

# Willow Field & Desalination brackish water

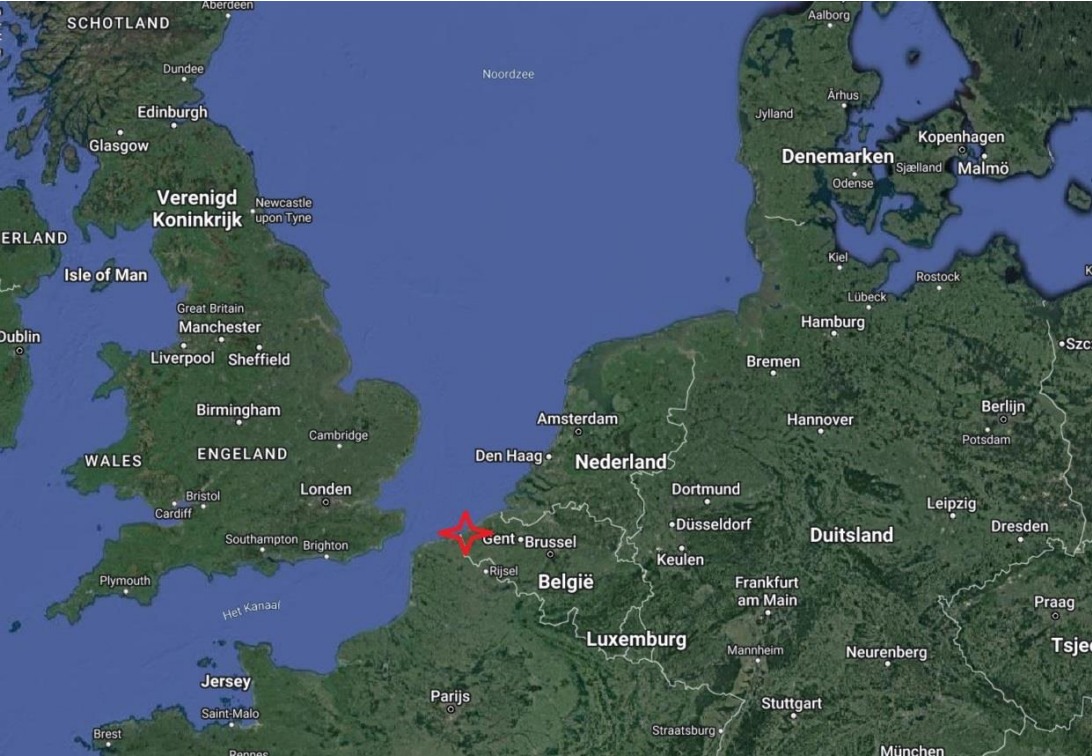


Vincent Winnock de Grave  
IWA Denmark  
13 sept 2022

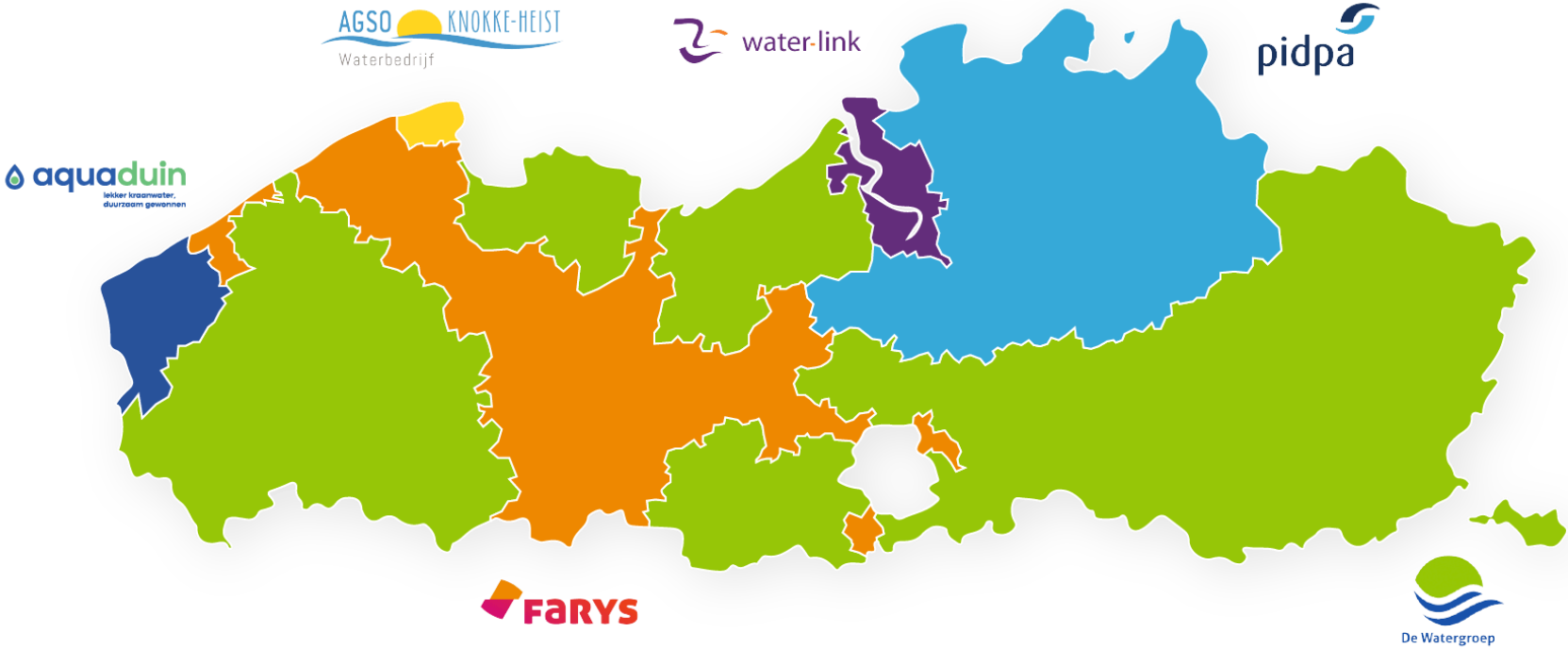
# Agenda

- 1- Aquaduin
- 2- Willow Marsh
- 3- Desalination brackish or seawater

# About Aquaduin



# About Aquaduin



# About Aquaduin



Last 5 years

Highest daily consumption: 21.811m<sup>3</sup>

Lowest daily consumption: 8.058m<sup>3</sup>

Figures from the year 2021:

Totaal delivered: 5.069.547m<sup>3</sup>

Own Production: 4.125.948m<sup>3</sup>

Infiltration water: 2.382.819m<sup>3</sup>

Length of distribution network: 1005 km

# Branches (Aftakkingen): 30.936

# Subscriptions (Abonnementen): 73.248

Population (estimated):

Winter: 62.000

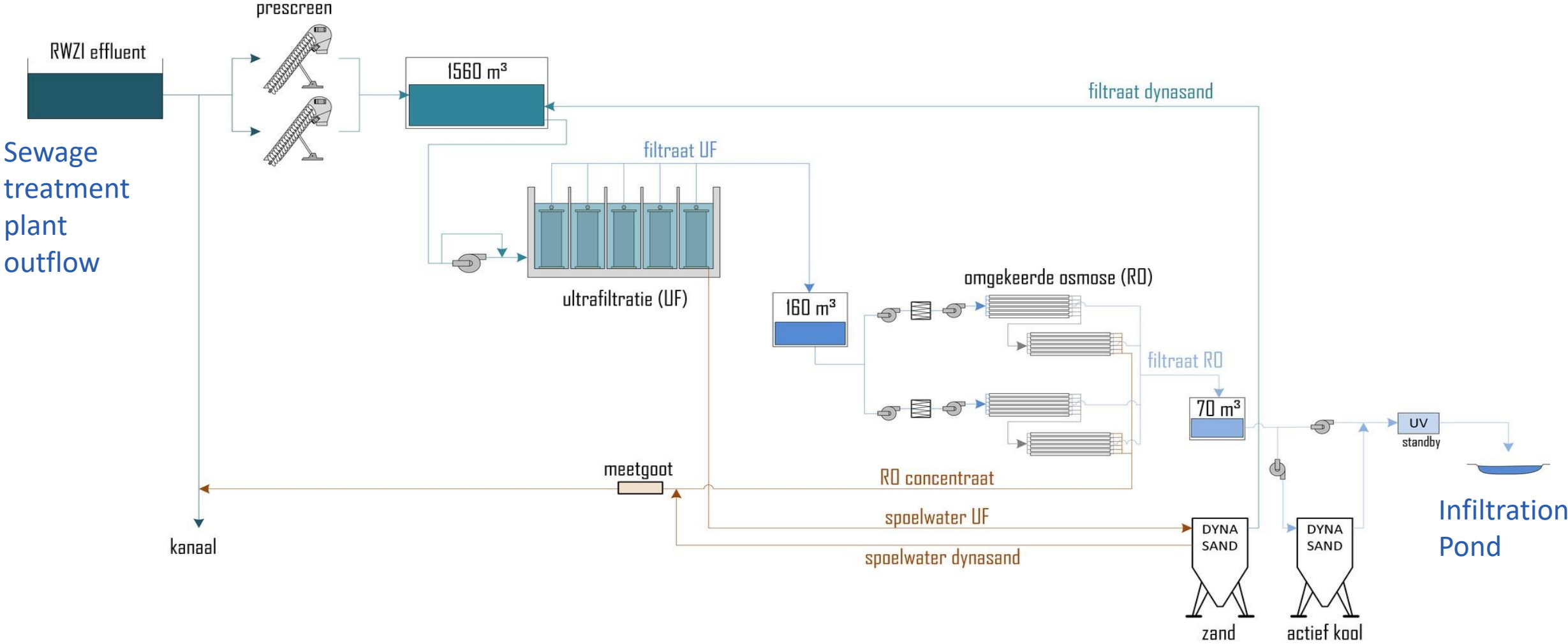
Summer peaks: 2\* winter population (Tourism)

# Infiltration water



In 2002 Aquaduin started with artificial recharge of the dune aquifer of St-André based on water reuse from the adjacent wastewater treatment plant of Wulpen

# Production of infiltration water



# Willow marsh

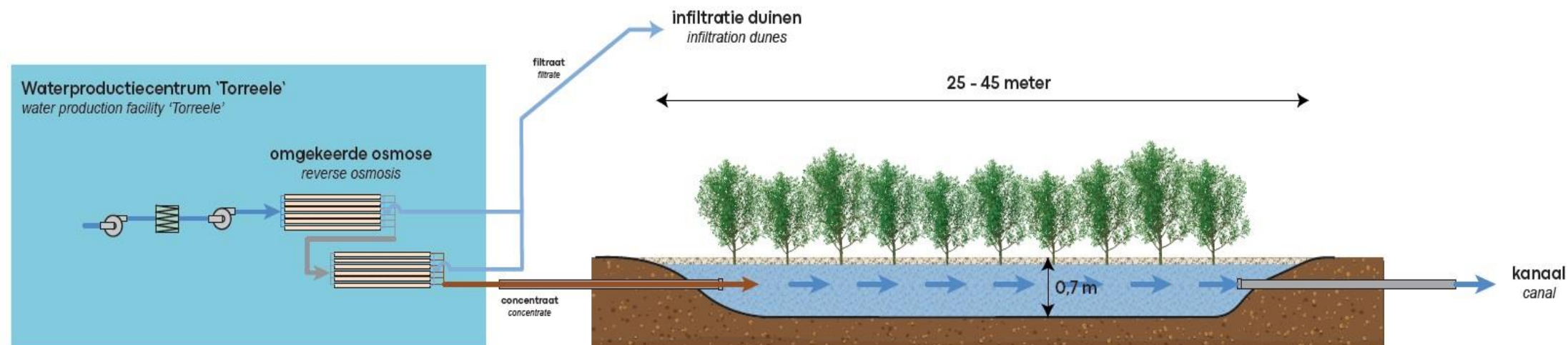
## Project definition

A willow field/marsh will be constructed near WPC Torreele (Wulpen, Koksijde) for the further treatment of the reverse osmosis concentrate.

This means that approximately 30% of the nutrient content can be removed.

It will then be further investigated whether the effluent from the willow field can be used in this way as a source for the production of fresh water for infiltration or agriculture.

The willows themselves will be cut every 2 to 3 years and this wood can be used for alternative CO<sub>2</sub>-neutral energy or heat generation or as a soil improver.





# Willow marsh

## Small scale testing (2013–2016)

- part of the DEMOWARE project
- objective is to remove nutrients and organic load from the concentrate from the reverse osmosis treatment in WPC Torreele (Koksijde) before it is discharged into a canal.
- The willow field resembles a landscaped reed field, but here willows are used instead of reed .
- Choice for willows:
  - 1) tolerate salt content of the concentrate, which varies between 2,000 and 8,000  $\mu\text{S}/\text{cm}$
  - 2) these plants sprout again after harvest.



# Willow marsh

Scale up research: 2016-2018

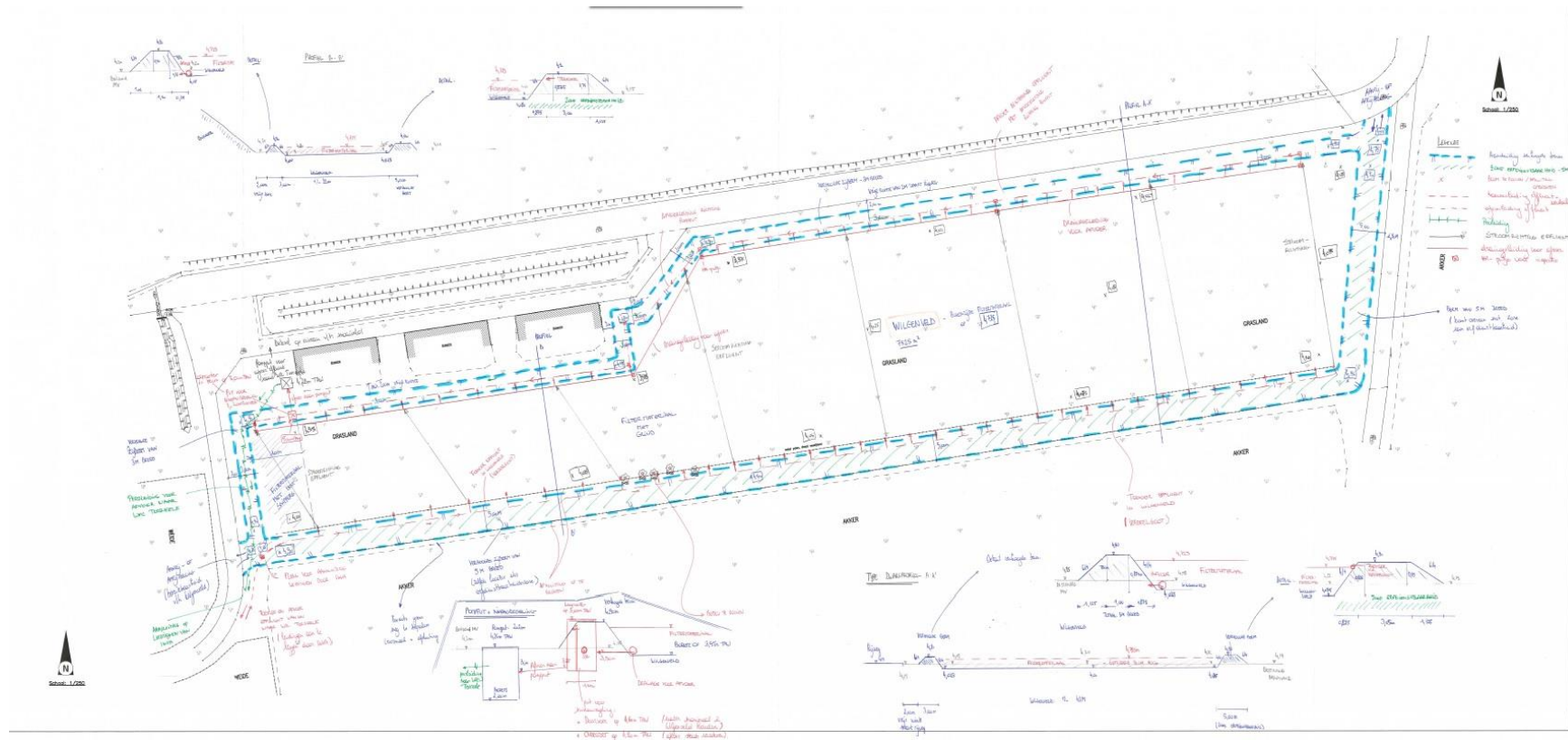
Finding location



# Willow marsh

Scale up research: 2019-2020

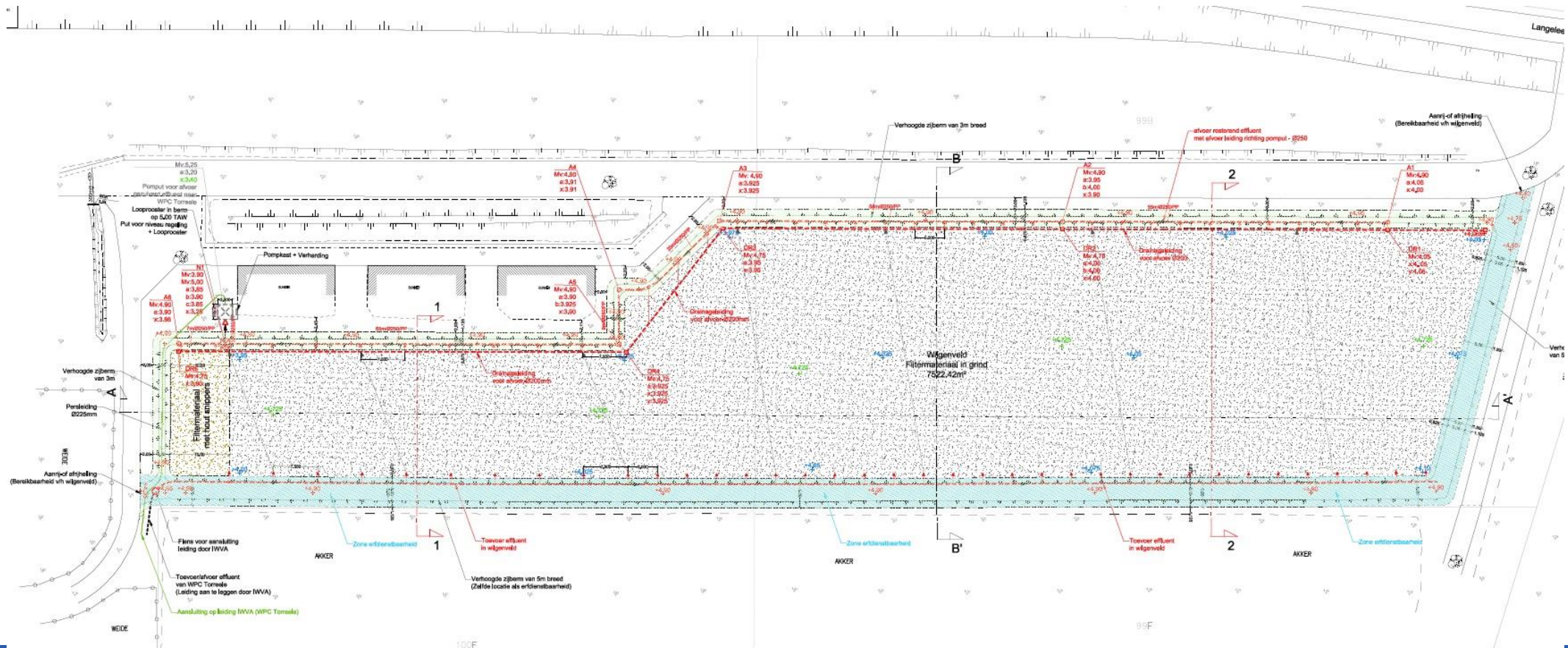
Drawing plans



# Willow marsh

Scale up research: 2020

Final plans, RFQ



# Willow marsh

Installation: 2021



# Willow marsh

Installation: 2021



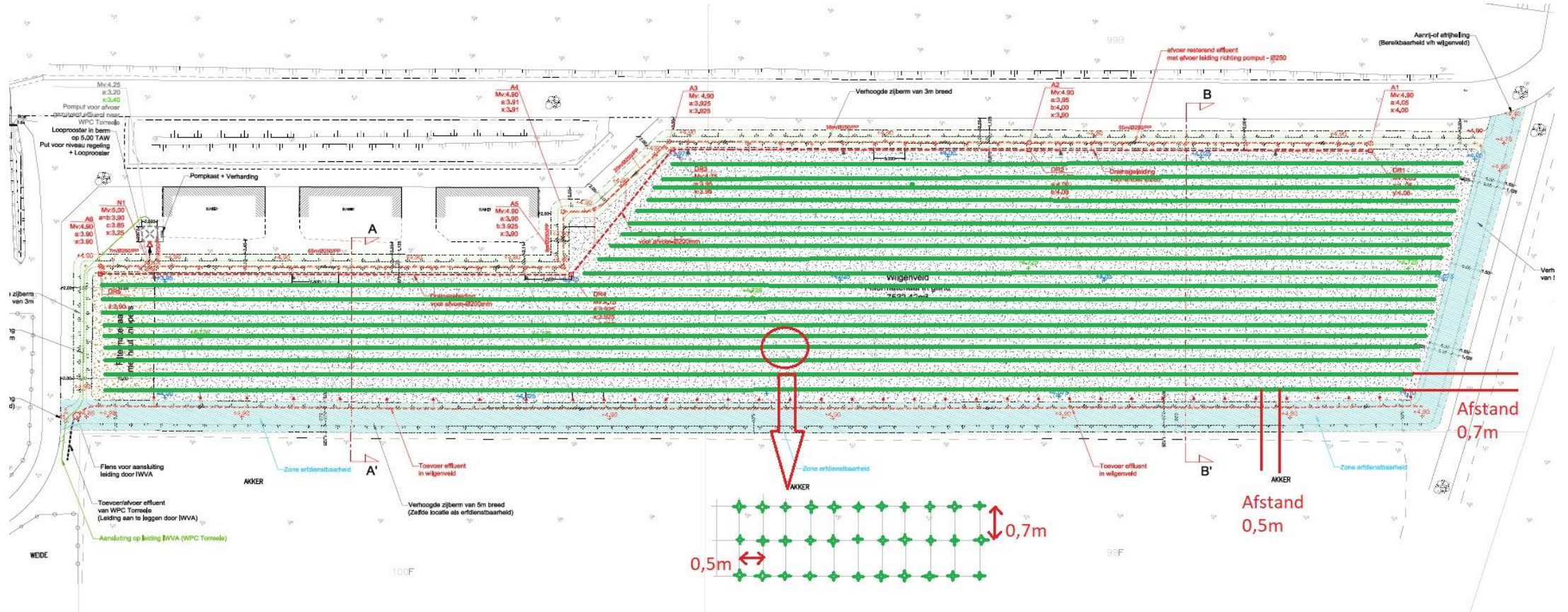
# Willow marsh

Installation: 2021



# Willow marsh

Installation: 2021





# Willow marsh

Installation: 2021



# Willow marsh

Start up: end 2021



# Willow marsh

Production: 2022 growth



# Willow marsh

Production: 2022 growth



# Willow marsh

Production: 2022 figures

Surface Willow Field: 7522m<sup>2</sup>

Influent willow field flow: 40-100m<sup>3</sup>/h

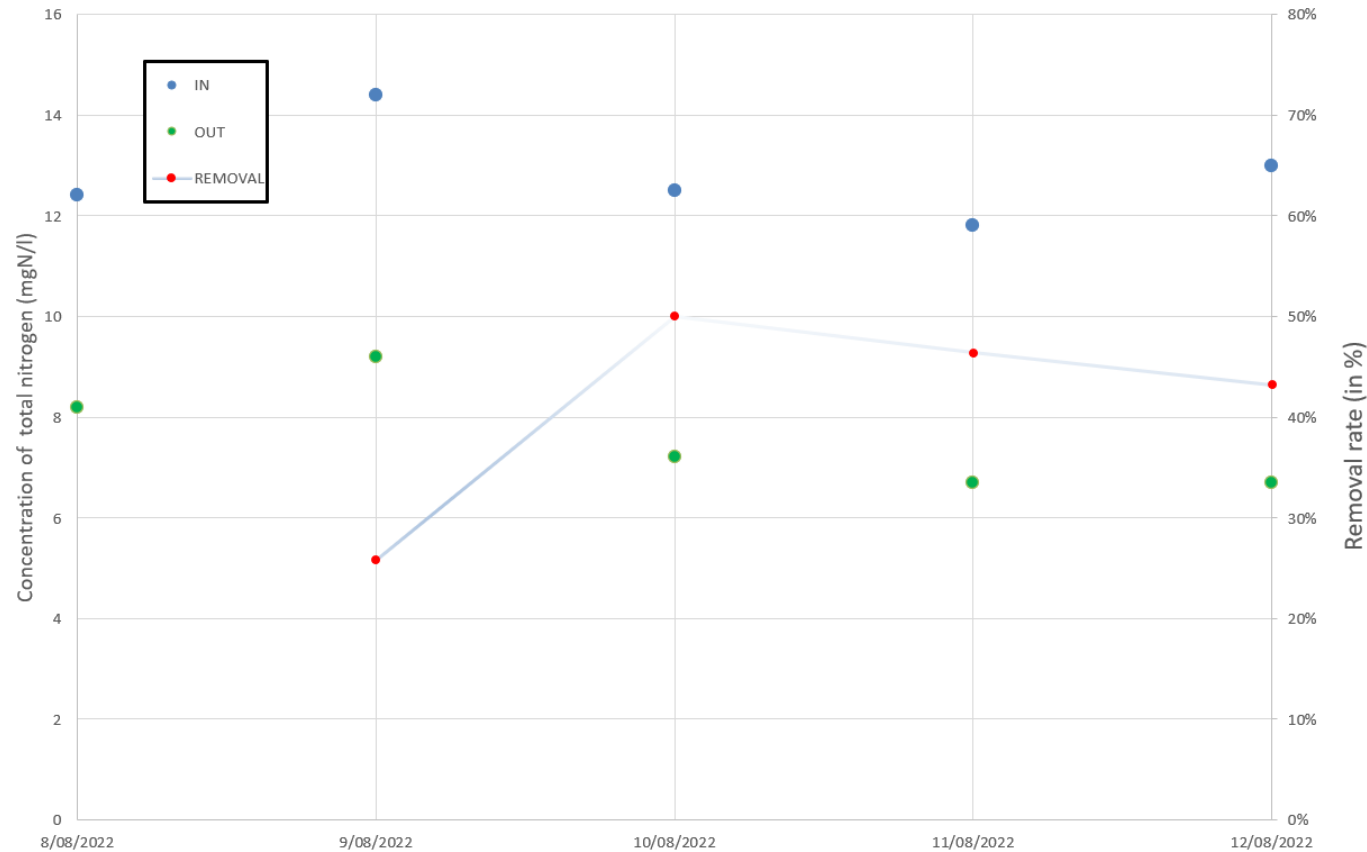
2 pumps of 110m<sup>3</sup>/h to pump the Effluent willow field back to the canal

Volume passed through field from startup until 6 sept: +-345.000 m<sup>3</sup>

Designed to treat annually 600.000 to 800.000 m<sup>3</sup> of concentrate

# Willow marsh

Results before and after willow treatment



Representative daily samples taken with a sampler

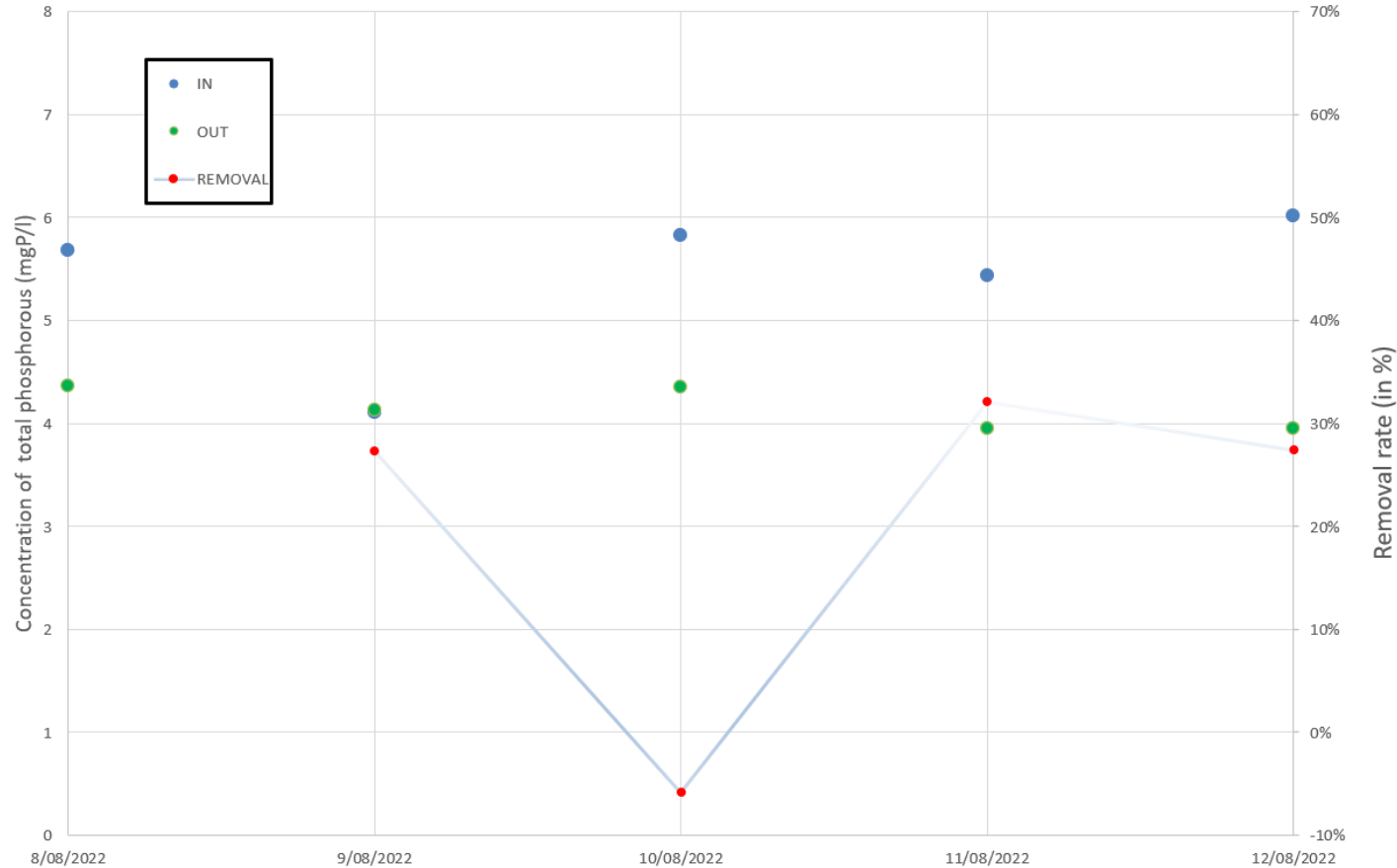


Good and constant removal of total nitrogen

Average of 41%

# Willow marsh

Results before and after willow treatment



Representative daily samples taken with a sampler

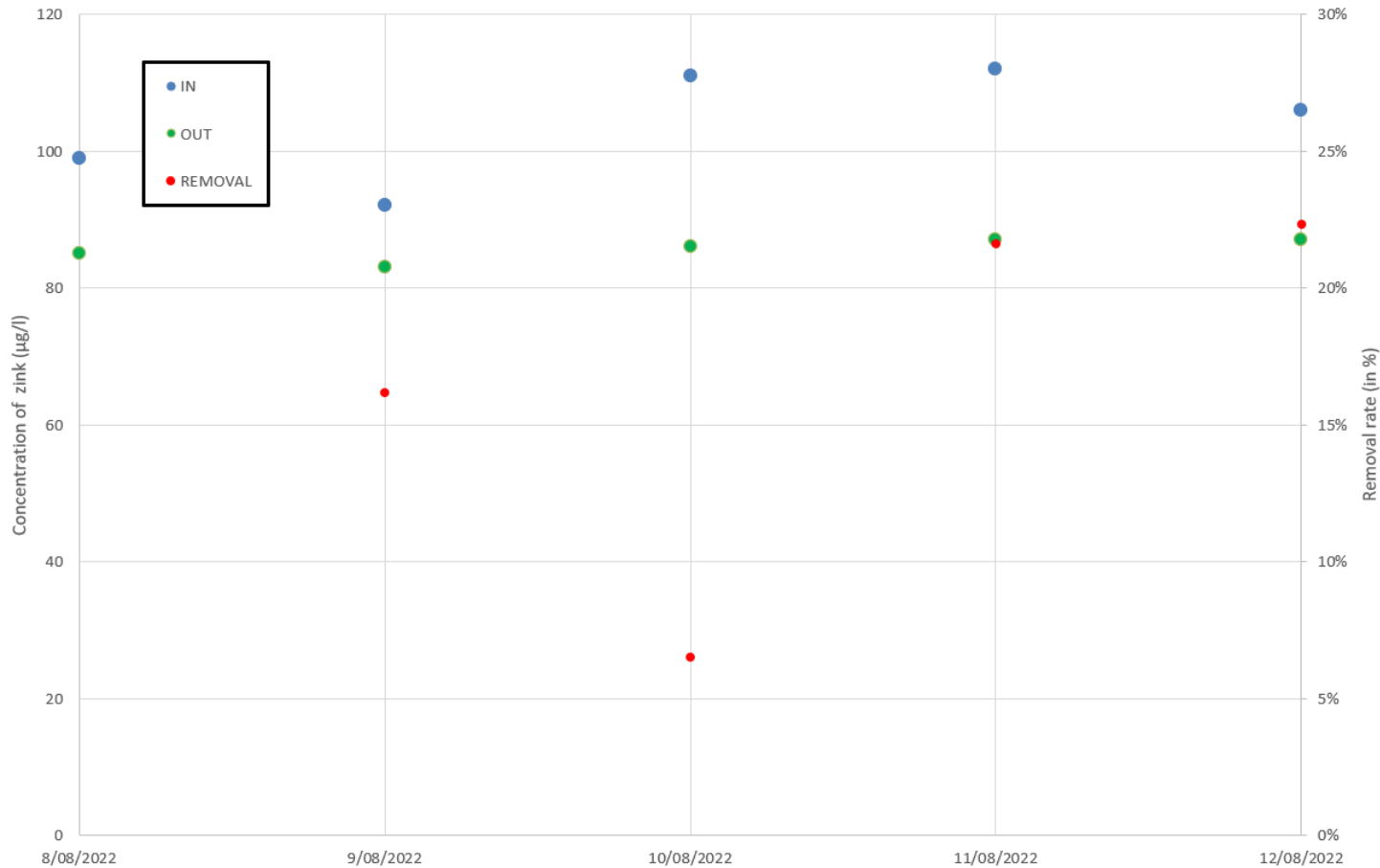


Good removal of total phosphorous

Average of 20%

# Willow marsh

Results before and after willow treatment



Representative daily samples taken with a sampler



Good and constant removal of zinc

Average of 17%



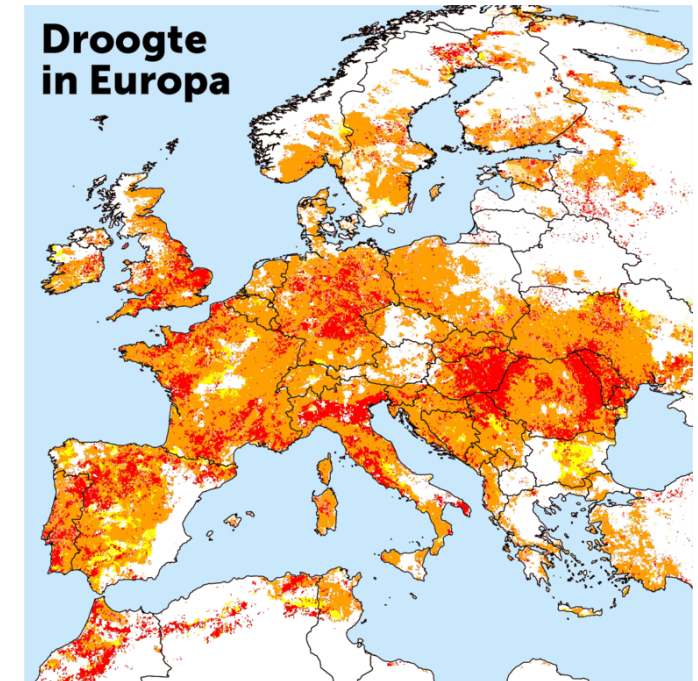
# Desalination brackish water and seawater

## West Flanders

- sensitive to a declining reserve capacity in groundwater and surface water for a variety of reasons
- high industrial consumption
- seasonal consumption pattern at the coast

## Climate

- more extreme weather conditions (drought)



- |   |                              |
|---|------------------------------|
| ■ Alarmfase: bedreiging van flora door grondwater- en vegetatietekort | ■ Volledig herstel           |
| ■ Waarschuwingsfase: grondwatertekort                                 | ■ Tijdelijk bodemherstel     |
| ■ Waakzaamheidsfase: neerslagtekort                                   | ■ Tijdelijk vegetatieherstel |

BRON COMBINED DROUGHT INDICATOR - EUROPEAN DROUGHT OBSERVATORY

# Desalination brackish water and seawater

Project definition

Partnership: Aquaduin, De Watergroep and Farys

4 to 5 Mio m<sup>3</sup>/year (1st phase)

Climate-robust solution focused on the future

Source diversification: Canal Plassendale, Yser, Havengeul,...



De Watergroep  
WATER. VANDAAG EN MORGEN.

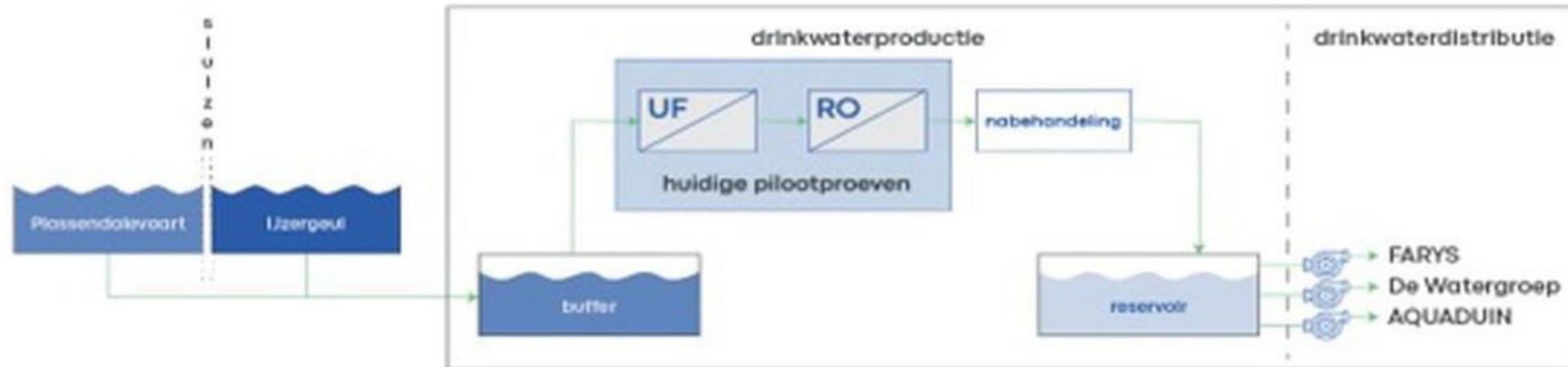
Innovation/challenge: brackish to seawater filtration in 1 production unit

Energy-conscious: priority for the best raw water source

Estimated installation: 2025

INNAME

WATERPRODUCTIECENTRUM  
'DE GANZEPOOT'



# Desalination brackish water and seawater

Location: Nieuwpoort, West Flanders, Belgium  
Ganzepoot lock complex



# Desalination brackish water and seawater



In the lock complex De Ganzepoot in the IJzer estuary, 6 waterways and the North Sea come together.

Wide range of waters are available: fresh, brackish and salt water

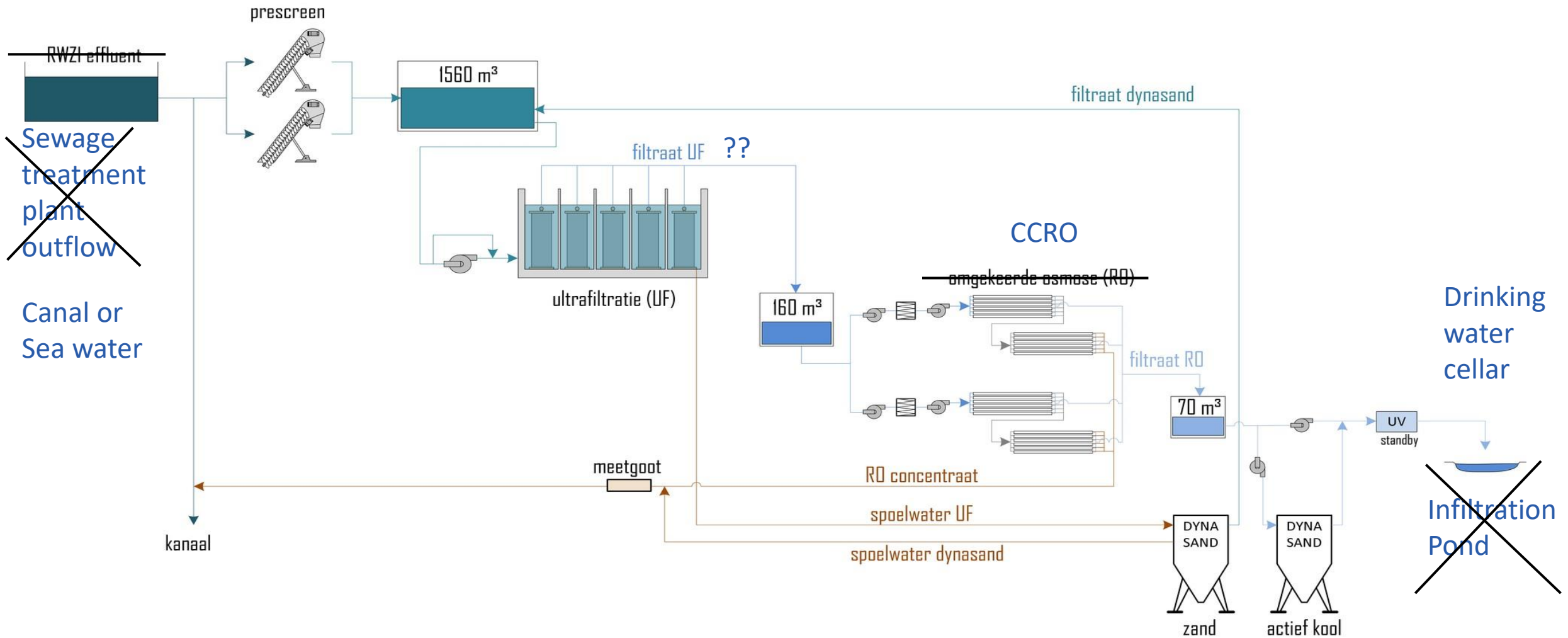
Different quality sensors in the locks will screen the incoming waters

# Desalination brackish water and seawater

Overview locations



# Production of drinking water from brackish or seawater



# Desalination brackish water and seawater

Challenge: treating different kinds of water with the lowest possible energy consumption.

The best available quality will be used: if sufficient fresh or brackish water is available, this is chosen.

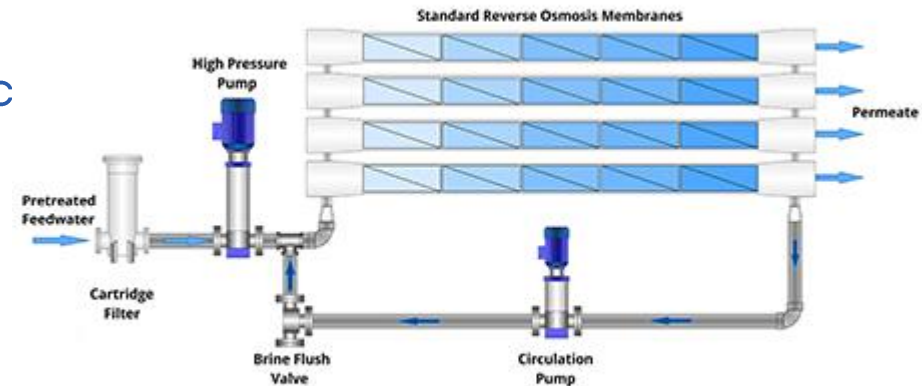
In times of drought and water scarcity, salt water can be used.

Possible filtration types:

- MBR (membrane bio reactor)
- Closed Circuit Reverse Osmosis (CCRO),
- Electrodialysis reversal (EDR) when using seawater a prefiltration
- Ultrafiltration

CCRO advantages:

- good yields at different salinities
- consumes less energy





Thanks for your attention.

Q&A