

OUSE WASHES



BARRIER BANKS IMPROVEMENTS



NRA

*National Rivers Authority
Anglian Region*

HISTORY

The fens, rivers, defensive banks and washes as we know them today are almost entirely man-made. Situated where several rivers ran off higher ground into the Wash the fenland area was for centuries a wet, boggy area frequently under water and inhabited by sparse populations of fen men who lived on the numerous areas of 'high' ground and who survived mainly by their cunning and knowledge of the area. In 1630 Francis Russell the Earl of Bedford formed a Company of Adventurers and engaged the Dutch engineer Cornelius Vermuyden to drain the "Great Level" of the Fens. By 1637 the old Bedford River was complete but many of the locals complained that there was no real improvement. In 1638 the King intervened in the argument and re-engaged Vermuyden to take a fresh look at the problems. In the same year the complaining commoners appointed Oliver Cromwell of Ely as their advocate against the drainage. In 1650, having fought and won the Civil War, Cromwell again called on the expertise of the Dutch in the shape of Vermuyden to complete the New Bedford or Hundred Foot River and a sluice at Denver. These two channels run straight towards the Wash enclosing a flood land which still fills with winter flood water as Vermuyden intended.

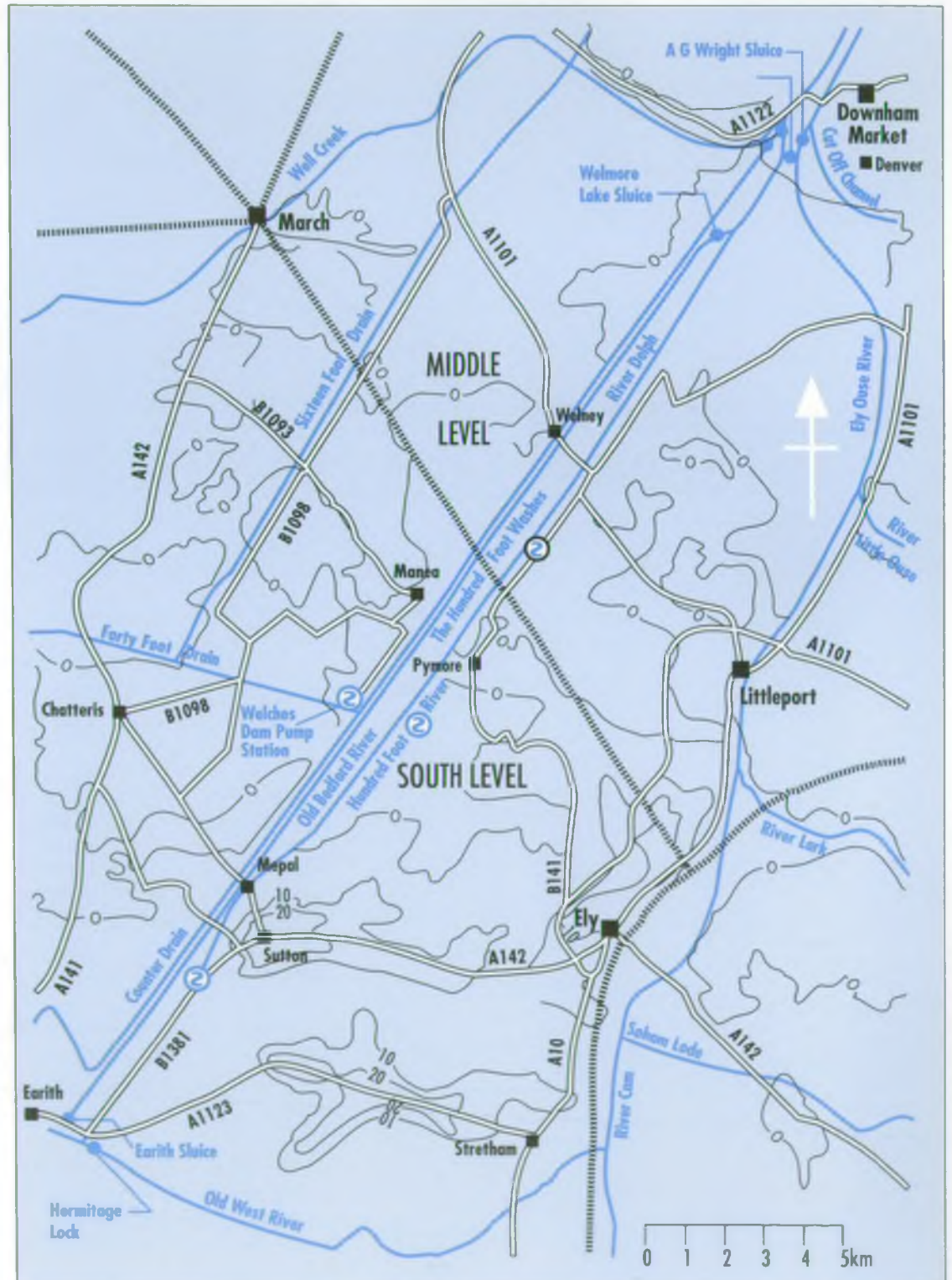
These wetlands, man made to act as a safety valve for flooding, are between the Old Bedford and the New Bedford (or Hundred Foot) River. Adjacent to and on the outer edge of those rivers are the Barrier Banks which form the rims of the water retaining area known as the Ouse Washes.



Cornelius Vermuyden



Oliver Cromwell

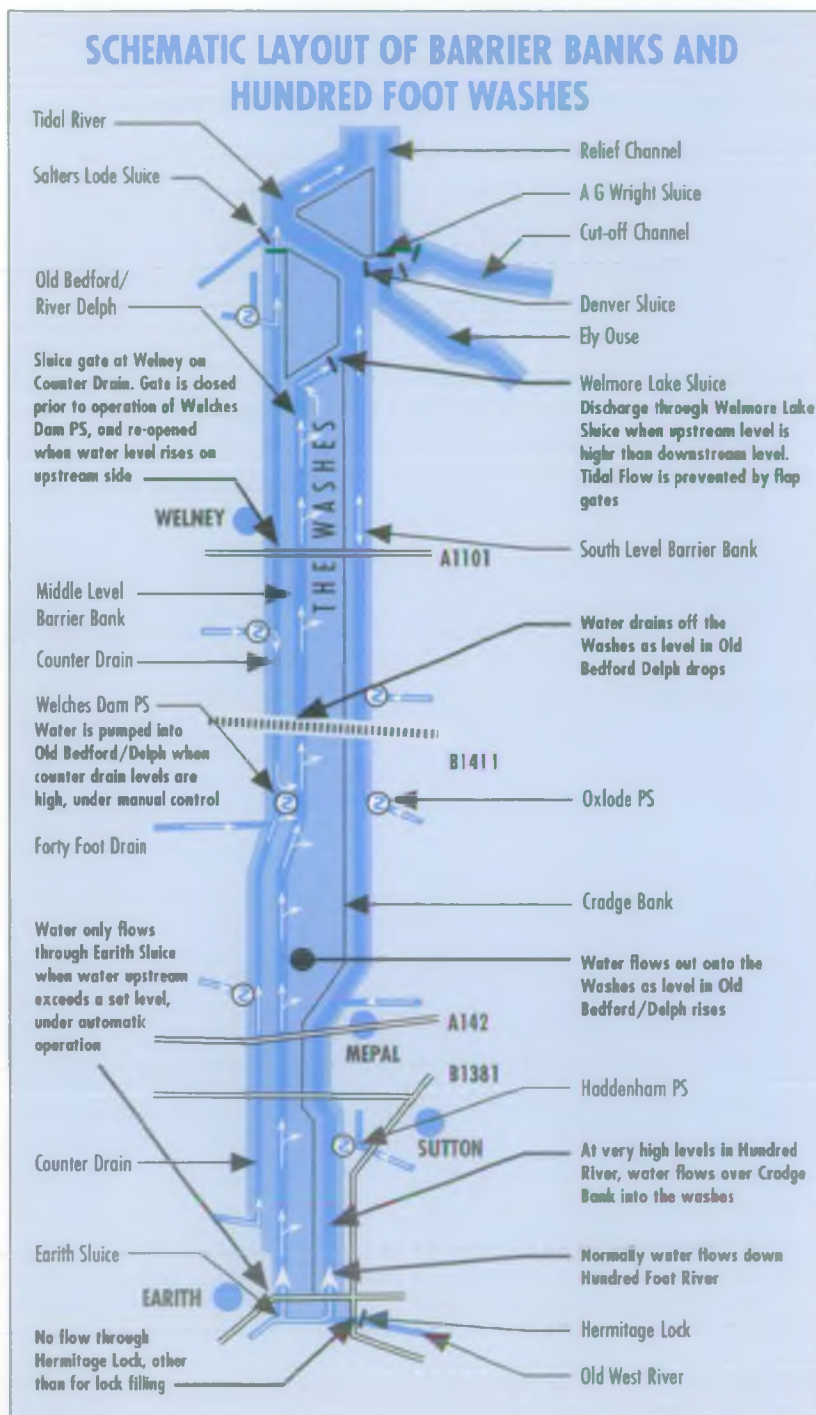


FLOODING

By the 17th century the fens were adjudged to be "drained". However, conditions were far from those we see today. Vermuyden had managed to create "summer lands" capable of being used for grazing during the summer with a few higher parts being used for arable farming. The present intensive cultivation only became possible with the formation of various Internal Drainage Boards which undertook on behalf of the farmers to embank tracts of land and keep them dry by cutting ditches and using engines to lift water off the land and up into the rivers.

The last three hundred years have seen the system fail on many occasions and vast areas of land have been temporarily flooded with either fresh or salt water. Banks have been constantly monitored and over the years the levels have been raised to keep pace with the slowly shrinking peat of the fens.

The floods in March of 1947 serve as a reminder of the catastrophic effects which can result when several forces of nature combine. Long hard frosts and heavy snowfalls followed by a sudden thaw in early March left fields waterlogged, ditches and culverts frozen solid with a rush of water from the higher land of the Ouse watershed trying to cross the Fens and get away to sea. The Washes were soon in use and by the morning of Sunday 16th March with water in the Washes and the Ouse and its tributaries rising rapidly, the flood water rose perilously near the peak of the banks. The efforts of large gangs of local men, the army and German prisoners of war to reinforce the banks was successful until East Anglia was buffeted by 100 mile an hour gales. In several areas banks gave way but the biggest breach occurred in the bank on the Ouse at Over. Thousands of acres of fertile farmland disappeared under water and



battle began to stop the spread of flood water across even larger areas of the fenland countryside. Water was rushing in a foaming torrent through a 50 metre wide gap at Over and spreading and deepening across the Fens. At Haddenham the water was up to 4 metres deep.

Throughout the black night came the dull thunder of the bursting banks, the village alarm of 'she've blowed'. The river is always feminine. In a thousand remote little farmhouses and cottages, islanded beneath wind-shriven willows or leaning poplars, the racing floods covered the black fields overflowed the straight dykes . . . and leaping upon those lonely homes with all the relentless force of wind and gales, burst open the doors, shattered the ground floor windows . . . and rushed gurgling and swirling up the narrow staircase. ⁹

WENTWORTH DAY

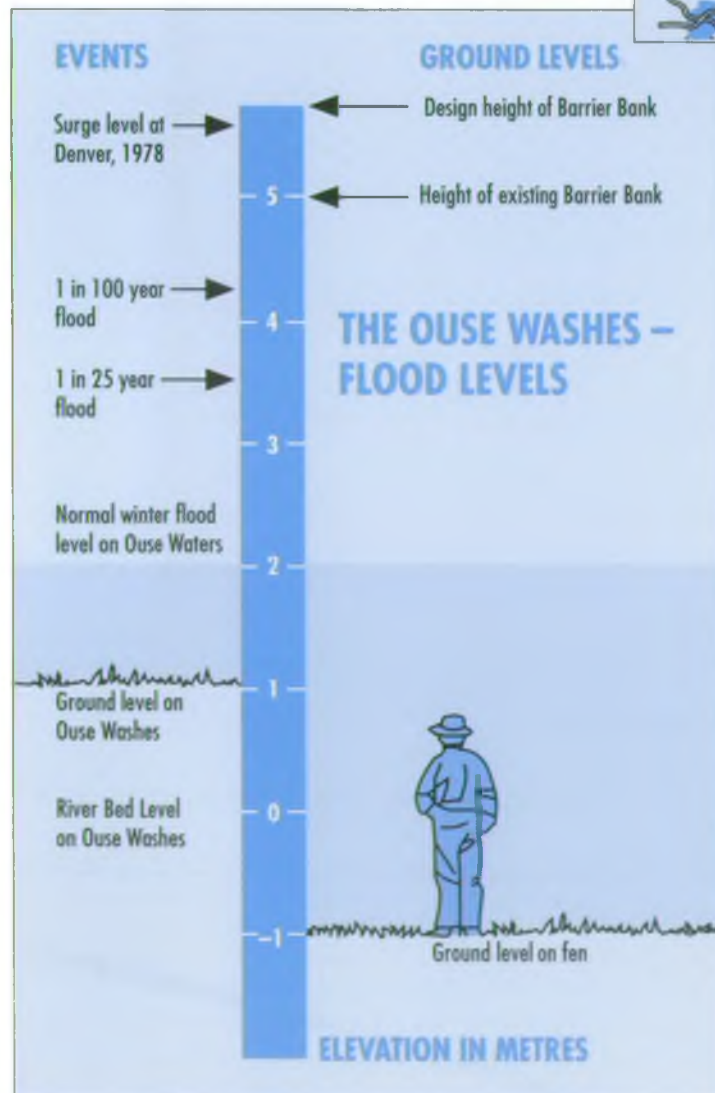
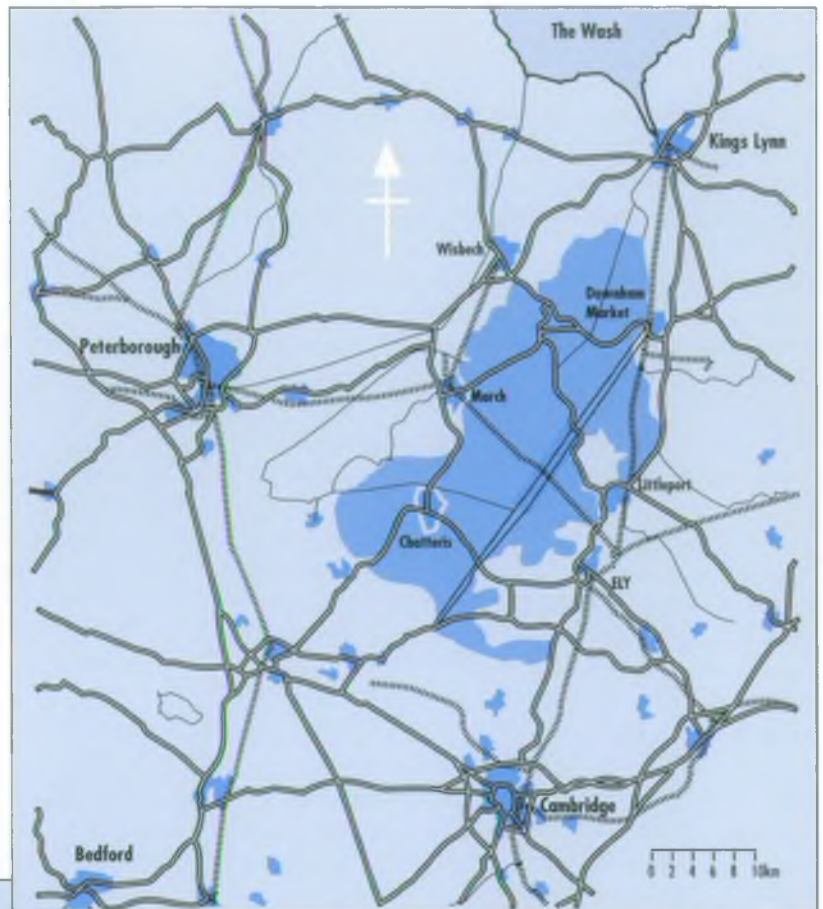
AREAS LIABLE TO FLOOD FOLLOWING A BREACH

 Area of fens liable to flood following a breach of the Barrier Banks

If the Barrier Banks were allowed to totally deteriorate the flooding would be even more extensive than shown. The fens would then flood up to Peterborough and Ely.

Since the 1940s the level of the land has steadily dropped in relation to the sea. The level of the peat Fenland has fallen by around 5m in many places since the Barrier Banks were built and the 'Greenhouse Effect' is predicted to produce a possible annual rise in sea level of 5mm.

The Barrier Banks, which contain the flood overflow from the Ouse Catchment are the key to the very existence of the Ouse Washes and also the effective drainage of the rest of the Fens. Extensive studies have shown that without major repairs there is a severe risk of instability which would lead to the collapse of sections of the banks.



Failure of the South Level Barrier Bank would affect 230 residential properties with flooding up to a depth of 1.8m causing damage valued at £4.2 million. Up to 11,000ha of high grade land would be flooded with crop damage totalling £12 million. When damage to buildings, machinery, commercial properties, road vehicles, road and rail infrastructure and repair to the bank itself are taken into consideration the total potential damage is estimated at some £23 million.

Failure of the Middle level Barrier Bank would inundate a significantly greater area with damage estimated at some £42 million.

THE PROBLEMS

In recent years concern has been expressed about the condition of the Middle Level Barrier Bank and South Level Barrier Bank. A comprehensive study of the Washes was undertaken which highlighted several issues, These include-

- a possibility of localised overtopping due to small subsidences might lead to more serious flooding.
- the construction of the banks could lead to major embankment failure due to deep seated slips whilst in places the steep gradients of the banks could lead to localised surface slips. There were signs that the Hundred Foot river channel is moving and the banks suffer in many places from poor access and consequently difficult maintenance.

- A minimum bank top width for vehicular access of 3m is needed to allow for rapid inspection during flood situations and also to allow maintenance and repair vehicles to get to damaged areas.

The study also took into account the rise in sea levels at Kings Lynn. Proposed improvements make an allowance for a 5mm rise in sea level each year due largely to sea level rise.

A cross section survey revealed there had been a general settlement of the banks of 200 to 300mm over the last 40 years.

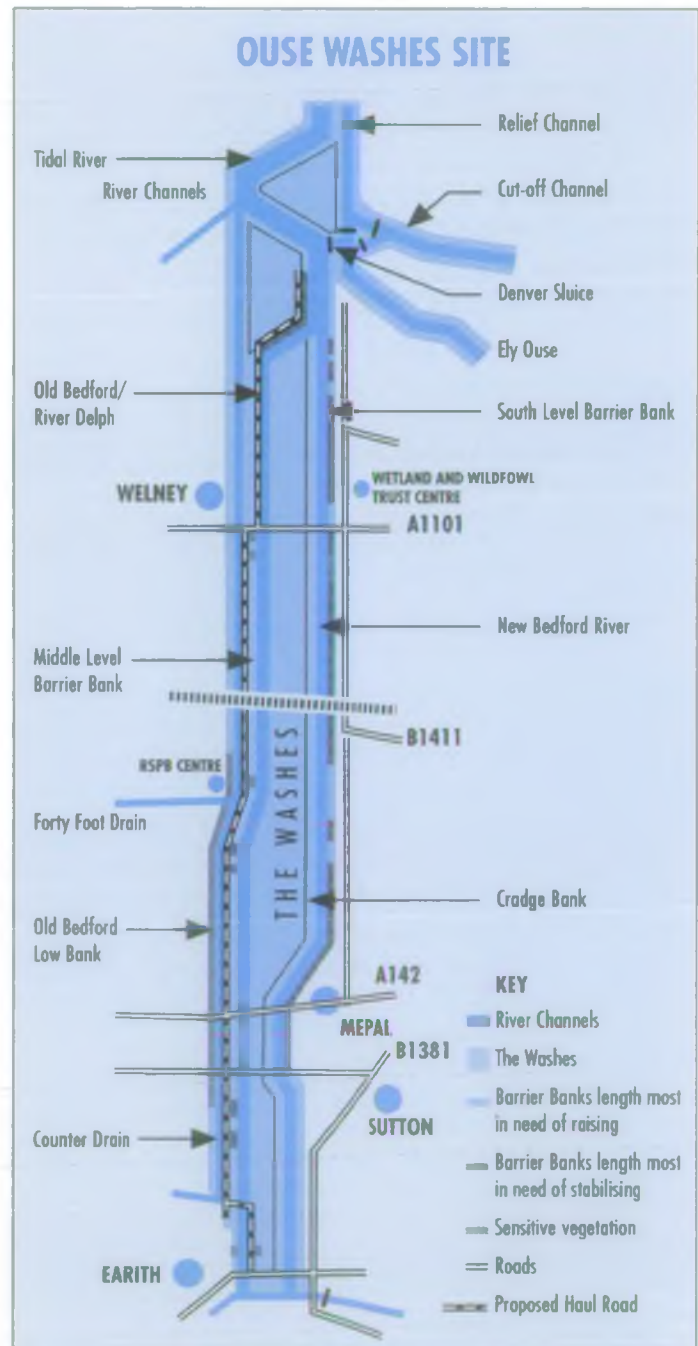
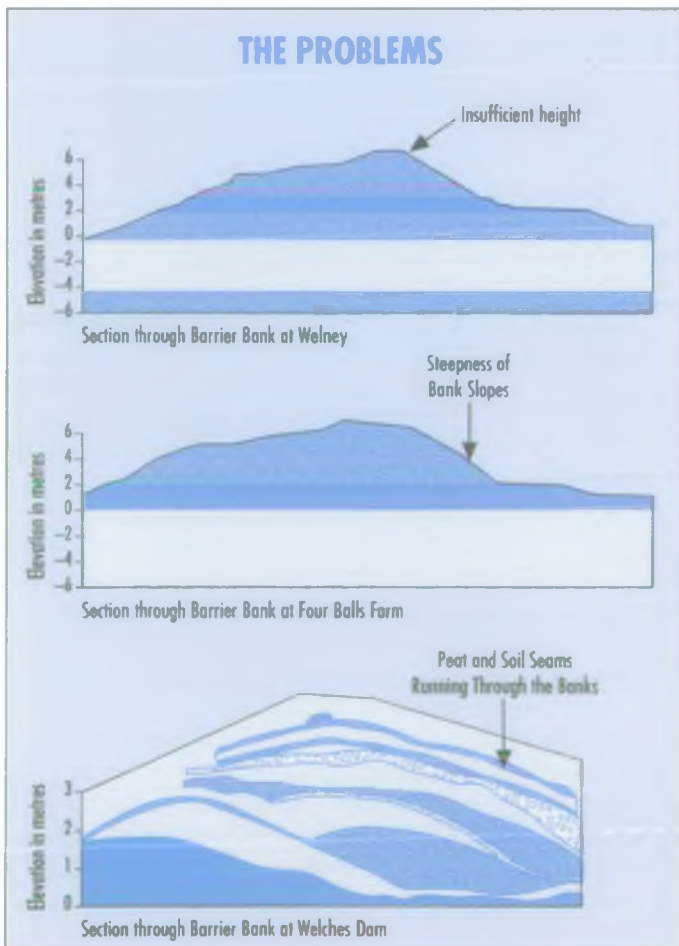
The present scheme seeks to overcome these problems of rising water levels, of deteriorating bank stability, of bank settlement and of problems caused by poor access.

SOLUTIONS

As part of a large study programme using both on site investigation and computer modelling many options were considered including the construction of a tidal barrier. A barrier would be no substitute for the necessary bank raising which is essential to secure present protection on both the Middle Level Barrier Bank and the South Level Barrier Bank.

Following discussions with the English Nature, the Countryside Commission and other conservation bodies it

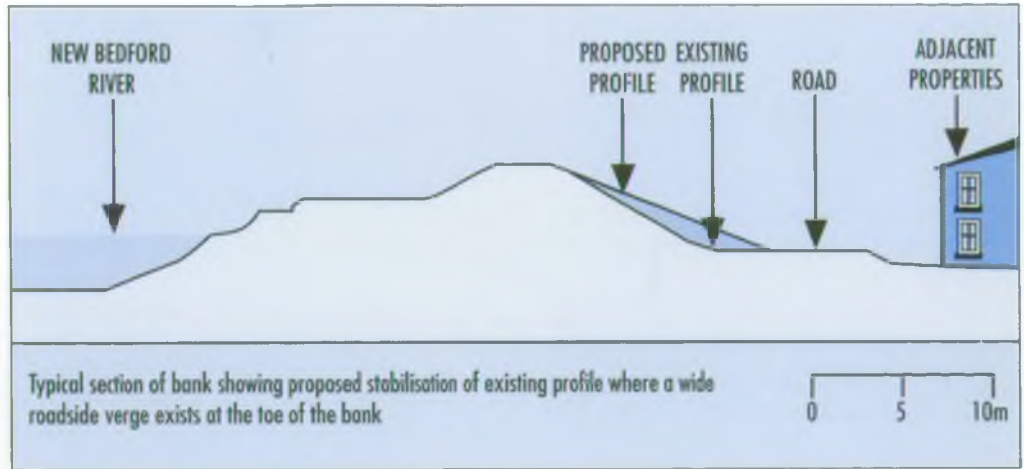
was agreed that the necessary infill material would be imported rather than acquired by channel dredging and a crest wall option was abandoned on environmental grounds.



MIDDLE LEVEL BARRIER BANK

The favoured option was for engineering works to raise the Middle Level Barrier Bank throughout its length using imported fill and to stabilise by reforming the bank with a 3m wide bank top width. A haul road is being provided along the bank toe for access and for use by construction traffic. This road will also permit future access for inspection and maintenance. Willow and osier planting, where practical, will be carried out to minimise bank erosion.

Estimated cost £13 million.

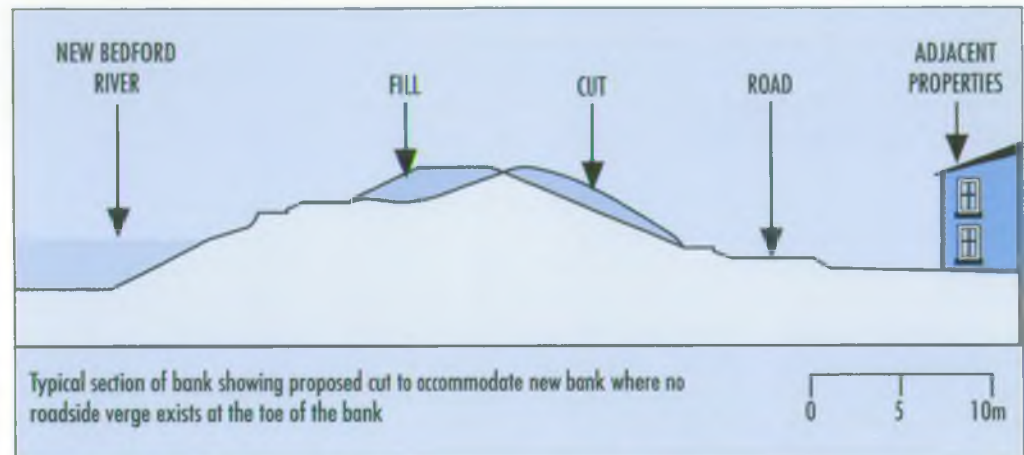


SOUTH LEVEL BARRIER BANK

Studies showed little actual raising of the South Level Barrier Bank was required except just south of Denver and south of Mepal.

The main work is to strengthen the bank either on the back face if there is no road or properties in the way or by moving the bank top towards the river where there are obstructions on the Fen side. On some isolated stretches additional reprofiling work will occur on the riverside face of the bank.

Estimated cost £8.5 million.



SUMMER FLOODING OF THE WASHLANDS

The increase in the frequency of summer flooding causes concern and measures to alleviate this problem are being investigated. A strategy has been prepared, and an environmental assessment carried out.

THE WORKS

HAUL ROAD

Access is presently available only where roads cross or run alongside the banks. Some 45 km of access roads are needed with the longest single length being 13 km. Roads are built straight onto existing ground and thickness

is varied according to the strength of the underlying peat soils which are very low.

On completion of the improvements the roads will remain, but access will be controlled. Trials are in hand to establish the preferred method of grassing over of these stone roads.

The use of this system of access roads means that only the principal local roads are used by construction traffic and the unclassified roads are not normally used.

BANK WORKS

Top soil is removed and stacked for re-use.

Any unsuitable material is removed from the bank crest and either re-worked and used in the bank toe or removed from site.

Fill material complying with tight specifications is imported to the site and placed and compacted in layers to rebuild the bank to the design profile. The placed material is tested to control the compaction quality.

The bank is then topsoiled and seeded. The seed mix used comprises several species of grasses together with wild flower seeds. The grasses have been selected to balance the need for early germination to protect the newly built bank and the longterm need of providing good grazing. Grazing with cattle or sheep will be the normal method of managing the banks.



Photograph courtesy of M. Rains

THE ENVIRONMENT

There was an option to do nothing to the Barrier Banks but this would have had a profound long term environmental effect on the habitat and on the lives of the people who live on the Fens. With increased flooding, land quality would degenerate with a possible increase in salinity and, given time, the Fens would return to their pre-seventeenth century delta state.

The main environmental effects of the work will be a local temporary disturbance during construction, with a longer term effect resulting from the new haul roads until they grass over. There will be a small, permanent visual change from the heightening and the widening of the banks, but careful selection will minimize any leachate effect from the imported material used to reprofile the banks. Where the banks are improved vegetation is restored immediately. The opportunity has been taken to enhance and extend some hedgerows.

There are several potential areas which will affect local residents and visitors during the construction period. Increased traffic could create noise and dust with short term disturbance to residents of houses living near the works. Users of the Washes, anglers, wildfowlers, bird watchers, land owners, graziers and farmers could all possibly suffer some disturbance.

The effect on wildlife will be a temporary disturbance to birds using the Barrier Banks and berms partly caused by the presence of construction traffic and partly by the change in vegetation as the sward recovers. Short grassland

is less suitable for winter grazing wildfowl (such as widgeon and coot) until it is well established. In areas with long grass and shrubs common birds such as sedge warblers, reed bunting and partridges will be temporarily disturbed but it is expected that the present bird communities will quickly re-establish. The main long term effect on birds will be the loss of the strip of land occupied by the haul roads. Although this will reduce the grazing area for some wintering wild fowl and effect the feeding and nesting habitats for meadow pipits and other species the presence of haul roads are considered unlikely to affect breeding populations significantly.

Fish are affected by river works but recover rapidly and no long term impacts are anticipated. The landscape will see small changes as the banks are heightened and widened but in the vastness of the Fens these changes will not be significant or adverse. Indeed landscape improvements could arise out of the tree planting and establishment of more wild flowers on the banks.



Photographs courtesy of The Wildfowl and Wetlands Trust



The National Rivers Authority

Guardians of the Water Environment

The National Rivers Authority is responsible for a wide range of regulatory and statutory duties connected with the water environment.

Created in 1989 under the Water Act it comprises a national policy body coordinating the activities of 10 regional groups each one mirroring an area served by a former regional water authority.

The main functions of the NRA are:

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| Water resources | — The planning of resources to meet the water needs of the country; licensing companies, organisations and individuals to abstract water; and monitoring the licences. |
| Environmental quality and Pollution Control | — maintaining and improving water quality in rivers, estuaries and coastal seas; granting consents for discharges to the water environment; monitoring water quality; pollution control. |
| Flood defence | — the general supervision of flood defences; the carrying out of works on main rivers and sea defences. |
| Fisheries | — the maintenance, improvement and development of fisheries in inland waters including licensing, re-stocking and enforcement functions. |
| Conservation | — furthering the conservation of the water environment and protecting its amenity. |
| Navigation and Recreation | — navigation responsibilities in three regions — Anglian, Southern and Thames and the provision and maintenance of recreational facilities on rivers and waters under its control. |



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