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Julian Deposit - Geology - Mettallurgy Study

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Julian Deposit Geology - Metallurgy Study

I have conducted an investigation of the Julian Deposit in search of any systematic variation in metallurgical characteristics with respect to the various mineralogic varieties. The study is based upon the following.

- 1957 Drilling, holes 1-4, grade (core recovery 50%), table test data
- 1958 Drilling, holes 5-9, grade data only
- 1962 Trench Area samples - grade data only

Grade and recovery data for all samples were matched with the present mineralogic classification of qtz-spec. sil., qtz-spec., qtz-spec. gran., qtz-gran. and other varieties. In most cases the sample intervals fairly well correspond with variety changes. Where sample intervals overlapped variety changes the sample data was divided. Individual samples and weighted averages were used as required to obtain the graphs shown.

Weighted Assay Distribution by Varieties

This plot shows the weighted assay frequency distribution curve for 95% of all core samples and 89% of the trench area, and the distribution within the frequency field of the four mineralogic varieties of importance. For example, the 27% shown in the spec.-sil. field for core samples means that 27% of all the core footage cut spec.-sil. rock whose grade varied as shown by the spec.-sil. field. The figure 27% is plotted at the center or weighted average for the spec.-sil. field. The compositional trend lines connect the averages for each mineralogic variety.

It should be readily apparent that in both the core and trench samples there is a definite trend shown by the grades of each variety, the order being from low to higher grade, spec.-sil., spec., spec.-gran. and granular as shown in the following table.

	Core Samples			Trench Area Samples		
Variety	% Total Field	% Fe	$\%^2$	% Total Field	% Fe	$\%^2$
Qtz Spec.-Sil	27	34.5	93	9	32.5	29
Qtz Spec.	14	36	50	23	34.5	79
Qtz Spec.-Gran.	37	37	133	42	36	150
Qtz Gran.	17	38	65	15	38	57
	95		341	89		315
Average		36			35.2	
True weighted average		35.45			35.71	

Note that the assay frequency curve ranges from the high twenties to the middle forties and that there is a wide range (32.5 to 40% iron) which includes 75% of all samples. This means that 3 out of 4 samples, volume or tonnage units should fall in the 32.5 - 40% iron range and 1 out of 4 units should be below 32.5 or greater than 40% iron. This test strongly indicates that the deposit is not very uniform with respect to grade.

As a further test for uniformity, grades were compared with sample lengths to see how rapidly the average grade is approached with increasing sample lengths representative of tonnage units.

Seven percent of the assay-sample length points fall well outside of what appears to be definite pattern. The points ignored are as follows.

60 ft. of 21% iron - ferruginous qte., hole 8
225 ft. - 38.5%
15 ft. - 64%
10 ft. - 49%
9 ft. - 50%
8 ft. - 53%
56 ft. - 45%
100 ft. - 43.5% in trench area
100 ft. - 44.6% " " "

The point population density has been contoured in 1% units to illustrate the trend. Note that points are scattered over a wide range, which is to be expected for short sample lengths of 20 feet or so. But note that even in 100 foot lengths the range is great and even with a 75% probability at 100 feet the range is still 32 - 38% iron.

It would appear that with benches 40 feet high one could expect about 95% of the ore body to fall in 28 - 44% iron range and 3 out of 4 forty foot tonnage units should fall in the 30-40% iron range.

There seems to be no escaping the fact that grade variations of up to 5% iron above or below the 35.5% average occur within the deposit in thicknesses of at least 100 feet and with a frequency such that this type of material should be expected 3 out of 4 times as normal ore for tonnage units of around 5-6000 tons and abnormal ore, which may run 20-30% Fe or 41-46% Fe in large units may be expected 1 out of 4 times. Such widely variable ore feed should certainly cause a wide variation in recovery.

An examination of the table test data available from holes 1-4 was made in which recovery was compared to crude grade. The values range from 25.5% recovery at 30% iron to 60% recovery at 43.5% iron. However, 80% of that data falls in a range from 40% Rec - 33% Fe to 52% Rec - 40% Fe. The concentration ratio is about 3 to 1 below 36% iron and about 1 to 1 above this. This is apparently an expression of the preferred presence of spec. in the 33-36% Fe half and more granular hematite in the upper half, 36-40% Fe. The reason why the concentration ratio drops in the higher ranges is due to the fact that the granular bearing ore contains, by far, the greatest percentage of the non-recoverable iron values, namely, the secondary iron oxides limonite and hematite which report as slimes.

Summary

The above indicated mineralogic metallurgical relationships suggest a mining-plant behavior pattern as follows:

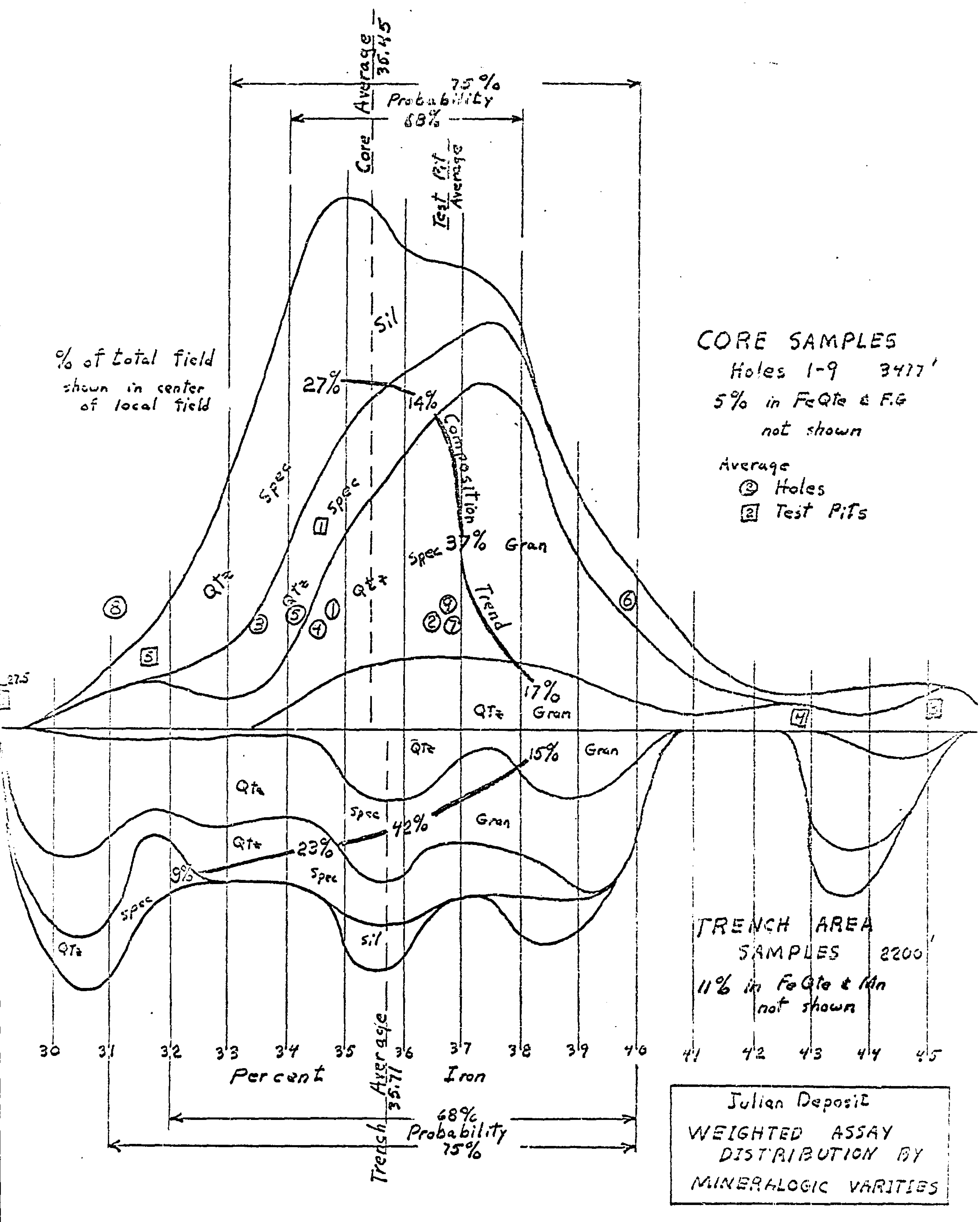
Condition	% Time	Grade	Recovery	Varieties	Thickness
Low Abnormal	10-15%	15-31% Fe	35% max.	Fe Qte > SS > S > SG	up to 60'
Low Normal	37%	32-36	43 ± 2	SS > S > SG	up to 100' at least
AVERAGE	75-80%	35-36 ± 5	48+ 4, - 8	SS - 18% S 13 SG 40 G 16 FeQ, Mn 8	up to 100' at least
High Normal	37	36-40	50 + 2 - 6 slime loss	SG > G > S	up to 100' at least
High Abnormal	15-10%	40% +	52-54 max. slime loss	G & SG	up to 100' at least

The above analysis of the current data seems to yield results which appear to be reasonable and are probably valid as an indication of the nature of the deposit with respect to its metallurgical characteristics. Of course the results can be no better than the quality of the basic data. In that there is not a very large difference between the core and trench assay frequency-composition data, this would suggest that they are both nearly representative of the deposit.

Thus, while the results presented here are only indicative of what the final behavior pattern will be, it is believed that the indicated behavior pattern will not change greatly upon completion of all drilling and metallurgical investigations as far as grade and recovery are concerned. In that we have no information regarding grindability it is not possible to predict the effects of this factor, but I believe we will find that as the proportion of granular hematite rock increases in the higher grade ores the ore will become harder to grind and liberate.

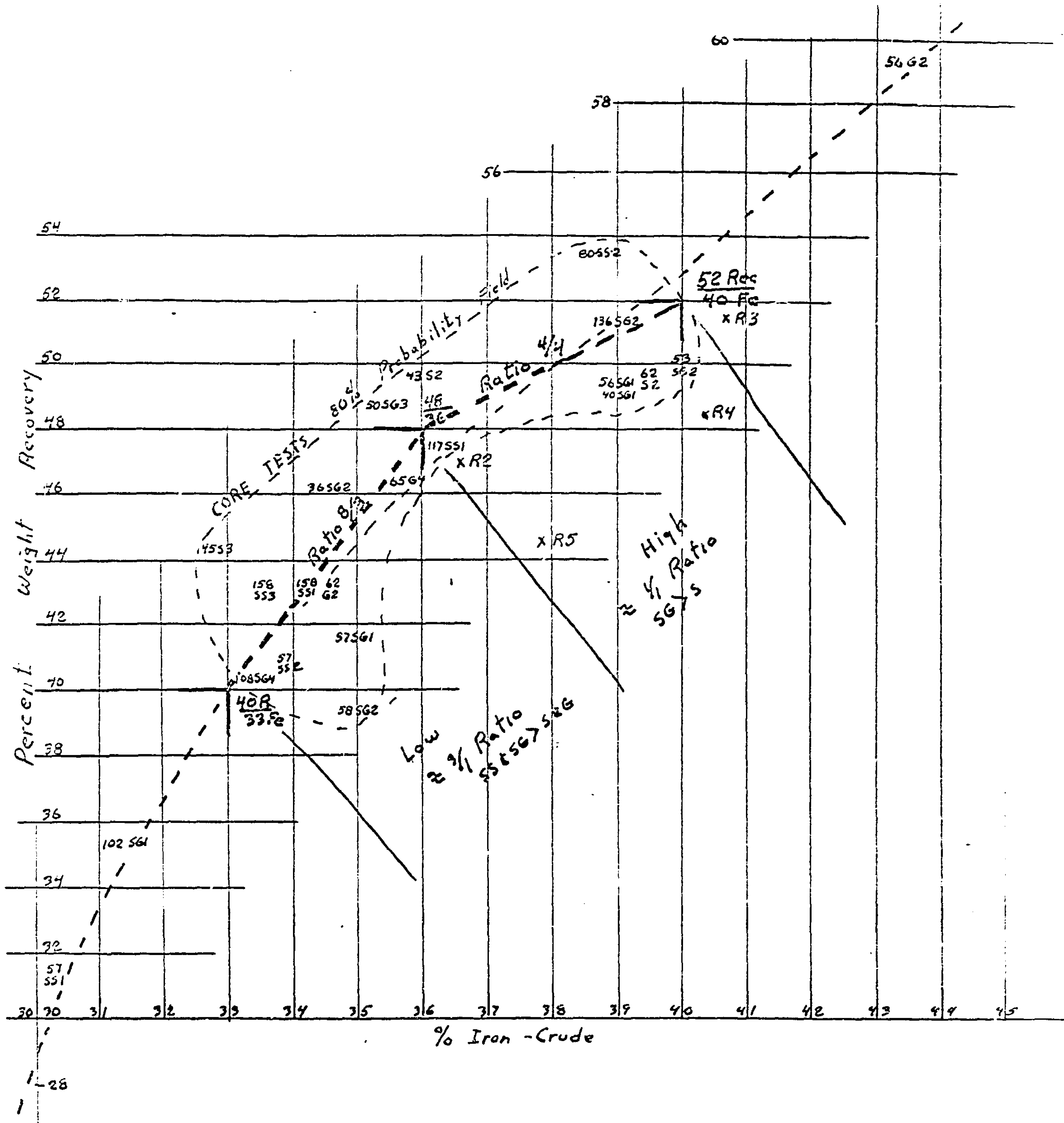
One thing is quite clear, that is, that pit blending of various ores is certainly going to have to be done on even "normal ores" in order to keep the recovery from changing up and down between 40 and 52% and the degree of pit blending will be more or less a direct function of the metallurgical tolerance of the plant.

SCANNED IMAGE




Julian Deposit.
GRADE – SAMPLE LENGTH
• Core data
x trench data
Point density contours at 1, 2, 3, 4, & 5% of 133 pts.
35 at 300'
35% at 170'
225
75% Probability
100' x = Trench.
80'
60'
40'
20'
lower limit
Upper limit
SAMPLE LENGTH, Feet
26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
% IRON

SCANNED IMAGE



legend

57 SG 1
Footage Variety Hole

R3 Lake Field Run 3

GRADE - RECOVERY DATA
Holes 1-4 Table Tests
1957