

SOURCES OF WATER INFLOWS AT THE CHARMITAN FIELD

Ishmukhamedova D.A.
GU "Institute HYDROINGEO"
Tashkent, Uzbekistan

ABSTRACT

The text discusses the study of groundwater in relation to the inflow of water into mine workings and the water supply issue at the "Charmitan" mine in Uzbekistan. The total water inflow into mines consists of groundwater, mine water from flooded workings and neighboring mines, industrial water, and surface water and precipitation. Water primarily enters the mine from aquifers in water-conducting cracks, neighboring goaf areas, and sometimes from the surface.

The Charmitan deposit is located in the Samarkand region of Uzbekistan. The climate in the area is sharply continental with extreme temperature fluctuations between summer and winter. Annual precipitation is limited, with significant groundwater recharge occurring mainly during the winter-spring period. The geological structure of the deposit includes Paleozoic rocks, such as quartz-micaceous and carbonaceous shales, sandstones, and limestones, as well as intrusions of granodiorites, granites, and syenites.

The tectonic structure of the area is characterized by longitudinal and diagonal faults. Longitudinal faults are parallel to the folds and complicate the wings of the anticlines, while diagonal faults occur mainly within the Koshrabad intrusion. Water inflows into mines can occur from groundwater in aquifers, mine waters from flooded workings and neighboring mines, industrial waters, and surface waters.

The text concludes that due to the insignificant predicted water inflows into future production workings at the Charmitan mine, special drainage devices are not necessary. Instead, water inflows can be directed into the mine workings and subsequently pumped to the surface.

INTRODUCTION

The main part of the work performed on the study of groundwater was considered in connection with the justification of water inflows into mine workings and the solution of the issue of water supply to the "Charmitan" mine. The total water inflow into mines and quarries is made up of: groundwater inflow (aquifers drained by mine workings); mine water coming from flooded workings and neighboring mines, industrial water supplied for irrigation, well drilling, etc.; surface water and precipitation. Water enters the mined-out space mainly from aquifers that fall into the zone of water-conducting cracks, from neighboring goaf areas, and sometimes from the surface of the earth.

MATERIALS AND METHODS

Study Area Description:

The study area is located on the southern slopes of the central part of the Northern Nuratau ridge, in the Koshrabad district of the Samarkand region, Republic of Uzbekistan.

The nearest large settlement is the regional center Koshrabat, situated 14 km away.

The climate of the study area is sharply continental with temperature ranges from $+35 \div +40^{\circ}\text{C}$ in summer to $-20 \div -30^{\circ}\text{C}$ in winter.

The long-term annual precipitation is approximately 321.9 mm.

The geological structure and hydrogeological conditions of the area are described based on the materials of the hydrogeological and engineering-geological survey of the Mitan GGP (Miraslanov and Zakirov, 2015).

☐ *Geological and Hydrogeological Characterization:*

The deposit is composed of Paleozoic quartz-micaceous, carbonaceous, clayey shales, sandstones, and limestones intruded by Upper Paleozoic intrusions of granodiorites, granites, syenites.

Different rock types are described, including syenites, granosyenites, quartz-mica schist, granites, and granite-porphyries, with their mineral compositions and secondary minerals noted.

Ore bodies are also described, consisting of quartz, carbonate, and pyrite, along with their associated minerals.

□ *Tectonic Structure:*

The tectonic structure of the area is determined by the presence of dislocated Early-Middle Paleozoic marine sand-shale strata and a large syenite-granosyenite intrusion.

Faults in the region are categorized into two groups: longitudinal faults developed among Paleozoic sedimentary strata and diagonal faults developed among both sedimentary and intrusive formations.

The characteristics of longitudinal and diagonal faults are described, including their orientation, dimensions, and sheared rock formations.

□ *Water Inflow Sources:*

The total water inflow into mines and quarries is described, which includes groundwater inflow from aquifers drained by mine workings, mine water from flooded workings and neighboring mines, industrial water supplied for irrigation and well drilling, and surface water and atmospheric precipitation.

Water enters the mine workings from aquifers in water-conducting cracks, neighboring worked-out areas, and sometimes from the surface of the earth.

□ *Water Inflow Types:*

Two types of water inflow into developed deposits are mentioned: district water inflow and bottomhole water inflow.

District water inflow occurs in the development workings and goaf of the excavation area, where water comes from mineral deposits, aquifers in the roof and soil of the workings, or drainage wells.

Bottomhole water inflow occurs in the bottomhole area of development and treatment workings, where groundwater and water from the mined-out area directly flow into the bottomhole.

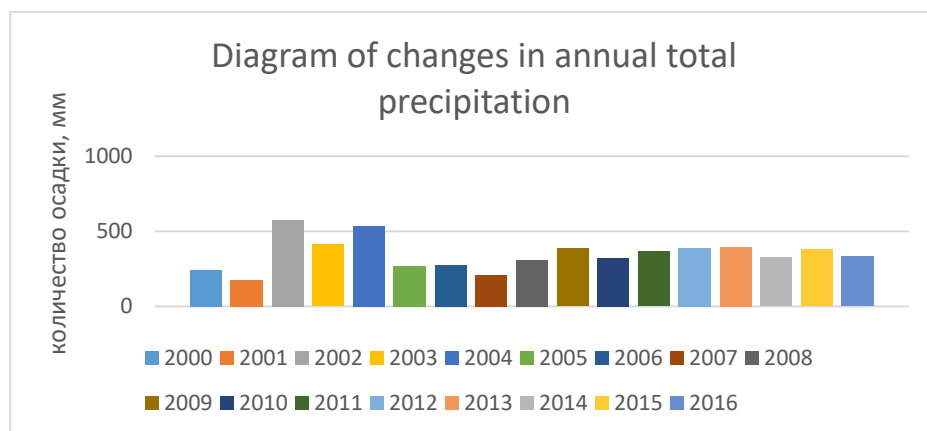
□ *Water Drainage Recommendations:*

Due to the insignificant predicted water inflows into future production workings, special drainage devices are not necessary.

Water inflows are recommended to be taken directly into mine workings and subsequently pumped to the surface.

RESULTS AND DISCUSSION

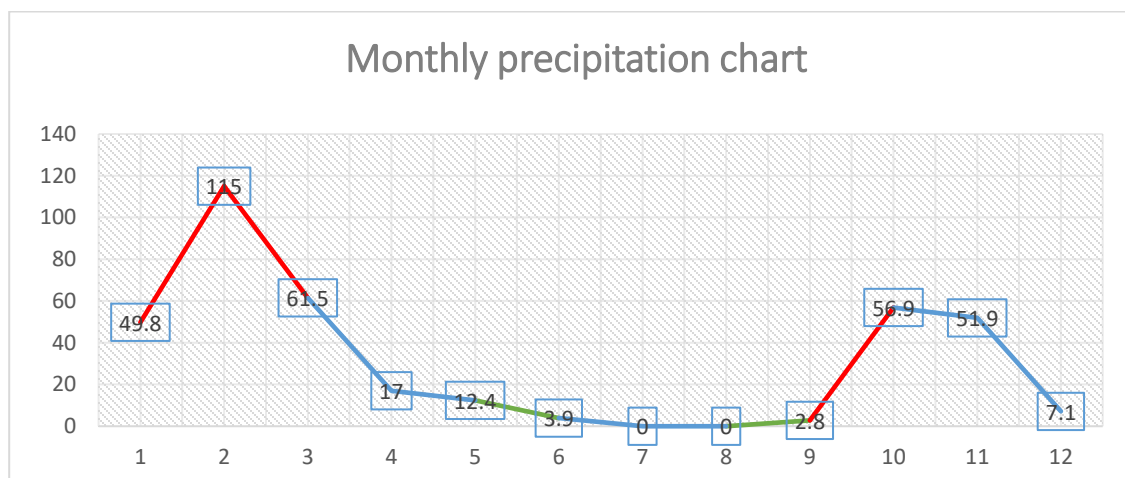
The development of deposits of solid minerals is one of the important areas of the economy. There are various negative impacts in the development of deposits of solid minerals. One of the negative impacts is the inflow of water from underground and surface water sources in mine workings. The main areas of water movement are zones of tectonic weakening or fault structures. Along with the development of exploitation of mineral deposits, the need to study the conditions of flooding of deposits gradually grew, tasks arose to determine the magnitude of water inflows and to develop rational methods for draining mineral deposits.



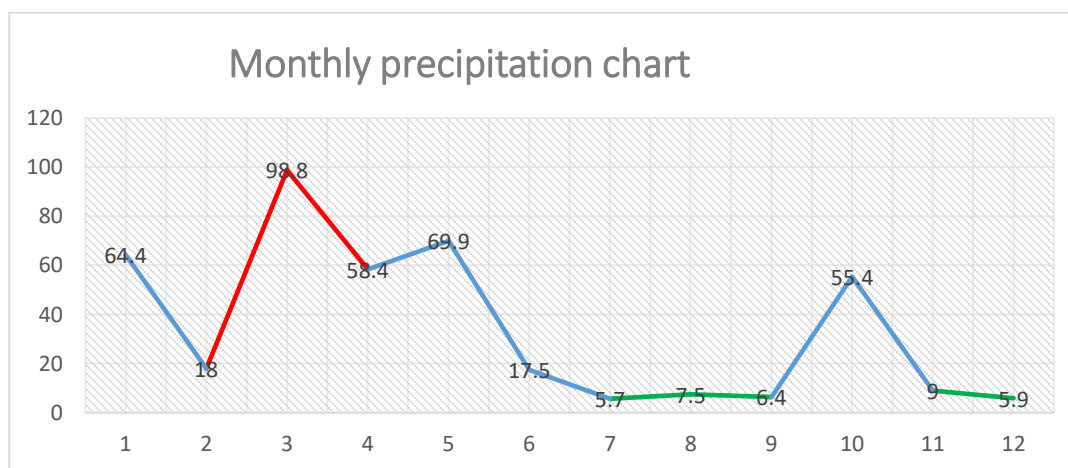
The Charmitan deposit is located on the southern slopes of the central part of the Northern Nuratau ridge. The administrative relation of the deposit refers to the Koshrabad district of the Samarkand region of the Republic of Uzbekistan. The nearest large settlement is the regional center Koshrabat (14 km).

The climate of the study area is sharply continental with sharp temperature drops from $+35 \div +40^{\circ}\text{C}$ in summer to $-20 \div -30^{\circ}\text{C}$ in winter. The hottest months are July, August with a maximum temperature of $+44^{\circ}\text{C}$, the coldest months are December, January with a minimum temperature of -30°C .

The long-term annual precipitation is approximately 321.9 mm, in connection with this, the prerequisites for the formation of significant groundwater resources due to infiltration of precipitation in the area are very limited. In zones of open fracturing of Paleozoic rocks, atmospheric precipitation can be sources of groundwater recharge.



Despite this, the most favorable conditions for feeding groundwater with atmospheric precipitation are observed in the winter-spring period, when up to 50% of the annual precipitation falls. In the summer-autumn period, the amount of precipitation is insignificant, evaporation in this period exceeds the precipitation rate several times.



An analysis of previous work in the area shows that the main part of the work was carried out to study groundwater, in connection with the justification of water inflows into mine workings and the solution of the issue of water supply to the mine "Charmitan". The geological structure and hydrogeological conditions of

the area of work are given on the basis of the materials of the hydrogeological and engineering-geological survey of the Mitan GGP (Miraslanov and Zakirov, 2015). The deposit is composed of Paleozoic quartz-micaceous, carbonaceous, clayey shales, less often sandstones, limestones, which are intruded by Upper Paleozoic intrusions of granodiorites, granites, syenites. The main petrographic varieties include: syenites of light pink color, porphyritic structure, pink, pinkish-gray microcline in phenocrysts, often with a white oligoclase rim, in the groundmass - microcline, plagioclase, dense green amphibole. The size of phenocrysts is up to 2-5 cm, grains - up to 0.3 cm. Mineral composition (%): plagioclase - 43-50, potassium feldspar - 17-45, hornblende - 4-8, pyroxene - up to 5, quartz - 1.7; secondary minerals – pelite, sericite, carbonate, chlorite, iron hydroxides, albite. The structure of the groundmass is trachytoid, while uniformly granular syenites are hypidiomorphic granular. Syenites vary in area and depth within small limits, mainly in fault zones and tectonic faults. Granosyenites are coarse and medium-grained porphyritic rocks of light gray, pinkish gray and light tones with large feldspar segregations. Mineral composition (%): plagioclase - 41-51, potassium feldspar - 21-35, quartz - 14-30, hornblende - 1-11, biotite - 4-13; secondary minerals (sericite, kaolinite, chlorite, epidote, carbonate) form veinlets in the rock and compose cement together with sericite and clayey material; they are present in zones of cataclased and mylonitized granosyenites. Quartz-mica schist is a fine-grained schistose rock, consisting of symmetrical, sometimes somewhat elongated quartz grains (0.05-0.1 mm), tiny sericite flakes and tourmaline needles. The mutually parallel arrangement of quartz grains and sericite flakes creates a schistose texture. The rock is cut by the thinnest cracks, made by a carbonate substance with an admixture of iron hydroxides. They are usually located perpendicular or at an angle to the layering, often made of fine-grained quartz. Granites, granite-porphyrries consist of (%): plagioclase - 10-55, potassium feldspar - 25-75, biotite - 3-10, hornblende - 15, quartz - 5-33, muscovite - 5; secondary minerals: pelitic matter, sericite, muscovite, chlorite, iron hydroxides, albite, carbonate, epidote, ore mineral; accessory - ore mineral, apatite, zircon. In the rock, the finest cracks are noted, made by iron hydroxides, micaceous minerals, carbate, chlorite. Ore bodies consist of (%): quartz - 30-35, carbonate - 10-15, pyrite - 55-60 (coarse-crystalline, weakly oxidized), feldspar, secondary minerals - micaceous, iron hydroxides. Rocks from ore zones: ore mineral is 1.5-2%, is released along cracks with a thickness of 0.05 to 0.1 mm, as well as in the form of clusters, grains and nests.

The tectonic structure of the area is determined by the presence of intensively dislocated Early-Middle Paleozoic marine sand-shale strata intruded by a large syenite-granosyenite intrusion (Report 1985-90).

According to genetic and morphological characteristics, faults in the region are combined into two groups: the first group is longitudinal, which are developed among Paleozoic sedimentary strata and are represented by faults oriented parallel to the strike of folded structures; the second group is diagonal, uniting faults developed both among sedimentary and intrusive formations and oriented diagonally to the strike of the folds.

Longitudinal discontinuities extend parallel to the folds and usually complicate the wings of the anticlines. They are reverse faults several tens of kilometers long and up to 100 m thick. Represented by intensely sheared rocks.

Diagonal faults are mainly recorded within the Koshrabad intrusion. Outside it, in the sandy-shale sequence, many diagonal faults fade. The described breaks are secant in relation to the structures of the region, and the angles between the axes of the folds and the lines of the breaks vary widely, from 30-60°.

A characteristic feature of diagonal ruptures is their development as a series of parallel or subparallel sutures grouped into separate sections. The length of the largest of them here reaches up to 15 km. All diagonal faults and a number of latitudinal discontinuities are characterized by vertical dipping of sutures and only shear displacements are recorded along them. As a rule, they are represented by thin (up to 1 m) friction breccias. Within the limits of the intrusion, the faults are accompanied by numerous fissures, along which the rocks are intensively chloritized.

There are several types of water inflow into developed deposits. The total water inflow into mines and quarries consists of: from the inflow of groundwater (aquifers drained by mine workings); mine waters

coming from flooded workings and neighboring mines, industrial waters supplied for irrigation, well drilling, etc.; surface waters and atmospheric precipitation (Lomtadze, 1977). The regime of water inflow into workings depends on the totality of the interaction of natural (climatic, geomorphological, geological and hydrogeological) and technological (shape and size of the mining area, depth and intensity of field development, development systems) factors.

district water inflow in mines consists of inflows into the development workings and into the goaf of the excavation area. In the development workings, water comes from mineral deposits, aquifers occurring directly in the roof and in the soil of the workings or from drainage wells. Water enters the mined-out space mainly from aquifers that fall into the zone of water-conducting cracks, from neighboring worked-out areas, and sometimes from the surface of the earth.

bottomhole water inflow in mines consists of inflows of groundwater and water coming from the mined-out area directly into the bottomhole area of development and treatment workings. The highest bottomhole water inflow is observed when the bottomhole is hypsometrically lower than the goaf.

Due to the insignificant predicted water inflows into future production workings, there is no need to organize special drainage devices. Water inflows are recommended to be taken directly into mine workings with their subsequent pumping to the surface.

REFERENCES

1. **Miraslanov M.M., Zakirov M.M (2015).** Engineering-geological processes developed at deposits of solid minerals in Uzbekistan: assessment and forecast. - T.: GIDROINGEO,. - 165 p.
2. **Report (1985-90).** Report of the mining party based on the results of detailed exploration for 1985-1990. "Hydrogeological and engineering-geological conditions for mining deep horizons on the southeastern flank of the Charmitanskoye field".
3. **Lomtadze V.D (1977).** Engineering geology, engineering geodynamics. - L.: Nedra,. - 298 p.

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