



*National Rivers Authority
Anglian Region*



WETLANDS ADVISORY SERVICE LTD.

**ENVIRONMENTAL CONSIDERATIONS AND PRIORITIES
IN RELATION TO RURAL SEAWALL POLICES IN ESSEX**

A PRELIMINARY STUDY OF LAND USE

VOLUME 1

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Frontispiece 1: Satellite Overview, April 1990 (copyright National Remote Sensing Centre).

This illustrates 225 km of Essex coastline under NRA and MOD control.



Frontispiece 2: This map shows the extent of flooded land in Essex in 1953 (by kind permission of the Essex Records Office).



NORTH

SEA

Scale of Miles

SUMMARY

- 1) This report examines environmental considerations in relation to 225 km of sea defences protecting 14,590 ha of low-lying farmland. The reclaimed land is divided into 58 non-residential sections by intervening high land or counter walls. The sections have a mean area of 251 ha, but there are 26 under 100 ha. On average, 1000 m of sea defence protects 65 ha.
- 2) Rising sea levels and eroding saltmarsh are likely to cause a significant increase in sea defence costs at a time when costs are already under review because of falling land values and agricultural returns. Given EC reforms, there is no likelihood of an increase in agricultural subsidies large enough to provide justification for continuing the policy of 'defend everything at any cost'.
- 3) The environmental value of the Essex coast is very high. Amenity interests are related to a strong demand for informal recreation facilities from a very large, urban-based population.
- 4) The area is of international importance to nature conservation. It is one of the top three sites for migratory waterfowl on the UK North Sea coast. Five zones have been selected where nature conservation should be of particular account in future sea defence decisions.
- 5) The 4,637 ha of Essex's saltmarsh are a very important natural resource. As a wavebreak in front of seawalls, it has a major role in reducing sea defence expenditure.
- 6) There are major habitat shortfalls for wildlife on the coast. These are: high level saltmarsh, a varied fresh water/saline habitat and extensively managed grassland. None of these will be provided by a process of abandoning existing sea defences.
- 7) Alternatives to hard engineering techniques are complicated by low land levels, residential considerations and long estuaries. A policy of immediate widespread retreat does not appear feasible.
- 8) Locally, some short sea wall sections are considerably over-resourced and a re-appraisal should be combined with the need to gain experience with tiered defence systems that appear to offer lower long-term costs, the retention of some land-use capability and longer-term prevention from erosion. Sixteen sites have been suggested for re-consideration.
- 9) Funding of alternative land use through the proposed ESA may provide some annual income, as well as allowing the translocation of some high value nature conservation sites to higher levels as they would be at considerable risk of elimination.

1. INTRODUCTION

This report stems from the recent connection made between two important facts. The first is the recognition that, in terms of its nature conservation value, the Essex coast is one of the top coastal wetland sites in the United Kingdom. For instance, it consistently ranks in the top five international sites supporting the European Atlantic population of wintering waders and national sites supporting the Western Palaearctic population of wintering wildfowl, as illustrated in Figures 1, 2 & 3 and Table 1. The second is that in terms of money spent and decision making power, the National Rivers Authority (NRA) has arguably a greater effect on that coast than all other agencies combined.

Until recently and for many years past, the entire energies of the NRA and its predecessors; the ERB, ERA & AWA (see Appendix 1 for acronyms used), were directed by the intensification of agricultural production and the conversion of low production grass marshes to highly productive, well drained arable land for winter sown cereal crops. This is still the most important land use and controlling interest. But there are now other items on the agenda. These were formally recognised in the 1989 Water Act which included the need for the NRA to exercise its powers in such a way "as to further the conservation of flora, fauna, and geological or physiographic features of special interest". Also, "generally to promote (without prejudice to other duties); the conservation and enhancement of the natural beauty and amenity of inland and coastal waters and land associated with such waters, the conservation of flora and fauna which are dependant on an aquatic environment, and the use of such waters and land for recreational purposes."

The increasing importance of nature conservation was confirmed in 1991 by the Ministry of Agriculture when it declared its intention to designate the Essex Coast as an Environmentally Sensitive Area from 1993. In effect this makes available to coastal landowners a new million pound crop with support prices ranging between about £40 and £130 per acre in addition to some agricultural income from the same acreage.

Finally, the prospect of increased rates of sea level rise are now firmly on the agenda of

everyone involved in coastal management. The current debate includes options as different as defending the present seawall line at any cost, including some very expensive surge barriers, to the prospect of wholesale retreat to allow the natural processes of coastal change more room in which to develop. This report has been written from a pragmatic viewpoint. It considers land use perspectives, landowner aspirations, nature conservation possibilities and sea defence costs and alternatives.

The report aims to provide a rationalisation of sea defences and the recognition that the MAFF/NRA cost benefit analyses need to be able to put a comparative value on the nature conservation potential of individual sites. The area of study is the Essex coast from Great Wakering to Point Clear, excluding Ministry of Defence sites.

2. FARMING PERSPECTIVES

Significant changes are taking place within the agriculture industry. The trend is of declining output prices and falling land values. In a free market this is likely to lead to a smaller labour force and a reduction in number of viable farm holdings which will be of increased size. The changes to the Common Agricultural Policy announced in June 1992 suggest that there will eventually be a reduction in support prices to near world market levels.

The changes in agricultural support are important because most of the farming that the sea defences protect are subsidised crops. An assessment of a 1990 satellite image (Frontispiece 1) has allowed us to estimate the areas covered by winter cereal crops, grass (i.e. beef & lamb), spring sown crops, Oil Seed Rape and Lucerne (Table 2.). It is most unlikely that the profits from growing these crops will ever return to the high levels of the early 1980's.

By comparison it should be noted that the Wash - a very much larger area of reclaimed land in East Anglia protected by a much shorter length of sea defence works - includes a much larger area of better quality land growing a much wider range of frequently

unsubsidised vegetable crops.

While we have been unable to ascertain the holding size of all the coastal farms, we do know that there is a wide size range from over 1000 ha to less than 40 ha. The larger farms in many cases could withstand a reduction in crop prices to world market levels. So too could many of the smaller units since they are likely to be part time and in some cases receive all their agricultural income from nature conservation support schemes. It is the overborrowed and medium sized units which are most likely to be affected by change.

Land values on the Essex coast are falling - one 364 ha farm has been for sale for 3 years, another 39 ha block had an asking price of £1,500 per acre - but values are still far above any direct relationship with their productivity. The largest purchaser of coastal land, including saltmarsh, in the last eight years has been the nature conservation sector. Purchases by the RSPB, EWT, NT and private wildfowling clubs exceed 2000 ha (excluding foreshore).

While arable farming is predominant, the amount of grassland below the 4 metre contour (c1250 ha) is not insignificant. It is estimated that there are about 50 full time livestock farms within the coastal plain of Essex or within convenient daily inspection time of it. This compares with a total number of farm holdings on the coast of less than 130.

Sea defence funding has been directly linked to the 30 year campaign after the 1939-45 war to develop high input / high output arable production. It is reasonable to point out the exasperation that is felt at the change in emphasis that ESA tier payments represents for a farmer who has just used every available grant to go in the opposite direction.

There is also a resistance to increasing farmers' dependence on something that many consider as not 'farming' and comes solely in the form of state aid. Support for food commodities sold is believable, financial payments for "unsaleable" nature conservation is not. Not a single farmer spoken to in the course of this investigation had faith in politicians or government departments to maintain such non productive support.

It is also widely held that all the coastal land will be needed for food or industrial crop production in the future. But the cost of improved levels of sea defence would add so much to the price of grain from fields in the smaller reclaims that it would be much too expensive in world terms. The 14,500 ha considered in this report is too small to be considered even in European terms. It is for example just one fifteenth of the area used within the EEC to grow tobacco.

The idea of losing land to the sea is an anathema to farmers. That over 500 ha has been lost in the last 200 years (Burd 1992) is not appreciated. There will be a fierce reluctance to 'throw away' land to the sea, especially when it is clearly seen that the nature conservation organisations are distinctly shy about seeing their own land flooded.

3. NATURE CONSERVATION VALUES

While it may be stating the obvious, it is appropriate to point out the weakness of the particularly well known, and oft repeated nature conservation truism "Natural systems are best and should be left to their own devices".

There are many examples from grazed chalk grasslands, hay meadows and coppiced woodlands to show that many of the richest assemblages of species in Britain are to be found where the hand of man has assisted and controlled the random events of natural selection.

Coastal wetlands are the same. In natural terms we are left with, not surprisingly, mere fractions of the natural systems that used to exist; the best fragments of these transitional habitats are Old Hall Marshes, the Dengie Saltings and the Colne Point Shingle Spit. But they are incomplete fragments and by design and appropriate management on adjacent land their value can be significantly increased.

The outstanding nature conservation value of the Essex coastline is recognised in the number of reserves including five NNRs (Table 3), its designation as an ESA and over

28,000 ha of SSSI. But it should not be assumed from these designations that the areas of land they cover are all irreplaceable or unimprovable from a conservation viewpoint.

Under the criteria of the Ramsar Convention on Wetlands of International Importance, ratified by the United Kingdom in 1976, an area is deemed to be internationally important if it regularly holds either 1% of a population of a species or 20,000 waterfowl. Britain's wildfowl are part of the north-west European population and its waders of the East Atlantic flyway population (Pirot *et al.* 1989). National importance is designated to wetlands which hold 1% of the British population of a species. Table 4 details those species of waterfowl of national importance wintering on the estuaries under consideration in this report.

The Essex coastline is indented with comparatively large estuaries bordered by extensive uniform fine mud flats, salt marshes and shingle beaches. Nearby reservoirs are roosting sites for much of the local estuarine wildfowl population. This combination of undeveloped coastal habitats and the local Abberton and Hanningfield Reservoirs, form one of the most important complexes of habitat for wildfowl in NW Europe, with a regional population of 60,000 wildfowl (Ratcliffe 1977 & Owen *et al.* 1986).

Additionally, the Essex coast between Great Wakering and the Crouch Estuary contains the second largest continuous area of intertidal flats in Great Britain alone, supporting 20% of the total world population of Dark-bellied Brent Geese (*Branta bernicla bernicla*) and the significant numbers of waterfowl detailed in Table 4.

The inter-relationship between all parts of this coast is well represented by the Dark-bellied Brent Geese which feed upon Eel Grass (*Zostera*) on Foulness Island in the late autumn. The *Zostera* stocks are rapidly depleted and the geese there spread out to all other Essex estuaries and beyond. In particular Blackwater Estuary which, with Hamford Water, then become the British population's main centre in Essex, feeding upon *Enteromorpha* and also flying over the seawalls to feed on inland fields (Owen *et al.* 1986).

The increase in saltmarsh habitat as one moves north along the coastline under consideration in this report, through the Dengie Peninsula and Blackwater Estuary to the Colne Estuary, provides a differing but equally important habitat for flora, invertebrates and vertebrates. The saltings and fresh marsh of the upper Crouch Estuary are important for wildfowl (Owen *et al* 1986) as illustrated throughout the area by Table 4 and the SSSI notifications for this and other sites are given as Appendix 2. These marshes and extensive saltings hold large numbers of dabbling duck and Shelduck (*Tadorna tadorna*) and are particularly valuable at passage times. Large gatherings of Wigeon (*Anas penelope*), Shoveler (*A. chrypeata*) and other waterfowl occur within the sands, dykes, creeks and flats of the region, as do large wader and gull roosts.

The Blackwater Estuary contains the fifth largest saltmarsh in Britain, with the other Estuaries ranking 19th (Colne), 21st (Roach and Foulness), 34th (Dengie) and 41st (Crouch). These areas combine to result in Essex containing the largest total area of marsh in Britain, at 4,637 ha. (Burd 1989). Although much of the original saltmarsh of the Blackwater Estuary has been reclaimed, the remaining areas still allow a diversity of shallow habitats, especially in the inner region of Osea Island, which continue to support internationally important numbers of Dark-bellied Brent Geese and Shelduck. Moving north towards the Colne Estuary, the inaccessible saltmarshes along sidecreeks are important for wildfowl, with seaduck and Mallard (*A. platyrhynchos*) in the main estuary channels (Owen *et al* 1986). Whilst these wintering waterfowl are present in internationally and nationally important numbers, passerines, raptors and other bird groups account for 60% of the region's wintering bird population (Ravenscroft 1986).

The area is also important for its breeding bird population and Table 5 lists the approximate numbers of breeding pairs of 25 species found on the Essex coast.

Of these, only Redshank is associated with the Essex saltmarshes which are too frequently flooded in the summer for other species to successfully breed. In a few places, particularly in the Colne, the saltmarsh is high enough, and high densities of breeding Redshank (100 pairs per km²) have been recorded (Allport *et al* 1986). Oystercatchers are frequently found nesting on higher banks in the saltmarsh, for example the seawalls

of Bridgemarsh Island. Lapwing nest on the grassland inside the seawall.

The borrow pit is probably the single most important coastal feature for nesting birds. In addition to Redshank and Oystercatcher that nest on its edge, it has attracted one colony of Avocets (*Recurvirostra avosetta*) and in one enlarged area, a pair of Black-tailed Godwit (*Limosa limosa*), breeding in Essex for the first time in 1992 (*pers. comm.*). The more vegetated sections are particularly attractive to Yellow Wagtail (*Motacilla flava*), Reed Warbler (*Acrocephalus scirpaceus*) and Sedge Warbler (*A. schoenobaenus*) and in a few sections there is enough Common Reed (*Phragmites communis*) to allow Bearded Tits (*Panurus biarmicus*) to breed.

The borrow dike frequently acts as a nursery area for broods of duck, Mallard and Shelduck particularly. Little Tern (*Sterna albifrons*) and Grey Heron (*Ardea cinerea*) use it extensively for fishing and the rough grass fringes are major hunting areas for at least a quarter of the Essex pairs of Barn Owl (*Tyto alba*).

The botanical interest of the coast is closely related to the ideal of semi-natural and natural plant communities developing without interference over long timescales. This is certainly true of saltmarsh communities represented in Essex which are one of the largest areas of natural unmanaged vegetation in the whole of south east England. The 4,637 ha of saltmarsh (c10% of the national total) is the second most important natural feature of the coast after the migratory waterfowl.

Inland of the sea wall (and on it), the plant communities are isolated remnants among the large arable fields and the coastal grassland SSSI's represent less than 8% of land protected by sea walls. Some management by grazing or hay making, favours a more complex plant community; fertiliser and herbicides reduce variety. The seawall with its wide range of microclimates and varied management regimes, is of particular importance as is the associated wetland community of the borrow pits and fleets. The slight brackish influence makes them particularly unique.

A limited number of plant species are of special interest because their distribution is

centred on the Essex coast. Maps of six have been selected and included in Appendix 3. They range from the brackish water tolerant Spiral Tasselweed (*Ruppia spiralis*), to Sea Clover (*Trifolium squamosum*) growing in short, well grazed SSSI grade pasture on or adjacent to the sea wall.

A notable shortfall is the absence of large reedbeds (*Phragmites communis*). At present the best example is at Old Hall Marshes. It would probably be the easiest semi natural community to create artificially.

Invertebrates suffer from less adequate reporting and less public interest (butterflies excepted) than either plant or bird population, but they are a good indicator of particularly rich natural communities. The two most important coastal SSSI's for invertebrates are at Foulness and Langenhoe. In both places, military requirements have overruled agricultural priorities and unmanaged grass and saline lagoons are common.

Some species, such as the mosquito *Aedes dorsalis* with only two records in Essex (Walton & Tollesbury) are so under recorded that they cannot be taken into account at all. Another rare species, the water beetle *Paracymus aeneus*, is known from a particular lagoon on the Blackwater and at only one other site in the United Kingdom. It is an unusual example, like the Essex Emerald Moth (*Thetidia smaragdaria*), of an insect whose population distribution is so restricted that it should be taken into account when considering sea defence options for that particular area.

Management for most other species is by habitat management or creation, and they will benefit particularly from the provision of wetlands and grassland with a minimal grazing and / cutting regime. There is, therefore, a potential conflict between insect populations and proper seawall management. A consistently well grazed turf will noticeably reduce butterfly populations. But a less intensive system, perhaps close grazing one year in three will satisfy both insect and sea defence creation.

3.1 The Coastal SSSI's

There are five major Sites of Special Scientific Interest on the coast between Colne Point and Shoeburyness. Their description and reasons for notification are provided (Appendix 2) as well as maps of their boundaries (except the Blackwater). This nature conservation designation is supported by five National Nature Reserves where English Nature have management rights, and the privately owned nature reserves of the RSPB and the EWT and others (Table 3).

Additional international status is provided by the designation of Old Hall Marshes as a site under the Ramsar Convention for Wetlands of International Importance especially as Waterfowl Habitat. European designation is provided by the Specially Protected Area (SPA) status of areas listed under the EEC Wildbirds Directive.

The multiplicity of designations are designed to protect the conservation value of the area and enhance its importance rather than to protect the interests of the landowner. They in fact are of little help in deciding where the NRA should spend the sea defence budget, especially as so much of the coastal defences are within SSSI boundaries. The following points suggest that a greater degree of flexibility in management (including flooding by saltwater) will allow retention and enhancement of conservation value.

i. Within Essex SSSI's (excluding mudflat and saltmarsh species) are records of six Red Data Book insects, six nationally rare plant species and one nationally rare damselfly. The remaining scientific interest lies in the mixed saltwater/brackish to fresh water plant and animal communities. These are very important but not as fragile as, for example, a herb rich hay meadow. They have all been subjected to saltwater flooding, albeit at long intervals, and are all products of changing conditions and can be created near the coast. The best example of this is the botanical and entomological value of the seawalls themselves. Because of variables in microclimate between wet and dry, salt and freshwater, disturbed and undisturbed, they are an extremely rich habitat. Yet all parts have been re-shaped and re-engineered with natural species re-introduction from neighbouring seed banks. The species mix has thus been maintained and it is suggested

that the same would happen if adjacent arable land was converted to a more benign management system through ESA funding, albeit with fewer microclimates present.

ii. Only three sites have been identified for which any degree of saltwater flooding (or other major change) would cause significant irreversible loss to nature conservation interests. They are Brightlingsea Marsh and Langenhoe Marsh on the Colne Estuary and Gunners Park at Shoeburyness. Only the first of these has sea defences managed by the NRA.

iii. A further three sites were identified where the natural transition from saltmarsh to grassland still exists. All of them are small - Paglesham Pool, Woodham Fen and Ray Island.

iv. Four of the SSSIs are either fragmented (Crouch, Foulness) or include mostly areas seaward of the borrow pit (Dengie and large parts of the Blackwater). Adding environmental value to these should be a high priority. The Colne estuary contains a better balance with large areas of high saltmarsh as well as adequate grassland.

v. In overall terms the migratory waterfowl populations are the most important nature conservation priority on the coast. In some years the Essex coast holds more waterfowl than any other site in the country. It also has the fourth highest wader count of all sites in Western Europe (Figure 2). The management of the Essex coast is thus a matter of international importance.

vi. While there is a shortage of grassland and high saltmarsh, these are the two habitats most likely to benefit from the creation of a tiered sea defence system. The estimated overall area covered by each of these habitats is listed in Table 6. The heading 'fleets' is included to show the number of existing fresh water sites in each estuary rather than their actual area. Most will require considerable management to be of environmental interest.

4. AGRICULTURAL FUNDING FOR ENVIRONMENTAL CHANGE

There have been two major initiatives which have significantly altered the availability of funds.

The Countryside Commission's Countryside Stewardship Scheme was introduced in 1991. It offered payments of up to £225/ha for the reversion from arable to "traditional waterside landscapes".

In autumn 1991, the Ministry of Agriculture announced that the Essex Coast was to be declared an Environmentally Sensitive Area from 1993. Detailed discussions on payments are still continuing but it appears likely that this scheme will supersede the Stewardship Scheme in Essex although payment rates will be approximately the same. This is a fortunate change as the Countryside Commission's funds are more limited than MAFF's and the ESA tiers are likely to be more suited to the Essex coast. But this assumes that the ESA prescription will include the same features that the Countryside Commission can fund; such as Reedbeds, Carr or Fenn and Brackish Pools (Appendix 4.)

The main ESA options will include payments for existing grassland to be managed more extensively and for the conversion of arable land to grass. Additionally it is anticipated that there may be a 'special case' tier to cover individual areas. This may include conversion to saltwater flooding and maintenance of high freshwater levels but the availability of capital payments for some associated works should not be assumed.

We have attempted to assess the importance of these possibilities and the quality of the habitats they are likely to create. These data are given in Table 5 for three types of created habitat. Because of the general importance of wintering waterfowl, and Brent Geese in particular, we have concentrated on bird populations but the overall benefit for all plant and insect species will show the same trend - wetter habitats will be more diverse and drier intensely managed areas (e.g. well mown grass for Brent Geese) will be of value to fewer species.

Twenty six species are listed as likely to benefit from the creation of superwet habitats, that is a range of permanently and semi-permanently flooded grassland, reed beds or open water.

The drier habitats of rough grassland (i.e. mown up to twice a year) and well managed grass for winter use by Brent Geese are likely to be of benefit to nine and ten species respectively. In terms of diversity the rougher grassland will be more beneficial to a wider range of invertebrates (see comments on Langenhoe Marsh, section 7.15) but the well managed goose sward will help to solve a particular crop damage problem by the important and large population of wintering Brent Geese. The Essex population represents approximately 3 million goose days of food which could be provided by about 1,000ha (Owen *et al* 1986).

The ESA scheme is entirely voluntary but opportunities may exist where applications by landowners to join the scheme could assist the NRA's flood defence decisions.

- i. If ESA payment can be made for created and managed saltmarsh (max. c20 inundations p.a.) then land subjected to increased saltwater flooding, but still managed for hay or grazing, will attract payment.
- ii. As many of the poor condition sea defences protect Sites of Special Scientific Interest, it could be beneficial for there to be ESA payments for grassland in a corridor next to the grassland SSSIs. This policy would assist environmental interests in the face of almost inevitable flooding. Such a specialist tier may be difficult to include, but the financial savings from reduced sea defence costs (cf Northey Island) are very significant.
- iii. At present the seawall itself (225km of seawall is approx 450ha) is not managed intensively and remains a high quality wildlife corridor with considerable plant and insect interest. However we are recommending an improved sea defence management regime which will reduce this value. A rough grass field margin against the landward side of the borrow pit would do much to prevent habitat deterioration.

iv. The NRA are likely to continue to need supplies of good clay for seawall repair or strengthening. As at Marsh Farm, South Woodham Ferrers (Plate 6), the material can be sourced from selected areas rather than an extra dig off the borrow pit. The excavation created, if properly landscaped, to include a small (min. 2 ha) high water table grass marsh, could attract annual payments although an initial sum for habitat creation is less likely.

Table 5 shows for birds, how species rich wetland habitat is compared with grassland. Some forms of wetlands are easily created. They have been created many times and properly managed artificial wetlands are often hectare for hectare better at attracting, feeding and protecting migratory birds than natural habitats. Management can create the optimum conditions with the desired habitat and hydrology. These would so seldom occur naturally in the right proportions that wild populations would always be below maximum carrying capacity of the available area. Correct management can maintain healthy populations on smaller areas than usual. This is what we would hope to see achieved by a closer integration between the current ESA proposals and the NRA coastal defence remit; that high value coastal wetlands should become an income producing crop for those owning and managing the land itself.

One final funding change for agriculture was announced in June 1992. The published draft of the amended EEC proposals for agricultural reform (the MacSharry proposals) include some important restrictions. As well as placing headage limits on livestock quotas (which will make ESA grassland management more difficult) a 15% rotational compulsory set-aside has been proposed. Land submitted for ESA tier funding will have to be accepted as a part of that 15%. Farmers will not be able to afford to put land into ESA as well as take 15% out of production.

At present, the set-aside area is designed to rotate around the farm from year to year. But to establish good quality environmental interest, the option of static set-a-side will have to be permitted within ESA boundaries.

5. RECREATION - THE HUMAN INTEREST

On any basis, Essex is in one of the most densely populated regions of the world. Defined to include the two 'biological' vice counties (ie: east of the River Lea, including Ilford, Barking, East Ham & West Ham) it has over 2.5 million people on 3,957 sq km. This is more populated than the Netherlands and on a world scale is exceeded only by the island states of Bermuda, Malta, Singapore and Hong Kong (Corke 1986).

The attraction of the coast is considerable. Dunwich Heath (Suffolk), a cliff top open space, is twelfth in the attractions table for East Anglia with 270,000 visitors p.a. The Essex equivalent, Cudmore Grove Country Park on East Mersea, attracts over 120,000 visitors. This compares with a 2.6 million visitor total for the Essex Country Parks combined (data from Tourism Department, Essex County Council). Additionally, the attraction of the coast is considerable even just for a walk. Columns of up to a hundred people may occasionally be seen winding their way along the seawall top footpath.

Fortunately fewer people go boating than walking. But they are still in large enough numbers for the RSPB to issue an advisory leaflet on how to be 'green' afloat.

Overall, tourism in Essex contributes £200 million to the local economy. Few landowners benefit from this - quite unlike Germany, where a young farmer may now take a part time job as a guide or even hire out bicycles for seawall cycle rides.

The coastal footpath is a public asset and extra funds should be sought from recreational sources to maintain heavily used seawall sections where the sheer weight of human feet is damaging the flood defence potential of the seawall itself.

Sport shooting has a long history and influence on the Essex coastline. Such shooting can provide a direct source of income for the landowner, currently up to £70 per gun per flight. However, over fed flight ponds are a major conservation problem and account for too great a proportion of the annual duck harvest. The ESA funded wetlands will have to have some restrictions placed on them to prevent an even larger duck harvest than

occurs at present.

6. SEA DEFENCE CONSIDERATIONS

During this project most sections of sea defence listed in the Rural Walls Report (NRA 1990) between Colne Point and Rochford were visited. The author has observed saltmarsh loss over a 20 year period and is familiar with the damage caused by particular storms (e.g. 1976) and the resultant increase in tidal defence expenditure.

The sea defence sections have been prioritised to select those where an extra element of paid nature conservation could reduce sea defence priority problems.

The following aspects have been assessed for each section:

6.1. Reclaim size and Seawall Length

To be cost effective a given length of sea defence should protect a large area of land. The average 1,000m of wall protects just 64 ha with large differences between the estuaries as shown in Table 7. Table 8 shows these data ranked at the value of land defended per metre of seawall. Smaller areas have been examined with particular interest, on size/wall length they may be over resourced at present; as saltmarsh erosion continues the problems will be exacerbated.

It is understood that areas quoted in the Rural Walls Report are of land below the 5m contour. Whilst this may reflect the area at risk in the long term it is recommended that individual sections should be surveyed more accurately on a 4m contour to provide a better assessment of vulnerable land and a more accurate cost benefit analysis.

6.2. Exposure and Saltings Width

The multi million pound value of saltmarsh in its wavebreak function has already been commented upon. Data from the NRA suggest that the total loss of saltmarsh in front of a wall will trigger the following cost increases:

- i. Capital costs: £1,000/m; revetment to the toe to replace eroded saltmarsh, and higher, wider walls to cope with increased wave run-up.
- ii. Maintenance costs: currently £2 million / year will increase substantially to keep pace with saltings loss.

Assuming that the observed rates of saltmarsh loss continue, a very large increase in funding requirements is predicted at a time of declining land and crop values.

Exposure to wave action exacerbates sea defence problems. The wall must either be higher to prevent overtopping or have a well managed landward face. Some vulnerable walls already have revetment on their landward sides.

6.3 Land Use

Current land use is important since it affects capital values. In particular the presence or absence of land drains has to be considered since increased flooding, fresh or salt, can block them; this may already be a problem on the Wallasea series clay soils.

The larger area of land loss to cereal production as a proportion of a farm, the more serious the consequences for that business. Equally a well run holding that gains income from field sports, could find that an increase in sporting rent for wetland features would compensate in part for localised inundation or a re-designed borrow pit similar to the Marsh Farm design.

6.4 Nature Conservation Potential

Present nature conservation values have been assessed using data supplied by English Nature and the possibilities for enhancing some of the very real habitat shortages examined. Protection from disturbance, appropriate management and the availability of fresh water at high levels is considered particularly important.

Combining these requirements with the SSSI maps, five zones have been identified where land use change in favour of nature conservation is particularly desirable. These are shown on maps in Figures 4 to 7.

6.5 Recreation and Access

The coastal footpath is a public asset (without implying ownership or rights) and in certain situations the walls should have their footpath function recognised in the cost benefit analysis.

A flood risk of less than five times a year should be acceptable without risk to the general public, subject to adequate sign provision.

6.6 ERP Flood Risk

Table 7 includes the current flood risk assessment as the Estimated Return Period (ERP) in years. These figures err on the side of caution with few sites flooded in the last 40 years. Sea defence sections with an ERP rating of 10 years or less have been examined when considering two tier defence options. Wetland construction opportunities by re-sourcing borrow dyke material is applicable to all seawall sections.

6.7 Land Levels

Figure 8 shows the field level at 21 different sites in relation to the average height of high level *Puccinellia* type saltmarsh outside the wall. The measurements range from

+684mm to -1,919mm with the majority of sites with levels between -750mm and -1,250mm. This relates to the relative sea level rise since most of the land was 'inoned' (claimed) in the 1600's and 1700's. Unlike the reclaimed land the saltmarsh has trapped sediment and been able to keep pace. Drainage inland has caused shrinkage and exacerbated the difference in level.

Such low levels are most important as they may make it necessary to consider a longer timescale for sediment deposition or even artificial recharge to create semi-natural saltmarsh habitats at an acceptable cost. Alternatively, a wall designed for overtopping and rapid runoff through enlarged sluices can achieve the same effect. Whilst many of the sites are at a level at which some saltmarsh vegetation will occur (*Spartina* or Sea Aster (*Aster tripolium*)), this is below the level required for the habitat we would most like to create - high level saltmarsh. This valuable and diminishing habitat is characteristic and of importance to the Essex coastline and its fauna and flora, maintaining both wintering and breeding populations of birds and other associated species.

7. RECOMMENDATIONS FOR INDIVIDUAL COASTAL SECTIONS

The individual sections considered here are those identified in the Rural Walls Report (1990). The bracketed numbers are those allocated by the NRA and refer to lengths of coastline and numbers shown on the maps in Appendix 5.

The recommendations reflect the need to consider the sea defence as an asset. A wall described as suitable for improvement implies that capital works to improve the ERP rating are justified. Sections identified for sustaining would normally be maintained at their present level. Other non standard recommendations are given in detail.

7.1. Seawick and Leewick (27)

6km protecting 468.5ha ~ 78.1ha/km.

Arable, Residential.

Size and residential component suggest that a full protection defence is required. Environmental input will have most impact if further excavation is required for a larger earth wall. These should compliment the adjacent Colne Point National Nature Reserve (EWT reserve). There is the potential to use effluent from the sewage works to enhance wetland creation.

Recommendation: Sustain.

7.2. Point Clear to Blockhouse Wick (28)

4km protecting 101ha ~ 25ha/km.

Residential.

Not suitable for inclusion in this report.

7.3. Linley Farm (29)

0.3km protecting 4.5ha ~ 13.5ha/km.

Residential
Gardens/Allotments.

Not suitable for inclusion in this report.

7.4. St Osyth Creek (30A)

0.4km protecting 3ha.

Unmanaged grassland.

A short earth wall not listed in the Rural Walls Report. The land behind is unmanaged and there is no prospect of cost effective sea defence management. It is a known site for the Essex Emerald Moth but it should be borne in mind that this will probably be

lost when the wall eventually breaches and that there is suitable land adjacent in the same ownership to undertake the same habitat management.

Recommendation: Consider increased flooding on an experimental basis. Costs do not justify full protection and site may not be under NRA management anyway. Allow time for species transfer to remaining EWT reserve.

7.5. Priory Marsh and Martins Farm (30)

3.5km protecting 86ha ~ 24.6ha/km.

SSSI Grazing Marsh.

The grassland (71ha) could easily be separated from the industrial area (8ha) at Martins Farm. This area has flooded at least three times in the last 100 years. The walls have been repaired recently and are in good condition.

Recommendation: Sustain, but enlarge sluices in preparation for overtopping which will occur.

7.6. Dines Farm (31)

1km protecting 8ha.

Arable and Caravans.

Only the last 150m of this wall now protects fields. 'Mobile' homes on top of 'inert' infill have extended right to the seawall. The borrow dike has been piped and appears now to be an open domestic drain. Not suitable for anything.

7.7. Great Marsh (32)

2km protecting 230ha ~ 115ha/km.

Arable and Farm Buildings.

All arable reclaim including most of the old channel that made Brightlingsea an island with significant areas at up to 2m below saltmarsh level. It is in a position protected

from wave attack and the wall is in good condition. Costs should not be high while the saltmarsh fringe remains. With limited access and available freshwater the nature conservation potential is considered high.

Recommendation: Sustain or consider for recharge. There is fresh water inflow from two sources, any works must enhance their influence.

7.8. Lower Farm (33)

2km protecting 72ha. ~ 36ha/km.

Arable.

All arable reclaim behind a good seawall in a sheltered location. If freshwater could be made available at the NW corner it would have a higher nature conservation potential especially as there is no footpath on the seawall (and thus less disturbance).

Recommendation: Sustain.

7.9. Brightlingsea Town (34)

Urban section. No comment.

7.10. Brightlingsea to Moverons (35)

6km protecting 179ha. ~ 29.8ha/km.

SSSI Grassland, Arable and Residential

A long and varied section which has been taken to include the south side of Alresford Creek. It includes sea defence requirements for part of Brightlingsea town, the neighbouring grassland SSSI, 70ha of arable land along the Colne and the improved grassland SSSI on the south side of Alresford Creek. Subdivision should be considered for these three areas.

The defences along the Colne are not of a uniform standard and the site is exposed to

a long wave fetch, particularly at high tide, from NW, W and SW gales. The present wall line has a high recreational value. Expansion of the SSSI northward under ESA payments would be a preferred land use option.

Alresford Creek has potential for increased flooding to a natural wooded contour. It would require an 80m counter wall to protect the Brightlingsea road. One 300m length of existing wall already has significant erosion and may require revetment.

All but one (Section 52) seawall section from here to Tollesbury Wick (Section 62) are part of the first of the Nature Conservation Zones where a change in land use favouring nature conservation is likely to be particularly beneficial.

Recommendation: Improvement of the main Colneside wall to ERP 10 or above. Sustain or reduce South Alresford (4ha min.) with a natural two tier defence.

7.11. Plumpton (36)

1.5km protecting 30.8ha. ~ 20.5ha/km.

Arable.

This is a better quality wall but in a similar situation to the above South Alresford. However, it protects a larger area of all arable land and one old farm complex at the 4m contour level. The creekside contours are interrupted by the valley created by Sixpenny Brook.

There is significant saltmarsh protection and the land quality (one creekside field is being used to grow Strawberries) does not justify consideration for a two tier defence at present. Future plans might include an option for environmental enhancement by creating one creek, feasible only in this location, where the transition from mudflat to woodland would be possible for an entire creek system.

Recommendation: Sustain.

7.12. Marsh Farm Wivenhoe (37)

2km protecting 32ha. ~ 16ha/km.

Grassland.

This section has benefitted from recent works in connection with the Colne Barrier. Given a high level of public access, the addition of the barrier and the probable re-location of the Sailing Club, there appears to be little nature conservation benefit (the grassland is not within the SSSI). Recreational interest and the Barrier works are priorities.

7.13. Frog Hall, Fingringhoe (46)

2km protecting 40ha. ~ 20ha/km.

The majority of this reclaim is permanent pasture and the land rises steeply away from the floodplain. Part is also being recharged with spoil from the gravel workings.

Recommendation: Sustain and/or recharge using local materials. Consider consequences of higher tides here, immediately downstream from the Colne Barrier.

7.14. South Green, Fingringhoe (47)

1km protecting 4ha. ~ 4ha/km.

Arable.

With the wide saltmarsh frontage this seawall protects the lower part of two arable fields that rise gradually away from the floodable zone. NRA expenditure is not justified here and a two tier defence option would seem feasible. However, any landowner could maintain a seawall of this type with his own equipment.

Recommendation: Consider for two tier defence when next scheduled for repair.

7.15. Langenhoe to Strood Marsh (48)

4km protecting 160ha. ~ 40ha/km.

This is a complicated section including all land uses from SSSI grassland to residential. It appears to meet with land protected by sea defence section 55. H. Grieves map of the 1953 flood (Frontispiece 2) suggests that the 'high' island near the Peldon Rose may have been surrounded by floodwater (The Great Tide. Essex Record Office).

The scattering of housing, and importance of maintaining site integrity for the only access to Mersea Island, override nature conservation interests. A 500m counterwall would allow a lower level of protection to be considered for the 1.5km of defence protecting the majority of Pete Hall Marsh. It should be noted that recent defence and tipping operations by the landowner have increased the level of protection for the small grass marsh at GR 013 154. It is the best example of private sea defence works being detrimental to environmental interests found on the whole coast.

Recommendation: Improve main section and cost alternatives for Langenhoe Marsh when maintenance required. An increasing proportion of this latter wall is without saltmarsh protection.

7.16. Barrow Hill (49A)

This section of coast between the Strood causeway and Bower Hall is illustrated in Plate 1; it does not appear to be maintained by the NRA. About 18ha of land were abandoned in 1953 and have reverted to saltmarsh. The land within the old reclaim slopes gently up from a middle range of saltmarsh vegetation into field margins where there is a poor DIY seawall. It is the only site found where it would be possible to repair old breaches and create a two tier defence without compromising already farmed land. Such work would have the extra advantage of repairing the coastal footpath.

Recommendation: Repair breaches, re-sluice and apply for part funding by the

Countryside Scheme. NRA input might be justified as a dummy run for major breach repair using contractors.

7.17. Bower Hall (49)

1km protecting 20ha.

Arable.

This seawall is low, well made and fronted by extensive high saltmarsh. It is not suitable for a two tier defence because it requires no work at present.

It would probably be more economical to reduce the size of this sector by re-aligning the suggested counterwall between sections 49 and 50, 400m further west on higher ground. This would halve the counterwalls length and height.

Recommendation: Sustain.

7.18. Maydays and Reeveshall (50)

4km protecting 263ha. ~ 65.8ha/km.

Arable, Grass, Farm Buildings.

A large area with no possibilities for reducing sea defence length. It is remote and partly in grass and set-aside / Countryside Premium already. As a fresh marsh it would add to the diversity of this region especially with the greater risk of Langenhoe Marsh (MOD) being flooded. However significant sections have no saltmarsh protection and maintenance costs are likely to escalate in the future.

Recommendation: Improve/maintain at ERP 40+

7.19. North Farm to East Mersea Golf Club (51)

2km protecting 50ha. ~ 25ha/km.

Adjacent to Cudmore Grove Country Park this is a very popular footpath. A limited number of residential properties might be affected. The Essex County Council have recently bought the grass fields behind this wall and they are part of the Colne Estuary National Nature Reserve, mainly for Brent Geese.

Recommendation: Sustain

7.20 East Mersea Hall and Rewsalls (52)

1.2km protecting 30.9ha. ~ 25.75 ha/km.

Given that the length of the area outlined in the Rural Walls Report as floodable is more than twice the length of the marked sea defence, the nature of the land suggests that this reclaim could flood round the ends of the existing sea defence regardless of the height to which this wall is raised. It is suggested that the actual area protected by the current works is about 20ha. The seawall is at considerable risk from wave action since it is exposed to all northerly and easterly gales. There are clear signs already of overtopping by wave action and maintenance costs are high at £60,000 p.a. (£3,000/ha/a). The defended fields are all grass including both silage and hay.

Recommendation: Sustain and prepare for more frequent overtopping by improving the backslope. Enlarge sluice.

7.21. Wellhouse (53)

2km protecting 37ha. ~ 18.5ha/km.

Arable.

This wall faces north west and has no saltmarsh protection for two thirds of its length.

It is not in a good state of repair. The land behind is all arable, without buildings, down to a level 1.5m below saltmarsh. The seawall footpath is well walked.

Recommendation: Sustain at present. Re-consider when major maintenance work required.

7.22. Weathercocks (54)

Not relevant since a reservoir was built.

7.23. Strood Cottages to House Farm (55)

1.5km protecting 86ha. ~ 57.3ha/km.

Arable, Grassland.

This section has already been mentioned as the other half of section 48.

Recommendation: Improve.

7.24. Sampsons and Copt Hall (56)

5.5km protecting 303.5ha. ~ 55.2ha/km.

Arable, Grass.

This all arable area includes two high islands and there are some possibilities for subdivision. The loss of saltmarsh will shortly be of concern for 4 of the 5.5km of sea defence. Of the five peninsulaS from Tollesbury Wick to the Geedon Saltmarsh at Fingringhoe, this is the only one with minimal environmental content (as yet the National Trust have made no significant changes at Copt Hall). Unlike the others, fresh water is available and nature conservation potential is considered high.

Recommendation: Sustain and cost alternative defence line linking high islands.

7.25. Coopers and Abbots Hall (57)

3km protecting 81.8ha. = 27.3ha/km.

Arable.

There are three possibilities for subdivision in this sector with high land approaching the seawall in four places. However, two thirds of the length is well protected by high level saltmarsh and the wall here is unlikely to require major works. The remaining third will continue to require substantial work, particularly along the toe. About 20ha could be isolated for consideration for 2 tier defence when work currently in progress needs replacement.

Recommendation: Sustain at present.

7.26. Virley and Salcott (58 & 59)

Arable, Residential.

These two sections involve the village of Salcott which is arguably more at risk in the long term than other coastal communities as much of the village is below the 3m contour. There is an obvious requirement to maintain and improve the wall and it would appear useful to move the southern enclosure line from GR 955 133 to 964 128 which would more than double the area of land protected for the additional requirement to improve one extra 1000m length of wall. It would also maintain the integrity of the seawall footpath from Salcott to Old Hall and reduce the length of counter wall required.

7.27. Old Hall Marshes (60)

10km protecting 440ha. = 44ha/km.

SSSI Grazing Marsh.

This block of land probably has the lowest capital and income value of any section of the coast on current financial testing. But in nature conservation terms it is also one of the highest in value (Plate 2). Established as an NNR in 1978 by the magnanimity of

Brigadier Colvin it was declared an SPA in 1991. It is now owned by the RSPB.

About 8km of the wall has either no or fast eroding saltmarsh and 3km of this will require revetment almost to low tide level within the next 20 years at current erosion rates. The wall itself is low, affording protection to risk level 3 at best, the high tide lapping the top of the wall five times in the last 12 years. The whole marsh has been flooded three times in the last 100 years.

From a nature conservation viewpoint abandonment is undesirable, but to rebuild and raise the walls to an acceptable standard would require over £5 million. It is in this situation that the need for a high value ESA tier to allow the nature conservation value of the existing marshes to 'spread inland' as a more cost effective solution may need to be considered.

Since the nature conservation interest of this area is not a species rich fresh water habitat - especially away from the central fleets - the following approach is recommended as follows;

- i. repair and raise some of the internal walls to create an inner central zone linked back to the old counter wall which crosses the marsh from Quinces Corner to Joyces Head,
- ii. improved sluice capacity to cope with the run off for occasions when overtopping does occur,
- iii. toe protection using positioned coarse material (as in Plate 3), and
- iv. a change in management away from Brent Geese (to be catered for elsewhere by the ESA) on the upper fields in favour of habitats likely to suffer from more frequent (ERP 1:2) flooding.

Recommendation: Sustain/re-design.

7.28. Guisnes Court to Dibleys (61)

2.5km protecting 53.5ha. ~ 21.4ha/km.

Arable.

This small area, including one well walked circular footpath from Tollesbury village, could be divided into three sections. Two are agricultural and one, south of the sewage works, is industrial.

Neither of the agricultural sections has any significant revetment although in places wave damage is severe. One agricultural section leads straight into rising land (1.2km protecting c20ha). The second, nearer Tollesbury with a fast decaying saltmarsh frontage includes c20ha of low lying land at up to 1m below saltmarsh level.

Although landowners could maintain parts of this wall at their own cost with relative ease, the low lying land will present considerable difficulties. Work will be needed here soon, but only in the section which is most difficult to re-design. Internal recharge could be an option.

Recommendations: The part most suitable for 2 tier defence does not require work at present. The remainder should be sandbagged if necessary (wall collapse is possible) and studied in detail.

7.29. Tollesbury Wick (62)

5.5km protecting 214ha. ~ 38.9ha/km.

This entire reclaim is now either SSSI or set-aside on poorly drained clay land in irregular field shapes. The fronting saltmarsh provides substantial protection for only a few short lengths. The seawall is a very popular footpath and gives access to the low water landing hard in Tollesbury Channel (the Leavings). No internal divisions exist. It is calculated that the free market annual income from the protected land is equivalent to £1.00 per metre of wall. Government payments in the form of SSSI compensation and

set-aside with Countryside Premium amounted to £10.00 per metre in 1990.

The piles of the Old Tollesbury Light Railway Pier provide a useful measurement of sediment loss from the surface of the mudflats; estimated at 60 cm loss in seven years.

Recommendation: Sustain at present. Improvement is unlikely to be justified. It would be unwise to suggest a two tier defence on so large an area in so exposed a position without several years experience on smaller situations.

7.30. Mell Farm - Rolls Farm (62)

4.5km protecting 162ha. ~ 36ha/km.

Arable and Set-aside.

It is estimated that in excess of £900,000 has been spent on this section in the last 5 years. This is certainly more than the capital value of the land. However, it is a very exposed site with a 4km wave fetch in the prevailing S.W. gales. There will soon be no saltmarsh protection for most of the wall's length. Most of the reclaimed land at risk is 1m below saltmarsh level. The risks involved are amply demonstrated by the breach immediately west of Rolls Farm. The resultant saltmarsh now covers less than 25% of the original enclosure, the remainder is now mudflat.

Recommendation: Sustain.

7.31. Skinners Wick to Highams Farm (64)

5km protecting 228ha. ~ 45.6ha/km.

SSSI Marsh, Arable, Residential.

The western end of this section protects the village of Goldhanger. To the east two possibilities for subdivision exist, one of approximately 60ha and one of approximately 100ha. However the land is over 1m below saltmarsh level and the poorest condition wall recently repaired. It appears there is no overriding nature conservation need to justify a change in policy.

Recommendation: Sustain.

7.32. Heybridge and Maldon (65 -69)

The sea defence protecting these densely populated sites have not been assessed because they are urban rather than rural. There may be some possibilities upstream at Beeleigh where a small area of tidal reedbed survives.

7.33. Northey Island (70)

1.2km protecting 20.2ha.

This island, with its large area of abandoned saltmarsh makes a secure high tide refuge for wildfowl and waders. It is the centre of the second of the five high value conservation zones identified in this report. It includes Osea Island and the south shore creeks as far as Stansgate Abbey (section 78).

The cost benefit equation on part of the island was sufficiently unfavourable (£60,000 to protect 1 hectare by standard NRA revetment) that an alternative option was introduced last year.

The existing wall was lowered by c1m and the excess material used to fill the borrow pit. Additionally, two lower sills were cut to allow flooding of up to 100 tides a year. The sea gained access in August 1991 and a small area of SSSI quality unfertilised grassland is now becoming puccinellia level saltmarsh.

The toe of the old seawall, collapsed due to salting loss, remains unprotected and a new counter wall prevents the sea reaching a natural contour limit some 50m inside it.

It is not envisaged that this is an example of a 2 tier defence system which should retain a re-inforced defence from c2.8m OD (i.e. a 5.5m tide would overtop the wall, a 5.3m tide would not.). There should also be a wooden top hung sluice to allow rapid drain

off of the 20-50 tides a year. Ideally discharge should take place into a falling tide since the water will cushion the outflow through the sluice and reduce possible erosion.

Recommendation: Sustain. Continue with the experimental wall to assess internal sediment deposition and erosion rates on the unprotected creek frontage.

7.34. Osea Island (71)

2.5km protecting 57ha. ~ 22.8ha/km.

Arable/Set-aside, Residential.

Although this is a relatively high island, houses are at risk. It would be possible to re-align some sea defences without threatening them, but the existing walls are relatively small. The fields are now managed to provide a feeding refuge for Brent Geese. Maintenance of sea defences at or above existing levels would appear the most suitable outcome.

Recommendation: Sustain/Improve.

7.35. Maldon to Lawling Hall (72, 73 & 74)

11.7km protecting 1,332.9ha.

We have combined these three sections because of substantial alternatives suggested for them.

The area excludes Maldon as the refuse infill is nearing completion. But significant numbers of residential properties are at risk as well as a very large area of land and two locally important B roads.

Our alternatives relate largely to the high island of Iltny Farm which is above the 10m contour. We suggest that the land here be excluded from the asset value calculations and the "island" be used as a natural sea defence line. Thus a counter wall from

Limbourn Creek to Bramble Hall Farm, across to Itney Farm and to Brookmead Farm would be 2km shorter than those proposed in the Rural Walls Report.

The area protected by seawall length 74 is particularly large (7 km protecting 597 ha). A 2.6km saving in length for wall improvements could be considered. Seafeld - the peninsula excluded - is a high island itself, rising to some 4m OD. The north facing seawall is revetted to mudflat level in places and may soon require work.

Recommendation: This suggested re-alignment would allow 4.5km of sea defence to be considered for sustaining and a reduced length of 7.2km for improved defence. It would give a relatively lower level of protection for c120ha out of the total of 1,333ha. The availability of fresh water from Mundon Wash is an additional reason for linking these coastal sections with Northey Island as one of the top five nature conservation zones.

7.36. Mayland Bay (75)

0.8km protecting 18ha.

Residential.

Not suitable for consideration in this report.

7.37. 76 Nipsells Farm

2.3km protecting 58ha. - 25.2ha/km.

Arable/Set-aside.

The seawall footpath is a popular walk and includes one field/mudflat boundary that is enough of a cliff (a geological SSSI) not to need a seawall at all. Even with lower seawalls much of the land would remain manageable for livestock farming and/or nature conservation.

Recommendation: Sustain or consider for a two tier defence.

7.38. Nipsells Chase (76A)

1km protecting 59ha.

Residential.

Not suitable for consideration in this report.

7.39. Pigeon Dock to Steeple Creek (77)

5.3km protecting 179.5ha.

Arable, Grass, Residential.

A varied length of wall, part very exposed and dropping rapidly to mudflat and part sheltered with a low earth defence line of a size that a farmer could maintain. The area could be divided in two with a short counter wall at GR 922 033. The mix of caravan site and farmland does not allow a change in policy. As a reminder of the 1953 flood this section used to include Canney Farm where an entire dairy herd was drowned.

Recommendation: Sustain.

7.40. Steeple Creek to Ramsey Island (78)

3km protects 406ha. ~ 135ha/km.

Arable.

The size of the protected area and high ridge extending north to Stansgate Abbey Farm suggests that the real cost of defending this section is reduced to less than 1km. Although it is exposed it is likely that the cost benefit in favour of a high defence level will remain for many years.

Recommendation: Improve.

7.41. Ramsey Island (79 & 80)

These two sections include the residential area at The Stone. They are not suitable for inclusion in this report.

7.42. Beacon Hill to Bradwell Wick (81)

3.2km protecting 82ha. ~ 25.6ha/km.

Orplands to Bradwell Power Station (82)

3.5km protecting 67ha. ~ 19.1ha/km.

Arable, SSSI grass, Residential.

These two sections include an unusually simple section of coastline (Plate 4). Approx 5km long, St Lawrence Bay has a narrow fringe of low lying land nowhere more than 600m wide before rising above the 5m contour. At high tide it is exposed with a wave fetch in N W gales of 3km. Revetment on the section at Orplands is in poor repair and overtopping due to wave action occurs there nearly every winter. It is considered likely that this seawall section, protecting only 25 ha of grazing marsh would fail most cost benefit analyses.

The remaining land is either arable, or close to Bradwell. Additionally one field has become a caravan plot site, albeit without planning consent.

Recommendations: Bradwell Marina to Power Station. Improve. The remainder should be costed in three sections with an extra counter wall at approximately GR 972 055. At least one should be considered seriously for a two tier system, if only because of the current state of the seawall and high maintenance costs. Because of the exposed nature it will not be an easy site and an obliquely aligned short stone groyne may be necessary to provide wave protection for a larger sluice to allow rapid discharge. Recharge material either from the Marina or accessed by barge should also be costed. This particular marsh is a grassland SSSI but it is not of irreplaceable value for much its

scientific interest could be maintained by a management agreement on neighbouring fields which either have better defences or are above the 3m contour. The defended value of section 8.1 should be re-assessed with a corrected sea defence length of 3.2km.

7.43. Bradwell Power Station to St Peters (83)

4km protecting 266.5ha. ~ 66.6ha/km.

Eastlands to Marsh House (84)

6.5km protecting 1221ha. ~ 187.8ha/km.

Round Barn to Holliwell (85)

8.7km protecting 2808ha. ~ 322.7ha/km.

Holliwell to Burnham (86)

4.3km protecting 1075ha. ~ 250ha/km.

Arable and Farm Complexes.

These sites contrast well with St Lawrence Bay. The Dengie marshes are arguably what most members of the public envisage as typical Essex coastal marsh. Very large reclaims, very large farms and fields. Any change in sea defence towards a two tier system would mean a complete double line of walls rather than allowing occasional inundation to rising contours. Counter walls do exist in a few sections which are particularly vulnerable to wave action.

It is a particular feature of this peninsula that the better, higher land is nearer the sea while land further west (between the old Round Barn - Holliwell Farm shell ridge and Burnham) is lower and heavier. Direct losses to the sea frontage would thus be

particularly unfortunate.

Outside the wall there is the largest single block of saltmarsh in Essex. As well as being an SSSI it has a multi million pound function as a wave attenuator.

The nature conservation value of the area is high. This is the third of the five high value nature conservation zones. Because of its size and remoteness there is considerable potential from a small change in land use. Attention for environmental enhancement should be focused on the three major freshwater outfalls. If any volume of material is required to reinforce the existing defences, the feasibility of extracting the material at any of these (at Marsh house and Grange Outfalls and GR 997 955) should be seriously considered.

Sections 85 and 86 are separated by a proposed counter wall some 7km long. To be fully effective this would have to be a sizeable structure built at considerable cost. There would appear to be arguments in favour of combining these sites and concentrating resources on the seawall itself.

Recommendation: Improve.

Footnote: Sites on the Crouch / Roach Estuaries.

The difference between the estuaries - the breadth of the Blackwater and the small size of the Colne - have already been highlighted. Both are very different from the Crouch/Roach complexes which are longer and narrower. The force exerted by the tidal flow in these channels is considerable (as testified by the author's personal experiences on a falling spring tide with a N E force 4 when an outboard motor temporarily failed in Quay Reach!).

7.44. Burnham-on-Crouch (87)

This section is not relevant to the report.

7.45. Elm Farm (88)

0.7km protecting 2ha. ~ 2.85ha/km.

Grass.

In view of the possibility of confusion between names, numbers and locations used in the Rural Walls Report, it must be noted that the length of sea defence between GR 928 962 and GR 923 967 is being considered here. The land at risk is part of a single field used for silage production.

Much of the revetment has been recently repaired and the seawall enlarged by raising the folding to within 1m of the top of the wall itself. Given that all the material for this has been brought in from elsewhere, the costing for such long distance haulage should be examined since this could justify our suggestions for environmental enhancement on the larger reclaims (e.g. sections 83 - 86).

Towards the western end the backslope of the wall is a good example of a gradient required for an overtopping wall.

Recommendations: Given large scale recent improvements - Sustain at present, reconsider when further work is necessary.

7.46. Stokes Hall to Stamfords Farm (89)

5km protecting 94ha. ~ 8.8ha/km.

This section covers the coastline between two high spurs. The cliff to the east and a lesser land elevation at GR 893973. Two thirds of the length are well sheltered by Bridgemarsh Island (Plate 5). But the easternmost third is exposed to both wave action

from the SW (up to 2.5km wave fetch) and to high current flows on the outside of a major bend in the course of the Crouch estuary.

This last section has no saltmarsh frontage, poor anchorage at the toe and collapsing blockwork. It would be an inexpensive operation to isolate this area from the less vulnerable and higher value land and residential interests to the west. A lower seawall standard could be applied and the SSSI payments adjusted accordingly. A case could be made for a natural two tier defence, but it is an exposed site with a well used footpath.

The value of the remaining two thirds justifies an improved defence, especially as these will be at a lower unit cost due to the efficiency of the Bridgemarsh Island breakwater.

The fourth high value Nature Conservation Zone covers the sea defence sections both sides of the river as far as South Woodham Ferrers / Hullbridge.

Recommendation: Improve two thirds. Re-cost remaining third (east) for maintenance and re-engineering or two tier defence to natural contours.

7.47. Stamfords Farm to North Fambridge (90)

5km protecting 516ha. ~ 103.2ha./km.

Permanent Pasture (SSSI),
Arable, Housing, Industrial.

While it would be possible to separate the grazing marsh and Stamfords by a 500m counter wall, it is not a recommended option. The wall cannot really be shortened and it protects a large part of the fresh water pasture of the Crouch Estuary SSSI, as well as residential and other interests.

Recommendation: Improve.

7.48. Riverside Cottages (91)

Residential.

Not suitable for inclusion in this report.

7.49. Hogwell Marsh (92)

3.5km protecting 210ha. ~ 60ha./km.

Arable, Permanent Pasture (SSSI).

The disturbance free refuges provided by the old abandoned walls at North and South Fambridge and the new works at Marsh Farm, South Woodham Ferrers (see section 93) give this marsh added value to nature conservation. It would lose this if it ever became like the neighbouring abandoned saltmarsh. In the present state of our knowledge, it is too large to consider for a two tier defence.

Recommendation: Sustain.

7.50. North Fambridge Marina (92A)

Developments associated with this marina have created a number of possibilities for testing the feasibility and value of tiered defence systems. The bunded sediment lagoons and re-enclosed saltmarsh give opportunities to look at reduced ERP protection schemes at both high and low land levels. We recommend that these opportunities be investigated.

7.51. Clements Green Creek & Railway (93)

7.6km protecting 293ha. ~ 38.6ha./km.

Country Park and Residential.

Work carried out here in recent years demonstrates well the feasibility of improving sea defence standards on the one hand and improving the area's nature conservation

potential at the same time by wetland creation. The new counter wall does allow for the remotest field to be left at a greater risk of flooding than the rest. Five past breaches have been abandoned to mudflat and saltings here (Plate 6).

To achieve funding through an ESA tier payment it would be necessary to provide a wet marsh meadow of about 2 ha minimum.

Recommendation: Improve / sustain in part.

7.52. Tabrums to Little Hayes (94)

3.6km protecting 66.2ha. - 18.4ha/km.

Arable/Set-aside.

The peninsula between the Upper Crouch and Fenn Creek - a part of this site - could be isolated with just 200m of counter wall. Where there is no saltmarsh the blockwork is already in poor condition and inside the seawall the land slopes gently up to unfloodable land. This could be a candidate for a natural two tier defence but we would prefer to look into the likely waterflow volumes that could result before recommending this option. These would be linked to flooding frequency and sill outfall level. Too low a level could attract too much water too regularly further up the Crouch than before. A higher level, giving an ERP of 1:1 to 1:5 could act as a safety valve for surrounding defences. Such a system undoubtedly reduced flood levels in some parts in 1953 (Grieve 1959).

At the head of Fenn Creek, Woodham Marsh is part of the coastal SSSI. It is a transitional habitat from saltmarsh to rough unmanaged grassland. Although appropriate for so small a site we would normally recommend a better management input for the larger areas we are considering.

Recommendation: Sustain and consider for re-engineering.

7.53. (95 & 96)

Too small and also residential, thus not suitable for inclusion in this report.

7.54. Above Battlesbridge (97A)

Approximately 60ha.

There are parts of the sea defences above Battlesbridge, excluding section 97 the Maltings, that warrant attention. The reduced salinity here and infrequent flooding does make it suitable for reed bed development as at Beeleigh. Managing the freshwater and effluent outflow is preferred over attracting saltwater upstream. Some land in this area has already been taken out of production and is either derelict or a motor cycle race track.

Recommendation: Examine defence costs when further work required, effluent purification possibilities and use of ESA payments to fund better land use.

7.55. Battlesbridge to Malyons (98)

4km protecting 204.2ha. ~ 51.1ha/km.

Arable, Grassland,
Farmsteads, Residential.

One vulnerable corner of sea wall has been abandoned already. Behind it, private tipping of "inert" infill is taking place, apparently without planning consent. About 1km of wall protects less than 30ha and a short counter wall (W of Battlesbridge and in Spittys Reach) could isolate this lower value section either for sustaining or a natural two tier defence rather than improvement which is clearly justified for the remainder.

95 acres of land, partially in this flood zone is currently for sale at an asking price of £1,500 per acre.

Recommendation: Separate into two sections and re-cost.

7.56. Kingsmans Farm (99)

Residential.

Not suitable for inclusion in this report.

7.57. Beckney Farm (100)

2.4km protecting 235.2ha. ~ 98ha/km.

Arable.

There are prospects for wall shortening in this all arable section. But the area of land involved and the lengths of counterwall required do not yet justify so major a change.

Part of the wall is already designed for overtopping with a 1m wide concrete top and 5 courses of standard blockwork on the landward face.

Recommendation: Sustain.

7.58. South Fambridge to Upper Raypits (101)

4.8km protecting 558.4ha. ~ 116.3h/k.

Arable, Residential, Road.

The recent considerable investment in refuse walls probably prohibit immediate alternatives for this section. Given that it is more or less a straight line protecting a large area it is considered that improvements were justified. One design feature used that could well be employed elsewhere is the use of very coarse hardcore (i.e. large concrete blocks) deposited loosely below level to protect the seaward toe. As much of the Essex saltmarsh erodes back to the seawall a way will have to be found to provide a flexible defence. Recharge either by coarse dredged aggregate or here as already placed, concrete rubble or open stone bitumen are all useful possibilities.

The design and size of the borrow pit, however, does not appear to have taken advantage of the experience gained from the Hadleigh refuse wall where a chain of islands left in the newly excavated borrow pit enhanced the wildlife value. The sheep grazing to compact the surface is clearly beneficial and should be applied to all seawalls.

Recommendation: None

7.59. Upper Ray Pits to Lion Creek (102)

4.5km protecting 334.1ha. - 74.2ha/km.

Arable and
Permanent Pasture (SSSI).

This is an all agricultural section to rising contours. There have been particular problems with parts of this wall especially at Black Point. However it is large enough to justify full protection.

Recommendation: Improve.

7.60. Wallasea Island (103)

15.5km protecting 935.9ha. - 60.4mk/ha.

Arable and Industry.

This is arguably the remotest section of sea defence with deep water channels on three sides. It has a current ERP of 5 years and apart from the extreme west end has no buildings at all. Given that the defended area is large enough to justify MAFF grant aid any nature conservation input should be directed towards the design of the necessary excavations rather than alter land use from fresh to saline.

Recommendation: Improve.

7.61. Loftmans to Finces (104)

7.7km protecting 633.1ha. ~ 82.2ha/km.

This large district includes scattered housing. The coastal fringe - one or two fields deep might flood but most of the protected land is relatively high.

Recommendation: Improve.

7.62. Waldrons to Rochford Creek (105)

5km protecting 187ha. ~ 37.4ha/km.

A complicated mix of arable land and residential. One possible alternative would be to shorten the wall at Waldrons, but the contours do not isolate it without counter walls and the house itself is in the way of the most cost effective line.

As with many sites there are advantages in creating saltmarsh but it seems unlikely that these can be incorporated into sea defence plans here. There is no obvious advantage to be gained by subdivision and the walls appear to be in reasonable condition with evidence of much recent work.

Recommendation: Sustain/Improve.

7.63. Rochford Creek to Sutton Bridge (106)

Residential/Industrial.

Not suitable for inclusion in this report.

7.64. Sutton Bridge to Mucking Hall (107)

3.5km protecting 111.6ha. ~ 31.9ha/km.

This wall is of very varied quality. Sections near Fleet Hall show recent work but further east the wall has no revetment and appears almost hand made behind an eroding fringe of saltmarsh. Two small stream valleys intrude at Butlers Farm and Mucking Hall. If these were isolated one could envisage the development of a wider saltmarsh fringe with the gently rising contours providing a useful mix of inundation frequencies.

Recommendation: Sustain or re-engineer.

7.65. Barling Marsh (108)

6.5km protecting 210ha. ~ 32.3ha/km.

Arable.

This is, with Great Marsh (section 32), the lowest enclosed marsh encountered. There is probably no feasible use for this land with increased inundation that would qualify as "traditional management" and allow it to be considered for ESA payments. Productive though mudflat is, the landowner would probably prefer to consider long distance recharge by barge. Much work has been completed on these walls recently.

Recommendation: Sustain.

7.66. Little Wakering (109)

Residential.

Not suitable for inclusion in this report.

7.67. Little Wakering to Oxenhams (110)

8.5km protecting 434.4ha. ~ 51.10ha/km.

Arable, Grass, Residential.

With Old Hall (section 60) this is arguably one of the worst maintained sections of sea defence on the coast. While other small sections may be worse, none protect so large an area including residential use. One short length here of cliffed erosion has had to be repaired with loose chalk/flint infill tipping.

The irregularly shaped peninsula is part permanent pasture, part arable in awkwardly shaped fields. Parts of the wall have to extend most of the way to low water mark. We estimate that a maximum length of 600m of counter wall would save upgrading 6km of seawall. With the next section this is part of the fifth nature conservation zone which includes one 300ha of permanent pasture on Foulness Island and associated saltwater creeks and freshwater fleets.

Recommendation: Consider for two tier defence with short counterwalls necessary. A policy of sustained rather than reduced defence should be the initial priority.

7.68. Rushley Island (111)

3.5km protecting 55.8ha. ~ 15.94ha/km.

This island consists of 55ha of arable land including one agricultural building. It has been in arable production for less than 20 years. It is owned by the Ministry of Defence and being separated by a tidal causeway is not the easiest of units to farm. It is probably going to be a problem for NRA to justify improvement as well as having some insuperable farming difficulties (size and access). Along with the previous section, a changed farming practice to one supported by ESA payments should be actively sought. But again, due to location, an immediate change to frequent saltwater overtopping is not advised. It is within one of the five nature conservation zones identified.

Recommendation: Sustain at present. Change in land use advisable.

8. DISCUSSION

The comments for each section are based on the standard MAFF / NRA cost benefit analyses (Rural Walls Report. 1990). Walls recommended for improvement obviously have overwhelming agricultural, industrial and residential justification without the prospect of cost saving alternatives. Walls recommended for sustaining tend to be the smaller, all agricultural sections with a minimum ERP rating of 10 years. In both categories habitat improvement should be sought by combining clay excavation for seawall work with the creation of 'superwet' areas for reedbed or wader scrape development. These two categories total 93% of the coastal flood plain.

Alternative recommendations have been made for 16 sites divided into two groups. Eight sites should be considered for a tiered defence system to a natural contour line. One is saltmarsh already. Their average size is 13ha and they total less than 1% of the total area defended by seawalls. Six of them are within the high value nature conservation zones, five are SSSI's. They reflect sea defences where the NRA cost benefit controlled expenditure might already be unjustified (four sites need work as a matter of urgency). The main benefit is increased experience in tiered defence systems rather than massive environmental benefit; for there is a clear need to test a range of techniques. Two sites (see sections 7.4 and 7.16) have been specifically included with this in mind.

A further eight sites should be examined in greater depth. Five of them are likely to require major works in the near future and full protection may be difficult to justify. They occupy a total of 828 ha or 6% of the coastal total and are listed in Table 9. As with all other sites, there is no common solution. Each one requires individual consideration and it is fortunate (catastrophic surges excepted) they will not all require assessment at the same time.

8.1 NRA Remit

The present limit of the NRA remit on flood defence does make it difficult to consider all environmental considerations when so many benefits involve land use change. For example, maintenance of saltmarsh outside the seawall will be seen as having a direct bearing on sea defence costs as a wavebreak. But the creation of saltmarsh inside a seawall will seem less relevant unless the cost benefit ratio is too unfavourable for anything else, yet saltmarsh is one of the rarest natural habitats in the United Kingdom and deserves better funding. It is to be hoped that the establishment of the new ESA will place values on natural habitats that can then be addressed in cost benefit equations as alternatives to normal farm crops. There are already examples where the purchase of the land protected would be cheaper than continued expenditure on its sea defences.

Equally a coastal management remit seems far more suited to coping with current land use changes than just a coastal defence remit.

8.2 Perceptions of the coast

This report addresses 60 sections of coastline totalling 226 km at an average length of 3.8 km per section; but there is a widely held belief, particularly among land owners, that the coast is not divisible and can only be considered as a whole. This is clearly not the case. It is a view that hinders the implementation of environmental objectives since it infers that any alternative towards a more flexible sea defence strategy threatens the whole coast with an increased inundation risk, not just small isolated sections.

8.3 Sea Defence Options

8.3.1 Hard Engineering

This includes all possibilities from concrete revetment to sheet piling to surge barriers.

The assessment of individual sections (in Section 7) leads to the recommendation that

196 km of seawalls defending 13,658 ha be improved or sustained. This represents 87% of the total length and 93% of the area defended (Table 9). The long term costs of maintaining such a policy are outside the remit of this project. The future of all non residential sites will thus have to be reviewed as circumstances alter.

The current ERP assessments could be improved if the sea defences were better maintained by limited sheep grazing on the back slope. Plate 7 is an example of an overtopped sheep grazed wall that withstood inundation without damage. There are many practical difficulties which prevent this technique being used in all but a few places. But the introduction of the ESA and experience at Marsh Farm Country Park of mixing people and sheep grazing justifies further consideration given the very significant benefits.

It should also be clearly understood that land defended by an improved standard sea defence can be integrated with nature conservation aims (such as Brent Goose population management) in addition to those that can be tailored directly to sea defence requirements for more clay.

In particular, attention is drawn to the whole region approach adopted by Germany in the Beltringharder Koog and in the Netherlands at the Oostvarderplätzen where, in each case, about 5,000 ha inside an improved sea defence has been devoted entirely to nature conservation. In the German case (Figure 9) this involved the installation of a special sluice to give a 40 cm tidal cycle within the reclaim. The environmental benefits are enormous but it will be argued that it is outside the NRA's remit of coastal defence. When combined with effluent purification however, an artificial wetland makes better sense than spending over £10 million extending a pipeline into the Thames for the discharge of almost untreated sewage from Southend.

One example of such an interdisciplinary approach already exists. On the Severn Estuary, NRA South West are opting for a tiered defence reverting 40 ha of land to the estuary side of the seawall. Over 60,000 cubic metres of spoil are being extracted locally for the new seawall whilst creating two major reedbeds under the auspices of The

Wildfowl & Wetlands Trust, one of which has been designed as a reedbed filtration unit. The landowner is being paid for the spoil and will continue to receive an annual rent from the occupier.

Domestic refuse has been used to improve three sections of the county's sea defences at Deal Hall, South Fambridge and Hadleigh. Additionally there are old coastal refuse disposal sites at Great Wakering and Two Tree Island.

There is no doubt that Essex has to dispose of large quantities of refuse but there are serious doubts as to the suitability of the coast as a site for a linear refuse tip. The coincidence of national government declaring the coast an Environmentally Sensitive Area whilst local government uses the most biologically interesting part (the junction of salt and freshwater) as a refuse tip could create conflict. It would be preferable not to undertake any further refuse sea walls until leachate problems and revetment protection have been assessed over a minimum of a twenty year period. At c7% Essex is still far short of the government's 25% refuse recycling target.

8.3.2 Soft Engineering Options

The House of Commons Environment Committee report 'Coastal Zone Protection and Planning' (Anon 1992) has brought together a number of valuable points concerning the attractiveness of tiered defence systems and the potential for funding the creation of new coastal habitats as an incentive to landowners to participate in a soft option sea defence system.

A sea defence consisting of a wide zone in which natural systems can fully operate is easiest to achieve where you have a linear coast, sparsely inhabited with a low tidal range. The section of the Essex coast covered by this report meets none of these criteria. Instead we are looking at a deeply indented coast, some densely populated areas and a tidal range of 4-5 metres.

However, the reverse argument is also important. Some seawalls are already over

resourced (Northey, Orplands, Rewalls) and cheaper defences are being investigated already. There is no other part of East Anglia where such expensive and unstable walls protect so little land (mean of 65ha protected by 1,000m of defence) that can be isolated so conveniently.

One of the chief difficulties with implementing soft sea defences is the implicit idea that they involve a loss of land to the sea. This is only true if land loss is built into their design as it is at Northey Island. But this is not a soft defence, more a soft retreat. A well engineered 2 tier defence system should be designed to be reversible should national priorities change.

8.3.3 Definitions

Other alternatives to a Tiered Defence System include Setback, Controlled Retreat, Engineered Retreat, Engineered Rollback and Re-alignment.

These alternative phrases are too negative to describe the two most important functions of a softer defence system. These are the retention and protection from erosion of existing sediments within an outer defence line and the albeit slow process of raising land levels by sediment trapping after periodic inundation. In all cases they appear to allow continuing erosion of an unprotected seaward edge.

Admittedly none of these points addresses sediment supply. Sediment appears to have been in short supply in the north of the area for many years; continual extraction in the Harwich deep water channel and the protection of the Walton to Clacton soft cliff face from erosion are contributory factors. Less cliff protection and some artificial recharge will have to be considered as part of a full coastal protection plan.

8.3.4 Abandonment

This is the only sea defence option that saves money from the moment the decision is made. It is a 'do nothing option' which can be made either when repairs become too

expensive or after a flood when a breach is not worth repairing. It is also irreversible and may exacerbate sea defence problems in adjacent areas.

F Burd (1992) documented 36 sites in Essex where abandonment has occurred in the past and as a result of surveys carried out for this project a further 10 are known. Only one is still worth repairing. Most show major sediment losses. Worse still, most have rather poor nature conservation value. We would argue strongly that Fambridge Marsh, Bridgemarsh Island (Plate 5) and Northey Island would be more valuable habitats if they were still enclosed although flooded by overtopping up to approximately twenty times a year.

There are two added reasons for preventing such sea wall breaches and expanding creek systems. First, they break up the coastal footpath and second they allow motorised access for power boats and jet-skis into the wader and wildfowl roosts. On the Pyefleet for example, jet-ski use has eliminated the second largest autumn Bar-tailed Godwit roost on the Essex coast.

8.3.5 The Outer Wall

A two tier defence implies that the outer defence will be overtopped. Given the NRA assessment of a 7mm per annum allowance for relative rise in sea levels, any wall sustained rather than improved will eventually overtop. We are not looking for a fixed overtopping frequency, more a range of seawall heights depending on footpath use, land levels inside the wall and preferred land use. Given that the most valuable habitats from the nature conservation viewpoint are at the upper end of the tidal range, environmental interests would be best served by defence levels equivalent to a 5.4 - 6.0 m tide height.

Revetment or open stone bitumen protection will have to be maintained although a preferred option would be foreshore re-charging tailored to provide an additional high level wave break. Ideally this could be used on the outer edge of existing cliffed saltmarsh in vulnerable areas. The use of placed stone as at South Fambridge (Plate 2) would also help and would be cheaper than revetment.

It should be clearly understood that the object is to recommend a sea defence system that costs less than the present techniques will. As mentioned in Section 6.2 these costs are likely to escalate significantly with saltmarsh loss because of the increased erosion from wave action on the base of the seawall. The only example of comparative costing available comes from Northey Island where we estimate a simple recharged foreshore protection and wooden high volume flap sluice would have cost about 50% of traditional revetment repairs with further savings in annual maintenance costs.

8.3.6 The Inner Defence Line

For reasons of cost it is envisaged that most tiered defence systems will be adopted where the second defence line is the natural contour rise which in places is only 100m behind the present seawall. A manufactured second defence line presents the possibility of little cost saving and is thus only a realistic consideration where there are very considerable savings in length (e.g. Mundon 400m vs 2,600m, or Old Hall 500m vs 9,000m).

8.4 NRA Sea Defence Work

Funds for sea defence work in Essex come from the Essex County Council and the Ministry of Agriculture. MAFF funded work is governed by cost benefit analysis which, until recently, would have covered the majority of all capital work. Now, however, with declining land and crop values, little work on rural seawalls meets MAFF criteria and lesser work is covered by the County Council's £8.1 million p.a. (1991).

It appears likely that an increasing amount of work, particularly during emergencies will be done using outside contractors. While the loss of a permanent staff of skilled people is regrettable, it would appear feasible to combine some of the small scale maintenance work with much of the environmental fine tuning that should be generated by the long term conversion to ESA land uses.

There are many examples where a small scale input and proper guidelines to farmers

concerning seawall uses would have saved or could still save large capital expenditure. There is already an agricultural contracting labour force that takes on work from ploughing to street cleaning which should be encouraged towards a sea defence / ESA management role by outside tendering.

Medium scale sea defence work by landowners tends to be linked with 'inert' waste disposal. Three examples (Sections 7.6, 7.15 & 7.55) have already been mentioned. Unless properly supervised (which is not the case even now) the effects are likely to be environmentally detrimental with varying standards of defence and unfortunate and possibly unplanned land uses as an outcome.

8.5 Implementation of Alternative Land uses

In 1932, A. G. Street, a well known farmer and agricultural columnist wrote "The best thing is to sell the consumer something he desires. He does not want the farmer's wheat, but does wish to camp on his land, have a picnic, stroll over a field and listen to the song of the Lark. Charge him for so doing".

Sixty years later, Sir Michael Franklin, Permanent Secretary, MAFF, wrote in the NFU Journal, "Farmers should be working to get the direct income payments transformed into payments for doing something positive, notably in relation to the environment and leisure activities instead of payments for not doing things".

It would seem ideal for both these ideas to be incorporated into the management of the Essex coast which has very high environmental value and is within a days visiting distance of half of London and Hertfordshire and the whole of Essex.

It would, however, be advantageous to see some form of voluntary co-operation among coastal landowners. This could be envisaged in much the same way as any farmers co-operative which agrees to benefit from the joint management of an asset. This might be Lucerne drying, machinery sharing, bulk buying and storage, or as here - managing and harvesting (by grant, ESA payment and access fee) of the coastal resource.

Such a change in outlook among about 130 landowners is not easy to achieve; but it is necessary if a public benefit is to be seen from an annual expenditure on sea defences of more than £10 million p.a. (c £30,000/km/annum). If compulsory set-aside becomes the long term reality, the public benefit is surely questionable.

There are too many government agencies involved with the implementation of nature conservation as a land use in the whole countryside for any landowner to have a clear view of the likely priorities. A common approach when discussing multi-role solutions is to suggest the formation of a new agency or authority. This does not appear necessary here, apart from a wide remit for the NRA, enabling it perhaps to consider compensation when this is cheaper than sea defence.

9. CONCLUSIONS

It seems unrealistic to assume that the present high level of sea defence funding can be sustained in all areas. The reduced land value and crop returns suggest that alternative strategies should be considered for some seawall sections.

The only soft engineering technique that has been fully tested is abandonment. This provides only a very limited nature conservation benefit for a significant and permanent loss of useable land. The worst scenario of all would be unplanned abandonment as a result of storm damage.

Environmental considerations, from footpath users to nesting Black-tailed Godwits, favour a more moderate adjustment which should be planned to allow the addition of an environmental buffer zone. Land use here could be funded through compulsory set-aside / ESA payments. It is to be hoped, although far from certain, that ESA options can be integrated with the specific requirements of a tiered defence system.

Tiered defences will require some continuing expenditure and cost savings; these should be looked for in the long term. The better mix of land uses and amenity benefits to the

taxpayer will provide a justification for expenditure which is lacking at present.

Eight sites have been identified where tiered defences should be costed and their advantages considered in detail. Most of the necessary techniques - better maintained lower walls, cheaper face protection (including recharge) and simpler, larger sluice construction need to be tried in sites which already require work.

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