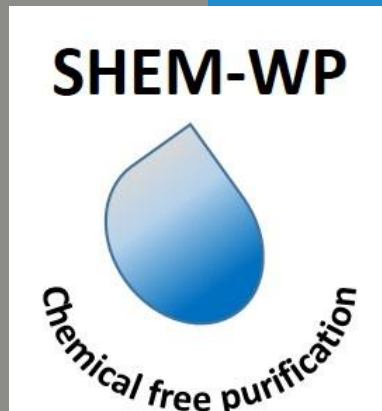


SHEM-WP 2019-21

INNOVATIVE NATURAL SOLUTIONS OF
SHUNGITE & EM –TECHNOLOGY FOR WATER
PURIFICATION

CBC 2014-2020

SOUTH-EAST FINLAND – RUSSIA



CBC 2014-2020
SOUTH-EAST FINLAND - RUSSIA

Funded by the European Union,
the Russian Federation and
the Republic of Finland.



Lappeenranta Lemi Luumäki Savitaipale Taipalsaari

LAPPEENRANNAN SEUDUN
Ympäristötoimi

LP, FIELDTESTS (FIN)



FIELDTESTS (RUS)



EM TECH, FILTER MEDIA (FIN)



Institute of Geology
Karel'ian Research Centre
Russian Academy of Sciences

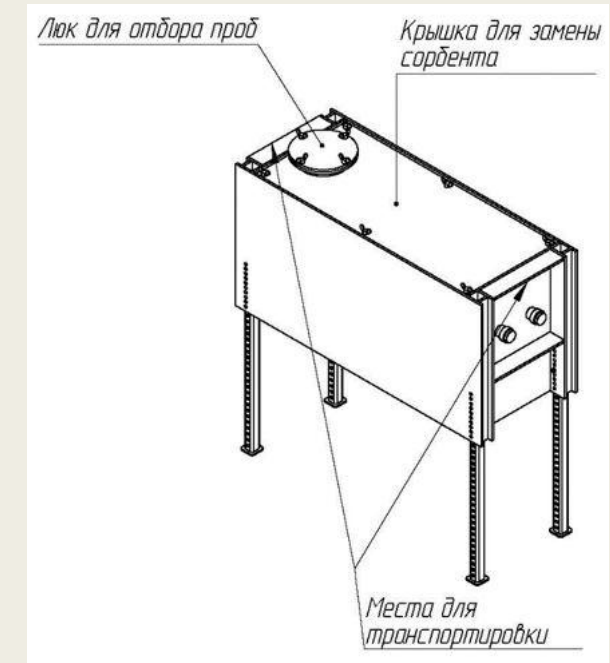
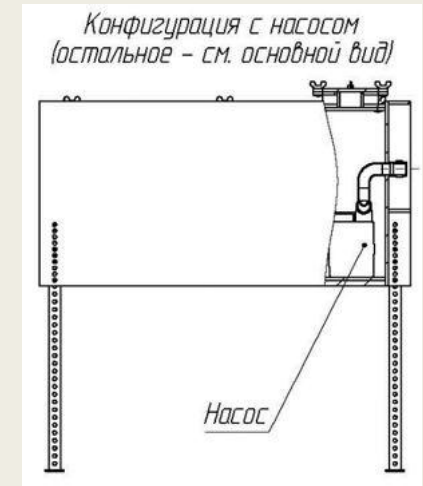
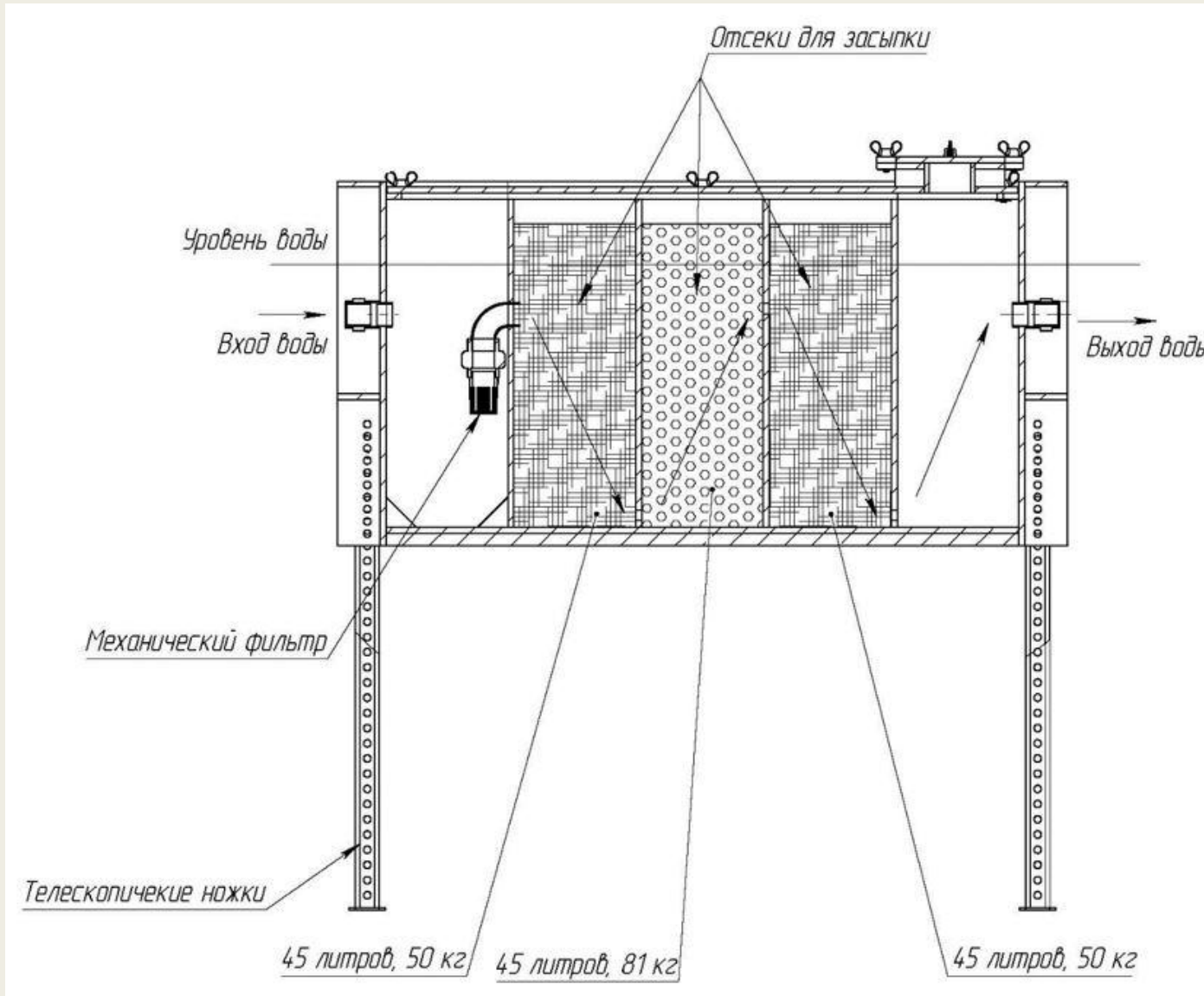
SHUNGITE, FILTER MEDIA (RUS)

Priority 3 Attractive, clean environment and region/

Field testing of shungite filters in St.Petersburg

Dmitry Frank-Kamenetsky
expert

Construction of sorption filter



Maximum productivity of sorption filter is 5 litres per minute

Filtering material used in the sorption filter

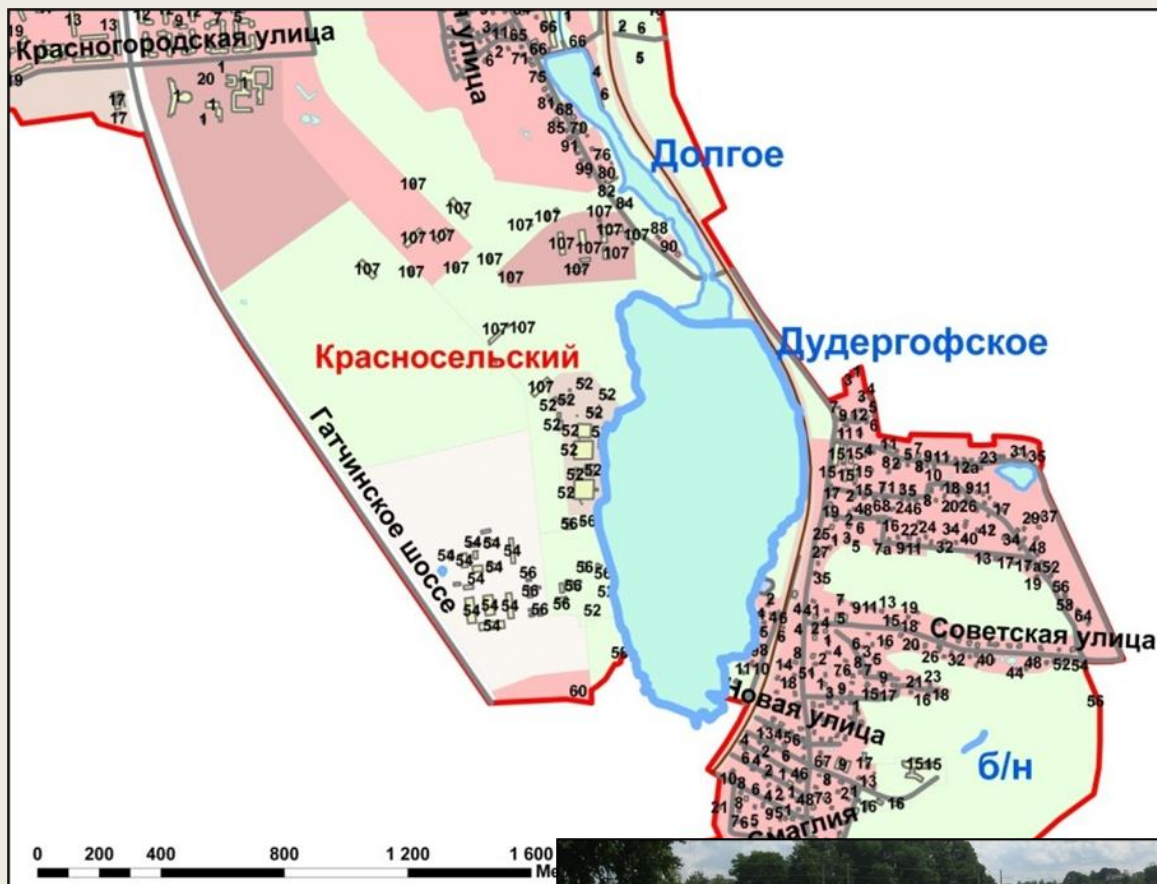
- Effective microorganisms

EM Active (EMa) Multicraft (Austria)

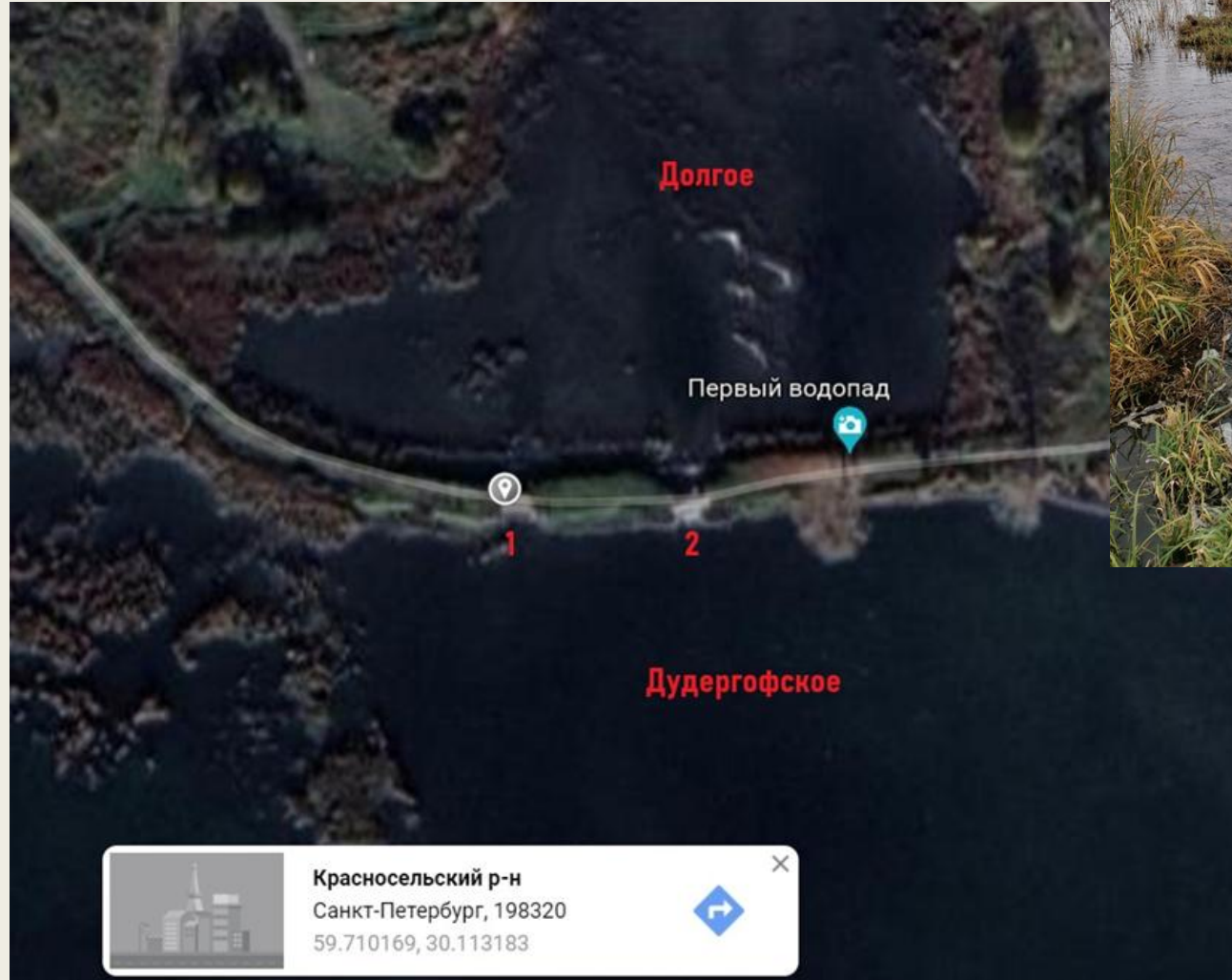
- Shungite sand.

Shungite sand with grain size of 5-10 mm was used as sorption material.

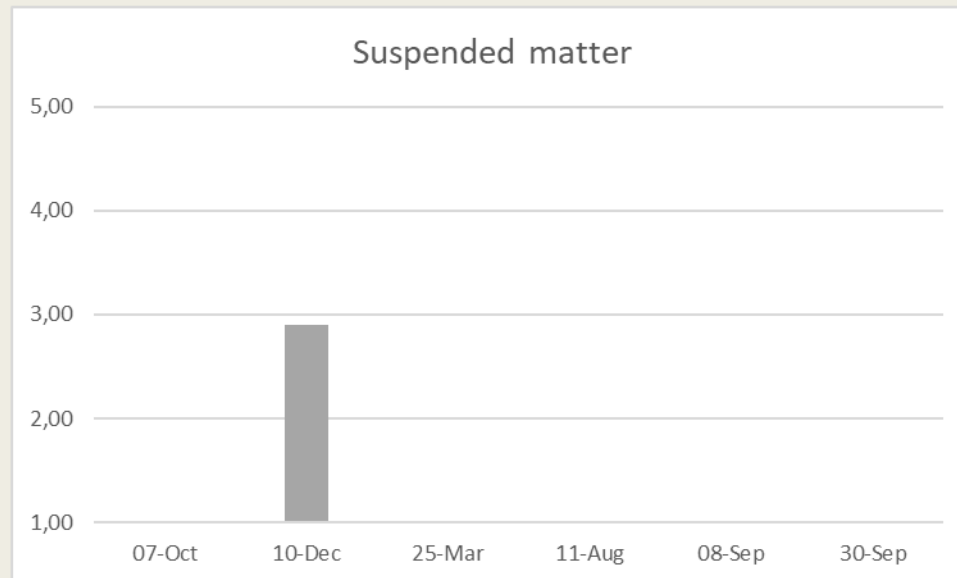
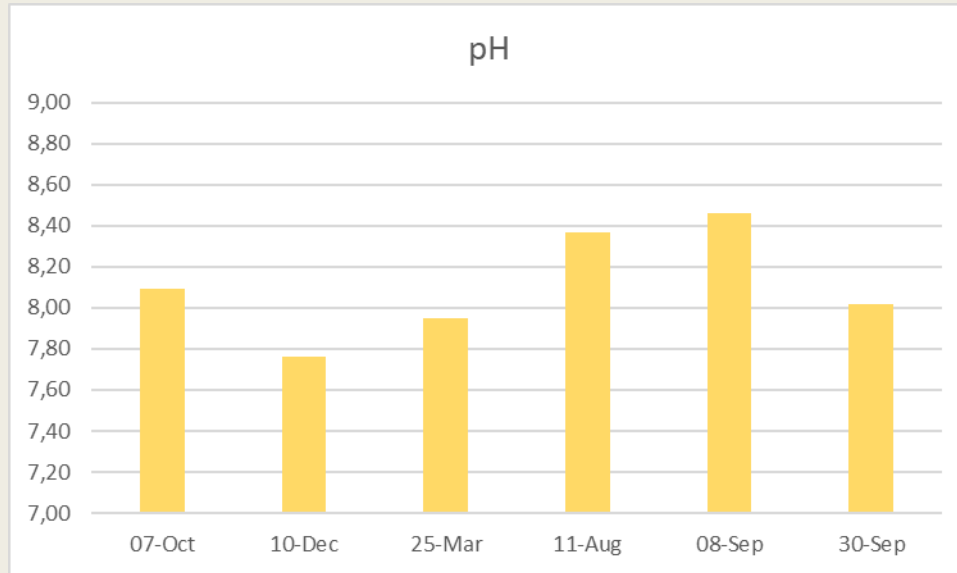
Water system of lake Dudergof and Dolgoe



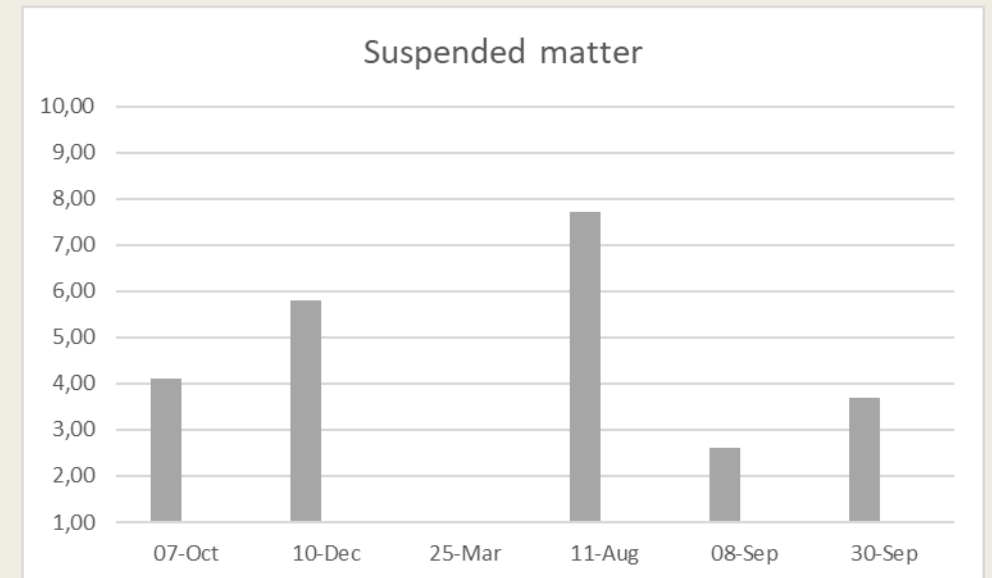
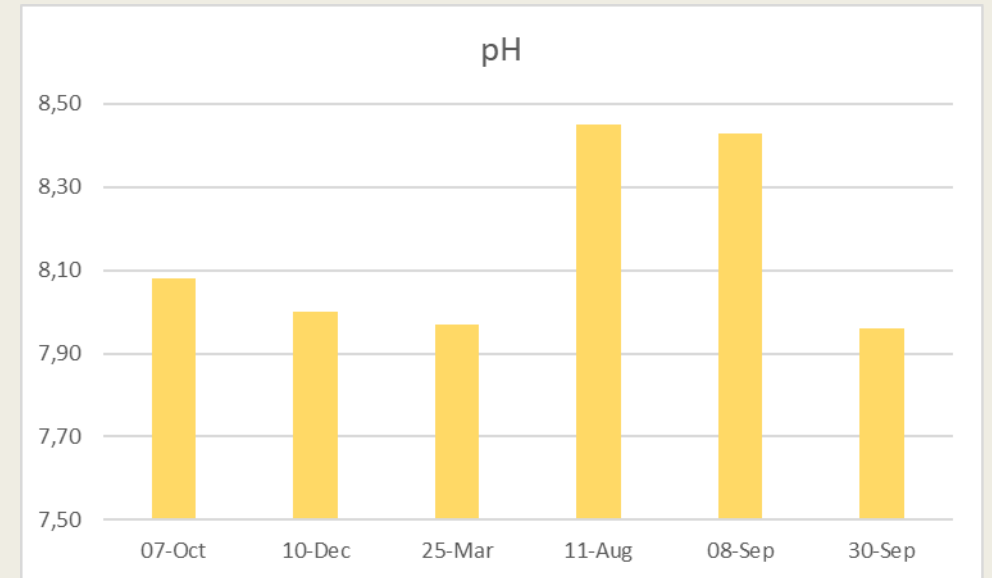
Location of sampling points and filters



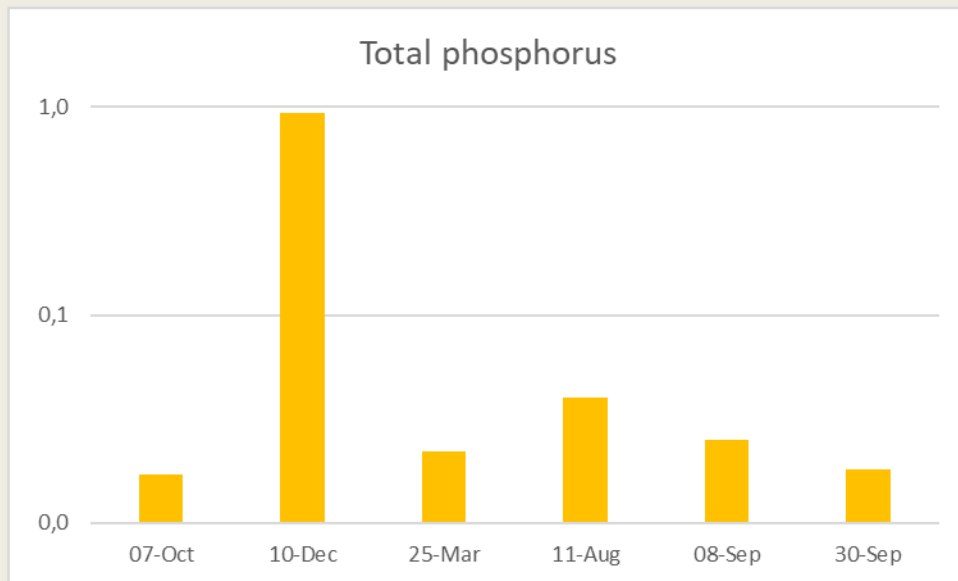
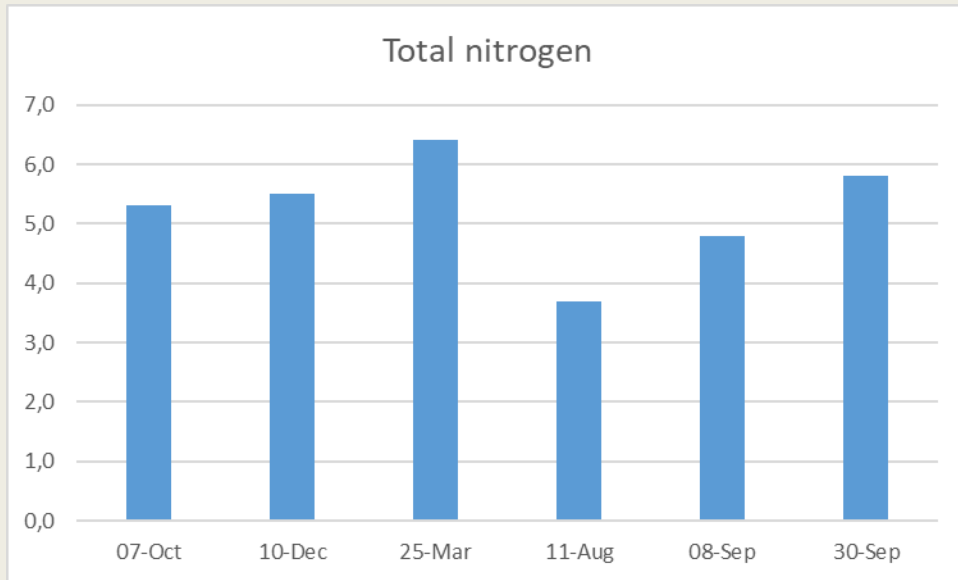
Dudergof



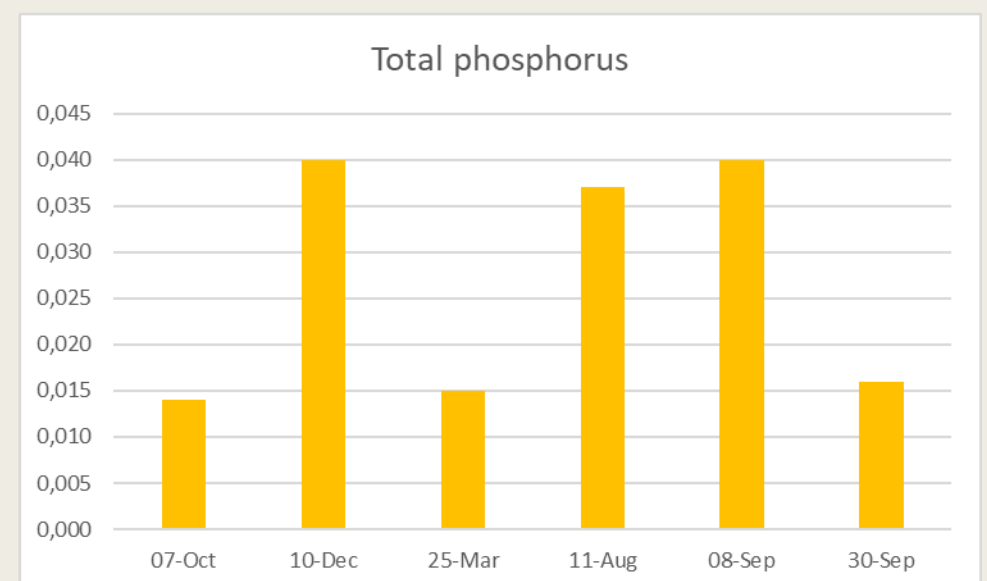
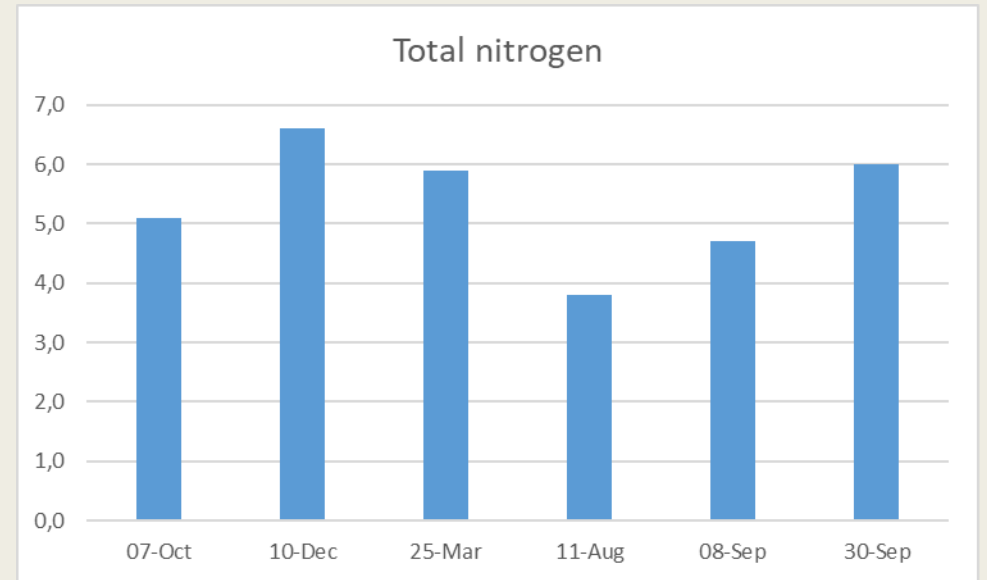
Dolgeo



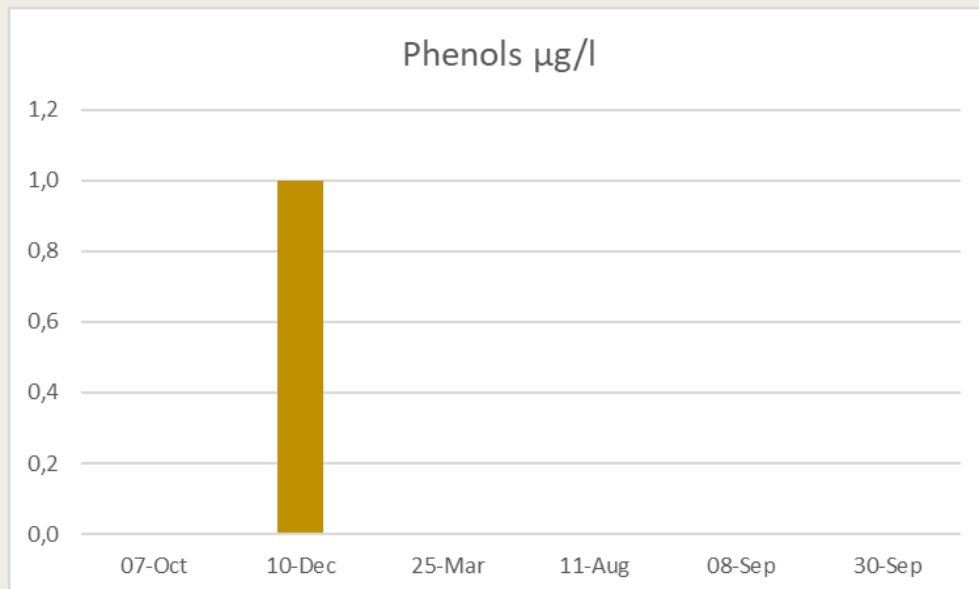
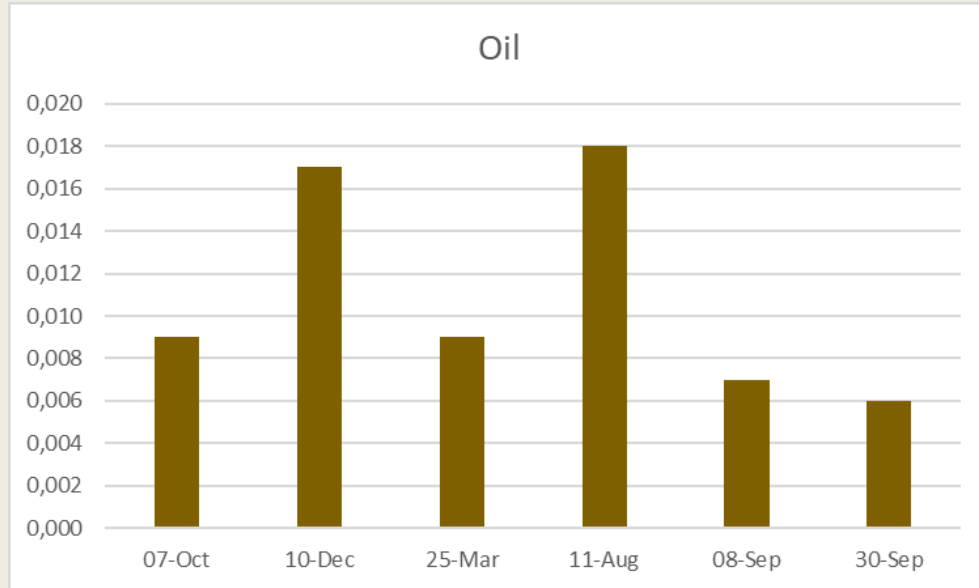
Dudergof



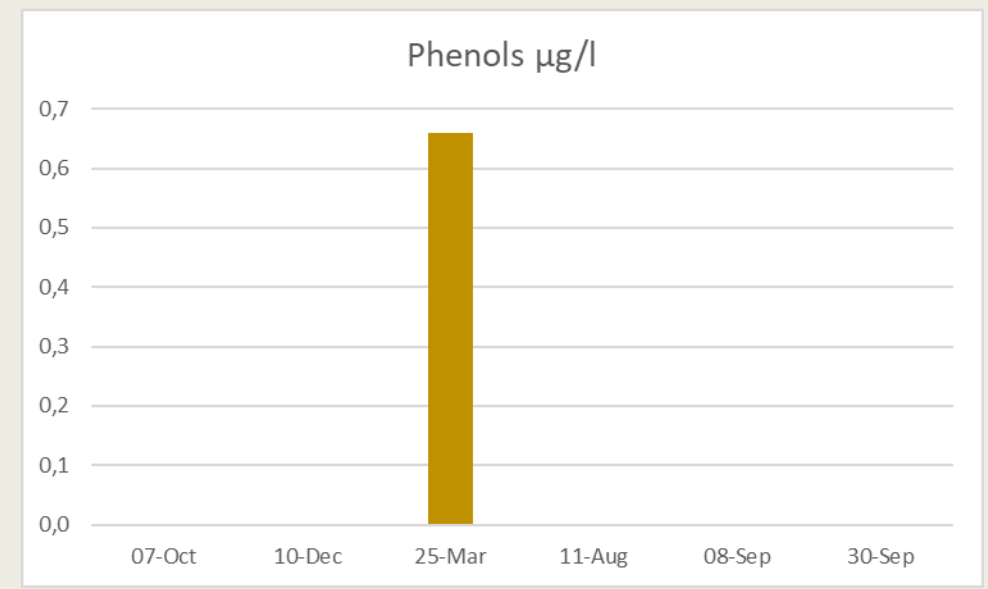
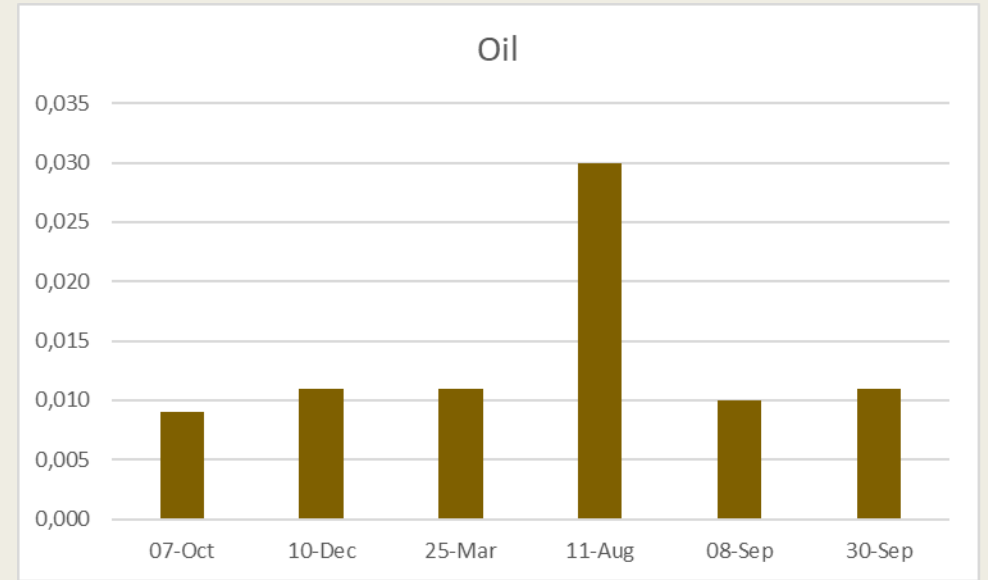
Dolgoe



Dudergof

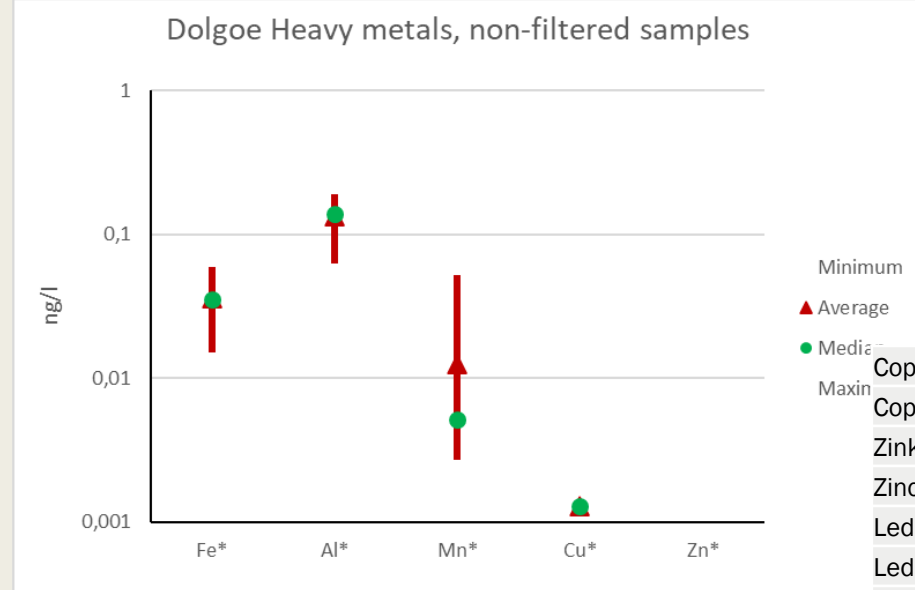
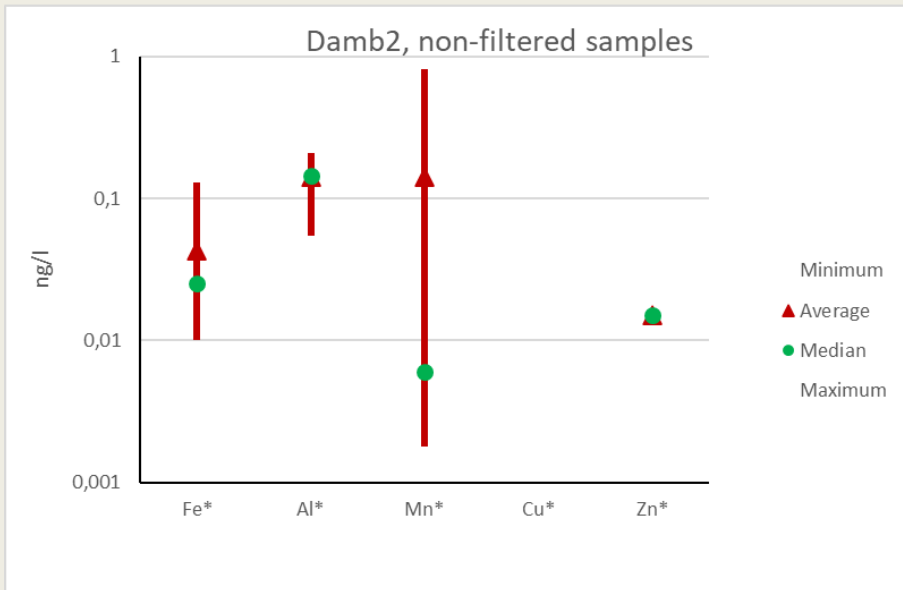
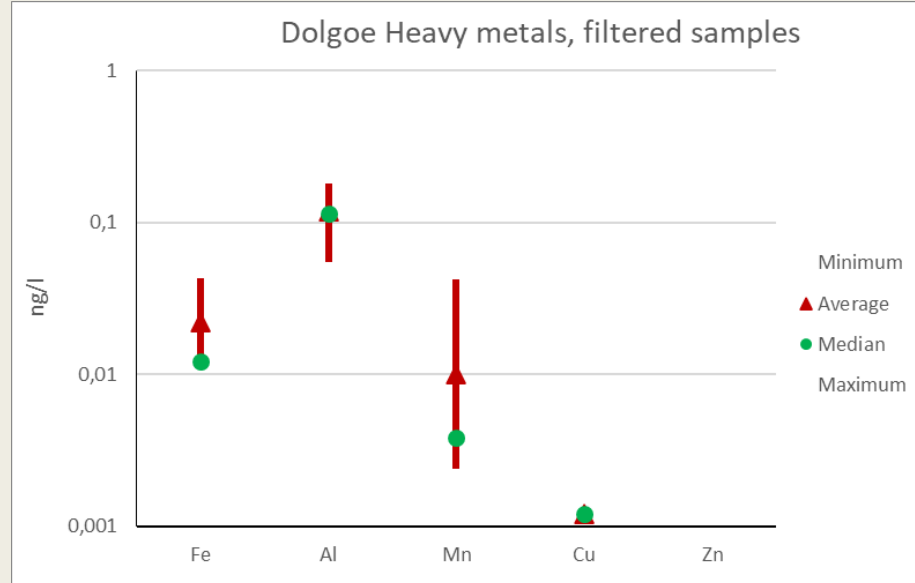
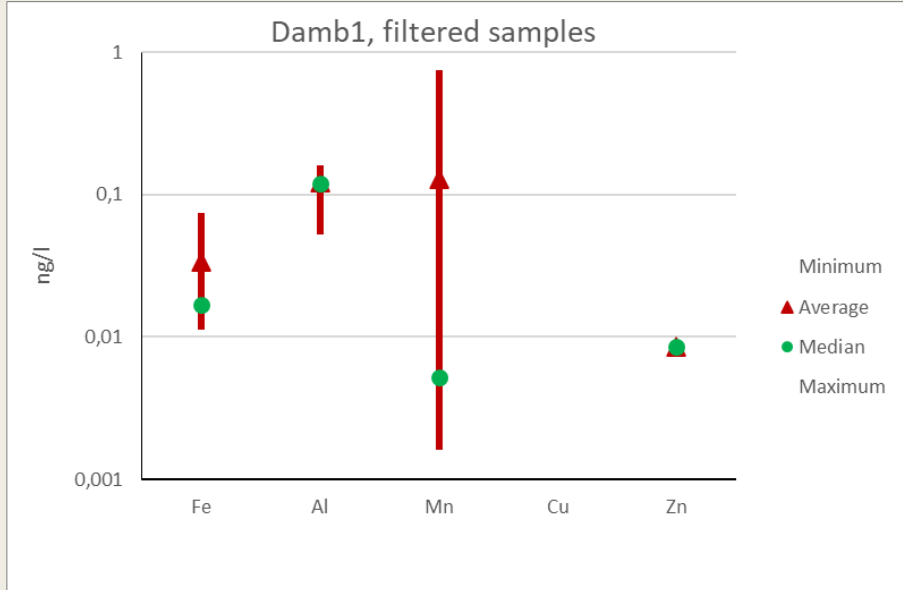


Dolgoe



Phenol µg/l <0,5

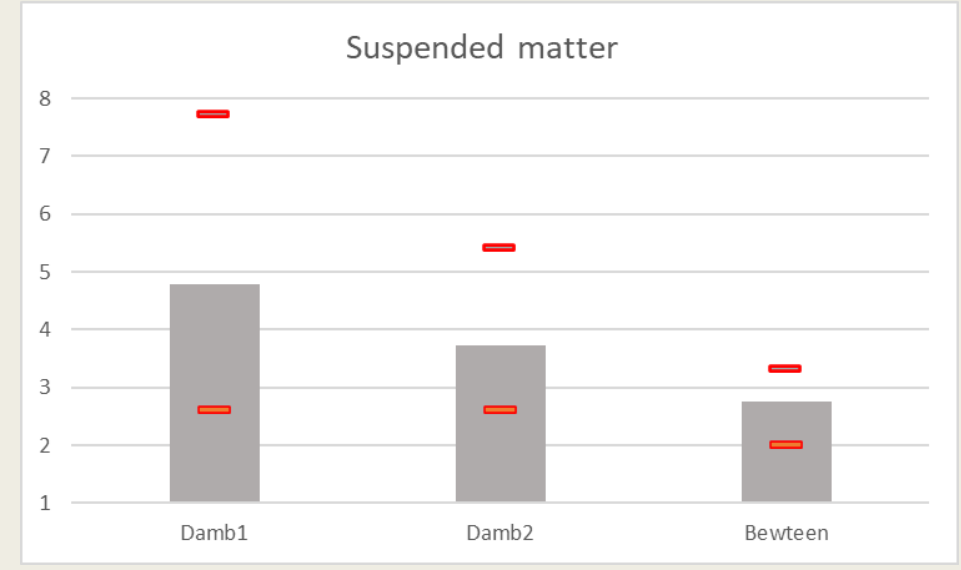
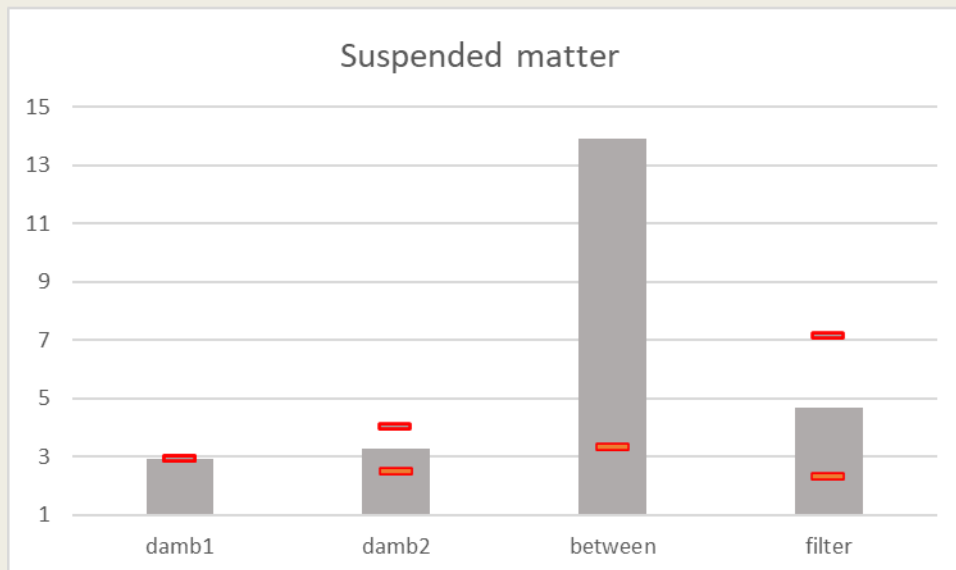
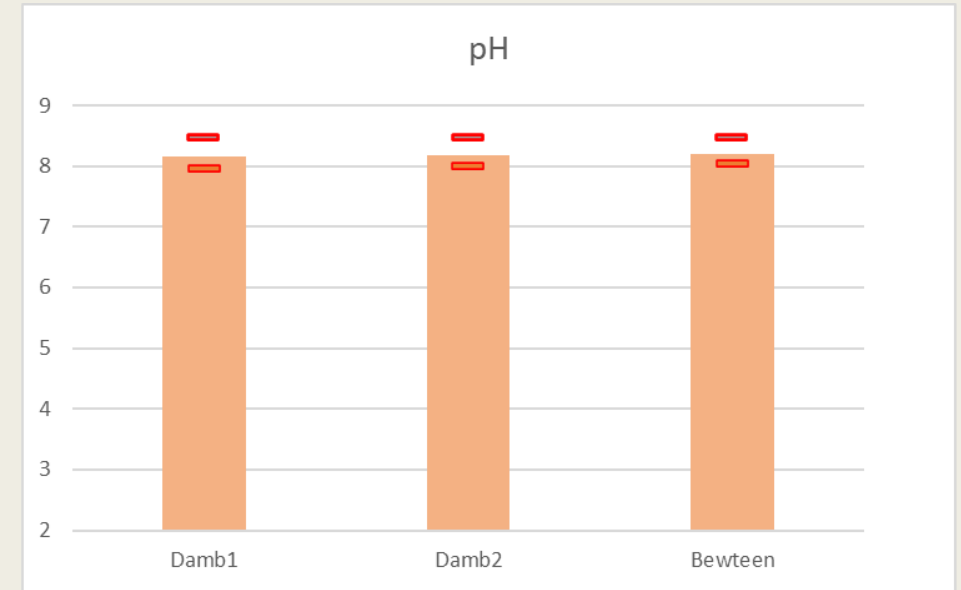
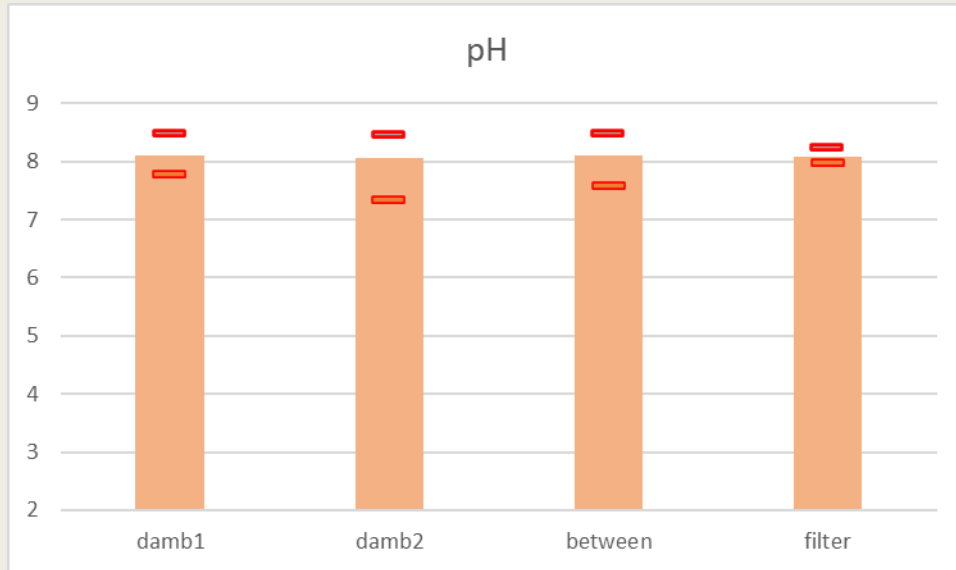
Dudergof



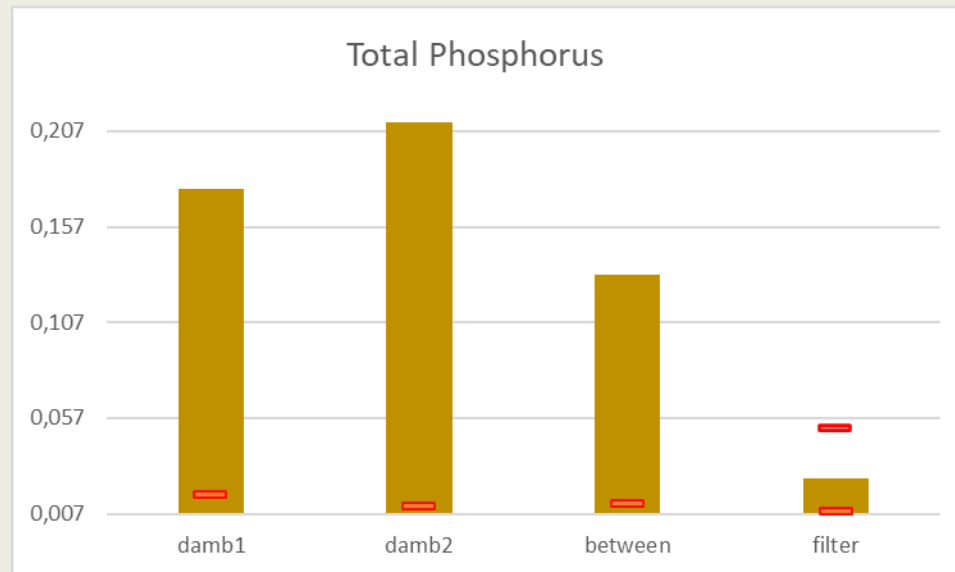
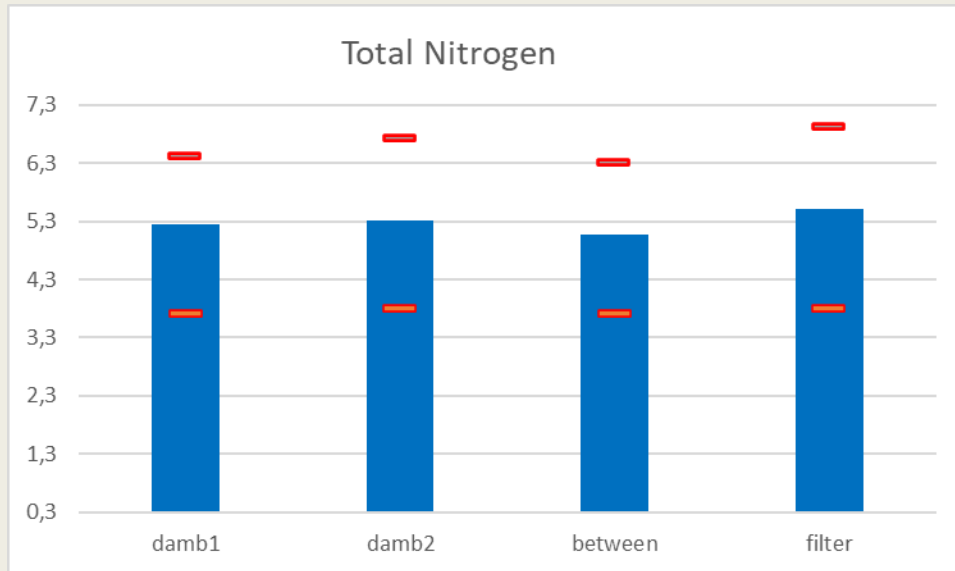
Copper*	mg/l	<0,001
Copper	mg/l	<0,001
Zink*	mg/l	<0,005
Zinc	mg/l	<0,005
Led*	mg/l	<0,001
Led	mg/l	<0,001
Mercury	µg/l	<0,01
		<0,01

Filter testing in the Dudergof and Dolgoe water system

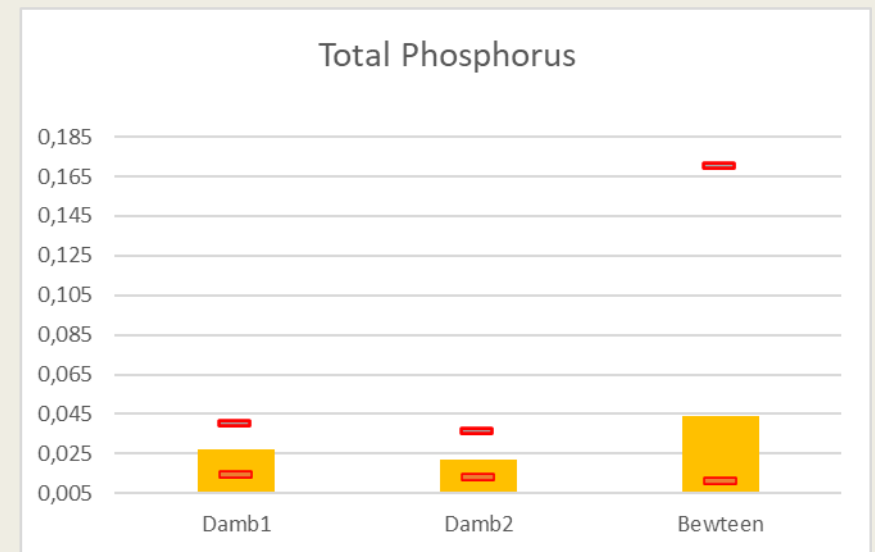
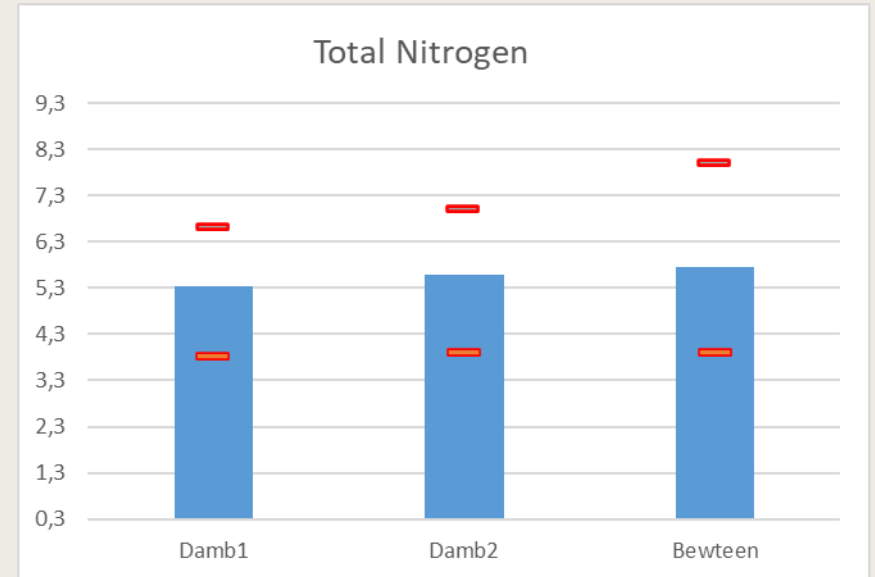
Dudergof



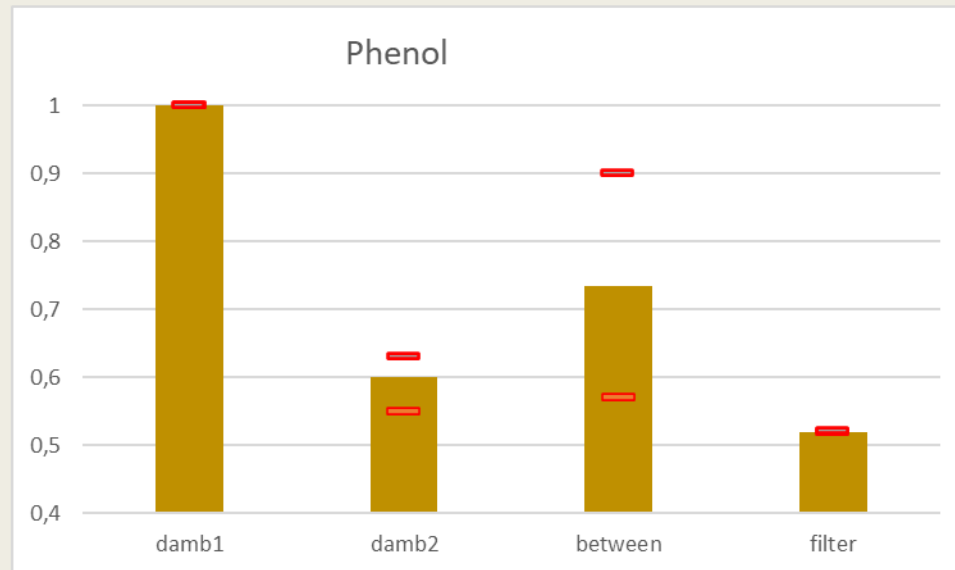
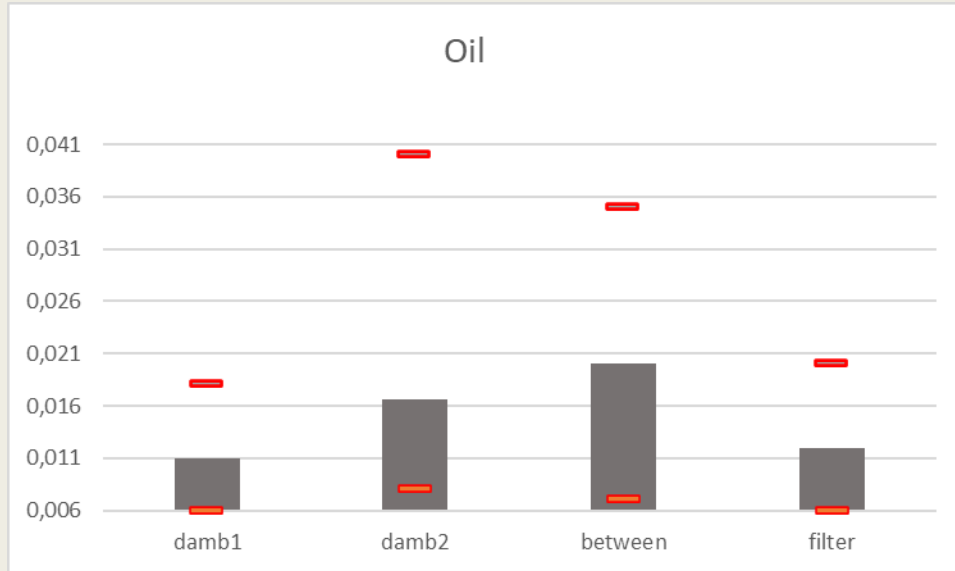
Dudergof



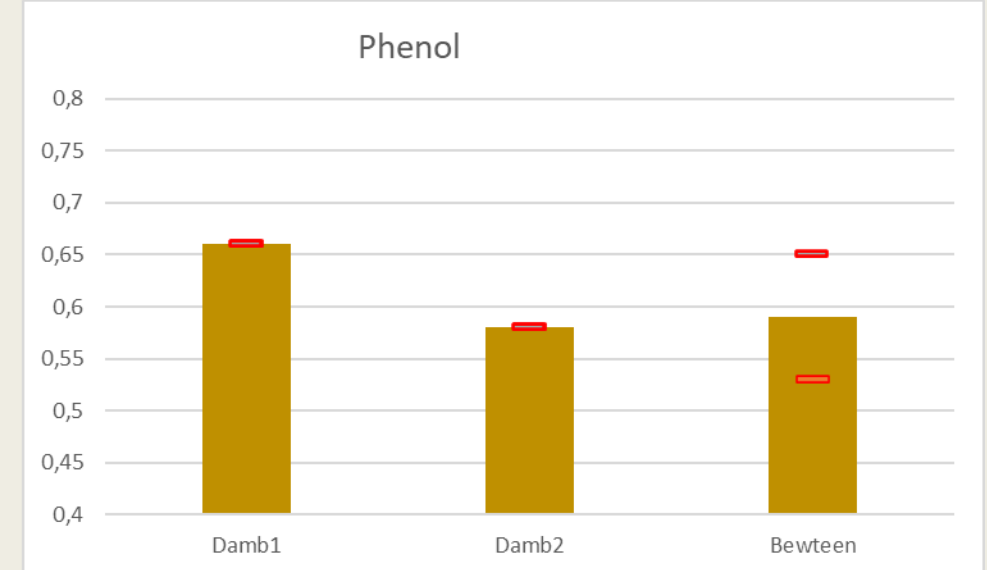
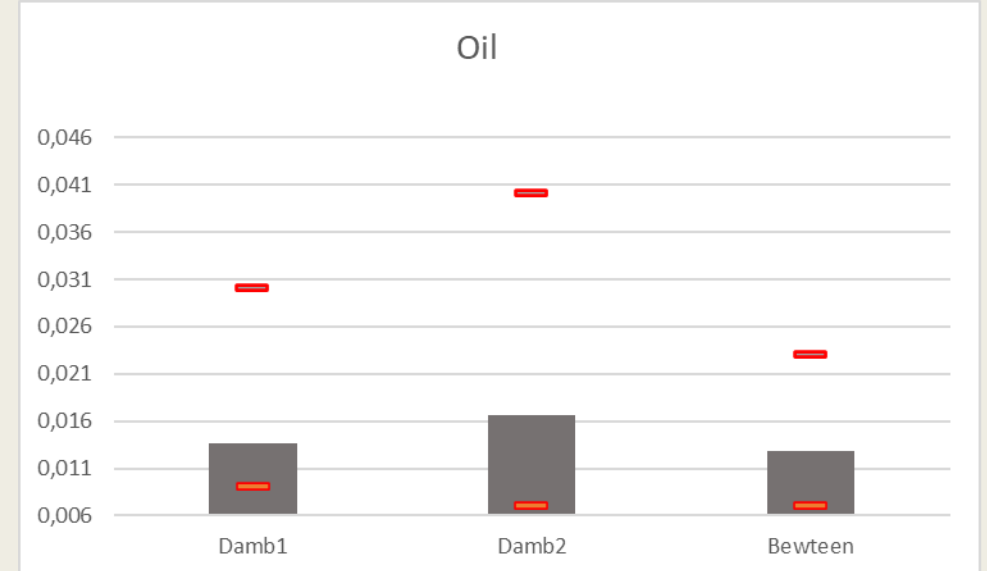
Dolgoe



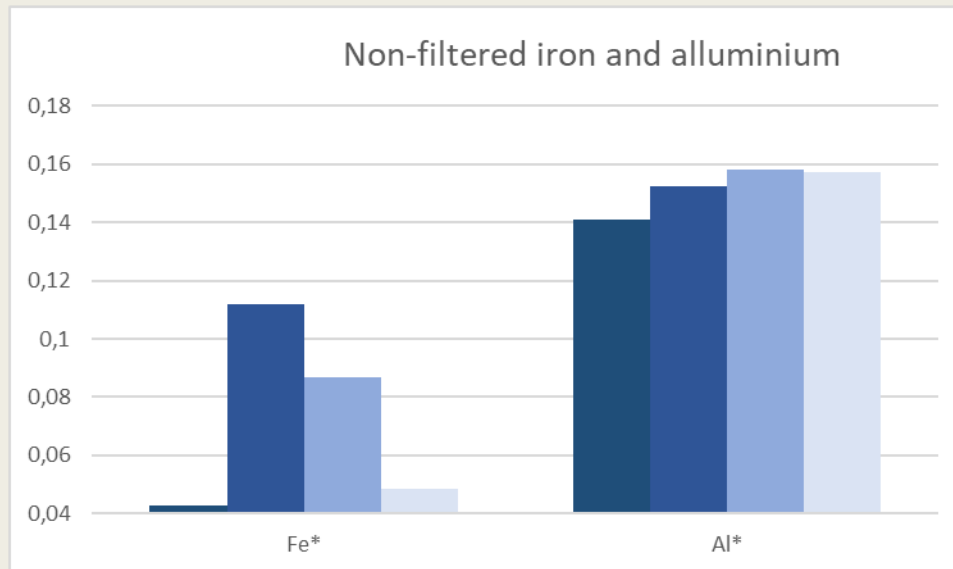
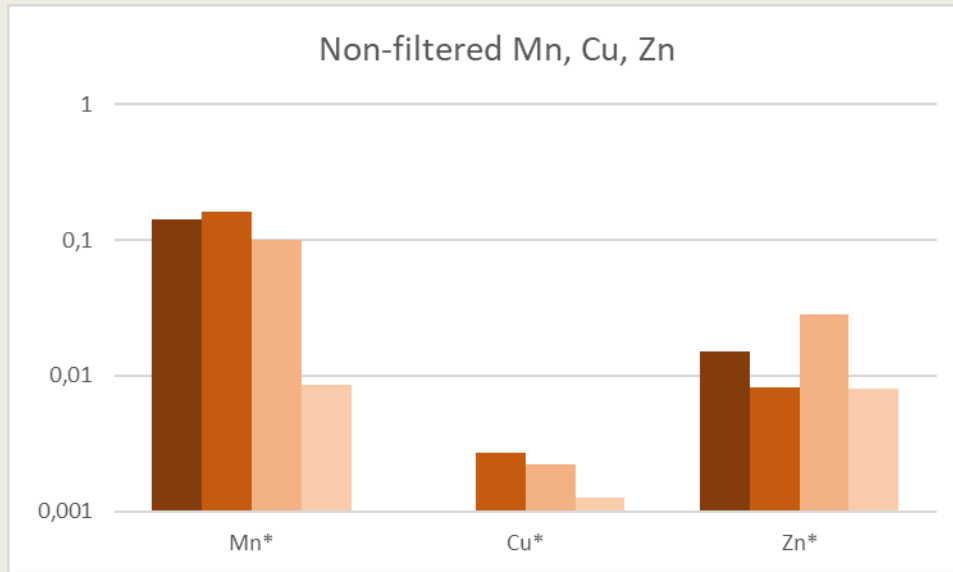
Dudergof



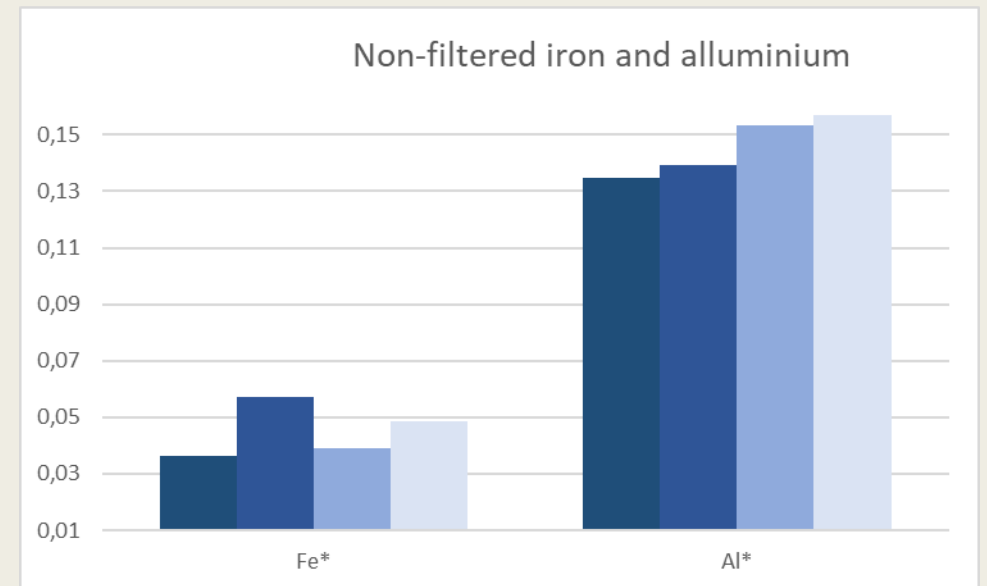
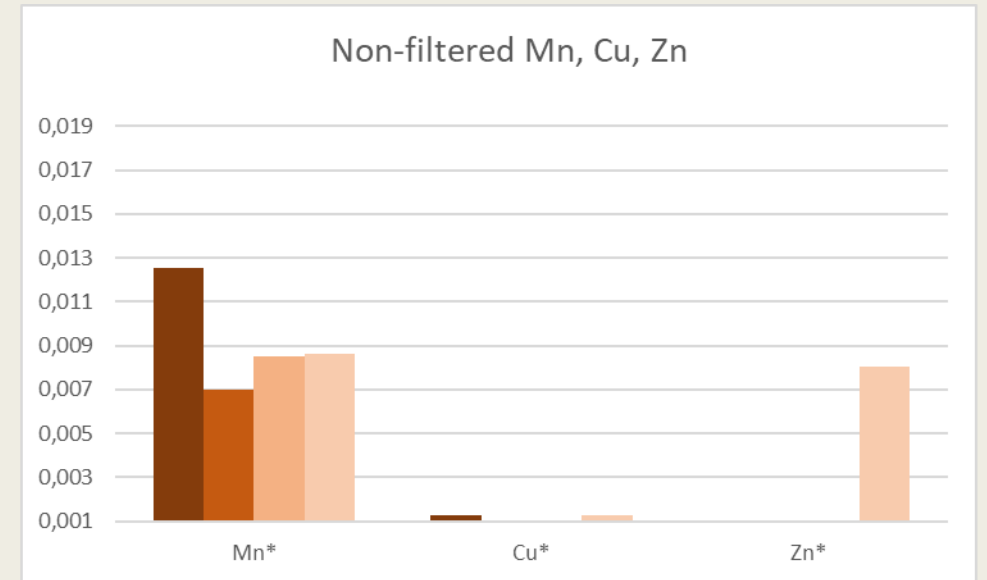
Dolgoe



Dudergof



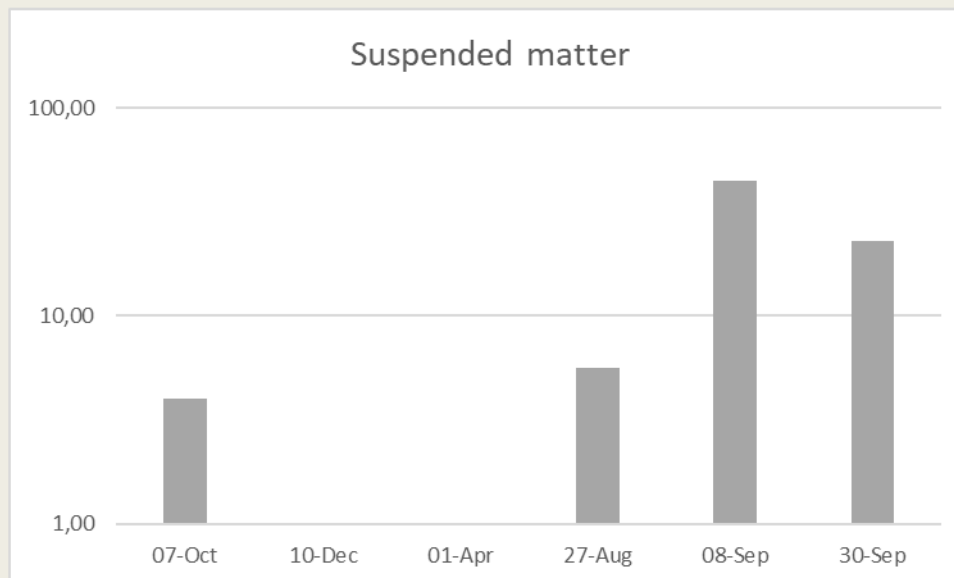
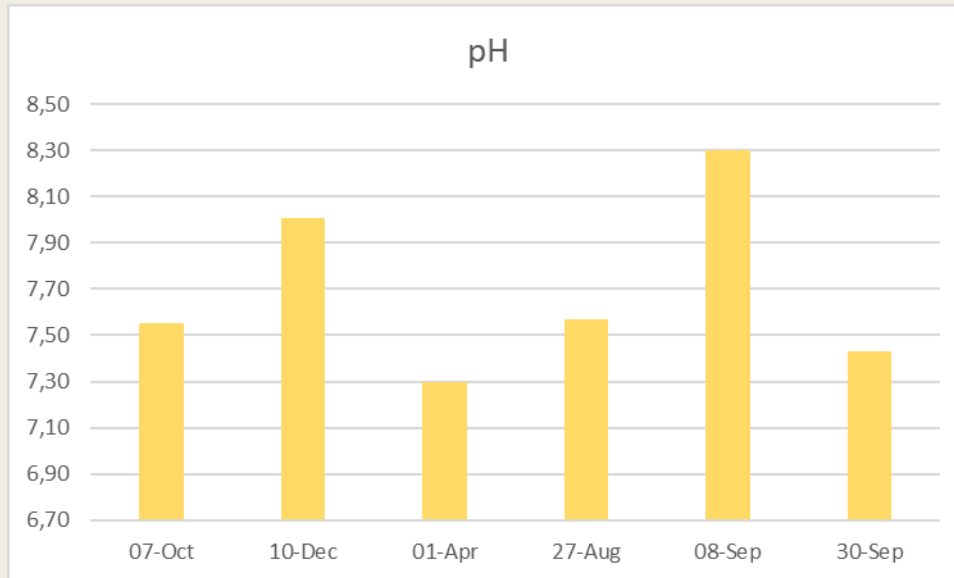
Dolgoe



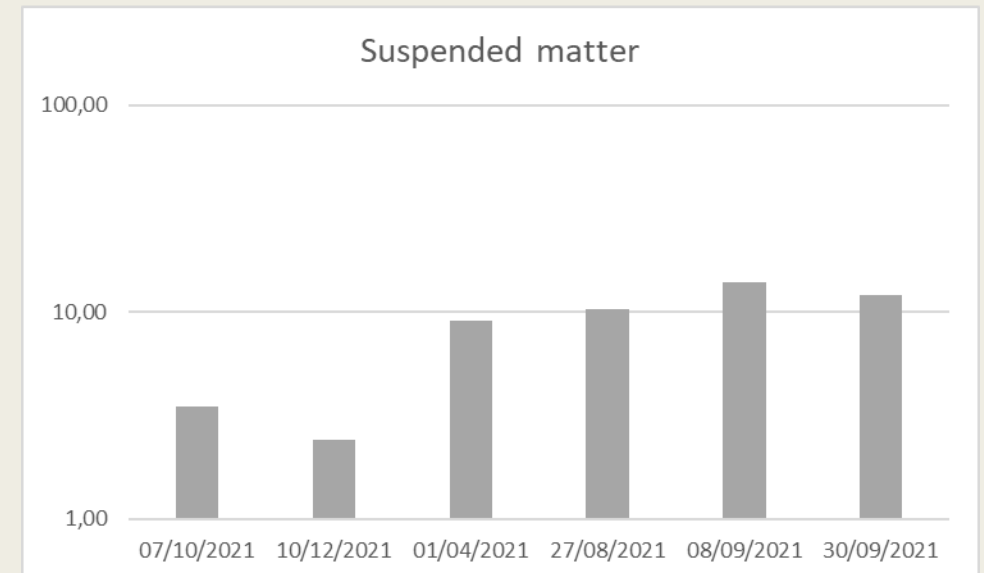
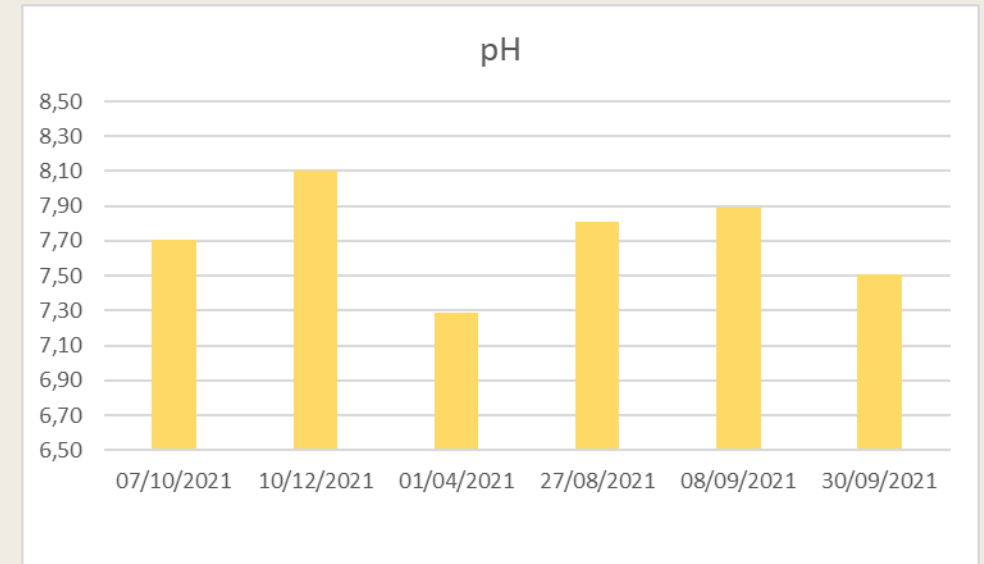
Pond Pionersky



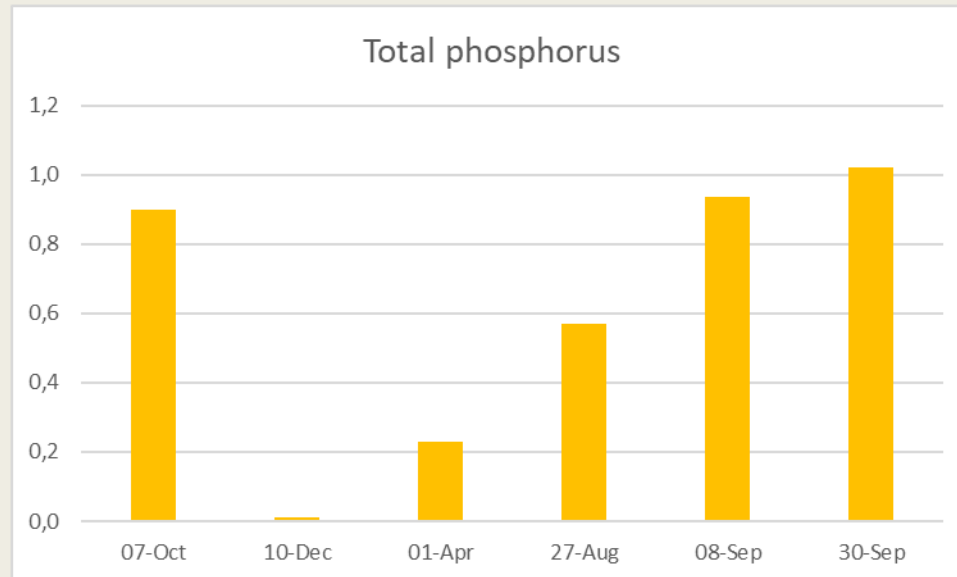
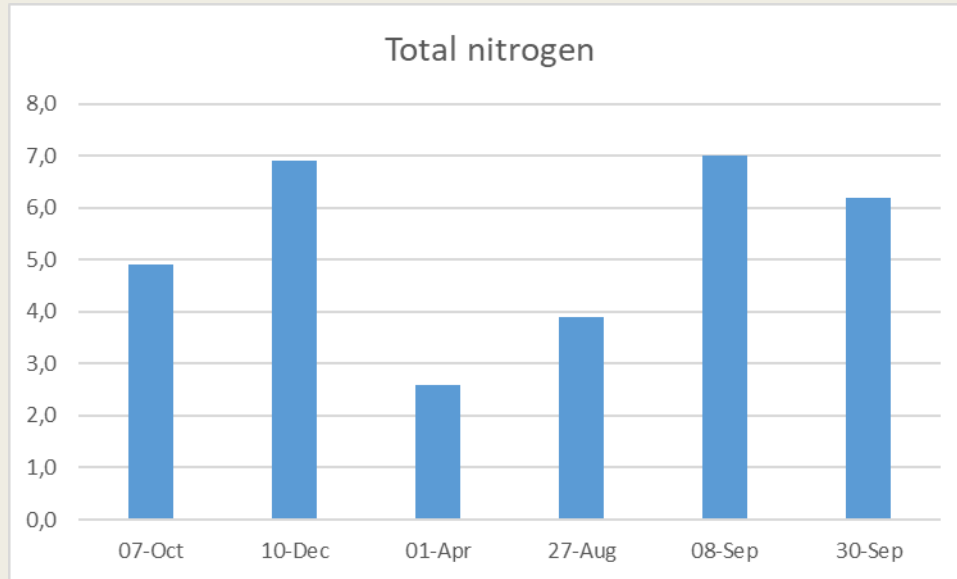
Large pond



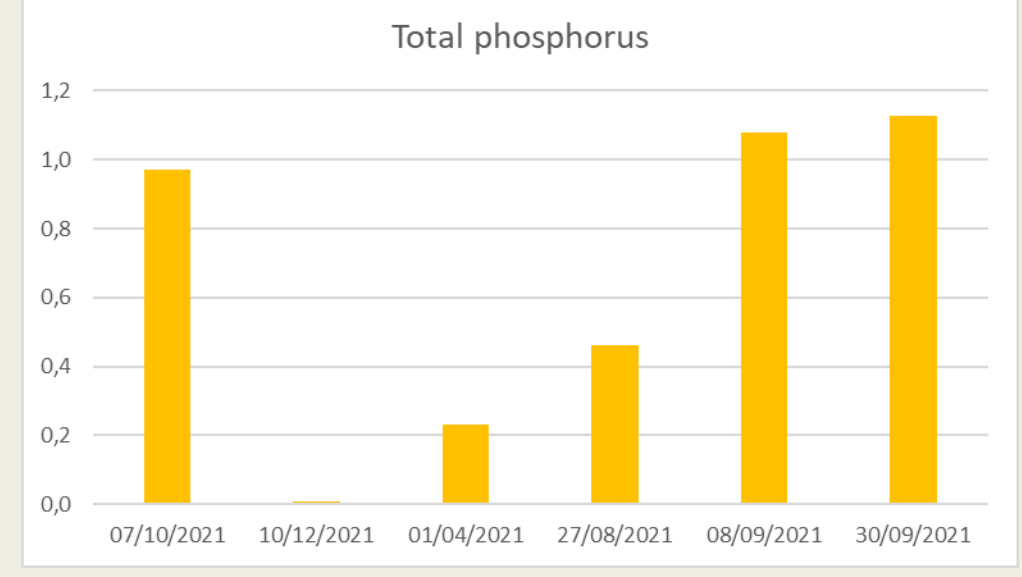
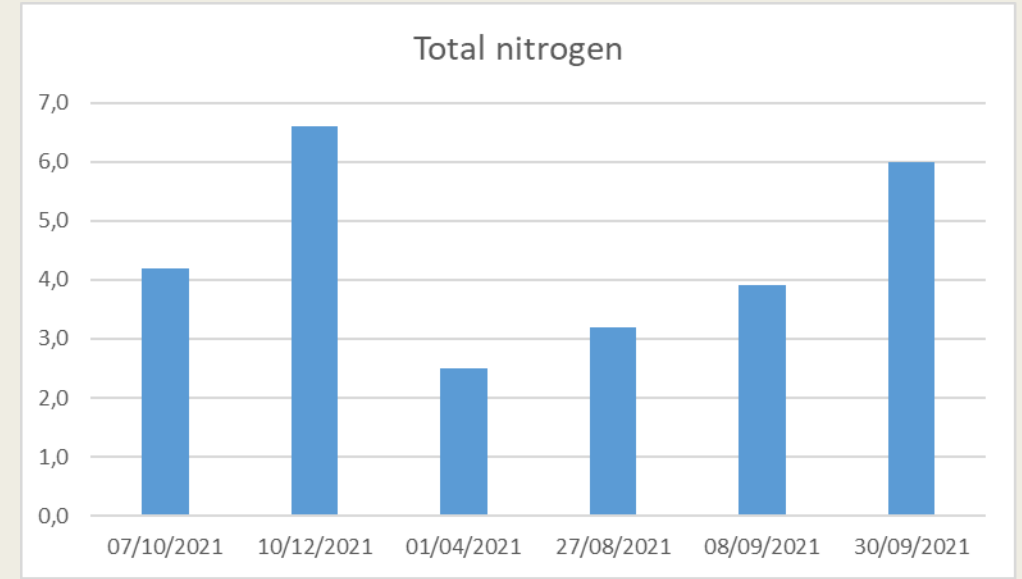
Small pond



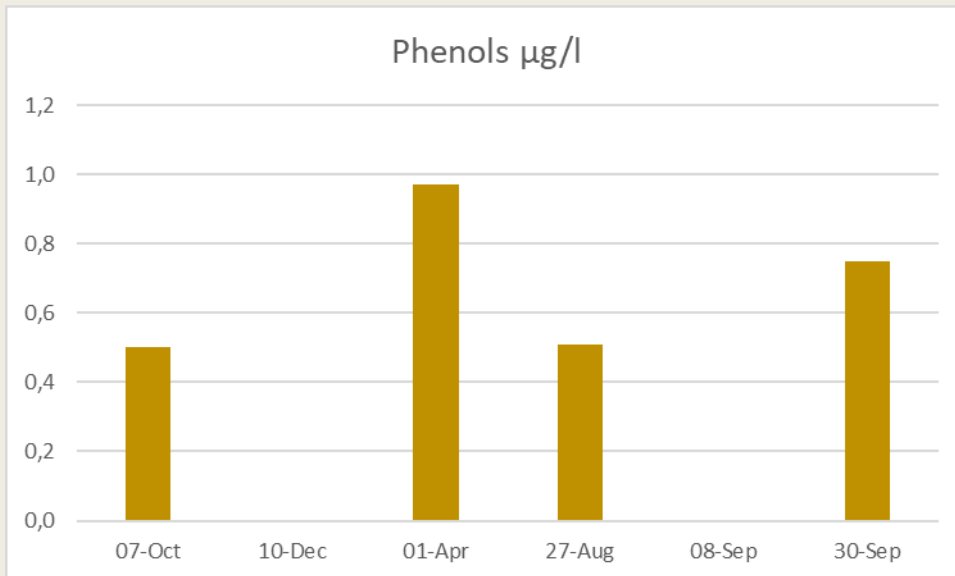
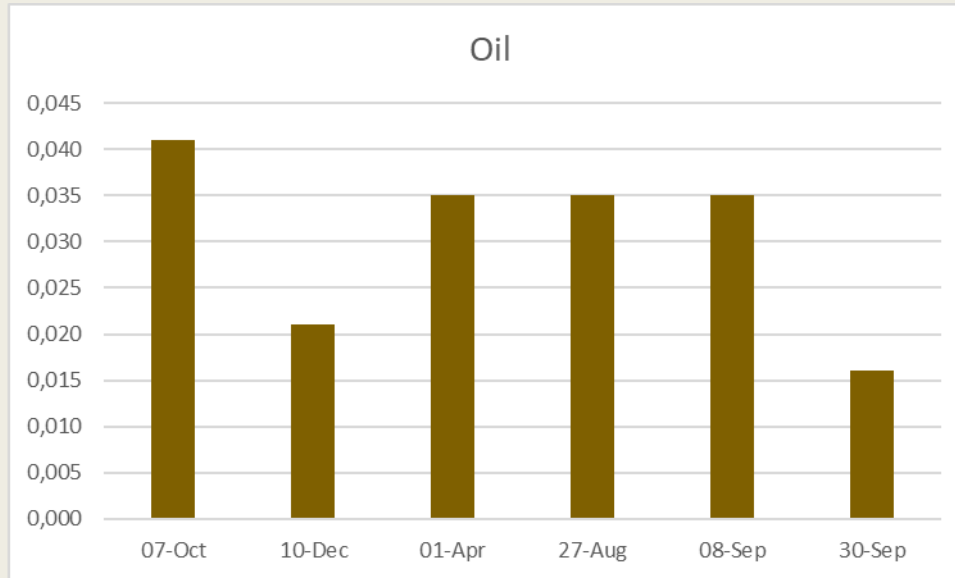
Large pond



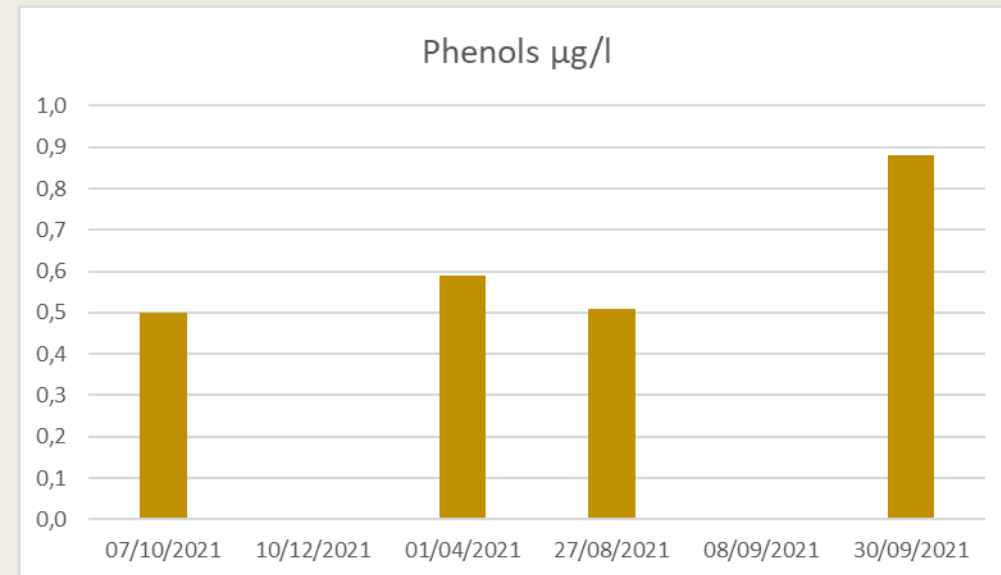
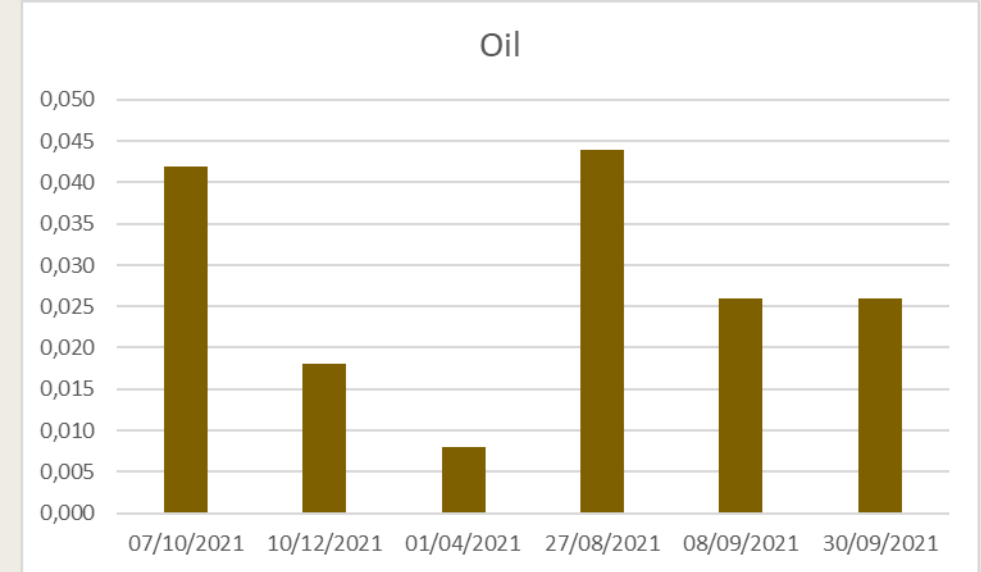
Small pond



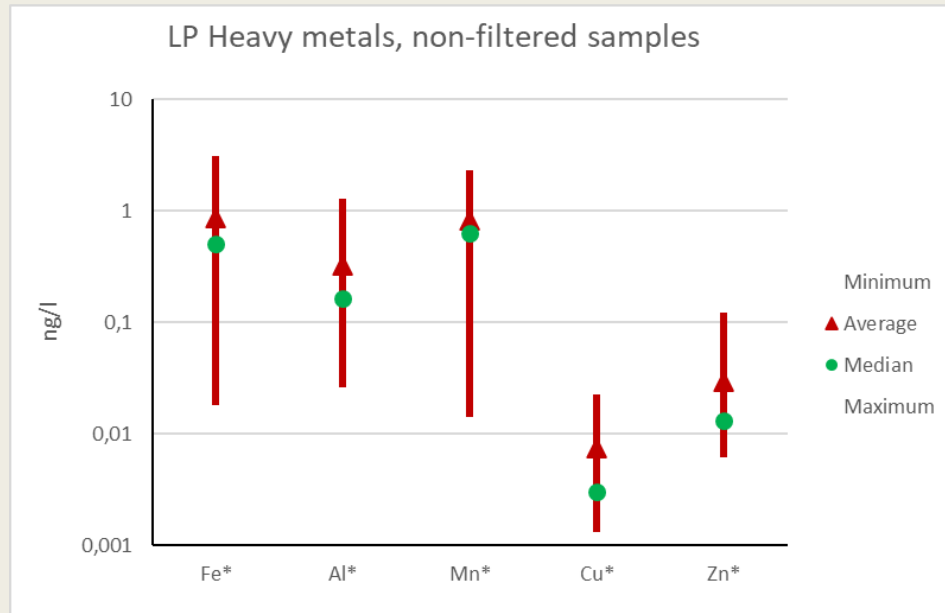
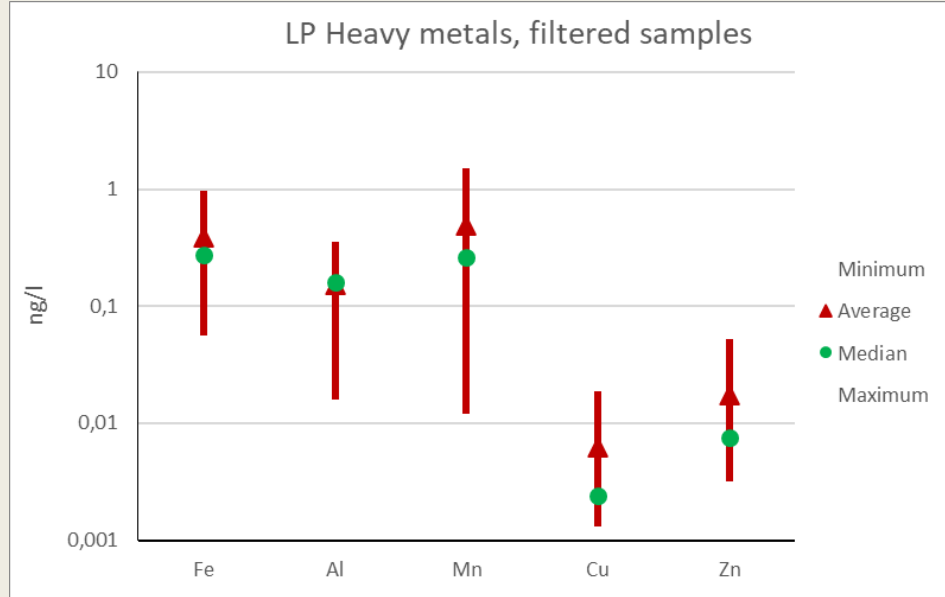
Large pond



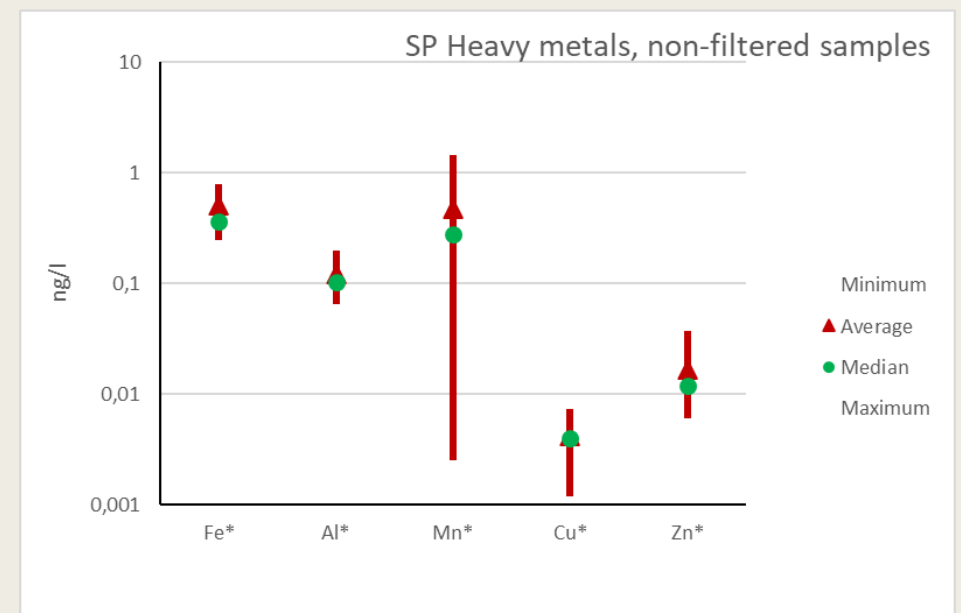
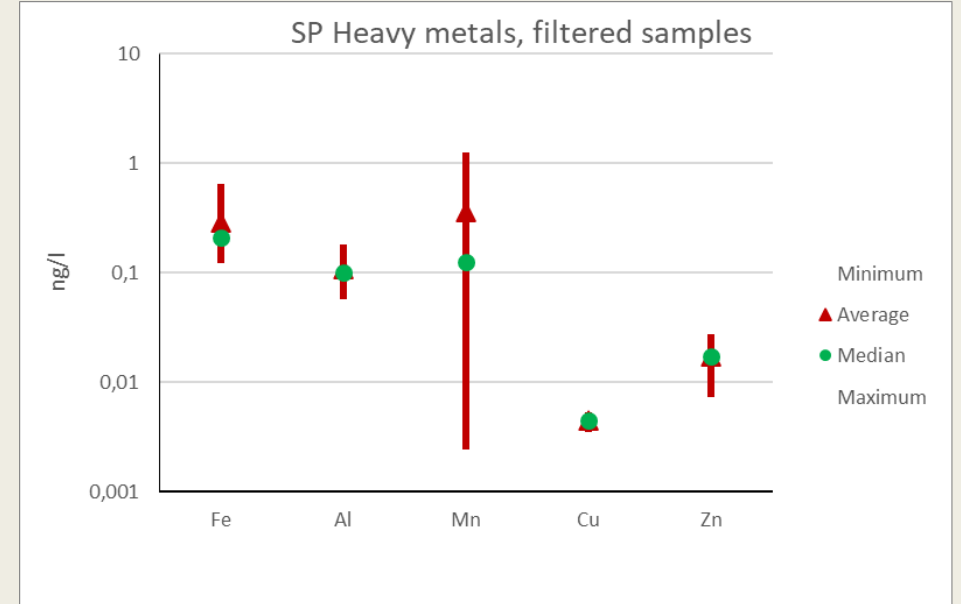
Small pond



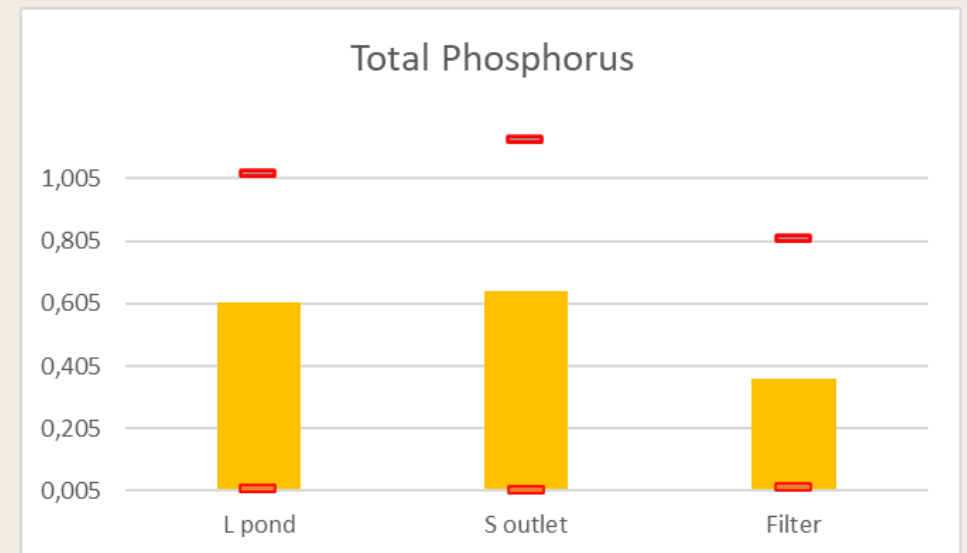
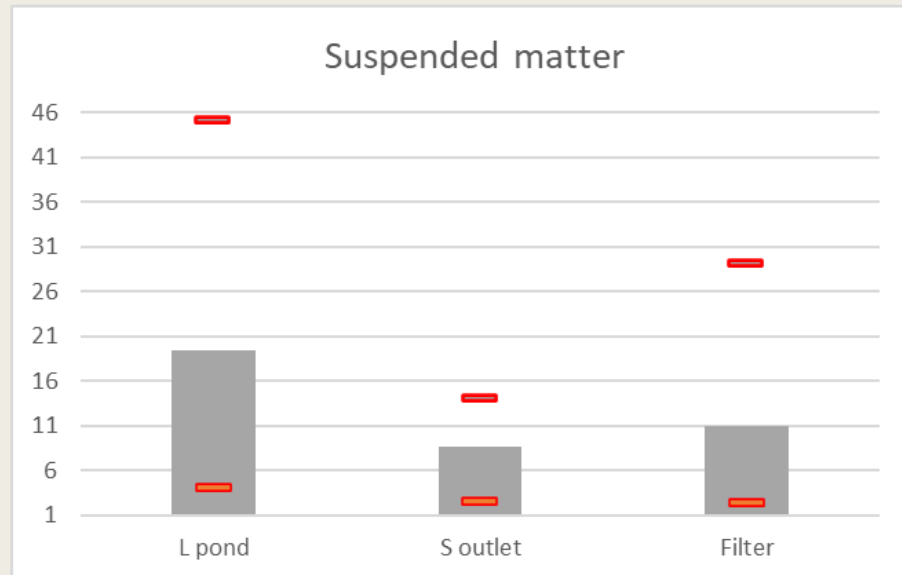
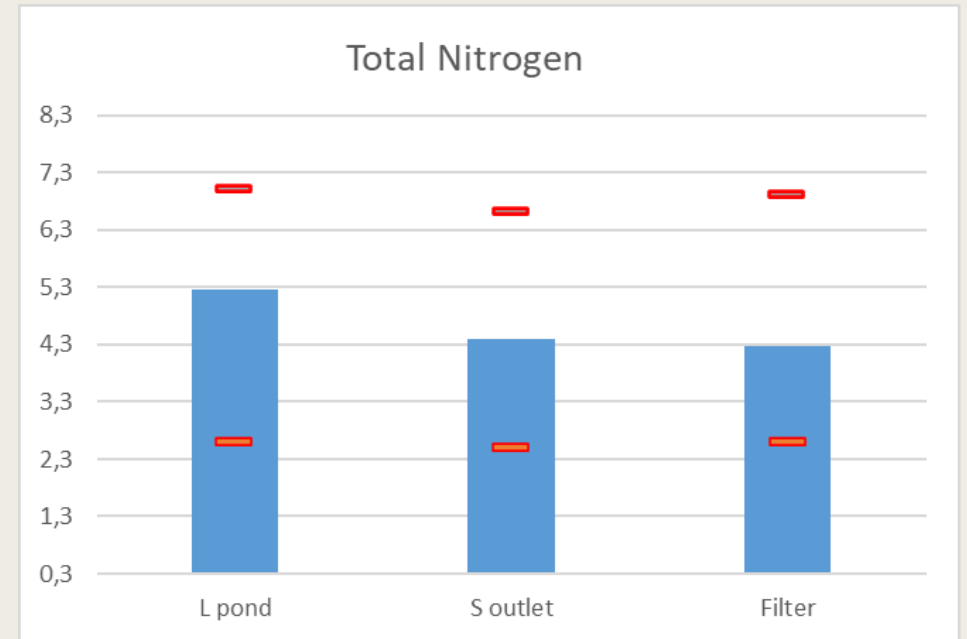
Large pond

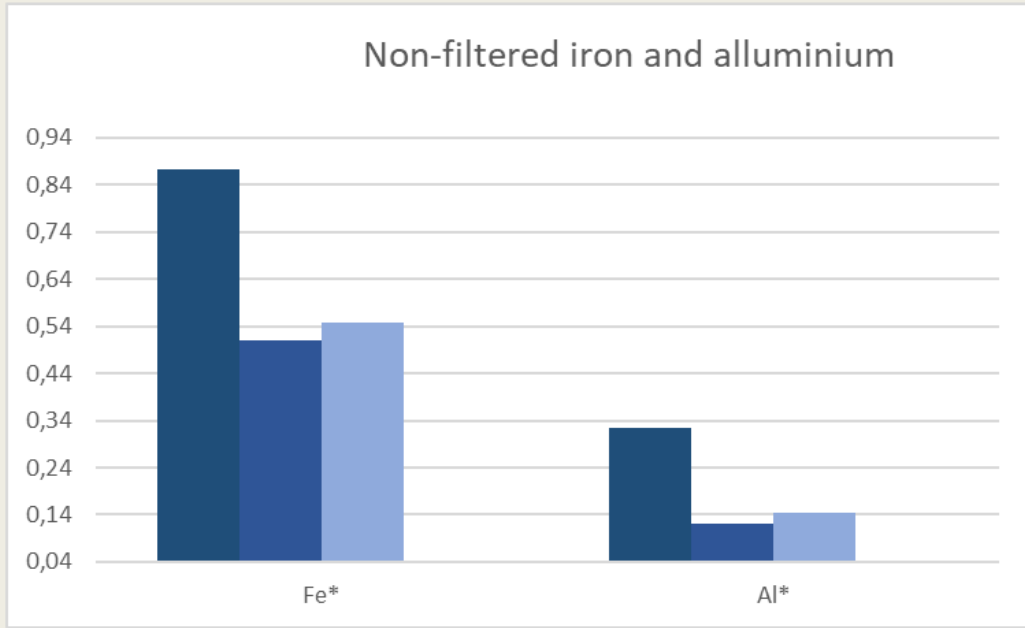
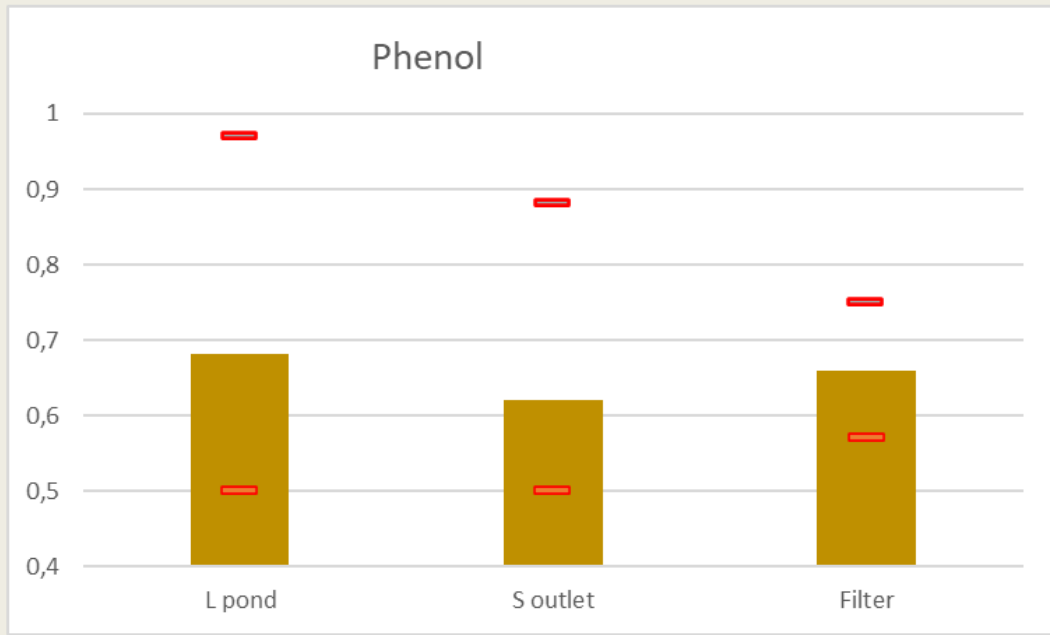
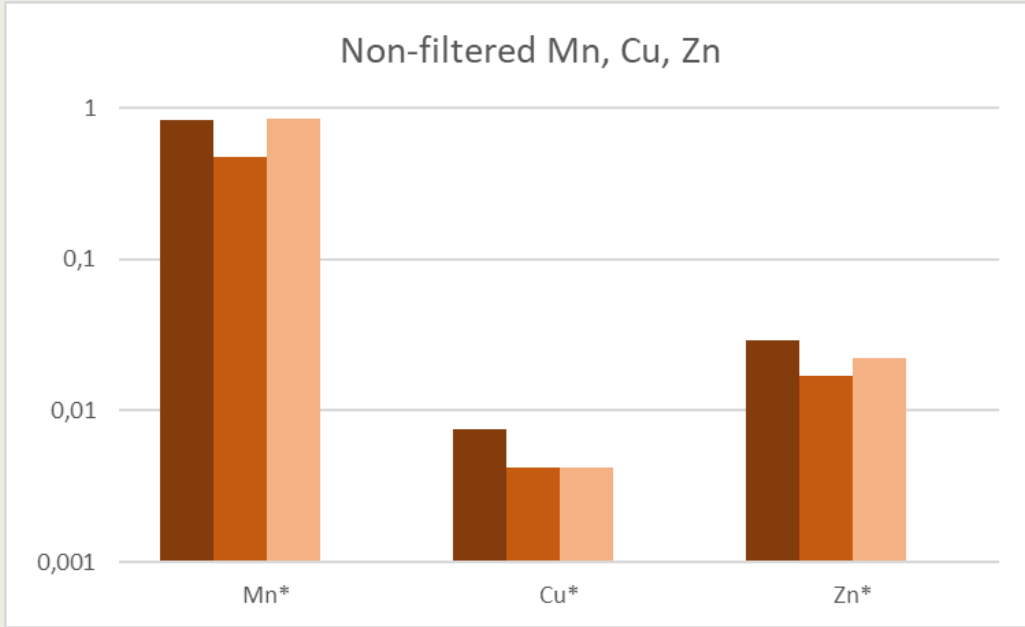
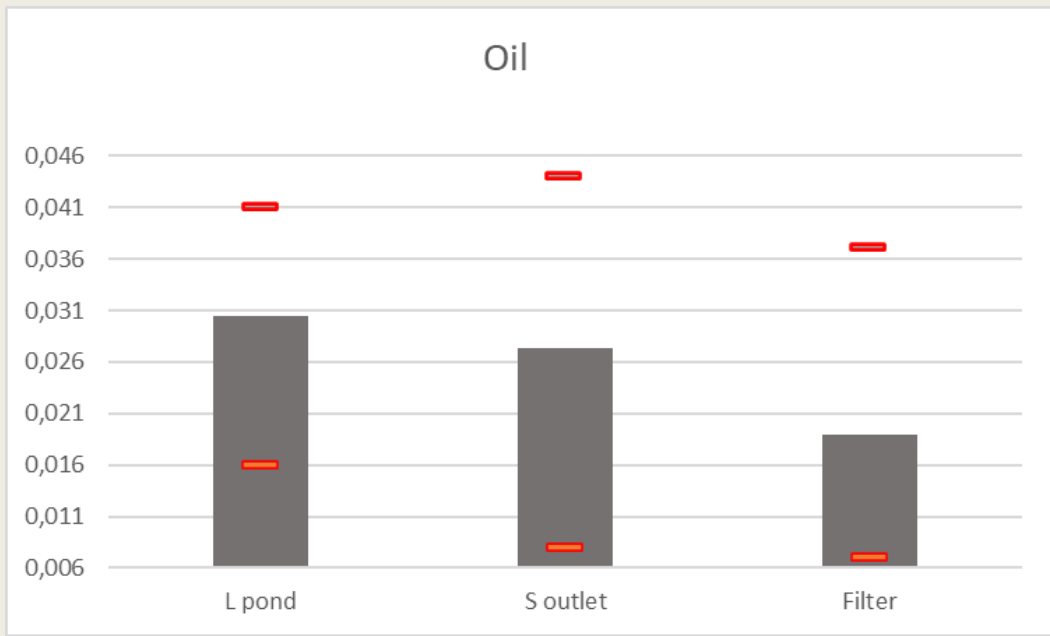


Small pond

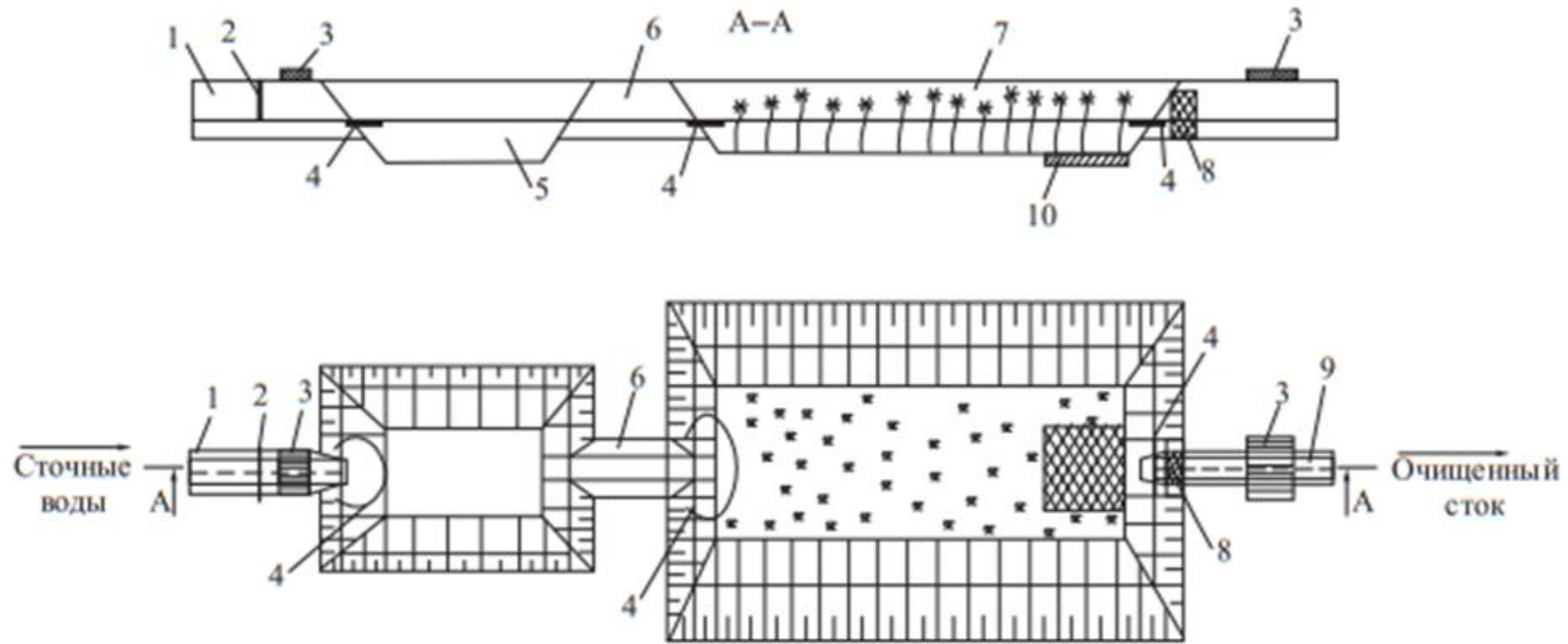


Filter testing in the Pionersky pond





Storm water retention pond



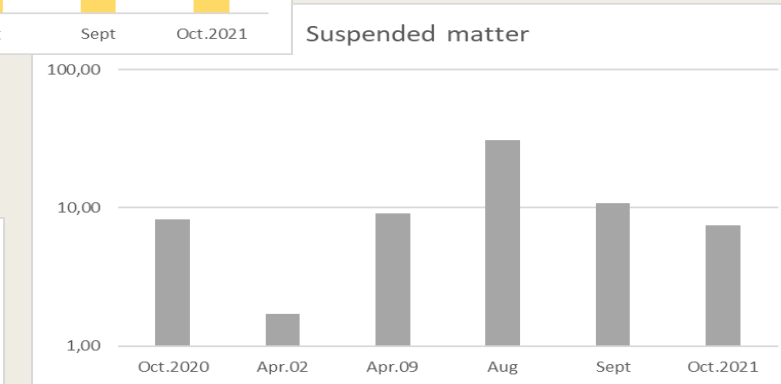
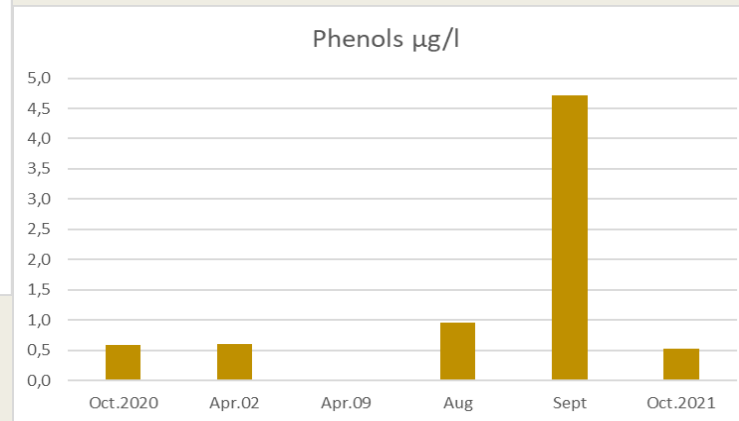
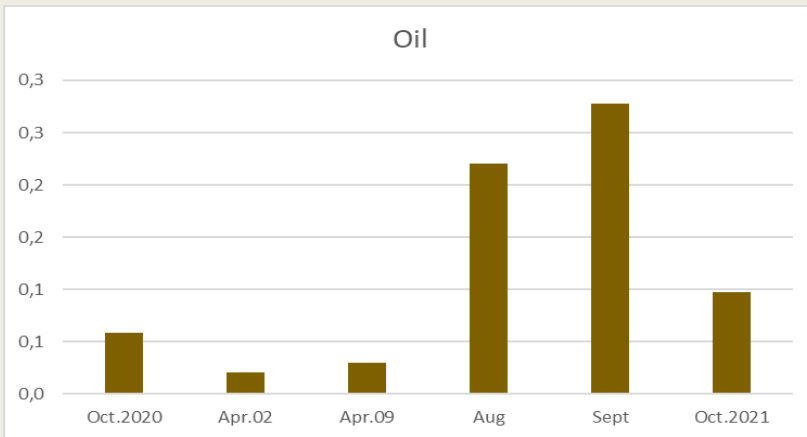
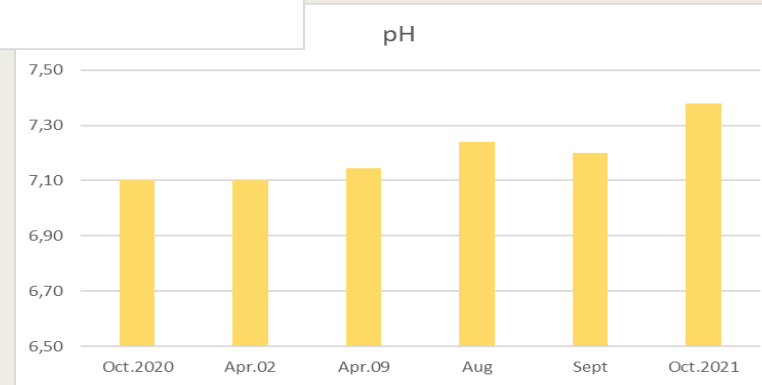
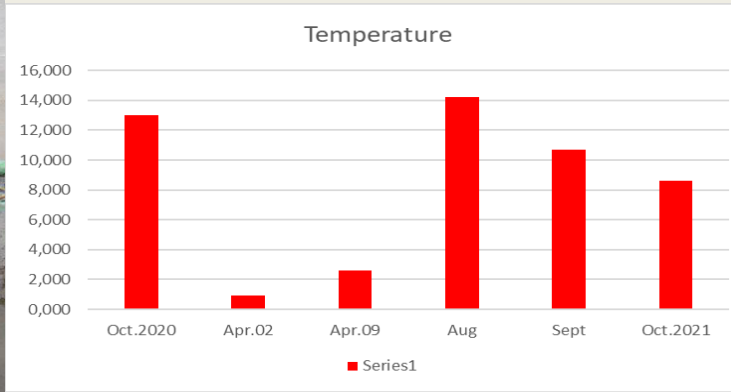
- 1 – подводящий лоток (канавка); 2 – решетка для улавливания плавающего мусора;
- 3 – мостки; 4 – плавающие боны из сорбирующего нефтепродукты материала;
- 5 – буферный пруд для осаждения наиболее крупных фракций взвешенных веществ;
- 6 – соединительный лоток (канавка); 7 – основной пруд ГБП с высшей водной растительностью;
- 8 – фильтрующая кассета с загрузкой природным сорбентом; 9 – отводящий лоток (канавка);
- 10 – площадка на дне пруда, выстланная слоем природных сорбентов

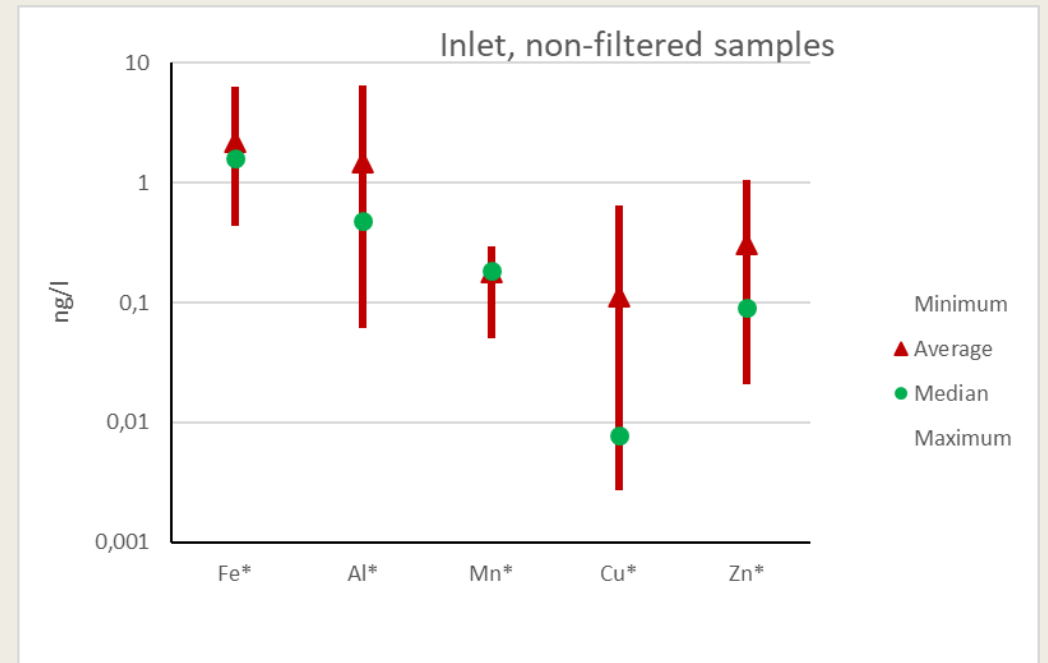
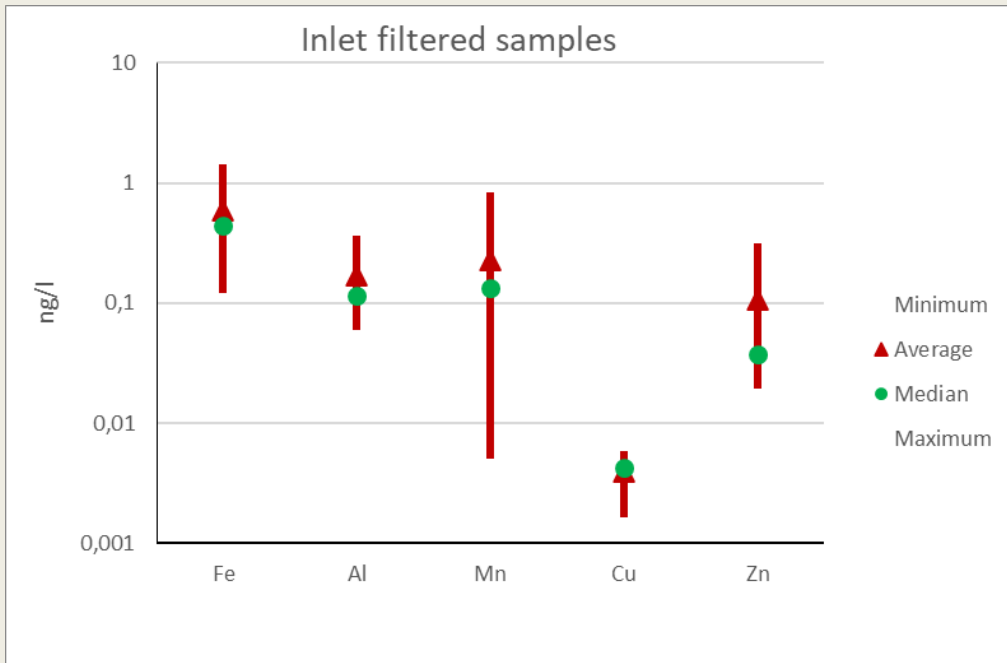
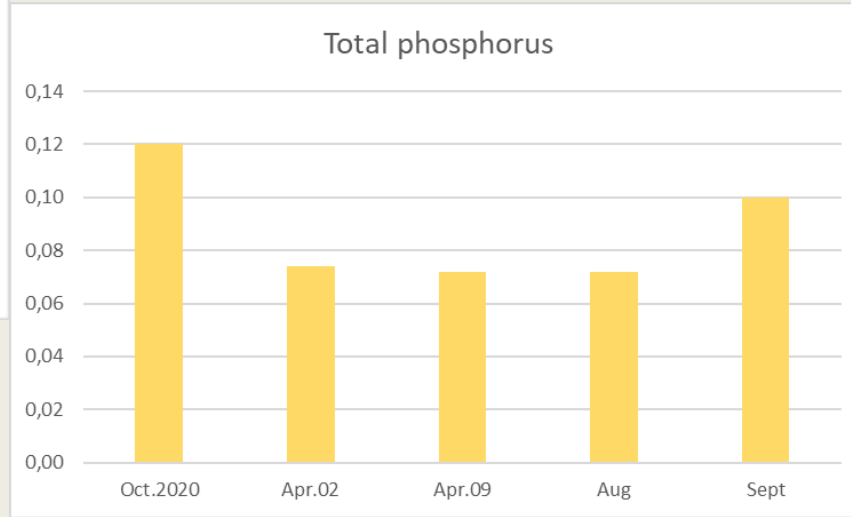
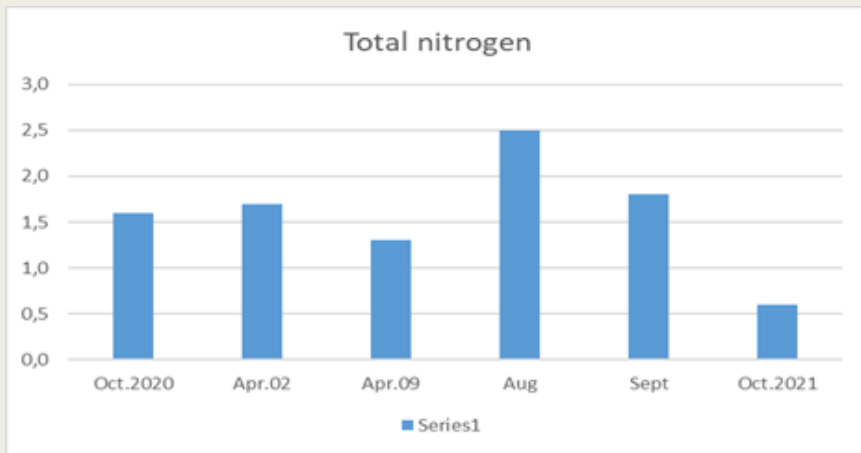
Рисунок 5 – Схема ГБП в составе двух прудов с усиленной защитой от нефтепродуктов

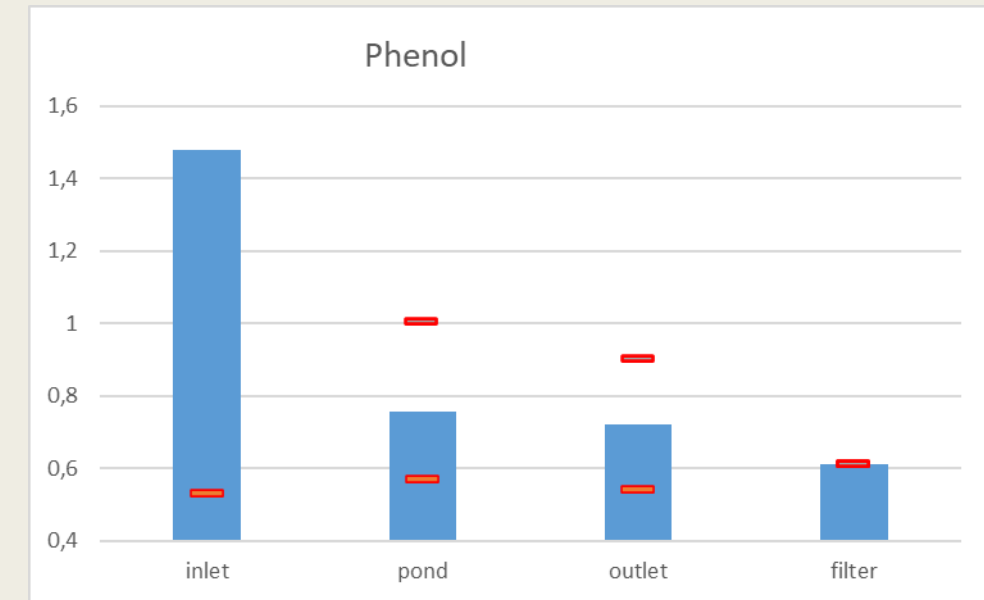
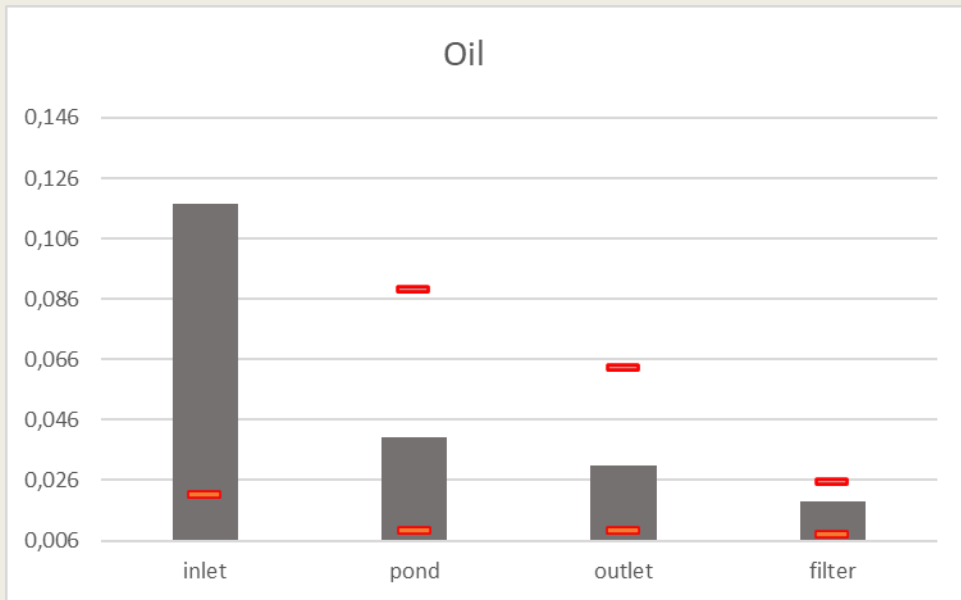
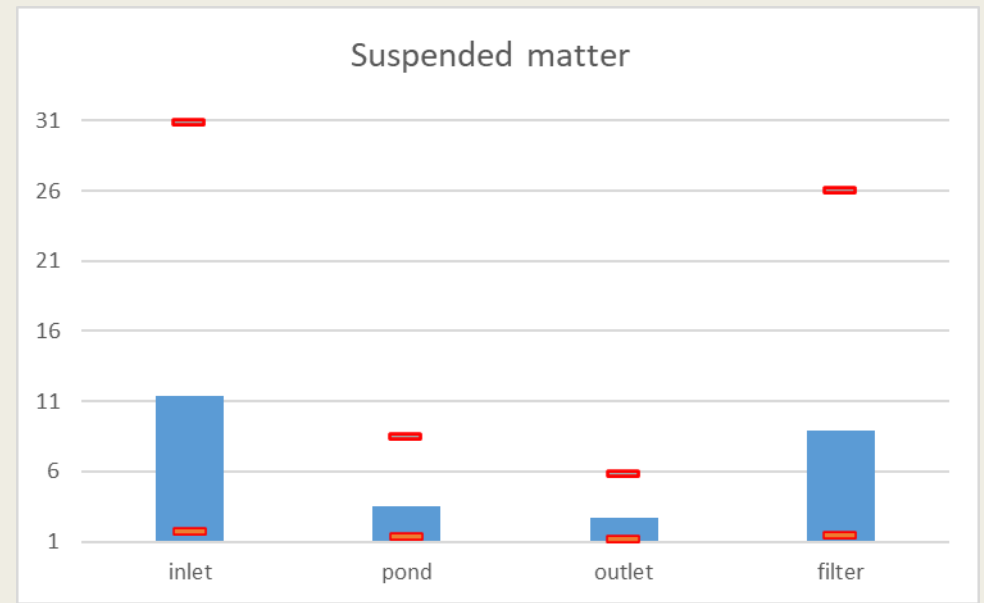
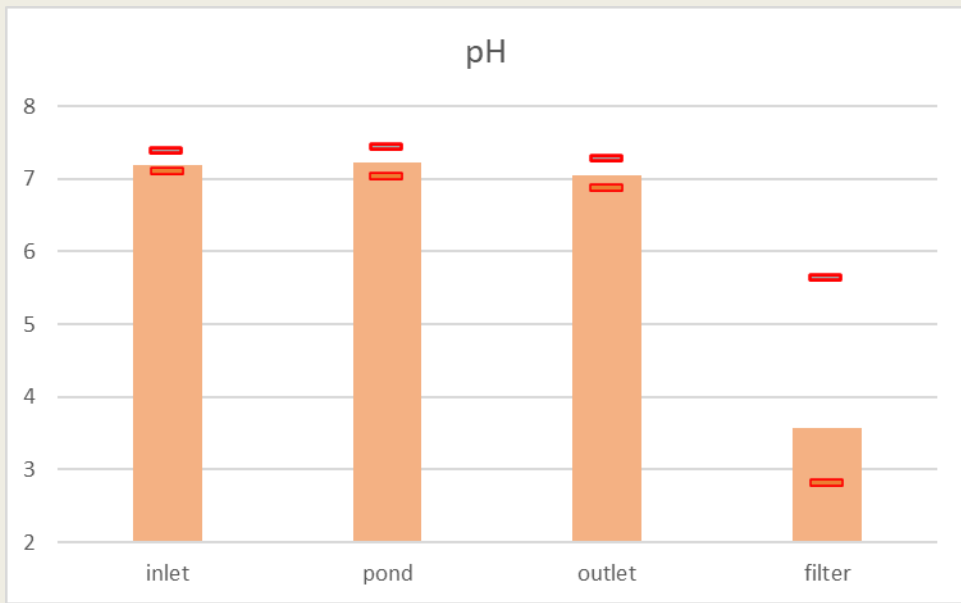
Storm water retention pond

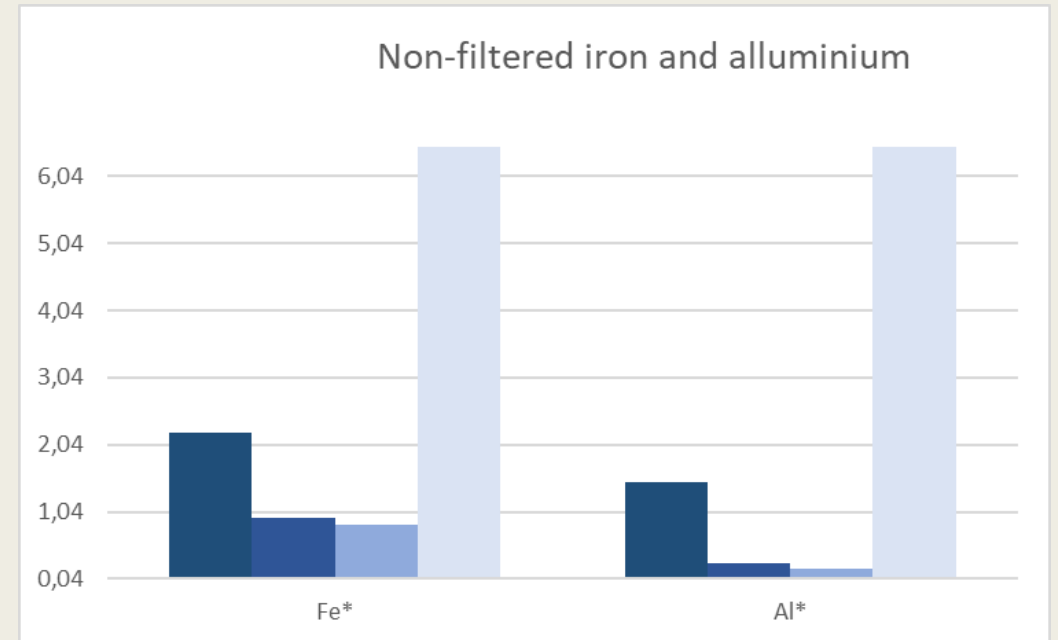
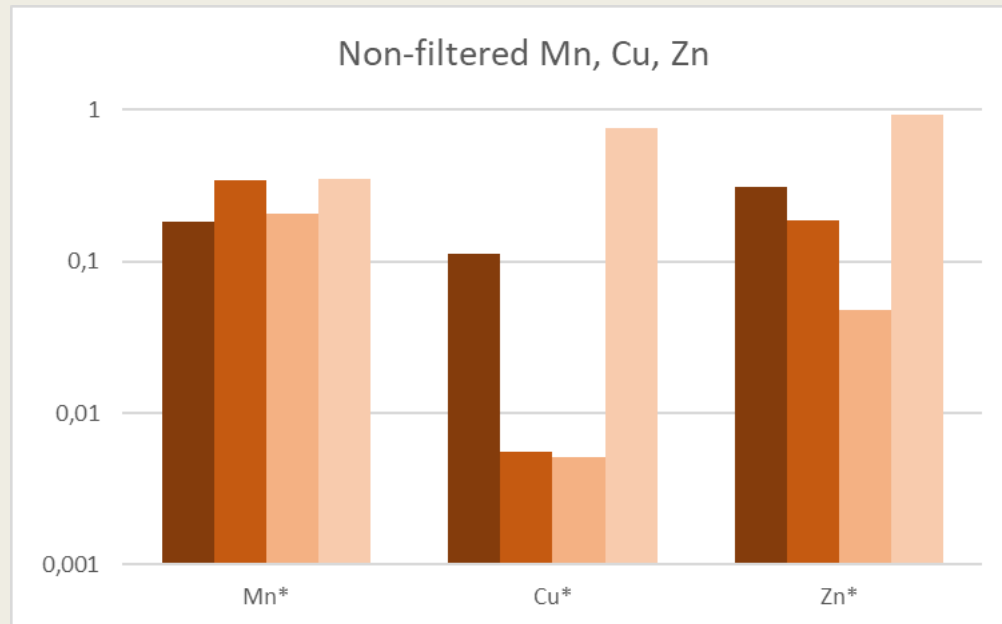
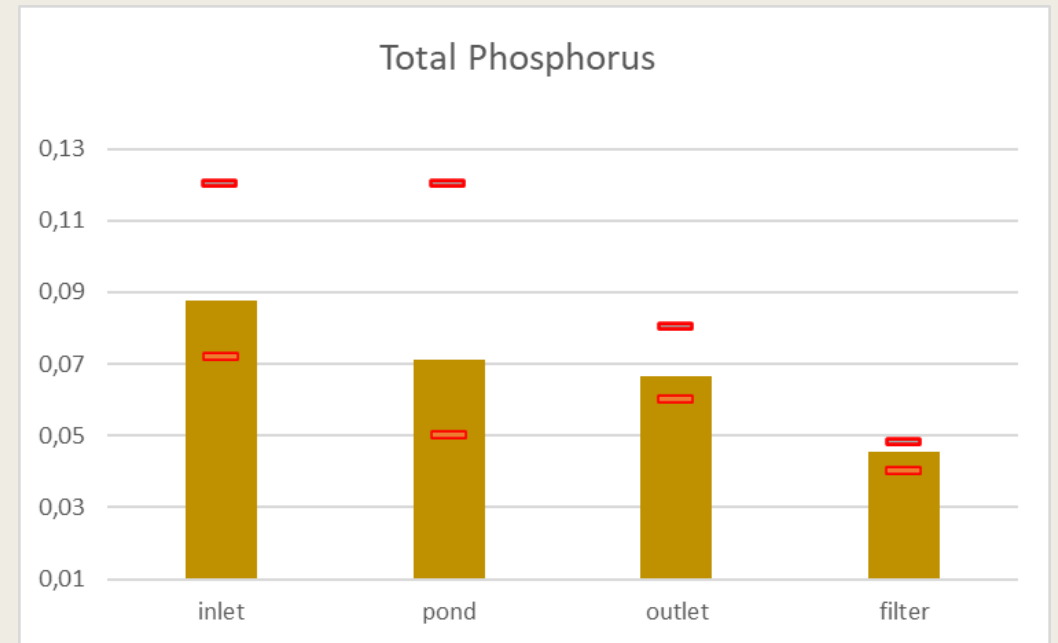
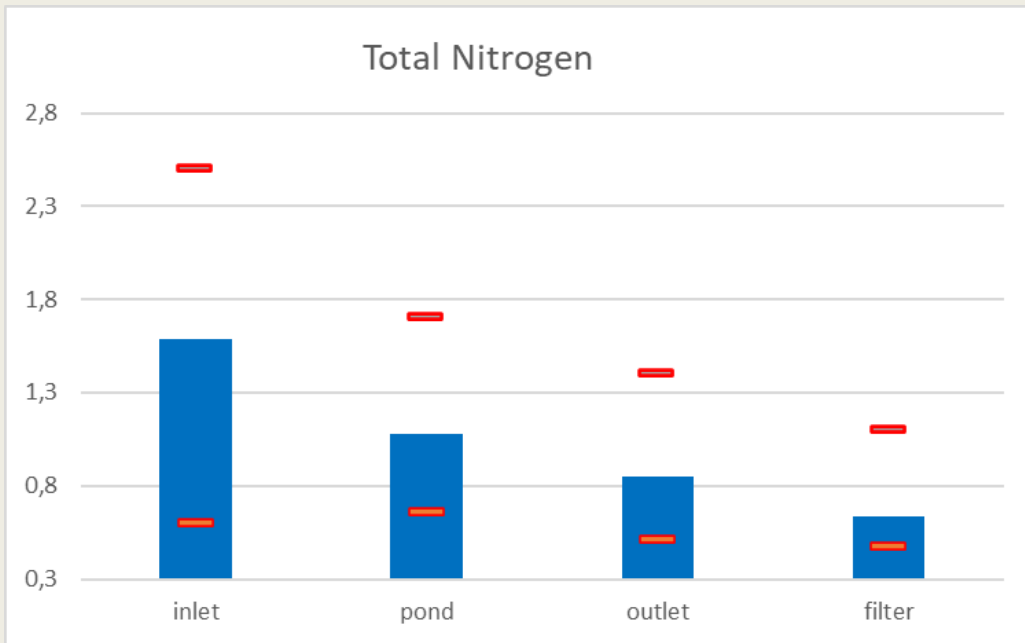


Characteristics of water in inlet









HELCOM Recommendation 23/5-Rev.1 REDUCTION OF DISCHARGES FROM URBAN AREAS BY THE PROPER MANAGEMENT OF STORM WATER SYSTEMS

Storm water management hierarchy

- I. storm water to be treated and utilized at the source,
- II. storm water to be conveyed away from the source with a system that retains and detains the water,
- III. storm water to be conveyed away from the source in a storm water sewer to retention and detention areas located on public areas before conveying the water to a waterbody (brook),
- IV. storm water to be conveyed in a storm water sewer directly to the recipient water body; and
- V. storm water to be conveyed in a combined sewer to wastewater treatment plant,

Discussion and preliminary conclusions

- Available data are rather limited and thus, only provisional conclusions and recommendations can be derived from testing shungite filters.
- Available data are not sufficient for any numerical assessment of sorption capacity of the filters.
- In general, filters demonstrate relative efficiency for purification of urban storm waters, mainly with respect of oily contaminants and nutrients (particularly phosphorus).
- More studies are needed to investigate the effect of filters on heavy metals. Available data and accuracy of analysis do not allow to demonstrate efficiency of shungite for sorption of heavy metals,
- Since shungite is natural material, its mineralogical composition might vary which is to be accounted selecting the material for filters.
- Capacity of tested filters is insufficient to affect water quality in large water bodies but they might be applied for purification of urban storm waters.
- Applicability of filters equipped by water pump for improvement of water quality in small closed water ponds is to be further investigated utilizing longer time series,