



BROADLAND

FLOOD ALLEVIATION STRATEGY



THE PROGRAMME FOR FLOOD DEFENCE WORKS



NRA

*National Rivers Authority
Anglian Region*





1993 SURGE TIDES

Recent flood events in Broadland have heightened public awareness of the area's vulnerability and the need to develop a long term strategy to protect the area. In February 1993 a spring surge sent tides of up to 2 metres upstream through the mouth of the Yare. It was the worst event in Broadland since January 1976. Within a few hours £450,000 damage was caused to the flood defences along the rivers. Major breaches took place at Hassingham, Haddiscoe Cut, Scare Gap, Bure Loop, North Breydon and Cantley.

PAST MAINTENANCE

Over the years, the NRA has tried to keep pace with strengthening and protecting banks from erosion particularly at Breydon Water and on the the tidal Waveney. Historically investment has not been adequate to cope with the widescale deterioration of the banks. Large scale investment is needed now together with a long term strategic approach.



THE STUDY

The NRA are committed to improvement of the standard of flood defences in Broadland but are concerned that they should maintain and, where possible, enhance the character of the area. To find the best way of achieving this we appointed consultants to identify ways to protect the area from flooding. In 1992 an "Options and Impact" document was produced identifying a number of flood defence options for debate and consultation in the public arena. Further development of the project has resulted in the following four options:

- 1 Bank strengthening
- 2 Bank strengthening and Bure Barrier
- 3 Bank strengthening and Bure Barrier and Washland
- 4 Bank strengthening and Yare Barrier.

Bank strengthening along with erosion protection is an essential part of any option as without it, continuous breaching and overtopping of the banks would eventually result in the permanent loss of 1,700 properties and 21,300 hectares of land.

Up to 75 per cent of the cost of the NRA's flood defence works comes from the Ministry of Agriculture, Fisheries and Food (MAFF). In order to qualify for funding, MAFF rules require the investment of all projects to be economically justified i.e. the benefits to be greater than the scheme cost. With this in mind, the conclusions to the study are:

BANK STRENGTHENING

There are 240km of banks in Broadland. The major cause of flooding in Broadland at the moment is caused by breaching of these banks. The last comprehensive bank improvement project was carried out almost 20 years ago

EXISTING EMBANKMENTS



Existing Embankments

so most of them now require strengthening and protection of the toe of the banks. In addition some banks may be raised by up to 375mm to take account of settlement and sea level rise.



BARRIER AND WASHLAND LOCATION



① Bure Barrier ② Yare Barrier ——— Railway line

The ten year bank strengthening programme will cost £57 million and has two main aims:

- 1 to strengthen the banks - cost £22m
- 2 to protect the toe of the bank from erosion by boat wash and waves - cost £35m

The works meet MAFF economic requirements, providing £1.72 of flood protection for every pound of public money spent.

Standard of Protection

Various levels of bank strengthening have been considered. However, major bank raising throughout Broadland is not feasible on engineering and technical grounds. The NRA will maintain the banks at approximately their existing standard over the next 15 years by building in an allowance for settlement and sea level rise.

This equates roughly to a one in seven year standard throughout ie. in any one year there is approximately a one in seven chance that the banks will overtop. Although overtopping may occur from time to time it will be less extensive and of short duration. It will not cause breaching of the strengthened banks, being contained, in part, within the marsh dyke system.

BANK STRENGTHENING AND BURE BARRIER (£57m + £3.5m)

A barrier across the mouth of the Bure will prevent flooding from high sea levels and would protect Northern freshwater broads from saltwater (saline) intrusion, but will not benefit the River Yare. Because of the low initial cost of the barrier, this may stand a chance of being justified economically. However, this requires further investigation into all of the benefits, particularly those of the environment. The NRA are currently working with environmental bodies to identify these benefits and a report will be produced later in the year.

BANK STRENGTHENING AND BURE BARRIER AND WASHLAND (£57m + 14.5m)

Washlands, are areas of land deliberately allowed to flood to prevent water levels rising elsewhere. A washland will reduce the risk of flooding for both protected and unprotected areas but will be flooded three to four times a year and could not be used for arable agriculture. However, the additional cost cannot be justified and is not a sound investment for public money.

BANK STRENGTHENING AND YARE BARRIER (£57m + £25m)

A barrier across the Yare would prevent flooding from high sea levels and reduce saline intrusion in the rivers. The Yare Barrier, however, cannot be justified on economic grounds at the present time, as for every pound of money invested over and above bank strengthening, the public would only benefit by avoiding 12 pence of flood damage.

SUMMARY

Neither a Yare barrier or a washland are sound investments. Further work is still being undertaken on the benefits of a Bure barrier. Bank strengthening, however, is necessary whether or not barriers are eventually built and is economically sound.

This option greatly reduces the risk of breaching and therefore provides a major improvement in protection.

BANK STRENGTHENING AND EROSION PROTECTION - THE WAY FORWARD

Works will involve increasing the amount of material in the bank and also providing, where necessary, erosion protection at the toe of the bank to prevent breaches, either by failure or by overtopping.



MAINTAINING THE STANDARD

Every fifteen years, there will be a ten year programme of bank renewal in order to maintain these standards (allowance for this is included in the 50 year design life). At no one point in time will all areas be protected to one precise standard. The reasons for this are:

- settlement of new bank material
- settlement of the bank structure as a result of the underlying ground conditions
- the effect of sea level rise

Carrying out bank strengthening in an area of such high conservation value will require careful management. Every opportunity will be taken to ensure that environmental enhancements are included wherever possible. Three specialist panels have been set up: Environmental, Recreation/Navigation, Agricultural. Membership of these panels comprises statutory consultees and directly affected organisations who will provide the NRA with guidelines and assistance on the formal progress of the project at its various stages.

PROTECTION FOR CURRENTLY UNDEFENDED PROPERTIES

There are at least ten sites of undefended properties which include land, business premises and holiday type dwellings (475 approximately). Strengthening the banks means the reduction of the risk of breaching and hence protecting 1,700 properties and 21,300 hectares of Broadland from frequent flooding and eventual permanent loss. However, undefended areas will return to their original flood risk level, because, in recent years, they have had the benefit of extra protection afforded by bank breaching which reduces water levels in the river system. Additional factors which also increase flood risk over time to these properties are:

- settlement of properties generally in Broadland at the rate of 20mm a year
- sea level rise

Undefended properties are at risk of flooding by tidal surges and/or by freshwater flows. Barriers could reduce some of the tidal risk but not change the freshwater or fluvial risk.

A desk study into the impact of bank strengthening and any worthwhile mitigating measures on undefended properties is underway.

WHAT HAPPENS NOW?

- A long term strategy of bank strengthening and erosion protection works over the next 50 years will be presented to MAFF and the Treasury for their approval
- The NRA will develop a five year programme of construction. This will largely focus on the lower parts of the rivers Yare and Waveney. Any urgent remedial works will also be carried out during the programme.





- The first phase of the bank strengthening works has been identified and will be on the River Yare between Reedham and Breydon Water which, it is hoped will

FLOOD PROTECTION ZONES and Provisional Construction Programme



start in 1995. On completion of this length, the defences between Great Yarmouth and Reedham will have been substantially improved, both in terms of the strength of the bank and its protection from erosion.

SOME LONGER TERM VIEWS

In the long term, particularly if sea level rise from global warming is a reality the only effective method of flood protection would be by a barrier or barriers. However, sea level rise is not proven and therefore a barrier or barriers cannot be justified on sea level rise grounds. If ultimately a Yare Barrier is needed for sea level rise reasons, then even if a Bure barrier had been built this would not be abortive as the operation of a Bure and Yare barrier in tandem would still be of benefit. If we do have sea level rise then how we justify economically maintaining current protection levels is relevant not just to Broadland but the whole of the coast in the Anglian region.

FURTHER INFORMATION

A selection of leaflets are also available in this series:

- Bank Strengthening
- Bank Erosion
- A List of NRA Reports on the Study
- Undefended Properties
- Your Questions Answered

And can be obtained from:
Public Relations Department,
National Rivers Authority,
Anglian Region,
Kingfisher House,
Orton Goldhay,
Peterborough PE2 5ZR.
Telephone (0733) 371811.

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 8 regional groups.

The main functions of the NRA are:

- 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; 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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