

To : Ian Horne, Acting Chief Engineer  
From : Fritz F. Prugger, Consultant

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Re: Grum Deposit - Proposal for Underground Mining.

A concept of underground mining for the Grum Deposit has been developed in collaboration with Quimo Perez.

It is proposed to exploit ore North of the open pit and below the pit bottom of Phase III from underground while open pit operations are still in progress.

Consideration should be given to the exploitation of parts of Open Pit Phase III by underground means as well.

Detailed planning for underground mining operations should start immediately to allow production of high grade ore (9 % to 12 % Pb+Zn) from underground to be added to the production from the open pit as soon as possible.

Data presented here is in rough form for a discussion on the Grum Underground Project and must be further developed and fine tuned considering all the details.

An extension of open pit ore is known to occur in depth to the Northwest. Information is available from core drilling at a drill pattern of 30 m. Three areas of interest for underground mining that require only a small amount of development work can be delineated from this data.

Using a 9% Pb+Zn cut-off grade, the following three mining blocks can be established for a preliminary rough estimate of ore in situ:

* Main Block	988,245	tonnes
* Upper West Block	326,450	tonnes
* Lower Block	56,450	tonnes

<b>Total in-situ</b>	<b>1,371,145</b>	<b>tonnes</b>
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It is proposed to rehabilitate and dewater the existing underground ramp and drive an underground ramp extension in the hanging wall to the known ore blocks.

A connecting raise from the underground workings to the open pit can serve as emergency exit and for ventilation.

Underground production as well as underground exploration to the Northwest can be carried out simultaneously.

The tonnage of in-situ ore for the three blocks under consideration has been calculated from the information available from core holes that have been drilled at a drill pattern of 30 m.

Section : Refers to the Number given to a drill section  
 Units : Number of units of 6.0 m x 7.5 m x 1.0 m  
 tpm : tonnes per meter = units x 3.5 tonnes per m<sup>3</sup>  
 Distance : Distance between drill sections in m  
 Tonnage : Tonnage between two drill sections

Section	Units	tpm	Distance	Tonnes	Remark
<b>Main Block (mb):</b>					
76	11	1,733	30	51,975	
77	13	2,047	30	61,425	
	3	470	30	1,400	East
78	17	2,675	30	80,250	
	8	1,260	30	36,800	East
79	21	3,300	30	99,225	
	10	1,575	30	47,250	East
80	26	4,095	30	122,850	
	6	949	30	28,850	East
81	35	5,510	30	165,300	Main + East
82	39	6,142	30	184,260	"
83	19	2,992	30	89,760	"
84	8	1,260	15	18,900	"
<b>Total Main Block</b>				<b>988,245</b>	<b>Main + East</b>

**Upper Block West (UBW):**

84	16	2,520	30	75,600	UBW
85	9	1,417	30	42,510	UBW
86	21	3,300	30	99,000	UBW
87	18	2,835	30	85,085	UBW
88	9	1,417	15	21,255	UBW

**Total Upper Block West** **323,450** **UBW**

**Lower Block (LB):**

75	4	630	45	28,350	LB
76	4	630	30	18,900	LB
77	4	630	15	9,450	LB

**Total Lower Block** **56,700** **LB**

This presentation has been prepared in haste and without the inside knowledge of the people on the property.

However, the possibility of obtaining high grade ore from underground within a short lead time and at reasonable cost does exist at the Grum Orebody.

It is, therefore, strongly recommended to work out further details immediately and start the actual work without delay.

  
Fritz F. Brugger