

Mining District File Summary Sheet

DISTRICT	Rosebud
DIST_NO	4010
COUNTY If different from written on document	Pershing
TITLE If not obvious	Memo about Indicator Kriging for Rosebud
AUTHOR	Ristorcelli, S; Hartzell, D
DATE OF DOC(S)	1995
MULTI_DIST Y / N?	
Additional Dist_Nos:	
QUAD_NAME	Sulphur 7½'
P_M_C_NAME (mine, claim & company names)	Rosebud Mine
COMMODITY If not obvious	gold, silver
NOTES	correspondence; handwritten notes; kriging NOTE: One page has notes on back Sp.

Keep docs at about 250 pages if no oversized maps attached
(for every 1 oversized page (>11x17) with text reduce
the amount of pages by ~25)

SS: DP 8/1/08
Initials Date

DB: Initials Date

SCANNED: Initials Date

FSS (DOUG HARTZELL)

60001874

4010

Facsimile Transmission

FSS International Consultants Inc.
245 Moonshine Circle
Reno, Nevada 89523
PHONE: (702) 345-0448
FAX: (702) 345-0449

DATE: June 16, 1995

TO: Steven Ristorcelli

COMPANY: MDA

FROM: Doug Hartzell

Fax #: (702) 856-6053

Number of Pages Including This Sheet: 3

Subject: Rosebud

COMMENTS

Attached is a memo with some of my thoughts. I will await your call before coming over to your office.

Memo

Re: Indicator Kriging for Rosebud
Date: June 16, 1995

To: Steven Ristorcelli
From: Doug Hartzell
cc:

Following our discussions yesterday I have given some thought to the Rosebud resource model and what is best in way of further work. Prior to this I thought our mandate was to complete a model using Indicator Kriging (IK) based upon a database and geologic model to be provided; much like someone saying "we want you to move this pile of rocks from here to there - can you do it?". It is now clear that we are to recommend what we feel is called for, while addressing the specific issue as to whether an Indicator Kriging model would be appropriate, i.e. "do you really think I need to move this pile of rocks?".

At this time I would not recommend building a new resource model, using IK or any other approach, without first undertaking studies that address more fundamental issues. Of these issues, better understanding of uncertainties associated with the zone boundaries would have top priority.

A precise definition of objectives will be needed before deciding that IK or other types of models are appropriate: Is this model to serve as a basis for stope design?; Is the objective to report a global resource?; Will the model be part of a due diligence study or part of a banking document?

The chest of indicator tools will be very useful for many of the studies that should be considered. Areas where further investigation are needed include:

Geologic Model/Zone Boundaries

Simply put, a resource model using hard boundaries is acceptable only if there is little chance for significant modification upon getting more data. This is particularly true if the model is being used for stope design. If further drilling is planned a set of zonal predictions at the proposed locations should be defined (and locked away) for direct comparison with the drilling results. The current data can be used to cross validate the present boundaries by looking at samples that straddle the boundary versus those pairs completely within either zone.

Rosebud Indicator Kriging

June 16, 1995

Continuity of grades

A scatterplot which shows nugget effect vs. cutoff grade should be constructed using indicator variograms. In addition check assay data can be used to develop a scatterplot of % misclassification vs. cutoff grade. This will provide an indication as to how much of the nugget effect on the indicator variograms is due to sample error.

Assay Data

There is potential for bias in several distinct populations of assay data: Lac vs. Hecla; Holes at different orientations; different drilling methods/core size; different phases of drilling/assaying.

Indicator Kriging

I have two concerns about the capability for doing an IK model using MEDS following our meeting yesterday. We must have the capability for defining a unique search strategy for each indicator cutoff; I don't recall seeing where this is allowed. In addition, I did not see any utility for identifying or solving order relations problems.

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*check
w/ CM*

At this time I would not recommend building a new resource model, using IK or any other approach, without first undertaking studies that address more fundamental issues. Of these issues, better understanding of uncertainties associated with the zone boundaries would have top priority.

*not
familiar*

A precise definition of objectives will be needed before deciding that IK or other types of models are appropriate: Is this model to serve as a basis for slope design?; Is the objective to report a global resource?; Will the model be part of a due diligence study or part of a banking document?

1/6/97

NO

The chest of indicator tools will be very useful for many of the studies that should be considered. Areas where further investigation are needed include:

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*don't
use model
worry*

*are you
saying
let's
do it*

Rosebud Indicator Kriging

June 16, 1995

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*- moving cutoff higher \rightarrow lower proportion of material
- but searcher, Δ w/ this doesn't happen w/ IK*

*uncomfortable w/ MEDS**2 weeks*

*- SVS
- estimate
- correction
- 1 week*

checking cutoffs IK's