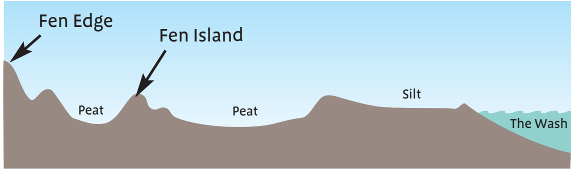
An Introduction to the Guide to Management Strategies and Mitigation Measures for Achieving **Good Ecological Potential in Fenland Waterbodies**

Water has always been at the heart of the Fens, and its management is vital to the life and livelihoods of the communities that live there. Modifications by man over hundreds of years to facilitate the passage of water from the land have left us a hidden wetland network of thousands of miles of ditches and drains within a vitally productive farmed landscape. These channels are not only essential today for this purpose but also provide an important refuge to nature, much like hedges in other farming landscapes.



Schematic section through Fenland

Fenland watercourses are very different from rivers, these channels usually contain slow-flowing water, retained behind sluices and pumped into main rivers or the sea; most have no 'natural' flow at all. Whilst the management objectives for water conveyance and ecology in this environment may appear to conflict there are techniques available that maximise the benefits for both at a range of spatial scales.

Fenland urban areas and rivers

Our challenge today in valuing our water environment is to ensure that any improvements we seek to make work in tandem with the wider needs of society to manage the risk from flooding and drought. This guide offers a key tool to considering how we can incorporate environmental enhancements into the lowland water bodies of the Fens whilst retaining these functions.

We hope that this introduction can inspire water managers in the Fens, whether they are a local farmer, Internal Drainage Board or national agency, to take further steps to improve the ecological potential of Fenland waterbodies. The more detailed guide explains how to interpret the relevant parts of the Water Framework Directive in the context of this lowland landscape and provides a consensus view of the Mitigation Measures available to water managers through a series of case studies.

Typical Fenland Landscape

The Water Framework Directive (WFD) puts the ecosystem at the heart of how we manage and protect the water environment, seeking more naturally functioning waterbodies, sustainable use of water resources, protection of water uses and high quality habitats for wildlife.

The WFD prescribes that the 'natural' condition of the water system should be used as the basis for determining the Good Ecological Status (GES) of each waterbody. However, the hydrology of the Fens is the result of centuries of human intervention and for cases like this, the WFD offers an alternative solution whereby competent authorities must define the ecological status they are actually going to strive to achieve Good Ecological Potential (GEP).

For artificial and heavily modified Fenland waterbodies the WFD is about achieving GEP, not GES. So rather than trying to restore the water environment to a set of physical characteristics it had in the past, we are seeking to increase the diversity of a channel's physical characteristics, its hydromorphology. This will result in a more diverse assemblage of habitats, species and communities whilst maintaining a channels core functions in conveying water.

The WFD requires that operating authorities look at what Mitigation Measures, or management interventions, can be taken to improve each waterbody's hydromorphology and ecological potential. However, a Mitigation Measure must avoid having a significant adverse impact on the use and functions of the waterbody.

Therefore, the key to improving the water environment is to get the maximum gain that can be achieved by implementing Mitigation Measures across the whole of the catchment, including private drains. In developing the guide we have identified 16 Mitigation Measures that may be implemented in Fenland waterbodies. For ease of reference these have been broken down into the following five key themes:

Working with form and function – improving the marginal habitat alongside Fenland watercourses and increasing their connectivity

- **A** Remove obsolete structures
- **B** Remove hard bank reinforcement / revetment, or replacement with a soft engineering solution
- **C** Preserve and, where possible, restore historic aquatic habitats
- **D** Increase in-channel morphological diversity, for example install in-stream features and 2-stage channels
- **E** Re-open existing culverts and alter the channel bed (within culvert)
- **F** Flood bunds (earth banks) in place of floodwalls; set-back embankments; improve floodplain connectivity

Structural modifications – enabling fish passage around and through water management assets and using soft engineering solutions where appropriate

- **G** Enable fish to access waters upstream and downstream of impoundment
- **H** Prevent fish entrainment in intakes
- **I** Preserve and, where possible, enhance ecological value of marginal aquatic habitat, banks and riparian zone
- **J** Operational and structural changes, for example to locks, sluices, weirs and beach control.

Operations and maintenance – appropriate management of marginal and channel vegetation and sediment as well as controlling invasive non-native species.

- **K** Appropriate techniques to prevent transfer of invasive species
- **L** Appropriate vegetation control regime
- **M** Retain marginal aquatic and riparian habitats
- **N** Sediment management strategies (develop and revise)
- **O** Appropriate channel maintenance strategies and techniques

Water management

- **P** Appropriate water level management strategies, including timing and volume of water moved
- **Q** Appropriate techniques to align and attenuate flow to limit the detrimental effects of pipes, inlets, outlets and off-takes

Education

- **R** Educate landowners on sensitive management practices

We have shown how all 16 of these Mitigation Measures can be implemented across a catchment on the schematic map inside, and highlighted nine case studies.

Actions to improve the water environment

C Creating habitats

As conveyance is key on a main drain to a pump, annual maintenance is needed to remove all vegetation resulting in a loss of ecological diversity. On the Smeeth Lode, a reedbed has been created by widening one side of the watercourse and transplanting a few small clumps of reed to colonise the area. The scheme created a 1 acre area of reedbed habitat, improving biodiversity and giving increased storage capacity within the drain without adversely affecting flow conveyance to the pumping station.

H Fish friendly pumping

Donningtons Pumping Station, within the South Holland IDB, was an obstruction to the movement of eels and had the potential to harm fish entrained in to the pumps. When the station was refurbished in 2016, eel Mitigation Measures were included as part of the works. These were the installation of new fish friendly pumps, an elver pass and an eel friendly outfall flap to allow passage of juvenile eels upstream during their migration.

D Increasing channel diversity

Typical trapezoidal drainage channels tend to be too deep for most emergent plants to grow. Therefore, leaving dead-end drains or head water ditches as conservation areas can be a very positive action to enhance biodiversity. When an old diesel pump on a drain was retired from service, the channel became a cul-de-sac on a spur off the main watercourses. By adopting a less frequent maintenance regime it has become an attractive and valuable conservation area where water violets and many other emergent plants have established and thrive.

R Sensitive land management

Fenland waterbodies can be impacted by high levels of phosphate and sediment from agricultural run-off and treated sewage effluent. This can cause excessive algal growth, stripping the water of oxygen in certain conditions and damaging the ecology of the watercourse. To reduce diffuse pollution entering a Fenland watercourse, there are a range of interventions a landowner could consider such as interception ponds, offline storage, no till drilling and grassland buffers strips, potentially providing considerable wildlife benefit.

G Fish and Eel Passage

Fulney Lock, in Spalding, was an obstruction to the movement of fish, including eels, from the tidal to the non-tidal River Welland. To increase an existing, very small, time window in which eels could negotiate the lock, and to make it accessible for fish, a 300mm aperture penstock was installed in the outer doors. Modelling showed that the aperture could be left open as a default without affecting flood risk or upstream uses.

M Marginal habitats

As shallow water areas where emergent plants can thrive are a scarce but ecologically valuable feature, the solution is to construct a submerged berm. This is a narrow ledge at the base of the bank just below the normal summer water level, creating new marginal habitat where aquatic plants can establish. Ideally the berm should not be absolutely level as the different water depths will favour different plant species creating a more diverse habitat structure. This two stage channel also increases the capacity to store additional volumes of water during flood conditions.

KEY

- Lock gates
- Septic Tanks
- High Level Carrier/Tidal River
- IDB Main Drain
- IDB Watercourse
- Landowner Drains
- Soke Dyke
- Embankments
- Road
- Urban area

Mitigation Measures Themes

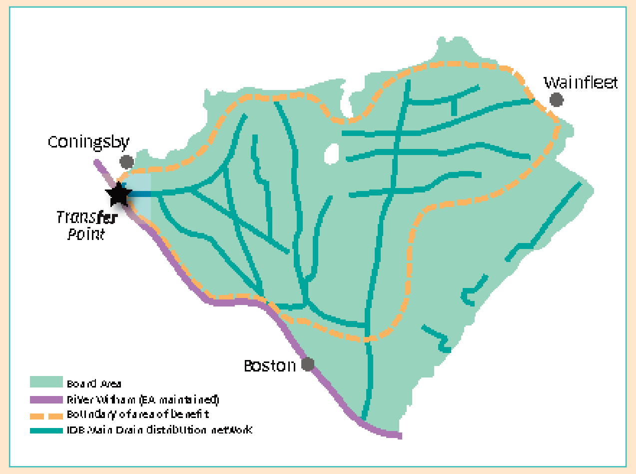
- Working with form & function
- Structural Modification
- Operations & Maintenance
- Water Management
- Education

B Erosion control

Hard engineering construction work may prove expensive and significantly impact the ecology and hydrology of the watercourse. Soft engineering tries to work with the natural processes and use natural products such as thorn faggots. The challenge is to find a sustainable solution to fix the problem that suits the natural environment. In some cases, this may be a combination of both hard and soft engineering methods depending on access to site and availability of local soft materials.

P Water level management

Following agreement between the EA and the IDB, growers concerned about access to water during dry years, joined forces and funded a scheme to transfer water from the River Witham into the upper reaches of the Witham Fourth catchment. The IDB manage the water transfer enabling them to maintain levels across the catchment. The scheme has provided additional improvements to water quality, by freshening up the usually static network of watercourses; ecological connectivity and a more consistent depth of water, for navigation, recreation and angling.



F Floodplain connectivity

The Long Eau was a typical example of an agricultural improvement scheme where flood defence banks cut off contact between river and floodplain. By setting back the banks washlands were created in the floodplain, opening up areas for seasonal flooding. This created valuable wetland that supports feeding wildfowl and waders, and where lapwing and redshank breed. With the additional benefit to flood protection locally as water spills onto the reconnected floodplain.

Where can I find out more?

The full guide and this brief introduction are available to download in pdf form from www.ada.org.uk

Who was involved?

This guide was completed through the willing input of the staff of the Environment Agency and Internal Drainage Boards who steered its content. Cambridgeshire ACRE was instrumental in bringing this content together and publishing the guide.

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Back cover photo © Kelvin Brown

Representing Drainage Water Level & Flood Risk Management Authorities

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Cambridgeshire ACRE

in partnership with Environment Agency

Middle Level Commissioners

North Level District Internal Drainage Board

South Holland Drainage Board

Water Management Alliance

Witham Fourth District Internal Drainage Board

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