

## **RELIABILITY AND QUALITY CONTROL OF GOLD ORE SAMPLING AT CENTRAL KYZYLKUM DEPOSITS (LOLAZOR DEPOSIT)**

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### **ABSTRACT**

The article examines the reliability of sampling gold deposits in the Central Kyzylkum of Uzbekistan using the Lolazor deposit as an example. Electronic databases for various types of Lolazor deposit sampling have been created. A comparison of core and sludge sampling was conducted, along with an analysis of the impact of sampling results on assessing the average metal content when calculating reserves. It has been shown that the application of new innovative approaches to sampling and control of sampling data allows for a more accurate calculation of mineral raw material reserves.

**Keywords:** *Reliability, representativeness, quality control of sampling, Lolazor deposits, Central Kyzylkum, Uzbekistan*

### **INTRODUCTION**

The Central Kyzylkum of Uzbekistan holds a leading position in the mineral and raw material base of Uzbekistan's gold ore. At the same time, issues regarding the reliability of calculated reserves remain relevant. This is due to the fact that gold is characterized by high variability in content. The gold deposits of Uzbekistan, located in the Central Kyzylkum segment of the Tien Shan Fold System, are located in complex geological conditions for conducting exploration and evaluation geological work.

Based on the sizes and shapes of ore bodies, Uzbekistan's gold-ore deposits are divided into three complexity groups based on their geological structure for exploration purposes (Zimalina V.Ya. *et al.*, 2008).

The 2nd group includes complex geological-structural deposits (areas) represented by large mineralized and veined zones with a length of more than 1 km, a thickness of 5-10 m or more (ore bodies of the Kokpatas deposit) or stockworks with an area of more than 1 km<sup>2</sup> (Muruntau, Mutenbay deposits), and extended (1 km or more) veins of significant thickness (up to 3-4 m). No The ore bodies of Group 2 deposits are characterized by variable thicknesses and uneven gold distribution (the variation coefficients of linear gold reserves and its quality are within 40-100%).

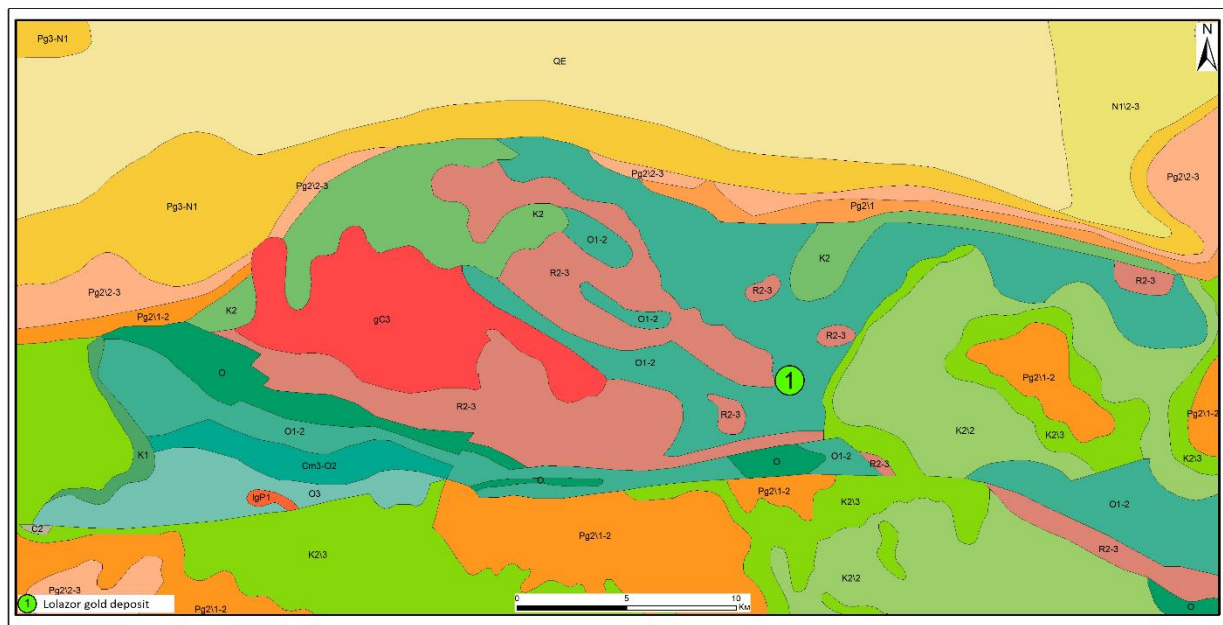
The 3rd group includes deposits (areas) of complex geological structure, typically represented by medium lengths (from 60 to 190 m, Aristantau, Auminza deposits), ranging from hundreds to thousands of meters (Daugyztau deposits), and large mineralized and veined zones, deposits extending and descending into the first hundreds of meters, with a thickness of 1-2 meters (Amantaytau deposit). With complexly constructed veins of variable thickness ranging from several centimeters to 3 meters (Yasvai deposits, etc.).

The distribution of mineralization is highly uneven, often intermittent (the variation coefficients of linear gold reserves and its quality fluctuate within 100-180%, but can reach even higher values).

The 4th group includes deposits (areas) of very complex geological structure characterized by sharp variability in thickness, intensive disturbance of ore bodies (Kokpatas, Telkitov, Karakutan, Tashkan deposit areas), and highly uneven gold distribution within them (the variation coefficients of linear gold reserves and its quality fluctuate within 180-300%, but can reach even higher values).

The affiliation of a deposit (section) to a particular group is determined by the degree of complexity of the geological structure of the main ore bodies, which constitute at least 70% of the deposit's total reserves.

In this work, the Central Kyzylkum gold-bearing deposit Lolazor (Auminzatau Mountains) was studied. Based on the complexity of its geological structure, it belongs to the 3rd group of complexity. Figure 1 presents an overview diagram of the Lolazor deposit's location.



**Figure 1. Overview scheme of the Lolazor gold deposit,**

Central Kyzylkum, Auminzatau mountains (Khalilov, 2026).

In connection with the changed conditions of the global gold market and the influx of foreign investment in recent years, the real industrial reserves and profitability of Uzbekistan's deposits require serious geological and economic assessment. To achieve this, the most important condition is the correct assessment of the average metal content and quality control of sampling at all stages of the geological exploration process.

## **MATERIALS AND METHODS**

The work utilizes published articles, monographs on assessing average gold content, monitoring sampling data, increasing the reliability and representativeness of sampling, methodological and instructional documents regulating gold geological exploration in the territory of the Republic of Uzbekistan, as well as internet resources (Usmanov F.A. et al, 2006).

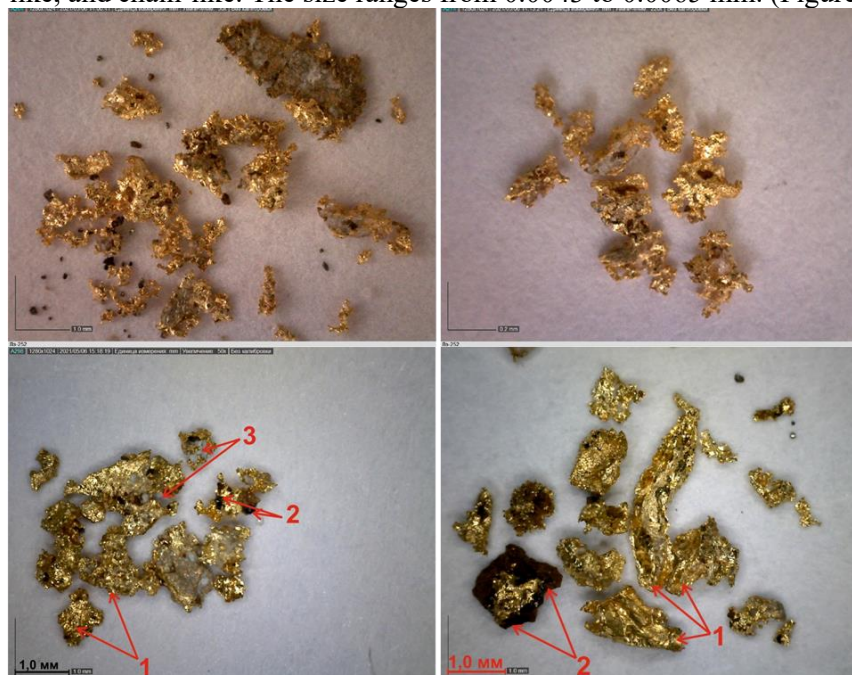
To prepare the database, geological data from the production reports of field geological exploration organizations stored in the State Geological Funds of the Republic of Uzbekistan (primary documentation of drilling wells; results of mineralogical and spectral analyses), personal field research, and experimental research results for quality control of sampling by the authors were utilized (Xolmatov U.A. *et al.*, 2023).

## **RESULTS AND DISCUSSION**

The material composition of the Lolazor deposit was studied using selected core samples and the following results were obtained:

1. The rocks containing the gold mineralization of the Lolazor deposit are represented by sandstones, aleurolites, coal-bearing shales, quartz veins, and their intensely iron-bearing varieties.
2. Sulfide mineralization is most clearly manifested at the contact points of the specified rocks with quartzization zones. Sulfides primarily form speckled, veined, and less frequently nest-like textures.
3. The productive ore-forming paragenesis includes gold-silver-quartz-pyrite-arsenopyrite, gold-silver-sulfosol-chalcopryrite, and silver-gold-quartz-carbonate-pyrite associations; the first of these is of primary practical importance.

4. The main ore minerals are represented by gold, silver, pyrite, pyrrhotite, markazite, arsenopyrite, sternbergite, chalcopryrite, bornite, covellin, sphalerite, galenite, and "black ore."
6. Accessory minerals include apatite, zinc, and rutile.
7. Pure gold is primarily found in carbonate shales, where it forms inclusions with sulfosols, specifically with tennantite (Fig. 3.10). In these samples, two levels of gold content are distinguished: high and above average; the latter occurs somewhat more frequently. The shape of the secretions is short-prismatic, rounded, needle-like, and chain-like. The size ranges from 0.0043 to 0.0065 mm. (Figure 2).



**Figure 2. Various forms of native gold from the concentrates of the Lolazor ore occurrence. 1-natural gold, 2-quartz, 3-getite**

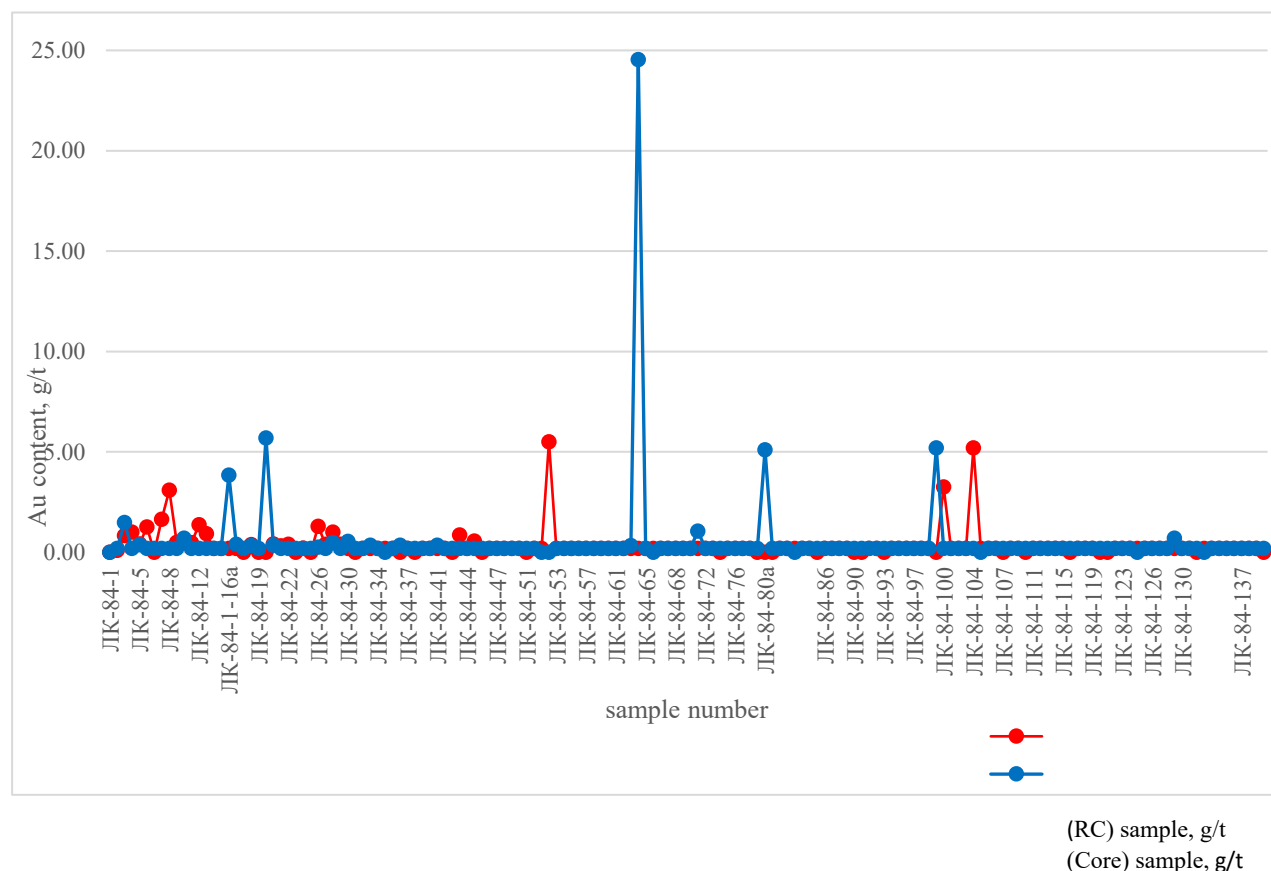
To analyze the quality and reliability of sampling at the studied Lolazor site, experimental drilling of reference control and verification wells was conducted using the drilling method at a distance of 1 meter from the main column drilling. The ZIF-1200 type drilling rig was used, equipped with a double column pipe and a complex with a removable core receiver, as well as coreless drilling using the RC (Reverse Circulation) method, which is a drilling technology with reverse circulation or blasting.

Table 1 presents the results of comparing the drilling wells No LK-84 (column drilling) with the control well No RC-17/3 (slag drilling).

**Table 1: Comparison of drilling results for well No LK-84 (column drilling) and control well No RC-17/3 (slag drilling)**

| Drilling well numbers                       | Sampling interval, m |       | Power (m) | Average Au content (g/t) | Maximum Au content (g/t) | Minimum Au content (g/t) |
|---------------------------------------------|----------------------|-------|-----------|--------------------------|--------------------------|--------------------------|
|                                             | from                 | until |           |                          |                          |                          |
| RC-17/3 (Slum)                              | 2.0                  | 13.0  | 11.0      | 1.1                      | 3.10                     | 0.41                     |
|                                             | 21.0                 | 24.0  | 3.0       | 0.9                      | 1.29                     | 0.22                     |
|                                             |                      |       |           |                          |                          |                          |
| LK-84 (core)                                | 2.0                  | 3.0   | 1.0       | 1.48                     | 1.48                     | 0.2                      |
|                                             | 9,0                  | 10,0  | 1,0       | 0,7                      | 0,7                      | 0,2                      |
|                                             | 55,4                 | 57,4  | 2,0       | 12,4                     | 24,54                    | 0,2                      |
| Difference (compared to LK-84 core samples) |                      |       | -10       | 12,58                    | 22,33                    | -0,03                    |

According to the "Methodological Recommendations for Ensuring Data Quality Control in Accordance



**Figure 3. Graph comparing the results of sludge (RC-17/3) and core drilling (LK-84) wells at the Lolazor field.**

**Table 3. Calculation of Lolazor deposit reserves during column and sludge drilling**

| Asset name | Total stocks, kg (100%) | Drilling method |                          |                          |                          |
|------------|-------------------------|-----------------|--------------------------|--------------------------|--------------------------|
|            |                         | Column (core)   |                          | RC (Reverse Circulation) |                          |
|            |                         | Difference, %   | Stocks (compared to SOD) | Difference, %            | Stocks (compared to SOD) |
| 1          | 2                       | 3               | 4                        | 5                        | 6                        |
| Lolazor    | 258.9 (1.18)            | 4.48            | 247.3 (1.13)             | 7.2                      | 240.2 (1.10)             |

with International Requirements during Geological Exploration for Solid Minerals" (Appendix 2 to the protocol of the meeting of the State Commission on Mineral Reserves of the Republic of Uzbekistan dated September 26, 2022), a graphical representation (graphs, diagrams, drawings) of the sampling quality analysis results (representativeness and reliability) must be provided. No This allows, firstly, to clearly see the control process and, secondly, to promptly implement corrective measures by analyzing the control data. Based on the above, a comparison graph of the results of sludge (RC-17/3) and core drilling (LK-84) wells at the Lolazor deposit is presented below (Figure 3).

The total estimated reserves for the Lolazor deposit are 258.9 kg, with an average gold content of 1.18 units. Results of column drilling: reserves - 247.3 kg with an average gold content of 1.13 U.S. with a difference of: in kg of total mass by 4.48%, with an average gold content of 0.05 U.S. According to the

results of drilling using the RC (Reverse Circulation) method, the reserves are 240.2 kg with an average gold content of 1.11 units, with a difference of: in kg of the total mass by 7.2%, with an average gold content of 0.08 units. The difference between the column method and the RC (Reverse Circulation) method is: 7.1 kg with an average content of 0.03 U.E.

#### Conclusions

The conducted research on determining the reliability of estimated gold deposit resources based on the study of the material composition of samples taken from boreholes at the Lolazor site allows for the following conclusions to be drawn.

1. The fluctuations in gold content are within wide limits. Thus, the maximum value for gold is 24.54 g/t.
2. Taking into account such high values of content variation coefficients and linear reserves according to mine workings sampling data, the deposit can be classified under the 3rd complexity group for exploration in accordance with the "Instruction on Applying Classification to Gold Mineral Deposits, 2000." The variation coefficient reaches up to 175.1%.
3. The Lolazor deposit consists of carbonate schists, aleurolites, quartz aleurolites, quartz, and altered (oxidized) rocks.
4. The main ore-forming minerals are gold, silver, pyrite, marcasite, arsenopyrite, chalcopyrite, coveline, sphalerite, galenite, and black clay ores. Quartz is a non-metallic mineral
5. The total estimated reserves for the Lolazor deposit are 258.9 kg, with an average gold content of 1.18 U.E. Results of column drilling: reserves - 247.3 kg with an average gold content of 1.13 units with a difference of: in kg of total mass by 4.48%, with an average gold content of 0.05 units. According to the results of drilling using the RC (Reverse Circulation) method, the reserves are 240.2 kg with an average gold content of 1.11 units, with a difference of: in kg of the total mass by 7.2%, with an average gold content of 0.08 units. The difference between the column method and the RC (Reverse Circulation) method is: 7.1 kg with an average content of 0.03 U.E.
6. The results of the control and verification work showed that the results of the ball borehole do not exceed 20%, which is significant.
7. When conducting geological exploration with gold reserve calculations at the Lolazor deposit and other similar gold-ore objects, it is recommended to drill using the cheaper RC (Reverse Circulation) method, as it has demonstrated sufficient reliability and sampling quality.

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