

LD&A DESIGN

SEASCAPE CHARACTER ASSESSMENT

SUFFOLK, SOUTH NORFOLK & NORTH ESSEX

Final Report

14th December 2018

Seascape Character Assessment

Suffolk, South Norfolk and North Essex
14 December 2018

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14 December 2018

Seascape Character Assessment

14 December 2018

Seascape Character Assessment

Contents

Preface	I
1.0 Introduction.....	2
1.1. Background	2
1.2. Structure.....	2
2.0 Approach to the Assessment	4
2.1. Step 1 – Define Purpose and Scope.....	4
2.2. Step 2 – Desk Study	5
2.3. Step 3 – Field Survey.....	6
2.4. Step 4 – Classification and Description.....	6
3.0 Existing Character Assessments and Characterisations	7
3.1. National and Regional Character Assessment.....	7
3.2. County, Borough/District and Local Landscape Character Assessment	9
4.0 Environmental Designations and Definitions.....	14
4.1. Landscape/ Seascape Designations and Definitions.....	14
4.2. Biodiversity Designations.....	16
4.3. Heritage Designations.....	20
5.0 Evolution of Seascape Character.....	22
5.1. Physical Influences.....	22
5.2. Cultural Influences	25
6.0 Perceptions of Seascape	39
6.1. Cultural Associations.....	39
6.2. Aesthetic and Perceptual Qualities.....	41
7.0 Seascape Character Type Descriptions	43
7.1. SCT 01 Inland Navigable Waters.....	44
7.2. SCT 02 International Ports and Approaches	48
7.3. SCT 03 Nearshore Waters.....	51
7.4. SCT 04 Developed Nearshore Waters.....	56
7.5. SCT 05 Coastal Waters.....	61
7.6. SCT 06 Offshore Waters.....	63
Appendix 1. Acknowledgements.....	I
Appendix 2. Data	I
Appendix 3. Figures.....	I

14 December 2018

Seascape Character Assessment

Appendix 4. References..... I

5997

14 December 2018

Seascape Character Assessment

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14 December 2018

Seascape Character Assessment

Preface

Seascape results from the way that the different components of our coastal and marine environment, both natural and cultural, interact together and are understood and experienced by people. Like landscape, it plays an important part in forming the setting to our everyday lives.

Suffolk, south Norfolk and north Essex possess some of the UK's most varied and interesting seascapes. They help tell the story of our islands history by displaying evidence of trade, migration, industry and warfare over thousands of years. Our seascapes also contain some of the UKs most important coastal and marine habitats and have been the inspiration to several well-known artists, writers and musicians.

Our seascapes are also important from an economic perspective. Coastal and inland ports are a major part of local, regional and international trade networks and they support a wide range of commercial activities, including fishing and offshore industries. Tourism is also a vital part of the coastal economy, and we have several thriving seaside towns and holiday resorts as well as numerous visitor attractions and opportunities to engage in active and passive pursuits, such as nature watching, recreational sailing, angling and swimming.

Like terrestrial landscapes, our precious seascapes are vulnerable to change. Climate change threatens to raise sea levels and cause more frequent and powerful storms. Change resulting from new development associated with infrastructure and coastal defence works, housing, conventional and renewable energy, port expansion, recreation and tourism can also influence seascape character.

The introduction of the UK marine planning system provides us with an opportunity to treat the land and sea as a continuum. For the first time, decision makers, developers and communities are in a position to address the future of our seascapes and landscapes in an integrated fashion.

This report maps and describes the seascape character of Suffolk, south Norfolk and north Essex in order to provide a comprehensive description of the marine environment consistent with information available for terrestrial areas. It will be a valuable reference for all those involved in making decisions about how our coastal and offshore environments should be planned and managed and it provides an authoritative baseline to assist in the assessment of the effects of proposed development and to monitor change over time.

Our thanks are extended to the Project Steering Group for their support and guidance; to consultees including the Suffolk Coast and Heaths Area of Outstanding Natural Beauty Partnership and Suffolk Coast Forum, for their feedback on the findings of a preliminary appraisal; and to LDA Design as consultants undertaking this assessment.

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14 December 2018

Seascape Character Assessment

1.0 Introduction

1.1. Background

Suffolk, south Norfolk and north Essex benefit from having relatively comprehensive landscape character assessment coverage for terrestrial areas. In addition to county and district scale assessments, some coastal areas in Suffolk have been assessed as part of the Touching the Tide Landscape Partnership Scheme and the estuarine waters of the Stour and Orwell are included in a landscape character assessment of the Shotley Peninsula and its hinterland.

By contrast, the only assessments undertaken for marine areas have focussed on historic and biodiversity character or assess and describe seascape character at the national scale of assessment.

During pre-application discussions between Suffolk County Council, Suffolk Coastal and Waveney District Council, Great Yarmouth Borough Council and Scottish Power Renewables regarding the proposed East Anglia One North and East Anglia Two offshore windfarms, it was noted that there was no published county scale seascape character assessment for their respective study areas. Furthermore, no assessment was planned to be undertaken by the relevant local planning authorities in the foreseeable future.

It was agreed that it would be necessary to map and describe seascape character to an appropriate level of detail to provide a comprehensive description of the marine areas of Suffolk, south Norfolk and north Essex to inform these projects and establish the baseline against which to assess the effects of the proposed windfarms on seascape character. It was also noted that the assessment produced would have a wider application in informing planning, design and management decisions undertaken by the councils and other interested parties.

In response, Suffolk County Council and Suffolk Coastal and Waveney District Council commissioned and oversaw the production of this assessment.

1.2. Structure

This section (Section 1) introduces the assessment and is followed in Section 2 with details of the approach and methodology adopted.

Section 3 presents a review of existing landscape and seascape character assessments and characterisations relevant to the study area.

Section 4 provides an overview of relevant environmental designations and definitions, followed in Section 5 by a summary of the natural and cultural factors that have shaped seascape character. Section 6 presents an introduction to references to the coast and sea in art, music and literature. It also summarises observations made regarding perceptions of seascape made during field surveys and informed by feedback from local stakeholders during consultation.

The Seascape Character Types (SCTs) identified in the assessment are presented in Section 7. The SCTs are generic in nature in that they cover different localities that share broadly similar combinations of physical, cultural and perceptual attributes.

14 December 2018

Seascape Character Assessment

Acknowledgements are presented in Appendix 1. A list of the datasets illustrated on the Figures is provided in Appendix 2, with the figures provided in Appendix 3. References in the report are provided in Appendix 4.

14 December 2018

Seascape Character Assessment

2.0 Approach to the Assessment

The approach to this assessment follows the steps set out in *An Approach to Seascape Character Assessment* published in 2012 by Natural Englandⁱ and its companion *An Approach to Landscape Character Assessment*ⁱⁱ.

The four steps are described below along with details of how they have been applied.

2.1. Step 1 – Define Purpose and Scope

Consideration of the purpose of an assessment at the outset influences its scope, including scale and level of detail; how much (if any) work is carried out regarding the underwater environment; the resources required; those who should be involved in its preparation; and the types of judgements that are needed to inform decisions.

Matters relevant to defining the purpose and scope of this assessment are as follows:

2.1.1. Purpose

The purpose of the assessment is to map and describe variations in seascape character for marine areas within an agreed study area to:

- sit alongside published landscape character assessments in Suffolk, south Norfolk and north Essex to establish a comprehensive character assessment baseline to inform planning, design and management decisions undertaken by a range of interested parties;
- contribute to the baseline evidence for the Seascape, Landscape and Visual Impact Assessments (SLVIAs) of developments in the coastal and marine environment; and
- provide the context and framework for local scale seascape character assessments.

2.1.2. Scope

Emphasis

The emphasis of the assessment is to produce a baseline description of seascape character types that is appropriate in scope and scale to inform decision making and the assessment of a proposed development on seascape character.

Skills and Specialisms

LDA Design is the principal author of the assessment. LDA Design is experienced in the assessment of coastal and offshore development and undertaking seascape character assessments. It was the lead author of Natural England's *An Approach to Seascape Character Assessment* and was on the Advisory Group for the *Seascape Character Assessment of Marine Plan Areas 3 and 4 and Part of Area 6*ⁱⁱⁱ.

The assessment has been carried out under the guidance of a Project Steering Group comprising representatives from the relevant local authorities and non-departmental public bodies. Royal Haskoning DHV has supported the assessment through the sourcing and provision of baseline data and mapping. Further details are provided in Appendix 1.

14 December 2018

Seascape Character Assessment

Geographic Extent

The study area for the assessment has been defined as follows:

- The landward extents are generally defined by the low water mark along the coastline and the margins of the major navigable rivers. Infrastructure at river crossings or other features are used to define the landward limits of the study area in some locations along rivers. Beyond these defining features, rivers are considered as a part of the surrounding landscape character type or area.
- The northern and southern extents are defined by lines drawn at a tangent from Harwich Haven (in the south) and Winterton Dunes (in the north) to meet the extents of the 50km study areas defined for the proposed East Anglia One North and East Anglia 2 offshore windfarms.
- The seaward extent follows the 50km study areas defined for the proposed East Anglia One North and East Anglia 2 offshore windfarms.

The study area, which extends beyond the UK Territorial Sea (12 nm from the coastline), was agreed with the Project Steering Group and is illustrated on **Figure 1**.

Scale of Assessment

The scale of assessment is compatible with existing landscape character assessments for Suffolk, Essex and the Broads Authority in order to establish a comprehensive and consistent baseline description of landscape and seascape character across terrestrial, coastal and marine areas at the county scale.

Level of Detail

The assessment maps and describes Seascape Character Types (SCTs). In addition to a summary of the natural and cultural factors that have influenced seascape character, aesthetic and perceptual qualities and the key characteristics for each of the SCTs are presented.

2.2. Step 2 – Desk Study

This involved a review of relevant background documents and spatial (mapped) information, drawing on sources/datasets recommended and approved by the Project Steering Group.

The analysis of various sources and types of data assisted in the identification of areas of common character, the mapping of draft SCTs along with the preparation of descriptions of natural and cultural influences.

Details of the mapping and data illustrated on the figures in Appendix 3 are provided in Appendix 2. References are provided in Appendix 4.

Desk study also included consultation with the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB) Partnership and Suffolk Coast Forum.

14 December 2018

Seascape Character Assessment

2.3. Step 3 – Field Survey

Analysis included consideration of the aesthetic and perceptual qualities at locations along the coastline and offshore. Views to, from and along the coastline were also considered. In addition to informing the descriptions of SCTs, observations made in the field also influenced the alignment of the boundaries for several SCTs.

Onshore field survey was undertaken in December 2017.

Offshore field survey was undertaken in September 2018.

2.4. Step 4 – Classification and Description

The final step in the assessment process refines and finalises the outputs of the assessment process by classifying, mapping and describing SCTs and compiling the report and supporting figures.

14 December 2018

Seascape Character Assessment

3.0 Existing Character Assessments and Characterisations

Several landscape character assessments have been undertaken within the terrestrial and coastal areas of Suffolk, south Norfolk and north Essex. The character of marine environments is also mapped and described at the national scale in the Seascape Character Assessment of the East Inshore and East Offshore Marine Plan Areas supplemented with biodiversity and historic characterisations.

The following section provides a summary of studies that have a coastal and marine focus and that have been referred to in the identification, mapping and description of the SCTs in this assessment.

3.1. National and Regional Character Assessment

3.1.1. Maritime and Marine Biodiversity Character

Natural Areas

Refer to **Figure 2**.

In 1996 the '*Character of England: landscape, wildlife and natural features*' map was published jointly by English Nature and the Countryside Commission (now Natural England) and shows England divided into unique Natural Areas¹.

The original map included descriptions for several Maritime Natural Areas around the English coastline. Further work, drawing on oceanographic processes, bathymetry and biogeographic characteristics mapped and described Marine Natural Areas.

Offshore the study area includes the full extent of the Suffolk Coast Maritime Natural Area, approximately half of the Sheringham to Lowestoft Maritime Natural Area, and part of the Southern North Sea Marine Natural Area. A limited part of the Greater Thames Estuary Maritime Natural Area is also included in the southern part of study area.

The Maritime and Marine Natural Areas relevant to this assessment are described in the following documents:

- Suffolk Coast Maritime Natural Area Profile^{iv}.
- Sheringham to Lowestoft Maritime Natural Area^v.
- Greater Thames Estuary Maritime Natural Area^{vi}.
- Southern North Sea Marine Natural Area^{vii}.

3.1.2. Landscape and Seascape Character

Refer to **Figure 3**.

National Landscape Character Areas

National Character Areas map and describe landscape character at the national scale for onshore areas. The terrestrial hinterland of the study area includes several National

¹ This work has now evolved to form the National Character Assessment, covering terrestrial areas only

14 December 2018

Seascape Character Assessment

Character Areas along the coastline (North East Norfolk and Flegg, The Broads, Suffolk Coast and Heaths, Northern Thames Basin and Greater Thames Estuary) all of which are described in individual National Character Area Profiles available online^{viii}.

East of England Landscape Typology

Within the context of the National Character Areas is the East of England Landscape Typology^{ix}. Landscape character types that lie along the coast comprise Coastal Dunes, Lowland Settled Farmlands, Forested Estate Sandlands, Coastal Levels, Saltmarsh and Intertidal Flats, Valley Settled Farmlands, Valley Meadowlands and Urban areas.

East Inshore and East Offshore Seascape Character Assessment

In April 2014, the Department for Environment, Food and Rural Affairs (DEFRA) published the Marine Plan for the East Inshore and East Offshore areas^x to provide a comprehensive and integrated approach to managing the marine environment.

The study area falls within the East Inshore Marine Plan Area and East Offshore Marine Plan Area.

The East Inshore Marine Plan Area is described as covering “...an area of 6,000 square kilometres and its coastline includes exposed sandy beaches, soft glacial till cliffs and seafront towns...busy with tourism, recreational activities and fisheries. Shallow waters and sandbanks provide important wildlife habitats and spawning grounds for many species and the area is rich in wildlife with many internationally designated sites.”

The East Offshore Marine Plan Area is described as encompassing “...the marine area from 12 nautical miles out to the Exclusive Economic Zone (the maritime borders with the Netherlands, Belgium and France); a total of approximately 49,000 square kilometres of sea”. It adds that the “...area is predominantly open, expansive, shallow water supporting oil and gas platforms and commercial activities such as shipping, aggregate extraction and fishing. Designated shipping routes, cables infrastructure and oil and gas pipelines cross the offshore area linking the United Kingdom mainland with Europe.” Furthermore, it adds that the area “...also contains a wealth of archaeological sites and heritage assets. In locations such as the Dogger Bank, the potential exists to discover evidence of prehistoric activity in areas that were once on land. In other locations across the offshore area discoveries of early human remains have been prevalent”.

In October 2012 Natural England published a pilot seascape character assessment of the Marine Management Organisation (MMO) Marine Plan Areas 3, 4 and part of area 6^{xi}. The assessment maps and describes 11 seascape character areas at the national scale and highlights their key characteristics and their physical and cultural influences along with aesthetic and perceptual qualities.

In July 2012 the MMO^{xii} published a study that was undertaken to summarise and respond to comments received following the informal consultation of the key characteristics for 10 of the seascape character areas described in the pilot study published by Natural England.

14 December 2018

Seascape Character Assessment

The study area includes the following Seascape Character Areas:

- Suffolk Coastal Waters
- Norfolk Coastal Waters
- East Anglian Shipping Waters
- East Midlands Offshore Gas Fields

3.1.3. Historic Seascape Character

Refer to **Figure 4**.

Historic Characterisation involves identifying and describing distinguishing patterns, features and qualities, or attributes^{xiii} of the landscape, the sea and urban areas.

Historic seascape characterisation (HSC) maps and describes the historic and cultural influences which shape present perceptions across marine areas and provides an archaeological understanding of time depth. Historic England is progressing HSCs to provide a holistic view of the seascape which, among other benefits, provides a context for the often 'point-based' historic environment datasets available for the marine zone.

The study area includes two HSCs:

Newport to Clacton Historic Seascape Characterisation

The majority of the study area is assessed in the Newport-Clacton HSC. This study maps and describes thirteen Broad Character Types and 26 Historic Seascape Character Types (HSCTs) extending from coastal areas (areas that “...when viewed from a maritime perspective can be shown to possess a distinctly maritime character”) to the UK Continental Shelf Limit at the Median Line with Dutch waters.

East Yorkshire to Norfolk Historic Seascape Characterisation

The northern portion of the study area falls within the East Yorkshire to Norfolk HSC. The HSC provides summary descriptions for Broad Character Types and 25 HSCTs.

3.2. County, Borough/District and Local Landscape Character Assessment

At the county level of landscape character assessment, the terrestrial hinterland of the study area falls predominantly within the area assessed in the Suffolk County Landscape Character Assessment. The southern boundary of the study area abuts Essex, the character assessment for which was published in 2003. There is no county scale assessment for Norfolk. However, there is an assessment of the Norfolk Broads.

Landscape character assessments have also been undertaken by individual local authorities. Furthermore, several studies have been undertaken at a local scale to specifically to assess and describe coastal areas from Covehithe to Felixstowe and the inland waters of the Stour and Orwell.

14 December 2018

Seascape Character Assessment

3.2.I. County Scale Assessments

Refer to **Figure 5a**.

Suffolk County Landscape Character Assessment

Suffolk County Council, in partnership with the Living Landscapes Project carried out a Landscape Character Assessment of the county (which was finalised in 2008 and revised in 2011)^{xiv}. The assessment is based on the Land Description Unit (LDU) methodology in which discreet units of broadly homogenous land are identified according to a set of physical and cultural characteristics. Historic landscape characterisation information was also used to inform and gain an understanding of the differences in character across the county. Following field surveys, the LDUs were amalgamated to form landscape character types (LCTs), of which there are thirty across the county.

The following LCTs are located along the coast within the study area:

- Coastal Dunes and Shingle Ridges
- Coastal Levels
- Rolling Estate Sandlands
- Wooded Fens
- Plateau Estate Farmlands
- Estate Sandlands
- Open Coastal Fens
- Saltmarsh and Intertidal Flats
- Urban

Essex Landscape Character Assessment

The southern boundary of the study is defined by the northern boundary of Essex. A character assessment for the county was published in 2003 which maps and describes seven LCTs and thirty-five landscape character areas (LCAs). Of particular relevance to this study is the Coastal Landscapes LCT and the Stour Estuary Slopes and Stour Estuary LCAs.

Norfolk Broads Landscape Character Assessment

The Broads Authority Landscape Character Assessment^{xv} assesses, maps and describes thirteen LCTs and 31 LCAs. The majority of the Broads area lies landward of the coast. The interface with the coastline lies to the north of the study area.

14 December 2018

Seascape Character Assessment

3.2.2. Borough/District Scale Assessments

Refer to **Figure 5b**.

Great Yarmouth Landscape Character Assessment and Waveney District Landscape Assessment

In 2008 Great Yarmouth Borough^{xvi} and Waveney District^{xvii} Councils published landscape character assessments of their administrative areas which were developed in parallel. A total of eleven LCTs were identified along with 29 LCAs.

Of particular relevance to this assessment are the following ‘Coastal’ landscape character types and areas:

- Dunes, Coastal Levels and Resorts
 - Winterton Dunes and Coastal Strip
 - Great Yarmouth Coastal Strip
- Coastal Cliffs
 - Pakefield to Benacre Coastal Cliffs
 - Southwold Coast

Tendring District Landscape Character Assessment

The Tendring Landscape Character Assessment^{xviii} was published in 2001. It maps and describes eight landscape types and their constituent landscape character areas.

The southern boundary of the study area is immediately adjacent to (and coincident with) the Open Estuarine/Coastal Marsh landscape type and specifically the Stour Estuary Marshes landscape character area.

The landward side of the estuary is characterised as the Clay Valley landscape type (Stour Valley System landscape character area).

Joint Babergh and Mid Suffolk District Council Landscape Guidance

In 2015 the two authorities published guidance^{xix} to improve the quality of development coming forward in the countryside. The assessment identifies nine landscape typologies for Babergh (following the findings of the Suffolk County Landscape Character Assessment) with additional information provided relevant to the district.

Of particular relevance to this assessment are landscape types fringing the Stour and Orwell across the Shotley Peninsula – notably the Coastal Levels and Saltmarsh and Intertidal Flats landscape character types.

Suffolk Coastal Landscape Character Assessment

The Suffolk Coastal Landscape Character Assessment was published in 2018^{xx}. It presents a landscape character assessment of the whole of Suffolk Coastal District, at a scale between National Character Areas and detailed LCTs which exist for Suffolk.

14 December 2018

Seascape Character Assessment

LCT boundaries in the Suffolk County Council assessment have been used to define 37 LCAs, which have also been shaped by the Waveney Landscape Character Assessment and Touching the Tide Landscape Character Assessment (see below).

3.2.3. **Local Scale Assessments**

Managing a Masterpiece

A Historic Landscape Study has been undertaken as part of the ‘Managing a Masterpiece: Stour Valley Landscape Partnership Scheme’. It concentrates on the waters of the upper Stour and its tributaries west of Manningtree^{xxi}, and as such has a limited interface with the study area.

Touching the Tide Landscape Character Assessment

Touching the Tide is a Heritage Lottery Fund (HLF) Landscape Partnership Scheme. The scheme area stretches along the coast from the boundary of the Suffolk Coast and Heaths AONB at Covehithe to Landguard Fort at Felixstowe and is a maximum of 10km wide where estuaries penetrate inland. It covers an area defined as the Suffolk Heritage Coast but includes the upper Deben Estuary and Felixstowe seafront which share many of the same issues and much of the same landscape history.

A key reference informing the Landscape Conservation Action Plan for the Suffolk Coast^{xxii} is the Touching the Tide Landscape Character Assessment^{xxiii}. The assessment builds on the landscape character assessment by Suffolk County Council and draws on the Natural England Seascape Pilot Study.

The Touching the Tide assessment maps and describes ten Coastal Character Areas (CCAs) to reflect local variations in landscape character, with each CCA comprising several LCTs. The CCA descriptions provide information on the coast and coastal change covering aspects of landscape evolution, present day character, current values and how change may occur in the future.

Shotley Peninsula and Hinterland Landscape Character Assessment

The Shotley Peninsula and Hinterland assessment^{xxiv} was prepared for the Stour and Orwell Society and Suffolk Coast and Heaths AONB Partnership and covers the Shotley Peninsula as far inland as the A12 and includes the Orwell Estuary to the north and Stour Estuary to the south.

Within the study area, the assessment maps and describes the following LCTs fringing the Rivers Stour and Orwell:

- Saltmarsh and Intertidal Flats
- Coastal Levels
- Valley Meadowlands

The rivers are included in the following LCAs that are identified, mapped and described in the assessment:

- Orwell Estuary
- Stour estuary

14 December 2018

Seascape Character Assessment

Landscape Character Assessment of the Essex Coast

In 2005 SAIL (Schéma d'Aménagement Intègre du Littoral) and Essex County Council commissioned a study to collate information about the Essex coast^{xxv}. Only the northern most part of the study falls within the study area (at the River Stour) and are described as forming part of the Unvegetated Foreshore Landscape Type.

14 December 2018

Seascape Character Assessment

4.0 Environmental Designations and Definitions

The Suffolk, south Norfolk and north Essex coast is well known for the quality of its natural and built environment.

A range of environmental designations and definitions are located within and adjacent to the study area and as such have informed this assessment.

A summary is provided below.

4.1. Landscape/ Seascape Designations and Definitions²

Refer to **Figure 6**.

4.1.1. Areas of Outstanding Natural Beauty

An AONB is one of several designated landscapes in England and Wales that the Government has confirmed as having the highest status of protection in relation to natural beauty.

The boundary of an AONB located on the coast extends to the mean low water mark – the limit of planning authority for terrestrial planning authorities. However, there are many links between an area's natural beauty and the adjacent marine environment. For example, views out to sea, along the coast, or from sea to land are often part of what makes an area special to people. There can also be ecological links, for example seals breeding and resting on beaches rely on the sea for their food. Cultural links can also contribute to the special qualities of an area. For example, archaeological remains in the intertidal zone and further offshore can help to tell the story of human activity in an area over time^{xxvi}. This is particularly the case in coastal areas where there has been significant marine transgression, and where former settlements and structures have been lost to the sea.

The Suffolk Coast and Heaths AONB extends across the majority of the coast of the study area. The Norfolk Coast AONB lies adjacent to the study area at Winterton-On-Sea.

Suffolk Coast and Heaths AONB

The Suffolk Coast and Heaths, confirmed as an AONB in March 1970 and covering approximately 403 square kilometres, extends across two tracts of landscape; the first from the northern side of the Stour estuary towards the A14 west of Felixstowe and from the northern fringes of Felixstowe as far north as Kessingland.

The AONB consists of a mosaic of different habitats and land uses including farmland; heathland; ancient woodland; commercial forestry; reedbeds; estuaries; grazing marsh; small towns and villages; low cliffs and shingle beaches.

The eastern (seaward) boundary of the AONB is deeply indented by five estuaries - the Blyth, Alde/Ore, Deben, Orwell and Stour and consists of cliffs, shingle beaches, coastal lagoons, freshwater marshes and reedbeds stretching along the low-lying coast.

² The Broads National Park lies inland of Great Yarmouth and Lowestoft. Dedham Vale is landward of Manningtree. As such these areas are not considered as part of this assessment due to their limited physical and visual relationship to the coast and sea within the study area.

14 December 2018

Seascape Character Assessment

The AONB is an important area for wildlife and significant areas are designated for their biodiversity and nature conservation value. The mud flats and creeks of the areas salt marsh fringed estuaries are noted as being particularly important as they contain wetland sites of national and international importance. The low-lying coastal hinterland is also noted as containing some of England's few remaining areas of ancient open heathland, known locally as Sandlings. These areas are described as a refuge of the nightjar, woodlark, and rare butterflies such as the silver-studded blue. There are also ancient woodlands, large commercial forests, often important for recreation, and areas of arable farmland which is the largest land use type in the AONB.

Visitor activity is centred around Aldeburgh and Southwold which offer a traditional seaside experience, and in smaller towns and coastal hamlets such as Orford, Dunwich, Bawdsey and Walberswick. The popularity of water-sports is noted as having brought leisure usage, including to the Stour, Deben, Blyth and Alde/Ore estuaries. The area also has three long distance footpaths: the Suffolk Coast and Heaths Path, the Stour and Orwell Walk and the Sandlings Walk in addition to a network of rights of way and areas of open access land.

Important references with regard to the AONB are the Suffolk Coast and Heaths AONB Management Plan 2013-2018^{xxvii} and the Suffolk Coast and Heaths Area of Outstanding Natural Beauty Natural Beauty and Special Qualities Indicators^{xxviii}. This document highlights several 'natural beauty indicators' that are directly related to coastal and marine areas – including the coastal cliffs, shingle spits and beaches; the aesthetic, spatial and emotional experiences of open and exposed areas on the coast; presence of military and infrastructure elements; and contemporary use of the estuaries and coast for recreation.

Norfolk Coast AONB

The Norfolk Coast AONB was designated in 1968 and covers intertidal, coastal and agricultural land with a total area of over 450 square kilometres. It extends from the Wash in the west through the coastal marshes, soft cliffs and hinterland of north Norfolk, to the dune systems at Winterton in the east.

The AONB Management Plan^{xxix} includes a 'Statement of Significance' which summarises the area's special qualities and natural beauty. Of particular note are references to the dynamic character and geomorphology of the coastline; the strong and distinctive links between land and sea; the diversity and integrity of the landscape, seascape and settlement character; geology; varied and distinctive habitats; sense of remoteness, tranquillity and wildness; and the rich historic environment.

4.1.2. Heritage Coast

Suffolk Heritage Coast

Heritage Coasts are areas of undeveloped coastline managed to conserve natural beauty and, where appropriate, improve accessibility for visitors. There are no statutory requirements or powers associated with the Heritage Coast definition.

The Suffolk Heritage Coast was defined in 1973 and is largely contained within the Suffolk Coast and Heaths AONB but extends approximately 1.5km (0.8nm) offshore.

In May 1993 the Heritage Coast Forum published a gazetteer of Heritage Coasts in England and Wales^{xxx}. This describes the Suffolk Heritage Coast as a low-lying coast of long shingle

14 December 2018

Seascape Character Assessment

beach formations, estuaries, marshes and low sandy cliffs which are subject to change and erosion from the sea. It adds that much of the coast is designated and managed for nature conservation. It also highlights features such as Orfordness, the longest shingle spit in the UK, and sites of historical interest including Sutton Hoo and defensive structures including Martello Towers and those associated with both World Wars. Recreational interest cited in the gazetteer includes the coastal path and bird watching. It adds that visitor activity is centred on the small towns of Aldeburgh, Southwold, Walberswick, Dunwich and Thorpeness. The popularity of water sports, particularly in the estuaries, is also highlighted.

4.2. Biodiversity Designations

Refer to **Figure 7**.

The UK has signed up to the Convention on Biological Diversity and the OSPAR Convention which are international agreements to establish an ecologically coherent network of well-managed Marine Protected Areas (MPAs). The sites in the network comprise both coastal areas with a marine component and offshore areas.

In the study area the MPA network comprises Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Marine Conservation Zones (MCZ). Sites of Special Scientific Interest (SSSIs) with marine components and Ramsar sites also form part of the UK's contribution to the MPA network.

A summary of the principal designated areas with marine components and that lie offshore is presented below:

4.2.1. Special Protection Areas/Special Areas of Conservation with Marine Components

Stour and Orwell Estuaries SPA^{xxxii}

The Stour and Orwell estuaries straddle the eastern part of the Essex/Suffolk border and include extensive mud flats, low cliffs, salt marsh and small areas of vegetated shingle. The SPA also includes an area of low-lying grazing marsh at Shotley Marshes on the south side of the Orwell. In summer, the SPA supports important numbers of breeding avocet while in winter they hold major concentrations of waterbirds, especially geese, ducks and waders. Geese also feed, and waders roost, in surrounding areas of agricultural land outside the SPA.

Deben Estuary SPA^{xxxiii}

The Deben Estuary extends for over 12km from the town of Woodbridge to the sea just north of Felixstowe. The channel is relatively narrow and sheltered and has limited amounts of freshwater input. The estuary mouth is the narrowest section and is protected by the presence of shifting sandbanks. The intertidal areas are constrained by sea walls.

Saltmarsh and intertidal mud flats occupy the majority of the designated area and a range of swamp communities fringe the estuary, and occasionally form larger stands. In general, these are dominated by Common Reed. The estuary is of importance for its wintering waterbirds, especially avocet.

Alde-Ore Estuary SPA^{xxxiii} and Alde-Ore & Butley Estuaries SAC^{xxxiv}

The Alde-Ore Estuary SPA comprises the estuarine complex of the Rivers Alde, Butley and Ore, including Havergate Island and Orfordness. There is a variety of habitats including

14 December 2018

Seascape Character Assessment

intertidal mud flats, salt marsh, vegetated shingle, saline lagoons and semi-intensified grazing marsh. The Orfordness/Shingle Street land form is geomorphologically unique within the UK in combining a shingle spit with a cusped foreland. The diversity of wetland habitat types present is of particular significance to several bird species as these provide a range of opportunities for feeding, roosting and nesting. At different times of the year, the area supports notable assemblages of wetland birds including seabirds, wildfowl and waders. As well as being an important wintering area for waterbirds, the Alde-Ore Estuary provides important breeding habitat for several species of seabird, wader and raptor. During the breeding season, gulls and terns feed substantially outside the SPA.

Alde-Ore & Butley Estuaries SAC is designated for its estuarine habitats.

Orfordness-Shingle Street SAC^{xxxv}

The primary reason for the Orfordness- Shingle Street SAC designation is the coastal lagoon habitat, annual vegetation and drift lines and perennial vegetation of stony banks.

Minsmere to Walberswick SPA^{xxxvi} and Minsmere to Walberswick Heaths and Marshes SAC^{xxxvii}

The Minsmere to Walberswick complex comprises a complex mosaic of habitats, notably areas of marsh with dykes, extensive reedbeds, mud flats, lagoons, shingle, woodland and areas of lowland heath. It supports the largest continuous stand of Common Reed in England and Wales and demonstrates the nationally rare transition in grazing marsh ditch plants from brackish to fresh water. There are nationally important numbers of breeding and wintering birds. In particular, the reedbeds are of major importance for breeding bittern and marsh harrier. A range of breeding waders such as avocets and heathland birds occur in other areas of the SPA. The shingle beaches support important numbers of breeding little tern, which feed substantially outside the SPA in adjacent marine waters. The site is also important for wintering bitterns and raptors.

The habitats that are a primary reason for selection of the SAC designation are annual vegetation of drift lines and European dry heaths, whilst perennial vegetation of stony banks is a qualifying feature.

Benacre to Easton Bavents Lagoons SPA^{xxxviii} and Benacre to Easton Bavents Lagoons SAC^{xxxix}

Benacre to Easton Bavents is located between the coastal towns of Kessingland (to the north) and Southwold (to the south). The coast here is low-lying and consists of shingle beaches in the northern part and low cliffs around Easton Bavents and Covehithe. Benacre Broad is a natural brackish lagoon separated from the sea by a shingle bar, reed-fringed on the landward side and then grading into deciduous woodland on the rising ground behind. The smaller Covehithe and Easton Broads have developed similarly, with fringing reedbeds. Elsewhere, grazing marsh fields include unimproved meadows, which are separated by ditches rich in water plants and invertebrates.

The area supports important populations of breeding birds, which are particularly associated with reedbed and shingle beach habitats. The reedbeds also support bittern in winter. Little terns feed substantially outside the SPA in adjacent marine waters.

Benacre to Easton Bavents Lagoons is designated as a SAC as it supports a series of percolation lagoons. The lagoons (the Denes, Benacre Broad, Covehithe Broad and Easton Broad) have formed behind shingle barriers and are a feature of a geomorphologically

14 December 2018

Seascape Character Assessment

dynamic system. This range of salinity has resulted in a series of lagoonal vegetation types, and associated specialist lagoonal species.

Great Yarmouth North Denes SPA^{xi}

The Great Yarmouth North Denes SPA is located on the North Sea coast of Norfolk. Behind a wide shingle beach, the North Denes dune system is actively accreting. These low dunes are stabilised by marram grass and there are extensive areas of grey hair grass. The location supports important numbers of breeding little tern that feed outside the SPA in nearby waters.

4.2.2. Marine Special Areas of Conservation

Margate and Long Sands Marine Special Area of Conservation^{xii}

The northern part of the Margate and Long Sands SAC extends into the study area south east of Felixstowe. It contains a number of sandbanks slightly covered by seawater at all times, the largest of which is Long Sands itself. The sandbanks are composed of well-sorted sandy sediments, with muddier and more gravelly sediments in the troughs between banks. The upper crests of some of the larger banks dry out at low tide. The banks are tidally-influenced estuary mouth sandbanks, the southern banks aligned approximately east-west in the direction of tidal currents entering the Thames Estuary from the English Channel whereas Long Sand is aligned in a north east - south west orientation with influence from the North Sea. In common with all sandbanks, the structure of the banks is dynamic and there have been significant movements of the bank edges over time. The fauna of the bank crests is characteristic of species-poor, mobile sand environments, and is dominated by polychaete worms (cat worms) and amphipods (shrimp-like crustaceans).

Within the troughs and on the bank slopes a higher diversity of polychaetes, crustacea, molluscs and echinoderms are found. Mobile epifauna includes crabs and brown shrimp, along with squid and commercially important fish species such as sole and herring.

Southern North Sea Candidate Special Area of Conservation^{xiii}

This candidate site stretches from the central North Sea (north of Dogger Bank) to the Straits of Dover in the south, covering an area of 36,951 square kilometres. The majority of this site lies offshore, but also includes coastal areas of Norfolk and Suffolk. A mix of habitats, such as sandbanks and gravel beds are included in the site, which overlaps with Dogger Bank SAC; Haisborough, Hammond and Winterton SAC; and North Norfolk Sandbanks and Saturn Reef SAC. The Southern North Sea cSAC has been identified as an area of importance for Harbour Porpoise and includes key winter and summer habitat for this species.

Haisborough, Hammond and Winterton Marine Special Area of Conservation^{xiiii}

The Haisborough, Hammond and Winterton SAC lies off the north east coast of Norfolk and contains a series of sandbanks formed via headland associated geological processes since the 5th Century AD. These sandbanks are curved, run parallel to the coast, are composed of sandy sediment and lie in full salinity water with intermediate coastal influence. The site contains a mosaic of different physical habitats corresponding to different biological communities. The fauna of the sandbank crests is predominantly low diversity polychaete and amphipod communities that are typical of mobile sediment environments. The banks

14 December 2018

Seascape Character Assessment

are separated by troughs containing gravelly sediments and support diverse infaunal and epifaunal communities with occurrences of reefs of the tube-building Ross Worm.

4.2.3. Marine Special Protection Areas

Outer Thames Estuary Special Protection Area^{xliiv}

The Outer Thames Estuary SPA is classified for the protection of the largest aggregation of wintering Red-throated Diver in the UK (38% of the wintering population of Great Britain).

The area of the SPA contains areas of shallow and deeper water, with high tidal current streams and a range of mobile sediments, including several shallow sandbanks. Much of the area is less than 20m water depth, extending into the 20-50 m depth contour towards the eastern boundary of the SPA.

The SPA extends northward from the Thames Estuary to the sea area off Great Yarmouth on the east Norfolk Coast. The foraging areas protected for little tern and common tern, enhance the protection afforded to their feeding and nesting areas in the adjacent coastal SPAs, including the Minsmere to Walberswick SPA.

Greater Wash Special Protection Area^{xlv}

The Greater Wash is proposed to protect marine areas of great importance for different tern species during the breeding season (sandwich tern, little tern and common tern) as well as a range of seabird species during the non-breeding season (red-throated diver, common scoter and little gull).

4.2.4. Marine Conservation Zones

Kentish Knock East Recommended Marine Conservation Zone^{xlvi}

The Kentish Knock is one of several sandbanks lying relatively far offshore between Kent and Essex, out from the mouth of the River Thames.

The predominantly sand and gravel seabed contains a diversity of animals living within the sediment, with hermit crabs across the surface among small sand goby fish and foraging rays and catsharks.

There are deeply gouged channels in the coarse sediment, ancient remnants of when the glacial floodwaters broke through from the North Sea. The thermal water fronts mean this is a productive area, with numerous species of fish living in mid water. Many species of seabird forage for food around the sandbanks in both summer and winter.

Orford Inshore Recommended Marine Conservation Zone^{xlvii}

The seafloor within this area is extremely important as a nursery and spawning ground for many fish species, including dover and lemon sole, sprat and sand eels. skates, rays, small spotted catsharks and several crustacean species are also found here.

The area may also be of importance to foraging seabirds, such as the black-legged kittiwake, northern fulmar, northern gannet and sandwich tern. Harbour porpoises also pass through this area.

Designation of this site is regarded as important to ensure connectivity between existing sites in the network is maintained.

14 December 2018

Seascape Character Assessment

Alde Ore Estuary Recommended Marine Conservation Zone^{xlviii}

Located in close proximity to Aldeburgh on the Suffolk Coast, the Alde Ore Estuary reaches no more than 5 metres in depth. The seabed comprises estuarine rocky habitats, sheltered muddy gravel as well as mixed sediments and biogenic reef habitats.

Smelt use the estuary for spawning, whilst many juvenile sea fish use the area as a nursery ground. These include sprat, herring and flatfish such as sole and dab. Blue Mussels, Tentacled Lagoon Worms and oysters have also been recorded here.

The Orfordness geological feature, part of which lies within this recommended MCZ, comprises of nationally important shingle ridges extending 15km along the Suffolk coastline.

4.3. Heritage Designations

Refer to **Figure 8**

There is a great diversity of designated heritage sites and features on the coastline of the study area including Scheduled Monuments, Listed Buildings, Registered Parks and Gardens and Conservation Areas. Of particular significance to this assessment are sites and features that are located on the coast and have a relationship to coastal and marine areas, and navigable waters.

Defensive sites and structures are well represented. The study area formed part of England's vulnerable eastern coastline that has seen or been threatened by waves of invaders from Roman to more recent times. Sites and features include coastal castles, batteries and forts (for example, Orford Castle, Landguard Fort and Shotley Battery). The string of early 19th century Martello Towers between Harwich and Aldeburgh are also a notable feature. There are also more recent defensive features, such as the Black Beacon at the Orfordness Atomic Weapons Research Establishment.

Several towns and villages were (and in many cases remain) closely associated with fishing, commerce and trade. Harwich for example includes many designated buildings and structures, such as the premises of the Orwell and Harwich Navigation company, the Train Ferry Berth and Treadwheel Crane (now the sole visible element of the 17th century naval dockyards^{xlix}).

Several historic lighthouses are designated along with coastguard stations and lookouts – such as at Felixstowe, Sizewell Gap and Aldeburgh. There are also several designated monuments which commemorate famous seamen (the first monument in England to Admiral Lord Nelson is in Great Yarmouth) and disasters at sea (for example the Lifeboat Disaster Monument in Aldeburgh).

Several settlements are designated as Conservation Areas (Felixstowe, Aldeburgh, Thorpeness, Dunwich) and contain concentrations of Listed Buildings – many of which have a direct relationship to marine activity and trade. There are also several former settlement sites that are designated (for example Caistor-on-Sea Roman settlement) and ecclesiastic buildings and centres (Leiston Abbey first Site and Greyfriars Dunwich) that would have, at one time, been part of thriving coastal communities.

Several coastal towns have Registered gardens dating to the late nineteenth and early twentieth centuries. Cliff Gardens and Town Hall Garden in Felixstowe date to the early

14 December 2018

Seascape Character Assessment

20th century and are associated with the rapid expansion of the town which had become a popular visitor attraction following the establishment of a natural spa well. Great Yarmouth began to emerge as a seaside resort in the later 18th century and became a leading holiday destination in the Victorian period. During the 1920's Great Yarmouth Borough Council began work to construct a major new sea wall along the length of the town. The reclaimed land which lay between this wall and the seafront promenade was progressively developed as public pleasure gardens.

Offshore there are numerous wrecks. There is a single wreck designated under the Protection of Wrecks Act (1979) in the study area - known as the Dunwich Bank Wreck. The wreck is of a 16th century armed merchant's vessel. It is and is considered to be of international significance. It was located in October 1993 by Southwold fisherman who recovered ship timbers and concreted shot in a trawl. Subsequently a bronze gun was discovered. The gun was raised and treated in a specially constructed tank at Sizewell B Nuclear Power Station¹. The study area contains two further wrecks protected by the Military Remains Act (1986). The HMS Exmoor is located approximately 22km (12nm) off Lowestoft. The HMS Amphion is a cruiser that now lies 65km (35nm) off the coast at Dunwich^{li}.

14 December 2018

Seascape Character Assessment

5.0 Evolution of Seascape Character

The variations in seascape character evident in Suffolk, south Norfolk and north Essex reflect the complex interplay of a range of physical and cultural influences over millennia. These forces continue to shape the character of the coastline and marine areas and also influence how they are perceived and experienced.

The following section provides an overview of the factors that have shaped, and continue to shape, the character of the coast and the adjacent marine environment.

5.1. Physical Influences

5.1.1. Geology

Refer to **Figure 9**

Offshore, the broad geological patterns that are evident were set in the early geological history of the area, but more recent geological events, such as changes in sea level associated with glaciation, have had a profound effect upon the character of the seafloor.

The bedrock comprises rocks of Cenozoic Era (Palaeogene and Neogene rock types) resting directly upon Lower Palaeozoic layers, forming the Anglo-Brabant Massif. However, this is rarely exposed on the seafloor as it is largely buried beneath Pleistocene and Holocene sediments (clays, silts, sands and gravels). The oldest of these deposits are marine and estuarine sediments from rivers that once extended into the North Sea. Resting upon these are marine, estuarine and glacial sediments which underlie much of the modern floor of the North Sea.

Occasionally the underlying geology finds expression in offshore reefs and on riverside and coastal cliffs, where the soft nature of the geology can sometimes be seen in slips and collapses. Some locations along the coastline are well known for their fossil bearing beds.

5.1.2. Bathymetry

Refer to **Figure 10**

Water depth varies considerably within the study area. Much of the inshore part of the area has relatively shallow waters, rarely exceeding 10-20 metres in depth, although variations occur, and sandbanks are a notable hazard to navigation in places along the coastline.

Water depths increase from the coast to more than 50 metres in the centre of the study area, albeit the majority of these offshore areas are between 30m and 50m deep.

Water depths also vary in the navigable inland waters, which are dredged to accommodate recreational craft and deeper drafted commercial vessels in the larger waterways leading to major coastal and inland ports.

5.1.3. Coastal Processes

The coastline delimits the dynamic boundary between terrestrial and marine environments. Its location has changed over time in response to sea level change; variations in wave, tidal and surge conditions; alteration in the location of sediment sources and sinks; and as a result of coastal management.

14 December 2018

Seascape Character Assessment

Evidence shows that this coastal region has undergone considerable morphological change involving both the coastline position as well as the associated nearshore bathymetry over many centuries. For example, historical recession has continued for as long as there is archival data, such as old maps, Admiralty Charts, anecdotes, diaries, parish records, maps, aerial photographs, elevation/bathymetric surveying. Some areas are particularly well documented. For example, there has been much interest focussed on Dunwich which saw a powerful storm surge in 1286^{lii} that destroyed at least a third of the medieval settlement.

Coastal change continues along the coastline. For example, the cliffs between Benacre Ness and Southwold, 7-15 km to the north of Dunwich, are characterised by the fastest recorded recession rates in the UK. The geology, comprising soft, sandy sediments of the pre-glacial Norwich Crag Formation is vulnerable to erosion. It is also particularly important for sediment release into the southern North Sea and the formation and maintenance of features such as Orfordness. Cliff sediments are also important for the maintenance of nearshore banks and shoreline features, for example, growth in Sizewell-Dunwich Bank system and movement of Benacre Ness^{liii}.

5.1.4. Broad Habitats

The following broad habitat types can be found along the coast and offshore^{liv & lv}. As highlighted in the citations for a number of the designated sites, there is often a close relationship between terrestrial and marine areas.

Grazing marshes and dykes

Coastal grazing marsh is an important habitat supporting breeding wading birds, particularly Redshank and Lapwing. In winter, flocks of wildfowl and waders feed and roost on the marshes, particularly at high tide when the adjacent mudflats and saltmarshes are covered with water. Some grazing marshes are rich in plant species. Traditional management consists of late spring and summer grazing when the grass is growing enough to provide sufficient feed value. Dyke systems within the marshes, some of which are medieval in origin, have a range of water salinities from fresh to brackish and support diverse plant communities. The invertebrate interest of dykes is often significant.

Reedbeds

Smaller reedbeds occur in areas of grazing marsh which are not grazed. Larger reedbeds are used by rare reedbed birds, such as bitterns, marsh harriers, bearded tits, savi's warbler and cetti's warbler, as nesting and/or overwintering habitat. All the larger reedbeds are Sites of Special Scientific Interest (SSSI), and Special Protection Areas (SPA), which reflects their importance for bird conservation. The largest and most important reedbeds are found associated with saline lagoons behind shingle banks which have diverted rivers or where large areas of grazing marsh have been flooded, such as the Minsmere Marshes.

Saline lagoons

Saline lagoons are an internationally important habitat because of the very small size of the resource and the specialised invertebrate fauna found within them. They form where shingle blocks the mouths of small rivers causing ponds to form. Smaller lagoons occupy depressions in shingle beaches and on land behind ridged shingle beaches.

14 December 2018

Seascape Character Assessment

Many specialised invertebrates inhabit saline lagoons. The larger lagoons also support many species of breeding waders and wildfowl and in winter support migrant waterfowl.

Mud flats and salt marshes

Larger estuaries, such as the Alde and Ore, have extensive intertidal mud flats fringed by salt marsh, which forms at the edge of estuaries where the mud level is higher than the neap high tides and represents a transition between mud flats and terrestrial habitats.

Estuarine muds support a great density of invertebrates such as lug worms, rag worms, mud snails, shrimps and bivalve molluscs. These habitats are also important for their overwintering bird populations and support redshank, black-tailed godwit, teal, avocet, brent goose, grey plover, ringed plover, dunlin and shelduck. In the winter, large numbers of waders and wildfowl arrive from sub-arctic/arctic breeding grounds to feed in the estuaries before continuing south to southern Europe and Africa.

Shingle structures

Shingle beaches and spits are important for their geomorphological aspects and for the plant and animal communities which they support. A range of plant communities can be present, from pioneer communities of sea pea, sea kale and yellow horned poppy on more mobile shingle to a thin turf of shingle heath on stable areas. Shingle beaches are used by nesting birds where there is little human disturbance.

Inshore sublittoral sediment

Inshore sublittoral is defined as the sea-bed below low water but under coastal influence, for instance through local shelter from wave action, change of tidal stream speed or different water salinity. Inshore areas extend to around 3km (1.6nm) out to sea.

Sublittoral hard substrate

As noted previously, the geological bedrock of the study area has largely been masked by sediments. Just one area of significant natural hard substrate has been found four to eight metres under the sea, approximately 2-4km (1-2nm) offshore between Thorpeness and Sizewell. The combination of the rarity of the habitat and the unique animal community means that the Thorpeness rocky reef is of particular interest.

Seabed substrata

Benthic habitats are defined by the substrata of the seabed. Within the study area the seabed is composed predominantly of sandy gravel closer to the shore, whereas further offshore the sediment is mainly sand with patches of gravel, sandy mud and sandy gravel.

Different types of sediment grade into one another, and as such gravel, sand and mud merge to create a wide variety of habitats. The general habitat types are described below.

Gravel habitats

The diversity and types of community associated with this habitat are determined primarily by the sediment, and also a variety of other physical factors such as the relative exposure of the coast and differences in the depth, turbidity and salinity of the surrounding water. Sublittoral sand and gravel sediments are the most common habitats found below low water mark around the coast of the UK. Sands and gravels tend to be formed from rock material,

14 December 2018

Seascape Character Assessment

although shell fragments and whole shells may form 30% or more of the gravel sediment off the coast of Suffolk.

The gravel habitats found in deeper offshore areas (generally greater than 30 metres of water depth) tend to be less perturbed by natural disturbance than those found closer inshore. These areas also tend to support a diverse marine fauna which may include a wide range of anemones, polychaetes, bivalves and amphipods, and both mobile and sessile epifauna.

Sand habitats

Sand habitats are widespread throughout the study area. They tend to be mobile but accumulate in areas of moderate to strong tidal currents. In such situations the sands are coarse and clean with little silt or mud. More mobile sand habitats tend to be characterised by robust and sometimes impoverished faunas, dominated by organisms which are capable of rapid burrowing, such as certain mobile polychaete worms and thick-shelled bivalves.

Within the areas of sand that dominate the coastal waters within the study area are a series of sandbanks and tidal sand ridges. Many sandbanks are more or less of straight linear form but some are strongly 'V' or 'S' shaped in plan view. The complex sandbanks are thought to be related to systems of ebb or flood dominant channels.

Tidal sandbanks can be active or moribund forms. The latter are found in areas where the present-day tidal currents are weak (less than 1 knot near the sea surface) and are thought to be relict features. These older banks were probably formed largely after the end of the last glacial period, but before sea level reached its present height.

Sandbanks found inshore are generally in shallow water. The communities they support are determined by the sediment type and a variety of other physical factors, including geographical location, the relative exposure of the coast and differences in the depth, turbidity and salinity of the surrounding water. Scroby Sands is a large sandbank feature. It is the location of an offshore windfarm and southern parts of the bank have been exposed for a sufficient duration for grasses to colonise.

Mud habitats

The presence of mud mixed in with other sediment types usually indicates an area of relative shelter from wave exposure or from tidal currents. Under such conditions silt can settle onto the seafloor and become incorporated into the sediments. Because of the exposed nature of much of the study area offshore, few areas of mud-dominated sediment can be found except in deeper water such as in troughs or deeps – examples include areas off Felixstowe. Polychaete worms, bivalve molluscs and brittlestars often dominate the fauna of muddy sediments.

5.2. Cultural Influences

Alongside natural processes, humans have had a significant role in influencing the coastal landscape and seascape of the study area through the way it has been populated, managed and exploited over thousands of years.

Each generation has added to the layers of evidence of their forebears. This cultural continuity or 'time depth' adds richness and diversity to a story that covers millennia of activity and often underpins why people value the landscapes and seascapes around them.

14 December 2018

Seascape Character Assessment

Evidence of the evolution of coastal and marine areas is preserved in the archaeological record, documents, maps and charts as well as structures and features visible today. Some places are also imbued with meaning, perhaps due to their associations with people and events from the past that have left no visible or indeed physical remains.

The earliest evidence of human occupation north of the Alps has been discovered in the study area at Pakefield. However, the brief overview below commences with the period that saw the UK become detached from continental Europe.

5.2.1. **Mesolithic (c.8000 to c.4000BC)**^{lvi,lvii}

Prior to the period of dramatic sea level rise starting about 10,000 years ago, water was locked up in great ice sheets, meaning that sea levels were some 100m lower than today. At this time, what is now Suffolk, south Norfolk and north Essex was an upland on the edge of a vast plain covering the area that much of the North Sea now occupies.

The undulating lowland landscape (known as Doggerland) was covered with lakes and rivers and a patchwork of birch and pine thickets and herb rich tundra. This ancient landscape was home to a significant seasonal population of hunter-gatherers. Remains of their material culture including their tools, and the animals they hunted (including bison, wild horses and mammoth), have been trawled up from the seabed many kilometres out to sea.

As the climate warmed, the area of Doggerland was progressively submerged by the sea and by 8,500 years ago Britain had become separated from the continent, though what is now the offshore Dogger Bank survived as an island for perhaps another 1,500 years – becoming an increasingly swampy area of willow, alder and reeds. Doggerland was finally submerged after a tsunami triggered by an underwater landslide off Norway, known as the Storegga Slide. After that, what had been the biggest and perhaps last of the Doggerland islands became the shallows of Dogger Bank off the coast of Humberside (north of the study area).

By 7,000 years ago the coastline lay some 7km (3.8nm) to the east of its present location. The land was forested with oak, elm, lime and alder and early Mesolithic family groups were likely to have hunted deer, wild boar and beaver whilst also taking advantage of the fish and wildfowl in rivers and along the coast. The use of marine and riverine resources is well attested in the Mesolithic, including the earliest direct evidence for boat construction (a hollowed pine log that may have served as a watercraft was reported from Pesse in the Netherlands^{lviii}) and paddles are known from the sites of Star Carr in Yorkshire, Friesack and Duvensee in Germany, and from sites in Denmark^{lix}.

Whilst Mesolithic archaeology in Suffolk mainly consists of finds recovered from the plough soil, there is the potential for the marine area to reveal Mesolithic remains.

5.2.2. **Neolithic (c.4000 to c.2400BC)**

The Neolithic in Britain was a period of considerable change, represented by the domestication of animals and early adoption of arable agriculture. This necessitated a shift from mobile communities towards a settled lifestyle, with land clearance for grazing and cultivation resulting in gradual deforestation. An increase in material culture is also visible in the archaeological record with the onset of pottery production, polished stone tools and the construction of communal funerary monuments.

14 December 2018

Seascape Character Assessment

In comparison to the dramatic, often rapid changes in sea level during the Mesolithic, it is generally assumed that the coastlines of Britain have remained broadly unchanged since the beginning of the Neolithic. However, changes in sea level and localised erosion and accretion have had sometimes very dramatic effects on the coastline in the study area.

Archaeological evidence for the exploitation of marine resources and maritime activity during the Neolithic is limited to a number of log boat finds elsewhere. Evidence that these craft were used for fishing and were capable of journeying onto the open sea is suggested by faunal evidence from shell middens at Neolithic sites which contain the bones of deep-water fish. In addition to exploiting marine resources, indirect archaeological evidence also points to the advent of maritime trade during the Neolithic. The discovery on the UK mainland of stone axes manufactured in Ireland implies transport by sea.

5.2.3. Bronze Age (c.2400 to c.700BC)

The Bronze Age in Britain was characterised by the adoption of metalworking, notably copper and bronze. The exploitation of the environment became more intensive following this development. The Bronze Age was also notable for a shift away from communal burial towards single inhumations and cremation. A major upsurge of agricultural activity is also known to have taken place in the Middle Bronze Age.

Sea level rise would have been markedly less dramatic in the Bronze Age. Nevertheless, relative sea levels across eastern Britain do appear to have risen from the beginning of the period.

Advances occurred in maritime technology during this period and there is evidence that during the Bronze Age complex composite boats were in use. Hide boats are argued to have been a common vessel and sewn plank boats were a new development.

The east coast of England, and most notably the Humber Estuary, has produced some of the earliest examples of Bronze Age ships and shipping in northwest Europe. Furthermore, archaeological evidence suggests an established maritime trade and the transport of cargoes of prestige goods was underway. For example, Scandinavian amber was being transported across the North Sea to the UK, and Whitby jet was being carried by boats to the south coast and the continent.

Finds of Bronze Age boats in the River Humber, and its position in relation to possible routes across the North Sea and up and down the east coast of England suggests that during the Bronze Age vessels were passing through the study area^{1x}.

5.2.4. Iron Age (c.700BC to c.44AD)

The British Iron Age was characterised by the adoption of iron working and the intensification of agriculture.

The general settlement pattern in England during the Iron Age appeared to favour inland sites over coastal ones, though late Iron Age coastal settlements are recorded in a number of areas. The apparent lack of settlement does not mean that coastal resources were not exploited.

The period is defined by similarities in material culture across wide geographical spaces, facilitated in part by coastal and riverine trade. There is evidence for skilled livestock

14 December 2018

Seascape Character Assessment

management throughout the period and salt marshes appear to have been used for grazing, perhaps seasonally. Sea salt also appears to have been exploited intensively in the Iron Age – as a preservative, a salt lick for animals and as a commodity to be traded. Salt could only be harvested in the summer, and it is likely that its production was one of the structuring elements in the seasonal cycle of the Iron Age agriculturalists. Within the study area, Iron Age pottery has been recovered from a probable salt working site on the River Alde estuary.

Evidence indicates significant coastal trade continued into the Iron Age with increasingly sophisticated trading networks including with the regions in Europe that had come under the Roman sphere of influence and governance.

5.2.5. Roman (c.43 to c.410AD)

The Roman period is characterised by a number of changes which are visible in the archaeological record, including the adoption of Roman and continental material culture, building types, transport infrastructure and, later, settlement patterns.

The number of salt-working sites found along the intertidal zone indicates that salt was produced on an industrial scale during the early Roman period, extending activity established in the Iron Age. Salt extraction appears to focus primarily on the area surrounding the River Alde and sites with associated clay briquetage and pottery have been recorded at Iken.

Towards the south of the study area, there was a Roman fort at Walton Castle and there is evidence for a port at Felixstowe (both lost to the sea). Areas of significant Roman finds in the area around The Dip indicate that this was the likely location of the port, which could have served merchants trading along the British coast and across to the Rhine, as well as providing an anchorage for ships of the Roman fleet that guarded the British coast^{lxi}.

Lying centrally in the study area a relatively large estuary appears to have existed at Dunwich, with some archaeological and historical evidence to suggest a Roman settlement or an anchorage in the area. If this were the case, the remains of the port and settlement would now be at least 1.5km (0.8nm) offshore.

Indicating the strategic importance of this area, a later Roman fort at Caistor-on-Sea is paired with a late 3rd century 'Saxon Shore' fort at Burgh Castle. These formed part of the Roman network of coastal defences located on major estuaries and constructed in response to the appearance of seaborne raiders from the mid-3rd century. These defences extended from Brancaster in the north to Portchester in the south and included Walton Castle noted previously^{lxii}.

Roman vessels travelling between these coastal forts and ports as well as across the North Sea to the northern frontier, would have been passing through the study area, navigating hazardous, shifting offshore banks. The possibility of Roman wreck material along the coastline cannot be discounted.

5.2.6. Medieval (c.410 to c.1500AD)

The decline of the Roman navy (Classis Britannica) in the 5th century left the sea around Britain open. This in turn led to an increase in maritime activity in the North Sea, due in part to raiding, migration and the intensification trade. The strategic importance of the east of

14 December 2018

Seascape Character Assessment

England to Germanic settlers is highlighted by finds arising from early Saxon burials found inland from the coast on navigable rivers within the study area. The most famous site is at Sutton Hoo where, in 1939, the burial of a king or warrior was excavated in a royal cemetery overlooking the River Deben. Another important Saxon burial ground was found at Snape on the River Alde. Both sites had boat burials, indicating the importance of maritime links to the continent for trade and maintaining cultural connections across the North Sea. Further highlighting the significance of maritime trade and activity in this period is the growth of a number of major ports on the east coast^{lxiii}. For example, Ipswich, located on the River Orwell, is recorded as an important Saxon trading settlement and documentary sources indicate that Dunwich was minting its own coins by the 10th century, suggesting a defended settlement of considerable size and status.

In the later Anglo Saxon period evidence can be found of Danish invasion and settlement, again placing emphasis on the role of the North Sea in linking the east coast of England to continental Europe. The Vikings are well known for their impressive clinker built Longships that were able to navigate the open seas. Their relatively shallow draft also allowed them to penetrate far inland along rivers. Ipswich saw successive raids and periods of occupation, even after the Norman conquest. However, raiding and warfare were only part of the Viking story. In the north of the study area there is a high occurrence of place names (for example ending in 'by') that indicate Danish settlement. Flegg is probably Old Norse, meaning a place where water plants or flags could be found^{lxiv}.

Following the Norman conquest in 1066, new international trade links were established, for example in wine, wool and cloth. The period also saw the development of new shipbuilding techniques and technologies. A further catalyst for increased commercial activity and the development of ports across north western Europe, including on the east coast of the UK, was the establishment of the Hanseatic League in Lubeck in 1169. Great Yarmouth and Ipswich were two of several ports that benefited from the alliance^{lxv}.

The pattern of coastal settlement we see today became consolidated throughout the medieval period. Ship building and associated industries, fishing, the wool trade, grain exports and the import of timber from Scandinavia meant that several towns prospered. Highlighting the wealth generated, several coastal settlements possess fine medieval stone churches and there is evidence of ecclesiastical foundations and fortifications dating to the period.

It is suggested that sea-levels were relatively high during the Medieval Warm Period (c. 11th – 15th centuries) and that this, coupled with storm events, had a dramatic impact on the coast, culminating in the loss of some settlements and sites including the fishing hamlet at Slaughden, part of Aldeburgh and the first Leiston Abbey. By far the most famous lost settlement within the study area is Dunwich where scanning and diving has added much to the understanding of the history of the town. There was an estuary (where the Dingle Marshes are now located) and ships could anchor in the lee of a shingle spit known as Kingsholm^{lxvi}. By 1086 the burgeoning herring fishing industry meant that the town had 236 burgesses and a large number of early ecclesiastical buildings. Despite the efforts of the people of the town to protect the lower part of the settlement from flooding, coastal change continued, and a succession of storms blocked the entrance to the harbour, forcing ships to move to Walberswick, 5km to the north. By the 14th century, the churches of St Leonard, St Martin, St Michael and St Mary had been lost to the sea.

14 December 2018

Seascape Character Assessment

It is clear that there is the potential for the preservation of submerged archaeological remains from the medieval period within the study area.

5.2.7. Post Medieval (c.1500AD -1900AD)

It is suggested that slightly lower sea levels would have been experienced during the Little Ice Age (c. 1650–1750). However, coastal erosion remained a threat and communities continued their attempts at land claim, enclosure and defence from the advancing sea throughout the period.

The once thriving port of Dunwich continued its decline and in the 1560s and 70s, Queen Elizabeth I offered financial assistance to the town to compensate for the loss of its port. By 1602 estimates suggest that it had shrunk to a quarter of its previous size and further losses were experienced. For example, storms in 1740 caused widespread destruction. The loss of All Saints has been well chronicled, and a series of drawings and photographs chart its demise before finally disappearing over the cliff edge in the twentieth century^{lxvii}.

Commercial maritime trade which began during the medieval period continued and expanded with many commodities forming part of inland and local coasting trade. From an early date, coal was shipped through the study area – mostly from Newcastle to London and the southeast^{lxviii}. Fishing was also an important component of post medieval maritime activity. Herring fisheries were particularly significant to the local economy. In 1670, Great Yarmouth was home to about 220 fishing boats and by the early 1790s, Yarmouth had 150 vessels fishing for herring alone.

Commercial trade and fishing were not the only maritime activities in the study area during the post medieval period. The North Sea more widely witnessed an increasing level of naval activity as relations with continental Europe declined for various reasons at different times. For example, the Anglo-Dutch Wars saw a number of naval engagements, including Battle of Lowestoft in 1665. The battle, forty miles off the coast of the town, took place during the second Anglo-Dutch War and is regarded as helping to establish England as a dominant naval force^{lxix}.

The post medieval period saw the number of vessels crossing the North Sea increase hugely and several wrecks are noted within the study area. The most significant of these losses is the Dunwich Bank Wreck which is thought to be the remains of a 16th century armed merchant vessel, from which has been recovered a bronze cannon. Other examples include a Flemish vessel which appears to have foundered on the banks close to Minsmere Haven in 1634 and was seized in the name of the King to prevent looting, and the wreck of an English packet which became stranded between Dunwich and Sizewell in 1669 and appears to have been carrying mail between Harwich and Hellevoetsluis (Netherlands). Many of the wrecks were beached on the shoreline or sandbanks and were either broken up for salvage or are recorded as having become broken during the storm with which their loss is associated. Consequently, although many losses are recorded, this should not be seen as a true reflection of the number of shipwrecks that remain in the intertidal and offshore zones. Despite this, there is clearly a greatly increased potential for post medieval maritime archaeology in the study area.

The continued strategic military importance of the Suffolk, south Norfolk and north Essex coast in the post-medieval period is evidenced in the number of defensive structures that were established. The first major interventions were made in the Tudor period, and

14 December 2018

Seascape Character Assessment

specifically following the break from the Catholic Church under Henry VIII. At the end of the 18th century Napoleonic France emerged as a major threat to the country and in response a chain of forts was constructed along the coastline at vulnerable points. 29 Martello Towers were constructed along the east coast (between Clacton and Aldeburgh) from 1808 to 1812.

By the 19th century the UK possessed the largest empire in the world, which was serviced by a vast merchant and military fleet. Defence of the realm remained important. However, little new work was undertaken along the coastline of the study area except for at Harwich Haven where defences and guns were upgraded on several occasions and new batteries constructed^{lxx}.

The economic importance of maritime trade prompted measures in this period to improve the safe passage of ships in the area. The first lighthouses built by Trinity House were located at Lowestoft, Caister and Winterton in response to requests in 1609. Further south along the coastline, the first lighthouse was built on Orfordness in 1634, later to be replaced under Charles II by two timber towers. The tower which remains to this day was built in 1792. Until 1818 ships were guided into Harwich harbour by two lights – a fire in a room above the town gate and a wooden lighthouse above the beach. These were replaced by the brick High and Low lighthouses in 1818. All the lighthouses which remained were converted to electricity in the 20th century and eventually became completely automated.

Lifeboat stations were also operational in this region from a very early date. Both Lowestoft and Great Yarmouth had lifeboats by 1801-1802. In 1823 the Norfolk Association for Saving the Lives of Shipwrecked Mariners was established, and a more sophisticated lifeboat launched at Great Yarmouth in 1825. Following this, the Suffolk Association for Saving the Lives of Shipwrecked Seamen was established in 1826 and an 8-oar boat based at Sizewell. Further south a lifeboat was launched at Harwich in 1821 but withdrawn in 1825. The Southwold lifeboat was established by 1841 and an official station opened in Caister in 1845. The Royal National Lifeboat Institution (RNLI) began to take control of the lifeboats in the 1850s and consequently permanent stations were set up in including at Lowestoft in 1855, Harwich in 1875, and Walton in 1884. Both Caister and Harwich received a second station by 1890.

5.2.8. Modern (c.1900 AD to present)

Military

The east coast remained strategically important to the defence of the UK throughout the 20th century and changing threats and technologies has left a legacy of coastal forts and batteries. For example, by the late 19th century, modern naval artillery could destroy even the most well defended structures and therefore tactical reliance was placed on the Royal Navy. The result was that no new fortifications were constructed in the early years of the century on the coastline of the study area. However, major naval ports and anchorages were improved including at Harwich Haven.

During the First World War, the navy remained an important element in the defence of the nation. However, recognising the threat of an invasion, defences (including barbed wire and trenches) were constructed at coastal towns such as Felixstowe. Some areas were also reinforced after the German fleet shelled Great Yarmouth in 1915 and Lowestoft the following year. Between the better defended Essex coast and inhospitable Norfolk coastline, Suffolk was seen as particularly vulnerable and later in the war pillboxes started to appear.

14 December 2018

Seascape Character Assessment

Other innovations included the construction of seaplane hangars on the shore of the River Orwell and the establishment of the Royal Flying Core's Experimental Flying Station at Orfordness in 1915.

During the interwar years the primacy of the air threat was recognised, and investment was made in preparing for a future war. The experimental base on Orfordness was reopened with the east of the ness used as a test range in 1924. A decade later it was selected as the site (along with Bawdsey Manor) for research into what was to become known as radar.

During the Second World War, the Suffolk coast was believed to be an ideal potential landing place for invading forces, and in response the area was to become the third most heavily defended region in the country. The defences were intended to delay and hold back enemy armoured columns that were expected to drive inland from the invasion beaches and ports.

Suffolk's anti-invasion defences reflected constraints imposed by the landscape as well as by military priorities. Interventions along the coastline included trenches and linear barriers and stop lines constructed from barbed wire, scaffolding, anti-tank cubes and mine-fields, linking pillboxes and marching camps. Surviving remnants of the coastal defences can be seen at several locations along the coastline including anti-tank blocks and pill boxes. To counter the threat from the air, heavy anti-aircraft batteries were established at several locations including Felixstowe and Lowestoft and barrage balloons were moored at military targets such as Harwich Haven and on ships in the Orwell estuary. Balloons were used at Lowestoft only after it suffered repeated air raids. Towards the end of the war, Diver Batteries were established all along the coastline from Clacton-on-Sea to the Lowestoft-Yarmouth Gun Defence Area.

The coastline was also important for military training and logistics. Orwell Park (south east of Ipswich) was used in preparations for Operation Overlord and at Boyton there was an Armoured Fighting Vehicle range. The Orford Battle Area is also noteworthy. Activity at this 3,200ha site resulted in widespread damage to the landscape and property. On one occasion, naval warships fired live shells to recreate battlefield conditions and caused damage in neighbouring Aldeburgh. The site was also instrumental in testing and developing modified tanks, sometimes referred to as 'Hobo's Funnies', that were capable of clearing mines and beach defences.

The marine record for this period is dominated by wreck sites of both aircraft and ships. Several World War II aircraft crash sites are recorded in the study area and include a Lancaster MK II DS17, lost in 1943, a Wellington MK II Heavy Bomber, lost in 1942 and two German planes.

Following the Second World War, many coastal defences were abandoned. However, a new threat from the Soviet Union triggered the Cold War and there was a growing recognition that the development of the atomic bomb had changed the shape of warfare. By the 1960's missile technology meant that relatively little warning was available in the event of a nuclear strike and in response 'Over-The-Horizon' (OTH) radar was developed as a method of detecting distant launches. Cobra Mist, an OTH station, was established at Orfordness in 1964. Orfordness also became the focus of research into the development of the UK's own nuclear arsenal and from 1953 the Atomic Weapons Research Establishment had a test site there. Concrete 'pagodas' which were test cells designed to absorb any explosions in the event of an accident are still visible on the ness.

14 December 2018

Seascape Character Assessment

In 1979 one of the last developments related to Cold War defensive measures on this stretch of the English coast was the installation of Bloodhound Mark II missiles at Bawdsey. The layout of concrete hard standings typical of other Bloodhound sites was accompanied by structures including tactical radar, stores and operation rooms^{lxxi}.

Military activity is still a feature of the study area today. Naval, military or aerial exercises are carried out within extensive military practice areas east and south east of Felixstowe.

Coastal Defences

Coastal processes in the study area are complex and operate at different scales. Change along the coast has been a constant characteristic and the construction of coastal defences have been a response of communities over the centuries, with evidence remaining of medieval sea walls and embankments and more recent interventions such as wooden groynes, rock armour revetments and concrete wave walls^{lxxii}.

The coastline within the study area is generally made up of soft geology and the energy of the waves causes erosion and moves sediment along the shore. In some areas the tides are also important, particularly where there are headlands and where the shoreline and estuaries interact with each other.

Sediment generally moves from north to south along the shoreline. This can, however, vary locally and in some areas the overall movement of sediment is quite low. Examples of such areas are the Pakefield and Kessingland cliffs, along the Minsmere and Thorpeness cliff frontages and in areas such as Hollesley and Felixstowe bays. In other areas, such as at Easton Bavents and Covehithe or at Orford Ness, erosion and sediment drift is persistent and, particularly at Covehithe, rapid.

As sea level has risen in the past, the coast has tended to retreat. This process has been limited in places by defences. However, along more undisturbed areas where sediment is limited, coastal areas are exposed and more vulnerable to flooding. This risk will increase with sea level rise. Without defences the coast would continue to retreat over its whole length. In some areas this might be limited. However, in other areas erosion could be over several metres over the next century. The risk of erosion threatens homes, historic assets and the local economy. However, erosion in one area also provides sediment that maintains the beaches, provides defence to other areas of the coast, as well as sustaining many important habitats^{lxxiii}.

Shoreline Management Plan (SMPs) have been prepared for the full extent of the coastline within the study area and present a strategy for managing flood and erosion risk for a particular stretch of coastline, over short, medium and long-term periods. SMPs identify the best ways to manage coastal flood and erosion risk to people and the developed, historic and natural environment.

The first round of SMPs were completed approximately a decade ago and since then work has been undertaken both in managing defences around the coast and in building a better understanding of the issues and behaviour of the coast through studies and monitoring.

A SMP subdivides the coastline into discrete units, each of which has a unifying characteristic. Policies are allocated to these units for each of three periods, or 'epochs', forming the plan period.

14 December 2018

Seascape Character Assessment

The shoreline management policy options are as follows^{lxxiv}:

- No active intervention (NAI): A decision not to invest in providing or maintaining defences or management of the coast.
- Hold the line (HTL): Maintain or upgrade the level of protection provided by defences or the natural coastline.
- Managed realignment (MR): Manage the coastal processes to realign the 'natural' coastline configuration, either seaward or landward of its present position.
- Advance the line (AtL): Where ongoing expansion of port activities advances the line e.g. Bathside Bay or Felixstowe Port.

As illustrated on **Figure 11**, there are three SMPs covering the study area^{lxxv}.

- SMP 6 Lowestoft Ness to Kelling;
- SMP 7 Lowestoft Ness to Landguard Point; and
- SMP 8 Essex and South Suffolk.

Industrial Activity and Energy Generation

Refer to **Figure 12**.

Coastal and marine areas make an important contribution to the local and regional economy. Of particular significance to the study area include aggregates and energy generation.

During the period when the UK was connected to continental Europe, major rivers such as the Yare, Blyth and Orwell deposited sand and gravel over their floodplains. These areas became submerged following the retreat of the ice sheets and some are now important sources of marine aggregate. The dredging process involves trailing a pipe along the seabed while moving slowly forwards. Powerful centrifugal electric pumps draw a mixture of sand, gravel and seawater through a draghead which rests on the seabed, up the dredge pipe and into the hold of the vessel. Dredging is highly regulated, and activity is restricted to licenced areas.

A further important activity along the Suffolk coastline and adjacent marine areas is energy generation.

Nuclear power generation has been a feature of the Suffolk coast since the 1960s, when Sizewell A was commissioned. The twin reactor Magnox station was constructed from 1960 and first supplied electricity to the grid in 1966. It ceased generating electricity in 2006 and is being decommissioned. Sizewell B was constructed between 1988 and 1995. It began generating electricity in February 1995. The principle features of these power stations include the main generating structures and ancillary buildings and infrastructure and coastal defences comprising a vegetated embankment and a secondary lower vegetated shingle bund. The Sizewell A intake and outfall headworks structures are also notable features in the marine environment and support a breeding Kittiwake colony. The Government has identified sites that are potentially suitable for the deployment of new

14 December 2018

Seascape Character Assessment

nuclear power stations in England and Wales before the end of 2025. Sizewell is listed along with seven other sites^{lxxvi}.

The study area also contains several operational wind farms. Scroby Sands, commissioned in 2004, was one of the UK's first commercial offshore wind farms. It comprises 30 turbines^{lxxvii} located approximately 2.5km (1.3nm) off the coast on the Scroby Sands sandbank. A further operational windfarm within the study area is the Greater Gabbard Offshore Windfarm. Cables link the 140 turbines to a substation located south east of the Sizewell power stations. Further turbines forming the operational London Array and Gunfleet Sands windfarms can also be seen from within the study area in clear conditions.

Several offshore wind farms are also under construction within the study area. Galloper Windfarm, an extension to the Greater Gabbard Wind farm, is located 30km (16nm) from the coast and comprises up-to 56 turbines. East Anglia One comprises 102 turbines. Vessels serving (or constructing) these wind farms are noted as passing through the study area.

In August 2017 consent was granted for East Anglia Three – a development of 172 turbines to the north east of the study area^{lxxviii}. Further windfarm zones are at the pre-planning stage within the study area (East Anglia Two, East Anglia One North, Norfolk Vanguard East and Norfolk Vanguard West).

In addition to the power cables associated with wind turbines, other submarine cables and pipelines pass through the study area including the Bacton-Zeebrugge Interconnector. One of the earliest connections to the continent was the England–Holland Submarine Cable (1853) that ran from Orfordness to Schevening on the Dutch coast (telegraph equipment was housed in the lighthouse)^{lxxix}.

Licensed Oil and gas fields are also notable in the north eastern portion of the study area and extending further into the North Sea where there are several active terminals^{lxxx}.

Tourism and Recreation

Recreation and seaside entertainment are very significant to the economy of several coastal towns.

At Southwold its early success was linked to local businesses keen to capitalize on the railway which had reached East Anglia in the middle of the century. From 1897 a service of paddle steamers operated between London and Great Yarmouth and called at Southwold - the town's pier was built in 1900 as a landing stage for these steamers. In its early years, bathing huts would have been a common sight on the beach. However, as mixed gender bathing became acceptable, tents and then the characteristic beach huts became a fixture^{lxxxi}.

At Felixstowe, the iron-rich water had reputed health-giving properties and the town became a fashionable spa, notably after the visit of the German Imperial family in 1891. The natural topography of the steep sea cliffs added to the drama along with the Seafront Gardens which have recently been restored^{lxxxii}. Other towns that catered for tourists with seafront gardens were Great Yarmouth and Lowestoft. The Venetian Waterways in Great Yarmouth were opened in 1928 and originally commissioned as an employment relief after the First World War.

14 December 2018

Seascape Character Assessment

Thorpeness is also a notable early tourist destination. Dating to the 1910's and 1920's it was the vision of Scottish barrister Glencairn Stuart Ogilvie and is believed to be the world's first purpose-built holiday village^{lxxxiii}.

These and other coastal settlements retain a strong tourist emphasis and cater for visitors through the provision of amusement arcades, restaurants, hotels and other accommodation. Holiday parks are located at several locations along the coast, and notably between Kessingland and Winterton-on-Sea.

Recreation resources include opportunities to explore the coastal landscape with routes for walking, cycling and horse riding. Long distance paths include the Suffolk Coastal Path, Norfolk Coast Path and Sandlings Walk. The England Coast Path is open in the north of the study area (forming the southern part of the stretch of the route between Hopton on Sea to Sea Palling). Proposals for the remainder of the route remain in development^{lxxxiv}.

Wildlife watching is a popular activity with several nature reserves located along the coastline. Destinations include the Royal Society for the Protection of Birds (RSPB) Minsmere Reserve and North Warren RSPB Reserve and several coastal National Nature Reserves (Orfordness-Havergate, Westleton Heath, Suffolk Coast and Benacre). There are also numerous popular cultural and heritage sites. These include Dunwich Heath and Beach, the National Trust's Dunwich Coastguard Cottages, Orford Castle, Landguard Fort, Burgh Castle and Caistor Roman Fort. Many visitor attractions have a maritime connection such as Harwich town docks and the historic docks at Great Yarmouth.

Angling is popular at locations throughout the study area. Water-sports, include windsurfing, kayaking and water skiing are also noted. Swimming is popular with several beaches having good or excellent results. Blue Flag status has been awarded to beaches at Southwold and Dovercourt Bay, Harwich. Felixstowe Swimsapes was established in 2012 for open water swimmers.

Sailing is a particularly popular activity. Offshore passage between coastal harbours, for example at Lowestoft and Southwold requires careful navigation to cope with the tides, weather conditions and banks and deeps, as well as potentially being out of sight of land for some distances. By contrast, piloting navigable rivers often relies on using visible landmarks and features^{lxxxv}. Several inland navigations contain quays, marinas, moorings jetties and boatyards, and Royal Yachting Association (RYA) clubs are located along the coast including at Southwold, Aldeburgh, Orford, Felixstowe and Harwich and the RYA has several training facilities at the latter two locations. RYA general boating areas are located on the River Deben at Woodbridge, Alde and Ore, Blyth and offshore between Felixstowe and Bawdsey; Aldeburgh and Lowestoft and between Lowestoft and Great Yarmouth.

Fishing

Mirroring other parts of the UK, the 20th century has seen a gradual decline in the fishing industry. Despite this, several commercial fish and shellfish fisheries operate in the study area, both offshore and on several of the inland navigable rivers and estuaries. Commercial fishing boats operate out of several ports and harbours and beach launching is practiced in some areas, notably at Caister.

14 December 2018

Seascape Character Assessment

Species caught in the study area can be grouped into three main categories^{lxxxvi}:

- Shellfish, including crabs and lobster. These are among the most valuable UK fisheries and may be caught using pots, traps and dredges.
- Pelagic fish live in open water between the sea floor and surface. They can form large shoals and are highly mobile or often migratory. Examples include mackerel and herring that are typically caught using nets.
- Demersal fish, such as cod, live near or at the seabed, which are typically caught using trawls pulled along the seabed.

Smaller vessels tend to operate in the shallower waters along the coastline, up-to approximately 11km (6nm) from the shore. Larger vessels, including those from continental Europe tend to fish in the deeper waters, generally outside UK territorial waters, 22km (12nm) offshore.

Marine fish can live and move over large areas irrespective of human jurisdictional boundaries and populations and catches can vary over time subject to a range of influences. In 2008 the predecessor to the Eastern Inshore Fisheries and Conservation Authority (IFCA) set up a collaborative project, working with local fishermen to create indicative charts of fishing grounds used by fishermen based in the district^{lxxxvii}. The charts provide an indication of fishing grounds for several catch species within the study area. However, noting the date of the project and the small number of participants, the charts should not be used to ascertain the current or complete distribution of fishing activity for these species.

Catches are sold to local markets and restaurants and some are processed to be sold direct to the public, for example from Southwold Harbour and the beach at Aldeburgh. Catches are also sent to auction houses and merchants, with some destined for the international market including the far east and middle east.

Navigation

Refer to **Figure 13**.

The MMO online marine planning mapping tool^{lxxxviii} illustrates that tankers and cargo vessels transit the area between major north east coast ports and continental Europe (notably the ports of Zeebrugge and Rotterdam). There is also significant marine traffic passing between the Strait of Dover and Baltic and Scandinavian ports. Mapping of vessel movements indicates that the area of sea approximately 75km (40nm) east of Felixstowe is particularly busy. There is also a high density of large vessels entering and leaving the ports including Harwich, Felixstowe and Ipswich in the entrance to the Stour and Orwell. Passenger vessels show a lower intensity of activity, albeit along similar routes linking north east coast ports to the continent. The direct route between Harwich and Rotterdam is a relatively intense area of passenger vessel movements.

Other activity within the study area includes vessels sailing to and from licenced dredging areas. Vessel movements are also associated with offshore wind farm developments and include the transit of plant and supplies for wind farm construction, operation and maintenance activities.

The ports of Felixstowe and Harwich, Great Yarmouth, Ipswich and Lowestoft are essential to the UK's transport infrastructure and economy - which is heavily dependent on

14 December 2018

Seascape Character Assessment

international trade. They are also vital to the local economy, providing employment and income on a large scale. The Port of Felixstowe was originally founded in 1875 and has grown significantly over the years. By the late 1960's it had become the UK's first purpose-built container terminal, selected because of its proximity to shipping lanes and major ports of Northern Europe. Since then growth has continued and the most recent phases of development were opened in 2011 and extended in 2015^{lxxxix}.

Harwich International handles containers and cargo with established routes to northern Europe, North Africa and the Mediterranean. It also handles liquid bulk and dry bulk including grain from across East Anglia^{xc}. Approximately 40% of the country's container traffic travels through the Harwich Haven Authority area^{xc}.

The Port of Great Yarmouth is strategically located to serve the Oil and Gas fields of the southern North Sea and the existing and planned offshore windfarm development off the east coast. It also has a long tradition of handling a wide range of cargoes including aggregates, grain, fertilisers, forest products, dry and liquid bulks^{xcii}. Lowestoft handles a range of cargo types. It is home to the Operation and Maintenance Base for Greater Gabbard Offshore wind farm and hosts a substantial fleet of offshore standby/support vessels. The Port of Ipswich is located at the head of the River Orwell and handles various cargos including dry bulk materials and timber from Scandinavia and the Baltic states.

In terms of maritime rescue, large coastguard stations are located at Great Yarmouth and Gorleston, Lowestoft, Southwold, Aldeburgh and Harwich^{xciii}.

14 December 2018

Seascape Character Assessment

6.0 Perceptions of Seascape

In addition to being informed by the complex interplay of natural and cultural forces, the variations we see and experience in seascape character are also often influenced by the associations we make, such as with events and people, as well as references in art, literature and music. Our perceptions are also shaped by our senses, and much depends on the influence of a vast range of factors, including the weather, which affects visibility and conditions at sea, sounds, smells and distance from the shore.

6.1. Cultural Associations

Art

The Suffolk, south Norfolk and north Essex coast has been important to artists since the turn of the 18th century. In addition to their artistic merit, paintings of the coast and sea are a valuable record of past lives, allowing us to observe how communities interacted with their environment at different times. The 19th century also witnessed an increasing interest in the natural and earth sciences as well as natural events such as coastal erosion, landslides and floods. Numerous paintings and prints depicting such scenes assist scientists and researchers by providing an indication of the nature, scale and pace of coastal change.

During the 18th and 19th centuries a number of distinguished landscape painters drew their inspiration at various locations along the coast; many focussing on the popular subjects of Dunwich, Walberswick and Southwold. As well as those artists who painted coastal settlements and communities, a number of artists were primarily marine painters who sought to capture shipping against the backdrop of the North Sea or coastline.

Perhaps the most well-known painter to visit and paint in the area is Joseph Mallard William Turner (1775-1851). He made numerous sketches (captured in a sketchbook covering Norfolk, Suffolk and Essex) in 1824^{xciiv} and made paintings including Dunwich (c.1824), Aldeburgh (c.1826) and Orford (c. 1828).

John Moore of Ipswich (1820-1902) painted Bawdsey Ferry near Felixstowe and Slaughden Quay in the early 1880's and Henry Moore (1831-1895) painted 'Crossing the bar, Walberswick Sands' in 1857. Walter Crane (1845-1915) painted a detailed watercolour of 'Eastcliff, Southwold' in 1886. Walter Langley (1852-1922), who is associated with the Newlyn School of Cornwall, visited Walberswick in 1891 and produced a number of views of the village and Southwold. The celebrated watercolourist Myles Birket Foster (1825-1899) painted a view of Walberswick in the 1890s, and Charles Robertson (1844-1891), a follower of the Pre-Raphaelite School of Artists, painted a view of Southwold and Walberswick.

A wealth of well-known artists also visited East Anglia in the later 19th and early 20th centuries. William Eden (1884-1913) painted views of Walberswick and Marion Seward (1861-1924) from Cambridge painted views of Walberswick as well as recorded the loss of All Saint's Church Dunwich as a result of coastal erosion.

E.W. Cooke (1811-1880), who made an important contribution to British coastal art, exhibited several detailed geological coastal scenes and depicted shipping and craft. 'Yarmouth' (1838) illustrates a busy coastal scene against the backdrop of the town and jetty.

14 December 2018

Seascape Character Assessment

Some painters also depicted sailing scenes offering insight into the type of vessels that were in use in the area, as well as the drama of navigating in stormy conditions. Cooke's 'Scheveningen Pinks off the Coast of Yarmouth' (1864) is a detailed rendering of fishing boats (known as pinks or pincks) from the Dutch port making their way to Yarmouth for safety as strong easterly gales approach^{xcv}. Wrecks were also depicted, such as the 'Wreck of the Princess Augusta on Southwold beach' by Captain Henry Alexander dated 28 October 1838^{xcvi, xcvi & xcvi}. John Berney Crome depicted the devastation caused by a storm that hit Great Yarmouth in 1836.

Artists continue to paint coastal scenes. Joseph Lubbock (1915-) is a well-known contemporary artist and writer. His work draws extensively on the Suffolk landscape^{xcix}.

Literature

George Crabbe (1754 - 1832), an English poet and artist, was born in Aldeburgh. His first major work, a poem entitled 'Inebriety', was self-published in 1775. He became most well-known for 'The Village' (1783) and 'The Borough' (1810)^c.

Arthur Ransome (1884-1967), author of *Swallows and Amazons*, moved to Suffolk in 1935 and set two of his children's books in the area. The first, 'We Didn't Mean to go to Sea', tells the story of a group of children drifting out to sea as they leave the safety of the River Orwell. The 'Secret Water' is a tale of exploration of the Walton Backwaters in neighbouring Essex. It opens at Pin Mill^{ci} on the River Orwell.

Eric Blair under his pen name George Orwell (1903-1950) had close associations with the study area and is thought to have taken his name from the River Orwell. He wrote 'A Clergyman's Daughter', based on his life as a teacher and on his experiences in the town. He is commemorated in a mural on Southwold Pier. More recently, the crime writer PD James (1920-2014) had a home in Southwold and set several novels in Suffolk including 'Death in Holy Orders' at Covehithe.

Music

The composer Benjamin Britten (1913-1976) was born in Lowestoft and grew up in a house that looked out across the North Sea that would inspire much of his music^{cii}. He returned to Suffolk after the Second World War and reinvigorated the artistic community in the area. 1948 was a pivotal year in the history of both Britten and the town of Aldeburgh when he founded the Aldeburgh Music Festival, alongside his partner Peter Pears and the librettist Eric Crozier. By 1967 the Aldeburgh Festival had grown to such an extent that Britten decided to build the Snape Maltings Concert Hall. In 1957 Britten and Pears moved to The Red House in Aldeburgh, where Britten would stay until his death. The house is now open to the public. The inspiration Britten drew from the area is most notable in the 'Four Sea Interludes' from his opera 'Peter Grimes'. This, one of Britten's most famous compositions, was inspired by a poem written by the poet George Crabbe.

In November 2003, a tribute to Britten and his music was unveiled on the beach just north of Aldeburgh. 'Scallop' is a four-metre high steel sculpture and was conceived by Suffolk-born artist Maggi Hambling and made by Aldeburgh craftsmen. The phrase "*I hear those voices that will not be drowned*" (from Peter Grimes) is pierced through the steel, to be read against the Suffolk sky.

14 December 2018

Seascape Character Assessment

6.2. Aesthetic and Perceptual Qualities

The MMO online marine planning mapping tool^{ciii} illustrates the theoretical visibility of the sea from the land all along the coast of England and Wales. The analysis indicates that visibility extends to a maximum of approximately 20km (11nm) from the coast within the study area.

However, this is only a tool, and the degree of inter-visibility between the coast and sea and along the coast is dependent on several factors including atmospheric conditions and weather. In clear conditions views can be extensive. However, sea fogs and coastal mists can significantly restrict views.

Views to sea and along the coastline from the shore can make a significant contribution to sense of place and experiential qualities that are unique to coastal areas. The nature of views varies dependent on the viewing location, orientation and objects in the view. From some locations, the sweeping bays of the coastline can be observed. Views directly offshore can be to a vast and uninterrupted horizon, although in some location's views to wind turbines and shipping are possible, subject to conditions.

Within the harbours and navigable rivers, a more intimate character prevails. Views are generally channelled along the river, and often restricted where the rivers are flanked by urban areas and port development. However, in rural areas, relatively expansive views across adjacent lower lying landscapes are often possible.

When offshore the visibility of the coast plays a significant role in orientation and navigation. Near to the shore and along the navigable rivers, distinctive features and landmarks are important for piloting and are often shown on Admiralty Charts and in guides. For example, the last remaining radar pylon at Bawdsey can make a reference point when approaching the Deben.

The wide field of view from locations offshore allows the sweeping bays that are characteristic of the coast to be appreciated. However, at greater distances from the shore, these become flattened in the view and the coastline forms a low horizon.

In areas of seascape with no, or only limited views to the coastline, a sense of remoteness and wilderness prevails. To some, feelings of exposure can be unpleasant and are amplified in stormy conditions. To others the sense of isolation experienced when surrounded by sea is welcome. Where limited (or no) views of the coast are possible, vessels or infrastructure, such as offshore wind turbines, are the only cultural cues in an otherwise wild and natural scene. Far out at sea, there can be a profound connection to natural processes.

An interesting and disorientating quality of the visual environment along the coastline and at sea are mirages. Fata Morgana is a type of mirage that is normally associated with the open sea but can also be seen at times on land. Its name is taken from Arthurian legend; the sorceress Morgan le Fay was said to use mirages to lure sailors into her traps. This type of mirage is responsible for unusual sightings, from mountains and city

14 December 2018

Seascape Character Assessment

skylines in the middle of the open sea to ships that appear to be flying. For a Fata Morgana to appear, a cold air mass close to the surface of the water sits below a warm layer of air higher in the atmosphere. Rays of light passing through the warm and cool air masses are bent which makes the mirage appear.

14 December 2018

Seascape Character Assessment

7.0 Seascape Character Type Descriptions

This section of the assessment describes each of the six seascape character types (SCTs). Their distribution is illustrated on **Figure 14**.

For each SCT the key characteristics are presented together with an overview of its location, physical influences, cultural influences and aesthetic and perceptual qualities.

14 December 2018

Seascape Character Assessment

7.1. SCT or Inland Navigable Waters

7.1.1. Key Characteristics

- Sheltered estuarine waters and gently meandering tidal rivers fringed by bays and small inlets or creeks where tributaries enter. Tidal muds and occasional sandy or shingle beaches revealed at low tide.
- Topography and land use along the rivers vary. Low lying and generally flat intertidal muds, salt marshes and coastal levels contrast to stretches of river with pronounced valley sides, localised soft cliffs expressing underlying geology
- Engineered stone and concrete flood defences adjacent to settlements, ports and marinas and raised earth embankments often adjacent to areas of farmland.
- Wetlands are of importance for breeding birds in the summer and overwintering water birds.
- The remains of past wharfs along the foreshore and historic ship hulks in the mudflats contribute to time depth and express the strategic importance of these navigations for communication and trade over many centuries.
- Often busy waters, piloted by some large commercial vessels and small pleasure craft to inland ports and marinas which have typical infrastructure including quays, jetties, boatyards, slipways and in some cases warehouses. Riverine muds dredged periodically to maintain navigations.
- Recreational sailing widespread. Landward areas are popular for walking, bird watching and angling.
- Commercial fishing, especially in the larger estuarine waters.
- Several rivers have strong cultural associations.
- Long distance and relatively expansive views inland possible, especially across adjacent low-lying marshes. Views to adjacent towns, major ports and infrastructure (including river crossings) have localised urbanising effect.
- Landmarks aid navigation and can reinforce a strong sense of place and local identity.

7.1.2. Location

The **Inland Navigable Waters SCT** extends across the estuaries and tidal reaches of the major coastal rivers of the Stour, Orwell, Deben, Alde, Ore, Blythe, Waveney and Yare. Each river displays a unique character as they vary considerably in length and width and in their relationships with adjacent land uses.

The low water mark defines the edges of the **Inland Navigable Waters SCT**. The landward limits are typically defined by features such as bridges and other infrastructure crossing the river. The eastward (seaward) limits of the Stour and Orwell are defined by the adjacent **International Ports and Approaches SCT**. The eastward boundary of the remaining rivers is defined by the **Nearshore Waters SCT** or the **Developed Nearshore Waters SCT**.

14 December 2018

Seascape Character Assessment

7.1.3. Physical Influences

At high tide, the often gently meandering river channels and estuaries are characterised by tracts of turbid water fringed by bays and small inlets or creeks where tributaries enter. At low tide, the channels narrow to reveal intertidal muds formed of marine alluvium and occasionally sandy or shingle beaches. These superficial deposits largely mask the underlying geology. However, occasionally low cliffs define the river edge to reveal the underlying geology. For example, at Stutton Ness on the River Stour, fossil bearing Pleistocene cliffs are exposed.

The rivers form an intimate mosaic with adjacent land uses and significant variations in character exist between and along these watercourses. Some stretches of river are fringed by relatively pronounced rolling valley sides where farmland, woodlands and parklands extend to the river's edge. Elsewhere the adjacent intertidal mudflats and saltmarshes merge into low lying coastal levels and grazing marshes, or the boundary is marked by raised earth embankments. Some areas are more urban in character with the river's edge defined by concrete and stone food defences adjacent to port infrastructure and buildings.

The matrix of open water, intertidal areas and adjacent farmland are important habitats. Several rivers are designated, typically as they form summer breeding grounds for birds such as avocet and in winter host major concentrations of water birds, including geese, ducks and waders which feed and roost in surrounding agricultural areas. The Rivers Yare and Blythe provide continuous foraging for species such as little tern by linking designated areas along the coast to the wetlands further inland at Breydon Water and the Minsmere-Walberswick tidal lagoon.

7.1.4. Cultural Influences

The navigable rivers have been strategically important routeways and the focus of trade and communication for thousands of years. Evidence of their significance can be found at various locations, both along the coast and inland in the form of ancient riverside settlements, buildings and archaeological sites. In many cases, historic quays, wharfs and jetties lie below modern development. However, some decaying remnants survive. Perhaps the most evocative features are the hulls of ships and boats which are revealed at low tide.

Several inshore settlements were established as ports or had industries related to maritime activity and there has been continuous habitation and expansion at several key centres. Perhaps the most well-known is Ipswich which can trace its origins to the early Saxon period as trading port at the first available fording point on the River Orwell. Woodbridge on the River Deben was known for building merchant ships and men of war for the navy and enjoyed coastal and continental trade until the railway opened in the 19th century. At Snape, there was already a busy shipping port prior to the establishment of the Maltings to ship malted barley to breweries in London by Thames barge. The contemporary port of Misterley may have its origins as a Roman port. However, today many buildings in the town are contemporary with the quay constructed in the early 18th century and subsequent expansion of operations to handle imports of coal and the export of corn to London markets and other coastal ports. Other sites have disappeared or changed location or function. For example, nothing remains of the once important medieval port of Goseford also on the River Deben.

14 December 2018

Seascape Character Assessment

These waterways may have had ritual or symbolic importance. Excavations at Snape and Sutton Hoo have revealed Anglo Saxon ship burials which have a close relationship to the adjacent navigable river channels. Ancient churches also occupy riverside locations and are particularly evocative when viewed from the water, such as the church of St Botolph at Iken on the River Alde and Holy Trinity Church overlooking Blythburgh Water. These must have been important aids to navigation and remain helpful points of orientation today.

Controlling access to these inland waterways is also evidenced in the remnants of forts and defensive structures. Burgh Castle, constructed in the late 3rd century, is one of the best-preserved Roman monuments in the country. It was paired with nearby fort at Caistor and controlled the entrance navigable waterways. It was later reused as the site of a Norman motte-and-bailey castle. At Orford, the imposing polygonal tower keep overlooked the former port, which fell into decline once the Alde became silted up and the spit of Orford Ness increased, making access difficult for larger vessels.

Designed parklands are a distinctive feature on the rolling banks overlooking the Stour and Orwell. For example, at Misterley there are remnants of a parkland laid out and remodelled by the Rigby family which built the original quay. Two porticoed Classical towers are all that remain today of a grandiose but highly unconventional Georgian church which was designed to lie centrally in the view from the old hall to the River Stour.

Several rivers continue to be used for commercial shipping and are periodically dredged to maintain navigations for deeper drafted vessels. Large ships can be seen piloting the rivers and at anchor in inland ports and harbours such as Mistley, Ipswich, Lowestoft and Great Yarmouth where grain silos, warehouses, yards and cranes are characteristic features.

Fishing vessels operate out of and within several of the rivers. Activity ranges from rod and line fishing to trawling with fixed or drift nets, with commercially caught species including bass, mullet and flounder. Dover Sole is targeted closer to the estuaries.

All of the rivers are popular for recreational sailing. The RYA has designated the upper reaches of the Deben, stretches of the Alde and Ore and Blyth as general boating areas. There are numerous harbours, marinas, quays, moorings and boat yards. Buoys often mark the approaches to the rivers and navigable channels within them. Churches, grain silos and other prominent structures act as landmarks to aid navigation. Yachting and sailing clubs are also located along several rivers.

The rivers are also the focus of terrestrial recreational activity. Walking, angling and bird watching are particularly popular pursuits and there are several nature reserves and footpaths along the rivers, including stretches of national and promoted routes. Seasonal ferries operate on some rivers, such the summer ferry across the mouth of the River Deben.

Several rivers have strong cultural associations with events and people. The Saxon epic poem Beowulf, which evokes the royal elites buried at Snape and Sutton Hoo, has close associations with the River Deben and is celebrated at an annual festival at Woodbridge. The River Orwell and Pin Mill provide a setting for several books by Arthur Ransome.

Benjamin Britten lived for a time at the Old Mill in Snape and the Maltings now hosts a range of concerts including many of those associated with the Aldeburgh Festival which he established.

14 December 2018

Seascape Character Assessment

7.1.5. Aesthetic and Perceptual Qualities

The rivers vary significantly in their visual character. Hard defences, infrastructure, warehouses and riverside development are characteristic of stretches of the river adjacent to ports and larger settlements. Here an urban character prevails, and views from the river can be relatively constrained by built development. Elsewhere, the rivers are characterised by a rural hinterland. When fringed by saltmarshes and intertidal flats, views can be relatively expansive, and the lack of access to the river edge can create an isolated and wilderness character. Elsewhere, the riverside is bordered by rolling farmland and parkland. Here a rural character prevails, and in some instances, landform and woodland can restrict expansive views from and across the river creating a more intimate character, although views along the river are typically expansive.

Stretches of river adjacent to and approaching ports and harbours can have a busy character. However, even in remoter stretches, recreational craft are sometimes visible.

Tides have a profound influence on the visual character of these riverscapes. At low tide, the rivers narrow to reveal sometimes wide expanses of intertidal muds and on occasions the evocative hulks of ships, boats and former wharves.

Landmarks, including lighthouses, riverside structures and prominent features aid navigation. Some features reinforce a strong sense of place and local identity, such as the Orwell Bridge (Orwell), Woodbridge Tide Mill (Deben) and Orford Castle (Alde).

14 December 2018

Seascape Character Assessment

7.2. SCT 02 International Ports and Approaches

7.2.1. Key Characteristics

- Deep-water haven and approaches sheltered by prominent headlands with localised shallow waters.
- Underlying geology largely covered by sediment.
- Heavily engineered shoreline with nature conservation interest limited to short stretches of remaining intertidal foreshore and areas of vegetated shingle.
- Rich cultural legacy related to maritime trade and defence. Multiple military structures indicate the strategic importance of the deep-water haven and reflect changing threats and military technologies over time.
- Major port infrastructure juxtaposed with sailing and yacht clubs and in close proximity to residential and commercial land uses.
- Busy waters. Large passenger ships, tankers and cargo vessels entering and leaving ports and anchorages contrast to much smaller passenger ferries, fishing boats and personal craft.
- Despite scale of port operations, waters and adjacent coastal towns popular for a wide range of recreational pursuits and tourism.
- Strong associations with historic events.
- Aesthetic qualities dominated by large scale port infrastructure and shipping, juxtaposed with historic port buildings and private vessels.

7.2.2. Location

The **International Ports and Approaches SCT** extends across the deep-water Harwich Haven and its approaches and along the coast as far as the Felixstowe seafront. The westward limits of the SCT are defined by the adjacent **Inland Navigable Waters SCT**, and landward by sea walls, port infrastructure and occasional sand and shingle beaches at Harwich and between Landguard Point and Old Felixstowe.

7.2.3. Physical Influences

The sand and shingle spit of Landguard Point and the Harwich peninsula create a sheltered, deep water haven at the head of the Stour and Orwell Rivers that is unique within the study area. Whilst the main channels are deep enough to accommodate some of the world's largest shipping vessels, shallow waters also exist, such as the Harwich Shelf on the west side of the entrance to the haven, and Shotley Spit in the centre of the harbour.

The underlying geology is largely masked by superficial deposits of sand, gravel and mud, which are periodically dredged to maintain navigations for deep drafted container vessels and tankers. However, small sandbanks and rocky outcrops occur. For example, Cork Spit and Andrews Spit have been dredged for shingle in the past and Stone Banks and Felixstowe Ledges are a product of cemented volcanic ash within the London Clay.

14 December 2018

Seascape Character Assessment

The coastal edge has been heavily modified with timber and rock groynes, concrete step work, sea walls, piers and dock structures, meaning only limited areas of intertidal muds and shingle beaches are present. However, limited areas of seminatural habitat and biodiversity interest are present. Landguard Common is a sand and shingle spit with a stabilised vegetated beach and loose shingle foreshore that is designated in part to protect fragile and nationally scarce habitats. The Harwich Foreshore is also significant; it is the best exposure of the Harwich Stone Band and is also of prime importance for London Clay fossils^{civ}.

7.2.4. Cultural Influences

The historic record, archaeological finds and standing structures show that Harwich Haven has been a source of national wealth and prestige over many centuries, and particularly at times when commercial or military interest was focused on the continent. A Roman coastal fort (the only one in Suffolk) is known to have existed at Walton, and the Anglo-Saxon Chronicle records a naval battle off Harwich in the late 9th century in which King Alfred's forces defeated a Viking fleet^{cv}. Following Henry VIII's decision to appoint himself Supreme Head of the Church of England in the 16th century, the coast was vulnerable to invasion from France and Spain. This, along with the development of more effective gun technology, triggered the first modern national strategy for invasion defences. Harwich Haven, then a naval dockyard and the only large natural harbour between the heavily defended ports of London and the Humber, became a focus of attention. Landguard Point and Harwich on the Essex side of the estuary were identified for the creation of defensive earthworks and gun placements. The continued threat from the continent resulted in periods of rebuilding to maintain or update defensive capabilities. Landguard's bulwarks were reinstated in 1588 in anticipation of the Spanish Armada and a new fort was constructed between 1625 and 1628 which incorporated ideas from the continent on military defensive and offensive design. Landguard was instrumental in defeating the raiding Dutch army in July 1667.

Over the following centuries the Harwich Haven continued to be of military significance during periods of threat. For example, Martello Towers were built to repel an invasion by Napoleonic France. These were generally to a standard design. However, additional defensive features were added to the tower at Walton Ferry, now beneath the Felixstowe container port, possibly reflecting the high level of importance attached to defending the haven. Highlighting the significance of Harwich at this time, Lord Nelson visited the town in his ship *Medusa* to assist in the formation of Sea Fencibles, a local naval defence force. Over the remainder of the century, batteries, redoubts, forts and guns were improved at Harwich, Landguard and Shotley Point. Innovative defences continued to be constructed during the 20th century and in particular during the two World Wars. Successive periods of building record the evolution of military design and tactics, which can sometimes be interpreted in the remaining fabric. Within the waters of the haven there are several recorded obstructions, including wrecks.

In addition to strong military and naval associations, there is a rich cultural and architectural legacy related to the movement of people and the trade of commodities over a long period, including historic buildings and structures associated with port activity, particularly in Harwich town. Much of the physical evidence of earlier centuries has been lost or is buried beneath later phases of port development. However, structural remains such as lighthouses, commercial buildings and piers are a reminder of the haven's maritime history.

14 December 2018

Seascape Character Assessment

Today, the haven and approaches are busy waters and movements are continuous and dense. Vessels range from large container ships and tankers to passenger ferries and harbour authority launches. The Harwich Haven Channel (the deepest approach to any UK container port at 14.5m deep) is fundamental to the continued success of the ports of Harwich and Felixstowe. The haven and approaches are within the jurisdiction of Harwich Haven Authority. The main shipping channels are marked by buoys and dredged, along with berthing areas, for deep drafted vessels. There are also separate yacht entry tracks. The harbourside is characterised by stacks of containers awaiting shipment, warehouses and typical port infrastructure including docks, jetties and pontoons. Tower cranes are particularly prominent and can be seen from some distance from these ports.

Commercial fishing boats operate out of the port of Harwich, and fish the estuarine waters, rivers and offshore. Dover sole, flounder, bass, mullet and herring are targeted in the haven and potting for crabs and lobsters is also a focus for some crews.

In addition to sailing, the haven and surrounding areas are popular for recreation and contain several visitor destinations. There are a range of heritage sites, museums and nature reserves open to the public. Stretches of the Essex Way and Suffolk Coast and Heaths Path provide access to the water's edge and there is a wild swimming club at Felixstowe. Recreational angling is also undertaken from several stretches of beach with a catch including whiting, cod, sole, bass and garfish^{cvi}. Despite the proximity of the busy ports, Felixstowe remains as a popular seaside town, with a pier and wide range of visitor facilities fronting onto a wide beach. The waters of the haven and approaches are popular for recreational sailing to and from inland quays and marinas and navigating the Rivers Stour and Orwell.

As noted above, the haven has strong associations with historical events, principally associated with the defence of the realm. However, cultural associations also include those related to travel and trade. Harwich was the homeport of the Mayflower which set sail from Plymouth to the New World in 1620. Its Captain, Christopher Jones, was also born in Harwich.

Fossils from Harwich have been collected and studied for more than 300 years making this important in the history of geology. In Arthur Ransome's novels of the late 1930's 'We Didn't Mean to Go to Sea' and 'Secret Water', Commander Walker is a naval officer stationed at Shotley. The names of marine features and navigations are also evocative. For example, the Medusa Channel is named after Nelson's flagship that was moored off Harwich.

7.2.5. Aesthetic and Perceptual Qualities

Views inland from the haven are limited to port related development. However, expansive views out to sea and into the haven are possible from coastal locations.

Tower cranes are by far the most prominent landmarks, but other features act as navigation aids, such as the tall steeple of Harwich Town Church, radar towers and Landguard Fort.

The juxtaposition of large-scale port structures and shipping to the domestic scale buildings within the towns of Harwich and Felixstowe and smaller private craft navigating these busy waters and approaches is a defining quality of the haven. The enormous scale of larger container ships can often only be appreciated when seen in the same view as a yacht at sail or against the backdrop of port infrastructure.

14 December 2018

Seascape Character Assessment

7.3. SCT 03 Nearshore Waters

7.3.1. Key Characteristics

- Sheltered or moderately sheltered coastal waters, adjacent to long curving bays backed by shingle beaches, vegetated dunes, low cliffs and occasional coastal settlements.
- Active length of coast with a fluctuating patchwork of erosion and accretion. Dynamic nature of coastline illustrated by events in history such as the inundation of coastal settlements and the creation of shingle features resulting from the movement of sediment over time.
- Sea floor underlain by superficial sediments largely masking underlying bedrock.
- Relatively shallow waters up to approximately 20 metres deep with sand bank systems parallel to the coastline in places.
- Interaction of terrestrial, coastal and offshore areas important for biodiversity, evidenced by extent of national and international designations.
- Strategically important coastline with numerous historic military sites.
- Commercial fishing activity is relatively intense along the coast. Beached fishing boats are characteristic in some locations.
- Popular tourist area, notably for walking and nature watching with activity focussed on visitor destinations and tourist towns located along the coast.
- Sea fishing, sailing and water-sports activity throughout, albeit centred upon destination towns and approaches to navigable rivers.
- Strong cultural associations, notably in art.
- Strong visual relationship with the predominantly rural coastline. Occasional coastal towns and large-scale developments including energy and military infrastructure evident in some views act as orientation points/navigation aids.
- Expansive views offshore encompass largely undeveloped seascape. Offshore shipping and wind farms visible in adjacent seascape character types, subject to weather conditions.

7.3.2. Location

The **Nearshore Waters SCT** occupies the shallower coastal waters associated with the largely rural Suffolk coastline between Old Felixstowe and Lowestoft, which is adjacent to the Suffolk Coast and Heaths AONB and includes areas defined as the Suffolk Heritage Coast.

The southern limits of the Nearshore Waters SCT are defined by the **International Ports and Approaches SCT**. To the north is the **Developed Nearshore Waters SCT**. The landward extent of the SCT is broadly defined by the low water mark. Its seaward extent is generally between 5 and 8km (2.7-4.3nm) from the shoreline, where it meets the **Coastal Waters SCT**.

14 December 2018

Seascape Character Assessment

7.3.3. Physical Influences

The shape of the coastline is formed by a series of headlands, referred to locally as nesses, defining sheltered or moderately sheltered curving bays and havens. Some headlands, for example Thorpe Ness, are formed of the underlying geology, whereas others are mobile features created by the accumulation of sand and shingle. For example, the sweeping spit of Orfordness, which defines the boundary between Hollesley Bay and Aldeburgh Bay, has been created by the action of longshore drift and is one of the largest and most important shingle structures on the British coast. Benacre Ness is an example of a small cusped foreland moving north, counter to the direction of sediment transport.

The largely rural coastline of low cliffs, vegetated dunes sitting behind shingle and occasionally sandy beaches forms the backdrop to the marine environment. Agricultural landscapes typically form the coastal strip, although some stretches of coast are interrupted by broad inlets, now almost entirely filled with estuarine sediments to create extensive open fens and levels. Small coastal settlements and towns also exert a localised influence.

This is an active length of coast with a fluctuating patchwork of erosion and accretion. The active nature of the coast can be seen in some locations – such as the coastal cliffs at Dunwich and Covehithe, which are described as the most rapidly eroding areas on the English coast^{cvi}.

Offshore, the underlying solid geology is largely masked by superficial deposits of intermixed gravels, sands and muds. However, an outcrop of Pleistocene Coralline Crag is a notable feature off the Thorpe Ness headland.

Waters are typically up to approximately 20 metres in depth although extend to up to 30m in depth in places towards the seaward extent of the SCT. However, water depths are not uniform, with areas of deeper and shallower water throughout, often resulting from natural features including sandbanks running parallel to the coastline. These features are generally submerged but can cause wave breaking at low tide. They can also influence the colour of water locally. Examples of these features included the Sizewell Bank which acts as a natural wave break, Aldeburgh Napes and Aldeburgh Ridge (or Onion). All present a navigational hazard to shipping and can create areas of turbulence.

Coastal forms and the complex interaction between geological and marine processes has created important wildlife areas, recognised by the coastal edge and nearshore waters falling almost entirely within various international and national nature conservation designations. The majority of the coastal seascape is included within the Outer Thames Estuary SPA which is classified for the protection of the largest aggregation of wintering red-throated diver in the UK and foraging areas for common tern and little tern during the breeding season.

7.3.4. Cultural Influences

The recession of the coastline over many thousands of years and hazardous coastal waters means that there is the potential for evidence of submerged landscapes and archaeological remains dating to multiple periods. Dramatic events caused by storms, and the effects of erosion and deposition over a long period of time have also been recorded, providing detailed insight into the history and evolution of the coastline.

14 December 2018

Seascape Character Assessment

The much-studied settlement of Dunwich is perhaps the most well-known historic town to have been lost to the sea in the study area. It was at one time one of the largest seaports in eastern England but now much of the former settlement lies offshore, having been engulfed by tidal surges during the Medieval period. The fortunes of other medieval coastal towns and trading centres have also been influenced by the dynamic nature of the coastline. For example, Aldeburgh was an important medieval port and had a thriving shipbuilding industry. However, in the 16th century trade declined as a result silting of the river. Orford was similarly affected and the spit that once offered safe anchorage continued to increase in length reducing the accessibility of the river to large ships. The mouth of the estuary is now several kilometres south of Orford.

The busy and sometimes hazardous nature of the coastal waters is evidenced in the high occurrence of wreck sites. Perhaps the most notable is the Dunwich Bank Wreck, the only designated wreck within the study area. Other examples include three shipwrecks, all sunk by mines during World War I. These are located on or near the Cutler Sandbank. Two were naval vessels and one was carrying coal from the Tyne to London and their presence indicates the important role of the East Anglian coast to both the defence of Britain and coastal trading.

Military sites and structures are located along the coast providing evidence of its strategic importance over many centuries. Aldeburgh's name derives from the 'Old Fort' and Orford is the site of an impressive 12th century castle keep. Several Martello Towers survive along the coast dating to the early 19th century. During the 20th century, defences reflected constraints imposed by the coastal landscape as well as by military priorities. Many stretches of beach were mined, and anti-tank scaffolding, cubes and ditches were installed to prevent assault craft from landing. Minsmere itself was flooded during the Second World War as a defence against invading troops landing on this vulnerable stretch of the coast. Orfordness is particularly significant from a military perspective. The remote and isolated character of the ness made it the ideal location for military activity and it provides evidence of the evolving priorities and advancements in offensive and defensive technologies over a prolonged period.

The Thorpe Ness crag, sandbanks and other features on the seabed along the coastline are a particular focus for commercial fishing. Small vessels fishing these waters operate out of ports and marinas and beach launches. Potting is deployed to catch species of shellfish (including lobsters, edible crabs and whelks) and trawling, long lining and netting are used to catch fish including cod, bass, sole, thornback ray, whiting, herring and smooth hound. Buoys and flags can often be seen marking pots and nets.

The coastline is popular amongst tourists and offers a range of visitor destinations and activities. Southwold, Thorpeness and Aldeburgh are particularly popular seaside towns, with a strong relationship to the coast and sea. Southwold has significant Victorian architecture, including a promenade, villas and a pier reflecting its growth as a seaside resort. The beach is also noted for its colourful beach huts. Thorpeness was established as a holiday resort in the early twentieth century and its design was inspired by Ebenezer Howard's garden city principles^{cvi}.

Popular visitor attractions along the coast include the National Trust's Coastguard Cottages at Dunwich, Orford Ness Nature Reserve and RSPB Minsmere Reserve. A network of rights of way provides access to and along significant stretches of beach and coastal edge. Of particular importance is the Suffolk Coast Path. Recreational angling is popular off several

14 December 2018

Seascape Character Assessment

beaches including Aldeburgh, Dunwich, Southwold, Sizewell, Thorpeness, Walberswick and Minsmere. Offshore sailing and water-sports activity is located throughout, albeit centred upon destination towns and approaches to the navigable rivers. A RYA general boating area follows the coast between Aldeburgh and Lowestoft. Recreational diving boats are launched from Southwold^{ciix}.

Submarine cables meet the coastline at several locations, including Aldeburgh and at Sizewell, which is the site of two generations of nuclear power station.

This stretch of coastline has strong associations artists. Dunwich, Southwold and Walberswick were particularly popular amongst painters and scenes illustrate beaches littered with fishing boats, huts and kit, such as nets and pots (for example 'Southwold' by Edwin Hayes and 'Eastcliffe, Southwold' by Walter Crane) and busy coastal waters and harbours (for example 'Orford Ness Lighthouse' by William Daniell RA and John Moores 'Slaughden Quay'). The treacherous nature of these nearshore waters was also referenced in renderings of wrecks – such as the coloured lithograph of the 'Wreck of the Princess Augusta on Southwold Beach' by J.B. Chrome.

A mural on Southwold Pier and plaque on his former home attest to the connection between George Orwell and the town. Benjamin Britten is closely associated with Aldeburgh and established the Aldeburgh Festival in 1948. He is celebrated in a steel sculpture located on Aldeburgh Beach.

7.3.5. Aesthetic and Perceptual Qualities

The absence of a coast road and widespread development imparts a rural character to the terrestrial hinterland of the Nearshore Waters SCT. This is reflected in the designation of the Suffolk Coast and Heaths AONB and Suffolk Heritage Coast definition. Some large-scale developments are accommodated on the coastal edge, including the nuclear power stations at Sizewell and military structures at Orfordness. There are also several coastal settlements and small towns which exert an influence locally.

The nearshore waters are largely undeveloped. However occasional structures projecting into the sea are notable including Southwold Pier, groynes on beaches such as at Aldeburgh and Southwold, harbour walls at Walberswick at the entrance to the River Blyth, Minsmere Sluice outfall and Sizewell A intake and outfall headworks structures.

The Nearshore Waters SCT typically encompasses large scale panoramic views out to sea and along the coastline. From many locations on and offshore, the morphology of sweeping bays, headlands and shingle structures such as Orfordness can be appreciated, although these features become flattened towards the seaward extent of the SCT to form a low narrow horizon.

Several landmarks are evident along this stretch of the coastline. These include the sweeping lines of Orfordness, larger settlements such as Southwold and Aldeburgh and prominent structures such as the Orfordness Lighthouse and power stations at Sizewell. Closer to the coast, navigation aids include features such as the cottages at Shingle Street, Hollesley Prison chimney and the masts and pagodas at Orford Ness. Church towers are particularly distinctive along the coast, such as the partially ruined Church of St Andrew Covehithe.

14 December 2018

Seascape Character Assessment

Views offshore are typically across vast expanses of open sea. Subject to conditions, pleasure and fishing craft are sometimes visible and there are frequently views to large container ships and tankers typically moving across or at anchor on the horizon.

When visibility is good, there are distant seaward views from some locations on the coast and at sea to the south-west towards the Greater Gabbard offshore wind farm. There are also very distant seaward views towards the wind turbines of the London Array and Gunfleet Sands wind farms when seaward visibility is excellent.

The proximity and visibility of the coastline limits the sense of exposure and remoteness at sea, albeit this is dependent on weather and atmospheric conditions.

14 December 2018

Seascape Character Assessment

7.4. SCT 04 Developed Nearshore Waters

7.4.1. Key Characteristics

- Sheltered or moderately sheltered coastal waters, adjacent to bays backed by sandy beaches, vegetated dunes, low cliffs and almost continuous development.
- Much of the coast is erosional and sea defences are characteristic of the foreshore in many places.
- Sea floor is underlain by superficial sediments largely masking underlying bedrock.
- Relatively shallow waters up to approximately 20 metres deep with sandbanks parallel to the coastline in places.
- Offshore areas and coastal dunes and beaches designated for their wildlife importance.
- Strong associations with maritime history and in particular the fishing industry.
- Modern man-made harbours adjacent to river mouths protected by sea walls and rock revetments.
- Largely developed coastline with relatively large settlements, holiday parks and leisure developments linked by coastal roads.
- Contemporary commercial fishing activity is relatively intense along the coastal strip and in the vicinity of historic fishing ports.
- Tourism is an important focus for the local economy, with numerous visitor facilities and attractions along the coastline.
- Recreational sailing is particularly intense on approaches to navigable rivers leading to inland quays and harbours.
- Where present, sand and shingle features and dune systems create a semi natural character juxtaposed to a relatively developed coastal fringe, with frequent views to development, port infrastructure, offshore wind turbines and sea defences.

7.4.2. Location

The **Developed Nearshore Waters SCT** extends along the predominantly developed stretch of the coastline north of Kessingland and adjacent to the port towns of Lowestoft and Great Yarmouth.

Its southern limits are defined by the **Nearshore Waters SCT** which is closely associated with the largely rural coastline that falls within the Suffolk Heritage Coast and adjacent to the Suffolk Coast and Heaths AONB. The northern limit of the SCT is defined by the study area boundary. Landward the SCT is defined by the low water mark. Its seaward extent is between 5 and 8km (2.7-4.3nm) from the shoreline, where it meets the adjacent **Coastal Waters SCT**.

14 December 2018

Seascape Character Assessment

7.4.3. Physical Influences

The shape of the coastline is formed by a series of headlands, referred to locally as nesses, defining sheltered or moderately sheltered bays. Headlands at Lowestoft and Great Yarmouth are defined by rock and concrete defences and Ness Point, or Lowestoft Ness, is particularly notable as this is the easternmost location on the UK mainland. Elsewhere, headlands are defined by mobile features created by the accumulation of sand and shingle, for example the narrow cusped foreland at Winterton Ness.

The coastline is typically characterised by low cliffs and vegetated dunes sitting behind sand and shingle beaches. Landward is an almost continuous belt of development following roads running parallel to the coast. Development comprises the port towns of Lowestoft, Great Yarmouth, Gorleston-on-Sea, coastal villages, holiday resorts and caravan parks.

This is an active length of coast with evidence of erosion and accretion. For example, the beach at North Denes is actively accreting, whereas the cliffs at Pakefield are eroding, often to reveal fossil beds. The vulnerability of coastal development to the effects of erosion is evidenced in the frequency and scale of defensive structures, including concrete sea walls, rock revetments and wood and stone groins projecting into the sea. In other locations along the coastline unmodified topographic features act as effective flood and erosion defences, such as the sand dunes at the northern part of the area around California and Great Yarmouth (the 'Denes').

Offshore, the underlying solid geology is masked by superficial deposits of intermixed gravels, sands and muds. Water depths are typically up to approximately 10 metres although extend to up to 20m in places. Sandbanks lying parallel to the coast are also notable and nearshore banks are often visible or cause wave breaking at low tide. Even when submerged, these features can be identified as they influence the colour of water locally. East of Great Yarmouth is Scroby Sands - the largest nearshore sandbank in a group of offshore shoals and is the site of an offshore windfarm. This bank is exposed for sufficient durations to provide a stable enough surface for marram grass to become established and to support seal colonies and nesting terns.

The interaction between geological and marine processes has created important wildlife areas both on and offshore. The developed Nearshore Waters SCT falls within the Outer Thames Estuary SPA and Greater Wash SPA which supports large aggregations of non-breeding red-throated diver and little gull. Onshore, the dunes at North Denes and Winterton Sands are also designated. North Denes is a wide shingle beach with dunes that supports important numbers of breeding little tern that feed in nearby waters. Seals can often be seen in the waters off this stretch of the coast and basking on the intertidal sandbanks.

7.4.4. Cultural Influences

The recession of the coastline over many thousands of years and presence of sandbanks that are hazardous to shipping, means that there is the potential for evidence of submerged landscapes, archaeological remains and wrecks in this SCT.

At Pakefield, a coastal site well known for its fossils, excavations have found flint artefacts that provide the earliest evidence for human presence north of the Alps, pre-dating other

14 December 2018

Seascape Character Assessment

evidence by as much as 200,000 years^{cx}. The high occurrence of wrecks is linked to the frequency of coastal sandbanks. Scroby Sands is recorded as having caused several accidents, including the SS Hopelyn which ran aground in 1922 whilst carrying coal to London from Newcastle. Its rescue was a nationally acclaimed act of bravery.

As with other vulnerable stretches of coastline, evidence of military sites and structures are relatively common, albeit the density is less than along the Suffolk coastline further south. The oldest surviving site is the Roman fort at Caistor-on-Sea which originally occupied a large island on the north side of an estuary where the rivers Ant, Bure, Yare and Waveney entered the sea. Its location within the context of modern-day Great Yarmouth is an indication of how significant changes to the coastline have been in this area over the past 2,000 years. The strategic location of the town continued to be of military importance, and following Henry VIII's review of the English coastline, two batteries were constructed at the port and it was selected as the site of a naval base and hospital during the Napoleonic War. The major ports of Great Yarmouth and Lowestoft were also the focus for defence during the two World Wars. Concrete pillboxes, gun placements and lookouts still survive intact at several points along this coast, but several have been lost due to erosion.

Great Yarmouth and Lowestoft are particularly well known for their fishing heritage. Indeed, the rivalry between the two ports led to them taking different sides in the English Civil War. From its origins in the medieval period, the size of the fishing fleets grew over the centuries and so did the catches. In the 19th century the industry expanded rapidly, in part thanks to better connections to markets provided by the arrival of the railway. At this time, the scale of operations depended on seasonal workers from around the country to gut and process the catches which had to be done immediately once the boats had landed. The herring industry declined rapidly in the 1930s and the town's last steam drifter, the Lydia Eva, landed her last catch in 1938.

This stretch of the coastline displays continuity with the areas fishing heritage. Sandbanks and other features on the seabed are a particular focus for commercial fishing. Smaller craft fishing these waters operate out of Lowestoft and are launched from several beaches including Kessingland and Pakefield. Potting is deployed to catch species of shellfish (including lobsters, edible crabs, whelks) and trawling, long lining and netting are used to catch fish including cod, bass, sole, thornback ray, whiting, herring and smooth hound. Buoys and flags can often be seen marking pots and nets.

Great Yarmouth and Lowestoft continue to be important port towns, and both have deep water outer harbours, protected by concrete sea walls and rock revetments. Significant amounts of activity in and out of the ports is connected with the offshore energy industry, and servicing dredging and oil and gas operations in the southern North Sea.

In addition to maritime trade and industries, recreation and seaside entertainment are significant locally. A string of holiday resorts along the coastline bring many visitors to the area, and income to the region every year. The towns of Great Yarmouth, Gorleston-on-Sea and Lowestoft are a particular focus for visitors, and contain many attractions including piers, pleasure beaches and seafront gardens. Heritage attractions and museums, such as the historic docks and Time and Tide Museum at Great Yarmouth and Lowestoft Museum and Heritage Quay provide a connection to the area's maritime history. The latter has been enhanced by a Maritime Heritage Trail leading out to Lowestoft Ness. Remnants of the

14 December 2018

Seascape Character Assessment

fishing industry are key to this trail. The areas ongoing connection to offshore energy generation is represented in the Scroby Sands visitor centre.

Outside of the main settlements, leisure and tourism related facilities include holiday parks, golf courses, and static caravan parks which contribute to the developed character of the coastline.

Significant stretches of beach are accessible, often via steep steps and ramps leading from footpaths and roads, residential areas and holiday parks along the cliff tops. The northern terminus of the Suffolk Coast Path is at Lowestoft and a completed stretch of the England Coast Path runs between Hopton on Sea northwards to Winterton-on-Sea and beyond the boundary of the study area. Despite the built-up character of the coastal hinterland, there are opportunities for nature watching including at nature reserves at Gunton Warren and Winterton Dunes. Grey and harbour seals may be seen along the coast and beach throughout the year.

Angling, sailing and water-sports activity is located throughout the SCT, albeit centred upon towns and approaches to the navigable rivers at Great Yarmouth and Lowestoft. A RYA general sailing area runs along the coastline as far north as Great Yarmouth.

This stretch of coastline has strong associations with its maritime history, principally focussed on the port towns. Painters were particularly attracted to the area around Great Yarmouth and there is a large archive of photographs depicting various aspects of the herring industry from drifters at sea to gutting, salting and packing herring. Military and naval associations are also strong. Nelson is commemorated in Great Yarmouth in a monument which was built in 1819.

7.4.5. Aesthetic and Perceptual Qualities

Built development associated with the Great Yarmouth and Lowestoft, along with smaller coastal settlements, holiday resorts and caravan parks linked by coastal roads, form an almost continuous backdrop to views along the coast and towards the coast from locations offshore. Where present, areas of farmland and woodland mark the separation between adjacent settlements.

From many locations on and offshore, the morphology of bays and headlands can be appreciated. Especially dominant are the headlands created by port infrastructure at Lowestoft and Great Yarmouth.

The ports of Great Yarmouth and Lowestoft are used by commercial, fishing, and private vessels travelling to quays and harbours along the navigable rivers. The busy entrances the harbours and docks are marked by buoys, with navigation aided by local landmarks. Close to shore details such as cliff profiles, streets and historic buildings and structures can be discerned, including church towers, lighthouses and other distinctive structures. With distance, trees and buildings merge to form a narrow horizon, in which only taller structures can be clearly identified and used as landmarks to aid navigation. For example, at Lowestoft, particularly prominent structures seen from the seaward extents of the SCT include the wind turbine 'Gulliver', and tall buildings, some of which can be some distance inland, such as St Peter's Tower.

Juxtaposed to the more developed coastal views, shingle and sand beaches and dunes at North Denes and Winterton retain a semi-natural character. Sea cliffs and dunes can also

14 December 2018

Seascape Character Assessment

obscure views to development inland from some stretches of beach. However, the developed character of the coastline is often identifiable throughout this SCT, for example through the higher frequency of sea defences, structures along the foreshore projecting into the sea and the visibility of offshore wind turbines at Scroby Sands.

From locations offshore, the proximity and visibility of the developed coastline limits the sense of exposure and remoteness, albeit this is dependent on weather and atmospheric conditions.

14 December 2018

Seascape Character Assessment

7.5. SCT 05 Coastal Waters

7.5.1. Location

7.5.2. Key Characteristics

- Open expanse of sea marking the transition between nearshore and offshore areas with a simple bathymetry typically ranging between 20 and 30 metres in depth.
- Seabed is characterised by relatively undisturbed sediments.
- Significant areas designated for biodiversity value. Sandbanks form important habitats in some areas.
- Several shipping routes travelling to and from continental Europe and major coastal ports. Activity also includes fishing boats and vessels servicing designated aggregates dredging areas and offshore wind farms.
- Visually unified and extensive open water character in views offshore.
- Coastline seen as low horizon and offshore windfarms are visible subject to location and conditions.

7.5.3. Location

The Coastal Waters SCT is located approximately 8km (4.3nm) from the coast, extending approximately 18km (9.7nm) out to sea. It marks a transition between the **Nearshore Waters SCT** and **Developed Nearshore Waters SCT** and the **Offshore Waters SCT** which lies further out to sea.

7.5.4. Physical Influences

The Coastal Waters SCT is a transitional area between the shallower Nearshore Waters and deeper Offshore Waters of the southern North Sea. Bathymetry is relatively simple, ranging on average from 20-30m in depth. Local variations occur, for example north of Great Yarmouth where sandbanks run parallel to the coastline.

The seabed is characterised by a mix of relatively undisturbed sediments and the bedrock is rarely exposed on the seafloor. Sediments include those laid down by ancient river channels prior to the formation of the North Sea.

A significant proportion of the Coastal Waters SCT is designated, or proposed for designation, for its nature conservation interest. It forms part of the Southern North Sea Candidate SAC, Greater Wash SPA and Outer Thames Estuary SPA, and includes parts of the recommended Orford Inshore MCZ. Sandbanks north of Great Yarmouth fall within the Haisborough, Hammond and Winterton SAC and are a particularly important feature as a range of fish species including sand eels, goby and plaice use them as feeding and nursery grounds.

14 December 2018

Seascape Character Assessment

7.5.5. Cultural Influences

Material trawled from the seabed indicates that there is potential in the offshore sediments for evidence of the communities and landscapes that occupied the area prior to the formation of the North Sea. There are also numerous recorded wrecks, highlighting the busy nature of these waters throughout history.

Today, the Coastal Waters SCT contains several busy shipping routes. Vessels predominantly travel north-south parallel to the coastline and transit to and from European ports and the English Channel. Traffic includes cargo vessels, tankers and passenger ships. The frequency of vessel movements is particularly high on the outer approaches to the larger ports of Harwich, Felixstowe, Ipswich, Great Yarmouth and Lowestoft. East of Felixstowe the Harwich Haven Harbour Authority Area coincides with an area of particularly dense vessel movements and there are several anchorages and buoys marking the approaches to the Haven.

Other commercial activity includes vessels travelling to and from licenced aggregates dredging areas approximately 8km and 30km (4.3-16nm) east of Great Yarmouth and Lowestoft within the Coastal Waters SCT and adjacent Offshore Waters SCT. Vessels associated with the transit of plant and supplies for the construction, operation and maintenance of offshore wind farms in the adjacent Offshore Waters SCT are also noted.

Commercial, charter as well as some recreational vessels fish these waters. A key focus is potting for whelk, crab and lobster and white fish including skate, ray, whiting, herring, sole and bass are also targeted.

Aesthetic and Perceptual Qualities

Subject to conditions, views to the coastline are possible, limiting the sense of isolation and exposure in this SCT. The coast typically forms a low, narrow horizon, on which major landmarks are the only aids to navigation. In poor weather views to the coast become obscured and a more remote character prevails. Views offshore are unified and formed of consistent panoramic horizons.

Views encompass tankers, passenger ships and cargo vessels utilising shipping routes, fishing boats and vessels servicing offshore wind turbines and aggregates dredging areas. From some locations, views to operational offshore wind turbines in the adjacent Seascape Character Types are possible, subject to weather conditions.

The SCT can display a relatively busy character, particularly on the approaches to the major ports due to the regular transit of commercial vessels.

14 December 2018

Seascape Character Assessment

7.6. SCT o6 Offshore Waters

7.6.1. Key Characteristics

- Simple bathymetry of consistently deep waters, generally in excess of 30m.
- Seabed is characterised by relatively undisturbed sediments.
- Wide areas designated, or proposed for designation, due to their wildlife value. Sandbanks form important habitats.
- Busy shipping waters with several established commercial shipping routes.
- Commercial fishing activity, including from larger vessels.
- Industrial activity includes dredging for aggregates and offshore wind farms.
- Large military practice area.
- Visually unified. Consistent panoramic horizons across extensive tracts of sea.
- Wild and isolated qualities although views to large vessels, dredging activity and offshore wind turbine arrays become important points of orientation in an otherwise vast and featureless seascape.

7.6.2. Location

The **Offshore Waters SCT** lies seaward of the **Coastal Waters SCT** at a distance of approximately 18km (9.7nm) from the coastline, extending to the seaward extents of the study area.

7.6.3. Physical Influences

The bathymetry of the Offshore Waters SCT is relatively simple and generally in excess of 30m in depth becoming shallower towards landward and seaward limits of the SCT.

The seabed is characterised by a mix of relatively undisturbed sand and gravel sediments and the bedrock is rarely exposed on the seafloor. Sediments include those laid down by ancient river channels prior to the formation of the North Sea. Curving sandbanks running parallel to the coastline are of particular note north of Great Yarmouth.

A significant proportion of the Coastal Waters SCT is designated (or proposed for designation) for its nature conservation interest. It forms part of the Southern North Sea Candidate SAC, Margate and Long Sands SAC and part of the Outer Thames Estuary SPA. Also, within the Offshore Waters SCT, are parts of the recommended MCZs of Orford Inshore and Kentish Knock East. These are dominated by habitats composed of subtidal mixed sediments which are important as nursery and spawning grounds for many fish species, including commercially fished species such as cod, plaice, sole, mackerel and herring. Species of burrowing anemones can also be found within the sediment, alongside sea cucumbers, urchins, starfish and several nationally important shark species, including the small-spotted catshark. The area is also important for foraging seabirds and harbour porpoise can also be seen passing through. Sandbanks north of Great Yarmouth fall within the Haisborough, Hammond and Winterton SAC.

14 December 2018

Seascape Character Assessment

7.6.4. Cultural Influences

There is potential in the offshore sediments for evidence of the communities and landscapes that occupied the area prior to the formation of the North Sea. There are also several wrecks, including two designated under the Protection of Military Remains Act. These are the HMS Exmoor, which was sunk by an E-Boat approximately 22km (12nm) east of Lowestoft in 1941 whilst escorting a convoy and the HMS Amphion located 65km (35nm) east of Dunwich. The Amphion won the first victory of the war but was itself wrecked the following day by one of the mines laid.

The Offshore Waters SCT contains several busy deep-water shipping routes for cargo vessels, tankers and passenger ships. These vessels transit between major European and UK ports and the English Channel. The density of vessel movements is particularly high where routes leading to and from the Straits of Dover intersect with east west routes between Harwich/Felixstowe and Dutch ports. In the busy waters east of Harwich Haven anchorages and shipping routes are marked by navigation buoys.

The Offshore Waters SCT includes some of the UK's most important marine aggregate resources and licenced dredging areas and there are numerous oil and gas wells recorded in the northern portion of the SCT (north of Lowestoft). East of Felixstowe is the operational offshore windfarm of Greater Gabbard. There are also offshore turbine arrays under construction at Galloper and east Anglia One. Vessels associated with the transit of plant and supplies for the construction, operation and maintenance of offshore infrastructure and other operations are noted.

Like much of the North Sea these waters are rich commercial fishing grounds and the benthic habitats support extensive spawning and nursery areas for a variety of commercial fish species. Activity includes bottom trawling, dredges and mid-water trawling, as well as the use of static gear (lines, nets and pots). A number of UK vessels are active within this area, targeting species such as sole, bass, and cod, and whelks. Larger vessels from France, Belgium, The Netherlands and Germany are also active (up to the 12nm UK territorial waters limit) and a variety of gear types are used to target species including dover sole, and plaice.

Military use of the Offshore Waters SCT includes munitions dumping grounds approximately 20km (11nm) east of Orford and part of extensive military practice areas east and south east of Felixstowe. These are areas in which naval, military or aerial exercises are carried out.

7.6.5. Aesthetic and Perceptual Qualities

The Offshore Waters SCT is visually unified with consistent and extensive panoramic horizons. The vast scale of the seascape and distance from the coast imparts a wilderness quality and sense of isolation, which becomes more pronounced in poor weather.

Within the context of an open and largely natural seascape, offshore wind turbines and vessels at anchor or in transit are often the only cultural cues. Subject to conditions, wind turbines can be visible for great distances and are typically the only fixed points of orientation and scalable visual references. Container ships and tankers, smaller vessels often associated with servicing offshore industries and fishing boats are also visible, although sea mists and swell can limit their visibility.

14 December 2018

Seascape Character Assessment

Appendix 1. Acknowledgements

LDA Design would like to thank members of the Project Steering Group for their contributions and guidance throughout the project.

The Project Steering Group is made up of the following organisations:

- Suffolk County Council
- Norfolk County Council
- Suffolk Coastal and Waveney District Councils
- Great Yarmouth Borough Council
- Suffolk Coast and Heaths Area of Outstanding Natural Beauty
- Natural England
- Historic England
- Royal Haskoning DHV
- Scottish Power Renewables (observer status)

Project Steering Group Meetings were held on the following dates:

- 2 October 2017
- 30 January 2018

Consultation on the findings of a preliminary appraisal, focussing on the key characteristics of draft Seascape Character Types, was undertaken with the following organisations during Summer 2018:

- Suffolk Coast and Heaths Area of Outstanding Natural Beauty Partnership
- Suffolk Coast Forum

Out thanks are extended to the many individuals who participated.

14 December 2018
Seascape Character Assessment

Appendix 2. Data

The following data is illustrated on the figures presented in Appendix 3.

Theme	Data	Source
Baseline	County Boundary	Ordnance Survey
	Local Authority boundary	
	12 Nautical Mile Limit	United Kingdom Hydrographic Office
Landscape and Seascape Character and Designations	Coastal Natural Areas	Natural England
	Marine Natural Areas	
	National Character Areas	Natural England
	East of England Framework	Landscape East
	East Inshore East Offshore Seascape Character	Marine Management Organisation
	Newport to Clacton Historic Seascape Character	Historic England
	Suffolk Landscape Character Assessment	Suffolk County Council
	Essex Landscape Character Assessment	Essex County Council
	Broads Authority Landscape Character Assessment	Broads Authority
	Great Yarmouth Borough Landscape Character Assessment	Great Yarmouth Borough Council
	Touching the Tide Landscape Character Assessment	Suffolk Coast & Heaths ANOB
	Shotley Peninsula and Hinterland Landscape Character Assessment	
	National Park	Natural England
	Area of Outstanding Natural Beauty	
Heritage Coast		

14 December 2018

Seascape Character Assessment

Theme	Data	Source
Cultural/Physical Influences	RAMSAR Wetlands	Natural England
	Sites of Special Scientific Interest (SSSI)	
	Marine Conservation Zones	Joint Nature Conservation Committee
	Marine Special Areas of Conservation	
	Marine Special Protection Areas	
	Listed Building	Historic England
	Scheduled Monument	
	Registered Park or Garden	Suffolk County Council
	Conservation Area	
	Marine Heritage	
	Sediment Geology	British Geological Survey
	Digital terrain / Bathymetry	MarineFIND
	Shoreline Management Plan Areas/Zones	Environment Agency
	Wind Farms/ zones	The Crown Estate
	Dredging	
	Aggregates	
	Cable / Pipe Routes	
	Oil /gas Fields	Oil & Gas Authority
	Navigation Aids	Maritime and Coastguard Agency and Marine Management Organisation, ABPmer 2017 and The Crown Estate
	Anchorage and Berths	
Shipping Routes		