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Drinking Water Engineering and Science Discussions

Interactive comment on "Water quality and treatment of river bank filtrate" *by* W. W. J. M. de Vet et al.

W. W. J. M. de Vet et al.

w.w.j.m.devet@tudelft.nl

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General comments

Remark: We thank you for your critical, but positive appraisal and hope to have improved the manuscript sufficiently by the following corrections and additions.

Specific comments

A main goal of the manuscript is to determine that the quality of the raw water is the result of redox reactions and mixing of river bank filtrate and polder water. To this end, the authors use and try to analyze data from the wells and the treatment plants of a Water Company in the Netherlands.

> They do not present data neither of redox values nor of flow rates.

Reply:

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Interactive Discussion

Discussion Paper

» We do not have redox measurements in the aquifer or individual wells; however, it is generally accepted that the in paragraph 2.1.2 listed parameters give an adequate picture of the redox state of the water (see Stuyfzand, 1988). We suggest no changes concerning redox changes during aquifer passage.
» Flow rates and patterns in the aquifers near well fields are modelled in detail by geohydrological groundwater models. We suggest to add a column with the calculated mixture ratio based on the (measured) sulfate concentrations and that calculated by the groundwater model for each well in Figure 2 in paragraph 2.1.2.

> Thus, they use measurements of pollutants' concentrations to support the validity of their speculation. However, these long term data were obtained at different time intervals (2005-2009, 1998, 1999-2000, 1997-2006) and questions arise for the validity of their speculations.
Reply: In general, the groundwater quality is very constant in time; we had to rely on the available data from the production plants. However we do not think the different ranges are really negative influencing our discussion. The data presented and obtained at different time (intervals 2005-2009, 1998, 1999-2000, 1997-2006 are indeed independent data series, each giving a complete picture of the discussed issue. If so, please indicate in which set you miss data. The only case of overlapping data is for methane at WTP Reijerwaard, where we present concentrations for individual wells from one period (hydrology section) and values in a raw water header from an other period (technology section). However, the header water concentration is measured and not calculated from individual well qualities (2005-2009) in Figure 2, and still consistent with a mix of the later.

Drinking water treatment is the second main goal of the manuscript. The authors describe the effectiveness of the used methods of the Water Company.
> However, they miss important literature information about simultaneous removal of

DWESD
2, C119–C122, 2010

iron, ammonia and manganese and their redox interactions.
Reply: References about the simultaneous removal of iron, ammonia and manganese are discussed in de Vet et al. (2009b), as written in paragraph 2.2, page 137, line 6-8; the discussion in that paper focuses on the (redox) interactions of these processes that may be relevant for the Oasen groundwater treatment systems; in the current paper, the role of redox interactions is discussed in paragraph 3.4, page 141, line 23 and further;
We suggest to add the following text in paragraph 2.2, page 137, after line 8 (. . .possible interactions with nitrification were discussed in that earlier paper.:
Added: It also contained a number of the many relevant references about the interaction of iron, manganese and ammonium in groundwater filters (Mouchet (1992); Vandenabeele et al. (1995); Štembal et al. (2005); Tekerlekopoulou et al. (2006).

> Te biological approach is very weak.
Reply: It was not the aim of this article to present the results of microbiological research into the functioning of the filters, but to deduce possible processes which are relevant for the understanding of previously published, well documented nitrifications problems (de Vet et al. 2009b). To this aim, the overall functioning of comparable full-scale filters at one WTP and the likeability of theoretically possible processes were evaluated. For the results of more elaborated microbiological research by the authors by for instance molecular techniques, we refer to de Vet et al. (2009a). Other papers by the authors are in preparation on this subject.

To correct this we propose to add the following text at the end of the Introduction paragraph:
Added: This article is not a research article sensu proprio, lacking the strictly defined structure with Materials and Methods and Results sections. It presents a general approach to evaluate the functioning of defined parts of the geohydrological and treatment system of Water Treatment Plants. By comparing the extended but still

DWESD
2, C119–C122, 2010

scarcely analyzed datasets from full-scale systems, that are available in many Drinking Water Companies, with the appropriate theoretical concepts, interesting deviations and focus points for further research have been formulated.

Added references

> Mouchet, P. (1992) From conventional to biological removal of iron and manganese in France. Journal / American Water Works Association 84(4), 158-167.

> Štembal, T., Markic, M., Ribiĉić, N., Briški, F. and Sipos, L. (2005) Removal of ammonia, iron and manganese from groundwaters of northern Croatia - Pilot plant studies. Process Biochemistry 40(1), 327-335.

> Tekerlekopoulou, A.G., Vasiliadou, I.A. and Vayenas, D.V. (2006) Physico-chemical and biological iron removal from potable water. Biochemical Engineering Journal 31(1), 74-83.

> (Vandenabeele, J., Vande Woestyne, M., Houwen, F., Germonpre, R., Vandesande, D. and Verstraete, W. (1995) Role of autotrophic nitrifiers in biological manganese removal from groundwater containing manganese and ammonium. MICROB ECOL 29(1), 83-98.)

Interactive comment on Drink. Water Eng. Sci. Discuss., 2, 127, 2009.