Study of Geo filtration Processes of a Water Intake Structure Based on A Set of Mathematical Modeling and Software

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ABSTRACT

In the article, the problem of modeling geofiltration processes in the water intake area, constructing numerical solution algorithms and providing the population with high-quality drinking water based on software has been studied and investigated. The determination of changes in the level of river water, water resources, taking into account changes in hydrogeological conditions, groundwater and surface water, was carried out using a large number of effective computational experiments based on the created software, issues of increasing reserves and preventing depletion of groundwater deposits were discussed.

Keywords : Groundwater, geo filtration model, software package, computational experiment

Introduction

On the basis of comprehensive implementation of geofiltration processes, many scientific research and calculation experiments in the world indicate the need to meet the population's requirements for drinking water, build hydrotechnical structures, assess groundwater reserves, protect the environment, protect regions from flooding and correctly determine the existing hydrogeological conditions. For this reason, freshwater resources of a drinking water source on the basis of water intake facilities are considered to be very urgent issues due to changes in various conditions, the study of the state of the underground hydrosphere and the mathematical modeling of geofiltration processes in the effective use of groundwater, the construction of the initial information array, databases and their use, the improvement of.

Based on the study of the processes of geofiltration of groundwater based on the modeling of its properties and properties, Ch.Teys, Ch.Djeykoba, L.Luckner, W.A.Mironenko, V.M.Shestakov, A.A.Samarsky, N.N.Verigin, L.S.Yazwin, B.V.Borevsky, I.K.Foreign scientists such as gavić, as well as F.B.Abutaliev, U.U.Umarov, R.N.Usmanov, J.X.Djumanov, I.N.Gracheva, P.P.Compatriot scientists such as Nageevich conducted geofiltration modeling studies in the area of groundwater extraction .

The idea, ideological issues such as "model assessment of the perfect water capacity of the Damkhoja water intake facility"-based on geofiltration processes and additional filtration experiment and testing, mathematical modeling work on the territory of the Damkhoja water intake facility in the current underground water field, Zarafshan Oasis, which is being used due to changes in water management activities in the area under study after achieving independence.

The research carried out in the field of hydrogeodynamics is imperfect parametric circuitry and mathematics of simulation of keltirilgan buvlib hydrolimlyar, this ishda Damha is a tool for geofiltration of

Unity.fundamentals of hydrogeological hydrogeological research geofiltration conditions.

Part Base

The software tool created was implemented in the Delphi environment in the MS Windows operation system. At the launch of the program, hydrogeological schematization of the research object based on data from the zarafshon hydrogeological station was carried out to construct a digital model describing the natural hydrodynamic conditions of the field, and in different years a number of computational experiments were carried out in determining the ampletod of the subsurface water level by the area of the water intake.

Initially, the incoming and outgoing values, according to the water balance, are distributed according to the plan. In this process, as represented by a layer in multi-layer porous media of different thicknesses with large slopes of groundwater level in the ridge and along the plain, the aeration area and downstream were adopted into the model, resulting in the layer being non-pressurized, with the free water level representing the upper layer.

The determination of the potential of the planned water intake facility in the exploitation ditch was carried out mainly in the quadruple category in the same models as in the following schemes.

Geology-the process of obtaining water from an individual well of the exploration category;

Water extraction processes as an experiment;

The processes of extracting water from wells of the Gangetic (Cust) group;

Water extraction processes from golereal Wells;

The software set is developed in relation to the planned filtering scheme in the water-holding layers, and this scheme is based on the following two hydrogeological conditions:

- on Dyupyui on the constancy of the vertical water level in permeable layers;

-on the vertical nature of filtering in water separator layers according to Myatiev-Girinsky.

It uses algorithms to solve a system of algebraic equations under these conditions, as well as the fact that these differential equations are the result of approximating the processes of geofiltration with the scheme and equations of finite subtractions.

The algorithm of the resulting solution was compiled, in a convenient form for use in the program, as well as the following water level reduction expressions were applied in the area of the water intake facilities [4]:

$$S=Q/4\pi T\ [W(u)+2\zeta(\bar{r},\bar{\Gamma},\alpha,\beta)];$$

in this, $T=k_1 m_1+k_2 m_2$; $\bar{r}=r/m_1$; $\bar{\Gamma}=l/m_1$; $\alpha=k_1/k_2$; $\beta=m_2/m_1$.

In the framework of studies carried out at the first stage to solve the assigned tasks, modeling was carried out to assess the state of the water level every 100 m of the gallery when working as part of a general system of a certain length. On this basis, that is, through mathematical modeling, the effect of building a 200 m additional section of the gallery in the upper reaches of the river, which is 100 m cha, on the existing section of the gallery, was assessed.

The model was calibrated by comparing the state of the actual water levels in observation wells (Figure 1) and measuring levels at checkpoints in the process of solving reverse issues based on the program, the model was calibrated, the model of the gallery fragment and the actual water consumption were studied.

In the predictive version, the state of the "extension" of the gallery 200 m above the river is imitated. Modeling of the 3-year period of the 300-meter gallery made it possible to assess the performance of the existing section of the gallery, which was reduced due to the "fall" of part of the underground flow by the predicted section of the 200-meter length. After detailed testing of the upper part of the deposits with research work along the continuation of the gallery consisting of the recommended alluvial mountain ranges, a second-stage modeling was carried out with the aim of reevaluating exploitation reserves of 100,000 m3/day (Figure 2). In this case, the reevaluation of the exploitation reserves of groundwater was reduced to the calculation of the discharge of the gallery, provided that the dynamic surface is reduced to 6.5-7.0 m at a certain depth.

The filtration coefficient varies from KF, m/sut in the Western qsim to 17-25, 75-110 in the eastern part and 325-350 in the central part. In such a general model, the thickness of the alluvial layers of the gallery was added, which were presented to prevent the turbidity of the filters and its grinding. The filtering parameters of these layers were evaluated in the experimental testing of the fragment.

Study of the nature of the connection between groundwater and the river and preliminary assessment of the filtration resistance of the river bed. The modeling covered the area of the flood and the terrace I above the plain with an area of 3000 m * 500 m with 300 cells along the ordinata axis and 50 columns along the abscissa axis. The minimum mesh grid spacing for modeling is 5 * 5 m in the area where the gallery fragment is placed, with a maximum of 10 * 10 m on the sides of the model.

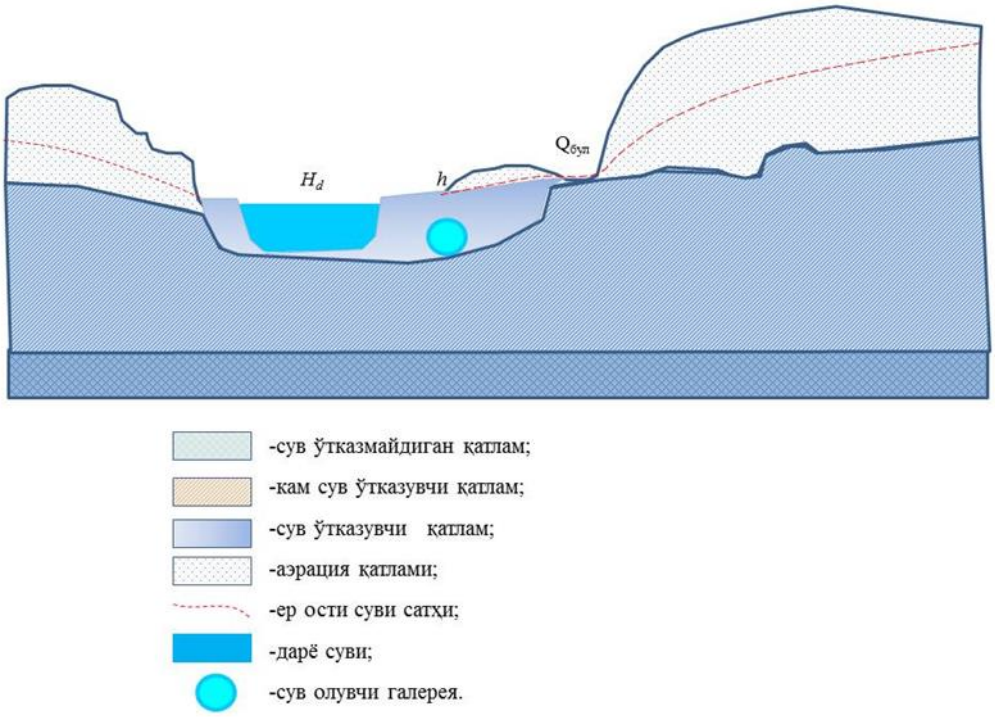

Figure 1. Hydrogeodynamic scheme of groundwater and groundwater monosubates in hydrogeological shear

The model was taken as the initial basis, along its eastern and Northern contours, saturation conditions were established that correspond to a decrease in the level of groundwater; in the center - epig drainage with mahlum parameters (the coefficient of permeability characterizing the permeability of filters and holes in the pipe), and, in turn, water collection the corresponding slope of the pipe; along the Southern.

The program is called BoreHole and is designed to conduct numerical research in the field of Hydrogeology, as well as in the modeling-based solution of parabolic-type issues in gallery groundwater extraction facilities using unin, that is, in the solution of practical issues of geofiltration processes. BoreHole _d part software reads MXN-sized two-dimensional information arrays (Informate) in a form corresponding to the filtering area, printing to match the numerical subtraction Area scheme to determine if a specific result is obtained, increasing the clarity and speed of sath change analysis.

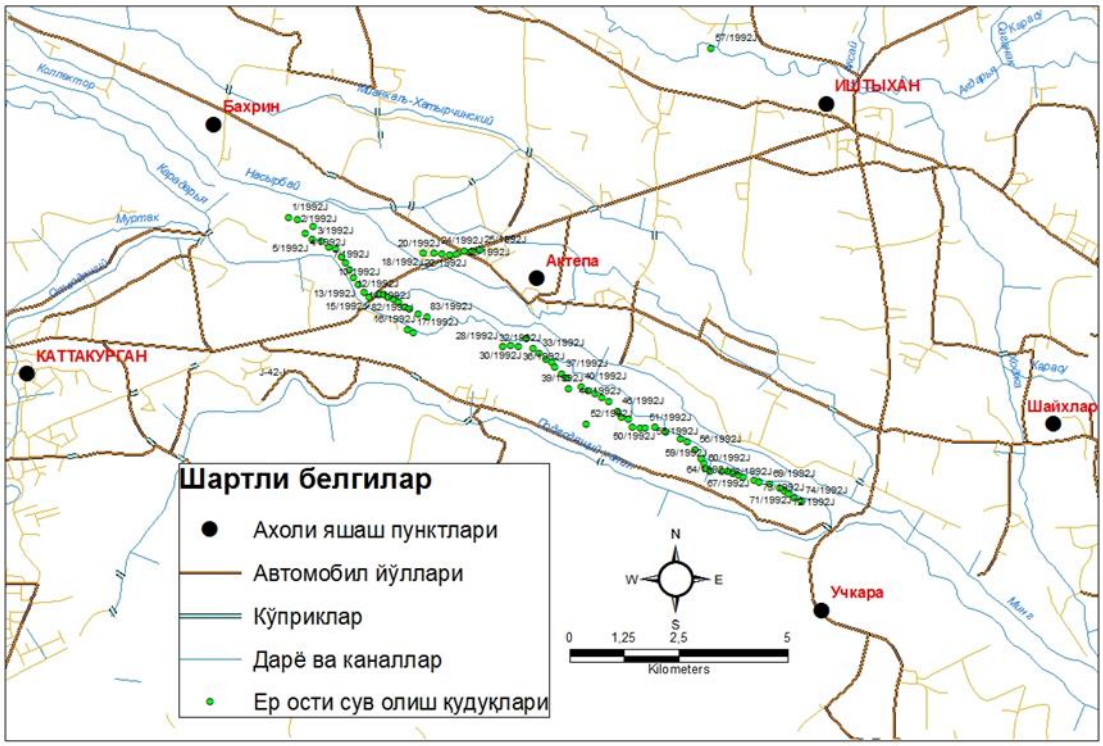

Figure 2. Map of the material data of the field under study

The BoreHole _B qsim Program (Water balance) performs a water balance calculation and calculates the local balance according to the results of solving non-state issues in the border area, rivers and canals, as well as the receipt of water for squash. In addition, capacious water can be used to determine balance and inconsistency in solving a non-specific issue in order to calculate all the components of the balance in addition to reserves. The BoreHole _K qsim program is used when solving a non-linear issue to recalculate water (coefficient filtering) fluidity and water permeability on this basis, and to determine the thickness of the water-holding layer, to determine the coefficient of leakage by Regions.

The BoreHole _P qsim program corrects the water permeability, infiltration, and water loss values of the high horizon when solving unstable and non-stationary inverse issues. A library of program modules (BoreHole _Lab) is created to run and stream programs. This library contains content in which information about the program (module), that is, its name, address, is stored. The presence of content reduces the time spent searching for the desired module.

Conclusion

When water was taken from this cluster, gallery and yarrow catchment area based on water pumps, hydrogeological regime the coefficients of filtration and water permeability in data processing, as well as the filtration resistance of the river bottom, computational work was carried out on the model, the initial calculation of reserves was justified by this galley method.

When analyzing the initial results of the model calculation work, it turned out that only the first thin layer of water, consisting of superficial modern alluvial Stones, has the importance of drinking and industrial water.

As a result of the study of the Qoradaryo groundwater deposit, the aquifer in the current quaternary deposits of the river zone was studied in detail. It is characterized by: the groundwater level is located at a depth of 0.8-1.0 m; the layer capacity is 6.7-13.5 m from the surface of the Earth, the amplitude of groundwater does not exceed 1.5 m; the

filtration coefficient is on average 200 m/Day; the flow rate of the well is 19-45 l/St

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