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The peculiarities of the formation of pollution zones of water bodies due to filtration discharges of highly mineralized brines from technological storage tanks

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One of the world's largest deposits of potassium and magnesium salts is located on the upper Kama river - Verkhnekamskoye deposit of potassium and magnesium salts (VKMKMS). Currently, it is being actively developed, and the consequences of this have a negative effect on the state of the Kama River and the Kama reservoir formed on it. Industrial enterprises of the cities Solikamsk and Berezniki located in this zone actively use in their technological chains the raw materials obtained as a result of the development of this field, and their wastewaters, which are excess brines, are characterized by very high mineralization ($\sim$ 300 g/l) and, accordingly, high density ($\sim$ 1020 g/l).

As the analysis show, main contribution to the pollution of water bodies in the considered territory is made not by the declared point sources of pollution, but by diffuse sources, caused by filtration discharges from large technological storage tanks of brines. In order to study the zones of pollution of water bodies formed by these sources, their detailed comprehensive study was conducted, including field measurements of pollution zones and their hydrodynamic modeling. The paper presents the main results of the study.

The studies have shown that "heavy" brines entering water bodies as a result of filtration discharges, due to the suppression of vertical turbulent pulsations, can propagate without significant reducing their concentration over considerable distances, which has extremely unfavorable consequences for benthic hydrobionts. To study the effect of density stratification on the processes of dilution and transport of highly mineralized brines, numerical simulations were carried out within the framework of the three-dimensional hydrodynamic approach in the non-hydrostatic approximation. Numerical results are in a good agreement with the materials of field observations.