Distribution of nitrates in the groundwater of Svilajnac

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Svilajnac is a city located in central Serbia, with population of about 10 000 inhabitants. The terrain is mostly flat, consisting of alluvial plain located near the confluence of the Resava and Velika Morava rivers. The only hilly parts are river terraces located in the northeast part of the area. The population of Svilajnac is supplied with drinking water from one water supply system, public fountains and individual wells, all of them located in the quarter sediments. Within these intergranular porous rocks, the local aquifer was formed, and it is hydraulically connected with the rivers Resava and Velika Morava. Piezometric level of the wells is generally 3 to 6m below the ground, while their depth is between 8 and 12m.

This research has been done in order to determine nitrate concentration and create maps of nitrate distribution in the region of Svilajnac, by sampling water from 21 sampling point in the period of June-August 2013. Twenty samples were taken from individual wells, and one sample from well that is being used in water supply sistem.. The laboratory tests were done in the Institute „Jaroslav Černi“, Belgrade and in Public communal company „Morava“, Svilajnac, in order to determine nitrate concentration. For creating maps of nitrate distribution in the region, the Surfer programme was used.

It has been determined that the nitrate concentrations in the centre of Svilajnac region and its rim are not equalized. An increased nitrate concentration, above 50 mg/dm^3, was found at 6 sampling points which are located on the rim, where one of these sampling points had the maximum nitrate concentration of 97.24 mg/dm^3 (Fig. 1). This point is more than 790 m away from the Resava and is located outside the area of the city. These grounds are used for keeping cattle and growing different crops, therefore the usage of fertilizers is common. Concentration of nitrates is considerably lower in the central part of research area consisting of the city centre closer to the river. The lowest measured concentration in this part is 12.40 mg/dm^3. This is justified considering that the whole population is using this groundwater for drinking.

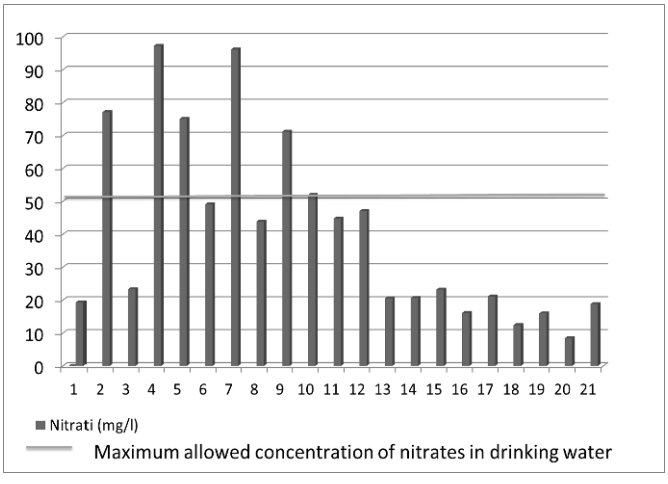

Fig. 1.: Concentration of nitrates at the sampling points

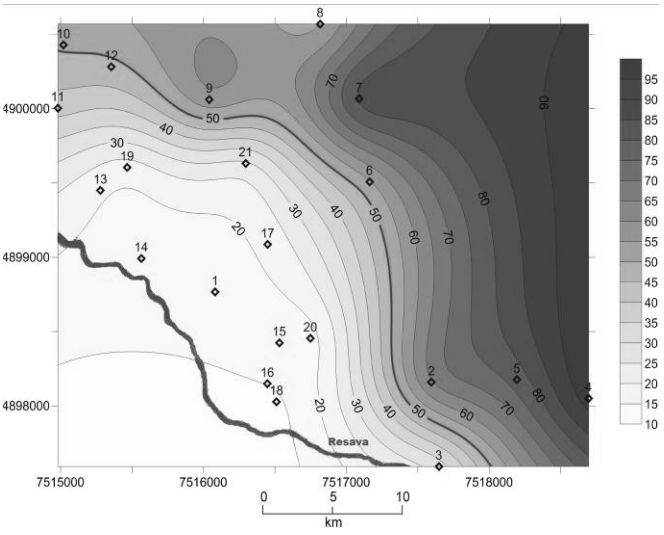

Fig. 2.: Interpolation map which shows distibution of nitrates in the groundwater (squares with numbers are showing the sample locations, while the gray-scaled bar shows the concentration of nitrates)

Interpolation maps showed that the concentration of nitrates is decreasing from the northeast to the southwest of the area, which coincides with the shortening of distance between the sampling points and the river (Fig. 2.).

It is supposed that the increase of nitrate concentration in the rim of the research area is caused by using fertilizers, from which nitrates can be easily infiltrated in the ground. As they cannot stay linked to it, they continue to be infiltrated in the groundwater. According to the terrain relief, the groundwater moves from the hilly to the flat parts – from northeast to the southwest of the research area. During this movement of the water, the nitrates from the rim diffuse, which lead to attenuation of the nitrates and lowering their concentrations.