



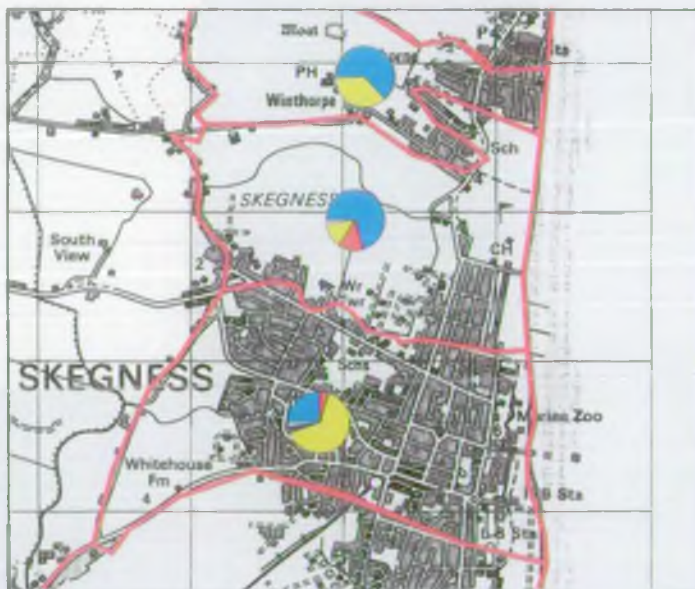
## ENVIRONMENT AGENCY

Anglian Region

### LINCOLNSHIRE SHORELINE MANAGEMENT PLAN

#### VOLUME II - ATLAS

DECEMBER 1996



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ENVIRONMENT AGENCY



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## INTRODUCTION

## LINCOLNSHIRE SHORELINE MANAGEMENT PLAN

### Introduction

This document is Volume II of the Lincolnshire Shoreline Management Plan.

In total the SMP comprises three volumes; these are:

- Volume I: Core Report
- Volume II: Atlas
- Volume III: Supporting Document.

The scope of the three documents is outlined below:

**Volume I, Core Report:** The Core Report describes how the Lincolnshire coast has been considered as a number of so called "management units"; these are lengths of coast with coherent characteristics in terms of natural coastal processes and land use. It sets out the specific objectives of the SMP with regards to the whole coast and these management units. The coastal defence options are then appraised in terms of these objectives and in terms of their economic viability. Preferred strategic options are thus derived.

The remainder of the Core Report is concerned with recommendations for future research and monitoring of the coast, and recommendations for the future review procedures for the SMP.

**Volume II, Atlas:** The Atlas comprises 18 maps accompanied by short descriptions of the information presented and the sources of the data. A list of the maps included in the Atlas is provided in Table 1.

**Volume III, Supporting Document:** The Supporting Document provides further background and details to the information contained in the Atlas.

Some diagrams and tables are repeated between documents to avoid excessive cross-reference.

### Consultation

The Lincolnshire SMP has been developed in two stages. Stage 1 dealt with the collection and presentation of data and Stage 2 with the integration of all information which, together with the results of consultation, led to the preparation of the coastal defence strategies.

At the beginning of Stage 1 (March 1995) a Scoping Document was issued to over 100 interested parties to advise them of the project and to request relevant information. Data collected was used in the preparation of draft editions of the Atlas and Supporting Document. At the end of Stage 1 (August 1995) these documents were issued for consultation.

During Stage 2 the Atlas and Supporting Document were revised in the light of the consultation and a draft of the Core Report prepared. These three documents formed the draft SMP which was issued for consultation in December 1995. Finally, comments from this consultation were incorporated into the three documents and the SMP published in December 1996.

A list of those consulted during the preparation of the SMP together with a summary of responses received during the Stage 1 and Stage 2 consultation is provided in Appendix A of Volume III.

### Atlas

This document presents information on the following key issues:

- coastal processes
- coastal defences
- land use and the human environment
- natural environment.

The information presented is the result of the data gathering and consultation exercises undertaken during the preparation of the SMP.

## GLOSSARY

<b>Astronomical Tide</b>	The tide levels and flows which would result from gravitational effects eg. of the Earth, Sun and Moon, without any meteorological influences.
<b>Atlas</b>	This document provides a summary of data collected during the preparation of the Lincolnshire Shoreline Management Plan
<b>Beach Nourishment</b>	The importation of material to supplement the existing beach (also known as beach recharge/replenishment/feeding).
<b>Bedload Current Residual</b>	The difference in the capacity of the flood and ebb tidal flows to transport material along the seabed.
<b>Chart Datum</b>	The level to which both tide levels and water depths are reduced on marine charts. On UK charts, this level approximates to the predicted lowest astronomical tide level (LAT).
<b>Core Report</b>	This document sets out the strategy for the Lincolnshire coast. It includes details of the appraisal process leading to the selection of the preferred options. It also contains recommendations for future monitoring, research and updating.
<b>Detached Breakwaters</b>	Coastal structures lying parallel to, but not connected to the shore. They are generally constructed from imported rock or concrete units placed on the sea bed.
<b>Drift Divide</b>	A point where the orientation of the coast changes abruptly and beach material is moving away from the point.
<b>Ebb</b>	Period when tide is falling. Often taken to mean the ebb current which occurs during this period.
<b>Fauna</b>	Animals
<b>Flood</b>	Period when tide is rising. Often taken to mean the flood current which occurs during this period.
<b>Flora</b>	Plants
<b>Geomorphology</b>	The study of landforms and landforming processes.
<b>Groynes</b>	Coastal structures lying at right angles to, and connected to the shore. They may be constructed from timber, concrete, steel sheet piles or rock.
<b>Hard Defences</b>	Defences that tend to confront and resist the natural coastal processes, eg. seawalls.
<b>Hinterland Boundary</b>	The landward boundary of the Lincolnshire Shoreline Plan.
<b>Local Plan</b>	A document which sets out the policies at a district level.
<b>Longshore Transport</b>	Movement of beach sediments approximately parallel to the shoreline. Also known as longshore drift.
<b>Management Objectives</b>	Objectives for the management of the shoreline. These objectives form the basis for the appraisal and development of the strategic coastal options.
<b>Management Unit</b>	A length of shoreline with coherent characteristics in terms of both natural coastal processes and land use.
<b>Neap Tide</b>	Tides of small range which occur twice a month (when the moon is in quadrature).
<b>Offshore Boundary</b>	The seaward boundary of the Lincolnshire Shoreline Management Plan.
<b>Planning Policy Guidance</b>	Notes prepared by the Government to provide guidance to local authorities and others on policies and the operation of a planning system.
<b>Ramsar Site</b>	Protected wetland site under the Ramsar convention on wetlands of international importance especially as waterfowl habitat.
<b>Revetment</b>	A sloping surface of stone, concrete or other material used to protect an embankment, natural coast or shoreline against erosion.
<b>Residual Life</b>	The number of years the defence is estimated to last before its integrity is compromised as a result of progressive deterioration.

<b>Sea Walls</b>	Solid coastal structure built parallel to the shoreline.
<b>Scoping Document</b>	The document issued to interest parties at the start of the first stage in the production of the Lincolnshire Shoreline Management Plan.
<b>Sediment Cell</b>	A length of coastline which is relatively self-contained as far as the movement of sand or shingle is concerned.
<b>Sediment Sink</b>	A point on the coast where material is moving towards the point and beaches are tending to build up.
<b>Shoreline</b>	The interface between the land and the sea.
<b>Shoreline Management Plan</b>	A document which sets out a strategy for coastal defences for a specified length of coast.
<b>Significant Wave Height</b>	The average of the highest one third of the waves
<b>Soft Defences</b>	Defences designed to work with rather than against the natural coastal processes. They tend to absorb rather than reflect wave energy and be dynamic rather than static eg. beach nourishment.
<b>Spring Tide</b>	Tides of large range which occur twice a month (when the moon is new or full).
<b>Standard of Defence</b>	The return period of the storm event that the defences are able to provide protection against.
<b>Strategic Coastal Defence Option</b>	Generic term for any coastal management strategy eg. do nothing, advance, retreat or hold the existing coastal defence line.
<b>Structure Plan</b>	A document providing strategic policies and the statutory planning framework for the county.
<b>Supporting Document</b>	This document provides background to the information contained in the Atlas.
<b>Surge</b>	Change in water level as a result of meteorological conditions (wind, high or low atmospheric pressure).
<b>Tidal Range</b>	The vertical difference between high and low water.
<b>Tidal Current Residual</b>	The difference between the flood and ebb tidal flows.

#### ABBREVIATIONS

<b>Agency</b>	Environment Agency (Anglian Region)
<b>CCA</b>	Coastal Conservation Areas
<b>ELDC</b>	East Lindsey District Council
<b>ESFJC</b>	Eastern Sea Fisheries Joint Committee
<b>GCRS</b>	Geological Conservation Review Site
<b>LCC</b>	Lincolnshire County Council
<b>MAFF</b>	Ministry of Agriculture, Fisheries and Food
<b>NCC</b>	Nature Conservancy Council
<b>NNR</b>	National Nature Reserve
<b>NRA</b>	National Rivers Authority (Anglian Region)
<b>OD</b>	Ordnance Datum
<b>PPG</b>	Planning Policy Guidance
<b>RIGS</b>	Regionally Important Geological Site
<b>RNLI</b>	Royal National Lifeboat Institution
<b>RSPB</b>	Royal Society for the Protection of Birds
<b>SAC</b>	Special Area of Conservation
<b>SMP</b>	Shoreline Management Plan
<b>SMR</b>	Sites and Monuments Record
<b>SNCI</b>	Site of Nature Conservation Importance
<b>SPA</b>	Special Protection Area
<b>SSSI</b>	Site of Special Scientific Interest

**TABLE 1**  
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## MAP 1 - INTRODUCTION TO LINCOLNSHIRE COAST

### Plan Boundaries

The Lincolnshire Shoreline Management Plan covers approximately 50km of coast between Donna Nook to the north and Gibraltar Point to the south.

This length of coast has been designated sediment sub-cell 2c. The boundaries for this sub-cell were determined by HR Wallingford from an assessment of the movement of material along the coastline. The northern limit at Donna Nook is considered as a "drift divide" boundary ie. a point where the orientation of the coast changes abruptly and beach material is moving away from the point. It is also thought that the beaches at this location are being fed by the nearshore sand banks. The southern limit at Gibraltar Point is considered as a "sediment sink", ie. a point on the coast where material is moving towards the point and beaches are tending to build up.

In addition to these coastline boundaries it is also necessary to establish hinterland and offshore boundaries for the SMP.

All land below the +5m OD contour is at risk of flooding. This constitutes a large area which extends up to 15km inland of the coast. From practical considerations the hinterland area defined for the purposes of the SMP is broadly based on the extent of flooding that occurred in 1953. This area has, however, been extended to include areas which, though not flooded, were isolated by flooding. It has also been extended, in places, to provide a minimum width of 1km from the coast. The hinterland boundary is shown on Map 11.

The offshore boundary has been located at the - 20m contour so that the seabed features influencing the coastal processes along the Lincolnshire coast are included within the SMP. These include the Inner Dowsing Sand Bank and the sand bank systems north of Mablethorpe and south of Skegness. This boundary is shown on Map 2.

Material is currently being extracted from an area of the seabed approximately 5km southeast of the Inner Dowsing Sand Bank for the nourishment of the Lincolnshire beaches. It has, however, been established that these dredging operations will not affect the coastal processes along the Lincolnshire coastline and the offshore boundary has therefore not been extended to include this dredging site.

### Description of Coast

The Lincolnshire coast is formed from alluvial deposits composed mainly of sand, but pockets of mud and fine material also occur. These deposits are underlain by clay. Wide sandy beaches exist to the north of Mablethorpe and to the south of Skegness and these are subject to accretion. Between Mablethorpe and Skegness the beaches comprise a thin layer of sand and are subject to erosion and steepening.

The coastal defences between Mablethorpe and Skegness are predominantly man-made sea walls whereas those to the north and south comprise clay embankments and natural sand dunes.

The defences provide flood protection to an extensive area of low lying coastal plain. This area extends for up to 10km landward of the coast and much of the land is at or around mean sea level. Although the area is predominantly agricultural the coastal fringe is extensively used for recreation and tourism and many of the towns are popular holiday resorts in addition to being residential and commercial centres. Tourism is a vital component of the coastal area and it is estimated that East Lindsey district generates over £200 million in tourism spending each year with an estimated 5 million day visitors coming to the area.

### Flooding History

The Lincolnshire coastline is very much a battleground between the land and the sea and has a long history of flooding. The most notable recent event occurred in January 1953 when low atmospheric pressure and high winds raised the predicted spring tide levels along the coast by 2 to 2.5m. These high water levels combined with very rough seas resulted in multiple breaching of sea defences between Mablethorpe and Skegness and led to the loss of 41 lives and major damage to property.

The defences, rebuilt after 1953, were able to withstand events that occurred in 1976 and 1978. During these events the defences were overtopped but no breaches occurred.

The defences are still subject to ongoing major capital works. A study to examine the most appropriate strategy for the coastline between Mablethorpe and Skegness was completed in 1991. This led to a decision by the NRA to adopt a strategy of beach nourishment over the next fifty years. In addition to the initial nourishment, the strategy will require both the renourishment of the beaches and the maintenance of the existing sea walls.

Site work on this project started in 1994 and is due for completion in 1998.



## MAP 2 - SEABED CONTOURS

This map illustrates the bathymetry of the sea bed off the Lincolnshire coast. The contours are in metres relative to Admiralty Chart Datum which at Skegness is 3.75m below Ordnance Datum.

The seabed is relatively flat with sand banks providing the only notable features. Nearshore sand bank systems exist north of Mablethorpe and to the south of Skegness. Further offshore, a sand bank occurs at Inner Dowsing. This bank is orientated NW-SE ie. parallel with the tidal flows, and is around 15m higher than the surrounding seabed. The importance of these sand banks, particularly those adjacent to the coast, is discussed in Map 4.

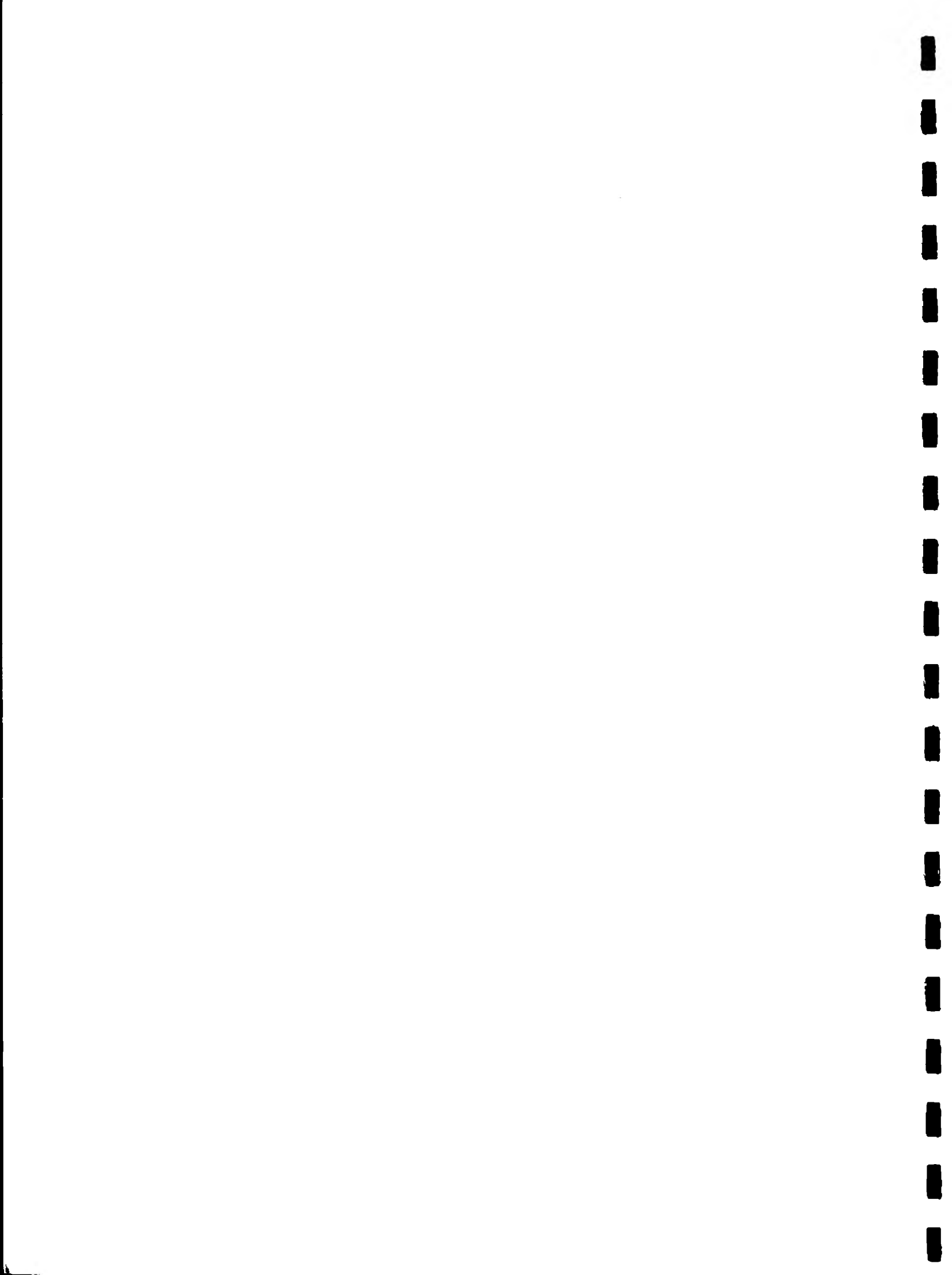
The interaction between the sand banks and the tidal currents can result in turbulent areas of sea known as overfalls. Saltfleet, Theddlethorpe, Trusthorpe, Protector and Inner Dowsing Overfalls are shown on the map.

The map also indicates the location of pipelines serving the gas terminal at Theddlethorpe and the sewage outfall south of Ingoldmells Point.

The offshore boundary of the SMP (-20m CD sea bed contour) is also shown on this map. The location of this boundary is discussed in Map 1.

### Sources of information:

- Admiralty Chart No 1190
- Admiralty Tide Tables, 1995



### MAP 3 - SEDIMENTOLOGY

This map defines the character of the deposits on the seabed.

Offshore the deposits are predominantly gravels, sandy gravels, gravelly sands and sands. The majority of the seabed is gravelly, with sand deposits occurring at Inner Dowsing. In general, the gravelly deposits are less than 1m thick whilst sand deposits are over 1m thick and locally on Inner Dowsing Bank are up to 12m. These deposits are mostly underlain by a stiff, stony clay.

Inshore there are sand banks north of Mablethorpe and south of Skegness. Sand deposits are also found at Mablethorpe and Skegness but the area between these locations consists predominantly of clays with sand found only at the shoreline.

#### Sources of Information:

- The Marine Sand and Gravel Resources off the Humber, Technical Report WB/92/1, British Geological Survey, 1992.
- Admiralty Chart No 1190
- Mablethorpe to Skegness Sea Defences, Strategy Study, NRA 1991

#### MAP 4 - GEOMORPHOLOGY

This map illustrates the main beach, nearshore and offshore geomorphological features.

##### Beach and Nearshore Geomorphology

The Lincolnshire coastline may be divided into three different zones, these are:

- Donna Nook to Mablethorpe
- Mablethorpe to Skegness
- Skegness to Gibraltar Point

North of Mablethorpe the beaches are wide and shallow and consist of a thick layer of fine sand backed by salt marshes and dunes. The zone between Mablethorpe and Skegness has narrow relatively steep beaches with little sand cover to the underlying clay. The final zone to the south of Skegness again has wide shallow beaches with abundant sand backed by salt marshes and dunes.

It is evident from the condition of the beaches that those to the north of Mablethorpe and south of Skegness are, in general, accreting whilst those in the middle zone are eroding. This differing behaviour is influenced by the nearshore sand banks which both reduce the wave energy reaching the coast and also provide a source of sand to the beaches. The sand banks north of Mablethorpe result from the dynamic balance of ebb and flood tidal flows from the Humber estuary, and those off Gibraltar Point from flows in the entrance to The Wash.

The sand bank system south of Skegness is migrating southwards (over 4km this century) and this length of the coast is therefore losing a source of sediment and being exposed to increased wave energy. As a consequence the interface between eroding and accreting beaches is also moving southwards. This tendency is, however, likely to be counteracted by the beach nourishment scheme (see Map 10) which will provide a new source of sand.

A further cause of beach lowering between Mablethorpe and Skegness is the erosion of the underlying clay layer. During a storm the thin sand layer is largely removed from the upper beach and transported offshore. This exposes the clay layer to wave attack. The clay is eroded, transported (in suspension) away from the beach and effectively lost. Following the storm, sand gradually returns to the beaches but at a lower level as some of the clay has been permanently lost.

##### Offshore Geomorphology

The main offshore geomorphological feature is the Inner Dowsing Sand Bank. This bank has been formed by differences in the ebb and flood tidal flows. Additionally on some sandy areas adjacent to the bank, sand waves have been formed by the strong tidal currents. These waves can be up to 8m high.

##### Sources of Information:

- The Sand and Gravel Resources off the Humber, Technical Report WB/92/1, British Geological Survey, 1992
- Admiralty Chart No 1190
- Atlas of Nature Conservation Sites in Great Britain Sensitive to Coastal Oil Pollution, Nature Conservancy Council, 1990.
- Mablethorpe to Skegness Sea Defences, Strategy Study, NRA, 1991
- Offshore Sand Banks, Dugdale, 1995 (report prepared for NRA)

#### MAP 5 - BEACH SEDIMENT SIZES

This map illustrates the typical grading of sand found on the beaches between Mablethorpe and Gibraltar Point.

The samples indicate that the beaches generally comprise fine to medium sand with a mean particle diameter ( $D_{50}$ ) of around 0.2mm. The grading of the beaches does, however, vary seasonally. In the winter months gravel is generally more evident as the rougher seas transport the fine sand offshore. In the summer months, when seas conditions are moderate, the beaches are able to rebuild and are generally covered with fine sand. It should be noted that the samples presented on the map were generally taken in August.

Sample F illustrates the grading of the sand used in the first phase of the beach nourishment scheme (see Map 10) which has a mean particle diameter ( $D_{50}$ ) of 0.57mm.

#### Sources of Information:

- Mablethorpe to Skegness Sea Defences, Strategy Study, NRA 1991
- Offshore Sand Banks, Dugdale, 1995 (report prepared for NRA)
- The North-East Coast of Lincolnshire, A Study in Coastal Evolution, MSc Thesis, University of Nottingham, Robinson, 1956.

## MAP 6 - SHORELINE EVOLUTION

### Historical Evolution

This map describes the evolution of the Lincolnshire coastline and comprises three sheets which illustrate:

- the position of the high water mark in 1880, 1900, 1950 and 1970
- the long term movement of the high and low water marks, and
- beach level trends between Mablethorpe and Skegness

The information relating to the high and low water marks has been derived from Ordnance Survey maps which were last updated in the 1970's. The long term movements are based on a comparison of maps prepared between 1850 and 1890 and those prepared in the 1970's. They represent, therefore, mean trends over approximately one hundred years. Beach level trends have been derived from an analysis of beach profiles undertaken between 1960 and 1990.

The map indicates that the high water mark to the north of Mablethorpe and to the south of Skegness is advancing and that the beaches are, in general, accreting. Between Mablethorpe and Skegness the high water mark is effectively held at about the line of the coastal defences. In contrast, the long term retreat of the low water mark indicates that the beaches over this length are steepening and eroding.

On the map it is noted that at Skegness the interface between retreat and advance had moved southwards in recent years. It is believed that this is due to the southern migration of the nearshore sand banks which has increased the exposure of the beaches to wave energy.

The beach level trends indicate that the beaches between Mablethorpe and Skegness are falling typically at a rate of 2cm/year, again indicating erosion along this length of coast. It is believed that these falling levels are due in large part, to the erosion of the underlying clay during storm events. This process is discussed further with Map 4.

### Future Evolution

It is likely that the trend of accretion will continue between Donna Nook and Mablethorpe.

The Agency are currently undertaking a scheme to nourish the beaches from Whitehouse Corner (1km south of Ingoldmells Point) to Mablethorpe by the importation of sand. This will result in an immediate advance in the high water mark. Longshore transport will, however, continue to cause erosion and the Agency will undertake periodic renourishment schemes in order to maintain the beaches.

In the future, the current trend of erosion immediately to the south of Skegness is likely to be reduced and possibly reversed by the beach nourishment scheme which will restore the supply of sand. The increased southerly transport of sand may result in the return of wide sandy beaches along this length and also enhance accretion rates further south at Gibraltar Point.

### Sources of Information:

- Anglian Shoreline Management System, Environment Agency
- Anglian Coastal Management Atlas, Anglian Water, 1988
- Mablethorpe to Skegness Sea Defences, Strategy Study, NRA 1991
- Offshore Sand Banks, Dugdale, 1995 (report prepared for NRA)

## MAP 7 - WAVE CONDITIONS

This map presents inshore wave conditions along the Lincolnshire coast.

Wave roses are shown for seven points along the coast. They illustrate the 1 in 1 year and 1 in 100 year significant wave height for directions between 0° N and 120°N. The wave heights have been calculated using wind data from the Dowsing Light Vessel and take into account the effect of the sea bed on the waves as they approach the coast. Statistical techniques have been used to determine the 1 in 1 year and 1 in 100 year wave heights. The significant wave height is defined as the average of the highest one third of the waves and has been found to approximate to the visual estimate of wave height that would be obtained by an experienced observer.

The wave roses indicate that the exposure of the coastline to wave energy reduces significantly to the south of Skegness. This reduction is due to the sheltering effect of the offshore sand banks. The roses also indicate that the largest waves approach the coast from the north-east.

Inshore along the Lincolnshire coast, wave action is the primary cause of the longshore transport of sand. The annual wave climate therefore determines the net direction and rate of transport discussed on Map 9.

### Sources of Information:

- Mablethorpe to Skegness Sea Defences, Strategy Study, NRA 1991 (this work has been extended for the SMP to cover additional points along the Lincolnshire coast).

## MAP 8 - TIDAL CONDITIONS

This map illustrates three sets of parameters:

- tide levels
- tidal currents
- current residuals

### Tide Levels

A table of tide levels at Skegness is shown on the map. It indicates that the tidal range, the difference between high and low water levels, is 6m and 2.8m on a spring and neap tide respectively. Levels are given relative to Ordnance Datum (OD). These are predicted astronomical tide levels and do not take account of surges which can have a significant effect. Surges are related to the weather and, under extreme conditions, can increase astronomical tide levels by over 2m.

### Tidal Currents

A table of tidal streams (in knots) is also shown on the map. The table indicates that the rising, or flood, tidal currents flow approximately north to south and that the falling, or ebb, tidal currents are from south to north. The tidal currents are moderate, with peak flows on a spring tide of approximately 2 knots (1m/sec).

The interaction between the sandbanks and the tidal currents can result in turbulent areas of sea known as overfalls. Saltfleet, Theddlethorpe, Trusthorpe, Protector and Inner Dowsing Overfalls are shown on the map.

### Current Residuals

The map also illustrates the direction of the tidal current residuals at a number of locations. Tidal current residuals are the net differences between the flood and ebb flows.

Inshore the tidal residuals do not contribute significantly to the movement of sediment as transport in this zone is dominated by wave action. However, further offshore these residuals are the primary cause of sediment movement and control the development and changes to the offshore sand banks.

### Sources of Information:

- Admiralty Chart No 1190
- Admiralty Tide Tables, 1995
- Hydrodynamics and Sediment Dynamics of the Wash Embayment, Eastern England. Ke, Evans and Collins (in press)
- Offshore Sand Banks, Dugdale, 1995 (report prepared for NRA).



## MAP 9 - NET LONGSHORE TRANSPORT

This map illustrates the direction and relative magnitude of the potential net longshore sand transport along the coast. The potential net longshore transport is the volumetric drift of sand that would occur on average over the period of one year.

The information shown on the map is as follows:

- the red arrows are from longshore transport calculations completed for the design of the Mablethorpe to Skegness beach nourishment scheme
- the black arrows are from longshore wave energy calculations completed for the Anglian Coastal Management Atlas.

Both sources of information used long term wind records to determine an annual wave climate for calculating longshore transport/wave energy.

Overall the coastline is subject to a net southerly transport of sand with rates increasing from Mablethorpe to Skegness. As a consequence, more sand is transported out of this length than arrives at Mablethorpe and hence the beaches are eroding. In practice, the full longshore transport potential is not realised because of a lack of sand on the beaches. This situation will, however, change after the completion of the beach nourishment scheme (see Map 10) when there will be sufficient sand to sustain this southerly transport and the beaches at Skegness will begin to accrete.

To the north of Mablethorpe and to the south of Skegness the longshore transport remains in a southerly direction but is complicated by the presence of nearshore sand banks. These banks both shelter the beaches from waves and provide a mechanism for the onshore and offshore transfer of sand. The significance of these banks is discussed further on Map 4.

### Sources of Information:

- Anglian Coastal Management Atlas, Anglian Water 1988
- Mablethorpe to Skegness Sea Defences, Strategy study, NRA, 1991
- Mablethorpe to Skegness Sea defences, Beach Nourishment Scheme, Phase 2 Design, NRA, 1995.

## MAP 10 - COASTAL DEFENCES

The coastal defences along the Lincolnshire coast may be broadly divided into the following lengths:

- Donna Nook to Mablethorpe
- Mablethorpe to Skegness
- Skegness to Gibraltar Point

The map, which comprises three sheets, illustrates the types of defence along each length. Further details are given below and in Table 2 which also identifies two further parameters: the standard of defence and the residual life of the defences. The standard of defence is defined as the return period of the storm event that the defences provide protection against. The residual life of the defences is the number of years until the integrity of the structure is compromised as a result of progressive deterioration.

The map also defines the frontage numbers used by the Agency to identify lengths of defence. This numbering system has been adopted in Table 2.

### North of Mablethorpe (sheet 1)

Over this length the defences are dunes between Mablethorpe and Saltfleet and an embankment, fronted by dunes, between Saltfleet and Donna Nook.

### Mablethorpe to Skegness (sheets 1,2 & 3)

For the majority of this length hard defences have been constructed. These include concrete seawalls, some with either rock armour or concrete units as toe protection, and revetments. These structures are, in general, fronted by short timber groynes.

The Agency are currently undertaking a nourishment scheme involving the placing of sand on the beaches from Whitehouse Corner, approximately 1km south of Ingoldmells Point to Mablethorpe. Work on this project began in 1994 and is due for completion in 1998. This scheme will provide a 1:200 year standard of flood defence.

### South of Skegness (sheet 3)

To the south of Skegness the defences are dunes except for a short length of embankment within the Gibraltar Point Nature Reserve.

### Sources of Information:

- Mablethorpe to Skegness Sea Defences, Strategy Study, NRA, 1991
- Anglian Shoreline Management System, Environment Agency
- Sea Defence Survey, NRA, 1990-91

**TABLE 2**  
**COASTAL DEFENCES**

Frontage No	Length (m)	Existing Type of Construction	Location	Standard of Defence (years)	Estimated Residual Life (years)
S1*	700	Natural Dunes	Gibraltar Point to Bulldog Bank	5	-
S2*	400	Clay Embankment	Bulldog Bank	200	-
S3*	3900	Natural Dunes	Bulldog Bank to Lagoon Walk/South Bracing	200	-
S4*	700	Concrete Seawall	South Bracing	100	40-60
S5*	350	Concrete Seawall	North Bracing	100	40-60
0.1	600	Concrete Seawall with Concrete Armour Units	Skegness Pier to Sea View Pullover	100	40-60
0.2 & 0.3	1600	Revetment (Rock)	Sea View Pullover to North Shore Golf Course	100	40-60
1	830	Concrete Seawall	Winthorpe to Carey House	200	6-7
2	450	Concrete Seawall	Carey House to N of Jacksons Corner	200	7-8
3	450	Concrete Seawall	N of Jacksons Corner to Midpoint Butlins	200	35-55
4	710	Concrete Seawall	Midpoint Butlins to Whitehouse Corner	190	7-8
5.1	300	Concrete Seawall	Whitehouse Corner	45	20-31
5.2	500	Concrete Seawall	Whitehouse Corner to Ingoldmells Point	20	40-60
5.3	150	Concrete Seawall	Ingoldmells Point	140	40-60
6	740	Concrete Seawall	Ingoldmells Point to access S of Vickers Point	200	40-60
7	390	Concrete Seawall with Concrete Armour Units	Access S of Vickers to N of Vickers Point	100	40-60
8	210	Concrete Seawall	N of Vickers Point	200	40-60
9	450	Concrete Seawall with Rock Armour Toe	S of Chapel Lake	100	40-60
10	440	Concrete Seawall with Rock Armour Toe	N of Chapel Lake	100	28-41
11	510	Concrete Seawall with Rock Armour Toe	Trunch Lane	200	24-38
12	1800	Concrete Seawall with Rock Armour Toe	North of Trunch Lane	170	40-60
13	100	Concrete Seawall	Chapel Basin	35	9-14
14	190	Concrete Seawall with Rock Armour Toe	Chapel Point	10	24-38
15&16	380	Concrete Seawall	North of Chapel Point	30	24-38
17	2030	Revetment	Foxholes to S of Anderby Outfall	5	3-5
18	190	Revetment	Anderby Sewage Works	150	3-5
19	360	Revetment	Anderby Creek	200	5-8
20	790	Revetment	Anderby Creek to Moggs Eye	175	0-2
21.1	730	Revetment	Moggs Eye to Huttoft Boat Ramp	200	40-60
21.2	1200	Concrete Seawall with Concrete Armour Units	Huttoft Car Terrace	150	40-60

**TABLE 2 (continued)**  
**COASTAL DEFENCES**

Frontage No	Length (m)	Existing Type of Construction	Location	Standard of Defence (years)	Estimated Residual Life (years)
22&23	490	Concrete Seawall with Rock Armour Toe	N of Huttoft Car Terrace	200	35-55
24	350	Concrete Seawall	S of Fairway Cottage	5	0
25	200	Concrete Seawall	Fairway Cottage	5	0
26	370	Concrete Seawall with Concrete Armour Units	Fairway Cottage to Boygrift Outfall	10	20-31
27	350	Concrete Seawall	Boygrift Outfall	15	13-20
28	210	Concrete Seawall with Rock Armour Toe	Sandilands Club House	25	35-55
29	480	Concrete Seawall with Rock Armour Toe	Sandilands	25	35-55
30	220	Concrete Seawall with Rock Armour Toe	Sandilands Pullover to Acre Gap	30	35-55
31	460	Concrete Seawall	Acre Gap to Church Lane Pullover	50	40-60
32	280	Concrete Seawall	N of Church Lane Pullover	100	6-9
33	260	Concrete Seawall	S of Garden Cafe	70	28-44
34	220	Concrete Seawall	Garden Cafe to Sutton Pullover	115	40-60
35.1	400	Concrete Seawall	Sutton Pullover to Bohemia Point	20	40-60
35.2	70	Concrete Seawall	Sutton Pullover to Bohemia Point	15	24-38
36	160	Concrete Seawall	Bohemia Point	75	18-25
37	160	Concrete Seawall	N of Bohemia Point	40	18-25
38	370	Concrete Seawall	N of Bohemia Point	20	40-60
39	170	Concrete Seawall	Trusthorpe	15	29-46
40.1	350	Concrete Seawall	S of Trusthorpe Outfall	35	29-46
40.2	405	Concrete Seawall	S of Trusthorpe Outfall	30	20-31
41	200	Concrete Seawall with Rock Armour Toe	N of Trusthorpe Outfall	5	35-55
42	230	Concrete Seawall	S of Gibraltar Road	135	29-46
43	170	Concrete Seawall	Convalescent Home	110	35-55
44	150	Concrete Seawall	N of Convalescent Home	45	35-55
45	180	Concrete Seawall	Mablethorpe	35	5-10
46	830	Concrete Seawall	Mablethorpe	55	40-60
N1*	7200	Natural Dunes	Mablethorpe to Saltfleet Haven	200	-
N2*	8000	Clay Embankment	Saltfleet Haven to Donna Nook	200	-

**Notes**

1. \*PD reference No. (no frontage no. assigned)
2. The standard of defence is defined as the return period of the storm event that the defences are able to provide protection against
3. The residual life of the defence is the number of years the structure is estimated to last before its integrity is compromised as a result of progressive deterioration
4. The table does not take into account the effect of the Agency's beach nourishment scheme on the standard of defence

## MAP 11 - LAND USE

This map comprises three sheets which illustrate the use of land within the hinterland boundary. The data has been compiled from the United States Landsat satellite images recorded in May and June 1994 and analysed to indicate the distribution of land use within the following classifications:

- Rural
- Residential
- Industrial
- Commercial
- Recreational
- Woodland
- Other

The area within the hinterland boundary has been divided into discrete compartments of the land, the boundaries of which are generally determined by topographical features (both man-made and natural). Within each compartment the land use data is displayed as a percentage of the land area.

Overall, the map illustrates that land use within the hinterland boundary is predominantly rural with residential, recreational and commercial activities occurring along the coastal fringe.

Rural use is mainly agricultural with both arable and livestock farming undertaken on land that has generally been classified as grade 3a. The main centres of residential and recreational activity are Mablethorpe, Chapel St. Leonards, Ingoldmells and Skegness. Military interests are confined to the firing/exercise areas of Donna Nook and Saltfleetby. A major gas terminal is located at Theddlethorpe, north of Mablethorpe.

The map also illustrates the hinterland boundary for the SMP. The location of this boundary is discussed in Map 1.

### Sources of Information:

- Flood Defence Standards of Service and Asset Management, NRA Anglian Region, 1995.

## MAP 12 - THE PLANNING FRAMEWORK

### National Planning Guidance

Through the publication of Planning Policy Guidance notes (PPGs), central government provides guidelines to all relevant authorities as to how they should execute their responsibilities with regard to the wider public interest. County Councils are required to take account of the PPGs in the formulation of Structure Plans, as are other responsible authorities in their strategic documents. Finally, in 1995 the Department of Environment Coastal Forum was formed as a coastal policy initiative to take forward the effective co-ordination of coastal zone policies and practice.

### Structure Plan Policies

The Lincolnshire Structure Plan (1982) is the primary statutory planning framework for the study area. The current county level policies are included in the following documents: Lincolnshire Structure Plan and "Alterations 1, 2 and 3" which are updates or revisions to the original Structure Plan undertaken by the Planning Authority as resources and requirements permit (Alteration 3 has yet to be finally approved by the Secretary of State). A further document of interest prepared by Lincolnshire County Council (LCC) in the mid-eighties is the Subject Plan entitled "Development on the Lincolnshire Coast".

Map 12 illustrates the areas of planning constraints relevant to the SMP. The Coastal Conservation Areas (CCAs) were originally outlined in the 1981 Structure Plan in an effort to protect the remaining natural character of the coastline and the requirements of sea defence. The CCAs contain a general prescription against development.

Policy 49a from the LCC Structure Plan, Alteration No. 3, states:

"Within the CCA planning permission will not normally be granted for development unless the local planning authority is satisfied that it is essential for the proposed development to be located in one of the conservation areas. Planning permission will not normally be granted for development which would adversely affect the saltmarsh.

Any essential development should not harm the amenity, character and/or nature conservation interest of the CCA because of its siting, scale, form, appearance, materials, noise of fume emissions or traffic generation."

and Policy 50A states:

"Coastal management and conservation measures, including schemes for dune protection and the regulation of access, will be introduced along popular and/or sensitive areas of the coast where physical damage is apparent".

Map 12 identifies areas around Mablethorpe and Skegness as multipolicy areas. The complex and built-up nature of these areas result in a wide variety of policies being developed by both LCC and East Lindsey District Council (ELDC) which are of general interest but are not set out in detail in this document.



### Local Plan Policies

East Lindsey District Council, the relevant district authority for the whole of the study area, prepared a Local Plan in 1993. ELDC was required to draw up policies for the CCAs in order to reflect local requirements and conditions.

Policy C19 states:

"Within CCA1 and CCA4 development will not normally be permitted unless it is essential in that location. In particular, no built development should be permitted on or to the seaward side of the sand hills. Where permitted, development shall not harm the amenities, character or ecological balance of the area because of its siting, scale, form, appearance, materials, noise or fume emissions or traffic generation".

and Policy C20

"Within CCA2 and CCA3 development will be permitted only where:-

- (a) it is essential in that location; or
- (b) it relates to an existing outdoor informal recreational use; or
- (c) it represents a minor extension to an existing building; and
- (d) it does not harm the amenities or character of the area because of its siting, scale, form, appearance, materials, noise or fume emissions or traffic generation."

ELDC has recorded its intention to implement the principles of co-ordination essential to coastal planning, though its Advocacy Policy C21 which states:

"The District Council will co-operate with the County Council and voluntary organisations in preparing and implementing a coastal management plan for the Coastal Conservation Areas."

ELDC has also adopted a number of policies relating to areas of countryside or areas of open character (see Map 12) which seek to retain the important areas of open land. With the exception of built up areas, almost the entire length of the study coast is included in such designations. Policies DC1, DC2 and DC3 stipulate and control the type of development which is allowed in the designated countryside areas.

ELDC has identified a number of settlements as defined coastal holiday areas within which the needs and requirements of the tourist industry will be afforded special attention in the consideration of proposals as detailed in Policy T2.

### Sources of Information:

- East Lindsey Local Plan, ELDC January 1993
- Lincolnshire County Council, "Development on the Lincolnshire Coast", LCC, 1986
- Lincolnshire County Council Structure Plan (including Alterations No. 1, 2 and 3, LCC, 1993.)



## MAP 13 - COMMERCIAL FISHING ACTIVITY

Management of the fisheries on the Lincolnshire coast (out to six nautical miles from the coast) is undertaken by the Eastern Sea Fisheries Joint Committee (ESFJC). Commercial fishing activity along the Lincolnshire coast is typical of many coastlines along the east coast of England. Fishing effort is essentially small scale, involving a wide variety of methods and vessels. One day trips are typical although vessels from the Wash and Humber do make longer trips which may incorporate working the Lincolnshire coast.

### Geographical Extent of Fishing Grounds

Map 13 shows the area of origin and principal activities of the vessels working along or adjacent to the Lincolnshire coast. The fishermen using this area will typically switch between different species of fish, depending on a number of interrelated variables such as market forces, availability of species, seasonality, demand from merchants and processors, weather and sea conditions. The variety of methods and grounds used by a number of independent vessels make it difficult to delimit specific areas of fishing activity. Similarly, any areas which are given boundaries are likely to be of limited value, as long term tools for strategic decision making, because of inevitable changes in fishing patterns which will occur as a result of market forces, etc. However, with regard to inshore fixed gear fishermen, it is possible to identify the fishing areas since each fisherman has preferred grounds on which to place pots, lines or nets.

Therefore, whilst it is not possible to delimit all fishing activity within the area trawling etc, it is possible to identify the inshore fishing areas at risk from interference by coastal defence works.

There are no designated commercial shellfish harvesting beds within the study area. However, there are beds just outside the study area to the north and south. Horseshoe Point and the Wash are currently classified as bivalve mollusc production areas (grade C) under the Food Safety (Live Bivalve Mollusc and other Shellfish) Regulations 1992 as required by Directive 91/492/EEC. At a number of locations along the coastline, there are isolated and irregularly harvested cockle beds. These are intermittently worked usually when the Wash based vessels are unable to operate in the Wash or Humber.

Shallow coastal areas are often important nursery grounds for species of fin-fish and the Lincolnshire coast is no exception. MAFF have undertaken a number of research trawls in this area (although most effort has been targeted at the Wash) the results of which suggest that there are a large number of immature fish in the coastal area at certain times of the year.

### Access Points

The locally launched vessels are reliant on there being sufficient launching points along the coast to minimise travel time to fishing grounds. Other vessels (from Grimsby for example) are brought to the Lincolnshire coastline for launching into the inshore grounds. The principal accesses used by fishermen are illustrated on Map 13 and include:-

- Skegness (North Shore Road)
- Huttoft
- Mablethorpe
- Anderby
- Chapel St. Leonards
- Wainfleet Haven
- Saltfleet Haven

### Sources of Information:

- Eastern Sea Fisheries Joint Committee Annual Reports
- MAFF
- UKDMAP

## MAP 14 - TOURISM AND RECREATION

Map 14 illustrates the principal activities which are involved in the tourism and recreation industry. The symbols used on the map are explained after a brief introduction to each of these activities.

### Tourism

The origin of the Lincolnshire coast as a destination for tourists can be traced back to 1875 and is closely related to the use of railway. The area enjoyed major periods of expansion in the 1930s and again in 1950s and 60s. On the whole, after a gradual decline in popularity in the 1970s and 80s the tourist industry in the area has stabilised. In recent years the industry has begun to recover. Tourism is a vital component of the coastal area and it is estimated that East Lindsey district generates over £200 million in tourism spending each year, with an estimated 5 million day visitors coming to the area. The importance of the tourism industry in terms of the provision of employment is illustrated in the high variation in unemployment rates between January (18.4%) and June (9.7%). The season for this stretch of coastline is relatively short, lasting only 20 weeks with a high season of 8 weeks during July and August. In addition, the coast has importance for local recreational use all year, albeit at a much lower intensity.

### Recreation

Water and land-based recreation has been developing along the Lincolnshire coast in line with national increases in this type of activity. In addition to providing an important resource for local residents, recreational activities are an important feature in attracting tourists and day visitors to the Lincolnshire coast. The area has attractive features for both formal and informal recreational activity.

### Activities

The following paragraphs explain the tourism and recreational symbols which have been used on the accompanying map.

"Peace and quiet" represents a resort which is recognised as a tranquil location, with few of the intensive style facilities of other beaches.

"Caravan Park" indicates the location of a caravan park.

"Beach" signifies a location at which the quality of the beach itself is of overriding importance in people's decision to use a particular stretch.

"Entertainment" indicates where there are formal facilities for entertainment of both children and adults (eg. amusement arcades).

"Sea bathing" indicates those locations at which this activity is popular.

"Wildfowling" is undertaken at these locations under the jurisdiction and control of local wildfowling clubs.

"Facilities for children" incorporates both toilet facilities and easy access.

"Wildlife interests" represents locations at which people gather to enjoy observing nature (eg. seals, wildfowl, wading birds).

"Sailboarding" signifies that there is an active windsurfing club.

"Sailing club" indicates that an active sailing club operates.

"Land yachting" signifies sand expanses where this activity is undertaken.

"Ski Lake" indicates the location of inland water used for water-skiing.

"Beach fishing" indicating a stretch of beach which is frequented by sea-anglers.

"Recreational boat fishing" shows launching points and broad fishing areas for this activity.

"Rural car park" represents formal parking sites, usually accompanied by a beach access point.

"Golf course" indicates that there is a formal course available.

"Public launching sites" indicates a sea access facility is available.

### Use Levels

The information used for the 'use levels' has been derived from observations made during summer 1991. These observations were made as part of a questionnaire survey during the Strategy Study for the Mablethorpe to Skegness Sea Defences. Although the data is qualitative rather than quantitative, it illustrates the relative use levels for different stretches of beach.

### Sources of Information:

- Mablethorpe to Skegness Sea Defences Strategy Study, Environmental Statement (1991).
- Mablethorpe to Skegness Sea Defences Strategic Approach Study. Amenity Value of Beach Recharge Option.
- Strategic Tourism Development Plan, Lincolnshire Coast Partnership, 1993.

## MAP 15 - COASTAL HABITATS

Much of the data used in the preparation of Map 15 has been reproduced from the coastal oil pollution maps prepared by the Nature Conservancy Council in 1990. The boundaries used in the map are illustrative only for two reasons: the changing nature of the coastline, and the scale of the map which limits the level of detail that can be shown. In reality the habitat assemblage is more complex, especially at Gibraltar Point, and in this regard is included as a separate map in the supporting document.

Despite the limitations of the data, the map illustrates the major types of habitats present on the coastline. Essentially the central stretch between Mablethorpe and Skegness consists of sandy beaches (with mud exposures) backed by hard defences, whereas towards the north and south of the Plan area there are more diverse habitats with both sand dune and saltmarsh.

Large areas of sand flats are found to the north of Theddlethorpe and from Skegness southwards. The relatively coarse grained sand flats, together with smaller areas of mixed sediment especially around Donna Nook, support a rich flora and fauna. Wading birds regularly feed on the invertebrates in the intertidal zone. In the northern part of the SMP area, the sand banks are used by seals as haul-out areas at low water.

The saltmarshes on the Lincolnshire coast have developed as a natural progression from mudflats. The periodic flooding of the mudflats, and the deposition of material raises the level of the mudflats allowing saltmarsh vegetation to develop. The saltmarshes provide valuable habitats for a range of plants and animals adapted to the saline environment. At Donna Nook, Saltfleetby and at Gibraltar Point the saltmarsh is backed by natural dune systems, which lead to the development of features such as brackish pools and sandy areas within the marsh. Such features increase the habitat diversity and improve the ability for a variety of communities to establish. In addition to supporting any animal and plant species, mature saltmarshes form important breeding sites for birds. A variation which occurs within the saltmarsh are the areas of freshwater marsh in the Saltfleetby and Gibraltar Point areas.

Sand dunes occur at intervals along the coast. They are widest at Theddlethorpe and Gibraltar Point where there is an active accretion zone, and fragmented between Mablethorpe and Skegness where coastal erosion is the dominant force. The plant and animal life diversifies as the dunes mature. At Saltfleetby the sand dune habitats are at their most valuable because there are damp and wet areas present (ie. slacks) which provide habitats for a variety of communities. The map also illustrates the main areas where waders and seals are present.

### Sources of Information:

- Atlas of Nature Conservation Sites in Great Britain Sensitive to Coastal Oil Pollution, Nature Conservancy Council, England, 1990.
- English Nature
- Lincolnshire Trust for Nature Conservation

## MAP 16 - CONSERVATION SITES

### Natural Environment

Sections of the Lincolnshire Coast are covered by a variety of local, national and international designations to protect features of the natural environment. The different designations provide varying degrees of protection, the principal designations being shown on Map 16. Table 3 provides a brief description of the designation and the main features of interest within the boundary. For the purposes of the table, sites are first and foremost identified as being SSSI's because of their role in providing the statutory mechanism through which the other national and international designations are implemented.

TABLE 3  
CONSERVATION DESIGNATIONS

Site Name	Designation	Main Features
North Lincolnshire Coast	Site of Special Scientific Interest (SSSI) Special Protection Area (SPA) Ramsar Site	Intertidal sand Shingle bars Mudflats Saltmarsh Low dunes Breeding grey seal colony Ornithological Coastal lagoons
Saltfleetby - Theddlethorpe	Site of Special Scientific Interest National Nature Reserve (NNR) Possible Special Protection Area (pSPA) Possible Ramsar site	Intertidal flats Sand dunes Salt and freshwater marsh Vascular plants Invertebrates Breeding and overwintering birds Natterjack toads
Sea Bank Clay Pits	Site of Special Scientific Interest	Isolated flooded clay workings Aquatic plant communities
Gibraltar Point	Site of Special Scientific Interest Special Protection Area Ramsar Site National Nature Reserve	Sand dunes Salt and freshwater marsh Invertebrates Passage and breeding birds Coastal geomorphology
Wash and North Norfolk Coast	Candidate Special Area of Conservation (SAC) (Marine)	Subtidal sandbanks Glasswort and other annuals Saltmeadows Saltmarsh scrubs Intertidal mudflats and sandflats Shallow inlets and bays Common seal
North Norfolk Coast and Gibraltar Point Dunes	Candidate Special Area of Conservation (Terrestrial)	Dune grasslands Lagoons Mediterranean saltmarsh scrubs Shifting dunes Shifting dunes with marram grass Humid dune slacks Coastal shingle vegetation
Sutton-on-Sea Foreshore	Regionally Important Geological Site (RIGS)	Intertidal area postglacial exposures
Wolla Bank Foreshore	Regionally Important Geological Site (RIGS)	Intertidal area postglacial exposures
Vickers Point	Regionally Important Geological Site (RIGS)	Postglacial deposits Peat and forest exposures
Chapel Point	Geological Conservation Review Site (GCRS)	Intertidal area postglacial deposits
Seacroft Foreshore	Site of Nature Conservation Importance (SNCI)	Sand and shingle ridges Extensive areas of mud Ornithological
Anderby Creek	Site of Nature Conservation Importance	Mature grey sand dune Reed dominated clay pits Passage migrants
Warren Road Dunes	Site of Nature Conservation Importance	Inner dune grassland
Huttoft (submerged forest)	Regionally Important Geological Site	Submerged forest

The existence of SPA and possible SAC sites both within and adjacent to the SMP area will bestow particular responsibilities on the relevant coastal authorities. The MAFF guidelines on SMPs state that "Shoreline Management Plans which include such sites will need to reflect the special protection afforded to the habitats or species for which they are identified as being of international importance. Damage to these sites is only permissible for 'imperative reasons of overriding public interest' and where there is no reasonable alternative option or different practicable approach available which would have lesser impact".

Table 4 summarises the conservation designations and legislation.

**TABLE 4**  
**CONSERVATION DESIGNATIONS & LEGISLATION**

Designation	Legislation
Special Area of Conservation (SAC)	Designated under Council Directive 92/43/EEC and implemented into UK Law by Conservation (Natural Habitats + C) Regulations 1994 and Wildlife and Countryside Act 1981.
Special Protection Areas (SPA)	Designated under Council Directive 79/409/EEC and implemented into UK Law by Wildlife and Countryside Act, 1981, and Conservation (Natural Habitats and C) Regulations 1994.
Ramsar Site	Listed under the Convention on Wetlands of International Importance implemented into UK Law through Wildlife and Countryside Act 1981.
Site of Special Scientific Interest (SSSI)	Notified under Section 28 of the Wildlife and Countryside Act.
National Nature Reserve (NNR)	Declared under Section 19 of the National Parks and Access to the Countryside Act 1949 or Section 35 of the Wildlife and Countryside Act 1981.
Local Nature Reserve (LNR)	Designated under Section 21 of the National Parks and Access to the Countryside Act 1949.
Site of Nature Conservation Importance (SNCI)	Designated by county wildlife trust and accepted by local authorities
Regionally Important Geological Sites (RIGS)	Designated by local RIGS group and accepted by local authorities

**Sources of Information:**

- SSSI citations and various documents relating to nature conservation sites.
- Shoreline Management Plans: a guide for coastal defence authorities, MAFF 1995.

## MAP 17 - ARCHAEOLOGY

Consultations with archaeological organisations established that there is only limited information available regarding sites of archaeological interest or potential in the coastal areas of Lincolnshire. The prime references for information regarding this subject are the county Sites and Monuments Record (SMR) and the results of a basic survey undertaken in the winter of 1989 - 90, the Lindsey Coastal Survey. The survey, involving beach observations and sediment testing, identified a zone between Seathorne and Mablethorpe which "...has exposures of archaeological importance for the Lincolnshire coast". Apart from the identification of the Ingoldmells Parish as being a site with "...marked concentrations of archaeological deposits..." the level of survey to date is unable to be more specific. Map 17 gives an indication of the type of archaeological remains that have been found in the area. It should, however, be realised that this map, built up from the sites identified in the SMR, does not indicate the whole archaeological potential of the area. The SMR is being enhanced continually, the information extracted for the SMP is only ever a snapshot of the archaeological resource on the date the SMR was consulted. The Lindsey Coastal Survey indicates the potential for as yet undiscovered archaeological finds.

### Sources of Information:

- Lindsey Coastal Survey, 1986
- County Sites and Monument Record

## MAP 18 - MANAGEMENT UNITS

In developing strategic coastal defence options for Lincolnshire it is helpful to divide the coastline into a number of lengths known as management units.

A management unit is defined as a length of shoreline with coherent characteristics in terms of both natural coastal processes and land use.

The management units proposed for the Lincolnshire coast are shown on Map 18. These units have been derived from the information on coastal processes and land use presented in this document. They have been numbered consecutively from Donna Nook to Gibraltar Point and the boundaries and characteristics of each unit are defined in Table 5. The basis for the location of the unit boundaries is briefly described as follows:

north of Unit 1	-	boundary with sediment sub cell 2b
Unit 1/Unit 2	-	change in land use; Unit 2 is essentially rural whereas Unit 1 includes the residential areas of North Somercoates and Saltfleet.
Unit 2/Unit 3*	-	change in land use; Unit 3 includes the residential and recreational areas of Mablethorpe, Sutton-On-Sea and Sandilands together with the Theddlethorpe Gas Terminal and pipelines whereas unit 2 is essentially rural.
	-	change in coastal processes; in Unit 3 the beaches are retreating whereas in Unit 2 they are advancing.
Unit 3/Unit 4	-	change in land use; Unit 4 is essentially rural whereas Unit 3 includes the residential and recreational areas of Mablethorpe, Sutton-on-Sea and Sandilands.
Unit 4/Unit 5	-	change in land use; Unit 5 includes the residential and recreational area at Anderby Creek whereas Unit 4 is rural.
Unit 5/Unit 6	-	change in land use; Unit 6 is essentially rural whereas Unit 5 contains Anderby Creek.
Unit 6/Unit 7	-	change in land use; Unit 7 includes the residential and recreational area of Chapel St Leonards whereas Unit 6 is rural.
Unit 7/Unit 8	-	change in land use; Unit 8 is essentially rural whereas Unit 7 contains the residential and recreational area Chapel St Leonards.
Unit 8/Unit 9	-	change in land use; Unit 9 includes the residential and recreational areas of Ingoldmells, Scathorne and Skegness whereas Unit 8 is rural.
Unit 9/Unit 10*	-	change in coastal processes; in Unit 10 the beaches are advancing whereas in Unit 9 they are steepening.
Unit 10/Unit 11	-	change in land use; Unit 11 is essentially rural whereas Unit 10 contains the residential area of Seacroft.
south of Unit 11	-	boundary with sediment sub-cell 2d

\* The boundaries between Units 2 and 3 and 9 and 10 are not clearly defined.

TABLE 5

## MANAGEMENT UNITS FOR SUB-CELL 2c: DONNA NOOK TO GIBRALTAR POINT

Management Unit		Boundary Demarcation	Coastal Processes			Principal Land Use	Existing Defences
No.	Name		Beach Sediment Type	Likely Drift Direction	Evolution		
1	Donna Nook to Saltfleet	Sub-cell 2b	Sand	Uncertain	Advancing	Rural Residential Nature Conservation	Embankment Dunes
2	Saltfleet to Mablethorpe	South of Saltfleet Haven (459 932)					
3	Mablethorpe to Sandilands	South of Theddlethorpe St Helens (489 882)	Sand	NW to SE	Retreating	Rural Residential Recreational Industrial Nature Conservation	Dunes Concrete Seawall
4	Sandilands to Anderby Creek	Sea Lane (528 808)					
5	Anderby Creek	North of Anderby Creek (549 767)	Sand	NW to SE	Retreating	Rural Residential	Revetment, Concrete seawall, Concrete Seawall with rock armour toe
6	Anderby Creek to Chapel St Leonards	South of Anderby Creek (554 756)	Sand	NW to SE	Retreating	Rural Residential Recreational	Concrete Seawall, Concrete Seawall with rock armour toe
7	Chapel St Leonards	Chapel Point (563 733)					
8	Chapel St Leonards to Ingoldmells	Trunch Lane (566 710)	Sand	NW to SE	Retreating	Rural Residential Recreational	Concrete Seawall, Concrete Seawall with rock armour toe
9	Ingoldmells to Skegness	Vickers Point (571 698)					
10	Skegness to Seacroft	South end of Lagoon Walk (570 624)	Sand	N to S	Advancing	Residential Rural Nature Conservation	Dunes
11	Seacroft to Gibraltar Point	Seacroft (566 610)					
		Sub-cell 2d	Sand	N to S	Advancing	Rural Nature Conservation	Dunes Embankment



MAPS

SUB-CELL 2b

Sheet 1  
Maps 6,10,11

Sheet 2  
Maps 6,10,11

Sheet 3  
Maps 6,10,11

NORTH  
SEA

SUB-CELL 2c

Maps 2,3,4,5,7,8,9,12,  
13,14,16,16,17,18



SUB-CELL 2d

LOCATION PLAN

Humber Estuary

sub-cell  
2c

Area covered  
by maps

The Wash

North

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ENVIRONMENT AGENCY  
Anglian Region

LINCOLNSHIRE SHORELINE MANAGEMENT PLAN

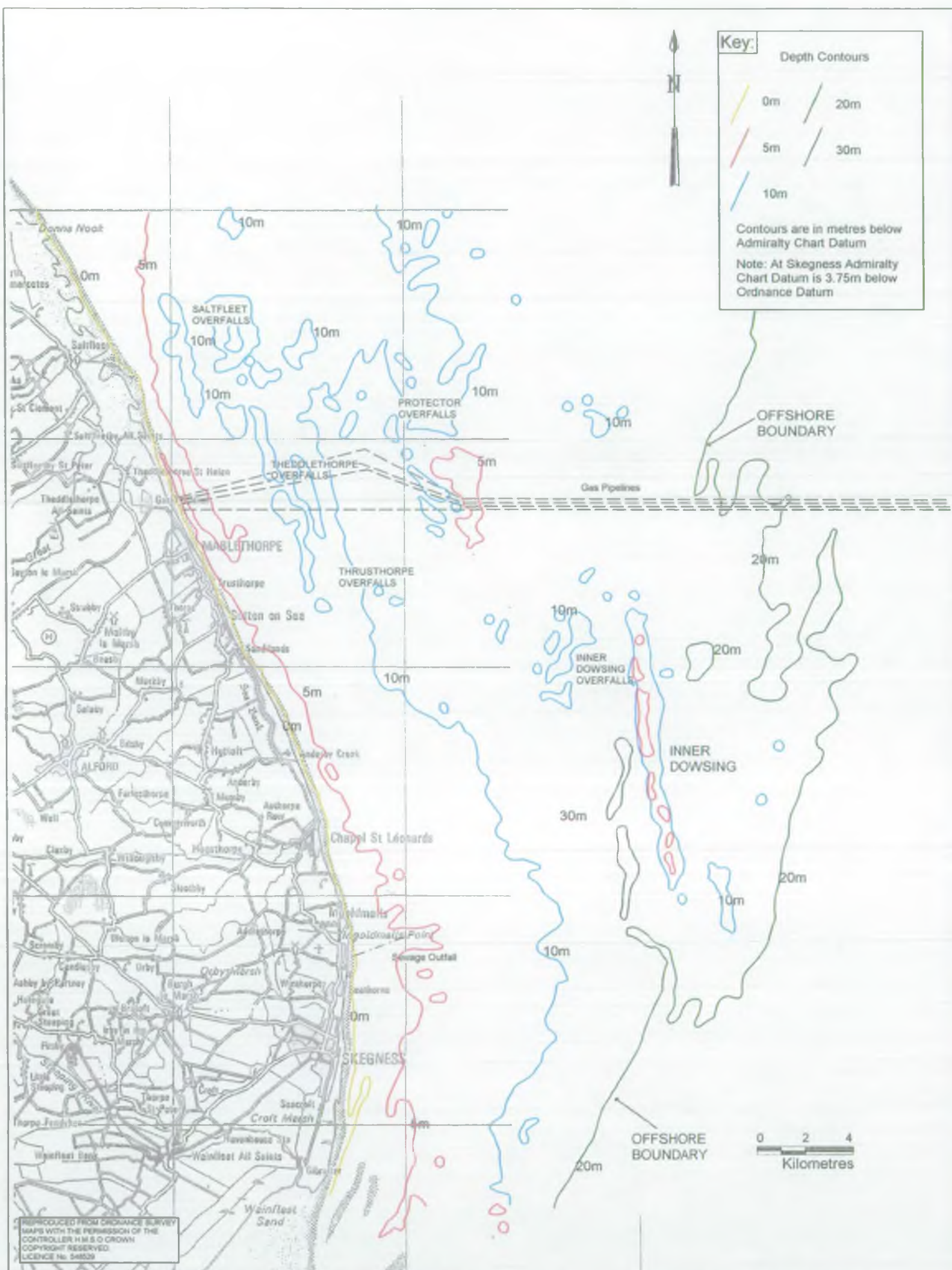
POSFORD & DUVIVIER

INTRODUCTION TO LINCOLNSHIRE COAST

MAP 1 sheet 1 of 1

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ENVIRONMENT AGENCY  
 Anglian Region

LINCOLNSHIRE SHORELINE MANAGEMENT PLAN

POSFORD & DUVIVIER

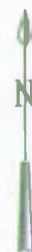
SEDIMENTOLOGY

MAP 3 sheet 1 of 1

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Key: Beach Sediment Sizes				
LOCATION	DESCRIPTION	D10 (mm)	D50 (mm)	D90 (mm)
A	Fine / Medium sand	0.17	0.22	0.35
B	Fine sand	0.07	0.14	0.25
C	Fine / Medium sand	0.08	0.25	0.35
D	Fine / Medium sand	0.11	0.20	0.35
E	Fine / Medium sand	0.08	0.25	0.35
F	Medium / Coarse sand	0.25	0.57	0.75
G	Fine sand	0.07	0.13	0.2
H	Fine / Medium Sand	0.07	0.32	0.5

Note: The grading parameters are defined as follows  
D90: particle size exceeded by 10% (by weight) of sample.  
D50: Particle size exceeded by 50% (by weight) of sample.  
D10: Particle size exceeded by 90% (by weight) of sample.



0 2 4  
Kilometres



ENVIRONMENT AGENCY  
Anglian Region

LINCOLNSHIRE SHORELINE MANAGEMENT PLAN

POSFORD & DUVIVIER

BEACH SEDIMENT SIZES

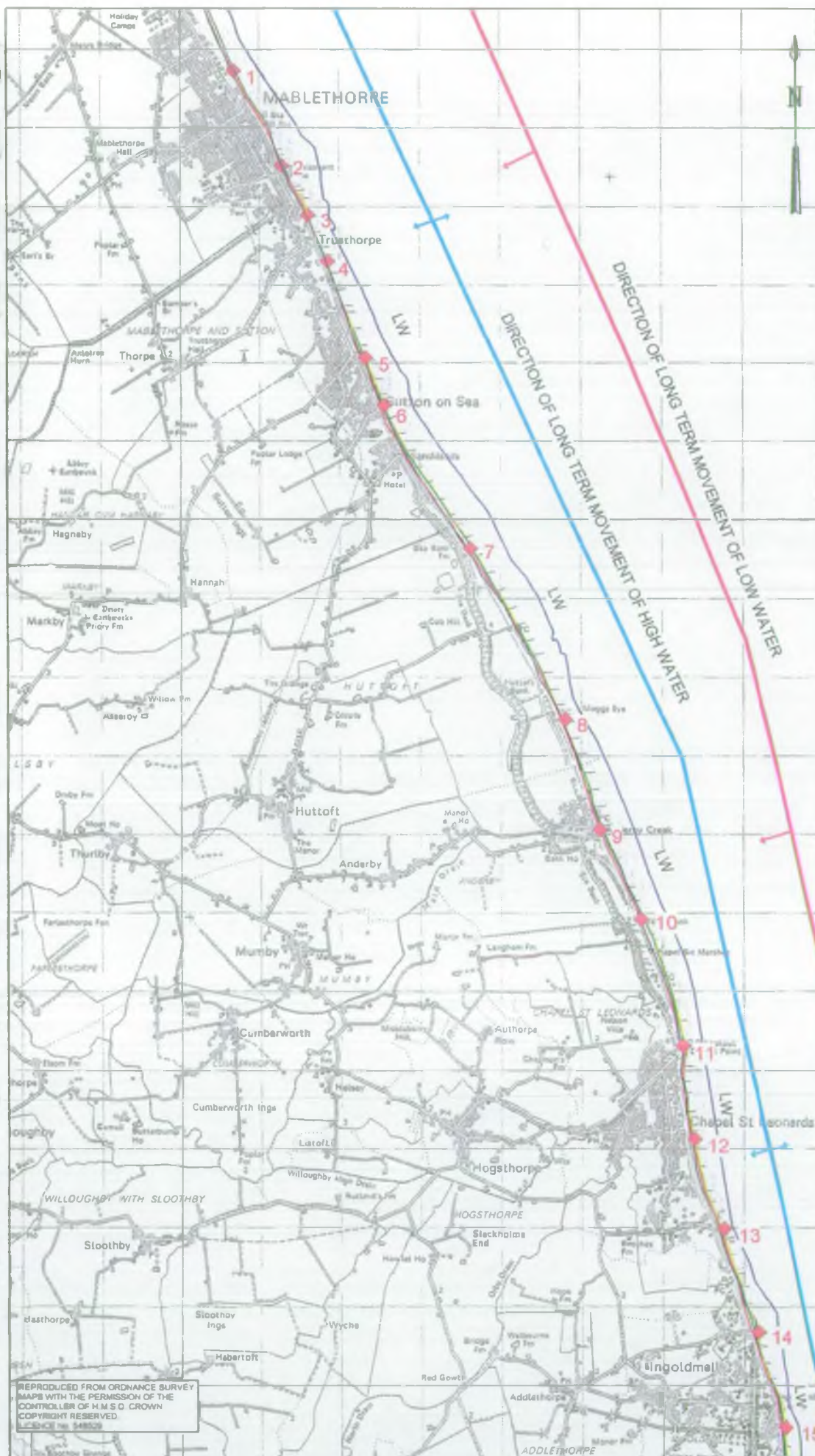
MAP 5 sheet 1 of 1

Dec 96









Key:	
Direction of Long Term Movement of High Water and Low Water Marks	
<span style="color: red;">—</span>	Retreat
<span style="color: blue;">—</span>	Mixed
<span style="color: yellow;">—</span>	Advance
Historical Evolution of High Water Mark	
<span style="color: yellow;">—</span>	1880
<span style="color: red;">—</span>	1950
<span style="color: blue;">—</span>	1900
<span style="color: green;">—</span>	1970

Recent Trends in Beach Levels		
Position	30 year (1960-90)	10 year (1980-90)
1	0.0	+1.0*
2	-2.0	+2.0*
3	-2.0	-2.0*
4	-2.0	-6.0*
5	-1.0	+1.0*
6	-2.0	0.0
7	-2.0^	-2.0^
8	-2.0*	-8.0*
9	0.0*	+1.0*
10	-0.5^	-1.0*
11	-3.0	-15 to -20^
12	-0.5	+4.0^
13	-2.5	-10.0^
14	-2.0*	-6.0^
15	-1.0*	-2.0^

Trends are given in cm/year  
 Negative values indicate falling levels  
 \* Profile steepening  
 ^ Profile flattening

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**Key:** Direction of Long Term Movement of High Water and Low Water Marks

Retreat (pink line)

Mixed (blue line)

Advance (yellow line)

Historical Evolution of High Water Mark

1880 (yellow line), 1900 (green line), 1950 (pink line), 1970 (grey line)

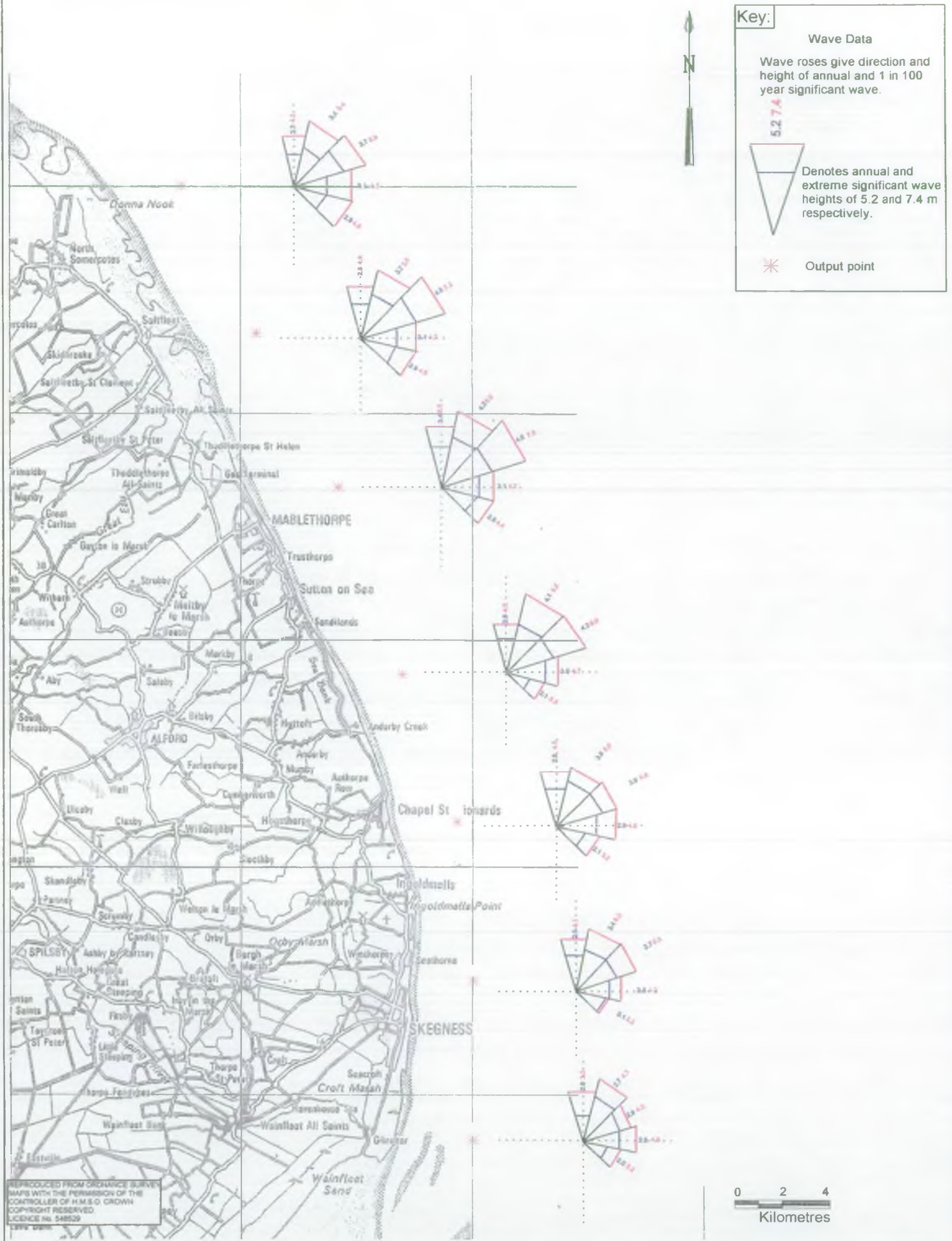
Recent Trends in Beach Levels		
Position	30 year (1960-90)	10 year (1980-90)
13	-2.5	-10.0 <sup>^</sup>
14	-2.0 <sup>*</sup>	-8.0 <sup>*</sup>
15	-2.0 <sup>*</sup>	-6.0 <sup>*</sup>
16	-1.0 <sup>*</sup>	-2.0 <sup>*</sup>

Trends are given in cm/year  
 Negative values indicate falling levels  
 \* Profile steepening  
 ^ Profile flattening

**Note 1:**  
 In recent years this length of coastline has been subject to erosion and the long term advance (1870 - 1970) has been interrupted

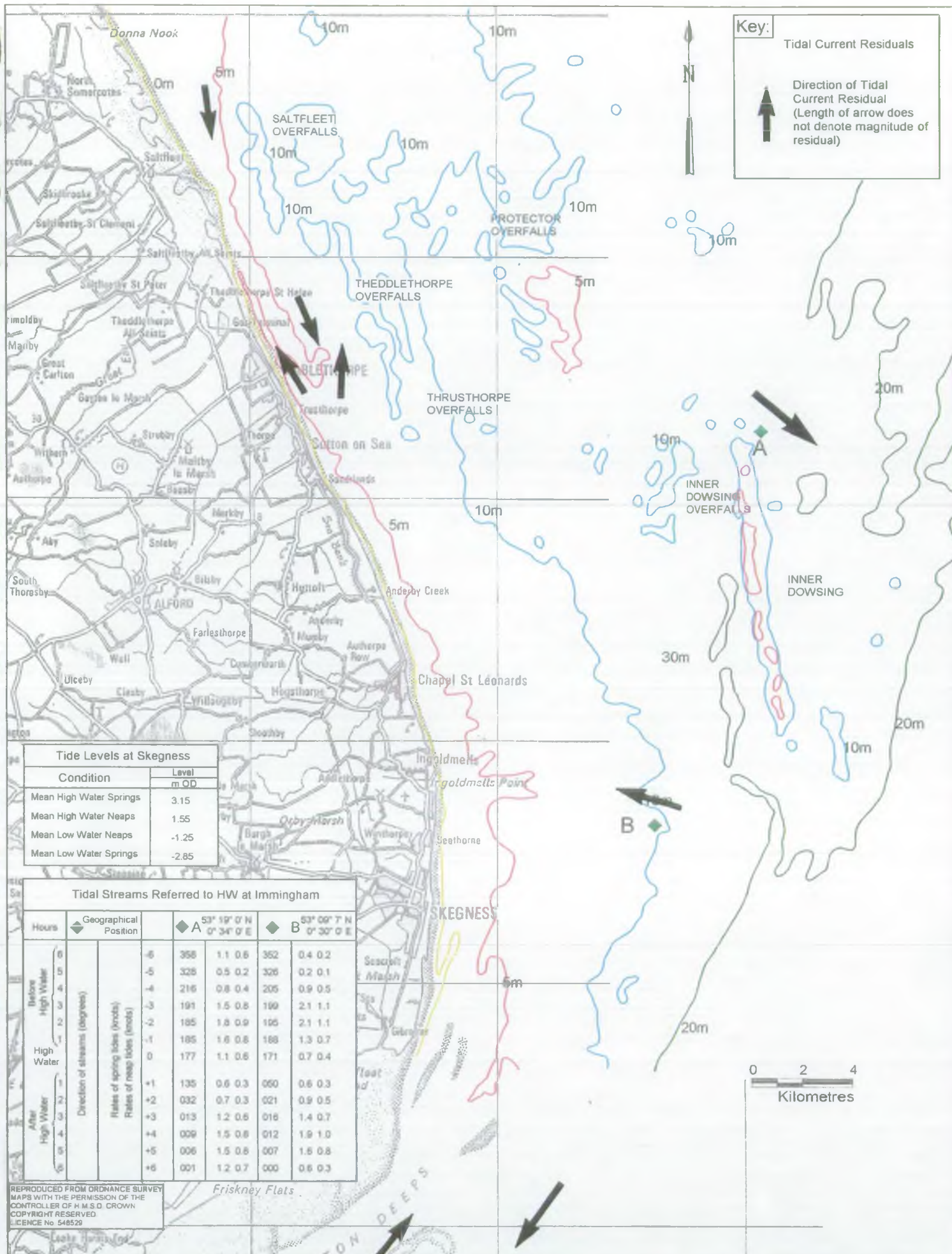
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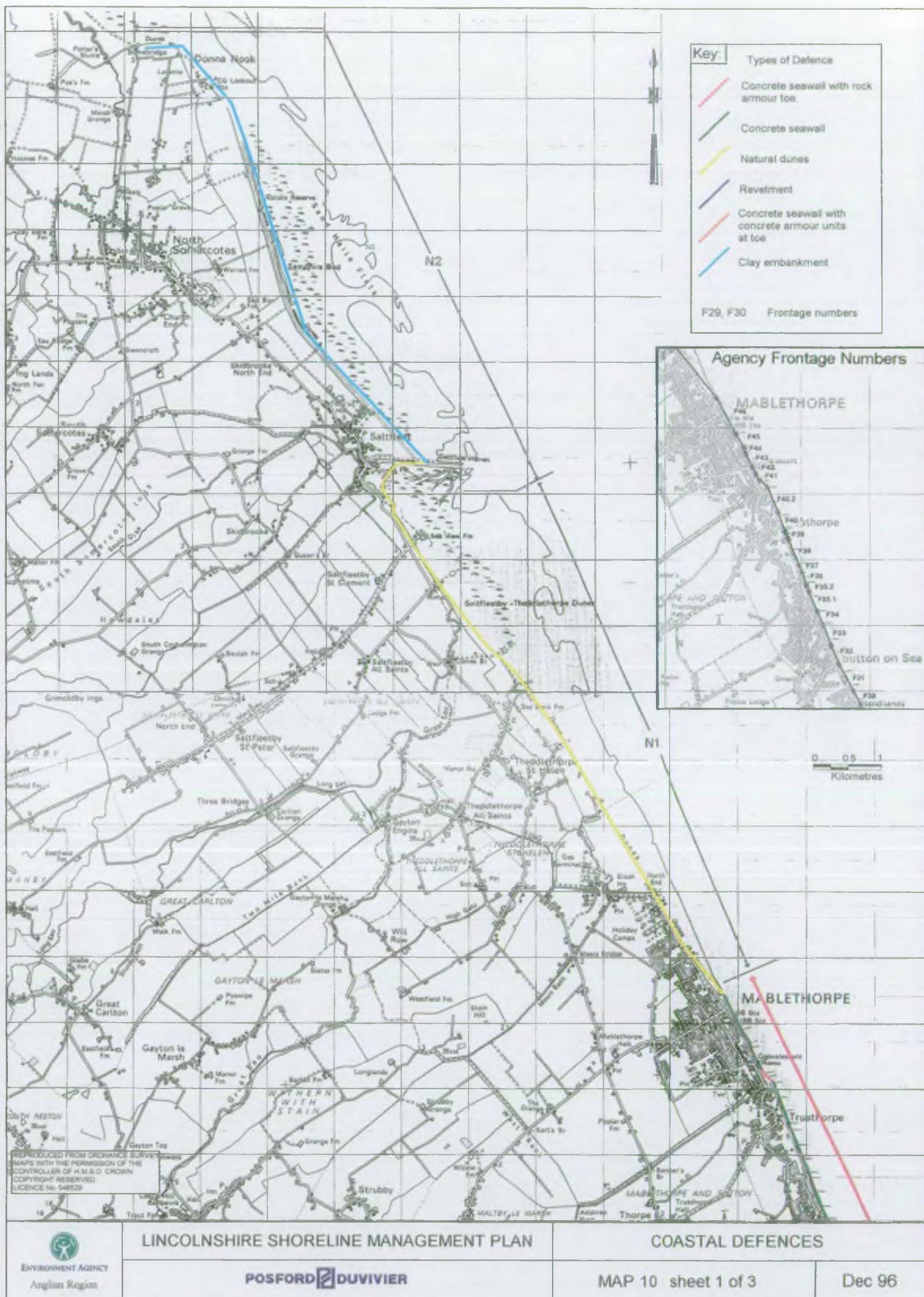
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NET LONGSHORE TRANSPORT

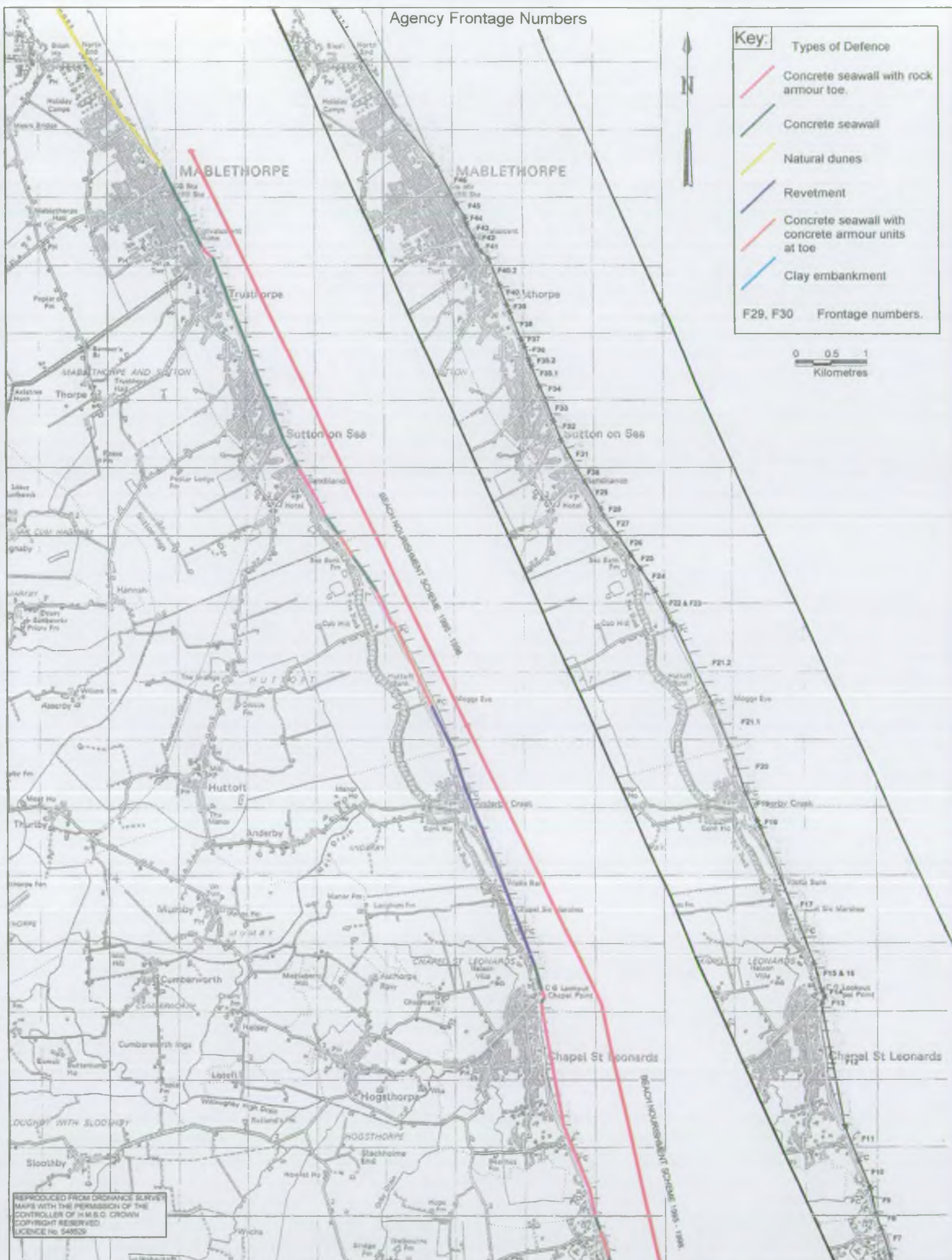
MAP 9 sheet 1 of 1

Dec 96





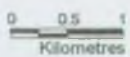








Key: Types of Defence	
	Concrete seawall with rock armour toe.
	Concrete seawall
	Natural dunes
	Revetment
	Concrete seawall with concrete armour units at toe
	Clay embankment
F29, F30 Frontage Numbers	

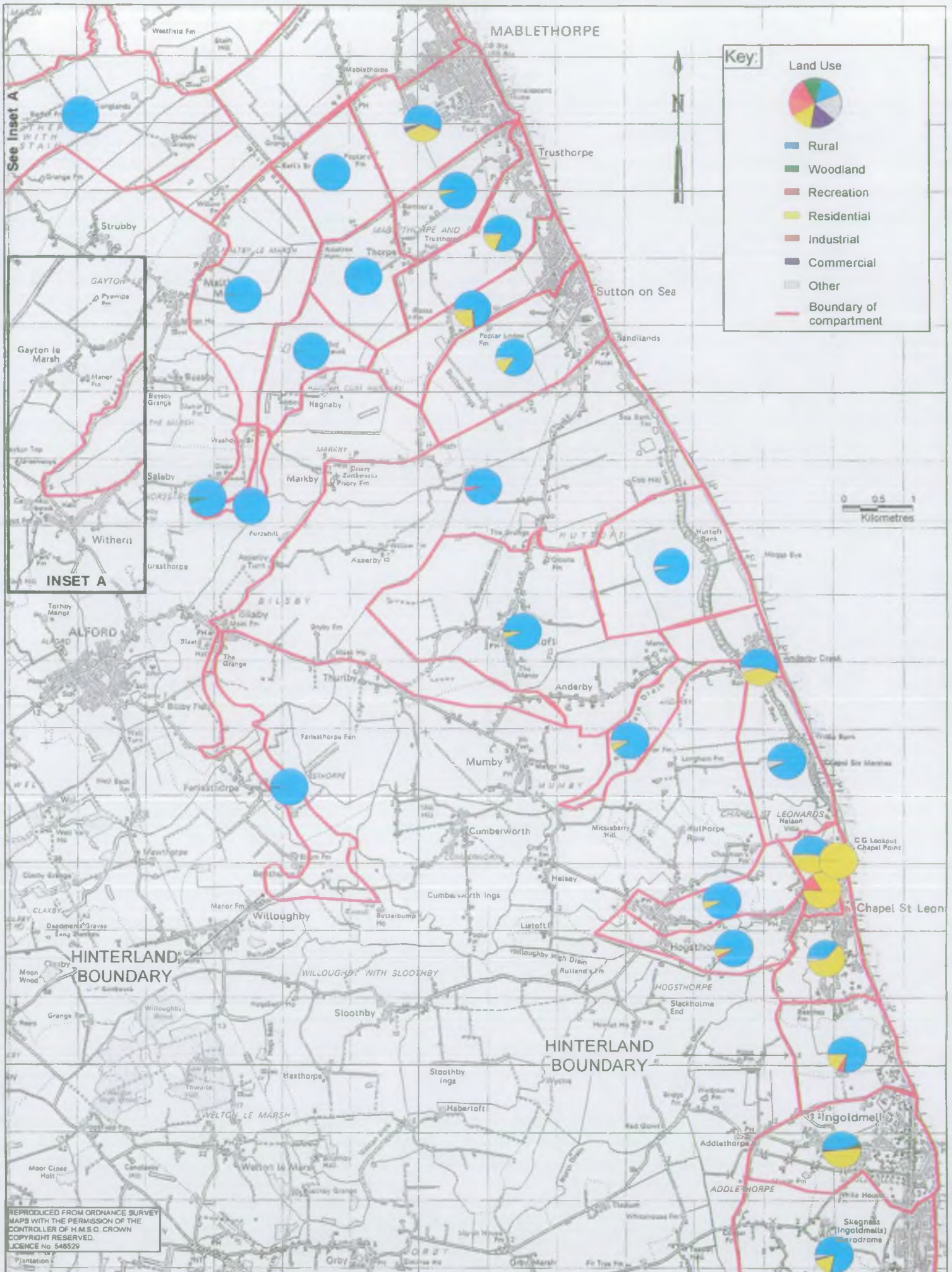


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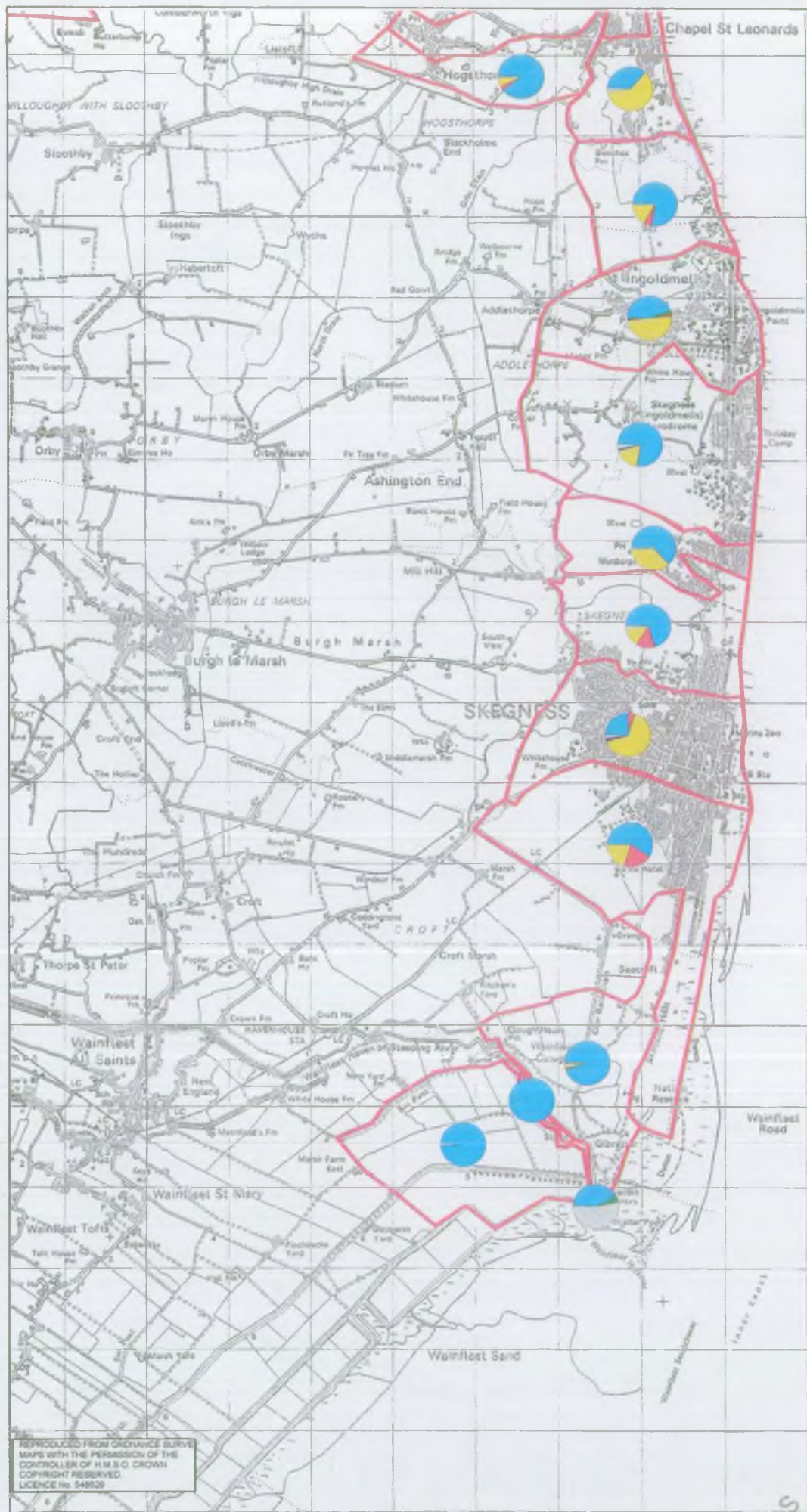
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LAND USE

MAP 11 sheet 2 of 3

Dec 96





Key:

Land Use



Rural

Forest

Recreation

Residential

Industrial

Commercial

Other

Boundary of compartment

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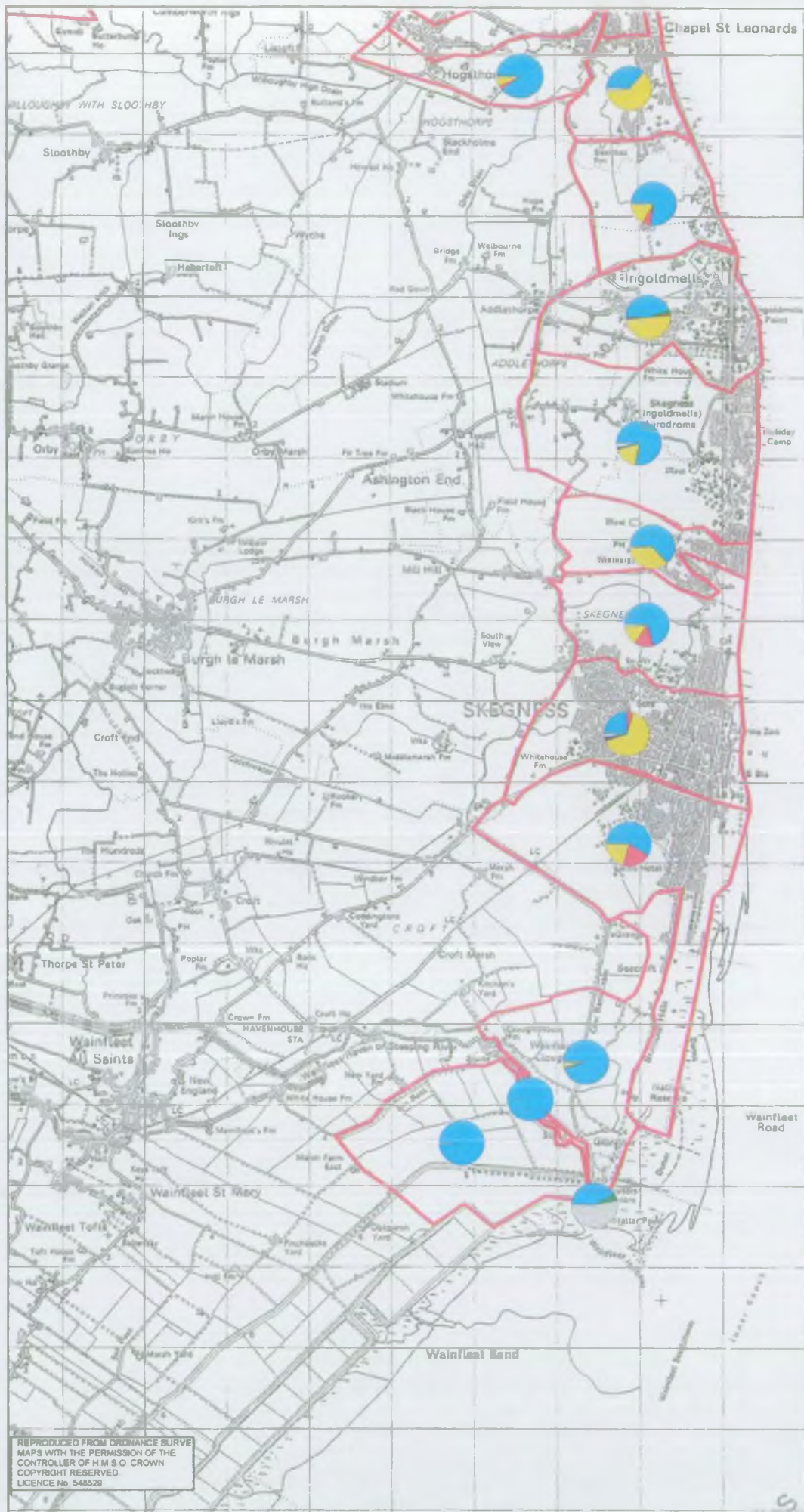
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LAND USE

MAP 11 sheet 3 of 3

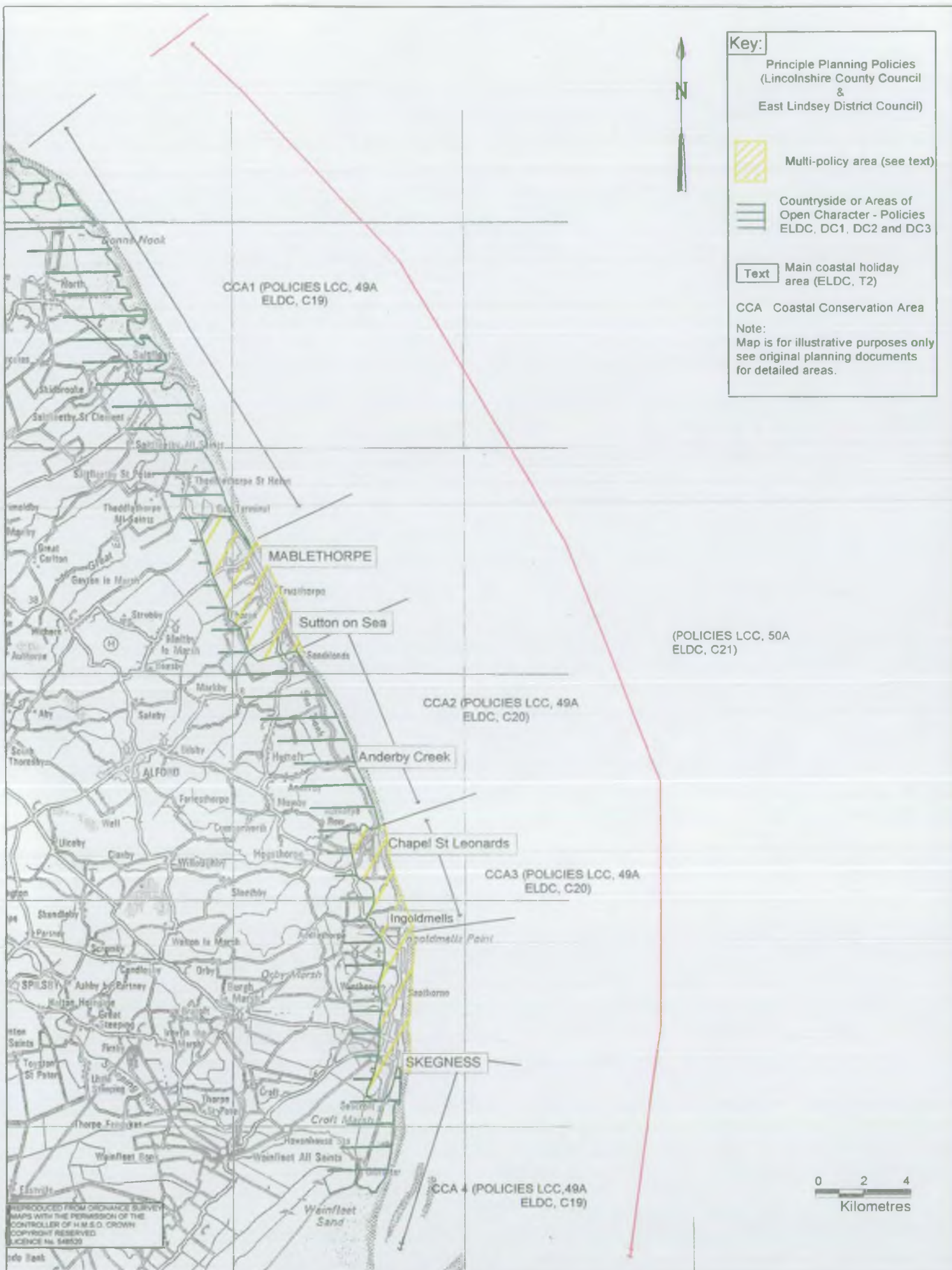
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### HUMBER VESSELS

Trawlers, gill-netters and long-liners work close inshore and the offshore banks, targeting cod in the Winter months and skate together with sole in the Summer.  
Potting vessels active during Summer months (April to October) for crab and Lobster both inshore and offshore.

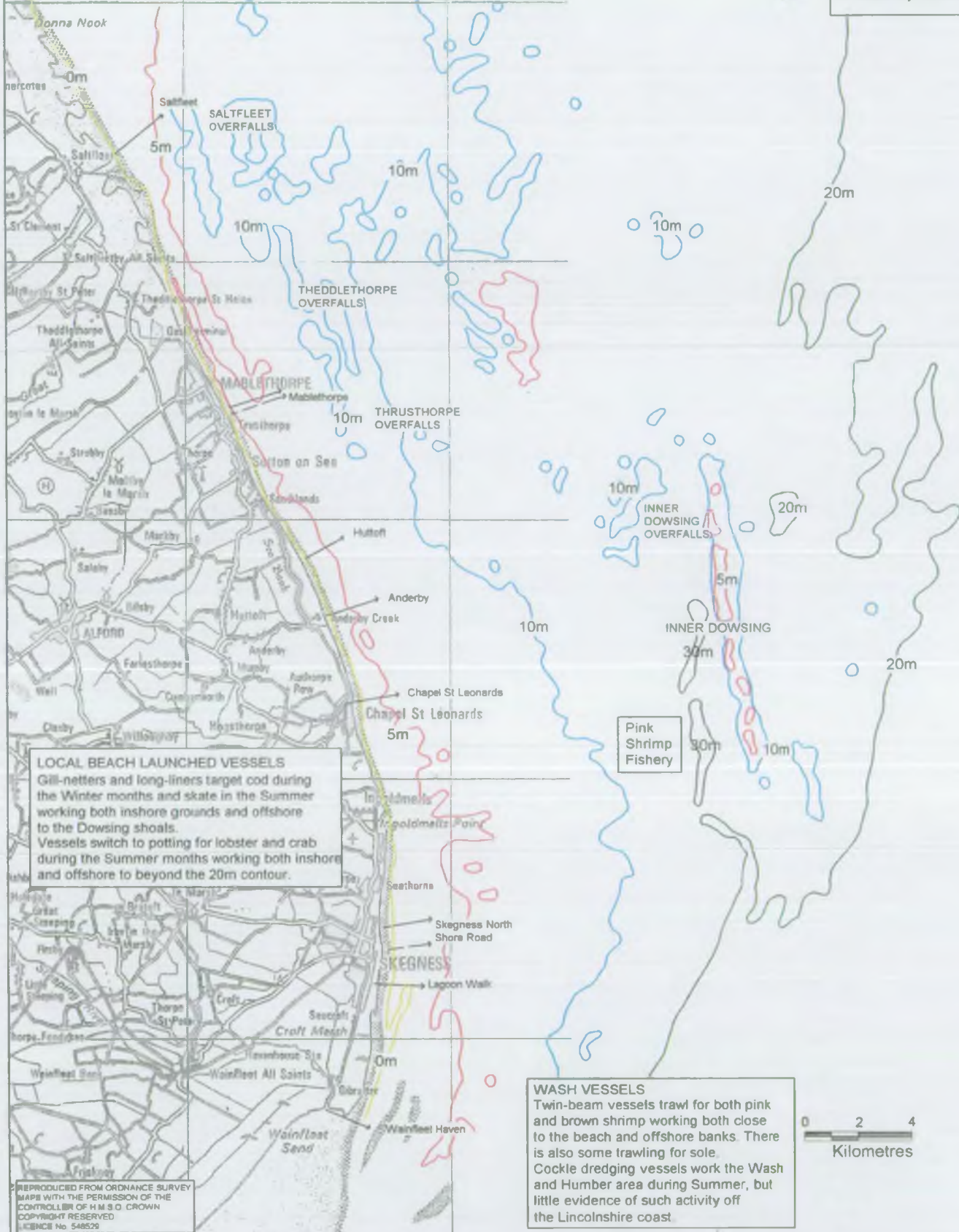
### Key:

Commercial Fishing

Fishing Vessel Access and Location

RNLI Launching Point

Depth contours in metres relative to Admiralty chart datum.







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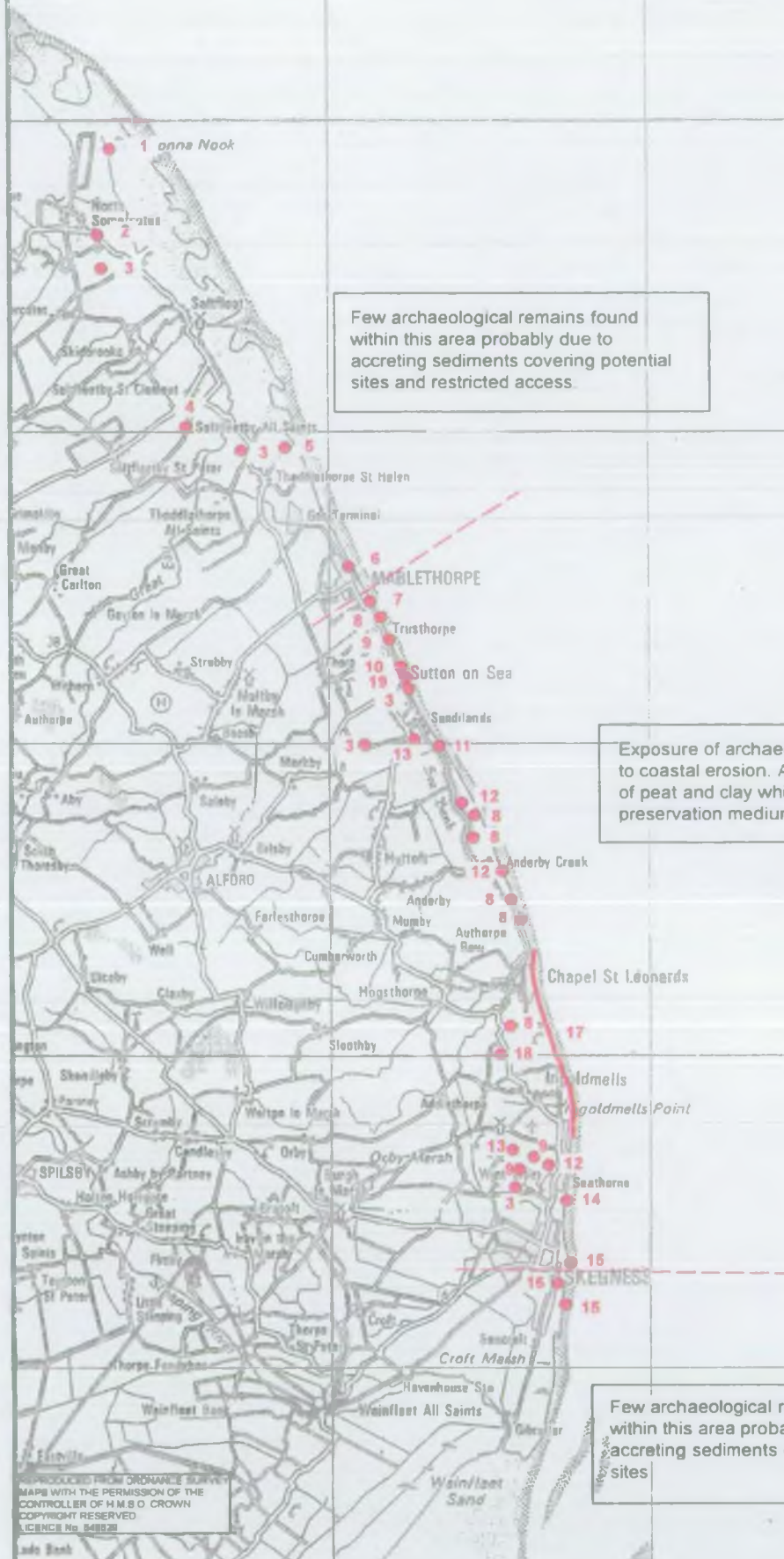




# Key:

## Archaeological Sites

1. Victorian lifeboat station
2. Medieval rabbit warren
3. Medieval village
4. Medieval churchyard
5. Brickworks
6. Neolithic remains
7. Iron age settlement
8. Romano - British Pottery
9. Medieval moat
10. Medieval saltern
11. Bronze age site
12. Medieval pottery
13. Medieval field system
14. Bronze age human remains
15. Stone axe (prehistoric)
16. Roman brothel token
17. Large number of finds found within this area, including:-
  - Medieval pottery
  - Medieval salt pans
  - Romano - British pottery
  - Roman artefacts
  - Iron age saltworks
  - Bronze age human remains and dagger
  - Prehistoric flint
18. Iron age saltern
19. Romano - British salt making site



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LINCOLNSHIRE SHORELINE MANAGEMENT PLAN

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ARCHAEOLOGY

MAP 17 sheet 1 of 1

June 1996



