7. IMPLEMENTATION AND MONITORING

7.1 Legal, Technical and Economic Issues

The application of the concept of the concept of critical natural capital and constant natural assets with Shoreline Management Plans raises a number of legal, technical and economic issues which have not yet been fully explored or tested. Section 3.4 recommended that the identification of critical natural capital and constant natural assets should concentrate on habitat and site re-creatability in principle. Accordingly, there may be a need for the preparation of an SMP to be followed by an Implementation Study. Issues which may be addressed at this stage include the following:

(i) *Legal Issues*

The EC Habitats Directive, implemented in the UK in 1994, introduces a number of new legal requirements relating to nature conservation, including the obligation on member states to maintain the favourable conservation status of species and habitats. Some of the implications are outlined in the MAFF guide "The EC Habitats Directive: Implications for flood and coastal defence"[16]. Similarly, the EC Birds Directive and the Ramsar Convention contain obligations to conserve the special interest of designated sites.

The Habitats Directive provides that a "plan or project" which has an adverse effect on the integrity of a European site (i.e. a Special Area of Conservation or a Special Protection Area) may only be approved if there are no alternative solutions and there are imperative reasons of over-riding public interest, and then only if appropriate compensation measures are taken. The definition of a "plan or project" has not been tested, but it is understood that the UK Department of the Environment takes the view that, whilst proposed coastal defence schemes constitute a "plan or project", Shoreline Management Plans do not. However, it is essential that the Implementation Stage of an SMP addresses the need for habitat replacement at a strategic level, to ensure that the UK's international obligations under the Habitats Directive, Birds Directive and Ramsar Convention are fulfilled.

There is also a need to meet the obligations of the Habitats Directive relating to protecting *site integrity* and the *favourable conservation status* of species and habitats, in the context of dynamic coastal systems within which habitats are being created and lost as a result of natural processes. The view taken by English Nature and the authors is that a dynamic coastal ecosystem cannot be sustainably preserved in an unchanging state. Sustainable management requires an acceptance of the processes of change which naturally lead to increases in some habitats and decreases in others. Moreover, the replacement elsewhere within the coastal subcell of habitats lost as a result of natural processes should not necessarily be seen as representing an adverse impact on site integrity. SMP implementation needs to ensure that this balance is achieved within the legal framework.

Article 6 of the Habitats Directive does allow a plan or project to be carried out for imperative reasons of over-riding public interest, even if it has a negative effect on the integrity of a European Site, provided that appropriate compensatory measures are adopted. Article 4 of the Ramsar Convention contains a similar provision. In the case of European sites which contain priority natural habitats or priority species, the Habitats Directive only allows considerations relating to human health, public safety or the environment, or other reasons accepted by the European Commission, to justify implementing a plan or project damaging to the integrity of a site. Although untested, this provision appears to allow for a situation where loss of habitat in a European Site through natural coastal change is allowed to occur, in the broader environmental interest of maintaining the integrity of coastal processes within the subcell, provided that appropriate steps are taken to re-create the habitat elsewhere.

(ii) *Technical Issues*

Technical issues which will need to be addressed as part of SMP implementation, in relation to sites and habitats which are likely to be lost or reduced in extent as a result of the SMP recommendations include:

- availability of land;
- location of replacement site;
- land acquisition;
- hydrological considerations;
- technical feasibility;
- time scale;
- funding mechanisms;
- acceptability to local authorities, residents groups, National Farmers Union, Country Landowners Association and other interested groups;
- local land-use planning policies;
- targeting of agri-environmental and other incentive schemes.

Habitat re-creation may need to be started well in advance of the expected loss of habitats which are to be replaced. It is therefore important that a strategic approach be taken to these technical issues, preferably through an implementation study covering the whole sub-cell.

(iii) *Economic and Funding Considerations*

To be eligible for UK government funding, capital coastal defence works must be able to show a positive cost-benefit ratio. In general terms, this means that the value of the assets to be protected must exceed the costs of the scheme to protect them. Traditionally, the assets included in such analyses have been those for which conventional markets exist, for example buildings and other property, infrastructure such as roads and land in agricultural or other economic use. However, where a need exists for capital investment to protect environmental assets, such as those identified as critical natural capital, there may be a need to include them within cost-benefit analysis, despite the absence

of conventional markets to value them. The types of approach which may be adopted include:

- Productivity loss (reduction in income from loss of an environmental asset);
- Travel costs incurred by visitors to a site;
- Replacement costs. This is especially applicable where there is a choice of protecting or re-creating a constant natural asset;
- Preventive expenditure;
- Contingent valuation (willingness to pay or to accept compensation for loss of an asset).

Where the implementation of SMP recommendations relating to nature conservation requires expenditure which falls outside cost-benefit rules, consideration will need to be given to other sources of funding. These may include grants from English Nature, central government funds or European Community funds.

7.2 Monitoring

The maintenance and enhancement of environmental assets requires the definition of measurable targets and monitoring to ensure that they are achieved. The monitoring should be designed to determine compliance with the strategic nature conservation objectives specified in the Shoreline Management Plan and with obligations under the EU Directive, i.e. the extent and distribution of habitats and the populations of rare, protected or internationally important species.

It is recommended that habitat monitoring should be done from aerial photographs, supplemented by site visits which will be necessary in order to identify certain important habitats. Habitat monitoring data may be presented as maps at a scale of 1:10,000 using the standard Phase I habitat codes defined by the UK Joint Nature Conservation Committee, and as tables of habitat extent in each coastal unit of a subcell. Replication of surveys over a cycle of about ten years will enable SMP objectives to be monitored.

Species monitoring will need to be targeted on species identified during SMP preparation as being of particular interest (e.g. those which are rare or endangered), groups which are readily observable (e.g. birds and seals), and species which serve as indicators of habitat or environmental quality. Where the presence of protected or endangered species is identified, population monitoring should be specified as part of the implementation of any engineered coastal defence schemes.

Geological resources can be monitored fairly readily, and again this should be specified as part of the implementation of any coastal defence schemes which may affect them.

8. EXAMPLES OF OBJECTIVE SETTING

The following examples of objective setting have been drawn from Shoreline Management Plans produced by Mouchel Consulting Ltd for two contrasting frontages: the Lizard Point to Land's End subcell in Cornwall and the North Norfolk subcell.

8.1 Lizard Point to Land's End, Cornwall

The Lizard Point to Land's End frontage is located in south-west Cornwall (Figure 2) and comprises two hard rock peninsulas separated by a bay of softer, erodible material. The frontage includes many nationally important geological sites, 19 of which are designated or proposed as SSSIs and two as RIGS. There are also eight SSSIs designated for their biological interest, three of which include parts of a National Nature Reserve, and 42 county wildlife sites.

Objective setting for Ecological Assets

(i) *Lizard National Nature Reserve (Coastal units 1-3)*

This site, which includes three coastal SSSIs, contains maritime heath and unique lizard heath, and is known to harbour 15 Red Data Book plants and 12 Red Data Book insects (Figure 3). The habitats are internationally important and non re-creatable, so the site qualifies as critical natural capital for habitats and species. The site requires protection from coastal development and recreational pressures. Erosion is slow so non-intervention is recommended, but there is a need to proactively route the coastal footpath away from the cliff edge to reduce vegetation trampling by visitors.

(ii) *Polygonum maritimum (Sea knotgrass) (Coastal Unit 3)*

This species is nationally endangered, and within the study area is confined to the strand-line in Gunwalloe Church Cove. Although of national importance, its habitat is readily re-creatable, so it represents a constant natural asset. The strand-line habitat of this species is vulnerable to both natural coastal change and human activities such as the construction of coastal defences to protect the adjacent cultural asset of Gunwalloe Church (Figure 4). However, the habitat depends on dynamic coastal processes and a degree of disturbance. If coastal defences are to be constructed at the site, re-creation of the habitat elsewhere in the cove and translocation of the plants should be undertaken.

(iii) *Loe Pool SSSI (Coastal Unit 4)*

Loe Pool is a freshwater lagoon and associated valley system which is separated from the sea by a shingle bar (Figure 5). Both the lagoon and the bar contain scarce species and habitats not found elsewhere in the county. It is a nationally important site which is essentially non re-creatable, so constituting critical natural capital for habitats and species. The bar appears to be stable, but the sediment supply may be affected by shingle extraction at Gunwalloe Fishing Cove at the east end of the same coastal unit. Monitoring

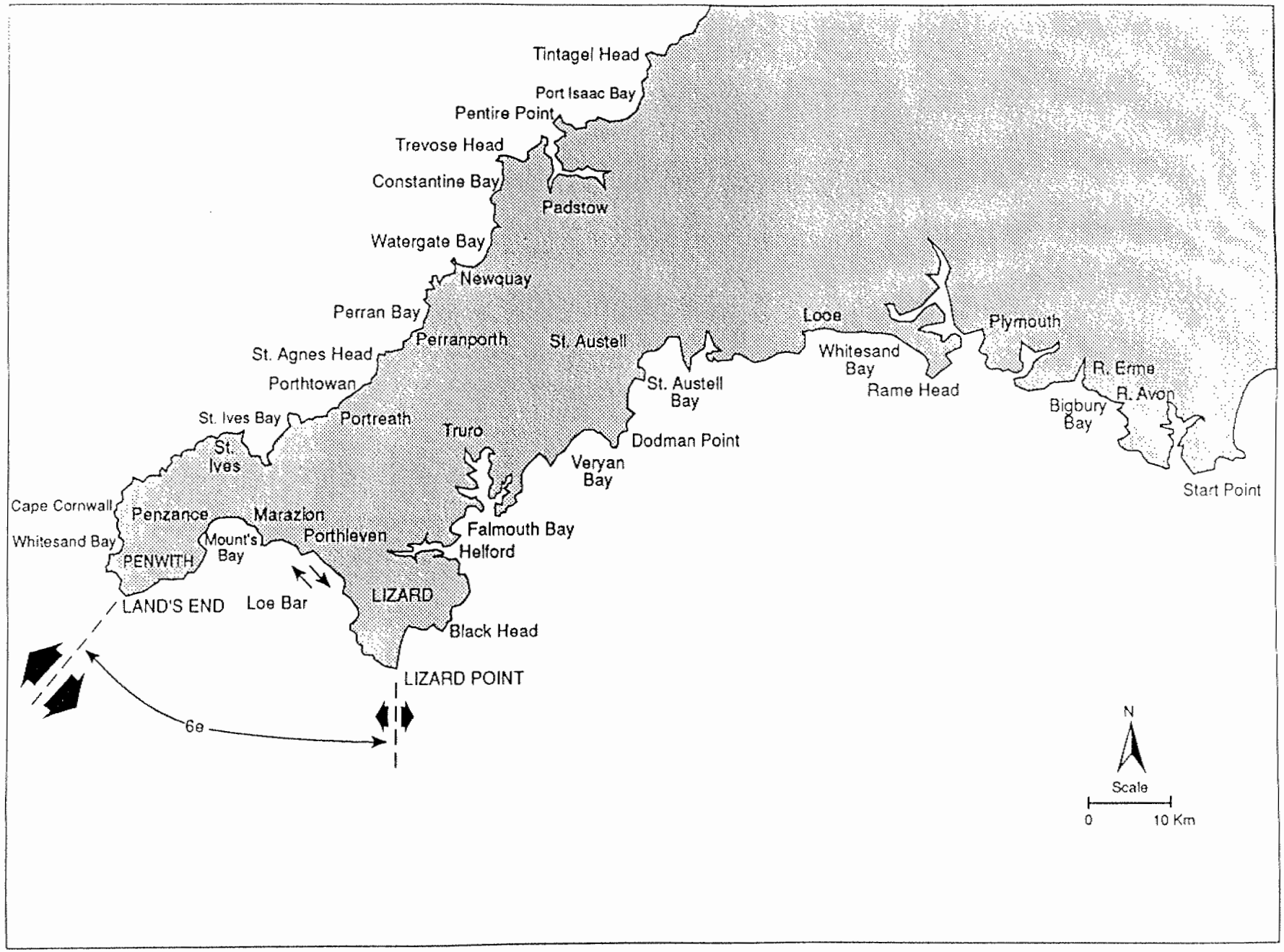

Figure 2
Lizard Point to Land's End Frontage, Cornwall (Coastal Subcell 6e)

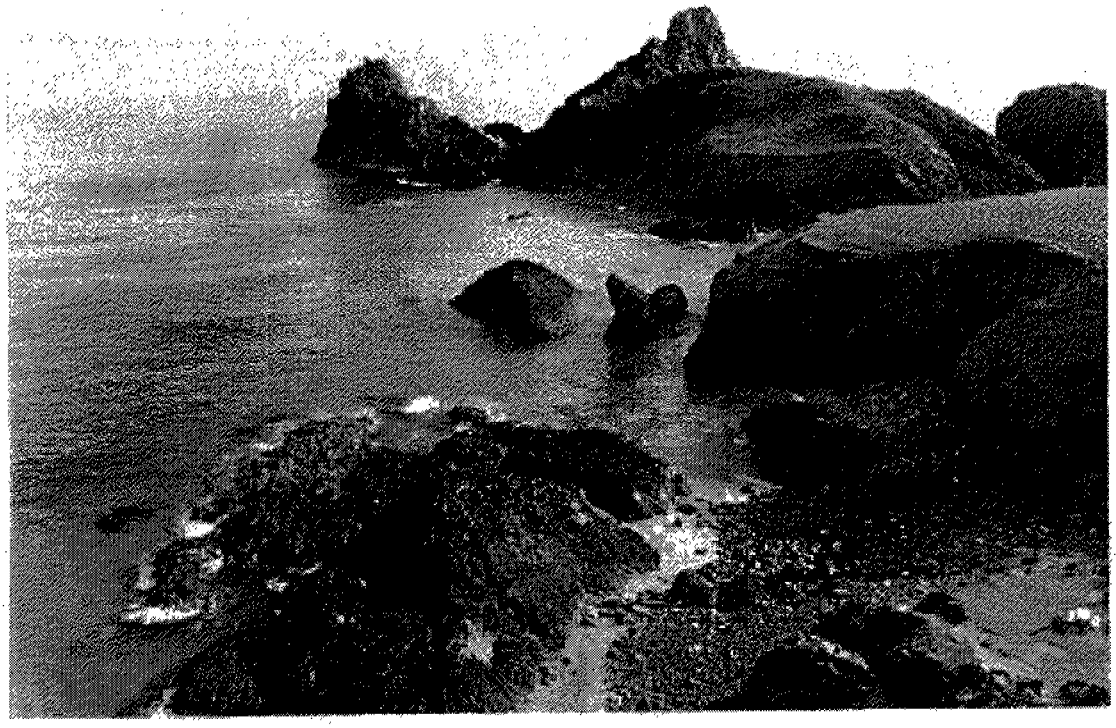

Figure 3
Lizard National Nature Reserve and Caerthillian to Kennack SSSI

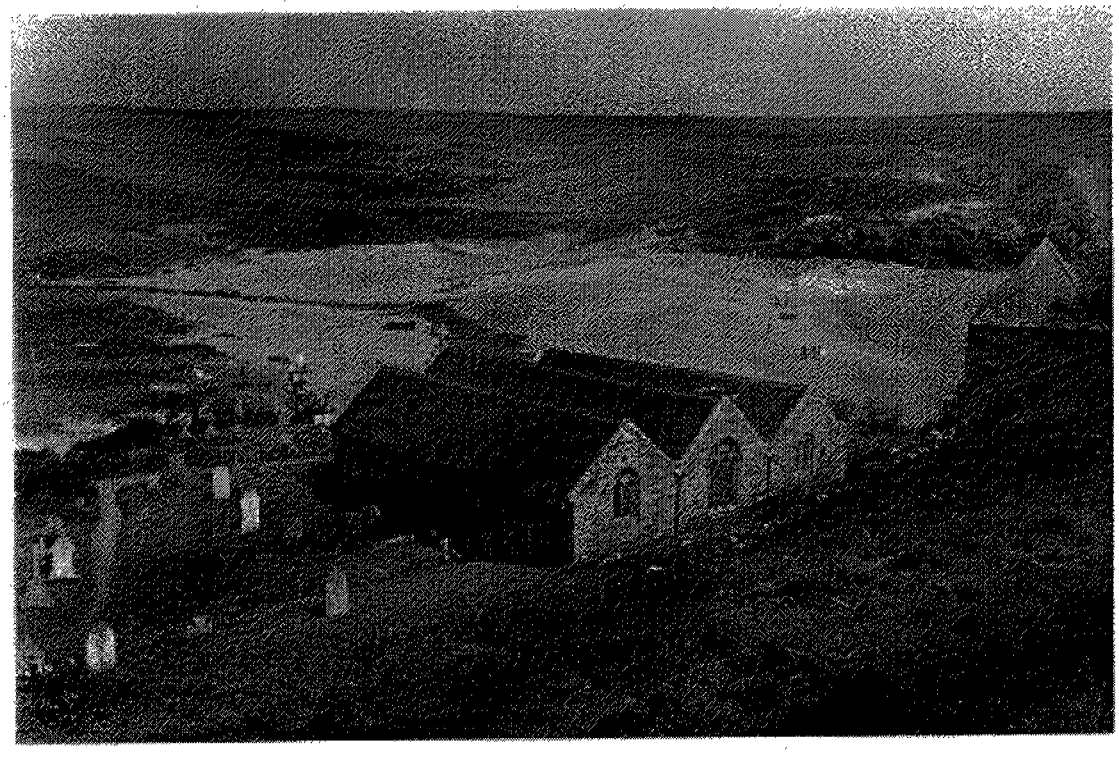

Figure 4
Gunwalloe Church Cove
Habitat for *Polygonum maritimum* is the strandline adjacent to the church

and further research to establish the stability of Loe Bar is a priority, and sediment extraction should be discontinued. The preferred defence option is non-intervention so long as Loe Bar remains stable. The introduction within this coastal unit of reflective hard defences or beach management structures which may reduce sediment supply to the bar should be opposed.

(iv) *Cathormiocerus brittanicus (Weevil) (Coastal Units 1-3 and 5)*

This is an internationally important species whose UK populations are confined to coastal grassland on the west coast of The Lizard. The populations would be very difficult to re-create, so the site qualifies as critical natural capital for species. Coastal erosion is slow, but the habitat of this species requires protection from development and recreational pressure, particularly trampling. Non-intervention is the preferred coastal defence option.

(v) *Greater Horseshoe Bat (Rhinolophus ferrumenquinum) (Coastal Unit 5)*

This is an internationally important species whose roosts are in old mine workings (which are Scheduled Ancient Monuments), close to cliffs undergoing variable rates of erosion (Figure 6). The roost sites would be difficult to re-create, hence qualifying as critical natural capital for species. They require protection from coastal erosion, demolition, infilling or human disturbance. There is no economic case for coastal defences, and hence non-intervention is likely to be the only viable strategy. If, however, erosion proceeded to the point where the mine workings were in imminent danger of being lost, the feasibility of some protection measures would need to be examined.

(vi) *Coastline from Porthleven to The Greeb (Coastal Units 5 to 8)*

The semi-natural coastal habitats along this coast mainly comprise maritime grassland and cliff-top communities, which support a number of rare and scarce species and merit conservation (Figure 6). They are of county importance and are re-creatable, so qualifying as constant natural assets. Erosion rates are variable, depending on the underlying geology. The shoreline management objective is to maintain the total area of habitats shown in the most recent habitat survey. Agricultural set-aside of arable and grazing land immediately inland of the coastal habitats would be an appropriate measure to maintain and, where appropriate, expand semi-natural habitats along the coast.

(vii) *Intertidal Habitats around Marazion and St. Michael's Mount (Coastal Units 9 and 10)*

These intertidal habitats have been identified as being particularly important owing to their high diversity. A nationally endangered plant (Greek sea spurrey *Spergularia bocconii*) was formerly recorded from part of this shore. There is insufficient information available to determine whether the habitats are of national importance and the degree to which they are re-creatable, so

Figure 5
Loe Bar and Loe Pool

Figure 6
Coastline from Porthleven to The Greeb, showing former tin mine, a roost site for Greater Horseshoe Bats

they are regarded as constant natural assets. The intertidal area is affected by recession of the low water line, coupled with the existing hard defences protecting the nationally important cultural asset of St Michael's Mount (Figure 7). Conservation of intertidal habitats should be an objective of future coastal defence works. Recommended strategies are to design any future coastal defence works to prevent recession of the low water mark as well as recession of the high water mark, and to reduce the reflectivity of the existing hard defences. Intertidal habitat re-creation and translocation of the endangered plant species should be undertaken as part of any works required to protect the cultural heritage interest.

(viii) *Marazion Marsh SSSI (Coastal Unit 10)*

Marazion Marsh is a freshwater wetland dominated by reedbeds which is of particular importance to birds, and also contains a number of notable plants and insects. The site is of national importance but it is fundamentally re-creatable so it qualifies as a constant natural asset. The marsh requires protection from further coastal development and hydrological changes (e.g. saline infiltration or lowering of the water table). The proposed objective is to maintain the existing hard coastal defences which separate the marsh from the sea.

Objective Setting for Geological Assets

(i) *Caerthillian - Kennack SSSI (Coastal Unit 1)*

This is nationally important stratigraphic site on a hard rock cliff (Figure 3), constituting critical natural capital for earth science. Erosion is slow, serves to maintain the exposures and does not threaten any property interests, so the coastal defence objective is non-intervention.

(ii) *Loe Bar (Coastal Unit 4)*

Loe Bar is a coastal geomorphological feature of national importance protecting the nationally important freshwater wetland of Loe Pool (Figure 5). The bar is fundamentally re-creatable but the habitats it protects are not, so this feature constitutes critical natural capital for environmental service provision and a constant natural asset for earth science. The proposed coastal defence objective is non-intervention. Human activities which would affect supply or retention of sediment (e.g. aggregate extraction within coastal cell, reflective hard defences within coastal cell) should be opposed.

(iii) *Porthleven East SSSI (Coastal Unit 4)*

This SSSI is a stratigraphic site of national importance on a soft rock cliff subject to both marine and groundwater erosion, backed by extensive property interests in Porthleven which require protection. It is unclear whether this site should be treated as critical natural capital or as a constant natural asset. Part of the site has already been obscured by the construction of hard coastal

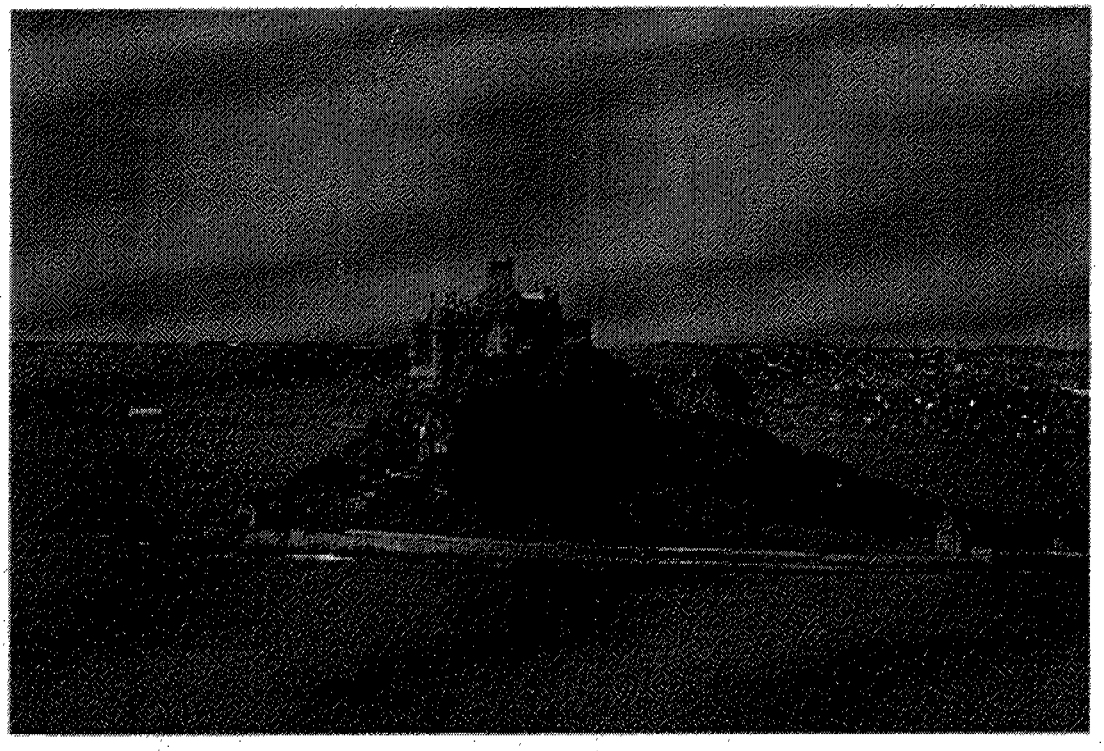

Figure 7
St. Michael's Mount

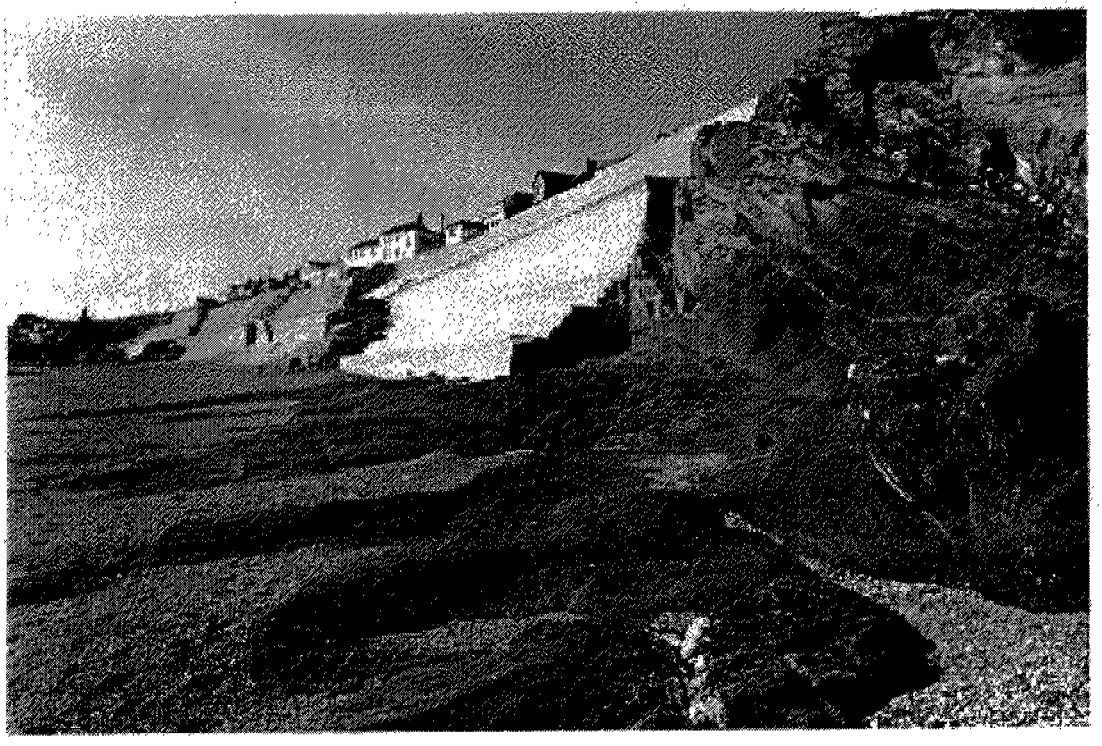

Figure 8
Porthleven East SSSI and recently constructed coastal defences

defences (Figure 8), and there is a foreseeable need for further defences. The proposed objective is to examine the full range of coastal defence measures including breakwaters, sills, revetments and cliff strengthening to inhibit marine erosion together with drainage systems to reduce groundwater pressure, as alternatives to traditional sea walls. Any further property developments which may lead to a future requirement for coastal defences to be extended further eastwards are to be resisted.

8.2 North Norfolk Coast

The North Norfolk coastal subcell (Figure 9) comprises an ancient coastline fronted by a barrier beach system of extensive salt marshes, sand and shingle. The area is of recognised international importance for nature conservation, especially in relation to birds. Most of the frontage is designated as the North Norfolk Coast SSSI, Ramsar Site, Special Protection Area, Biosphere Reserve and proposed Special Area of Conservation. There are also four National Nature Reserves within the SSSI. Most of the subtidal area is proposed for designation as a Special Protection Area. The whole coastline is also of great importance for geomorphological study, teaching and research.

Objective Setting for Ecological Assets

(i) *Cley Marshes NNR and Salthouse NNR (Coastal Unit 2)*

These two National Nature Reserves, both managed by the Norfolk Wildlife Trust, comprise a mosaic of freshwater habitats (grazing marsh, swamp, lagoons and reedbeds) with some saline influence (Figure 10). The habitats have been largely created over the last 60 years by management of water levels and maintenance of the shingle ridge which protects the reserves from flooding by the sea. The habitats are therefore considered to be constant natural assets. Continued maintenance of the ridge in its present position will become unsustainable in the long term without undertaking major capital works (the ridge was breached in storms during early 1996 leading to major flooding). The present policy of reprofiling the shingle ridge is leading to loss of shingle and is liable to affect the geomorphology of Blakeney Point, a spit in coastal unit 3 which is fed by shingle moving through coastal unit 2. The recommended policy is therefore maintenance of the ridge in the short term (5-10 years) followed by a policy of managed retreat in the long term. Allowing the ridge to adopt a more natural profile will lead to it rolling back over the marsh and to increased saline influence within the marshes. It is therefore recommended that consideration be given to constructing a second line of defence which will protect the freshwater characteristics of the southern part of the marsh and property in the adjacent villages of Cley and Salthouse, whilst creating new freshwater habitat on adjacent land to replace that which has become more saline or has been lost.

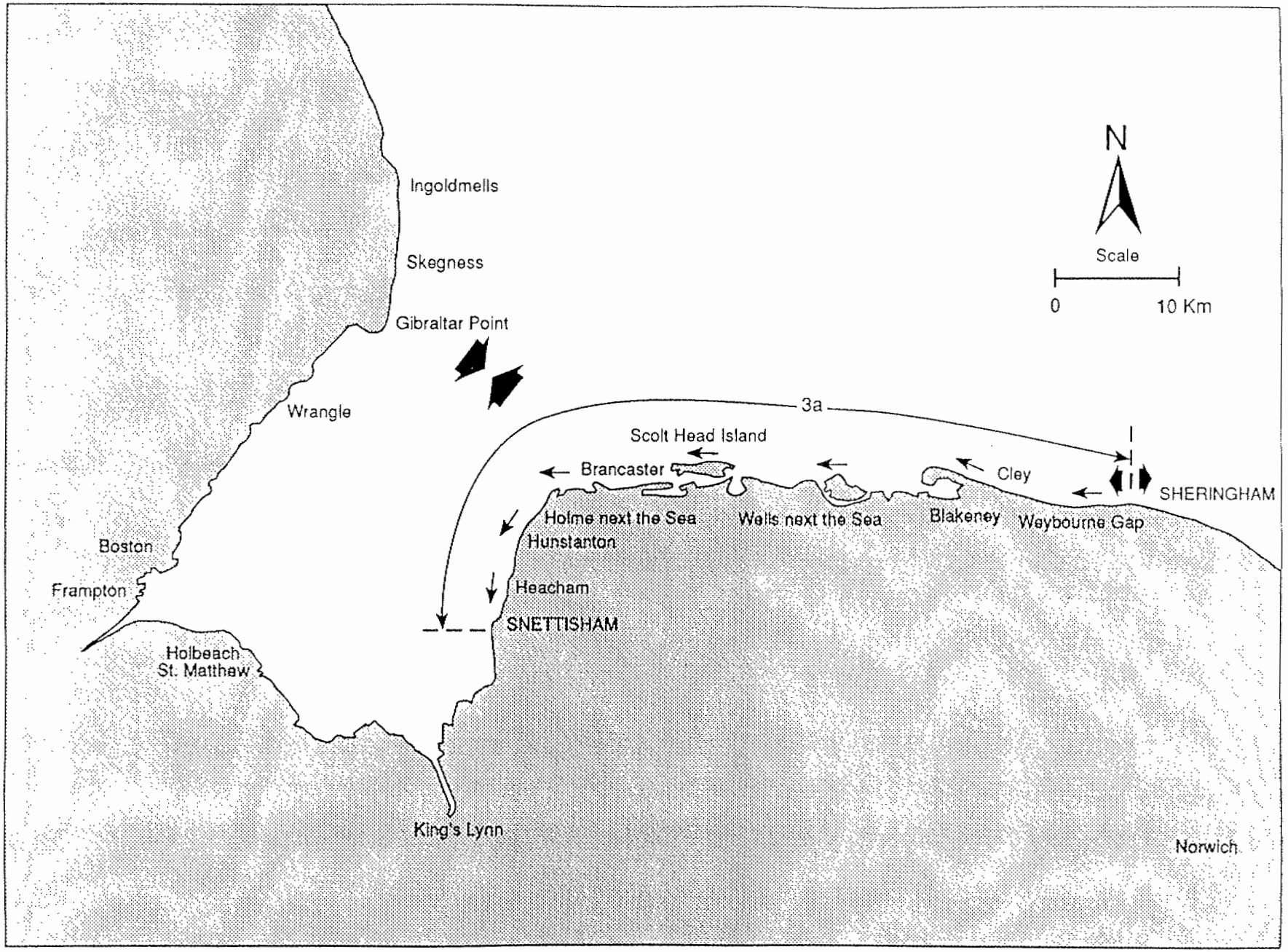

Figure 9
North Norfolk Frontage (Coastal Subcell 3a)

Figure 10
Cley Marshes National Nature Reserve, showing shingle ridge in the background

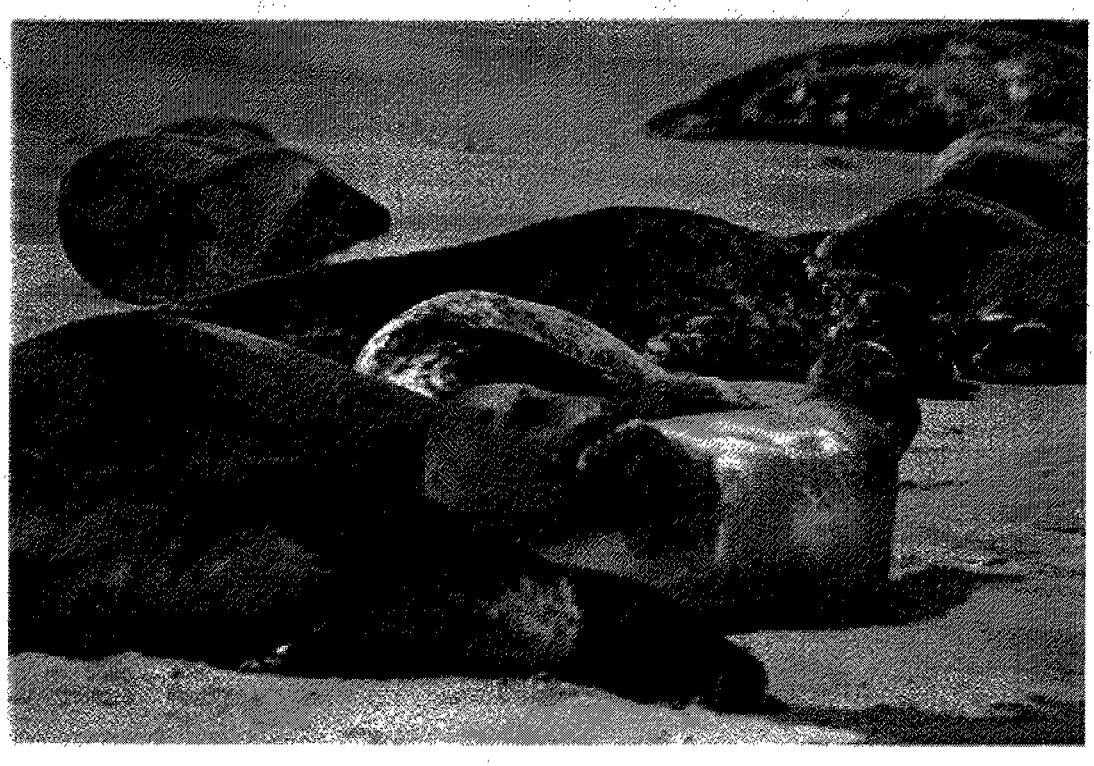

Figure 11
Seals on Blakeney Point

(ii) *Blakeney Point (Coastal Unit 3)*

Blakeney Point is a large shingle spit including sand dune and shingle habitats, and protecting both salt marshes and enclosed freshwater marshes to its landward side. The Point and adjacent habitats harbour several nationally rare plants and are internationally important for their breeding birds (particularly terns) and seals (Figure 11). The long-established dune and shingle habitats are essentially non re-creatable so qualify as critical natural capital. A policy of non-intervention is most likely to conserve the Point, and this includes ensuring the natural supply of shingle from the east.

(iii) *Holkham Meals (Coastal Unit 5)*

Holkham Meals include an extensive yellow and grey dune system, dune slacks, pine plantation, mixed woodland, wet meadows and freshwater lagoons. The grey dunes probably qualify as critical natural capital for habitats whilst the other habitats constitute constant natural assets. The habitats are not threatened by erosion and net accretion is believed to be occurring. The recommended policy option is, therefore, to hold the line, and it is proposed that opportunities be sought within the coastal unit to create new habitats to replace those likely to be lost elsewhere in the subcell.

(iv) *Scolt Head Island and Norton Marsh (Coastal Unit 6)*

Scolt Head Island is a barrier beach feature comprising shingle ridges, dunes and salt marsh (Figure 12). It is a National Nature Reserve of particular importance to breeding birds. Norton Marsh is an enclosed grazing marsh protected by embankments, situated inland from Scolt Head Island and separated from it by a tidal channel. Scolt Head Island constitutes critical natural capital for habitats, whilst the freshwater habitats of Norton Marsh are constant natural assets. The recommended policy for Scolt Head Island is non-intervention as allowing its natural evolution is most likely to conserve the existing habitats. Norton Marsh is considered defensible over the life span of the plan as it is protected by Scolt Head Island, and a policy of hold the line is recommended, with opportunities for freshwater habitat creation being sought in this and adjacent areas.

(v) *Titchwell Marsh (Coastal Unit 7)*

Titchwell Marsh is an RSPB Reserve comprising freshwater reedbed, a freshwater lagoon and a brackish lagoon, created by the enclosure of former salt marsh following its purchase by the RSPB in 1973 (Figure 13). The habitats are clearly re-creatable and so constitute constant natural assets. The sea defences are maintained by the RSPB but erosion of this unit is occurring and it is recognised that the defences cannot be sustained indefinitely. The recommended policy is therefore to sustain the defences in the short-term (up to ten years) whilst creating replacement freshwater habitats elsewhere, and to implement managed retreat over the long-term.