

Provision of Population with Drinking Water in OSH

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Abstract

The underground waters of the Ak-Buura valleys located among the mountains and the Mady underground water deposit located on the southern out skirts of the Mady village are of great value in providing clean drinking water to the city of Osh.

The water horizons of the alluvial-proluvial plains in the Ak-Buura river valley and the Mady ground water deposit are of great importance to the use of ground water to provide the population with clean drinking water.

Key-words: Groundwater, Operation, Water Quality, Water Supply, Drinking Water.

1. Introduction

Paper Rationale. The major issue of this paper is to find out the state of provision of the Osh population with clean water at present and in the future, the assessment of distributing the water resources and to determine constituent elements of the water resources. All Osh well sand springs, which the authors researched, can be used in the future in full to provide the population with clean drinking water. Thus, even today 65 spring sand 17 wells can be used, which metal the sanitary

regulation sand standards, the state of provision of the population with clean water at present and in the future was found out.

At present the industrial and civil construction in the regional center Osh is implemented on the basis of the current general layout developed in 1966. In connection with gradual increase in the construction work volume and with in ten se expansion of urban development area, increase in the population size, it is necessary to develop a new general layout of Osh. That's why, provision of the population with clean drinking water and assessment of using the water resources in the region by analyzing the water resources distribution in territories make this research rationale.

It was offered to solve a problem of providing the population with clean drinking water by an innovative method in the geographical science through the geographic-hydrological assessment of distributing the water resources in Kyrgyzstan's southern region.

In order to provide the population with clean drinking water, the laboratory research of physical and chemical composition of wells and springs was conducted. These methods allow studying the genetic components of the river flow, the underground waters, which is of great theoretical importance for studying the river flow genesis as well as is of practical importance for developing the water economy.

2. Research Methods

A designated purpose of the provided work is to receive necessary materials for developing the Osh general layout and to provide the population with drinking water, namely – assessment of the current and prospective the utility and drinking water supply; - detailed description of hydrological conditions with analyzing the chemical composition, quality and mode of the underground waters.

In order to solve the above-set tasks, the following kinds of work were provided for: - collection, systematization, study and generalization of geological, hydrogeological materials of explorations carried out in the past years;

- Collection of water samples (from excavations (wells, prospect holes) that penetrated the underground waters, the samples are provided for with a volume of 1.0 l with determination in a laboratory of standard chemical analysis);
- Hydrological work (determination of a degree of influence of the water bodies upon an adjacent territory. The reconnaissance investigation of rivers and river basins of various categories of complexity with determining the cross and longitudinal profiles in typical

ranges was performed. Parameters of annual, maximum and minimum flows along the drains in the research area were calculated.

- Laboratory research (the work was carried out in order to determine the salinity and the chemical composition. The laboratory work was carried out in accordance with the applicable regulatory documents and GOSTs.

All the work, which makes up a package of geological-engineering surveys, which is provided for by the research, is performed according to the effective SNIPs and GOSTs, standards.

3. Research Results

As a result, from 2015 to 2021 inclusive, the following work was performed:- river investigation – 10 km, river basin investigation – 50 km, 5 river ranges;- determination of physical properties – 1272 determinations; - water chemical analysis – 12 determinations;

As a result of analyzing the work conducted, office study of field data and laboratory data, a complexity category of the engineering-geological conditions for the entire territory was, on the whole, taken as III (complicated).

The research work was conducted jointly with the rural water supply department under the Kyrgyz Republic government. The research results can serve as the innovative and scientific-methodic basis for providing the population with clean drinking water, assessing the water balance and the resources of rivers located within the republic.

When summing up, let's say that during conducting the scientific research, a need to assess a volume of water resources and their reserves in providing the region population with clean drinking water was taken into account.

4. Novelty

Assessment of distributing the water resources was given and ways of providing the population with clean water in Osh were offered. The state of provision of the population with clean water at present and in the future was found out by assessing the distribution of the region's water resources. Influence of the water resources use in the agriculture and in the industry upon the underground waters state was found out. Thus, even now 65 spring and 17 wells can be used, which meet all the sanitary regulations and standards, the state of provision of the population with clean water at present and in the future was found out.

In the Ak-Buura river valley, in the south-east of the researched territory for centralized water supply of Osh and the industrial zone, in 1971-1972 ground water reserves of Osh deposit in the quantity of 353 l/s (30.5 thousand m^3/day) under the “B” category, with an all-year operational mode, were explored and approved. At present this deposit operates three group water intakes, including the South-Eastern water intake (pumping house No. 7), a water intake of the silk works and a water intake of the Osh kolkhozstroi-MKS association water intake, with the total quantity of 9 wells, the total water with drawal at the deposit made up 303.24 l/s (26.2 thousand m^3/day), including 206.94 l/s (17.88 thousand m^3/day) were used for the utility and drinking water supply and 96.3 l/s (8.32 thousand m^3/day) were used for the process water supply, or 85.9% out of the approved reserves. The water is hydrocarbonate-sulfate, with mineralization of 0.26 – 0.58 g/l, the total hardness is 4.6–6.8 mg/equ/l, and it is potable. This deposit has some reserves.

For process water supply of Osh production cotton association (micro district Kurmanzhan Datka) in the north-west of the territory, in the Ak-Bura river flood plain, the underground water reserves of Akbure deposit for water supply of the II stage of the Osh production cotton association in the quantity of 1650.4 l/s (142.6 thousand m^3/day) according to industrial categories, with an uninterrupted operational mode, were explored and approved. This deposit has a group water intake consisting of 12 wells, but at present, only 8 wells are in operation, and the total water with drawal made up 281 l/s (24.28 thousand m^3/day), which is used fully for the process water supply of the works. This deposit has significant underground water reserves, since it is used at 17%.

In terms of the chemical composition, the used underground waters are, in the main, sulfate-hydro carbonate, with mineralization of 0.64 – 0.96 g/l and total hardness of 9.4 – 11.7 mg/equ/l. Some wells had high nitrate concentration (NO_3) in water – 25-50 mg/l. In terms of quality, underground waters in this part of the river valley are slightly worse than they are upstream. High hardness, mineralization and presence of organics in water are explained by the fact that poorly purified sewage waters from urban sewage treatment facilities are filtered directly to the water-bearing horizon. With some treatment to funder ground waters, they can be used for the utility and drinking water supply.

For the North-East of Osh (micro district of the cotton works), including the Osh production cotton association, the Mady underground water deposit is operated, which is located on the southern outskirts of the Mady village, where reserves according to industrial categories “A+B” in the quantity of 232.4 l/s (24.4 thousand m^3/day) were approved. The water is with drawn by 1 well and 1 drain, which made up 210 l/s (10.14 thousand m^3/day), including it was used for the utility and drinking water supply in the quantity of 200 l/s (17.28 thousand m^3/day), and for the process water supply it was used in the quantity of 10 l/s (0.86 thousand m^3/day). The deposit has some underground water reserves,

since it is used at 74.3%. In terms of quality, the underground waters meet the requirements of GOST 2674-82 “Drinking water” and are potable.

A part from deposits with approved underground waters reserves for the utility and drinking water supply of Osh, the underground waters with unapproved reserves in the Ak-Bura river flood plain, on the southern outskirts of the city, are also used. The group main water intake (horizontal drains) with water with drawal is in operation here, of about 330 l/s (28.51 thousand m^3/day).

A part from that, for centralized water supply of Osh, surface waters of the Ak-Bura river are also used by the water intake “Ozgur”. Water is with drawn in the vicinity of Papanskoe gorge, near a distributive hydro electric generating complex, and then, via a pump-filter plant located in Ozgur village, is supplied to the city. Approximate water quantity for water supply is about 380-400 l/s(33.0-34.6 thousand m^3/day).

On the whole, for centralized water supply of the regional center Osh, at present, the water withdrawal in the above-mentioned water intakes is about 1.52 m^3/s (132 thousand m^3/day). A part from that, within a territory allotted for developing the Osh general lay out, some water wells (about 65 units) are operated for zonal and autonomous utility and drinking, process and agricultural water supply. Operation modes of these water wells are different – from 24 to 2 hours a day. The total water with draw al in them was about 380 l/s(33 thousand m/day).

Thus, for the whole of the territory, with draw al of underground and surface waters was about 2 m^3/s (165 thousand m^3/day).

However, it is necessary to say that a need for water was not met in full. Thus, in order to resolve this problem, the authors recommend:

1. Reconstructing the old water-supply net work;
2. Increasing the underground water with draw al at deposits with approved reserves, since there are some reserves of them, by drilling water wells or replacing the electric submersible pumps with more productive ones;
3. Using the suspended wells, and organizing the zonal water supply by drilling wells at the areas of qualitative underground water spread;
4. Increasing the capacity of the current main surface water intake “Ozgur” with sufficient purification of the water.

5. Conclusion

The authors' research showed that all springs, in terms of physical properties and chemical composition of water, are suitable for application and use to provide the population with clean drinking water.

Considering that the population is provided with clean drinking water, in the main, via springs and underground waters, control over their meeting sanitary standards is a vital issue.

The 2015-2020 research results show that these Osh water resources have no grave deviations from accepted sanitary standards according to sanitary-chemical and bacteriological indexes. In some instances, there are changes in the water composition, which are caused by climatic conditions. Thus, microbiological indexes of spring waters can be slightly changed in the event of heavy and prolonged rain precipitation. But, in the main, the sanitary standards of water resources of springs and underground waters meet the requirements of providing the population with clean drinking water.

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