay in New Zealand was received and spotlights problems with the deposit as in the ground considered either as a ball clay product or as a natural pottery base. It has become obvious that the potentially good chemistry reported by John Hosking in the early assessment done for Savage Resources reflects "accidental" beneficiation resulting from a simple wet processing of the raw clay feed although the loss on ignition factor was often uncomfortably high. Refinements to a wet processing route would seem to have potential to come up with a good end product; but elaborate wet processing plants have a history of getting into financial trouble and this is not a risk the partners are prepared to take.

It is also possible that the proportion of mica to kaolin is just too high at even the finer grainsizes, and that the fine organic matter component is also too high for a competitive end product. Some of the high loss on ignition may come from the mica.

A craft-use project at the Devonport TAFE again did not progress during the year but is definitely intended to go ahead this year; now for their own interest only. The sample material for this project comprises secondary kaolin from site QP 7 and dark ball clay from site QP 6.

Exploration Philosophy

The clay deposit was known as to its volume at the outset of the tenure, from a previous drilling program, but test work had not been done on the samples. The idea was to complete assessment work on representative samples from the drilling so as to establish its possible commercial uses; the most likely being pottery clay products.

Summary of previous work

The clay deposit was discovered by the writer in his previous capacity as senior geologist for Savage Resources. The company management chopped around with the assessment work in an arbitrary fashion leaving critical questions open. For example some initially promising results of ceramic test work were never followed up after the idea of using the clay as white pigment extender took off. A drilling program of four dozen odd auger holes in the deposit gave a reasonable fix on the volume of the deposit, but the samples taken were destroyed through neglect and mishandling after the pigment extender concept was abandoned, reputedly because more favourable deposits became known on the mainland.

The partnership retrieved something from the previous Savage Resources drilling: Not the samples themselves, but the previously unpublished logs of the auger drilling were typed up and published.

To substitute for the ruined Savage Resources samples an excavator program of 20 pits was conducted in January 1992. This program provided the necessary material for chemical analysis and industrial ceramic assessment; material for a craft pottery assessment was taken from existing exposures. These samples are at present stored at 319 Brisbane St, West Launceston.

Assay results on 24 representative samples, with a commentary on these assays and Rhyne Tanton's craft pottery assessment have been reported in the two previous annual reports.

Work completed in the 1993-94 report period

The six sets of representative samples from the core zone of the prospect were examined for grainsize distribution by ceramic consultant John Clay whose report is appended. The samples have been described in part in the previous annual report, but to clarify, the deposit contains a principal seam of up to 5+ metres of organic rich sandy ball clay which has altered to "white", more plastic secondary kaolin at top and bottom margins; the marginal layers are usually less than 1 metre in thickness in auger records but the pit sampling revealed some greater thicknesses, and surface exposures showed an upper secondary kaolin clay seam of up to about 1 metre which would seem to have been generally missed in the auger drilling. (Sample GS 34 - the best from the Savage Resources work - comes mostly from this upper secondary kaolin seam). The samples represent rough channel sections of these divisions of the main clay seam as follows:

Pit QP 14 sample QP 14/1 top secondary kaolin zone c. 1m
QP 14/2-5 central ball clay zone c. 4m.

Pit QP 16 sample QP 16/1-4 central ball clay zone c. 4m.

Pit QP 20 sample QP 20/1 top secondary kaolin zone c. 1m
QP 20/2-3 central ball clay zone c. 2m.
QP 20/4 bottom secondary kaolin zone c. 1m.

The rationale for this selection was that material from this core area had to be commercially viable if the deposit was to be a mining proposition.

The consultant's report gives a pass to the material with regard to grainsize distribution but is adverse in respect of the chemistry of the deposit. The point being the potash content which is considered to bind too much of an already limited alumina content to a notional "feldspar" mineral phase (really mica) at the expense of the desirable notional kaolinite. Beneficiation is considered non-viable.

Conclusions

It is accepted that the deposit is not saleable to whiteware or sanitaryware buyers as dug from the ground. The potential for a commercial refined product would seem to be there, going by the earlier results of Hosking (1987), which only incidentally beneficiated the clay. His approach brought about compositions in line with competitive export ball clays by removing the diluting effect of quartz sand, some organics and some iron (and titanium?) present in heavy minerals. (Pyrite/marcasite was observed and is indicated by sulphur in the assays). Doubtless better results could be obtained but the prospect of such extended development work with no certainty of success at the end, and the lack of any home market support make it too much of a risk for the partnership. Clay refining projects have a bad reputation including the case of the Gulgong plant, N.S.W. More recent literature e.g. Loughbrough (1992) indicates that such refined products have become valuable export products elsewhere.

Even a craft pottery use requires more development work; the best potential being in the secondary kaolin material.

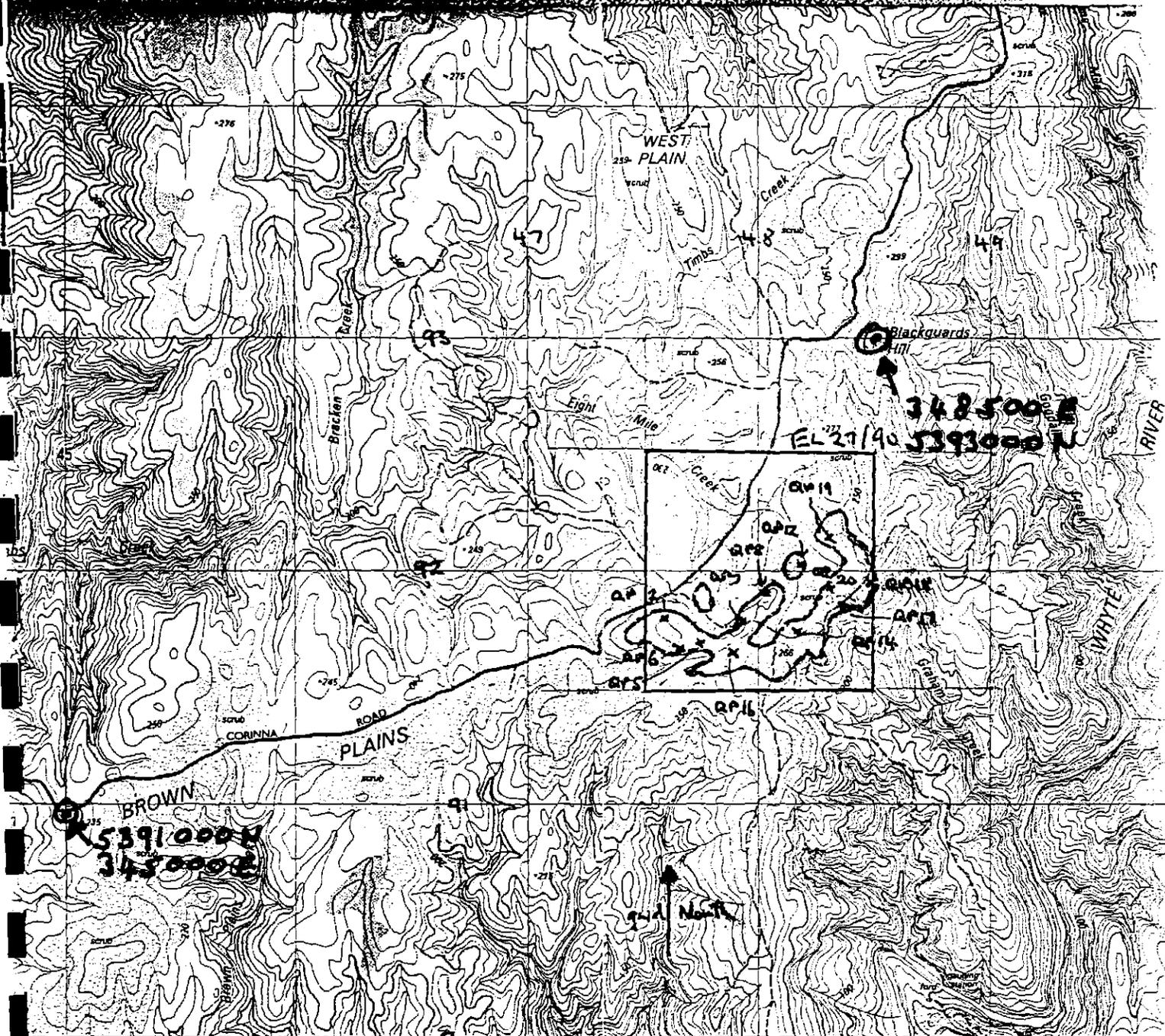
Rehabilitation status of excavations.

The costeans were backfilled on the day they were dug with the exception of sites QP 7 and QP 8, which are modifications to drainholes of a quarry complex, and QP 18 which is a road drain.

References

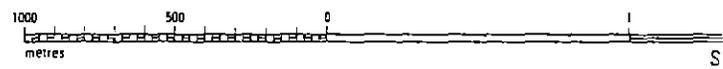
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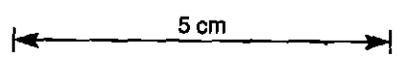


45 PIEMAN 46 47 48 SAMPLE LOCATIONS. 49 WABATAH 64

Residential area; Commercial buildings	
Roads maintained for continuous public use	Primary road with route number Secondary road with route number Minor road with route number Other road	
Roads of restricted use or access	Other roads with bridge Vehicular track with gate	
Walking track, horse trail (approximate position) with bridge	.....
Railway with station, Places entered in National Estate Register	.....	Karoola h
Power transmission line with pylon positions	.....
Building; Feature of historic or special interest; Ruin; Mine	.....	Brisbane Ruin PS FS sch
Post office; Police station; Fire station; School	.....	PS FS sch



Caravan park; Camping ground; Public toilets	.....
Disposal area; Visitor information centre; Cemetery	.....
Picnic area; Trig station beacon; Spot elevation	.....
Contour with value; Depression contour	.....
Quarry, pit or open cut mine	.....
Rock scree; Broken rocky surface	.....
Dense forest; Medium forest	.....
Low dense vegetation; Distinctive grass	.....
Orchard; Pine plantation	.....
Eucalypt plantation; Submerged trees	.....



AMG REFERENCE POINTS ADDED

Henry Shannon
319 Brisbane Street
West Launceston 7250
Tasmania
Australia

16 August 1993

CORINNA CLAY SAMPLES

Dear Henry

After a tremendous amount of effort and deliberation I have at last achieved some realistic results on the grain size determination on the samples you sent to me.

My first grain sizing gave results that looked good, but, a random check on a couple of the same samples gave significantly different results. The grain sizing was again undertaken, again with highly variable results.

After some thought and experimentation I have sieved off the larger practical sizes, anything above the 80 MICRON SIZE was removed prior to the sizing taking place. This amount removed per sample is shown as "residue" on the graph. These have been checked and are consistent.

It would appear that the larger particles are fractious and easily dispersed (variably) during the normal defloculation and shaking used in determining grain sizes.

THE GRAPHS AND RESULTS

Without exception the clays present a picture, as far as grain size goes, of being typical ball clays or sedimentary clays and in this respect would be no worse or better than the best English Ball clays except, of course, for the coarse fractious material taken out prior to carrying out the sizing.

I have to tell you that the clays in other respects does not measure up to being a good ball clay. Most ball clays have something in the order of 25% to 40% of Al₂O₃ contained within the structure. The most you have is 19.38 (Reference QP.14/1).

Clays are checked out by ceramists in a manner which is set out for you in APPENDIX A which is attached.

OBSERVATIONS

1. QP. 14-1 was chosen to be evaluated because of its relatively higher Alumina content than any of the other samples and therefore all the other samples would be inferior to QP 14 - 1.
2. The practice of determining the mineralogical content may not be scientifically sound, but it is never-the-less a practice which has worked well and consistently for the ceramic industry over many many years.
3. This type of clay is found in large quantities in both Australia and New Zealand and is generally discarded by good ceramists. Clays of a much better proportion are also abundant in Australia and New Zealand but in general, are discarded because of the colouring agents they contain.
4. Historically, beneficiation of clays has never been considered to be economically viable except in the case where variable seams of clay occur with a close chemical composition relationship and they are simply blended together by the pyramid stacking system.

Bearing in mind the retail price of clays or Silicas and Feldspars, this is not difficult to understand e.g. China clay \$500 per tonne, Ball clay \$500 per tonne, Silica and Feldspar at \$220 per tonne. It would cost approximately \$250,000 to install a sulphuric acid plant to remove the Fe_2O_3 and I am not aware of any equipment which will remove Titanium Oxide.

CONCLUSION

I am forced to conclude that the clay you have so far analysed is not good enough for the inclusion in general ceramics because of:

1. The mineralogical content is too far away in all respects from a classical clay.

The Feldspar is too high.

The Clay content is too low.

The Silica content is too high.

The Titanium and Iron are too high.

2. The beneficiation of these clays, would in my opinion, not possible, but even if it was possible it would economically be disastrous on the end price.

RECOMMENDATION

Have significantly more samples chemically analysed to try and find seams of clay that have significantly more alumina content in them. If you can find clays that are significantly better than those already sampled, simply carry out the arithmetic enclosed to ascertain its clay and mineral contents.

Yours faithfully

A J Clay

P S If you have other thoughts on the matter, I am quite happy to pursue them for you.

ENCLOSURE

APPENDIX A	
Graphs (Grain Sizes)	QP 20 - 4
	QP 20 - 2:3
	QP 20 - 1
	QP 16 - 1:4
	QP 14. 2:5
	QP 14. 1
Expenditure Sheet	8

This exercise is to examine the relationship between the major constituent parts of QP 14 - 1 and to identify the mineralogical contents.

ELEMENT	PERCENT	MOL WEIGHT	EQUIVALENT WEIGHT	REMARKS
SiO ₂	65.66	60	1.09	Percentage of the element divided by its molecular equals the equivalent weight.
Al ₂ O ₃	19.38	102	0.19	
Fe ₂ O ₃	0.78	160	0.005	
TiO ₂	0.85	80	0.11	
MnO	NOT SIGNIFICANT			
CaO	NOT SIGNIFICANT			
K ₂ O	2.44	94	0.026	
MgO	0.52	40	0.01	
P ₂ O ₅	NOT SIGNIFICANT			
SO ₃	NOT SIGNIFICANT			
Na ₂ O	0.06	62	0.01	

	RO	R ₂ O ₃	RO ₂	
MgO	0.01	Al ₂ O ₃ 0.19	SiO ₂ 1.09	The equivalent weights are grouped into radicals. RO =Alkaline=MgO:CaO:Na ₂ O K ₂ O R ₂ O ₃ =Neutrals=Al ₂ O ₃ Fe ₂ O ₃ RO ₂ =Acids SiO ₂ TiO ₂
CaO	—	Fe ₂ O ₃ 0.005	TiO ₂ 0.11	
K ₂ O	0.026			
Na ₂ O	0.01			

	RO	R ₂ O ₃	RO ₂	
MgO	0.05	Al ₂ O ₃ 1.000	SiO ₂ 0.57	The radicals are brought to unity by dividing all the radicals by the Al ₂ O ₃ radical. (Equivalent weights).
CaO	—	Fe ₂ O ₃ 0.03	TiO ₂ 0.58	
K ₂ O	0.16			
Na ₂ O	0.05			

The significant ^{pointer} ~~part~~ner to a ceramist is that the alumina (Al₂O₃) and Silica (SiO₂) should not be more than 1:5 respectively. Please note "a classic example would be 1:4.8". This indicates that the silica ratio in this clay is too high or alternatively the clay content is too low.

This empirical analyses can now be used to establish the mineral content of the above clay.

Soda, Potash, Alumina and Silica together form the mineral Feldspar, which acts as a flux when heated. Alumina and Silica form the simple clay mineral, which imparts plasticity.

Silica also forms Quartz Mineral, which imparts shrinkage. By noting the proportions in which these minerals exist within the sample, insight to the clays utility is achieved.

The following conditions are observed:

Sodium and Potassium oxide are combined and shown as KNaO : MOLECULAR WEIGHT 78.

The formulae for Theoretical Feldspar mineral is $\text{KNaO}:\text{Al}_2\text{O}_3:6\text{SiO}_2$
It's molecular weight is 540.

The clay mineral is $\text{Al}_2\text{O}_3:2\text{SiO}_2$ Molecular weight 258.
Iron is Fe_2O_3 Molecular weight 160.

Silica is SiO_2 Molecular weight 60.

To arrive at the equivalent for the mineral, divide the amount needed by the equivalent amount supplied. This gives the equivalent to be used. We see that 0.21 KNaO is needed and that 1.000 KNaO is supplied by the Feldspar mineral. Therefore, the equivalent of the feldspar mineral to be used is $0.21 \div 1.000 = 0.21$. Then each of the minerals supplied by $(1\text{KNaO}.1\text{Al}_2\text{O}_3.6\text{SiO}_2)$ is multiplied by this number (equivalent).

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BY DIFFERENCE

EQUIVALENTS	KNaO 0.21	Al ₂ O ₃ 1.000	SiO ₂ 5.7	Fe ₂ O ₃ 0.03	TiO ₃ 0.58	REMARKS
Feldspar	0.21	0.21	1.26			
Difference	0.00	0.79	4.44			
Clay		0.79	1.58			
Difference		0.00	2.86			
Silica			2.86			
Difference			0.00			
Fe ₂ O ₃				0.03		
TiO ₂					0.57	

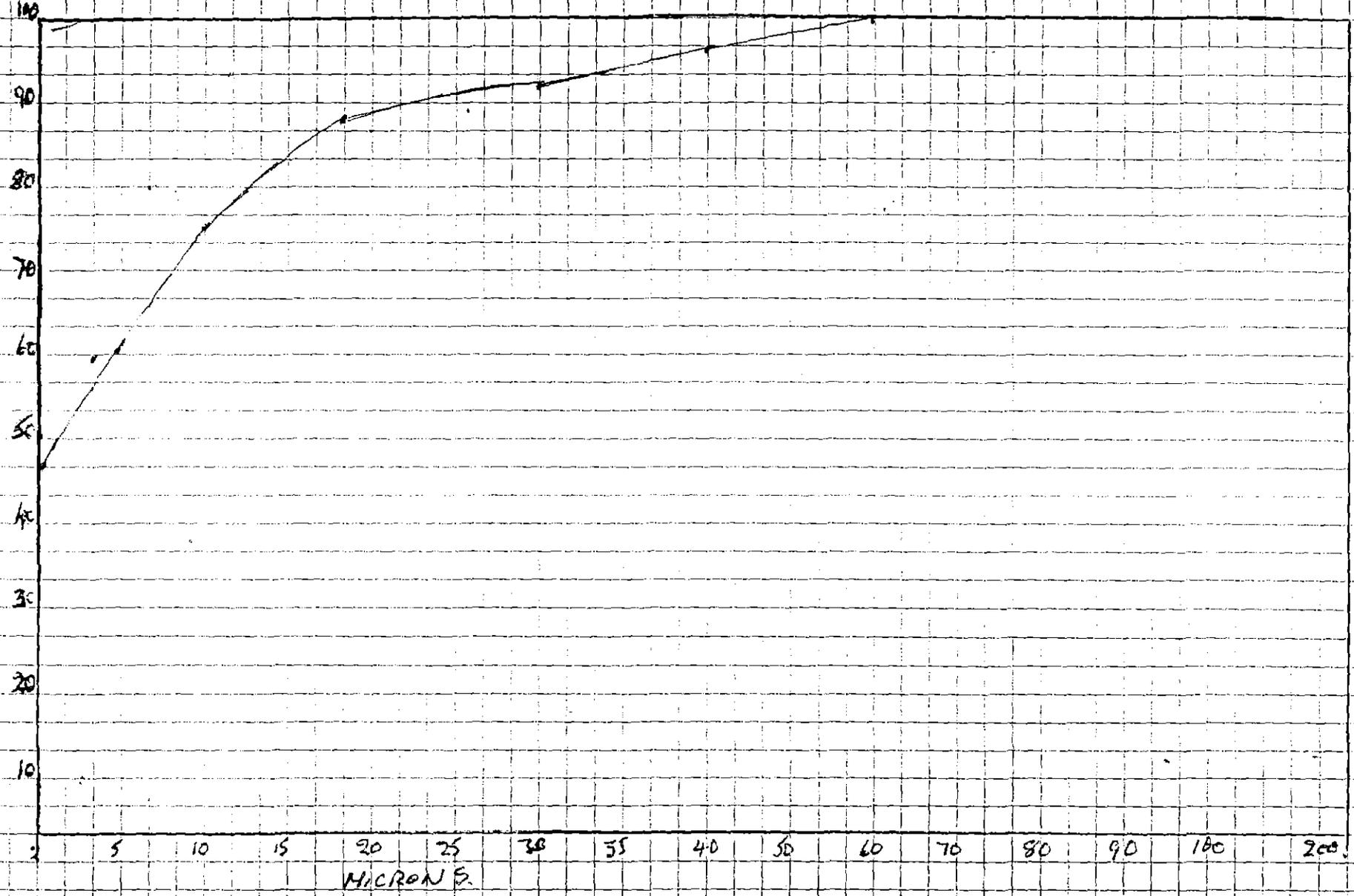
MINERAL	EQUIVALENT	MOL WT	REL WT	SUM	X 100	=	%	A CLASSICAL EXAMPLE
Feldspar	0.21	540	113.40	539.22	100	=	21.03	14%
Clay	0.79	258	203.82	539.22	100	=	37.79	65%
Silica	2.86	60	171.60	539.22	100	=	31.82	19%
Iron	0.03	160	4.80	539.22	100	=	0.89	1%
Titanium	0.57	80	45.60	539.22	100	=	8.45	1%
SUM =				539.22			99.98	100%

Measured against a classical Ball Clay it can be readily observed that the Feldspar is too high.

The Clay content is very low.
The Silica content is very high.
The Titanium is also very high.

NO. 40 BY SEDIMENTATION (HYDROTETER METHOD)
% FINER
PERCENTAGE FINER

GORMACK GRAPH PAPERS



RESIDUE LESS THAN 200

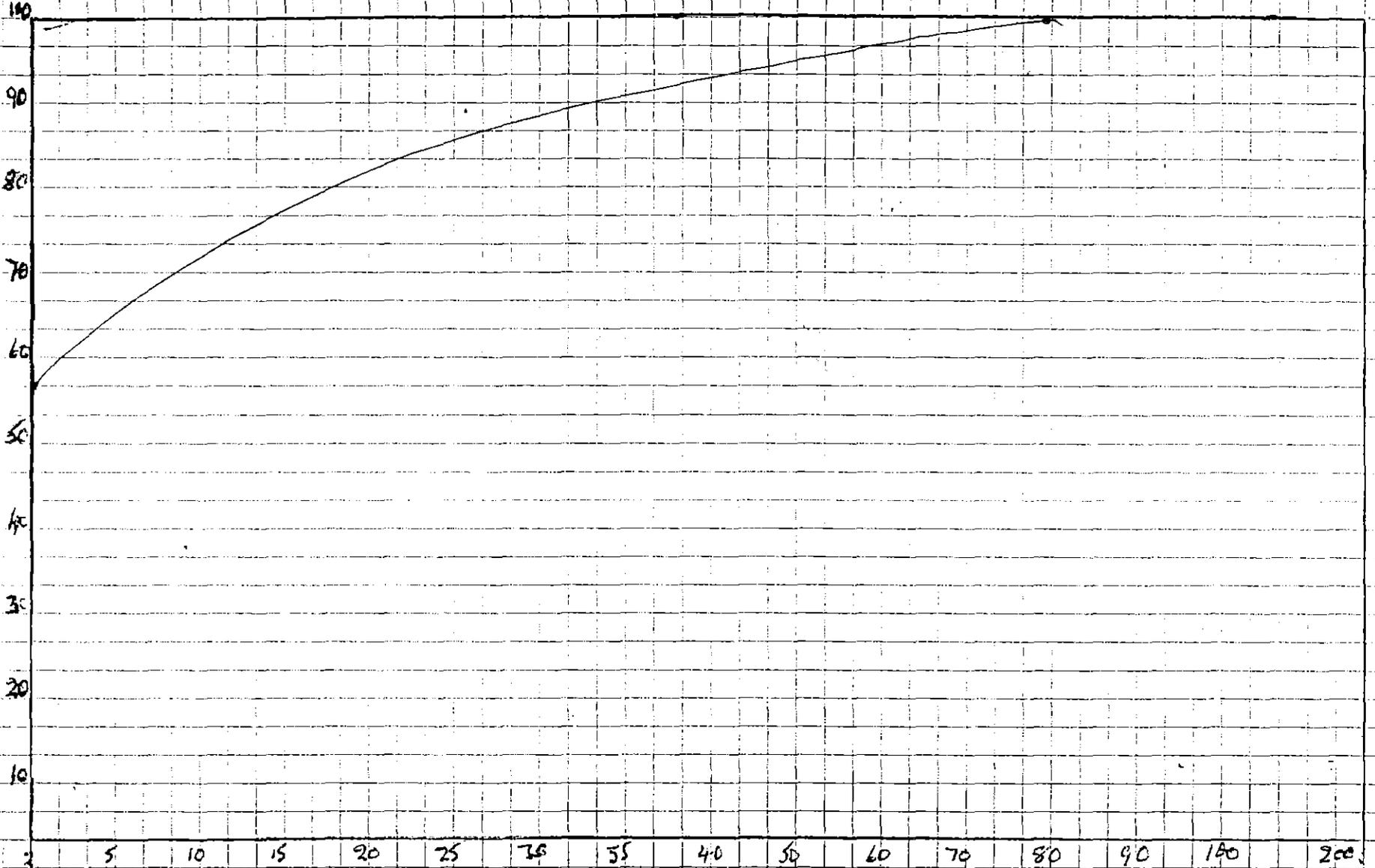
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40, 50, 60 SIZES DETERMINED BY WET SCREENING

REF QP. 14-265.

BELOW SIZE 40 BY SEDIMENTATION (HYDROTETER METHOD)

% FINER



MICRONS

RESIDUE LESS THAN 21/2

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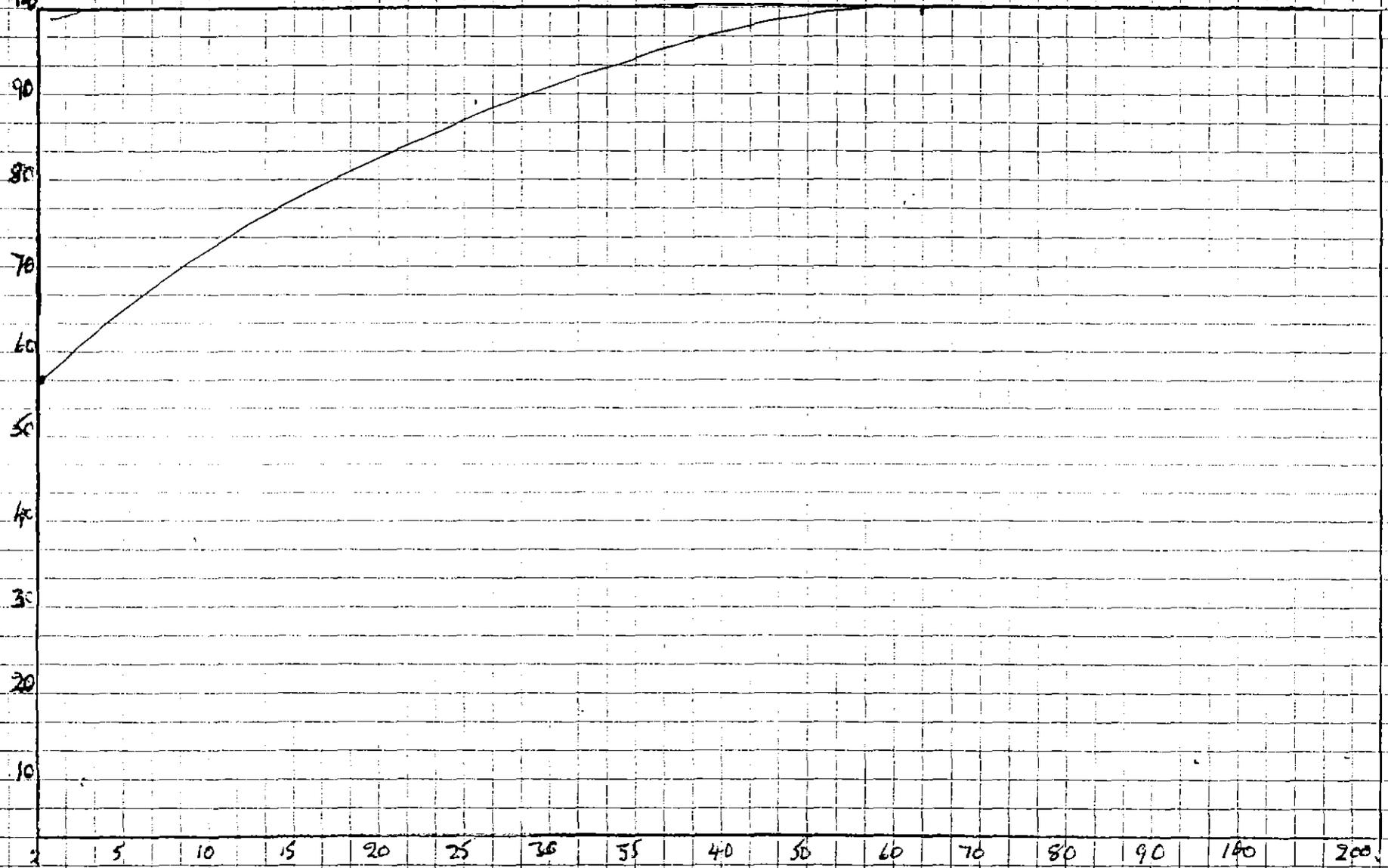
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20, 50, 60 SIZES DETERMINED BY WET SCREENING

Q.P. 16-1704

BELOW SIZE 40 BY SEDIMENTATION (HYDROMETER METHOD)

% FINER



MICRONS

RESIDUE LESS THAN 20 MICRONS

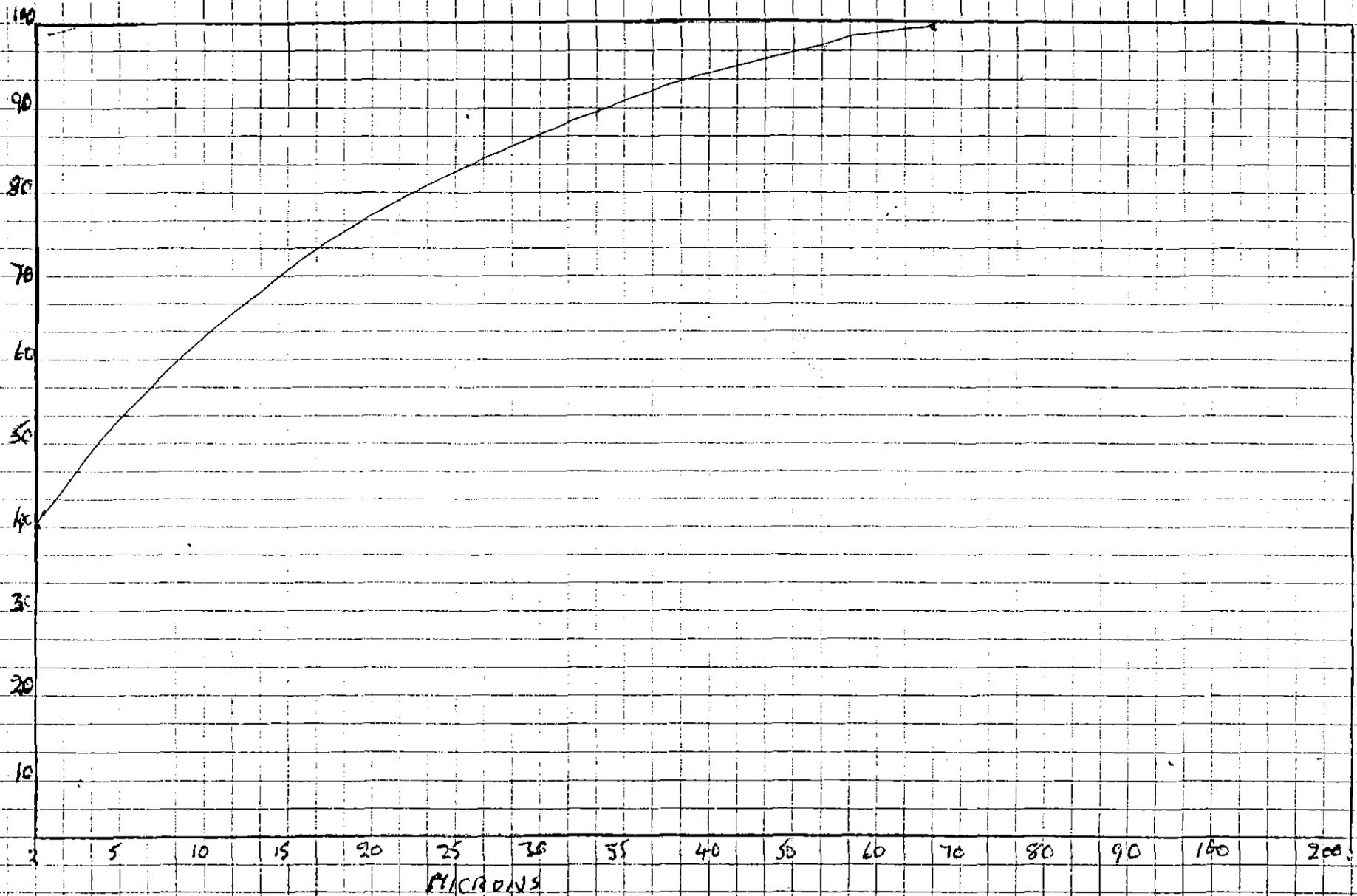
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40, 50, 60 SIZES DETERMINED BY WET SCREENING REF. D.P. 20-1

BELOW SIZE 40 BY SEDIMENTATION (HYDROMETER METHOD)

PERCENTAGE FINER



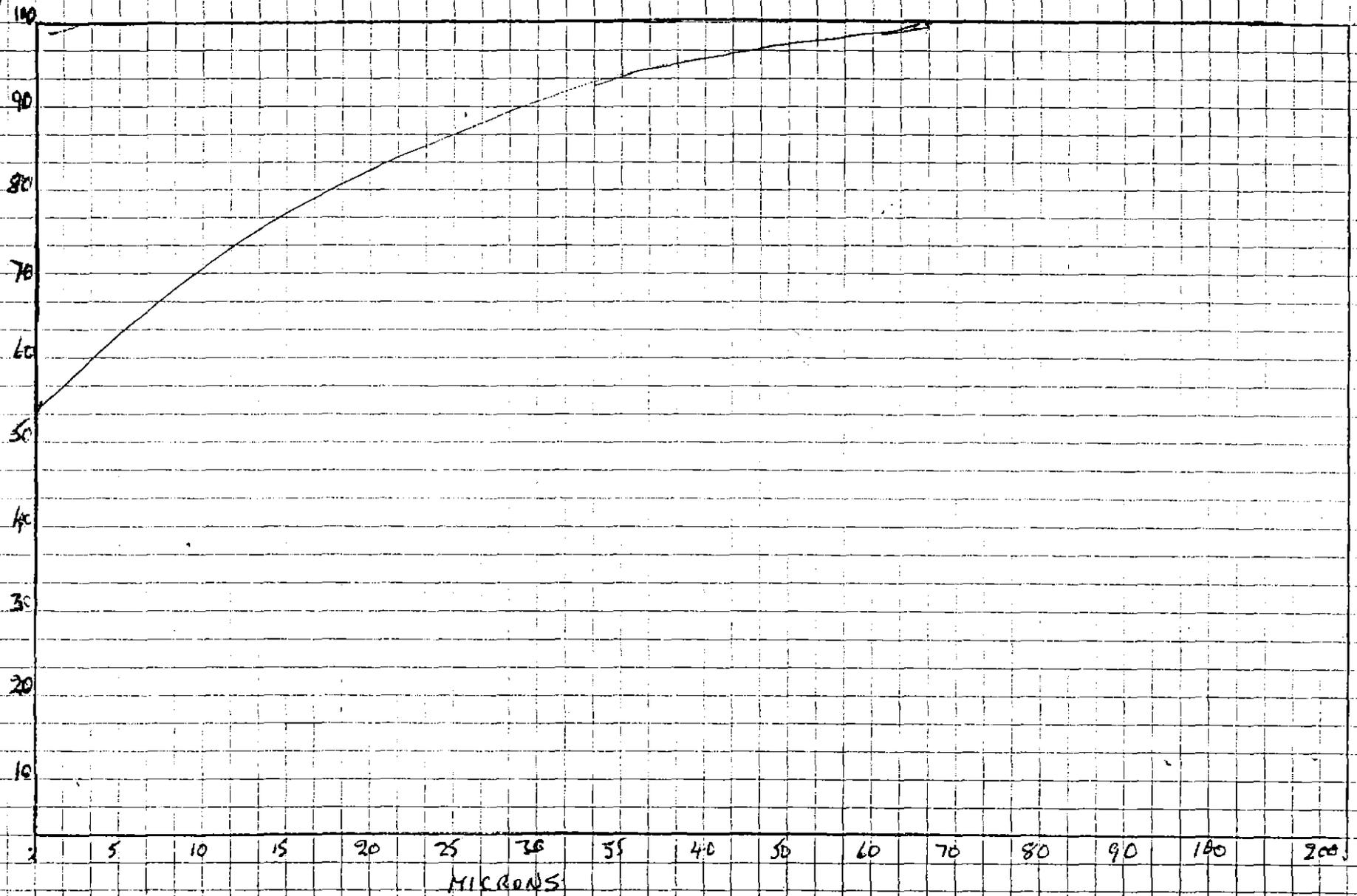
RESIDUE LESS THAN 10.5 μ 16.5%

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BELOW SIZE 40 BY SEDIMENTATION (HYDROTETER METHOD)

% FINER



RESIDUE LESS THAN 14.7

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