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FRESH4Cs
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# Investment 1: Water transfer network at Felixstowe (UK)

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# Executive summary

In this investment, the FRESH4Cs project has constructed a 11.5 km long pipeline network that transport natural surface water to reservoirs where it is used for irrigation agriculture. Water is pumped at the seawall where the Kings Fleet enters the Deben estuary. Two river screen pumps (240 m3/hr) are used that protect eels. Water quality is monitored using a sonde, and when quality is not met the pumps are stopped. This is especially relevant for conductivity because of the impact of road salt.

This investment had already a long preparing trajectory before the FRESH4Cs project. Preparatory work led by the Suffolk County Council brought all stakeholders together in 2013.
To organize this investment a separate company, Felixstowe Hydrocycle Ltd. , has been founded as a cooperative between six farmers. This company ensures the professional delivery of the project and the transparent management of members and Interreg funding. A proportional funding approach is used to cover the investment running costs of the business and is based on the requested volume of water per farmer. The cost for water varies with electricity costs for the pumps and lies between 20 and 25 pence per $m^3$. The project requires an Abstraction License from the Environment Agency

The main lessons learned are:

- The technical innovation is not big for this investment, but the innovation is mainly at non-technological level
- The initial engagement of all interested stakeholders at the very outset of the project was crucial
- Cooperation with formal partners Suffolk County Council, Environment Agency, Internal Drainage Board and University of East Anglia was very important
- Clarity around cost and benefits needed to be demonstrated to farmers to allow them to make the commercial decision required to fund the business
- Although this investment was successful, the business case still depends on public (Interreg) funding.

# Introduction

The water challenges that farmers face in the next years were clearly recognized seven years ago by a group of forward-thinking stakeholders. With the help of Suffolk County Council, they were coordinated and led by Jane Burch, through a vehicle called the Holistic Water Management Group. They identified a series of opportunities in Coastal Suffolk of which the re-cycling of drainage water was one. Importantly they recognized that if such a pioneering collaborative project was to be successful, then it would need all potential stakeholders to be engaged from the outset. The first initial meeting in 2013 was represented by 16 different stakeholders. With hindsight, this wide-ranging engagement ensured that the "ground had been softened", when the Interreg funding was secured, making the final build of the project possible.

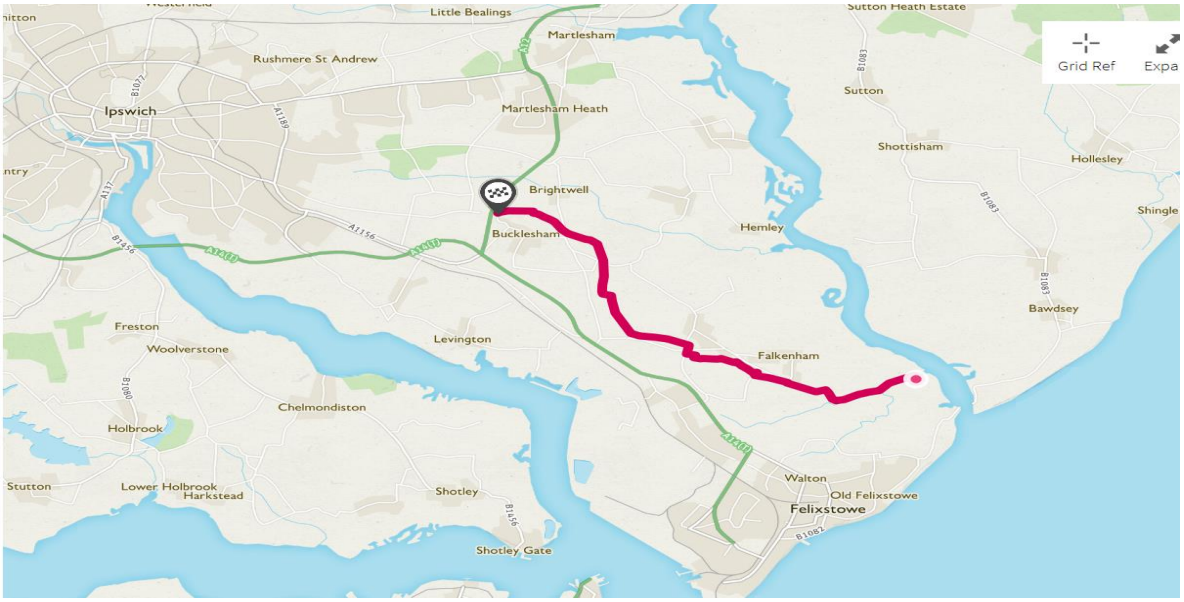
Agricultural irrigators in coastal Suffolk are facing reduced supply of freshwater resources (up to 25% by 2027), due to regulatory reform and competition from Public Water Supply. They also are predicting increased demand from increased customer requirements and climate change. As such, investments in alternative and sustainable water resources are necessary. In the same region high surface flow water is currently pumped into the North Sea by the Internal Drainage Board (IDB), from below sea level pumping stations, along the Suffolk coast, to meet their national drainage responsibilities. The obvious opportunity is to recycle this freshwater to farm based winter storage, to use for summer irrigation, instead of wasting this scarce resource to the North Sea.

To achieve this a 11.5 km twin pipeline has been installed, serviced by a common pumping station that is based on the seawall. This new pumping arrangement also reduces the damage caused by the existing pumping arrangement, that is eroding the European significant saltmarsh, in the Deben Estuary. The pipeline passes through different 11 different landholdings and via a series of pipe connections delivers to 11 existing reservoirs and 2 new reservoirs. The pipeline also services the Managed Aquifer Recharge demo site.

To deliver this demonstration project a company has been formed, Felixstowe Hydrocycle Ltd , to ensure the professional delivery of the project and the transparent management of members and Interreg funding. Each member invests capital in line with the volume of water he is committed to take from the scheme, members share of the water ranges from 2% to 34% .
This demo case combines innovations at technological and non-technological level to prove that a viable business case is possible. Through the farmers' co-operative, six farmers work together to deliver a collective scheme, taking advantage of the larger scale to minimize costs and organizational time needed. We developed a system to separate fresh and saline flows at the seawall, to allow freshwater to be pumped separately to saline water. The cooperation between the different private and public FRESH4Cs partners allows that all regulatory and environmental stakeholders are involved to solve regulatory and organizational problems, and to maximize benefits for farmers and the environment.
The Felixstowe demo case has the ambition to **serve as a best practice of farmer-to-farmer interaction** to preserve precious fresh water resources, with added benefits for all coastal water users including the environment. The MAR demo is treated as a separate demo and is not explained in this demo info sheet.

# Technical aspects of the demo

Please see map below, which shows where the project is located on the Suffolk coastline. The current drainage system gathers urban drainage water from Ipswich and Felixstowe, including two major highways ( A12 and A14 ), and combined with agricultural drainage water , pumps it out to the North Sea via a large Internal Drainage Board pump located on the sea wall on the edge of the River Deben Estuary, where the Kings Fleet enters the estuary.

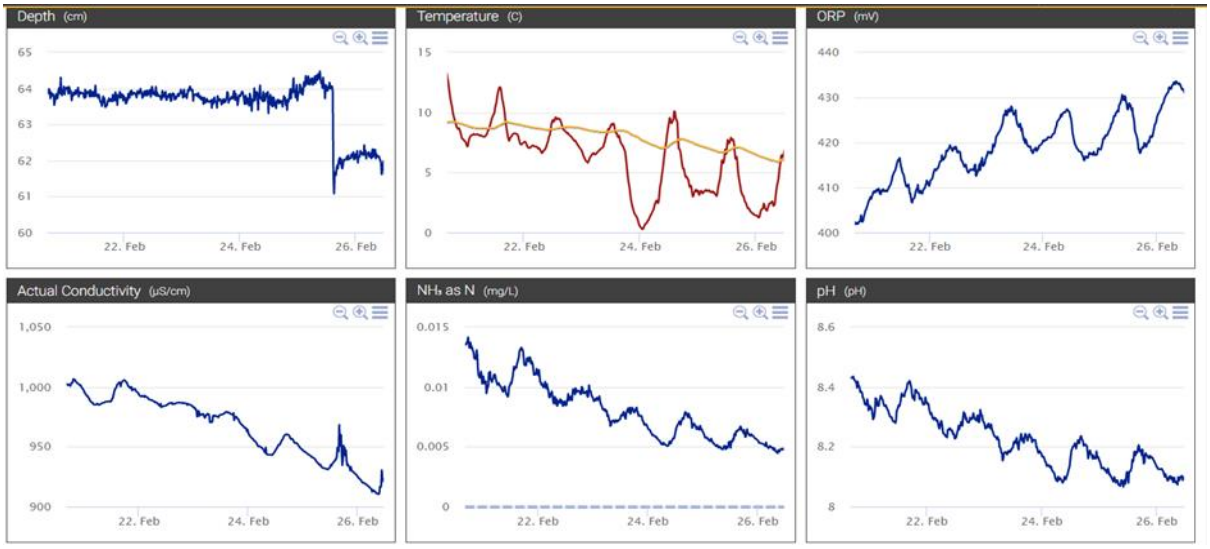



This historic pumping has caused concern that the valuable saltmarshes in the estuary are being eroded by the pumping activity (see picture below) .

To protect the environment from this risk, Felixstowe Hydrocycle , working in collaboration with the East Suffolk Internal Drainage Board , have installed a new pumping station , that intercepts the high flows and avoids the need to pump them into the estuary, hence reducing the damage to the saltmarsh.

The pumphouse is serviced by two Riverscreen high volume (240 m3/hr) floating pumps that are designed to protect young eels from damage . To do this the water has to pass through a 2 mm rotating screen .This is kept clean by a pressurised spay bar and the system is capable of operating in both very dirty water and at freezing temperatues.

Quality of water coming into the system is monitored by a 7-way sonde that allows a range of water quality parameters to be monitored and the pumps to be stopped if thresholds are reached. Because of the proximity to the sea the biggest concern is saltwater ingress. However, the only concerns to date, have come from elevated conductivity levels related to salt that is spread on the roads during icy conditions, making its way into the drainage water.



The water is pumped up to the main pumphouse (see below ) where it is then boosted by 2 x 45 kW pumps , into the pipeline at a pressure of 12 bar. To service this duty of pumping, a new 3 phase supply had to be installed with a new transformer. There are protection systems built into the controls to ensure that if a leak occurred, the pump control would recognize a drop in pressure and/or an increase in flow and automatically shut the system down. The monitoring and controls within the pumphouse can be accessed and changed remotely through a sophisticated telemetry system, that allows pumps to be controlled via an iPad.


This valuable water resource that is captured, is then returned back in land, via a pipework network to a combination of existing and new winter storage reservoirs. The pipeline consists of two 200mm PVC pipes laid next to each other in a common trench. Release of water to reservoirs is controlled through a series of stations that have remote control valves and flow recording, connected to a portal that allows access to all farmers.

The pipeline and pumping equipment was installed over a 5 month period during good weather and ground conditions and installed by one contractor using two small teams. Having a common contractor for both elements (pipeline and pumping ) helped ensure ownership of the effective operation of the whole project.

## Technical performance

First operational trials were completed in December 2020 and the system fully commissioned in January 2021. It has operated fully since this time, delivering 1,168,735 m3 to farm reservoirs by the 4th February 2023. At this stage with all reservoirs being full, the surplus water is released to sea. These released volumes are being recorded and there is an intention to use these volumes to approach the Environment Agency to expand the abstraction license to 900,000m3 p.a.
During this period the pumping has run very smoothly, with no technical or operational concerns. There have been 4 pipeline issues, with 2 blowouts being associated with faulty seals (see below).

A further two blowouts associated with air getting trapped in the system following long periods of non-operation. This has been overcome by re-programming the startup intensity of the pressure pumps and with the addition of 4 more air valves to allow release of trapped air.

In all cases the leak detection system worked and shut the pumps down before any significant damage occurred. The system has now run smoothly with no blowouts in the last 18 months of operation.

### Lessons learned

There are no significant technical design features that would be changed following the successful operation of the water transfer. This is probably a reflection of the quality of workmanship and the time that was put into the design and specification of the scheme before going out to tender.

## Non-technical aspects of the demo

### Regulatory framework

For water to be abstracted the company had to get an Abstraction License from the Environment Agency. To achieve this the company had to provide accurate evidence of the existing volumes being pumped into the sea. This was achieved through the installation a Mag meter to the existing IDB pump network. With this data secured and information confirming the suitability of the water quality, the company were able to apply for and achieve an abstraction license for 600 000 $m^3$ per year.. The abstraction must respect the need to leave some flow of water through the existing IDB pump system to protect freshwater flows for eel and fish attractant and for wading bird activity in the creeks. There is also a condition to maintain levels on the Kings Fleet to protect the fishing club interests.

### Business setup and business case

Felixstowe Hydrocycle has been formed as a Limited Company and is owned by the 6 member farms. Each member has requested a volume of water to be supplied to their farms, these vary from 3% to 34% of the total volume committed by the 6 members. To secure this volume the members have loaned 50 % of the capital required to set the business up (and match fund the Interreg funding), these loans are proportional to their committed volume. The bigger the volume of water required the more loan is required. This proportional funding approach is also used to cover the running costs of the business. The original budget for the cost of water supplied to farm reservoirs was 20 pence per $m^3$. This cost was achieved in the first two seasons of pumping but has risen to 25 pence $m^3$ in the last year due to the increase in electricity costs.

Governance is through a formal Board structure comprising of two Directors elected from the 6 farmers, an independent Chairman and a Managing Director employed to operate and manage the business. The long-term objective of the business remains the same. This is to deliver a sustainable and reliable supply of water to their farming businesses, in a cost efficient manner that is capable of repaying their loans over a 20 year investment period.

### Lessons learned

The big lessons learnt throughout this project are all based around the need and benefits of co-operation and collaboration.

- As mentioned above, the initial engagement of all interested stakeholders at the very outset of the project was crucial in ensuring everyone had had a chance to be heard from the very beginning.

- The willingness of the formal partners Suffolk County Council, Environment Agency, Internal Drainage Board and University of East Anglia, to be open minded , innovative and flexible, through the early stages was crucial in the development of this new way of capturing water resources.
- Clarity around cost and benefits needed to be demonstrated to farmers to allow them to make the commercial decision required to fund the business.
- Once the decision was made to deliver the project, the delegation of responsibility to a separate team, ensured that the project retained a focus separate to the day to day farming businesses.
- Sharing and support from partners in UK, Belgium and Holland were very valuable both in technical areas and in the regulatory process.

## Conclusions and replication potential

This has proved to be a successful project, despite the challenges of the pandemic, and one that has great potential to be replicated in East Anglia. The technical requirements are not that challenging or innovative, which in itself reduces the risk for much of the capital investment required for lookalike schemes. The innovation required and the challenge for anybody looking to replicate this scheme, is in the innovation of thought, that is required to get the significant groups of stakeholders thinking in a collaborative manner.

It should also be noted that even with great commitment and collaboration that Felixstowe Hydrocycle have achieved, it would not have launched without the considerable Interreg grant funding that allowed the farms to jointly fund this scheme. With the high material inflation that a lookalike scheme will be exposed to if built in the next couple of years, there is a need for both farmers and UK government to support and further value the benefit of such projects.