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Your file Votre référence

Our file Notre référence

May 7, 1984

Mr. Greg Jilson
Cyprus Anvil Mining Corporation
#330-355 Burrard St.
Vancouver, B.C.
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Dear Greg,

I understand from conversations with Charlie Jefferson that you and Dave Jennings have virtually completed your paper on the Anvil District, for the Northern Cordilleran volume of CIM. I wonder if I can enquire whether you have information in it regarding pyrite contents (versus sphalerite, galena) of the various Anvil orebodies, deposits and prospects. Wayne Goodfellow and I are especially interested in this kind of information from the viewpoint of modelling stable isotope and lead isotope data to deduce something of the changing nature of ore-forming fluids. Such information is rarely available in publications on mineral deposits, although iron sulphides usually (not always; e.g., XY) account for most of the sulphur present. I look forward to seeing your article when it comes to print, if not sooner.

Best Regards,

Ian R. Jonasson
Exploration Research Section

IRJ/jd

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May 30, 1984

Dr. Ian R. Jonasson,
Geological Survey of Canada,
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Ottawa, Ont.
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Dear Ian,

Dave Jennings and I have indeed recently completed a manuscript on the Anvil District for the Northern Cordillera volume. I am pleased to provide a copy of the manuscript with the proviso that this is preliminary and that much of it, particularly the interpretive material, will probably not appear in print. As such, I would ask that it be the basis of further discussion only and that it not be quoted without checking with the authors first. I have recently received a copy back from one of the reviewers and this summer will be embarking on a major rewrite , thus any comments you have will be welcome and useful.

The question of pyrite content of the Anvil Deposits is one for which a satisfactory answer cannot now be given. You will find relevant information in the manuscript but no definitive answer. This is because we are only now (this week - the coincidence of your query having arrived today is remarkable!) becoming able to provide quantitative and statistically reasonable data for the Grum deposit. I expect that this summer we will have some numbers we will be happier with but it is not likely that we will be in a position to summarize any deposit other than Grum.

The sort of data we have for Grum derives from the 9000 or so samples in the deposit's assay data base. Each of these samples represents about 2 meters or less of drill core and is cross-referenced against rock type. For all samples we have Cu, Pb, Zn, and Ag values and for many we have pulp SG, Au, soluble (in boiling 20% HCl) Fe and insoluble Fe. By assuming that insoluble Fe is largely due to pyrite etc. we can calculate from Zn, Pb and Fe insoluble normative sphal, galena and pyrites. (I have checked this assumption in a way by deriving an equation that calculates SG from chemical analysis and finding that measured pulp SG and calculated SG are comparable.) This is, of course,

a roundabout method of giving a pyrite content but I rather suspect the result will be much more meaningful than what we could estimate visually and integrate mentally over an entire deposit!

On the basis of the number of samples in the Grum assay database we can make the following generalization about relative proportions of ore types at Grum.

4A	ribbon banded graphitic quartzite	43½%
4CD	pyritic quartzite	21½%
4E	massive pyritic sulphides	18 %
4G	barite bearing massive sulphides/sulphates	7½%
4H	pyrrhotitic massive sulphides	½%
4K	carbonate bearing massive pyritic sulphides	1 %
4L	altered ore types and mineralized altered wall rock	8 %

These are weighted by number of assay samples, not length, but variation of length tends to average out, thus, if the deposit were evenly drilled, they would tend to reflect volumes of ore types. Unfortunately the core of the deposit is more densely drilled, thus, massive facies will tend to be overrepresented. No cutoff applies other than visible Pb-Zn mineralization, at a 4% Pb+Zn cutoff 4A and to a lesser extent 4CD volumes would decrease dramatically but quartzose ores would remain dominant. Note that the Grum deposit is unusually rich in quartzose ore types.

The following values are averages (again by number of samples, not volume in deposit) for chemical data in the Grum database. These numbers are derived from summary statistics gathered to study specific gravity not metal content and have an artificial bias built in since samples with low Pb+ Zn did not always have pulp SG measured while high Pb+Zn usually did. For this reason, the number should be considered preliminary and approximate, we will be coming up with more realistic metal content averages and distributions soon. Because of this, these figures should not be quoted but should be construed as nothing more than an idea of what sort of numbers we can come up with for Grum, and eventually the other deposits of the district, given the fairly impressive assay data that is available. The major roadblocks now are time and software limitations. These averages are however about what I would expect by "mentally averaging" visual observations of thousands of meters of drillcore.

		4A	4CD	4E	4G	deposit average	average metal in a published reserve est
Cu(%)		0.08	0.13	0.17	0.12	0.11	-
Pb(%)		2.00	3.05	4.80	5.45	3.16	3.1
Zn(%)		3.58	5.25	7.65	8.34	5.27	4.9
Ag(g/t)		36.0	53.0	81.3	91.8	54.9	47.0
Fe(%) soluble		1.86	3.45	3.39	2.14	2.44	-
Fe(%) insoluble		9.62	12.27	25.85	18.00	13.86	-
wt.% normative	galena	2.3	3.5	5.5	6.3	3.6	-
	sphal	5.3	7.8	11.4	12.4	7.9	
	pyrite	20.7	26.4	55.6	38.7	29.8	-
	"pyrrhotite"	2.9	5.4	5.3	3.4	3.8	-
vo.% normative	galena	1.0	1.6	3.2	3.7	1.7	-
	sphal	4.3	6.8	12.4	13.8	7.2	-
	pyrite	13.3	18.3	48.5	34.4	21.6	-
	"pyrrhotite"	2.0	4.1	5.0	3.3	3.0	-
Total volume %		20.6	30.8	69.1	55.2		

The deposit average is derived from a different assay database using computer modeled volumes and a 4% cutoff, thus is in only a general way comparable to these averages. Generally it's for the same deposit and the similarity ends there but the degree to which the values compare gives some measure of the believeability of these figures. I suspect the major difference would be due to the high grade core of the deposit being over represented as noted already.

Note that "pyrrhotite" is not really pyrrhotite but is all Fe soluble in boiling 20% HCl cast as FeS. We have no BaO analysis for Grum but by comparison of measured and calculated SG values we suspect 4E will have 3-5% BaO and 4G 15-20% BaO which is consistent with visual observations and in the ballpark of Faro deposit numbers I have seen.

The major conflict between visual and analytical guesstimates of sulphide volume % is for the massive sulphides which have a lower normative total sulphide content than expected. I think this is real and reflects a tendency to overestimate volume % sulphides in near massive ores but there may still be some bugs in our analyses or my calculations!

I hope these numbers are of some help to your understanding of the Anvil Distrct deposits.

Robin Tolbert has informed me that you will be in the district around July 15 and he has requested that I give you and your party a tour of the district at that time since he will not be in Faro. This is no problem, I will be happy to show your group around. We will be staying in Faro at 306 Campbell Street (across from the Faro Hotel) and will have a phone number, but I don't know what it will be quite yet (check directory assistance for Cyprus Anvil Explortion). Hope to see you then.

Yours very truly,

Gregg Jilson

GJ/lp
enclosures