



# Bank filtration combined with ozonation and GAC: natural organic matter and bacteria removal

## Challenges to bank filtration

Drinking water supply of Poznań (Poland) is based on Riverbank Filtration (RBF). The water at the RBF site (Figure 1) is characterized by:

- high concentrations of natural organic matter (NOM) with high molecular, total organic carbon (TOC), dissolved organic carbon (DOC), colour and UV absorbance, and
- high concentrations of bacteria in river water.

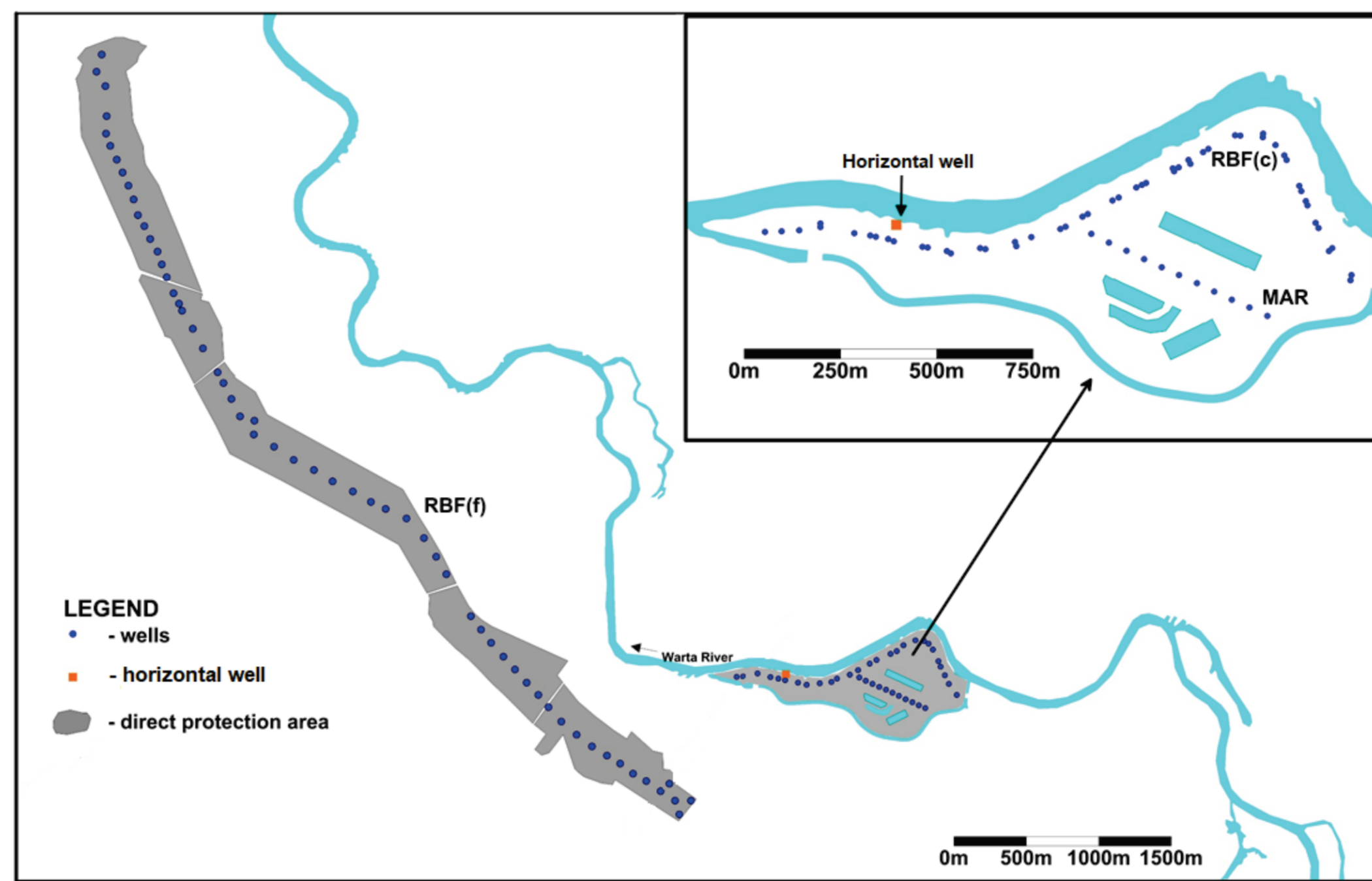


Figure 1. Situation map of Mosina-Krajkowo well-field

## Results

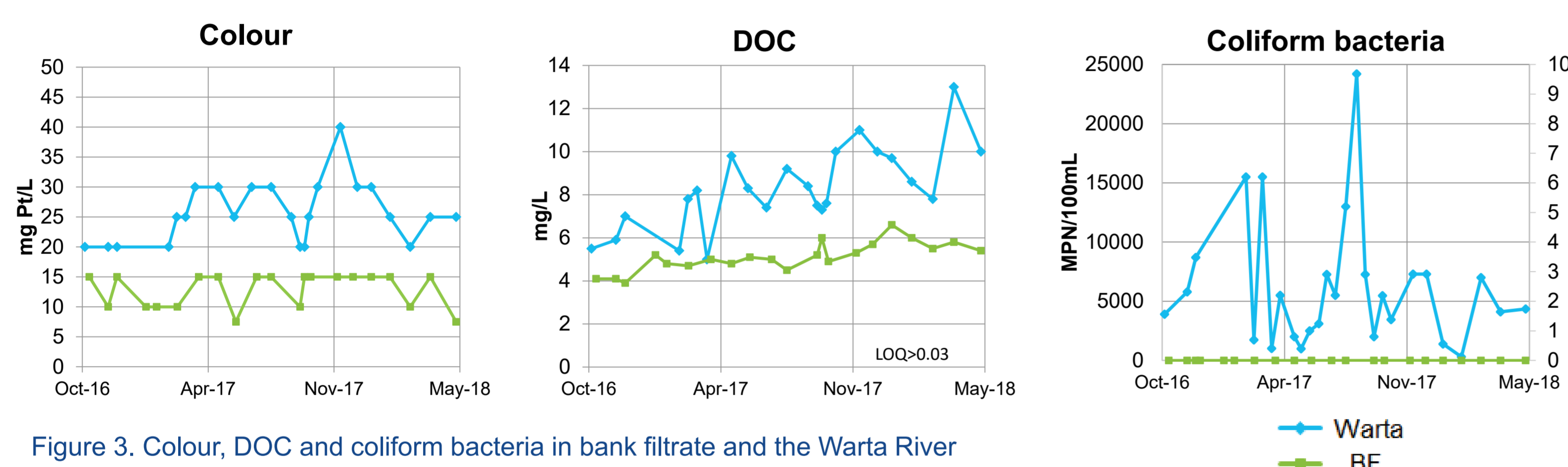


Figure 3. Colour, DOC and coliform bacteria in bank filtrate and the Warta River

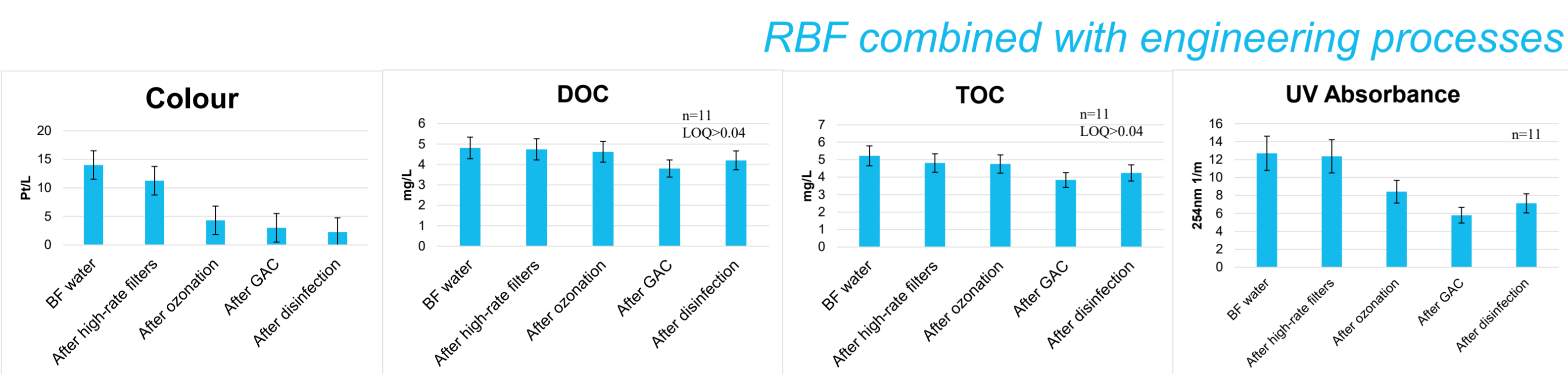


Figure 4. Colour, DOC, TOC and UV absorbance during treatment

	BF water	After high-rate filters	After ozonation	After GAC	After disinfection
Coli group bacteria MPN/100 ml	0	0	0	0	0
Clostridium perfringens CFU/100 ml	0	0	0	0	0
Enterococci MPN/100 ml	0	0	0	0	0
Escherichia coli MPN/100 ml	0	0	0	0	0

Table 4. Detectes of bacteria during treatment

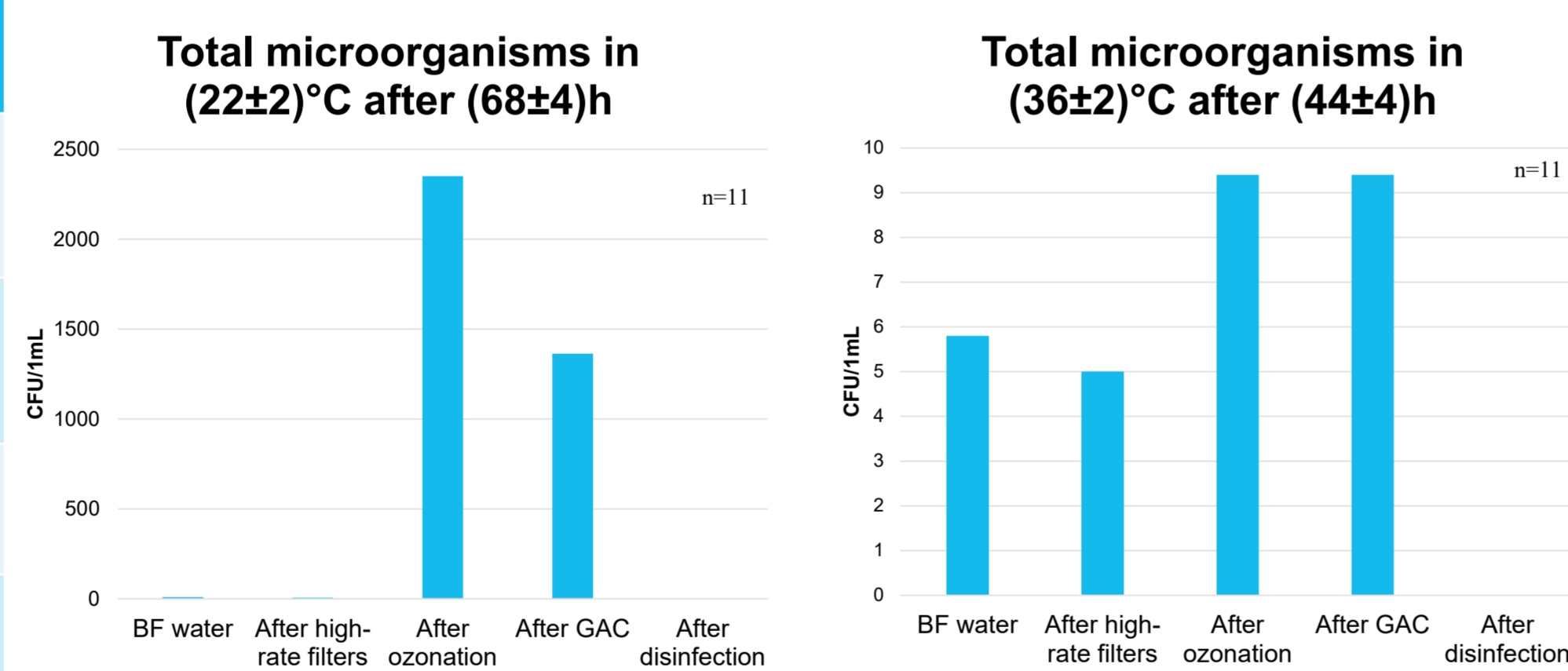


Figure 5. Total microorganism along the treatment train

## BF combined with engineering processes – by products

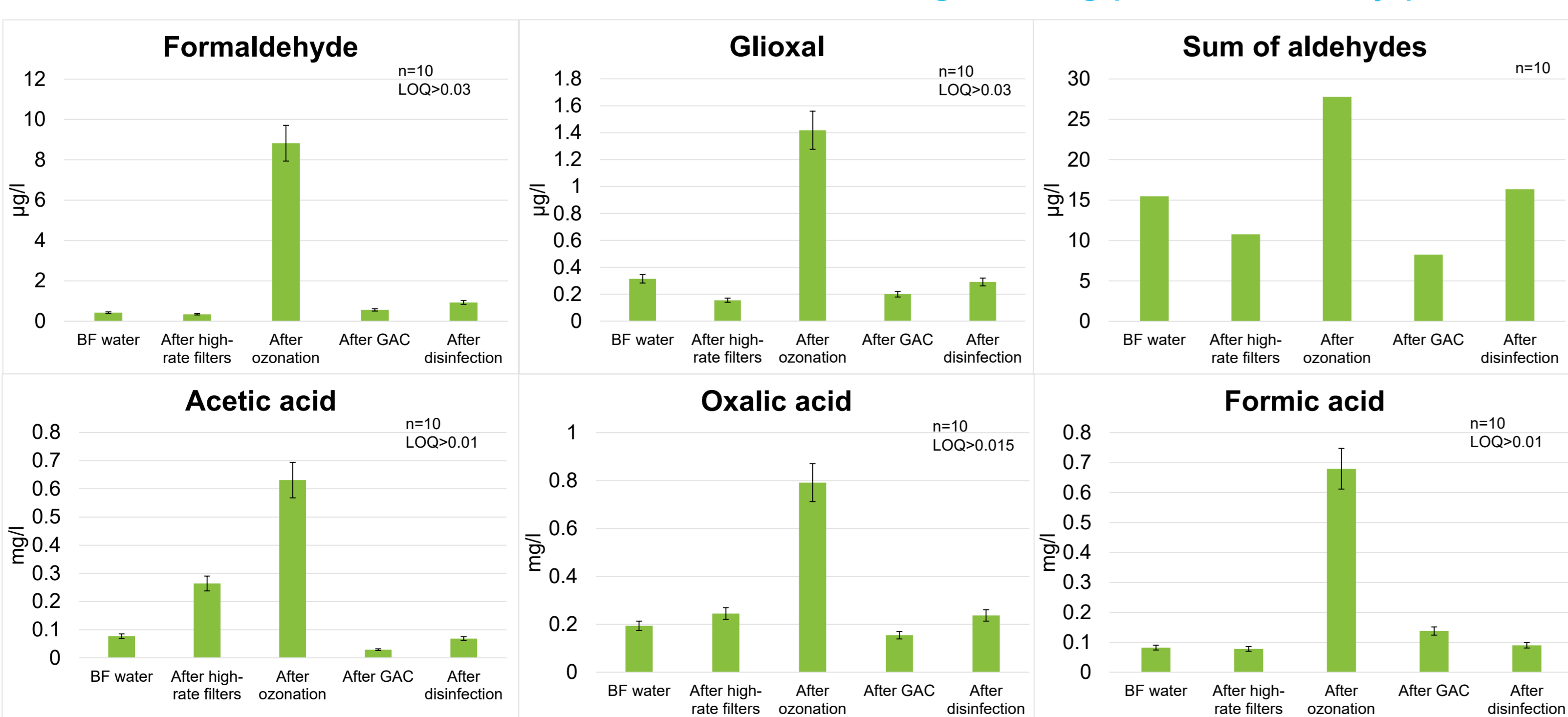


Figure 6. By-products during treatment

## Applied solution

Combination of bank filtration with ozonation and GAC

The treatment train consist of

- cascade aeration,
- rapid sand filtration,
- ozonation,
- granulated activated carbon (GAC), filtration, and
- disinfection with  $\text{ClO}_2$  and  $\text{NaOCl}$ .

Expected Benefits

- Reduction of NOM to ensure biological stability of water in distribution system.
- Lowering the chemical demand of  $\text{ClO}_2$  and  $\text{NaOCl}$  used for water disinfection.

## Technical demonstration

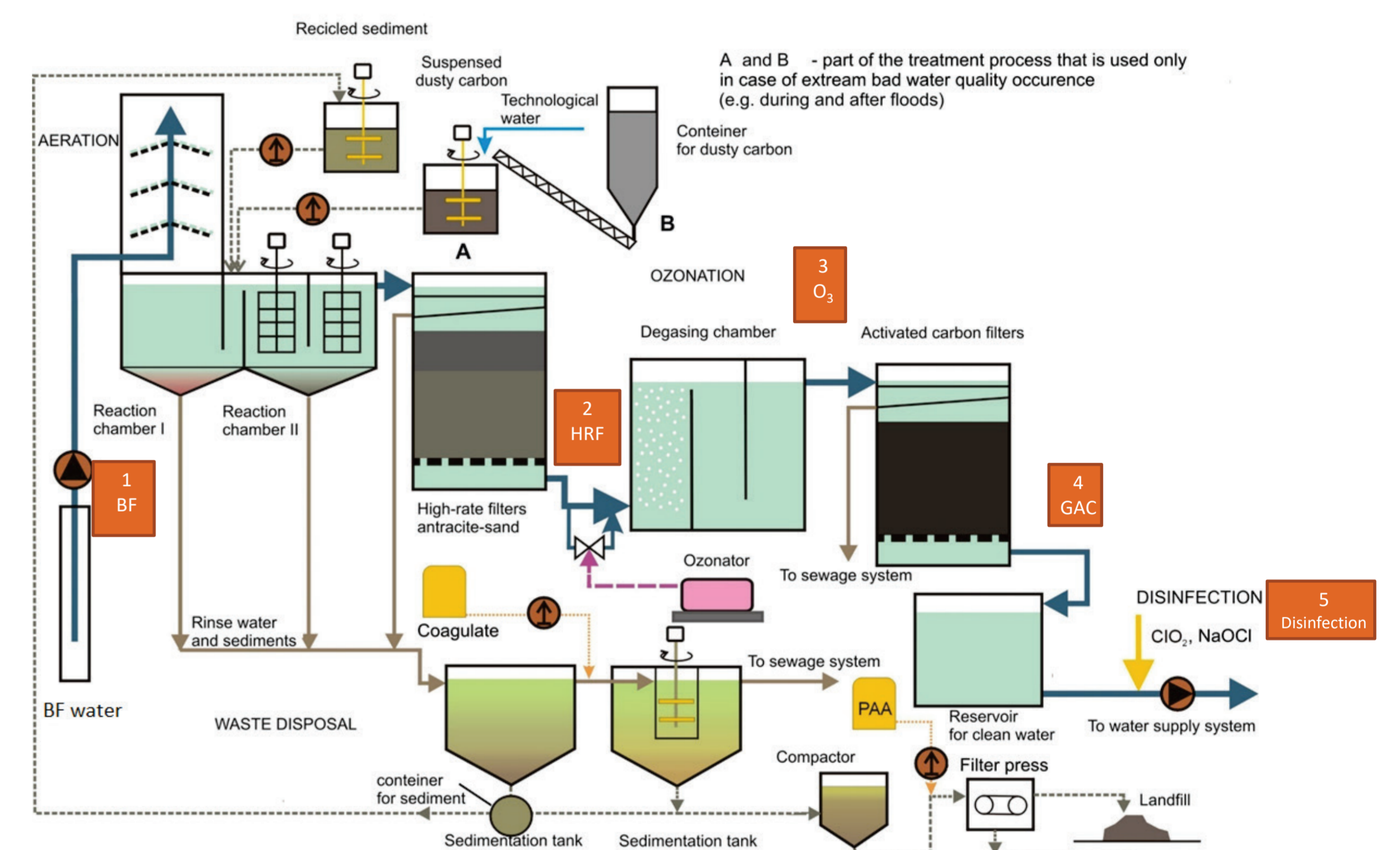


Figure 2. Scheme of full-scale treatment plant

## Conclusions

- Combination of RBF and ozonation + GAC can be used in case of high content of natural organic matter
- RBF in Poznań reduces colour by ~45%, DOC by ~40% and bacteria almost completely (~100%)
- Application of cNES further reduce colour and UV absorbance by ~50-80% and DOC and TOC by ~20%
- Bacteria formed during ozonation are removed in the disinfection process
- During ozonation by-products like aldehydes and carboxylic acids are formed, which are subsequently lowered by GAC by ~80%
- Applied technology reduced chlorine demand by ~75%

## Contact

Roksana Kruć, Krzysztof Dragon, Józef Górski  
Adam Mickiewicz University  
Wieniawskiego 1, 61-617 Poznań, Poland  
E roksana.kruc@amu.edu.pl