International Journal of Geology, Earth & Environmental Sciences ISSN: 2277-2081
An Open Access, Online International Journal Available at http://www.cibtech.org/jgee.htm
2025 Vol. 15, pp. 58-62/Kamagurova.
Research Article

RESERVES CALCULATION IN MICROMINE SOFTWARE USING THE EXAMPLE OF THE SARYBATYR DEPOSIT

***Kamagurova S.V.**
Institute of Mineral Resources, Tashkent, Uzbekistan
** Author for Correspondence: kamagurova_svetl@mail.ru*

ABSTRACT
This article presents a methodology for calculating the reserves of gold-bearing ores at the Sarybatyr deposit using Micromine software.

Keywords: *Oxidized Ores, Sulfide Ores, Gold, Database, Reserve Calculation, Block Model*

INTRODUCTION

The Sarybatyr deposit is located in the Central Kyzylkum Desert in the Kanimekh district of the Navoi region, 50 km south of Zarafshan. The Nukrakon (Vysokovoltnoye) deposit is 4.5 km to the east-northeast, the Daugyztau deposit is 8 km to the northeast, and the Amantaytau deposit is 21 km away (Fig.1).

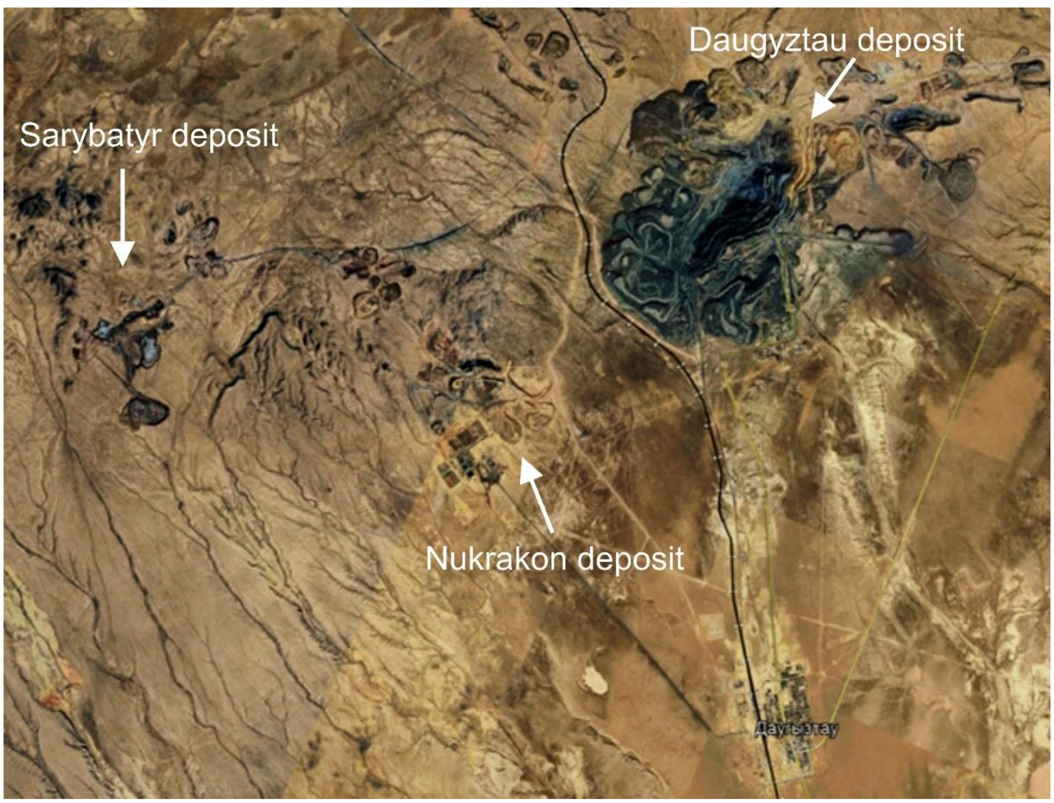

Figure 1: Space image of the research area, made in Google Earth

The Sarybatyr deposit is situated on the southern wing of the Beltau brachyanticline and is confined to a system of faults within the sandy-shale deposits of the Kosmanachin suite. The rocks are composed of unevenly interbedded carbonaceous sandstones, siltstones, and shales (Gleyzer *et al.*, 2020). In total, 10 ore bodies have been identified at the deposit based on the results of geological exploration. These include 6

steeply dipping ore bodies with dip angles ranging from 60° to 85° (b.z. 1, 2, 3, 5, 8, 9), 2 gently dipping ore bodies with dip angles up to 20° (b.z. 2a, 4), and 2 combined (inclined) ore bodies with dip angles from 30° to 60° (b.z. 6, 7) (Kamagurova, 2020).
Ore bodies have an unbalanced morphology along strike and dip, and a complex internal structure due to the alternation of ore and barren sections, as well as non-commercial layers.
Gold-bearing ores at the Sarybatyr deposit are low-sulfide, finely disseminated, and divided into oxidized and sulfide categories.
Reserves at the deposit were estimated using both block modeling and traditional methods. This article focuses on the block modeling methodology.

MATERIALS AND METHODS

Calculation of reserves based on the block model of the deposit involved the following key stages:
- creation of a database;
- identification of ore intervals;
- delineation of ore deposits;
- wireframe modeling;
- general statistical analysis and truncation of hurricane samples;
- construction of a block model and interpolation of grades;

Creation of a database

The database for the Sarybatyr deposit was compiled using materials from the report "Detailed Exploration of the Sarybatyr Section of the Daugyztau Gold Ore Deposit" for all surface and underground mine workings, as well as boreholes. The database for trenches and underground mine workings includes a file with the coordinates of trench trajectories and a file of sampling intervals. The trench trajectories were digitized from the surface sampling plans and the +340 m, +380 m horizon sampling plans. The well database consists of three files: wellhead coordinates, inclinometry data, and sampling intervals. Notably, inclinometry data were missing for some wells, so their trajectories were digitized based on geological sections.

Identification of ore intervals

Identification of ore intervals involved the automated calculation of ore intervals according to condition parameters. Identification of ore intervals was carried out on two sides of 0.5 and 0.7 g/t, using the following condition limits:
- minimum thickness of ore deposit – 5 m;
- permissible thickness of empty layers and substandard ores – 5 m;
- minimum metrogram – 2.5;

Contouring of ore deposits

Ore bodies were delineated along sections and horizons of mine workings, referencing the identified ore intervals. The following techniques were employed during the delineation process. Interpolation/extrapolation in the direction of dip was carried out by half the distance between workings, in some cases by a quarter of the distance. Taking into account the morphology and uneven thickness of ore deposits, wedging was performed proportionally to the thickness of the extreme section:
- if the thickness of the extreme section exceeded 30 m, then the ore deposit was wedged out by 1/3 of its thickness;
- if the thickness of the extreme section was less than 30 m, wedging was performed by half;
- if the thickness of the extreme section was 5–10 m, the ore body was wedged out by 5 m,
- if the thickness was smaller, wedging was carried out to a point.

Wireframe modeling

The ore body contours were linked into wireframe models (Fig. 2). Wedging in the strike direction was performed over half the area of the marginal sections. Interpolation between the working that undercut the conditional mineralization and the contouring working was performed over half the distance. Extrapolation of the marginal sections was carried out over half the distance between the exploration lines.

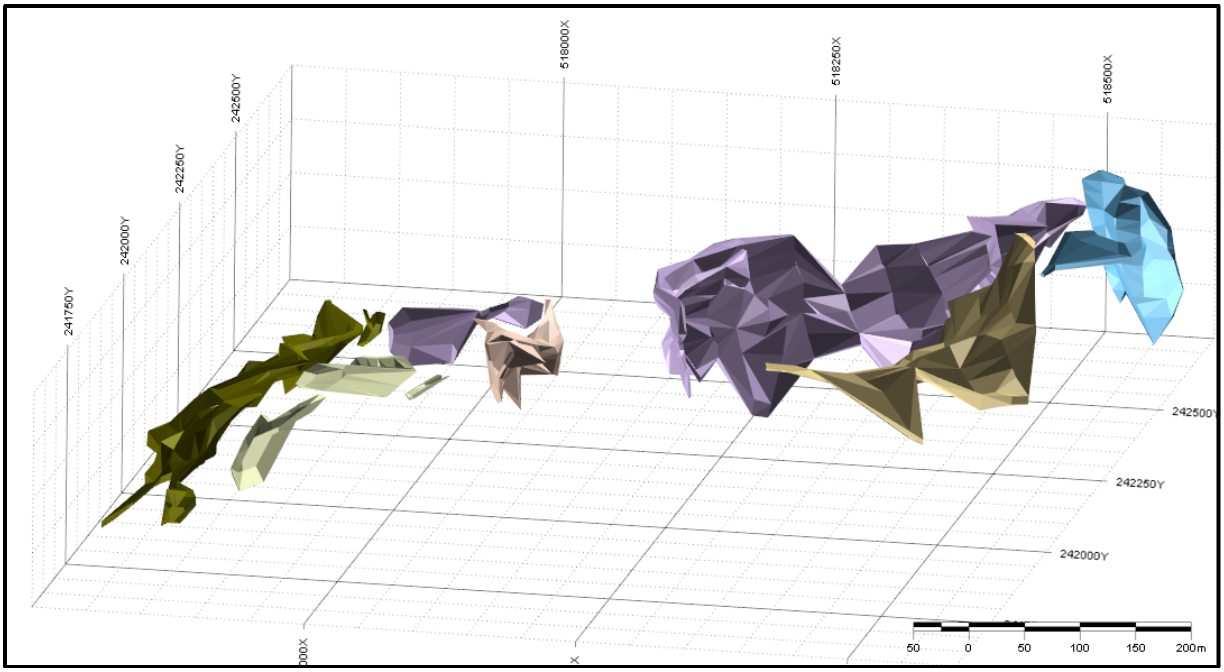

Figure 2: Wireframe models of ore bodies

General statistical analysis

Statistical analysis was performed on a sample selection within the ore bodies. The coordinates of the center of each sample were calculated and the spatial position of the samples within the wireframe models of the ore zones was determined using the coordinates. As a result, each sample was assigned the corresponding ore body number. The main statistical parameters of the distribution were calculated for the samples that fell within the ore bodies. A histogram was constructed to determine the distribution of gold content. Based on the statistical parameters (median, mode, and mean), it was concluded that the distribution of the studied population was lognormal, which is typical for gold.

Block model construction and grade interpolation

The construction of the block model involved creating an empty block model. The sizes of the parent blocks were chosen to be 5x5x2.5 m, based on the morphology of the ore bodies, the parameters of the exploration network, and the expected height of the quarry bench. Sub-blocking was performed along the X and Y axes into 10 parts and along the Z axis into 5 parts, ensuring a sufficient fit of the block model within the framework boundaries. Thus, the minimum sub-block size in the model was 0.5x0.5x0.5m. Considering the complex morphology of the ore bodies and the variability of their occurrence, interpolation using a unidirectional search ellipsoid was not feasible. Therefore, dynamic interpolation was used. Guides were created on each exploration line to correspond to the azimuth, dip, and declination of the ore body in that area. The bedding elements of the guides were interpolated into the empty block model using the nearest neighbor method. As a result, each block in the model was assigned the corresponding azimuth, dip, and declination. These parameters were then used to orient the search ellipsoid when interpolating grades into the block model using the inverse distance weighting (IDW) method (Fig. 3).

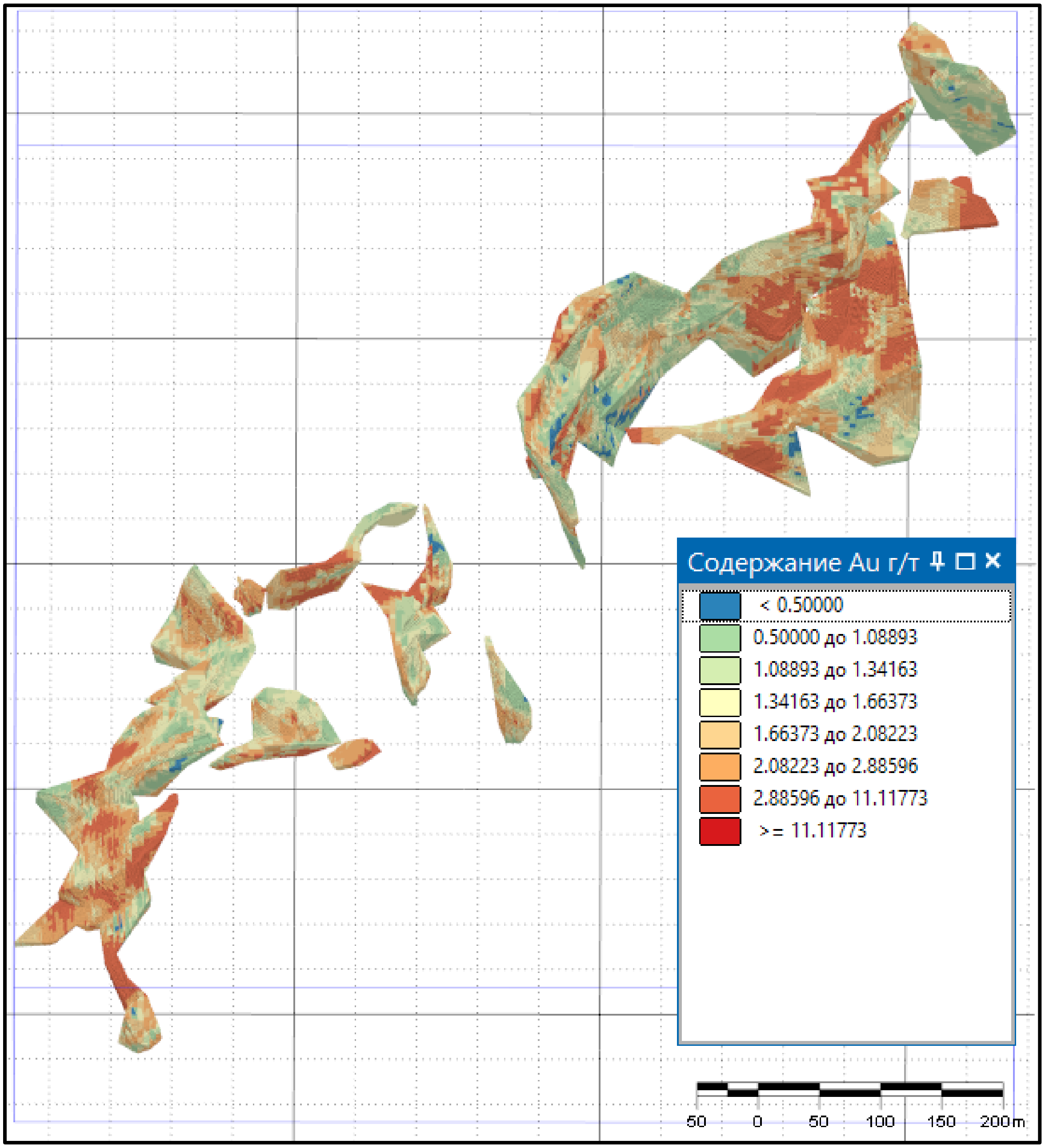

Figure 3: Block model of the Sarybatyr deposit

DISCUSSION AND CONCLUSION

The calculation of industrial reserves was performed in two versions, using cutoff grades of 0.5 g/t and 0.7 g/t, for each ore body, separately for oxidized and sulfide ores. The values for ore reserves (thousand tons), average gold content (g/t), and industrial gold reserves (kg) were obtained. For verification, reserves were also calculated using the traditional method. The discrepancies in all indicators (ore reserves, gold content, and average gold content) did not exceed 5%, which indicates the reliability of the estimated reserves at the Sarybatyr deposit.

REFERENCES

Gleyzer LM, Kamagurova SV, Klimenko OE, Sovin SV (2020) Features of the placement of gold mineralization in the Sarybatyr gold ore zone, principles of delineation of ore deposits and calculation of reserves. *Geology and Mineral Resources* **2**. 26-29. *In Russian.*

Kamagurova SV (2020) Methodology of geological exploration and parameters of ore deposits in the Sarybatyr gold ore zone. *Geology and Geoinformation Technology for the Study of Mineral Resources*, 22-26. *In Russian.*