Plutonium (Pu) is the second artificially derived chemical element. Today, 15 isotopes of Pu are known. Pu is extremely difficult for detection in natural objects. It is used in the manufacture of nuclear weapons as a nuclear fuel and as a compact energy source [3].

Coming into the biosphere, plutonium migrates to the earth's surface, entering the biogeochemical cycles. Its specific activity is 200 000 times higher than that of uranium; furthermore, the release of plutonium from an organism can hardly take place throughout its life. Plutonium is called "nuclear poison", its permissible content in the organism is estimated in nanograms. In human organism, plutonium is deposited in lungs, liver, bones, and other tissues, and excreted from organism very badly. In particular, its half-life in the skeleton is 50-80 years, which is comparable to the duration of a human life [3].

If we exclude the explosion of the atomic devices and emergency situations, the main source of radiation impact on the biosphere is the enterprises of NFC in standard operating conditions.

The most important feature of NFC is that in the process of power production a lot of harmful artificial radionuclides are formed. The main part of radioactive waste from NFC plants is of high specific activity. Some of the radionuclides have significant (from hundreds to millions years or more) half-lives.

Using the f- radiography method in the village Muslumovo (Chelyabinsk region) pollution of biological objects and natural environments with radioactive isotopes, including fissile elements, was established. It was stated that pollution of the River Techa ecosystem was caused by discharges of liquid radioactive wastes from radiochemical plant "Mayak" within the period from 1949 to 1956. This led to a significant radioactive contamination of the river banks.

Radiochemical analyzes were carried out, the concentrations of plutonium in the soil and input of fission elements through the root system in plants were not found. Distribution of fission elements in plants was found in the form of dust particles adhering to the surface of plants and less in the form of scattered penetration into the roots and leaves of plants.

Tomsk region is distinguished by siting the complex of Siberian Chemical Combine (SCC) on its territory, which is a large and widely known plant not only in the country but also abroad.

It became the focus of interest as the result of the accident in April 6, 1993. Survey of the SCC area showed the abnormal concentrations of artificial radionuclides near sanitary protection zone, in the River Chernilschikova, where wastes of co-current reactors were discharged. In the zone of SCC impact, mainly in the northern part, soil contamination with plutonium-239 and plutonium-240 was observed in excess of the background level 4 times more than other radioactive contaminations, rather weak, that are present in Tomsk Oblast in the form of local areas [4].

Research was performed on the distribution of fission elements in the blood of people living in Tomsk Oblast. In total, 4 blood samples from such regions as Seversk, Strezhevoy, Kargosok, Bakchar were studied. Besides, the standard sample was placed together with other samples [4].

In our research we used mica, on which the blood was applied in a thin layer, and then irradiated, and etched by HF and rinsed with water.

View of the detectors was carried out using an optical microscope with different magnification (X10, X20, X40 times). While viewing both separate tracks and their conglomerates ("stars") were recorded

It was found that the distribution of fission particle is different depending on the region. In the blood of people individual tracks were identified in Strezhevoy and Kargasok. The inhabitants of Seversk have hot particles with a distinct form of "stars".

Hot particles in the form of stars found in Tomsk Oblast in Seversk town as well as in the area of enterprise "Mayak" of the Chelyabinsk region (Baranov et al., 2011) are not typical for the blood of inhabitants from other areas. This fact led to the assumption that such hot particles are observed in areas with enterprises of the nuclear fuel cycle.

Owing to the f-radiography the presence of "hot particles" in the blood of inhabitants of NFC enterprise area was found. It indicates the negative effects of NFC enterprise on the adjacent territories, on organisms living in its vicinity. In my opinion, one should inform people about the threat to their health and the consequences of living in vicinity of such objects.

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NUMERICAL MODEL OF HYDROGEOLOGICAL CONDITIONS FOR CALCULATION OF UNDERGROUND FRESHWATER RESERVES OF THE STOLBOVOE OIL FIELD

M.S. Mikitenko
Scientific advisors associate professor K.I. Kuzevanov, associate professor I.A. Matveenko
National Research Tomsk Polytechnic University, Tomsk, Russia

The region of research is located in the central part of the West Siberian low plain in the territory of the Stolbovsky deposit in northwest part of the Kargasoksky region (Tomsk Oblast). The penetrated section is of practical interest. It is limited to deposits of Paleocene system, which are perspective for production of underground drinking waters. These deposits are distributed throughout the area and the site. In the hydrogeological aspect the study area belongs to the Irtysh-Ob groundwater basin of the second order structure, which is included to the West Siberian artesian basin of the first order. The works consisted in observing the decreases in the level of underground water at water well disturbances and replenishing the level of underground water after pumping equipment shutdown.

Since both wells operate one aquifer, pumping test was carried out in active well "1". As an observation well Well "2" was chosen. Static groundwater level in the well "2" was 3.90 m, "1" - 3.93 m prior to switching the pumping equipment.

The discharge of well was measured by the volumetric method hourly with the use of 200 liter measuring capacity. Time of filling the capacity was fixed on a stop watch within a second. During water pumping the discharge of well "1" was 4,1 liters a second.

During water pumping lowering of the underground water level in the active well "1" was 2,95 m, in the observational well "2" – 1,06 m. As a permissible decrease at the forced flow the magnitude of decrease in level is accepted as no more than the aquifer pressure of 72,1 m .

Geofiltrational modeling was performed for definition of decrease in water well taking into account the design flow discharge. In this case the discharge was considered to be constant at a calculated period of 10 000 days.

The expected complete decrease in the level at the water intaking area of "Stolbovoe" oil field, well No. 2 makes 2,1 m, including those due to interaction with the next water intakes - 0.6 m. The complete decrease in the underground water level obtained as a result of geofiltrational modeling is much less admissible one on the subsoil that shows sufficient availability of the underground water reserves necessary to meet the definite requirement

The reserve classification of underground waters has been carried out according to the requirements of Resource Classification and expected resources of drinking, technical and mineral underground waters [Classification …. 2007]. Reserves of underground waters were calculated on the subsoil site with an active water intake.

According to methodical recommendations on Classification application, [Methodical …. 2007] the estimated reserves of underground waters on the water intake of "Stolbovoye" oil field are recommended to be referred to the category C1 in number of 29 m3/d

Characteristics of the numerical model:

- Confined aquifer consists of two water-bearing and one low permeable layer.
- Calculated operation period – 10 000 days.
- The permissible well decrease doesn't exceed the value of a pressure over overlying bed. Its value is equal to 72,1 meters.
- Water supply wells work with constant specific yield during the operation time.
- Designed specific yield meets the contracted requirement.

To assess the model sensitivity to the changes in filtration and capacity parameters the assessment of the error in observed and modelled values of groundwater level was carried out on average deviation and the square root from an average standard deviation.

Good convergence of observed and model values of groundwater level confirms the filtration and capacity parameters, which were accepted after calibration.

Based on the the above metioned facts one can draw the conclusion on the fact that the created model reflects the real situation and can be used for the forecast.

Conclusions:

1/ The model of a definite water intake of small efficiency on the uniform finite-difference grid with 1000x1000 meters in size shows that in the calculated block with water well the decrease is several times less than the real change of underground water level.

2/ The difference between true and model decrease is connected with the features of the net as a result of which the expected decrease is calculated in the calculated block, but not in a well.

3/ The two ways are used to fit results of the numerical decision and real decrease in the operational well:

3.1/Application of analytical calculated formulas of additional hydraulic resistance of an operational well;

3.2/Decrease of the sizes of the calculated block for artificial filtrational resistance of an operational well.

4/ In practice of numerical modeling these problems do not pose any essential challenges in the presence of observation wells in which momentum discontinuity of level is absent, and design values of pressures are brought in conformity with the real measurements at the model calibration stage.

5/ Results of assessment of numerical model sensitivity to the spatial change in filtration parameters showed that at change of permeability coefficient, decrease changes slightly (Fig. 1, Fig. 2, Fig. 5), and change in the value of a resilient filter loss practically does not affect (poorly affects) the value of calculated decrease (Fig. 3, Fig. 4, Fig. 6).

6/ The closest dependence of calculated decrease of the level is established from the value of the well hydraulic resistance which requires self-justification and cannot be performed correctly without the data on observation wells.

7/ Materials of numerical model operation of an individual water intake show that efficiency of computer modeling decreases sharply and does not give noticeable advantages before traditional hydrodynamic calculations without hydrodynamic observation.

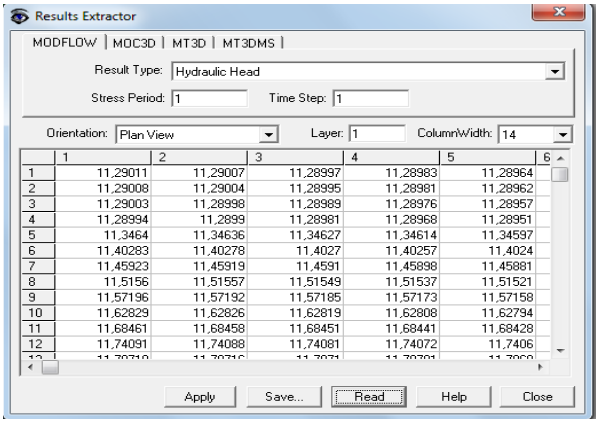

Fig. 1. Permeability coefficient is one level more

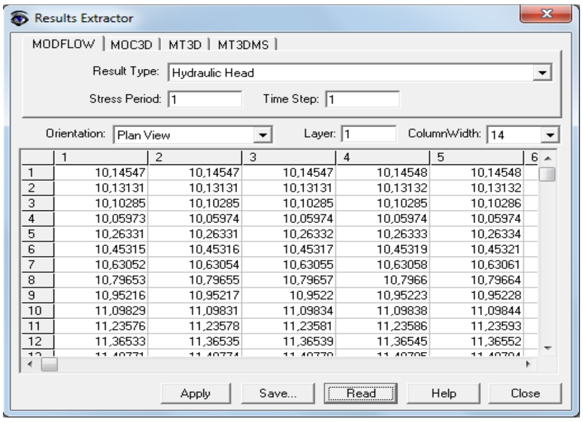

Fig. 2. Permeability coefficient is one level less

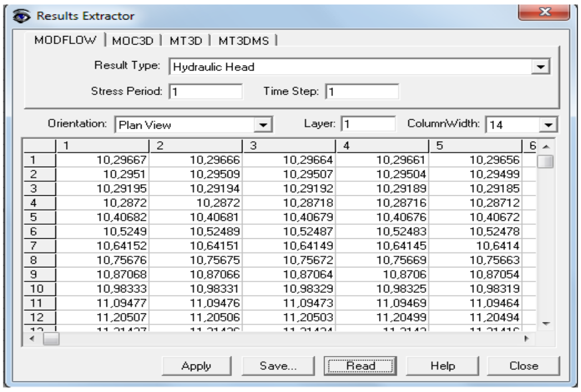

Fig. 3. Value of a resilient filter is one level more

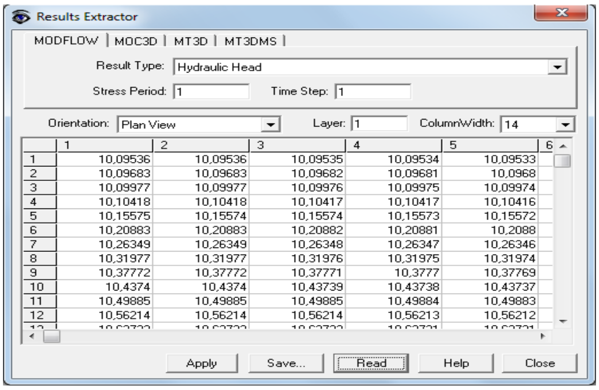

Fig. 4. Value of a resilient filter is one level less

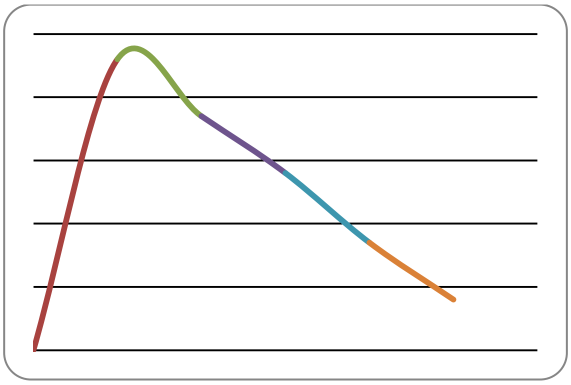

Fig. 5. Diagram of assessment of numerical model sensitivity to the spatial change in permeability coefficient

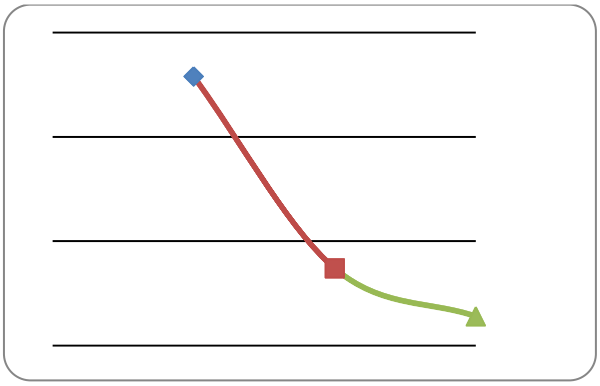

Fig. 6. Diagram of assessment of numerical model sensitivity to the spatial change in resilient filter

Thus, the usage of the modern computing technologies in calculation of reserves has to be informational provided, before calculation of underground waters reserves. For individual water intakes it is extremely desirable to have data on an observation well.

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