005144

To Distribution Copy to

From G. Jilson

Date November 6, 1984

Subject Summary of Grum Liaison Meeting in Faro, July 27, 1984

General Geology

Grum Deposit is a complex folded structure involving 3 - 5 or more layers of stratiform pyritic mineralization. The folds plunge shallowly toward the northwest, thus, ore becomes progressively deeper in that direction. The subcrop of the sulphide deposit is covered by a thick blanket of water saturated overburden. The deposit is truncated at its northwest and southeast ends by large 35 - 45° dipping normal faults and similar faults occur widely within the deposit. There are also several smaller, more steeply dipping faults. Host rocks for the ore-layers are relatively soft highly fissile phyllites with a prominent foliation dipping 20 - 40°. This foliation is parallel to axial planes of folds in the ore layers and parallel to ore lenses on the limbs of these folds. Many ore lenses have a massive upper (stratigraphic) and quartzose lower portion. An ore lens is commonly overlain (when upright) by highly broken and gouged phyllite. Since grade is strongly partitioned into the massive ore, thus there is a potentially serious compromise of underground mining tonnage.

Grum is similar to Faro but differs in several important respects:

a) since it is at a lower metamorphic grade both the ores and host rocks are less recrystallized and finer grained

b) Grum consists of thinner and more dispersed ore lenses often in highly contorted shapes with much intervening waste rock

c) Grum is less well endowed in massive ore types than Faro thus a significantly larger proportion of mill feed will be quartzose ore.

Drilling Density

The deposit has been drilled from the surface and ring-drilled from two parallel declines following the plunge of the fold structure. Most of the deposit southeast of 86E is drilled on 100' x 200' centers at a minimum; the bulk of the ore zone is drilled on 50' x 100' to 100' x 100' centers (locally closer). Most quoted reserves are

for the area between 62W and 86W, outside this area there is less drilling and more will be required to evaluate peripheral mineralization. The density of drilling in the volume containing quoted reserves is adequate to consider reserves proven and from an open pit point of view, little if any, additional drilling will be required to further define mineralization in this volume.

Areas Requiring Further Drilling

Champ Zone -

Stratigraphically highest ore lenses at the southeast end of the deposit (i.e. up plunge end). This is largely low grade mineralization now drilled on 200' x 200' density. This is not adequate to define the structure or number of horizons. Kerr Addison estimated 1.7×10^6 tonnes at 7.8% Pb+Zn in this area. 3,000' to 8,000' of drilling is required.

Northwest Extension-

Northwest of section 86W to about 100W there are scattered holes with high grade intersections. These show that the ore extends into this area and there may be 5 to 10^6 tonnes based on sectional reserves given for 80 - 86W. This is strictly underground potential as the best grade is at approximately 1,000' and deeper. About 20,000' will be needed to outline reserves followed by more detailed definition drilling probably underground.

Northwest and Southwest Margins -

Along the northeast margin of the deposit, several holes will ultimately be required to define deep reserves thought to be present in the extension of the upright panel. Along the southwest margin, the upper horizons are not well drilled off yet but work to date indicates low grades (this is a deep version of the champ zone). Additionally, there is the possibility of deep reserves down dip from the main horizons. A minimum of 25,000' will be required eventually to define but not solve the problem.

Dumpsite Drilling -

Several 500' - 1,000' deep drill holes will be required between Grum and Vangorda before dumping should be allowed in that area. No dumpsite holes are currently available for the southwestern overburden site. It is not likely that ore could occur within 1,000' of the surface here but consideration should be given to one hole to confirm the structure.

Geotechnical and Metallurgical Sampling -

There may be additional drilling required but no estimate can be provided now.

Database Available

Assay Data:

There are 9,000 samples all with PbZnAg analyses; approximately 10% of these are Kerr Addison data, the other 90% are Cyprus Anvil and additionally have Cu. About 2/3 of the samples additionally have Fe insol, Fe sol, Au, and Pulp S.G.

Histogram summaries of the assay database were provided and additional summaries are attached.

There are no assays available for BaO or Mn and no systematic data available for other elements such as Hg, As, Cd etc.

All CAMC assays were done by Kamloops Research and Assay Lab using several "Anvil Standards" for control. Pulps and rejects have been retained in KRAL for these samples; Pulps are N_2 purged, rejects are not.

Collar Co-ordinates and Downhole Survey Data:

All holes have been checked and brought to a common datum. A separate report by L.C. Pigage is available.

Lithology Data:

All lithologies have been updated and as much as possible brought to a common nomenclature.

Structure and Fault Data:

All holes have been brought to a common format that fits CAMC's plotting capability and current documentation. Fault files have been made for all holes.

A separate memo is available giving recommendations for the continuing maintenance of the Grum data base to avoid another major revision.

The following points were discussed:

Engineering/Geotechnical

Discussed the general lack of geotechnical data - only a few percentage of DDH logged geotechnically - no file for geotechnical data in database.

Discussed the open pit versus underground mining of the Grum deposit - what data is required to evaluate Grum as an underground proposition -

- tensile strength data - ore and rock
- RQD data
- water flow/transmissivity
- faults - properties of gouge
- joints and fractions - (not generally measured in (drillholes)

Little of this is available.

Discussed the lack of available expertise within company to make this study and need for consultants/acquisition of required staff.

It seems likely that a maximum open pit will be instituted with underground cleanup and that no study of the balance between open pit and underground saw off will be made since the data needed is not at hand.

An inventory of geotechnical information should be put together and an analysis of the information in conjunction with exploration should be made - as of now there has been limited interaction.

More sampling/drilling may be required to acquire geotech data.

Dumpsites locations and time frame requested in order to evaluate in view of exploration potential and priority for drill testing.

Discussed schedule for geological cross and long section interpretation - looking to have at least first half of deposit by 1 June, 1985.

Metallurgy and Milling

Examined samples of Grum ore in comparison to Faro:

D Maisson explained Claudia Gasparini's work to discover phases containing troublesome and desireable minor constituents in cons. and implications for modeling behaviour of traces in mill w.r.t. ore type and impact on data needed/useful to characterize ore types.

Discussed carbon content and learned that Leco organic carbon analyses are not necessarily useful. Is there a useful test for troublesome carbon?

Discussed availability of Lakefield samples - Inventory being assembled for Lakefield, Kerr Addison, CAMC and KRAL met samples, showing if possible deposit, location in deposit, report number and sample number.

Discussed desireability of integration of all met sample sites with geology and location in sections/plans.

Possibility of met sample data base to keep track of samples.

Discussed possibility of assembling ore samples representative of ore types from Grum Dump and concluded that this was not desireable due to uncertainty of location in deposit.

Discussed feasibility of drilling for met samples - could sample ore without too much problem of surface oxidation. Visible oxidation extends only to about 50 feet beneath overburden in most cases but locally in considerably deeper near faults in particular..

Dismissed possibility of assembling ore facies samples for a horizon by amalgamating DDH rejects because of likely oxidation.

We requested a list of desireable "elements" to analyse (especially BaO, Mn, Hg, As, $CO_3^=$?) concluded that would wait for results of Gasparini study to make recommendations - go ahead desireable within next six months in order to enter data into database for eventual inclusion in mine model.

Discussed density sorting of ores at some stage in the crushing.

Developments since the meeting:

Robin Tolbert has provided a map showing dumpsite locations proposed for Grum and Vangorda. One of these dumps partially covers prime exploration real estate and should not be implemented before several drillholes are put down to test the area.

An attempt has been made to provide an inventory of Lakefield and KRAL samples but little success has been had. This is continuing.

Review of D. Carson's report reveals that there are not many places where the massive sulphides of the main (dogmatic) horizon could have been (or were) sampled underground. Site B may be the only available samples from this horizon Carson's observations of a stratigraphic control to the fine grained texture and consequent middings problems may have a different explanation. It is likely that this is a deformation phenomena and may be intimately related to baritic ores. Since much of the metal in Grum is in baritic ores, the applicability of the bulk of available metallurgical data to this ore type should be examined.

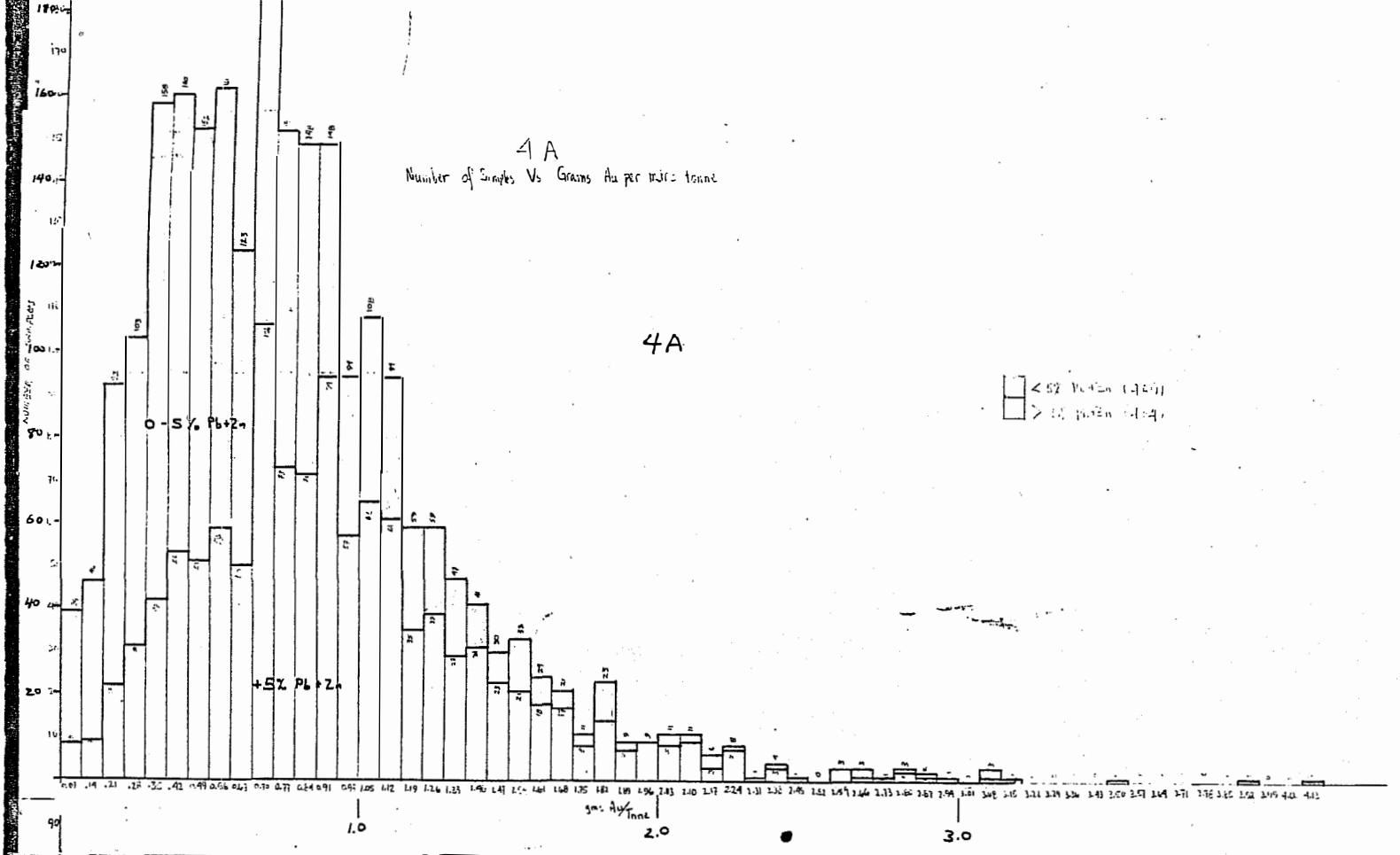
Some of the available geotechnical information has been reviewed. There appears to have been an assumption made resulting in S_2 dips that are 10^{o} (approximately) higher than are likely. We have collected additional surface fault joint and foliation data relevant to Grum and may be able to provide refined estimates of S_2 strike at depth through section interpretation and stereonet manipulation of structural elements. Once this have been done, the foliation data used for preliminary geotechnical studies should be re-examined.

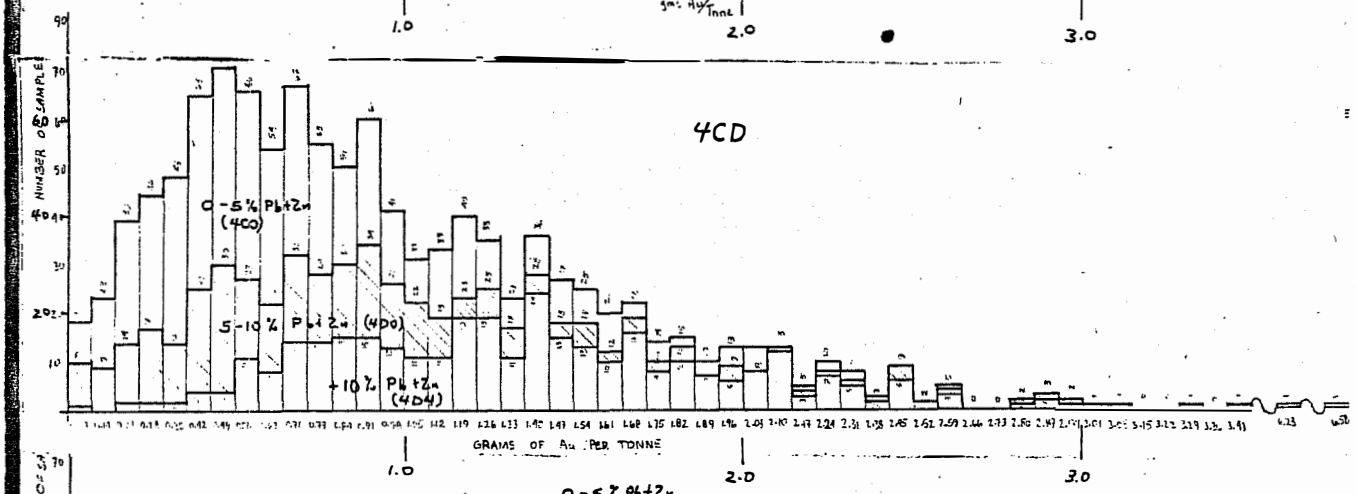
Sectional interpretation is proceeding. Cross sections between 60W and 68W are in progress and work is starting on long sections in that area. We see little problem with being able to provide cross and long sections for a considerable portion of the deposit by June 1985 but there is little likelyhood that cross and long sectional interpretation could be complete by then.

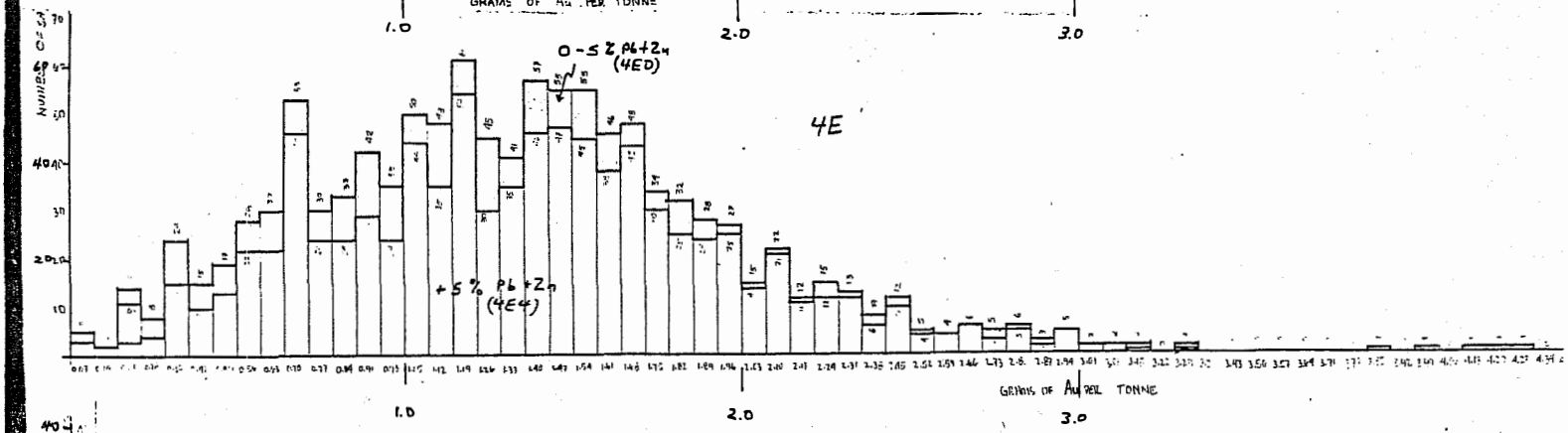
There is a tentatively scheduled geology/exploration meeting on November 13 in Calgary. Since the best available metallurgical results for Grum are in Calgary, I will attempt to review the data there. If travel plans for the various parties interest in Grum permit that would be an appropriate time to hold another meeting in order to review this data together. Since we have little to add to the above progress report, I do not see any reason to warrant a special trip for a Grum meeting, however.

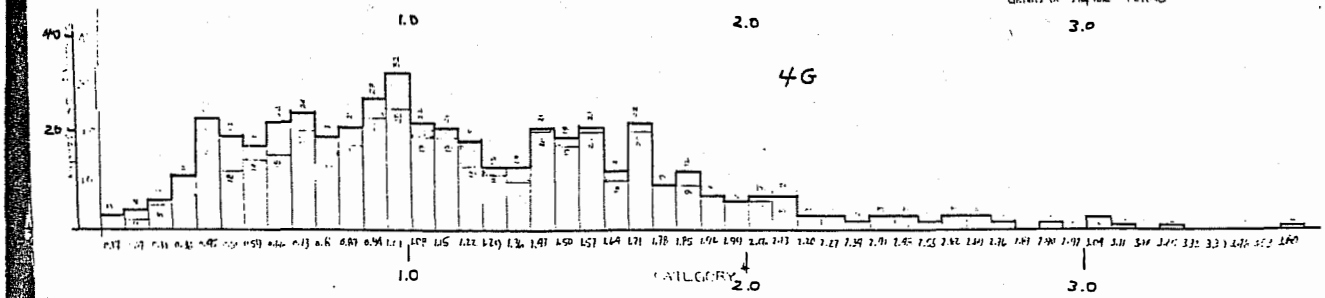
4A

Number of Samples Vs Grams Au per metric tonne

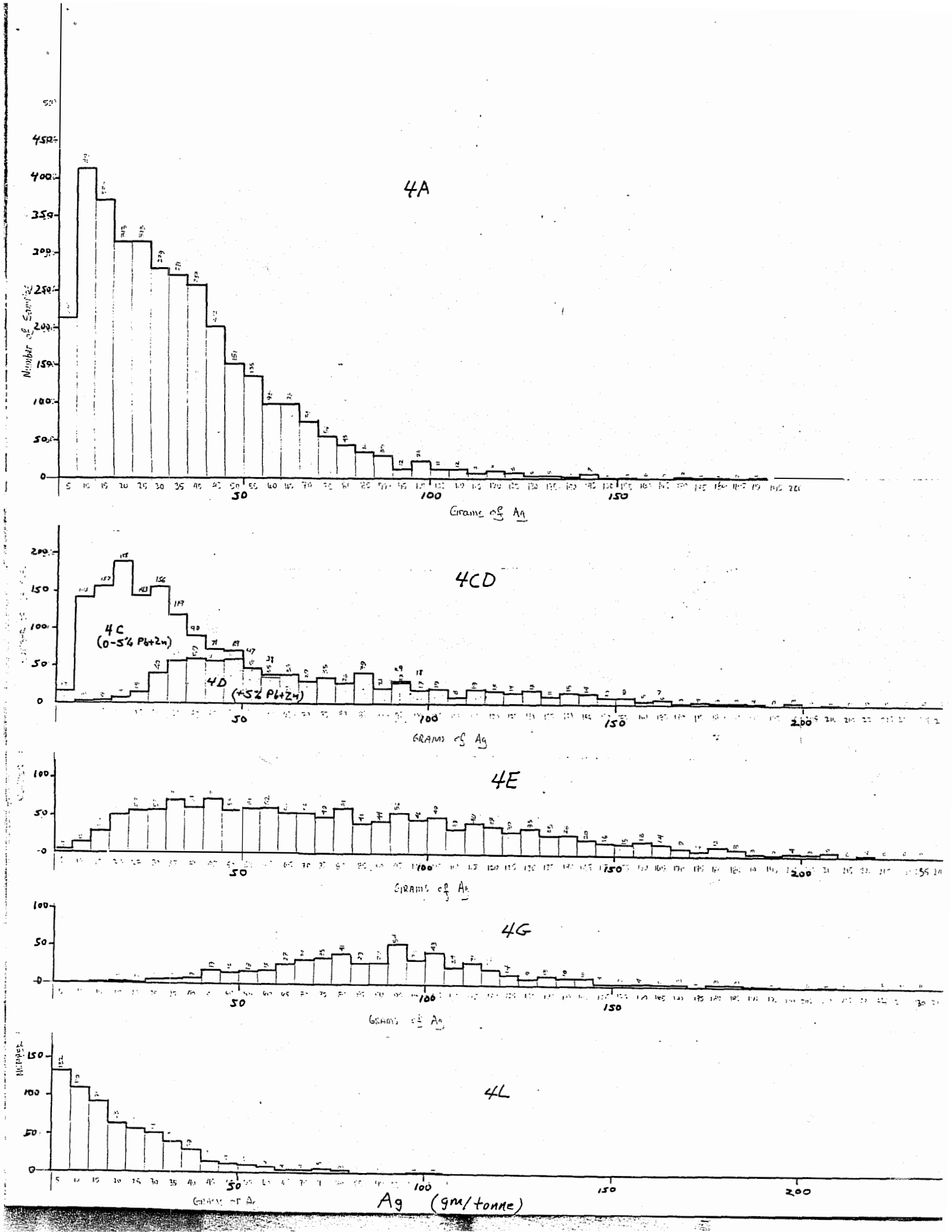


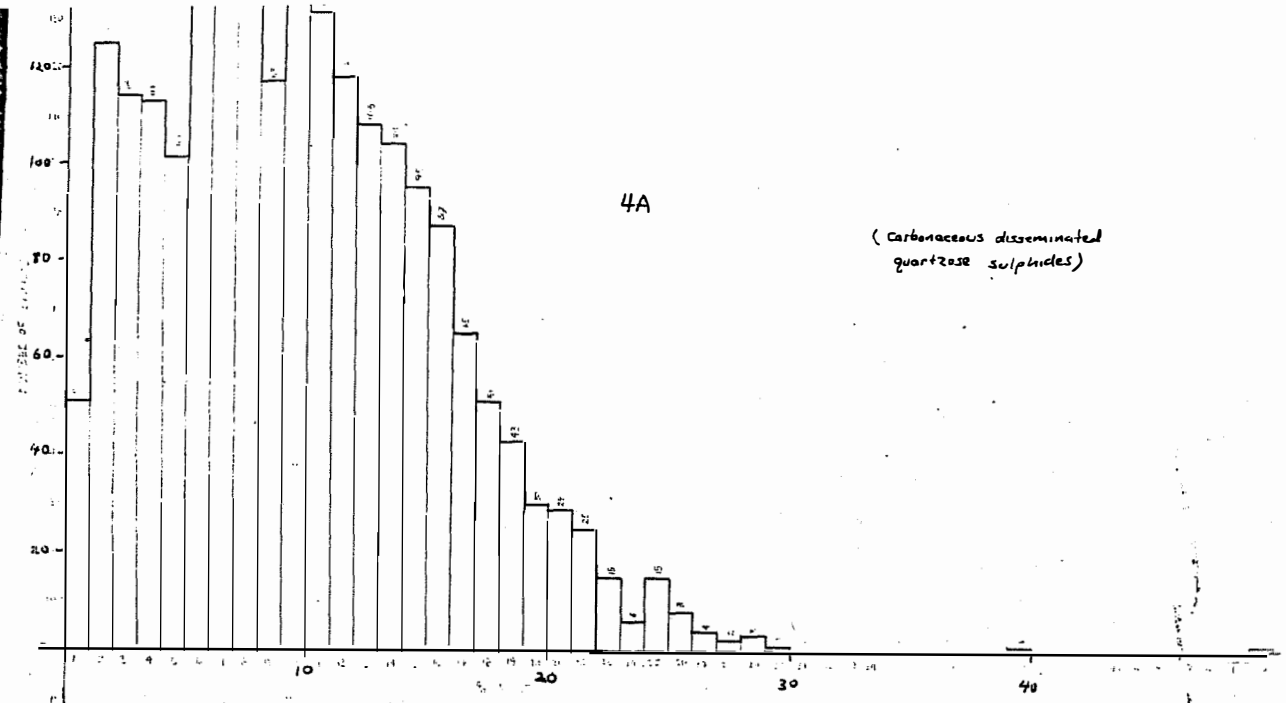


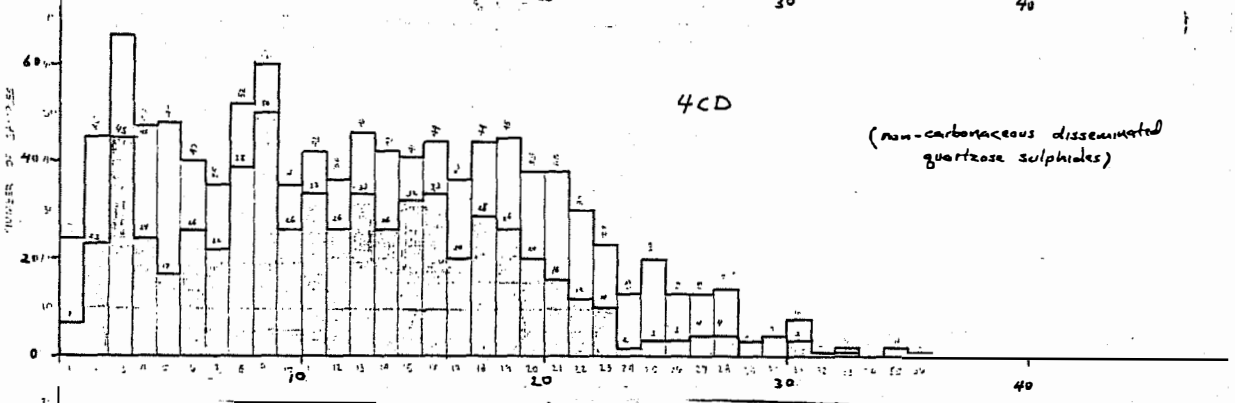


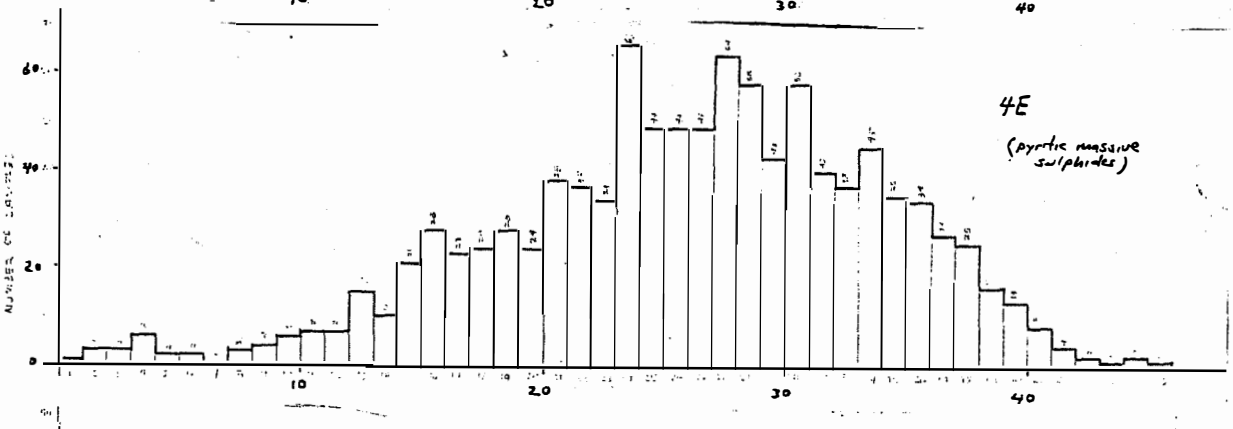


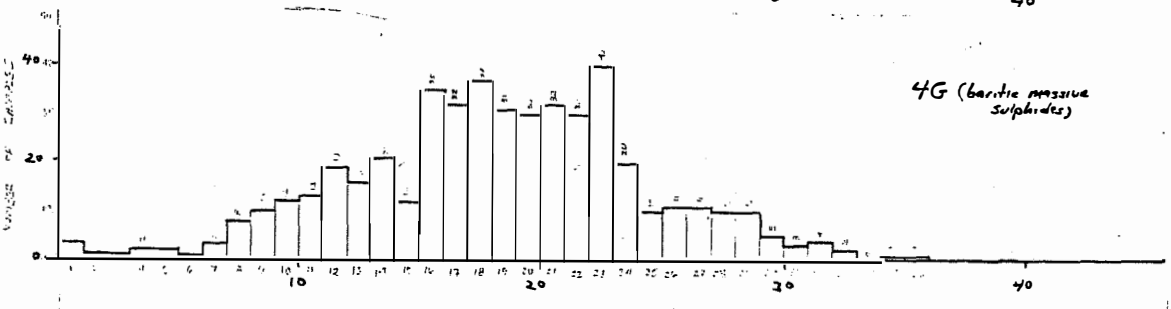
ACTUAL GRADE Au (gm/tonne)

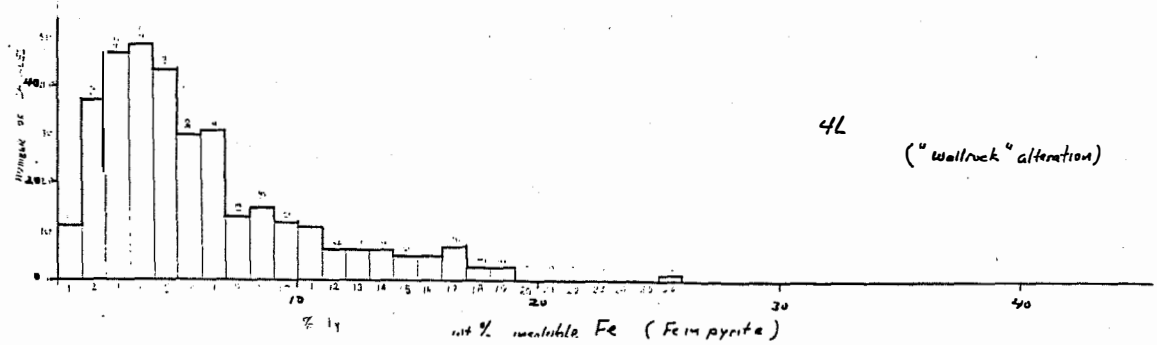

4A
Number of Samples
Grams of Ag
4CD
4C
(0-5% Pb+Zn)
4D
(+5% Pb+Zn)
GRAMS of Ag
4E
GRAMS of Ag
4G
GRAMS of Ag
4L
NUMBER
Grams of Ag
Ag (gm/tonne)


4A
(Carbonaceous disseminated quartzose sulphides)


4CD
(non-carbonaceous disseminated quartzose sulphides)


4E
(pyritic massive sulphides)


4G (baritic massive sulphides)


4L
("wallrock" alteration)
% ly
ratio % insoluble Fe (Fe in pyrite)