

**CURRAGH RESOURCES INC.**

## Inter-Office Memorandum

**TO:** Dave Tenney  
Senior Geologist  
Faro Minesite

**FROM:** Gregg A. Jilson  
Vice-President, Exploration  
Whitehorse Office

**RE: MORE ON POLYGONS AND GEOSTATS**

**DATE: 05 30 1990**

Jim Marlon-Lambert of GEMCOM has given me a preprint of a SRK newsletter with an article by Gary Giroux on polygons. Please note that this has not been released yet so it is not for general distribution, it is for your information only at this time. It will be published some time soon and you will get a copy, being a GEMCOM customer!

I took the liberty of getting a few comments on Giroux from Jim Marlon-Lambert as I have always trusted Jim's advice on such matters. Jim gives him a very high rating. In fact, he said there are three people in the world who Jim would trust on Geostatistics:

- a) Journal (who has been to Faro under CAMC's tenure);
- b) Rendu (who works for Newmont); and
- c) Giroux.

Jim warns us to beware of the French geostatisticians. They speak too fast and oversell the capabilities of geostats. They also use "French math" (which I assume, like in French law, is assumed to work until it is proven not to?). Perhaps he has been taking Meech Lake too seriously.

I only throw this out because Giroux's terse proposal did not make a very favourable impression compared to Dabgert's.

By the way, there is a copy of the CIM symposium volume "Methods, Models and Reality" [Refs. 1,3,4,5 and 6] at the minesite somewhere. I sent it up some time ago. I have a copy if you cannot find that one.

GAJ\*geb 

faro\polygons.dt

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Facsimile Transaction ReportProject No.Date: 29 MAY 1990Fax No. 403-668-6510Page 1 of 3Send To: GREGG JILSONLocation: CURRAGA RESOURCESFrom: JIM MARLON-LAMBERTSubject: POLYGONAL RESERVES

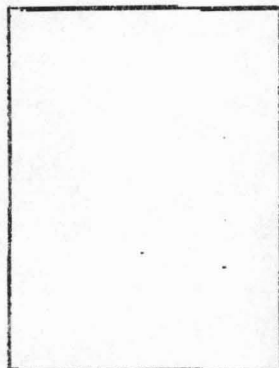
Please find a <sup>pre-</sup>print of the forthcoming SRK  
newsletter containing a copy of Gary Groulx's  
article on polygonal reserves

Best regards

Jim

June 1990  
 Issue No. 2  
 A newsletter for  
 friends and clients of  
 Steffen Robertson and Kirsten

## Windy Craggy, Open Pit Copper



Geddes Resources, from their Vancouver office, are tackling the challenging prospect of an open pit mine, high in the Coast Mountain range in northern B.C., surrounded by steep slopes, glaciers and pristine wilderness. Many aspects of the project, including hostile weather, rugged

topography and environmental constraints are testing the ability of the engineers involved in the feasibility. But the deposit is sufficiently exciting, over 114 million tonnes at a copper grade of 1.9% in the proven and probable categories with considerable potential for significantly increasing these reserves.

SRK has been assisting Geddes in the design of an open pit, the assessment of underground extraction and the management of tailings and waste rock. There is no doubt that an open pit, especially for the first 10 years, is the most economic route but it is a far from simple pit, especially at a production rate of 20,000 tonnes per day.

The detailed drilling to date has been carried out from underground stations. This development could give a ready access for the removal of ore via an in-pit crusher and ore-pass arrangement. However, the waste must be handled more conventionally necessitating some ingenious haul road configurations.

But the most difficult part of the design has been the initial pit development. As can be seen from the photograph, the topography is severe and the pioneering work must be carefully identified, and scheduled to demonstrate that the early years of the project are feasible. The other area that has strayed into semi-detailed design has been the first two to three moves of the in-pit crusher and ore-pass collar. Again, practicality had to be demonstrated.

SRK has relied on Gemcom design software and considerable use of Autocad to ensure that the full three-dimensional constraints of topography, orebody, ore-pass and adit are always obeyed.

The Windy Craggy project and Geddes Resources epitomise the excitement and challenge of mining, and SRK has felt privileged to be part of their team.

## Polygons - Sure They're Quick But Can We Afford Them? Gary Giroux, Montgomery Consultants, Vancouver, B.C.

Many mining companies have historically used the polygonal method of calculation for a quick, inexpensive "first pass" at an ore reserve estimate. All too often, however, the polygonal method has been taken all the way through to a production decision without any other reserve estimation procedure being applied.

A polygonal reserve estimate consists of assigning the grade of a central sample to a block of material defined by halving the distance to its nearest

neighbours. The procedure assumes a homogeneity of mineralization that simply doesn't exist in nature. It effectively assumes that the orebody can also be selectively mined in core sized mining units. Yet, a survey presented in 1986 by B.L. Kwa and F. Mousset-Jones (3) shows that of 114 companies questioned, 52% use polygons for exploration, 48% use them for target definition and 38% use them for production decisions.

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Over the years there have been numerous studies comparing polygonal estimates to other manual estimates and geostatistical procedures.

- C. Deutsch (2) showed that a polygonal method underestimated tonnage by 6% while it overestimated grade by 82% relative to kriging for the Eastmain gold deposit.
- P.J. Lafleur (4) demonstrated that orebody geometry is sensitive to reserve estimation - a thickness estimation of 6.2 m by kriging versus 8.2 m by polygonal methods leading to an anticipated 30% unnecessary dilution for the Monbrun massive sulphide deposit.
- R. Bryan (1) used measured head sample grades at the Candelaria silver mine to show polygons overestimated grade by 30% whereas kriging overestimated by 9%. He postulated a potential loss of \$22,500 per day if ore-waste decisions were made using polygons.
- M. Roper (6) showed an excellent comparison between kriged estimates and mill head grade for the Golden Sunlight gold mine. A polygonal estimate predicted a significantly higher grade than was achieved.
- J.H.L. Miller (5) demonstrated that kriging of blastholes at Equity Silver mine could increase the value of ore to the mill by at least a million dollars per year compared to using polygons.

This is only a small selection of available literature showing the inherent problems in polygonal reserve methods. While polygons may initially seem to be the most cost effective procedure, history shows in the long run they can lead to expensive mistakes.

Having said this, it is admitted that geostatistics can be abused especially if geological constraints are not applied. There have been examples of the "black box" approach to ore reserve estimation where ore reserves are allowed to grow, apparently at will! By the same token, sometimes polygonal methods do give correct answers but in these

situations geostatistics would be equally effective and would also quantify the precision of the estimate.

In fact, the accuracy of the answer is a very important issue. Polygonal methods are not able to determine estimation accuracy and the standard classification boxes, "proven", "probable" and "possible" are filled subjectively. Geostatistics, on the other hand, calculates an estimation variance which in turn quantifies the accuracy of the estimate. Informed decisions can be made on the merits of additional drilling. Will more holes substantially lower estimation errors, or should a production decision be based on the most current data base?

The aim of this article is not to denigrate polygonal estimation, but to suggest to those who use them that a properly applied geostatistical estimate will not only provide a comparative estimate, but also give an indication of the accuracy of the answer.

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