EWN Webinar

Niels Groot
Dow Benelux BV
Environmental Technology Center
ckgroot@dow.com

Terneuzen Strategy

Regional Collaboration

Concluding Remarks

Dow's priority water stressed sites

"water tools" – WBCSD, Aquaduct

Dow's Sustainability Goal #7: World-Leading Operations Performance

By 2025, Dow will reduce its freshwater intake intensity at key water stressed sites and its waste intensity footprint by 20 percent.

Dow's water vision:

- Sustainable water use and managament
- Innovative technologies
- Set new levels for efficient water use
- Creative partnerships

Water Balance:

- Reuse options
  - Cooling tower make-up
  - Boiler feed
  - Cascading
- Miscellaneous (service, firewater)
- Potable

Site specific:

- (Fresh) water availability
  - Location (sea, river, inland, local climate)
  - Surrounding
    - industry, cities, rural area
    - nature, recreation
- Focused on process (footprint reduction)
- Minimize wastewater to be treated
- Zero liquid discharge (when it makes sense)

DOW TERNEUZEN

NO WATER TO WASTE

Engineering with nature

I-Parc Dow Terneuzen

Quick Facts

- Second biggest Dow site globally
- 440 hectares
- 3,200 employees
- 17 Plants incl. 3 Ethylene crackers
- 800+ different chemicals and plastics
- 85% of products exported
- **Located in a Water Stressed Delta**
- **Fresh Water Annual Use is 22 million m³**

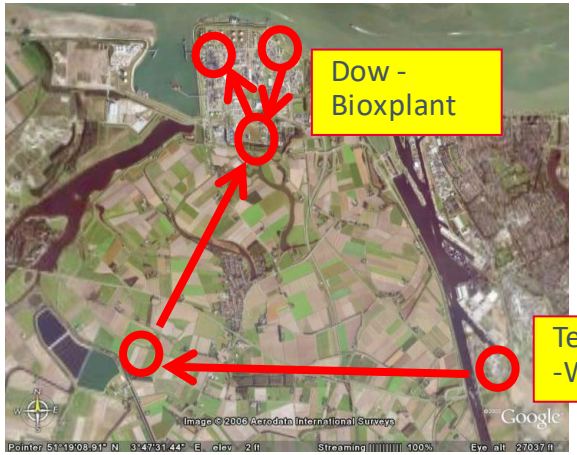
Zeeuws-Vlaanderen

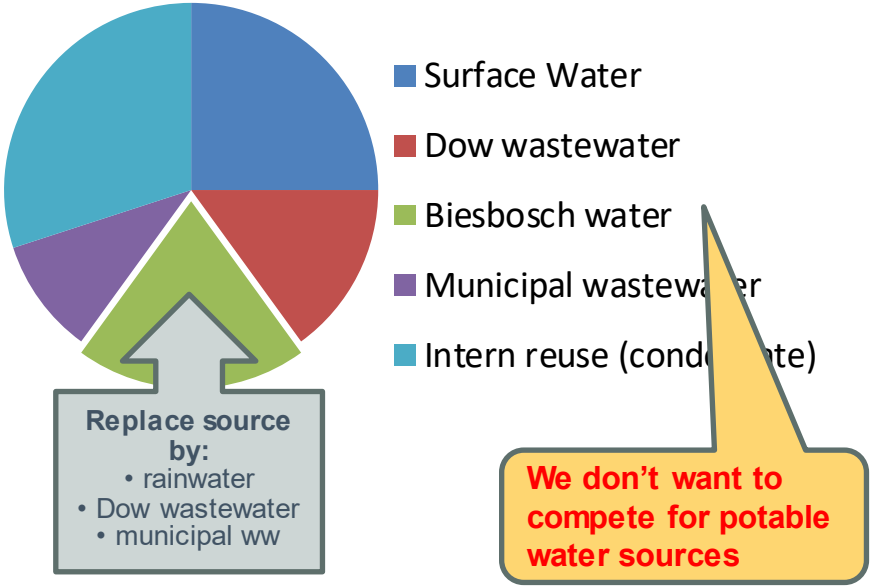
- 1-2 Million M³ water locally sourced
- Most water sourced remotely: pipeline ~120km
- Surface & Ground water mildly brackish

Terneuzen Water Management – annual water use 22 million m^3

75% reuse is realized → 100% by 2024 (SG #7)

Fresh water supply – 120 km

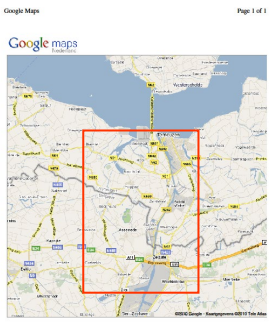




→ reduce Dow's water footprint

→ self provisioning region

Regional Robust Water system (multi stakeholder project)



Key attributes

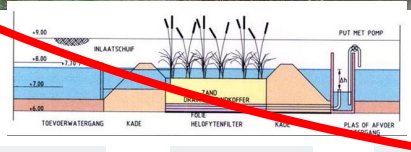
- Surplus of 100 million m^3 of mildly brackish water is discharged annually
- Save scarce potable water sources by using local alternatives
- Nature, landscape and recreation will benefit.

(treated) waste water, diffuse discharges, rain water

Influent buffer

Treatment wetlands

Removal of nutrients and suspended solids



JDA with Evides

E4Water

Hydraulic buffering

Agricultural usage

Mild desalination

Industrial use

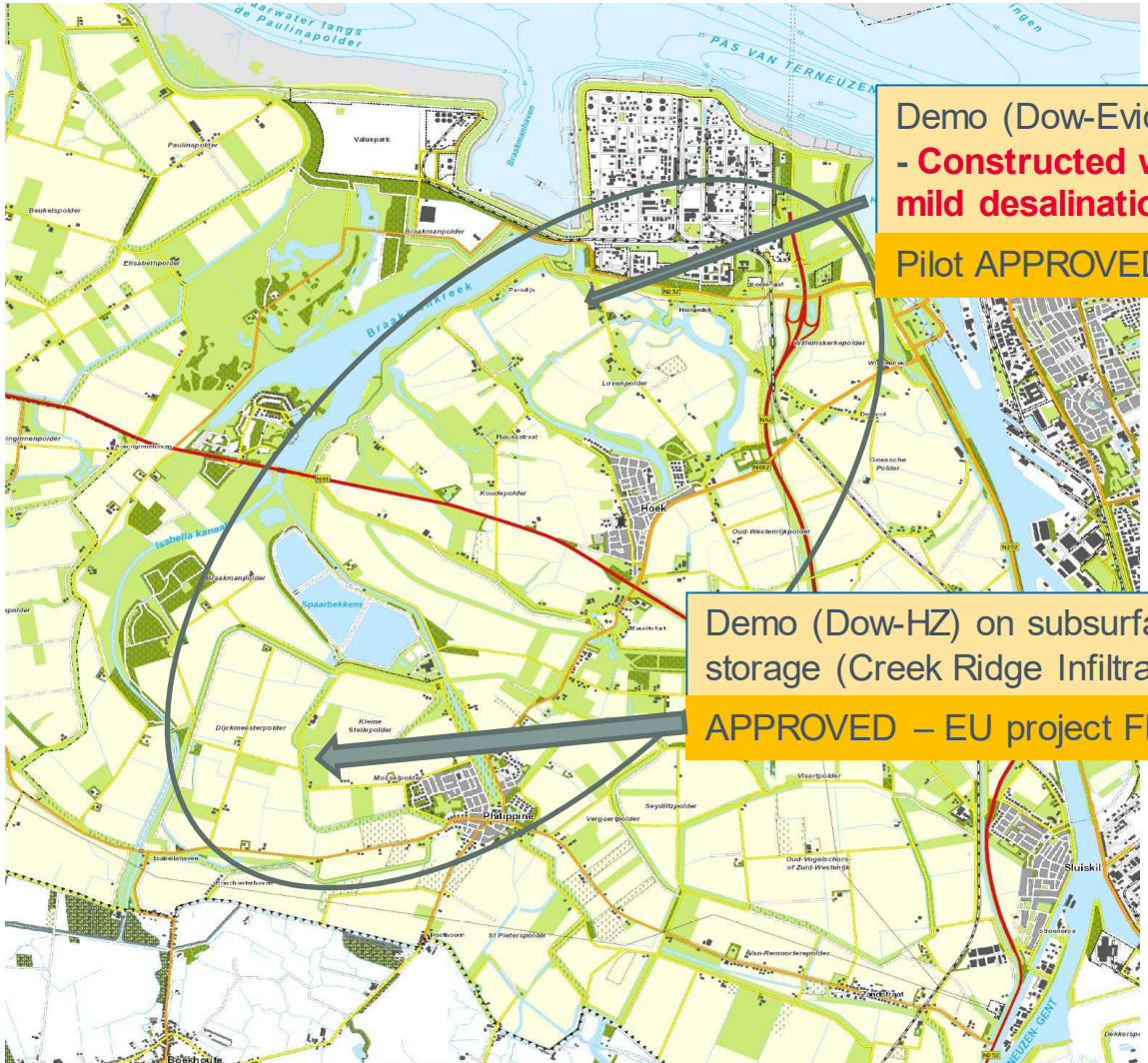
Waterschap Zeeuws-Vlaanderen

DOW

evides waterbedrijf

Grontmij

DELTA ACADEMY


Demo (Dow-Evides-Waterboard)
- Constructed wetland connected to mild desalination plant
Pilot APPROVED – Dutch Delta Fund
Demo (Dow-HZ) on subsurface freshwater storage (Creek Ridge Infiltration)
APPROVED – EU project FRESH4Cs

Realization as part of new 20-yr water supply contract with Evides Industriewater

Technical concept characteristics

- Addressing the need for **higher degree of reliability** and robustness, meeting **future water quality** objectives
- High quality CT make-up water represents an **excellent business case** for downstream facilities
- **Collected experience** of DW&PS SME's, Dow sites and external, current Evides water plant and preceeding E4Water (EU study) results
- Wetlands for feed stream equalization and biological stabilization
  - Cost savings vs. alternatives (BACF) in chemicals, energy, and O&M
  - Adds to Nature Goal (hybrid between green and gray)

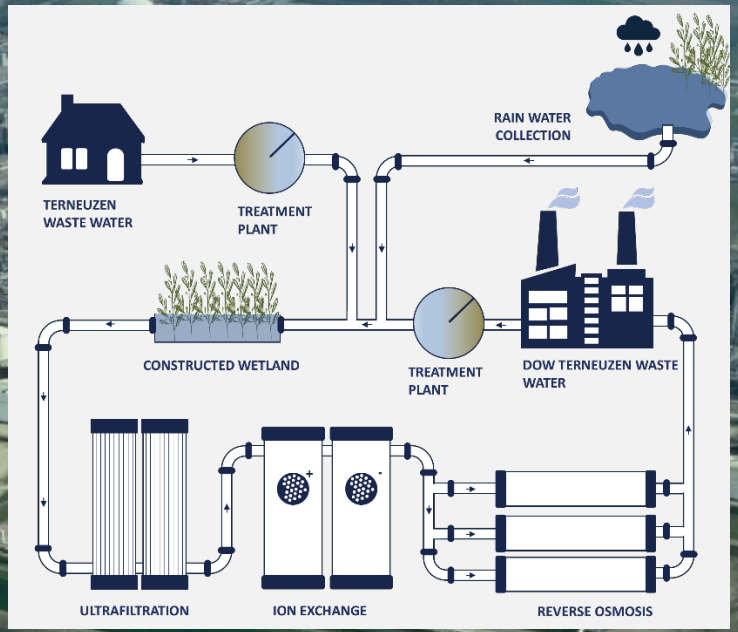
CLOSING THE WATER LOOP

Reuse of three different sources:

- **WWTP-effluent Dow** (increase from 2 to 4 million m^3/y)
- **Municipal effluent** (increase from 2.5 to 3.5 million m^3/jy)
- **Collected rainwater** (0.5 million m^3/y)

Biological system based on green infrastructure as pretreatment to reduce downstream biological fouling

2025

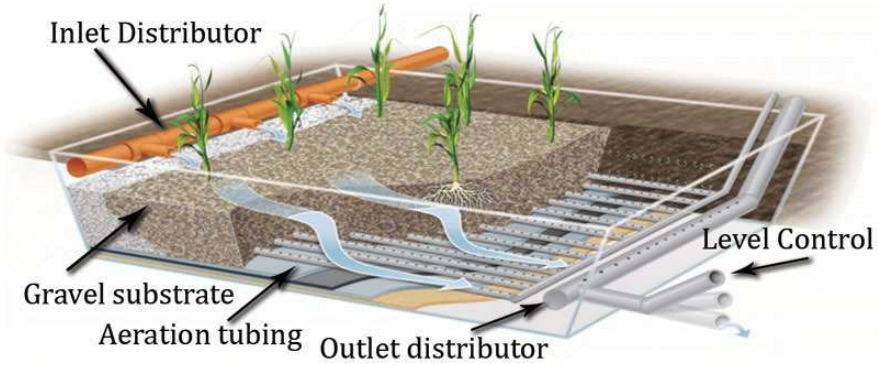


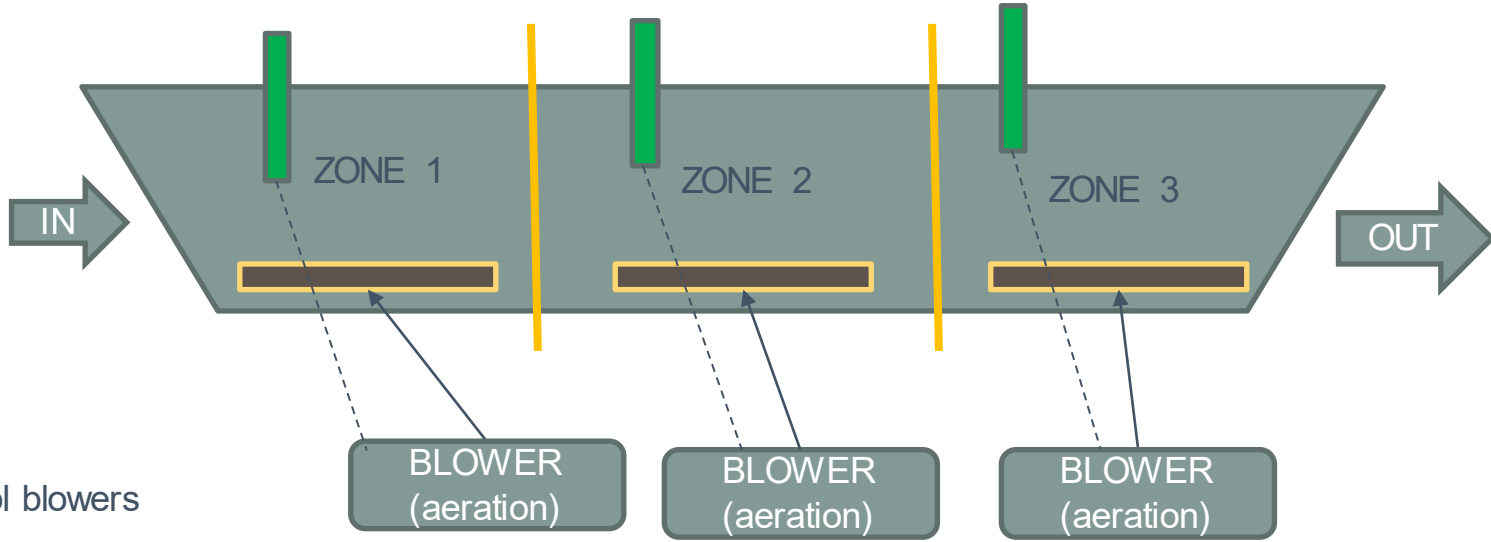
A STEP FURTHER: ENGINEERING WITH NATURE

Why WETLANDS?

Reduce use of chemicals and energy in conventional treatment systems

PRINCIPLE AERATED WETLAND





"A high tech wetland"

Wetland operation and control

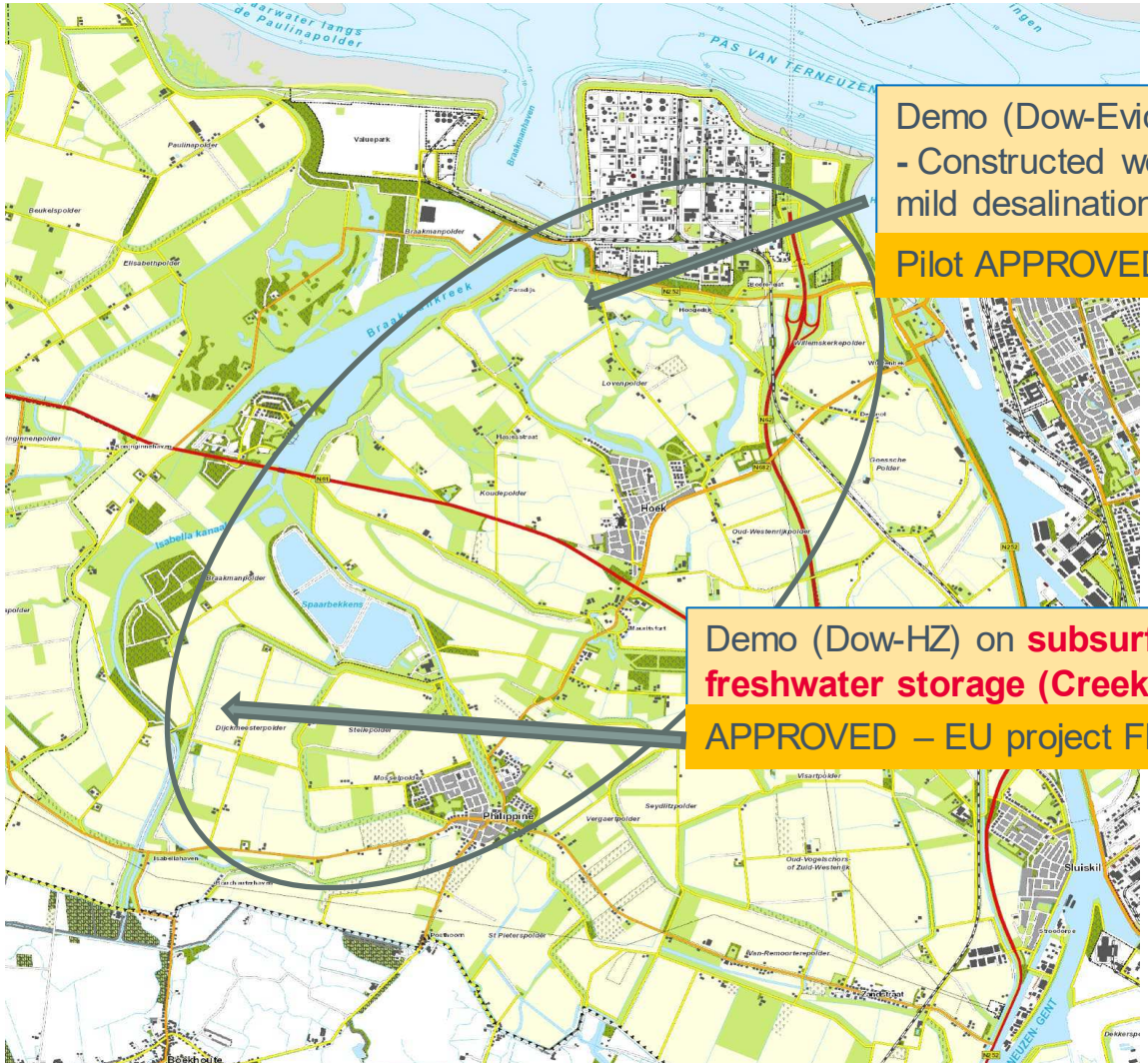
Blowers

UV Sensor

Nitratax sensor

Amtax sampler measuring ammonium

DO and temperature probes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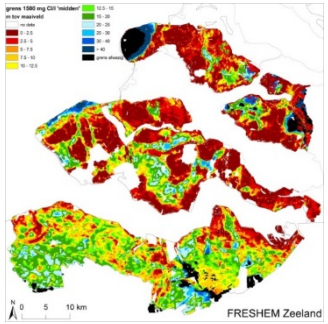
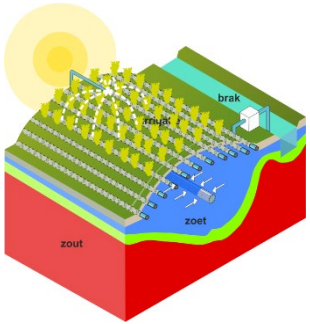
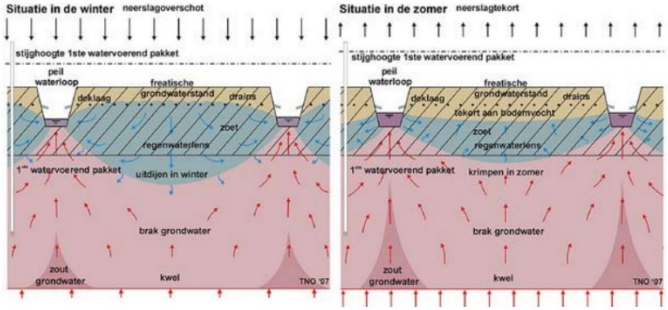
Deltares







Sustainable fresh water supply using subsurface

Creek ridge infiltration System opportunities

Interreg
2 Seas Mers Zeeën
FRESH4Cs
European Regional Development Fund

FRESH4Cs aims for sustainable alternative water resources for all users in coastal areas through the demonstration and replication of technologies for water buffering and water reuse.

Project partners:

www.fresh4cs.eu

Boundary conditions

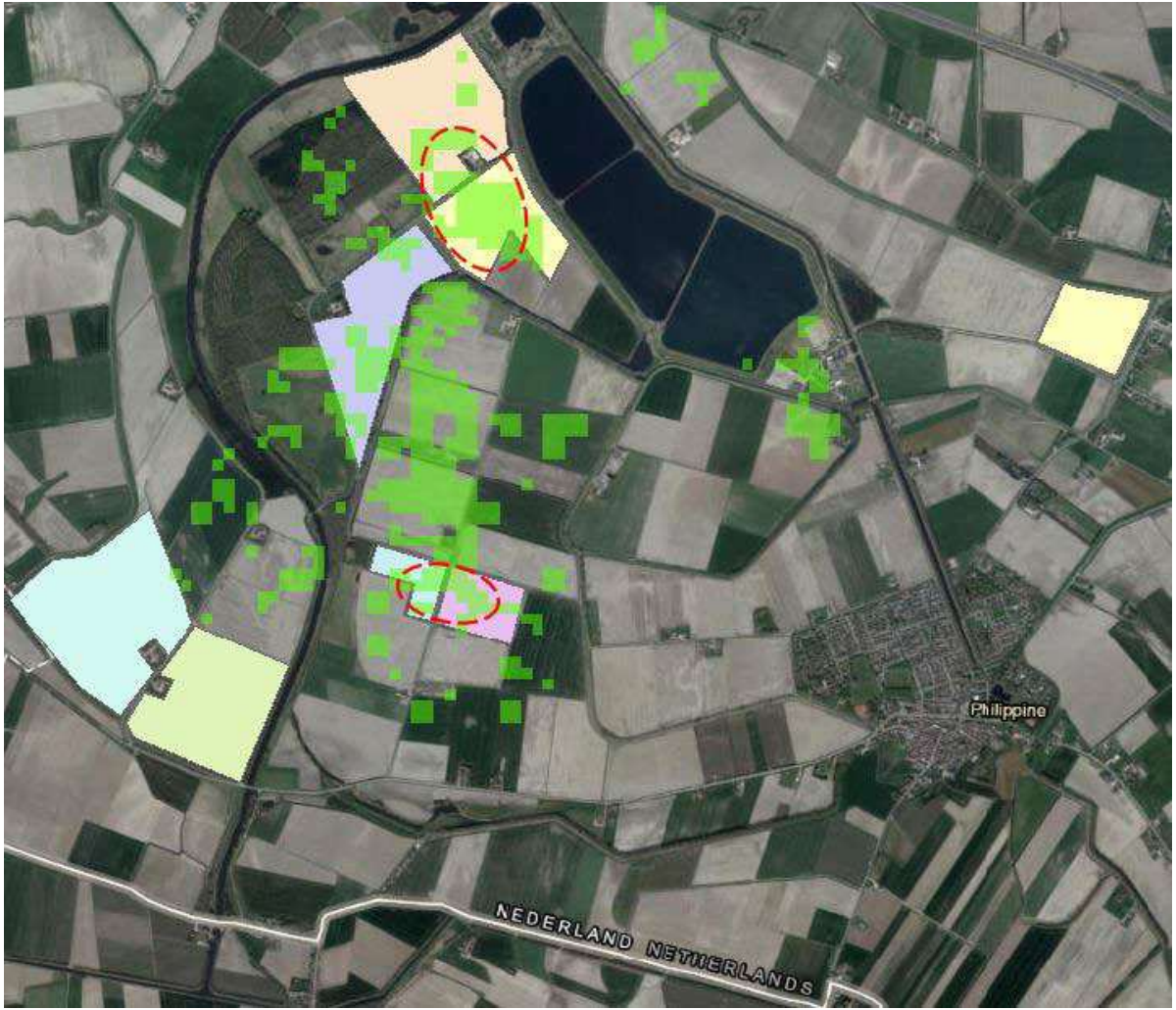
- Sandy creek ridge
- Presence of a fresh water lens in saline area
- Growth opportunities (sandy layers underneath)
- Agricultural land use
- Natural infiltration (no seepage)
- Groundwater level sufficiently low (unsaturated zone available)

Map of suitable areas for CRI

- green areas fulfill all criteria for CRI
- dashed areas identified for field measurements and demo in 2021/2022

Collaboration with agriculture, so that also farmers can benefit in periods of drought

Target 0.5 – 1 million m³



NEXT STEPS

1

2019

PILOT UNIT ~1.7 MM$

Evides

0.8 MM$ from the Government

Balance between Dow, Evides and Water Board

2

2021

3

2024

FULL SCALE **PLANT**

Terneuzen

4

2025

100%

Circular Water Use by **2025**


DOW
Connects
Chemistry & Water
with passion!
Water
Each drop counts!

Seek

Together™