Natural England Commissioned Report NECR106

Seascape Characterisation around the English Coast (Marine Plan Areas 3 and 4 and Part of Area 6 Pilot Study)

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Foreword

Natural England commission a range of reports from external contractors to provide evidence and advice to assist us in delivering our duties. The views in this report are those of the authors and do not necessarily represent those of Natural England.

Background

Seascape, like landscape, reflects the relationship between people and place and the part it plays in forming the setting to our everyday lives. It is a product of the interaction of the natural and cultural components of our environment, and how they are understood and experienced by people.

This work was commissioned to test and refine the emerging methodology for assessing the character of seascapes and to:

1) Contribute to the aims of the European Landscape Convention to promote landscape protection, management and planning, and to support European co-operation on landscape issues.
2) Provide practical tools and evidence to assist in responding to the increasing demands being placed upon the related marine and terrestrial environments, building upon the increased awareness of the high profile of the connections between land and sea reflected in the Marine and Coastal Access Act (2009) and the resultant marine spatial planning system.
3) Undertake a Seascape Character Assessment at a strategic scale for a defined area of the English coastline, so that a baseline of Seascape Character Areas is available to:

- provide the context for more detailed Seascape Character Assessment work; and
- inform Marine Spatial Planning, and the planning, design and management of developments - and a range of other projects - on and around our coastline.

Any comments on this pilot study should be forwarded to Christine Tudor **christine.tudor@naturalengland.org.uk**

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Further information
This report can be downloaded from the Natural England website: **www.naturalengland.org.uk**. For information on Natural England publications contact the Natural England Enquiry Service on 0845 600 3078 or e-mail **enquiries@naturalengland.org.uk**.

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Prepared for

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Seascape Characterisation around the English Coast (Marine Plan Areas 3 and 4 and Part of Area 6 Pilot Study)

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Digital outputs which are available and complementary to the content of this report are:

- GIS mapped polygons of character areas;
- GIS referenced representative field survey location points;
- Field survey photographic records.

1 Introduction

1.1 Purpose of Study

The following report has been prepared by URS/Scott Wilson on behalf of Natural England. The scope of the brief was:

- to test and refine the methodology set down in the emerging approach Seascape Character Assessment;
- to contribute to the aims of the European Landscape Convention to promote landscape protection, management and planning, and to support European co-operation on landscape issues;
- to provide practical tools and evidence to assist in responding to the increasing demands being placed upon the related marine and terrestrial environments, building upon the increased awareness of the high profile of the connections between land and sea reflected in the Marine and Coastal Access Act (2009) and the resultant marine spatial planning system;
- to undertake a Seascape Character Assessment at a strategic scale for a defined area of the English coastline, so that a baseline of Seascape Character Areas is available to -
    - provide the context for more detailed Seascape Character Assessment work;
    - inform Marine Spatial Planning, and the planning, design and management of developments - and a range of other projects - on and around our coastline.

The purpose of the exercise was to identify seascape character areas based on a review of the existing baseline context. The outcome of the exercise is the provision of a reference source for strategic decision makers to assist understanding of the distinctive character of the seascape environment. The assessment does not attempt to make judgements on the relative suitability of the seascape environment for particular needs or requirements.

1.2 Scope of Study

The extent of study was defined as the Marine Management Organisation (MMO) Marine Plan Areas 3, 4 and western extent of Area 6 (refer to Figures 1.1 and 2.1). The Draft Seascape Character Assessment Guidance for Great Britain (2011) defines seascape as ‘’*An area of sea, coastline and land, as perceived by people, whose character results from the actions and interactions of land with sea, by natural and/or human factors*”. The physical extent of mapped seascape character areas is defined as the area to the seaward side of the high water mark (in acknowledgement that the intertidal area may equally be considered within either land or sea based character assessment). The contextual influence does however also acknowledge the landward side of the high water mark, including inland extents defined by the visual extents of land/sea associations.

1.3 Report Outputs

The physical deliverables of this report provide a mapped extent of seascape character areas, a description of each area and a reference list (of existing GIS datasets and key issues) of relevance at the strategic level of consideration.

1.4 Limitations

Within the time constraints of the contract it has not been possible to incorporate stakeholder involvement which has instead been limited to steering group input during the assessment

process. There is therefore capacity for cultural elements and sense of place perceptions in particular to take on a greater significance than that which has been reported here. The amount of data that it has been possible to consider has also been limited in proportion to the time available to prepare the assessment (work was constrained to delivery by a multi-disciplinary team within a 9 week period). Further detail on limitations is provided within the supplementary report entitled 'Limitations and Scope for Further Work'.

1.5 Report Structure

The report has been set out to reflect the sequential approach identified in the Draft Seascape Character Assessment Guidance for Great Britain (2011). As such the report initially considers methodology, then goes on to relate the outcome of the stage processes of field study, desk study, classification and description and finally concludes with detail on the individual character areas identified. The various supporting illustrations and supplementary data sources are included within the Appendices at the back of this report. Supporting documentation providing detail on 'Limitations and Scope for Further Work' and 'Lessons Learnt and Methodology Development' has also been included in Annex 1 and Annex 2 respectively.

2 Seascape Character Assessment Methodology

2.1 Reference Sources

The overarching approach to characterisation is derived from the Draft Seascape Character Assessment Guidance for Great Britain (2011) (SCA)' (this is usefully summarised in the Seascape Character Assessment Methodology flow diagram extracted from the SCA and included in Appendix 3). It is acknowledged that this guidance is consistent with the 'Draft revised guidance, Landscape Character Assessment Guidance for Great Britain (2011) (LCA)', however the LCA document was not available at the time of assessment to validate the approach.

The current work does not have an immediate precedent to take reference from but does acknowledge the land based National Character Areas (NCA) as a scale compatible structure. In this respect the level of characterisation reported here is very much at the upper 'national' limits of definition of detail in anticipation that further regional and local scale studies will supplement and elaborate on the limitations of the current strategic assessment.

Steering group input comprised representation from the following bodies during the characterisation development process:

- Natural England
- Marine Management Organisation
- Environment Agency
- English Heritage
- Countryside Council for Wales
- Joint Nature Conservation Committee
- National Trust
- Europarc Atlantic Isles
- LDA Design

Such inputs proved invaluable in gaining an understanding of respective focus interests.

2.2 Desk Study

The initial filter applied to desk top data analysis was to distinguish which information was relevant at a strategic level of consideration. This was primarily defined by what was readily available in published format in relation to each of the Marine Plan Areas comprising the study area. Initial desk study focussed on the interrogation of GIS datasets supplied by Natural England. The amount of GIS information presented was extensive and resources constrained the amount of information that could be analysed and interpreted. Key considerations of relevance at the strategic level have been referenced in Appendix 4 and combined into composite themed maps illustrated in the figures in Appendices 1 and 2.

Topic specific approaches to desk study procedures are referenced below.

Ecology

The ecological component consists of a desk study baseline review of the ecologically significant flora and fauna present within the study area. In this case the term 'ecologically significant' was interpreted as those features occurring within designated sites.

Whilst not within the remit of this study, the sensitivity of the biodiversity resource to potential landscape use changes (recreation, disturbance through increased visitor pressure etc.) and the legislation and planning issues which may be pertinent to any such changes has been included for reference within Appendices 5.1 and 5.2.

The ecological designations have been mapped to form a spatial hierarchy reflecting the overall natural factors and characteristics of each area. This spatial analysis has allowed an assessment of ecological variation within the area to be made, leading to the identification of key zones.

Heritage

For the purpose of this high level assessment the inclusion of a cultural heritage asset to contribute to the seascape character was judged primarily from its geographic location as shown on Ordnance Survey mapping and its relation to the sea or intertidal waters, as defined by the study area.

The study was carried out in GIS (ArcView) to interrogate datasets supplied by Natural England and twin monitors to enable MagicMap data to be viewed alongside.

Broad scale geographic associations of heritage assets were identified where these may have a bearing on the identification of distinct character areas.

It is noted that English Heritage are currently preparing Heritage Historic Seascape Characterisation studies for the English coastline which provides reference for the Withernsea to Skegness section of the coast, but are otherwise yet to be completed for the remaining extent of the study area.

Landscape

Datasets with capacity to influence character at a National scale were mapped and congregations and correlations between different activities and features noted.

As a basis for determining the visual inter-relationship between land and sea at this scale, a generalised analysis of coastal vantage points and identification of notable coastal features was undertaken. Using the graph indicated within Box 6 of section 5.3.3 of the Draft SCA, an offset from the coastal topographical high points was produced to determine the theoretical visible horizon from the land (and therefore how far out the land would potentially be visible from the sea). This was considered an appropriate method in substitute for the otherwise time consuming preparation of a computer generated Zone of Theoretical Visibility (ZTV). The approximate extend of the resulting theoretical visible horizon is illustrated on Figures 1.2 and 2.2.

With the capacity for the visual perceptibility of land to influence character area in mind, key characteristics and landmarks as described in NCA descriptions for areas covering the adjacent coastline were mapped and lines projected perpendicular to the coastal geometry where these character areas met the sea. This was guided by the principle that character of the immediate seascape areas would reasonably be anticipated to be visually influenced by the character of the adjacent coastline.

Beyond this immediate zone of land influence, guidance then suggests that within 3km to 5km from shore the detail of land and the coastline becomes small and indistinct except for landmarks (The Department for Trade and Industry Guidance on the Assessment of the Impact of Offshore Wind Farms).

As an outcome of the desk study process, draft seascape character areas were created for subsequent validation in the field.

2.3 Field Study

Field study work included consideration of both sea and land based locations.

The seascape character guidance advocates visiting a minimum of three locations within each of the draft character areas. For the purposes of this assessment, to initially validate the scale of character areas, a variable number of representative field survey points were taken. Subsequent assessments will allow a more refined approach to be adopted to acknowledge a more consistent minimum three location approach in proportion to the anticipated scale of each character area.

The creation of the fieldwork pro-forma (see Appendix 7) took reference from the approach applied in the Dorset Coast Landscape and Seascape Character Assessment to test its comparative robustness at a strategic National level of assessment. In the absence of a detailed ZTV analysis and therefore a fuller understanding of terrestrial areas with a sea influence, the forms were adapted to be more generic, the outcome being a land based field form and a sea based field form. A fieldwork prompt sheet was also produced which sought to inform consistent descriptive analysis when out in the field.

At each survey location a field form was completed which included exact location coordinates taken from a GPS device and a panoramic photo record was also carried out using a digital SLR camera with a focal length equivalent to a 50mm focal length on a manual SLR camera. Where appropriate a “representative” photograph was also taken in order to illustrate the character context.

The approximate route of the land and sea based field work is illustrated in Figures 1.4a, 1.4b and 2.4 in Appendices 1 and 2.

Land based field work

Access to parts of the coastline was limited by the lack of roads or by a restriction on public access. Several of the locations visited required long detours where no real views of the sea were experienced until reaching the coastal edge where the seascape became apparent.

Representative locations were chosen based on the key characteristics of NCAs but also with regard to characteristics of coastal character areas. Points were chosen both within the NCA boundaries and where they abutted adjacent character areas to understand how this influenced seascape character (refer to Figures 1.3 and 2.3 which illustrate the extent of NCAs adjacent to the study area).

Though not available for this assessment, a digital ZTV would be a useful prompt at this stage to assist in identification of the extent of a perceived association with seascape.

The perception of scale and horizon was notably influenced by visual cues on land which relates the importance that the coastal interface plays in the perception of seascape from land.

From the land based assessments it was clear that activities at the coastal edge, geographical and intertidal characteristics and prevailing climatic conditions were the most influential components of what may be perceived as defining the seascape.

Offshore activity such as commercial fishing and shipping although occasionally perceptible were often difficult to determine in comparison to inshore activities such as windsurfing and recreational boat activity.

Sea based field work

Sea based field survey locations were selected to broadly correspond with the land based assessments within a 5km offset zone from the coastline in acknowledgement that this zone was most influenced by the local subtleties of the coastline. The identification of survey locations outside this boundary was informed by key offshore activity such as shipping routes, fishing grounds and offshore gas / windfarm installations.

The survey locations were discussed with each boat skipper in advance of carrying out the field visits so as to have regard to constraints posed by local conditions, tides and boat capabilities. The route was subsequently adapted where necessary to take advantage of tide conditions and increased possible range. Locations further out to sea were also selected to visit groups of offshore activities and to test theoretical assumptions on visibility and perception of features within their context.

The capability of the selected boat was heavily influential in determining the distance that could be covered in the time allocation. Ultimately however the tides and weather conditions were the most crucial factors.

Open sea areas were found to be more generically influenced by sea uses and as such once a representational understanding had been gained (and as it was not physically possible to cover the extent of area) it was considered that only a limited amount of field validation could be carried out in such areas.

In conjunction with the sea based field survey locations, a map was annotated to record landmark features and representational character features such as eroding cliff lines, clusters of boat activities and settlement pattern.

2.4 Classification and Description

The classification and description stage involved a review of all the collated baseline data with capacity to influence characterisation at a strategic scale. The filtering process was assisted through reference to the ‘wheel’ of elements informing seascape, as illustrated in Figure 1 of the Draft SCA. As an outcome of this process, the elements of greatest significance to the scale and context of the study area were highlighted and used to identify distinctiveness and boundaries between adjacent character areas. The descriptive content and format took reference from emerging NCA descriptions and other seascape assessments (Dorset Coast and East Midlands) as a basis for reporting the baseline information.

3 Desk Study

3.1 Introduction

The desk study involved review of background data (GIS mapping and documented reference sources) with relevance to the high level scope of the assessment. This required a strategic 'filter' to be applied and as such the desk study relates only to those initial prompts of significance which will need to be subject to elaboration with further more detailed study.

A list of desk study document and GIS reference sources is included in Appendix 4.

As an outcome of the desk study process a draft extent of character areas was identified which was subsequently moderated by the field survey work.

3.2 General Description of the Extent of Study Area

MMO areas 3 and 4, known formally as East Inshore and East Offshore, fall between Flamborough Head in East Riding of Yorkshire and Felixstowe in Suffolk. The extent of this study area broadly correlates with the Southern North Sea Marine Natural Area. MMO area 3 extends from the coastline to the 12 nautical mile UK territorial sea limit within this area.

The western part of MMO area 6, known formally as South Inshore, lies between the Isle of Portland in Dorset and Dartmouth in Devon. Its seaward limits broadly align to the 12 nautical mile UK territorial sea extents within the South Western Peninsula Marine Natural Area.

Although the study area is physically defined as ending at the high water mark, the interface with land is clearly one that influences the seascape areas. The relative influence between land and sea related topics is considered within the respective topic headings in Appendix 4 and ultimately reflected in the character area descriptions.

3.3 Study Area Boundaries

The study area was fundamentally defined by the Marine Management Organisation Marine Plan Area boundaries. Within this, consideration was given to how the sea to land and sea to estuary boundaries were to be defined.

For the purposes of this assessment the high water mark was taken to represent the physical landward extent of study. This allowed the land/sea overlap intertidal zone to be considered in acknowledgement that coastal processes and erosive and depositionary features are key character features.

Whilst the physical division of land and sea character area boundaries is drawn at the high water mark, the process and perceptual overlaps clearly require acknowledgement. The emerging character methodologies for land and sea have been written to acknowledge the overlap and the study has considered this with review of the draft updates to the land based NCAs. The Draft LCA was not however available at the time of this study to validate the overlaps in methodology. Descriptive overlaps with land area descriptions have been noted within the seascape character descriptions.

The estuarine limits of seascape at the strategic scale have been drawn to coincide with the perceptible face of the adjacent coastline rather than extend inland along the various tributaries. In the instance of the Humber, where the estuary is a more significant feature, the inland limit has been drawn to coincide with the boundary of the associated land based NCA.

3.4 Existing Character Assessments

Landscape and Seascape Character Assessment

The landward limits of the seascape study area take reference from the existing NCA descriptions although these do not cover the marine areas or significant areas of the intertidal zone. This assessment does not attempt to redefine these land based character descriptions but uses the essence of their descriptions to inform understanding of the character elements of relevance to this study, notably landmarks and seascape associations. The extent of those land based character areas of relevance to the study area are illustrated in Figures 1.3 and 2.3.

It is acknowledged that NCA descriptions are currently undergoing review and the draft format of these has been considered in the structure of this assessment to ensure continuity in focus where relevant to the strategic level of study.

County and District scale landscape character assessments co-incident with the study area have not been reviewed within the scope of this assessment as their level of detail is not proportionate to the scale of study. The exception to this has been the Dorset Coast study and East Midlands Regional Landscape Character Assessments where these make explicit reference to seascape areas and also draw reference from the Draft SCA approach.

Marine and Coastal Biodiversity Characterisations

The Marine Natural Area and Coastal Natural Area descriptions provide an invaluable reference point for understanding biodiversity associations within the marine and coastal environment.

The Marine Natural Areas define broad natural divisions in the marine environment, emphasising the importance of natural processes and the interaction with geology, wildlife and human activity.

The boundaries between adjacent Marine Natural Areas are partly based on the 50 metre isobath, which generally delineates the well-mixed and seasonally stratified water masses which tend to define the dispersal of plankton and therefore determine the location of biological food chains. The offshore extent of Marine Natural Areas is the 200 nautical mile limit or the median line of UK Controlled Waters.

The Coastal Natural Areas (which extend from about 6 nautical miles to above Mean Low Water) are identified by their unique combination of physical attributes, wildlife, sea and coastal use and culture. Areas are delineated by the coastal process cells and sub-cells in which sediment movement is largely contained within discreet zones. However, the Marine Natural Areas span much greater areas as they reflect other, broader scale processes and the need to take account of large areas for pelagic species.

Historic Landscape and Seascape Characterisations

The extent of Historic Seascape Characterisation is currently limited in respect of coverage of the English coastline and is only coincident with the Withernsea to Skegness extents in relation to this seascape study. As its coverage isn't consistent for the whole of the study area it was only referenced in a general sense in anticipation of it providing a more comprehensive reference source in future studies.

The historic assessment describes the study area in respect of character type in the intertidal and marine landscape and maps these as character areas drawing reference from past and present uses, perceptions and archaeological potential. The detail is at a much finer grain of

character area definition than that of the strategic study but the mapping allows some broad scale associations to be made in respect of land use influences in particular.

3.5 Field Study

Within the limited timeframe available it was only possible to validate and inform the desk study work with a select number of field study reference points to inform the assessment. This representation did however address both land and sea based reference points in order to illustrate the extent of topic coverage. The focus of the field study work was on the refinement of character area boundaries, with particular reference to the spatial, aesthetic and perceptual qualities which are otherwise limited within desk study analysis.

Outputs

A representational field survey point has been recorded for character areas 5 to 11 to provide a reference point for field survey interpretation (survey sheets located in Appendix 8 and field survey locations shown in Figures 1.13 and 2.12 in the appendices). It was not possible to include field survey points for character areas 1 to 4 as areas were too remote to be accessed by the survey boat.

A more extensive contextual record of field survey points in an un-typed format has been included to provide a further evidence base of field information should it be required (survey sheets located in Annex 3 and field survey locations shown in Figures 1.4a, 1.4b and 2.4).

Photos were taken extensively to record both the individual field survey points and the wider context character. The resulting images have been used to illustrate character area descriptions and field survey sheets and are also available as an electronic copy photographic record.

In addition to the field form and photographic record carried out at each field survey location a map was annotated to record significant features or character defining elements as well as perceptual character changes (refer to Annex 3). This was considered the most practical and time efficient method of recording characteristics across the study area.

Variables

Expectations of coastal activity were typically under-represented due to the seasonal nature of marine activities such as fishing and recreational sailing. Areas of the coast which are extensively potted/fished in summer months appeared devoid of activity at the time of field visit and so analysis of uses of the coast relied on desktop information and assumption and would require seasonal validation.

Similarly, climatic conditions, although important to a general perceptual/aesthetic association, are a very variable influence on activities and perception of seascape and a visit at one moment in time cannot be considered to be definitive.

From the sea based assessment it was possible to validate the following parameters.

- Character within 3km of the coastline is heavily influenced by what is happening at the coastal edge and activities close to shore.
- Character within 3-5km of the coastline is still influenced by the coastal edge but more limited to prominent features such as distinctive landforms or vertical structures.
- Beyond the 5km distance from the coastline the land becomes less significant and there is a more open water character although broad or distinctive geographic features

or distinctive vertical structures such as lighthouses or telecommunication masts still impart on the perceived character. The character is however more influenced by offshore activity such as commercial shipping or fishing boats and by the weather conditions at the time. Although these activities are perceived as visual character influences they are often reflective of processes below sea level (e.g. water depth or biodiversity) and hence inherently representational of wider contextual character influences.

- The influence of offshore windfarms and gas platforms was typically noted to be visible across long distances but didn't affect the perceived character until around 5km when their size and form would then begin to dominate.

4 Classification and Description

4.1 Introduction

The initial desk top survey stage identified a substantial and diverse baseline resource with a complex level of inter-relationships and detail. It was however possible to identify within these a number of key references and processes with a bearing on a strategic scale of interpretation of seascape character. These related to a combination of above and below sea level influences:

- Natural Marine Areas
- Coastal Marine Areas
- National Character Areas
- Coastal processes
- Bathymetry
- Sea and coastal use
- Visual influences

This does not discount the relevance of other reference sources but highlights those of most immediate significance. Whilst the relevance of the majority of these influences could be interpreted from mapped or documented evidence, visual influence required a more intuitive interpretation.

Those areas of seascape within approximately 5 kilometres of land retained a perceptible visual association with the land and could therefore be appropriately characterised by associated land related influences. Those areas of seascape beyond the 5 kilometres had a more open water character where land became less significant. Beyond the point at which land was no longer visible the character was much more remote and was characterised largely by marine activities.

4.2 Mapping

The purpose of the characterisation process has been to define distinct areas of varying character, however it should be noted that the typical lack of physically perceptible boundaries within the seascape context means that such delineation has the potential for variation within or beyond these lines. The weather in particular is a notable influence where visual associations form a defining aspect of the character definition. Boundaries are therefore effectively transitional rather than exact for the purposes of the current level of assessment and may extend over several hundred metres where not bounded by coastline.

Character areas which extend beyond the MMO Marine Plan study area limits are shown unbounded in extent as it hasn't been possible to validate where these end, taking account of the scale and time constraints. Individual character areas are illustrated in Figures 1.13 and 2.12 and the boundaries of these character areas have also been recorded as a GIS mapped data layer.

4.3 Database

A database record of information assessed to inform the characterisation is included in Appendix 4. The data is listed under subject heading for each of the Marine Plan areas

considered in this assessment to provide a reference source of more specific topic information. The key points described within the database are graphically illustrated within the figures in Appendices 1 and 2. There is future scope for elements of this database to be hyperlinked to map reference points.

4.4 Character Areas

Character areas have been defined as the product of broad associations of distinct elements. These fall broadly into those within a perceptible visual influence from land and those areas which are offshore where the influence is derived from below sea level processes which may in turn present themselves as surface sea use activities. Where areas associate with perceptible land influences, these are typically given land defined area names. Refer to Figures 1.13 and 2.12 for the extent and naming of character areas identified as an outcome of this assessment.

Boundaries are open ended and approximate in position. As such the limits of character areas at unbounded extents are not defined within the scope of the study and will need to be validated by further survey work within adjacent Marine Plan Areas.

Following consideration of the detail within the various topic headings, the baseline context was interpreted into the individual character areas to define their key characteristics, physical influences, cultural influences and aesthetic and perceptual qualities. The characterisation does not go so far as to identify forces for change or objectives as the focus is on providing an understanding of baseline context rather than to make judgement on the significance of the resource.

With the relative scale of this characterisation process, The Humber Estuary and The Wash have been delineated as individual character areas due to their generally enclosed nature, their closer visual association with the surrounding landscape and their identifiable estuarine characteristics. Smaller estuarine environments such as The Exe estuary have been excluded from the physical extent of the seascape character area boundary as their scale would be more identifiable with the land based character areas at the current scale level of assessment.

In terms of naming character areas it was ultimately considered important to retain some element of geographic name associations, particularly where these could appropriately be related to land influences and thereby associate with the area. Distinctive physical features such as water depth, geological features or sea use were also considered as prompts to add a further element of orientation around a perceptible feature so that the basis of the area boundary could be understood in the context of more remote offshore areas.

5 Character Area 1 – Dogger Bank

5.1 Key Characteristics

The key characteristics of the area are summarised below. The corresponding baseline data which informs the character definitions has been included in Appendix 4 and the associated field study reference sources have been included in Appendix 8 and Annex 3.

- Extensive areas of relatively shallow waters;
- Visually unified and expansive open water character;
- Widespread sand bank habitat;
- Important for fish spawning habitats and fish nursery areas;
- Expansive seascape with few surface features;
- Important archaeological potential of 'Doggerland';
- Large area designated for Round 3 wind farms.

5.2 Physical Influences

The Dogger Bank Seascape Character Area is dominated physically by the large submarine plateau which is the north westerly extent of 'Doggerland' (an area of approximately 17,600km² that rises about 45m above the surrounding seabed). The boundaries of the area broadly follow the -50m Chart Datum contour of Dogger Bank to the north and the -30 m contour of the Outer Silver Pit to the south. The area has no visual link with any landmass.

The bedrock of the area is rarely exposed on the seafloor as it is largely buried under Pleistocene and Holocene sediments. The raised area forming the Dogger Bank consists largely of glacial outwash deposits that have resisted erosion during the Holocene. These well-bedded deposits form a raised feature that influences the convergence and mixing of Atlantic water and residual flows from the English Channel.

Within the Area the seabed is composed predominantly of sand with patches of gravel, sandy mud and sandy gravel.

The bathymetry is generally less complex than areas within the coastal zone with the large offshore sandbank creating an extensive, flat area where the water depth does not generally exceed 20m, and may be considerably less in limited locations.

One of the most distinct water stratification fronts in the North Sea, 'the Flamborough Front', forms the northern boundary to this Character Area. This front occurs between the deeper waters to the north and the vertically mixed waters to the south of Flamborough Head which are permanently mixed. These frontal regions represent important physical, chemical, and biological boundaries which have a significant influence in the distribution of plankton.

These waters support important commercial fisheries, with several species of fish feeding directly on plankton. In addition to these species, plankton has a fundamental role in the food chain of many species of benthic and pelagic wildlife, including jellyfish and non-exploited fish such as the basking shark.

The area is also important for marine birds which feed on species of fish which take advantage of the sandy banks to spawn.

5.3 Cultural Influences

The character area has limited surface water features, with only a small number of gas platforms towards the southern boundary and navigation buoys. The area is also crossed by a number of active chemical and gas pipelines.

Its significance as an offshore feature is demonstrated by the naming of the large weather area of Dogger which features within the unique and distinctive BBC Radio 4 shipping forecasts and therefore is generally understood by those navigating at sea.

The Dogger Bank character area is an important offshore fishing area and part of a larger spawning grounds for herring, sprat and sole in addition to being a nursery ground for sprat and whiting. The western extent of the character area also forms part of a sand eel spawning and nursery area.

The Dogger Bank has been a commercial fishing ground for centuries, with cod, plaice and herring being especially abundant.

The area is part of a wider RAF military practice area, with the eastern part of Dogger Bank presently used as a submarine exercise area.

The extensive bank has a maximum tidal range in the area of c. 2-3m which creates a major navigation hazard for North Sea traffic. This is evident through the lower rate of sea traffic than surrounding areas.

The Dogger Bank character area has been shaped by thousands of years of dynamic sea level changes and erosion and deposition. The area is thought to have been formed c. 8700 Before Present. The relatively shallow nature of the sea bed means that the area was at one time dry land, almost certainly in the Upper Palaeolithic, Mesolithic and probably in the Neolithic periods.

The Mesolithic buried landscape of 'Doggerland' contains archaeology including human artefacts, flints, spear-heads, and mammal remains. There has reportedly also been Pleistocene fauna trawled from Dogger Bank, which consisted of mammoth and rhinoceros teeth.

A large proportion of the character area (approximately 50%) is designated for Round 3 wind farms.

5.4 Aesthetic and Perceptual Qualities

Deeper waters of the North Sea are visually unified by merit of consistent horizons across extensive and unchanging tracts of open water.

There is a much more remote and isolated quality to the seascape where sight of other marine vessels, swooping birds and other wildlife become more important within the sense of perception.

Unlike the shallower coastal waters where tidal dynamics, prevailing weather conditions and land based orientating landmarks are perceptible, there is a sense of disorientation due to a lack of visual cues. Views of the seascape become more searching in nature as a consequence and the presence of offshore activity and wildlife add a sense of familiarity to an otherwise remote environment.

Without sight of land the swell of waves and breakers become more dramatic, unsettling and sometimes threatening.

With fewer visual associations views become much more panoramic in nature and the seascape becomes monochrome and monotonous in character. Climatic conditions influence the perception of seascape and sensory experiences of sounds and smells become more important.

6 Character Area 2 – Dogger Deep Water Channel

6.1 Key Characteristics

The key characteristics of the area are summarised below. The corresponding baseline data which informs the character definitions has been included in Appendix 4 and the associated field study reference sources have been included in Appendix 8 and Annex 3.

- West-to-east deep channel which cuts across the south of Dogger Bank, known as the Outer Silver Pit;
- Broad channel at 175km at its widest point with waters deepening to 60-70m in places;
- Expansive seascape with small concentrations of gas platforms;
- Significant fisheries area because of important fish spawning and nursery habitats;
- Once a lake with tributaries running into it from Dogger Bank;
- Designated as a military practice area;
- Major North Sea navigation route;
- Extensive area designated for Round 3 wind farms;
- Localised concentration of gas platforms.

6.2 Physical Influences

This broad deep water channel also known as Outer Silver Pit, cuts across the south of Dogger Bank where the waters deepen to 60-70m in places although there are localised shallower areas in the south eastern corner in the region of 30m deep. On the southern side of the channel the waters become shallower around a large accumulation of sediment. The gradients of the channel are relatively shallow in nature.

At its widest, the channel is in the region of 175km and as such is a significant bathymetric feature.

The geology of the area is a complex anticline of Jurassic and Triassic bedrock overlain by glacial till (clay, sand and gravel debris deposited from ice sheets along with some early Holocene deposits of sand and peat) known as the Elbow formation. The Outer Silver Pit at its deepest points is dominated by these muddy, sandy shelf subtidal sediments.

The channel has been shaped by thousands of years of dynamic sea level changes, erosion and deposition. It is thought to have been a lake and sea embayment fed by what was once a land bridge between the UK and mainland Europe and what is described as 'Doggerland'. Silver Pit which lies to the east of Spurn Head is thought to be a tunnel valley formed by sub glacial erosion which flowed into this lake and is 80m deep in places.

A crater like structure which was later named the Silverpit crater after the Silverpit fishing grounds was discovered during seismic data analysis collected during gas exploration. It lies under 1000m of sediment and is about 3km in diameter. It is the focus of much speculation as to whether it is a meteorite impact crater or the result of a geological process.

One of the most distinct water stratification fronts in the North Sea, 'the Flamborough Front', forms the north western boundary to this Character Area. This front occurs between the deeper waters to the north and the vertically mixed waters to the south of Flamborough Head which are permanently mixed. These frontal regions represent important physical, chemical, and biological boundaries which have a significant influence in the distribution of plankton.

These waters support important commercial fisheries, with several species of fish feeding directly on plankton. In addition to these species, plankton has a fundamental role in the food chain of many species of benthic and pelagic wildlife, including jellyfish and non-exploited fish such as the basking shark.

These waters are an important offshore fishing area and form part of larger spawning grounds for herring, sprat and sole in addition to being a fish nursery ground for sprat and whiting. The western extent of the character area also forms part of a sand eel spawning and nursery area.

6.3 Cultural Influences

The seascape character area supports a diversity of different activities. Fishing and shipping are amongst the most abundant and recognise the relative depth of water conducive to navigation.

The name Outer Silver Pit is thought to have been a name used by generations of fishermen who fished these deep waters. Fishing deep water holes was regarded as particularly fruitful and so these deeper tracts of water became recognised and named areas.

The principal fishing activity in the area is beam trawling for white fish such as cod and whiting and flat fish such as sole and plaice and is closely linked with Dogger Bank which has also been a high yielding commercial fishing ground for centuries.

Shipping is a significant activity that occurs within the area and is a major navigation route for North Sea traffic with key links between Newcastle and mainland Europe navigating these waters.

The waters fall entirely within a major offshore military practice area. Submarines use the deeper waters as an exercise area with smaller areas demarcated as depth charge testing areas.

There are a small number of active gas fields which lie within, or partly within, the character area. The gas here is taken via submerged pipelines to Easington Gas Terminal which is located at Easington in the East Riding of Yorkshire, north of Spurn Head at the mouth of the Humber.

An extensive Round 3 wind farm allocation coincides with this seascape character area.

6.4 Aesthetic and Perceptual Qualities

Deeper waters of the North Sea are visually unified by merit of consistent horizons across extensive and unchanging tracts of open water.

There is a much more remote and isolated quality to the seascape where sight of other marine vessels and bird life become more important within the sense of perception.

The enormous scale of commercial vessels operating with regular frequency is a notable feature of the seascape environment. The industrial nature of commercial vessels is at odds with the wild and natural qualities of the open sea.

Views of gas platforms create an industrial and sometimes ethereal character, though the built intervention is typically at odds with the wild and natural qualities of the open sea. Despite the focus of activity they provide, they also amplify the contrast with the isolation and sense of remoteness which otherwise typifies the area. Platforms become visually imposing features within 5km of their location.

Unlike the shallower coastal waters where tidal dynamics, prevailing weather conditions and land based orientating landmarks are perceptible, there is typically a sense of disorientation due to a lack of visual cues. Views of the seascape become more searching in nature as a consequence and the presence of offshore activity and wildlife add a sense of familiarity to an otherwise remote environment.

Without sight of land the swell of waves and breakers become more dramatic, unsettling and sometimes threatening.

With fewer visual associations and a typically monochrome and monotonous seascape character, views become more searching in nature. Climatic conditions influence the perception of seascape and sensory experiences of sounds and smells become more important.

7 Character Area 3 – East Midlands Offshore Gas Fields

7.1 Key Characteristics

The key characteristics of the area are summarised below. The corresponding baseline data which informs the character definitions has been included in Appendix 4 and the associated field study reference sources have been included in Appendix 8 and Annex 3.

- Concentrations of offshore gas extraction and aggregate extraction activities that are nationally important;
- Extensive shallow offshore waters generally below 30m;
- Represents some of the UK's most extensive stores of shallow subtidal sediments;
- Series of submerged long straight sand banks and tidal sand ridges which pose navigational difficulties;
- Widespread sand bank habitats that support large fish spawning and fish nursery grounds;
- Commercial offshore activities such as fishing, dredging and dumping have a localised influence on benthic and pelagic environments;
- Significant fisheries areas.

7.2 Physical Influences

The bedrock of the area is rarely exposed on the seafloor as it is largely buried under Pleistocene and Holocene sediments and these are composed predominantly of sand with patches of gravel, sandy mud and sandy gravel. Despite the generally shallow nature of these waters the underlying geology is complex and includes a concentration of offshore gas extraction activities.

Much of the southern North Sea contains hydrocarbon stores which are the product of millions of years of geological development and climatic change which saw the burial of prehistoric Carboniferous coal forests. Huge pressures associated with the overlying rock formations converted these forests into extensive coal measures and gas stores.

Overlying these are permeable reservoir rocks which were the product of varying successive desert environments. The permeable rocks which contain these gas stores were capped by the impermeable salt stores and mudstones which were deposited over these sands by an evaporating body of sea. More recent trap structures which have formed by the deformation of rock layers have made these gas reserves accessible by offshore drilling.

The complex geological structure associated with the North Sea Basin and the higher occurrence of geological trap structures within this seascape character has led to a higher concentration of offshore gas extraction activity.

The United Kingdom's Exclusive Economic Zone defines the rights over the exploration of these marine resources, and the outer extent of this zone marks the eastern boundary of the seascape character area.

South of the Outer Silver Pit, the bathymetry becomes much shallower with much of the area being less than 30m in depth. The exception to this is the significant bathymetric feature of Silver Pit which lies to the east of Spurn Head. This is thought to be a tunnel valley formed by sub glacial erosion and is 80m deep in places.

The sandbanks are a notable bathymetric feature of these waters with Burnham Flats and Docking Shoal north east of The Wash merging northwards into the offshore sand banks of The Race Bank, The Ridge and Dudgeon Shoal.

These sandbanks form part of a wider series of sand banks and tidal sand ridges in the area which are generally straight in form and run broadly parallel to the general coastal geometry in a north-west to south-east direction. These are thought to be related to systems of ebb or flood dominant channels with older banks thought to have been formed after the last glaciation before sea levels reached their current depths. The banks are believed to comprise sediment storage up to 10m deep.

The widespread sand habitats within this character area are important within the wider ecosystem of the southern North Sea. These shallow sediment habitats support important commercial fisheries, the variety of sediment habitats providing ideal spawning and nursery grounds for a large range of commercially important fish species and habitat for shellfish species.

The well mixed shallow nature of the water column supports plankton blooms which have a fundamental role in the wider ecosystem, providing direct feeding opportunities or cumulative feeding opportunities for a wide variety of marine fauna, creating a complex and abundant food chain.

Particularly important habitats within these waters which have formed because of the nature of the mixed sediments present are the Sabellaria spinulosa reefs. These are solid reef structures created by small tube building polychaete worms that stabilise mixed sediment grounds. These reefs, once established, create an important habitat to the wider ecosystem.

These reefs and sandbank habitats are at risk from commercial trawling and dredging activities which has led to protective ecological designations.

7.3 Cultural Influences

The seascape character area supports the largest concentration of commercial extractive activities in the southern North Sea due to the concentrations of gas fields and aggregate deposits. Associated with this, the seabed is extensively crossed by a number of active chemical and gas pipelines.

Gas was first discovered in the North Sea in 1965 in an area that is now known as the West Sole Field. Several licensed gas fields are exploited under these waters with the gas being brought via submerged pipelines to three of the UK's main gas terminals located along the coast where the gas is processed and distributed via the National Transmission System (NTS).

Easington Gas Terminal is located at Easington in the East Riding of Yorkshire, north of Spurn Head at the mouth of the Humber. It deals with gas fields that are located about 70km off the coast.

Theddlethorpe Gas Terminal is located on the Lincolnshire coast close to Mablethorpe and collects gas from a series of gas fields which are over 120km off the coast.

Bacton Gas Terminal is located on the North Norfolk coast between Bacton and Mundesley. It is one of the largest gas developments in the country and not only distributes gas via the NTS but also supplies gas to Belgium via the 235 kilometre pipeline Interconnector system which when in reverse mode is used to import gas into the UK facilitating energy trading.

The gas fields under these waters and the infrastructure that is in place are of a national political importance as they heavily contribute to both the UK's energy needs and to the UK's economy.

The shallow mixed sediment environment contains some of the UK's most important marine aggregate resources and provides almost half of all the UK's marine construction aggregate.

Like most of the North Sea these waters are known for being highly rich commercial fishing grounds and the sand habitats support extensive spawning and nursery grounds for a variety of commercial fish species as well as supporting large concentrations of shellfish and crustacean fisheries such as whelk. Apart from the extensive crab and lobster potting, fishing activities that take place in these waters include long-lining and some netting for cod, roker, sole and brill, trawling for demersal fish by beam trawlers and shrimp trawling for brown and pink shrimp.

Shipping is also a significant activity that occurs within the area, with some of the world's busiest shipping lanes associated with key trade and passenger links between the major east coast UK ports and mainland Europe. The shallow offshore waters and the series of sand banks and tidal sand ridges are recognised as being hazardous to navigation.

Extending into the northern part of the seascape character area is a significant submarine practice area, the diverse bathymetry providing excellent training opportunities.

7.4 Aesthetic and Perceptual Qualities

Deeper waters of the North Sea are visually unified by merit of consistent horizons across extensive and unchanging tracts of open water.

There is a much more remote and isolated quality to the seascape where sight of other marine vessels, swooping birds and other wildlife become more important within the sense of perception.

Views of gas platforms create an industrial and sometimes ethereal character, though the built intervention is typically at odds with the wild and natural qualities of the open sea. Despite the focus of activity they provide, they also amplify the contrast with the isolation and sense of remoteness which otherwise typifies the area. Platforms become visually imposing features within 5km of their location.

Unlike the shallower coastal waters where tidal dynamics, prevailing weather conditions and land based orientating landmarks are perceptible, there is typically a sense of disorientation due to a lack of visual cues. Views of the seascape become more searching in nature as a consequence and the presence of offshore activity and wildlife add a sense of familiarity to an otherwise remote environment.

Without sight of land the swell of waves and breakers become more dramatic, unsettling and sometimes threatening.

Despite the increased occurrence of offshore structures views are panoramic in nature and the seascape becomes monochrome and monotonous in character. Climatic conditions influence the perception of seascape and sensory experiences of sounds and smells become more important.

8 Character Area 4 – East Anglian Shipping Waters

8.1 Key Characteristics

The key characteristics of the area are summarised below. The corresponding baseline data which informs the character definitions has been included in Appendix 4 and the associated field study reference sources have been included in Appendix 8 and Annex 3.

- Dense concentration of shipping activity;
- Consistently deep water between 20 and 50m;
- Designated shipping routes;
- Visually unified and expansive open water character with few surface features;
- Large areas designated for Round 3 wind farms;
- Extensive offshore commercial activities such as fishing and dredging;
- Large military practice area;
- Windfarm developments and gas fields.

8.2 Physical Influences

The bedrock of the area is rarely exposed on the seafloor as it is largely buried under Pleistocene and Holocene sediments and these are composed predominantly of gravel based shelf-subtidal sediments.

The offshore bathymetry is relatively simple with water depths ranging between 20m and 50m and there is a general southward littoral drift with tidal currents increasing in movement towards the Dover Straights and the English Channel.

Gravel habitats found in these deeper offshore areas tend to be less disturbed than those found closer inshore and so support a diverse marine fauna including anemones, polychaetes, bivalves and amphipods, and both mobile and sessile epifauna.

Particularly important habitats within these waters which have formed because of the nature of the mixed sediments present are the Sabellaria spinulosa reefs. These are solid reef structures created by small tube building polychaete worms that stabilise mixed sediment grounds. These reefs once established create an important habitat to the wider ecosystem.

These reefs are at risk from commercial trawling and dredging activities which has led to protective ecological designations.

The benthic habitats present in these waters support concentrated spawning and nursery grounds for a diverse variety of commercially fished species such as cod, plaice, sole, mackerel and herring.

8.3 Cultural Influences

The seascape character area supports a diversity of different activities. Fishing and shipping are the most predominant in recognition of the relative depth of water.

The North Sea waters contain some of the world's busiest shipping lanes and the waters here are intersected by trade and passenger shipping associated with North Sea and Baltic ports which are some of the worlds busiest.

Marine traffic is diverse with fishing boats, service boats for offshore industries and cargo ships as well as pleasure craft. There are also substantial zones in the south of the character area which are naval exercise and practice areas.

The broadly uniform water depths afford safe movement but the volume of vessels make navigation difficult and potentially treacherous. Routeing systems such as Chartered Traffic Separation Schemes and Deep Water Routes are imposed and these specially surveyed tracts of water are closely monitored so as to prevent environmental accidents in these busy waters. The waters therefore associate with a strict and organised operational context.

Like most of the North Sea these waters are known for being highly rich commercial fishing grounds and the benthic habitats support extensive spawning and nursery areas for a variety of commercial fish species

There are a small number of active gas fields which lie within, or partly within, the character area. The gas here is taken via submerged pipelines to Bacton Gas Terminal which is located on the North Norfolk coast between Bacton and Mundesley. The 235 kilometre pipeline Interconnector system which acts as a gas transporter between the UK and Belgium crosses the character area.

The shallow mixed sediment environment along this stretch of coast contains some of the UK's most important marine aggregate resources and cumulatively provides almost half of all the UK's marine construction aggregate.

The exposed and open nature of the seascape is evident in the number of wind farms proposed for this area. Two offshore wind farms are being constructed with another having been consented and a large proportion of the character area (approximately 70%) has been classed as a Round 3 wind farm zone.

8.4 Aesthetic and Perceptual Qualities

Deeper waters of the North Sea are visually unified by merit of consistent horizons across extensive and unchanging tracts of open water.

There is a much more remote and isolated quality to the seascape where sight of other marine vessels, swooping birds and other wildlife become more important within the sense of perception.

The enormous scale of commercial vessels operating with regular frequency and the complex network of routes create an unsettling character where safe passage relies on awareness and adherence to shipping routes. The industrial nature of commercial vessels is at odds with the wild and natural qualities of the open sea.

Unlike the shallower coastal waters where tidal dynamics, prevailing weather conditions and land based orientating landmarks are perceptible, there is typically a sense of disorientation due to a lack of visual cues. Views of the seascape become more searching in nature as a consequence and the presence of offshore activity and wildlife add a sense of familiarity to an otherwise remote environment.

Without sight of land the swell of waves and breakers become more dramatic, unsettling and sometimes threatening.

Despite the increased occurrence of offshore structures views are panoramic in nature and the seascape becomes monochrome and monotonous in character. Climatic conditions influence the perception of seascape and sensory experiences of sounds and smells become more important.

Wind farm developments are significant features within the perceived seascape and their scale and form contrasts with the vast featureless seascape context.

9 Character Area 5 – Holderness Coastal Waters

9.1 Key Characteristics

The key characteristics of the area are summarised below. The corresponding baseline data which informs the character definitions has been included in Appendix 4 and the associated field study reference sources have been included in Appendix 8 and Annex 3.

- Expansive, sweeping, fragile coastline suffering from severe erosion;
- Extensive soft glacial till cliffs;
- Heritage coasts of Flamborough Head and Spurn Head to the northern and southern extents;
- Open, exposed character by merit of low lying coastal topography and an absence of vegetation;
- Large and featureless seaward horizon;
- Flat topography results in the views of the seascape from land being generally restricted to coastal towns and immediate cliff edges;
- Heavily potted coastal waters with strong fishing heritage;
- Generally shallow waters which preclude commercial shipping;
- Submerged gas pipelines and Easington Gas refinery;
- Military practice area.

9.2 Physical Influences

The majority of the coastline along the Holderness Coastal Waters Seascape Character Area is highly dynamic with the highest erosion rates in Europe along virtually the whole length of the coastline. The only exception to this is the chalk cliffs at Flamborough Head. The soft glacial till cliffs emerge at Kilnsea and slowly rise along the coastline before being lifted by the underlying chalk at Sewerby to produce dramatic chalk cliffs.

The glacial till cliffs are erode through repeated landslide activity at an average rate of 1.6 metres per year and produces a significant supply of sediment to the coastal environment of the southern North Sea. The rate of erosion is however subject to much localised variation with the possibility of many meters being washed away in a single incidence. The Holderness coastline has retreated by around 2km over the last 1,000 years causing the loss of 26 villages listed in the Domesday survey of 1086.

The erosion creates a coastal zone which is unsettling and dangerous with coastal waters that are brown and turbid with sediment. There are localised areas of temporary stability where sea defences have been installed, however in some cases this is leading to increased erosion rates further along the coastline. The vulnerability of the coastline is illustrated at the various caravan parks where the loss of pitches and infrastructure to the sea is clearly evident.

The soft glacial till cliffs were created by the rapidly rising post-glacial North Sea cutting into substrate, creating cliff faces up to 35 metres in height and extending for almost 60 km coincident with the character area. They are composed of a mixture of mud, sand and gravel, with muds forming by far the largest fraction (approximately 70-75%), the remaining 25-30% being mostly sand with boulders and cobbles forming only about 1% of the total cliff mass.

The beaches of the Holderness coastline are generally thin, seasonal and fragile with the underlying clay often exposed after storms.

The foreshore along the Holderness Coastal Waters is characterised by sandy shingle, which form low, southward-migrating bars oblique to the shore. Between the bars there may be little beach sediment or none at all. To the south of Flamborough Head, the Smithic Sand is a 10km long sand bank at the centre of a tidal circulation and at the southern end of this stretch of coast Spurn Head forms a shingle spit 5 km long which carries a capping of blown sand.

At the northern end of Seascape Character Area the 30-50m high near-vertical chalk cliffs at Flamborough Head are recognised as one of the outstanding coastal landforms of the region. This extent of chalk cliffs presents nearly 9% of Europe's coastal chalk and is the most northerly outcrop of coastal chalk in the British Isles and a visually imposing feature.

The geology of the coastline is underlain by Upper Cretaceous fine grained limestones (Chalk Group), which extends from north-east Norfolk to Flamborough Head (often referred to as the East Midlands Shelf). The overlying sediment geology is predominantly sandy gravel, which gives rise to an offshore morphology which includes subtidal sand and gravel banks, such as Smithic Sands in Bridlington Bay and banks off the north Lincolnshire coast.

Along the Holderness coastline the sediment released from the eroding cliffs is typically transported in a southerly direction by wave-driven systems, resulting in the deposition of sediments along Spurn Point and the Lincolnshire coastline.

Along the Holderness coastline, a gently sloping clay platform extends from the shoreline for several kilometres. The bathymetry in this area is relatively simple with shore-parallel bathymetric contours. The sea bed remains shallow for some distance offshore along much of the coastline, with very extensive areas of sublittoral sediment. This shallow nature coupled

with tidal energy is generally sufficient to keep the water column well mixed through most of the year.

To the northern edge of the area is the “Flamborough Front”, a tidal front marking the boundary between deeper stratified waters to the north and vertically well mixed water masses to the south. These fronts are of biological significance as they are usually rich in plankton which attracts fish, birds, cetaceans and other marine life.

Along the length of the coast, shallow subtidal sediments form a broad habitat type. A significant chalk habitat exists around Flamborough Head where a reef formation supports extensive kelp forests growing in the exceptionally clear waters.

At Easington and Spurn Point, the sandy shingle beach habitats form important nesting sites for ringed plover and little tern. The tide-line throughout the area is used by a number of species such as Oyster Catcher and gulls.

9.3 Cultural Influences

The North Sea is an important focus for fishing activity and this stretch of the coastline is home to what was one of the most prolific fishing ports in the region, that of Bridlington. Although the fishing industry declined, the port remains a popular angling centre, is popular with divers visiting local shipwrecks and well used by recreational sailing boats.

This stretch of coastline is renowned for its shellfish fisheries in particular lobster, edible crab and whelks and is heavily potted. It is also an important spawning area for herring, lemon sole, sole, sand eels and sprat and nursery grounds for cod, whiting, plaice, lemon sole, sand eels and sprat.

The coastline is also known as a popular sailing area and the entire stretch of coastline is designated as a RYA Sailing Area with designated racing areas existing in the northern and southern extents.

Approximately half of this character area is designated as a military practice area, the most notable being the Flamborough Head submarine practice area. The active use of these waters are demonstrated in significant wreck clusters particularly near Flamborough Head and Bridlington and along the 12 nautical mile territorial water limits.

A localised area licensed for commercial dredging exists in the southern extents of the seascape character area but this is not a widespread activity within these coastal waters. Gas pipelines underlay a significant proportion of the character area and arrive at Easington Gas Refinery from offshore gas platforms of the southern North Sea.

Significant on shore wind farm developments along the coast are clearly visible from the sea, accentuated by the open and regular topography of the landscape, and provide significant visual landmarks. The seascape is subject to proposed round 2 offshore wind farms, which is likely to significantly increase the number and concentration of off-shore winds farms visible both at sea, and from the coastline.

9.4 Aesthetic and Perceptual Qualities

The seascape has a rugged and dynamic sense of place intimately linked with the obvious coastal processes and erosion that is occurring extensively along this coastline. These processes contribute to a sense of fragility and vulnerability.

The lack of coastal development and vegetation creates a very open, remote and exposed character to the seascape except in the northerly extents where the unique and scenic chalk cliffs at Flamborough Head creates a sense of enclosure and containment.

The seascape is generally experienced only from the edge of the land mass and as a result concentrated on views from settlements and access points at the coastal interface. Views are generally wide in nature due to the low land influence, absence of intervening built form and broadly linear geometry of the coastline. Seaward views are over a large and featureless seaward horizon.

Despite relatively busy coastal waters hosting recreational sailing and fishing activities, the exposed nature of the coastline coupled with the temperamental marine character creates a typically unsettling and uninviting quality.

10 Character Area 6 – Humber Waters

10.1 Key Characteristics

The key characteristics of the area are summarised below. The corresponding baseline data which informs the character definitions has been included in Appendix 4 and the associated field study reference sources have been included in Appendix 8 and Annex 3.

- The second largest coastal plain estuary in the UK bounded by notable intertidal mud and sand flats;
- Humber estuary drains approximately 20% of the country;
- Consistently muddy waters derived from tidal dynamics and suspended sediment from erosion taking place along the Holderness coast;
- Internationally important wildlife habitats and spawning grounds;
- Very large tidal range with constant and powerful tidal movements;
- Constantly dredged and maintained navigation canal associated with land uses along the internal shores;
- Waters host UK's largest port complex and waters are heavily trafficked with up to 40,000 ship movements per year;
- Views are dominated by shipping traffic;
- Extensive and complex mix of industrial, commercial, agricultural, residential and tourism estuary land uses which dominate views;
- Renowned for transportation and fishing heritage;
- Spanned inland by the Humber Bridge, the fifth largest single-span suspension bridge in the world;
- Divided from the sea by the dynamic and evolving sand spit of Spurn Head;
- Waters guarded at the mouth of the Humber by two early 20th century sand forts.

10.2 Physical Influences

The Humber Estuary is 120km long, 14km at its widest point, is one of the largest coastal plain estuaries in Britain and drains a number of important rivers, in particular the Yorkshire Ouse and the Trent. It drains approximately one-fifth of England including the major conurbations of Nottingham, Sheffield and Leeds.

The geology of the coastline is underlain by Upper Cretaceous fine grained limestones (Chalk Group), which extends from north-east Norfolk to Flamborough Head (often referred to as the East Midlands Shelf). The hard wearing glacial deposits protect the mouth of the Humber from erosion processes, with the overlying sediment geology intimately linked with tidal processes.

Whereas coastal areas are influenced by wave action, the estuary is driven by the action and power of the tides. Strong tidal flows into and out of the Humber Estuary intersect the north-south tidal flow and sediment transport pathway along the open coast and acts to partially block the sediment transport preventing gravels and coarse sands from passing the estuary mouth. Fine grained sediments are trapped in banks and shoals adjacent to Spurn Head with medium and fine sand able to pass the estuary and move onto the Lincolnshire frontage where extensive open coast accretion of saltmarsh and mudflats around Cleethorpes and Humberston is occurring. Additional accretion is occurring around the convergence of the River Trent and on the mudflats of the outer estuary.

A distinctive natural landmark feature which marks the entrance to the Humber Estuary is Spurn Head. This 5.5km long narrow sand and shingle spit extends from Kilnsea Warren and is a fragile and evolving entity which has a bleak, wind blown and wild character which exists as a result of sediment accumulation. The mudflats, sand flats and salt marsh of Spurn Bight exist as a result of the shelter provided by Spurn Head.

Sediment accumulation creates a very shallow estuary and this in turn slows down tidal currents. The Hawk Channel (and further west the Sunk Channel) is a regularly dredged navigation channel running along the southern edge of the mudflats and sand flats of Spurn Bight. Navigational maintenance dredging takes place within the Humber to allow the safe functioning of the deep water channel and therefore access for large container and freight vessels.

Sunk Island was claimed from the sea between 1675 and 1970 and this acted to narrow the estuary and increase tidal current speeds. Increased wave and tidal energy is eroding the natural and man-made sea defences.

The Humber is famous for its diverse coastal habitats which support an abundance of wildlife, including saline lagoons, salt marsh, sand flats, mudflats, sand dunes and shingle bars which support breeding birds, grey seal colonies and natterjack toads as well as providing feeding and wintering areas for over 133,000 waders and wildfowl. Saline lagoons are a nationally rare habitat on which 1% of the British breeding tern colony lives and the nationally rare spiral tasselweed grows. The estuary has been given RAMSAR designation due to its important wetland features.

The intertidal areas are rich in invertebrate communities and the estuary is a major fish spawning area which supports commercial fisheries for Dover sole, plaice, cod, dogfish and eel.

The surrounding landform is generally an expanse of flat, low-lying agricultural land bordered in many places by flood embankments and fronted by mudflats, sand flats and salt marsh. The shores of the Humber estuary play host to significant urban, commercial and industrial

development which have developed as a result of its proximity to Europe and access to marine transportation routes.

10.3 Cultural Influences

The number of scheduled ancient monuments along the length of the Humber Estuary reflects the long historic importance of the estuary. The estuary has been navigated for at least 3,500 years and the significant concentrations of shipwrecks at the mouth of the Humber and around the historic port of Hull coincide with its heavy maritime past denoting the dynamic and treacherous movements of the shifting underwater terrain.

The significance of the Humber is demonstrated by the naming of the large weather area of Humber which features within the unique and distinctive BBC Radio 4 shipping forecasts and therefore is generally understood by those navigating at sea.

Significant landmarks exist in the form of the Humber Forts. Bull and Haile Sand Forts are large fortifications completed in 1919 which were constructed to protect the estuary from enemy attack and stand guard at the mouth of the Humber, which reflects the estuary's importance.

The North Sea is an important focus for fishing activity and the Humber is home to two of the most prolific fishing ports in the region, that of Kingston upon Hull and Grimsby.

Grimsby developed as a port in the medieval period based upon the fishing industry and trade with Scandinavia and Europe and expanded to be become the largest fishing port in the world in the 1940s. It has since reduced in capacity due to overfishing and fish quotas resulting in much of the former dock areas now lying in a state of disrepair.

Kingston-upon-Hull was founded in the late 12th century and during the medieval period its prosperity was based upon the export of wool to the continent. Later development included the construction of a fishing port, and forts and a castle and town defences were added in the 16th century. Ship building flourished from the 17th century and in the 18th century the port had become an outlet for manufactured goods. The town grew rapidly and during this period whalers operated from the port. In the early 19th century a new dock was built and Hull prospered. Fishing and ship-building expanded rapidly but by the mid-19th century the whaling fleet declined. In the 1930's the town suffered severely during the Depression with many dockers and fishermen unemployed. It was also badly affected by bombing raids during WWII.

The port of Goole was constructed in the 1820's after the construction of the Aire and Calder Navigation that linked the industrial cities of Yorkshire to the coast. Coal from the Yorkshire coalfields was exported through the port. Until the arrival of the railways in 1848 the town was focused around the docks, but after the construction of a new railway station in the late 1860's new development was rapid.

The Port of Immingham, a once rural agricultural settlement and submarine base in WWII is now an important industrial area and at the forefront of the UK Port industry with its prime deep water docks providing excellent access to the trade routes between the UK and Scandinavia, the Baltic states and mainland Europe. Expansion of chemical and petroleum industries fuelled a rapid expansion and today the oil refineries, petrochemical works and power stations create a very industrial character.

The Humber Estuary creates the setting for recreation and tourism opportunities with many coming to see the world famous Humber Bridge and the iconic The Deep, Hull's award-winning 'submarium', as well as the many wildlife watching opportunities along the coast.

The coastline is also known as a popular sailing area and the waters are designated as RYA Sailing and racing areas. Cleethorpes developed as a seaside holiday resort despite being on the estuarine shores and remains very popular with long sandy beaches, a resort style frontage with a popular sea front promenade and pier. Cleethorpes exhibits the highest concentration of caravans in Europe, accommodating around 6.5 million visitors/year.

10.4 Aesthetic and Perceptual Qualities

There is a powerful sense of place determined largely by enclosure, a mix of historic and modern developments, dynamic and variable intertidal areas and busy marine activity.

The influence of tidal movements, marine activity and changeable weather creates a very dynamic, interesting and variable seascape. Relatively settled waters coupled with the inter-visibility across the estuary and the sense of enclosure provided by enclosing landform contributes to a feeling of safety.

Despite the enclosed character, views are generally open and panoramic in nature due to the low topographical influence and strong visual interrelationships.

The interplay between industrial and commercial developments and natural intertidal areas leads to a complex and diverse character. The consistency of these elements creates a sense of unity and balance and contributes to a strong sense of place.

11 Character Area 7 – East Midlands Coastal Waters

11.1 Key Characteristics

The key characteristics of the area are summarised below. The corresponding baseline data which informs the character definitions has been included in Appendix 4 and the associated field study reference sources have been included in Appendix 8 and Annex 3.

- Flat, low lying dynamic coastal landscape demonstrating a complex array of natural processes;
- Wild and dynamic nature of the seascape with strong wave action over generally shallow waters;
- Shallow waters divided by a deeper water channel called The Well;
- Extensive submerged sand flats making navigation treacherous;
- Temporal seascape character heavily influenced by the tides and the exposure of vast sand flats at low tide;
- Extensive linear coastal geometry creating long sweeping views along the coastline and out to sea;
- Gently rolling dune systems and intertidal sand flats supporting a variety of coastal habitats and supporting a rich diversity of wildlife;
- Perception of land and sea is strongly influenced by dunes and intertidal areas which presents a wild and remote character;
- Remote character influenced in places by concentrated urban settlements, commercial activities and both on and offshore wind farm developments;
- Sediment accretion influencing coastal economies and altering the perceptual associations with seascape;
- Recreational value of seascape represented by coastal resorts with much of the coastal waters designated as RYA racing and sailing areas;
- Commercial offshore activities such as dredging and dumping have localised influence on benthic and pelagic environments;
- Important fisheries areas, in particular shellfish fisheries.

11.2 Physical Influences

These coastal waters are linked with a wild, natural and dynamic coastline which is subject to a complex array of natural processes that are heavily influencing the perception of seascape by their generally accretionary nature. Coastal processes link this part of the coastline with the eroding cliffs of Holderness, with sediment being eroded and transported before being deposited in the area.

The geology of the coastline is underlain by Upper Cretaceous fine grained limestones (Chalk Group), which extends from north-east Norfolk to Flamborough Head (often referred to as the East Midlands Shelf). The overlying sediment geology is predominantly sandy gravel, which gives rise to an offshore morphology which includes subtidal sand and gravel banks.

There is a predominantly southward littoral drift between the extensive salt marshes at Donna Nook and Gibraltar Point which is creating extensive open coast accretion of salt marsh at Saltfleet and Saltfleetby, and sand dunes at Theddlethorpe. Erosion of the underlying clay unit is resulting in beach erosion between Mablethorpe and Skegness which is causing beach steepening. South of Skegness dunes are building and the sand beach is extending seaward.

Similarly, between the eastern edge of The Wash and Sheringham, there is an accretionary sub-cell with a moderate westward littoral drift depositing offshore supplies of sand and silt, together with a supply of pebbles from the east. Both waves and currents are important to this sub cell with waves dominating the coastal processes east of Blakeney and tidal flows becoming important west of Blakeney Point to The Wash. Salt marsh is developing in the lee of shingle spits

This accretionary nature has created a coastline with areas designated for their landscape and ecological value.

The Saltfleetby-Theddlethorpe dunes have a rich variety of flora and fauna including the rare Natterjack toad and also supports a variety of breeding bird populations. It is for these reasons that the area has SSSI status. Parts of the sand dune system here have been given National Nature Reserve status because they demonstrate outstanding assemblages of vascular plants.

At the northern most point of The Wash sits Gibraltar Point. This key zone consists of sand dune and mud habitats which are unique because they show all stages of colonisation. In addition the site supports many rare waterfowl and it is for these reasons that Gibraltar point has been afforded SPA and SSSI status.

North east of Gibraltar point lies another large offshore area of reef and sand bank. These habitats are both Annex I habitats because they are rare and fragile within the UK and this has given the area its SAC designation named Inner Dowsing, Race Bank and North Ridge.

The entire zone between The Wash and Weybourne, which is commonly known as the North Norfolk Coast, is dominated by estuary, mud flats and sand flat habitats. It is designated as a SAC because of its variety of Annex I habitats and the large number of wildfowl it supports in particular. Titchwell Marsh is one of the RSPB's most popular reserves and plays host to hundreds of thousands of migratory birds each year.

Sandy shingle beach habitats form important nesting sites for ringed plover and little tern. The tide-line throughout the area is used by a number of species such as Oystercatcher and gulls.

The benthic habitats of this stretch of coastline are defined by the substrate of the sea bed. A thin veneer of sub tidal unconsolidated sediment, dominated by sands, muds and gravels, is subject to natural movement and change from powerful waves coming off the North Sea. This

gives rise to a rich variety of marine fauna which is exploited by birds, predatory fish, mobile invertebrates, such as shrimps and crabs and by fishermen.

Sheltered areas close to the coastline which are generally made up of fine grained sediment provide important spawning and nursery grounds for a variety of demersal fish species which feed in the North Sea where they are fished commercially.

The presence of well mixed shallow warm waters encourages plankton growth and this in turn influences a rich ecosystem which denotes the presence of fish, sea mammal and bird populations prevalent in these coastal waters.

These waters are also effected by tidal flows into and out of the Wash and the Humber which act to mix saline water with freshwater. The volume of freshwater entering the sea from these two estuaries results in the salinity of the seawater between them being lower than the surrounding sea. In both summer and winter, salinity increases southwards down the coast of East Anglia.

The bathymetry off the coastline is relatively shallow, being generally less than 20m across the whole area. The gradient of the seabed is shallow with the 10m contour being within 5 – 10 Km from the coastline at most points.

There is a natural deep channel running along the axis of The Wash which extends out into the North Sea known as The Well. This separates the two sediment sub cells and reaches 30m below Chart Datum in places and is surrounded by shallow banks. This extends in a North Easterly direction alongside the sandbanks known as Burnham Flats and Docking Shoal. These are thought to be the remnants of deposits of peat, salt marsh and inter-tidal sands and muds which were laid down on the south bank of The Well during the early stages of sea level rise following the last glaciation.

Burnham Flats and Docking Shoal merge northwards into the offshore sand banks of The Race Bank, The Ridge and Dudgeon Shoal.

Generally the surrounding landform of the Lincolnshire and North Norfolk coasts is extremely low lying with some areas being at or below ground level, which contrast with the pronounced topography in the form of the Lincolnshire Wolds and the Cromer Ridge in the hinterland. This low landform creates a much more exposed seascape and increases the threats posed by rising sea levels.

11.3 Cultural Influences

Sediment accretion creates a dynamic and changing coastline and this is evident to see in small villages famous for their maritime and sea trading history which have been cut off from the sea and now located far inland. An example of this is Wells-next-the-sea. Once a major North Norfolk ship building and fishing port, it is now over a mile from open sea and accessible for short periods of time through a naturally maintained and winding channel on which boats regularly ground themselves.

These natural processes however have created a wild and naturally beautiful coastline and The Area of Outstanding Natural Beauty designation between Old Hunstanton and Weybourne recognises these undeveloped and natural qualities. Its designation as a Heritage coast also recognises this natural beauty.

The North Norfolk Coast Path is a 45 mile long distance footpath between Hunstanton and Cromer and is one of 15 National Trails in the country which take in areas of outstanding natural scenery and recognises the recreational value of the seascape.

The presence of beaches and the natural qualities of the coastline have led to a long association of tourism. The coastline became a popular destination for tourists during the Victorian period with the advent of the railway system and the acknowledgement of the health benefits provided by the sea. Many of the buildings and seafronts that exist in the coastal towns of this area such as Skegness, Chapel St. Leonards and Mablethorpe were constructed during this period and remain very popular tourist destinations.

Butlins at Skegness is a famous holiday camp that was set up in 1936 by Sir William Butlin and it defined the seaside resort character of this time, serving the population centres of Nottingham, Doncaster and Leicester.

The rich ecosystem which supports a huge variety of wildlife and many nature reserves also draws many visitors to the area every year.

The waters surrounding the coastline are popular with boat users and there are several marinas and harbours along this coastline that harbour recreational boats. The majority of the coastline is designated as a RYA Sailing and racing area.

The exposed and open nature of the seascape is evident in the construction of a number of land based wind farms along the coast and within coastal waters. Notably the operational offshore wind farms of Lynn and Inner Dowsing are visually prominent and can be seen from great distances to varying degrees of significance. They are significant features within the perceived seascape as their scale is at odds with the vast, expansive, low lying nature of the coastline and expansive featureless seascape and are incongruous to the character and setting of the natural environment.

Two wind farms are currently under construction further off the coast and another has been proposed.

Shallow waters and submerged sand flats make navigation dangerous and various hazards including the inner dowsing overfalls and a gravel/sand ridge are well known by those who use the sea.

The waters along this coastline are renowned as being highly rich fishing grounds and are heavily potted. Apart from the crab and lobster potting, fishing activities that take place in these waters include long-lining and some netting for cod, roker, sole and brill, trawling for demersal fish by beam trawlers and shrimp trawling for brown and pink shrimp.

Owing to the high mobility of the sediments on this part of the coast these waters are important for the extraction of marine aggregates. According to the Crown Estates 11th annual report (Marine Aggregate Dredging 2008) there are large licensed dredging areas off the coast of Saltfleet, Mablethorpe and Chapel St Leonard's.

The area also has a significant military practice area at Donna Nook where vast expanses of salt marsh play host to RAF bombing practices. This bombing range is also a renowned Grey Seal breeding area and visitors flock to the area late in the year to see the newly born seals.

11.4 Aesthetic and Perceptual Qualities

The seascape is dramatic and evocative and has a temporal and dynamic character, heavily influenced by coastal sedimentary and erosion processes and the rising and falling tides.

Expanses of vast uninterrupted sand flats and sand dunes create a natural, wild and untamed character to the coastal edge and a largely featureless horizon evokes feelings of remoteness and loneliness.

The exposed and open coastline together with changeable climatic conditions creates highly variable experiences and can induce a character that is tranquil and beautiful or unsettling and treacherous.

Views from the sea are dominated by sand dunes and coastal vegetation which are often seen at great distances because of the shallow nature of the coastal waters. The uniformity of the natural coastal edge coupled with very low topography and only occasional groups of development creates a degree of disorientation and loneliness.

In concentrated locations where human activity and development are imposing, such as where wind farms have been constructed, coastal resorts and during military training, the feeling of wilderness and remoteness is challenged and a managed and tamed quality is imposed on the seascape character.

12 Character Area 8 – The Wash

12.1 Key Characteristics

The key characteristics of the area are summarised below. The corresponding baseline data which informs the character definitions has been included in Appendix 4 and the associated field study reference sources have been included in Appendix 8 and Annex 3.

- England's largest tidal estuary;
- Extremely low lying coastal seascape containing extensive areas of inter-tidal sand banks and mudflats and a complex network of tidal creeks and inlets;
- Temporal seascape character heavily influenced by the tides and the exposure of vast sand and mud flats at low tide;
- Hazardous navigation due to shallow waters and offshore sand banks;
- Natural deep water channel at the entrance to the Wash provides access to inland navigable channels to what were once coastal ports;
- Seascape largely perceived at great distances creating panoramic views with extensive vistas to level horizons;
- Generally remote and inaccessible seascape;
- Internationally important wildlife habitat with mudflats supporting the largest numbers of migrating waterfowl of any site in the UK and waters providing important shellfish breeding habitats;
- Important fisheries with particular importance to shellfisheries;
- Very large tidal range with constant and powerful tidal movements;
- Broad visual associations with Lincolnshire Wolds to the north and Cromer Ridge to the east;
- Exposed character and changeable weather creates dynamic and variable experiences;
- Natural and remote character challenged by commercial vessel movements in deeper waters;
- Small scale human activities are typically lost within the expansive landscape;

- Noteworthy landmarks generally appear at great distance, Ely Cathedral known as the 'Boston stump' and the dramatic Hunstanton Cliffs.

12.2 Physical Influences

The Wash is a broad mouthed bay of approximately 615km² and is the largest estuarine system in the UK formed where the Rivers Ouse, Nene, Welland and Witham drain in to the North Sea.

Marine processes dominate the physical and biological characteristics despite the large freshwater input and The Wash is highly important within the context of the wider coastal environment.

The Wash Estuary is significant for its multiple environmental designations which pay tribute to the diversity of internationally important habitats present and denote the importance these waters and intertidal areas pose to wildlife.

Valuable habitats of conservation significance exist in various locations and these include estuarine environments, sea inlets, mud flats, sand flats, saline lagoons, saltmarsh, shingle structures and sand dune complexes, demonstrating varying stages in natural colonisation.

It has the second largest area of intertidal mudflats and sand flats in Britain and this provides a rich breeding ground for a variety of shellfish species. This in turn provides valuable feeding and roosting grounds for large populations of birds with The Wash supporting the largest numbers of migrating waterfowl of any site in the UK. The Wash also supports the largest colony of common seals in England and is an important spawning and nursery ground for a variety of fish species.

A variety of Lower Cretaceous and Jurassic sediments underlie The Wash and there is no significant littoral drift present. Fine sands and silts are brought in from the North Sea by tidal action and tidal currents distribute these in the sheltered low energy environment allowing saltmarsh to expand, particularly on the western and southern margins of the estuary.

The bottom deposits of The Wash range from gravel, through sand to finer muds. The central main channel at the mouth is characterised by a high proportion of gravel. Moving closer to the shore, sand, mixed with varying amounts of gravel or mud, dominates large shallow subtidal areas. Higher up the foreshore, particularly where the Great Ouse and Welland drain into the Wash, fine muddy sediments are typical.

The distinctive and imposing Hunstanton Cliffs are a natural landmark feature on the north eastern side of The Wash and these expose the underlying reddy-brown Carstone geology overlain by red and white Chalk.

The Wash has a tidal range of 6.5 metres which is the highest on the North Sea coast of Britain.

The bathymetry within the Wash embayment is generally shallow (on average less than 10m) with extensive areas of inter-tidal sand banks and mudflats. There is a natural deep channel running along the axis of the bay, known as The Well which reaches 50m below Chart Datum in places and is surrounded by shallow banks.

The surrounding landform is large-scale, flat, open landscape of a largely agricultural context relating to the extensively drained and reclaimed fens.

12.3 Cultural Influences

The Wash represents an area where the land and sea boundary is in constant flux. Sediment deposition and land reclamation have altered The Wash within historical times where several towns that were once important coastal settlements (notably King's Lynn) are now several miles inland.

More land has been reclaimed from The Wash than any other British estuary with large areas of marshland and swamp being progressively embanked and drained since Roman times. Recent shoreline retreat suggests the balance may be unsustainable.

The shallow nature of waters and the various sand banks such as Breast Sand, Bulldog Sand, Roger Sand and Old South Sand which are exposed at low tide make these waters hazardous for navigation. This is evident in the number of navigation buoys and lightships present. Despite the treacherous waters it is a RYA designated sailing area.

Maintenance dredging is also common particularly in the navigable channels leading to Boston and King's Lynn.

The Wash is renowned as a productive fishing area. It is heavily potted and other fishing activities such as shrimp trawling, dredging for mussels and suction dredging for cockles takes place within The Wash. Mussel farming activities are also present.

The area includes two military Air Weapons Ranges which are locally significant as they tend to be closely associated with the large intertidal zones.

A famous myth associated with The Wash is that King John's Crown Jewels were lost there in the year 1216.

12.4 Aesthetic and Perceptual Qualities

There is a powerful sense of place associated with The Wash due to the large and lonely expanses of intertidal areas. This, coupled with the lack of landform influence creates a highly exposed and open character to the seascape.

The seascape is dramatic and evocative and has a temporal, stark character heavily influenced by the rising and falling tides and the exposure and submergence of intertidal areas.

The generally enclosed and sheltered nature of the seascape can create a relatively safe and settled character, however the shifting shallow waters and open, exposed nature of the seascape can induce a rather unsettling and treacherous character.

Large concentrations of birdlife and the dynamic intertidal formations create a very wild and remote character which is highly evocative. The lack of imposing human intervention also adds to this sense of wilderness.

Busy shipping lanes, fishing activities and the presence of navigational marker buoys, although challenging the natural character, do not detract from the natural qualities.

The flat topography and difficulty in accessing the coastal interface over the reclaimed Fens means that the perception of seascape from land is generally limited to the accessible edges of the mudflats. Similarly, safe navigation on the sea is limited by the shallow waters created by shifting sands which precludes access close to land. As such the association with the sea is usually at great distance which leads to a rather inaccessible and remote quality.

Due to the largely inward facing nature of the area, the perception of seascape is also heavily influenced by climatic conditions and geographical aspect. This is due, in the main, to the 'horse shoe' shape of the estuary which results in north, east and west facing shores.

13 Character Area 9 – Norfolk Coastal Waters

13.1 Key Characteristics

The key characteristics of the area are summarised below. The corresponding baseline data which informs the character definitions has been included in Appendix 4 and the associated field study reference sources have been included in Appendix 8 and Annex 3.

- Extensive erosion of soft glacial till cliffs;
- Wide variety of erosion protection measures implemented along the coastline;
- Relatively inhospitable marine environment with few safe havens for marine users except ports of Great Yarmouth and Lowestoft;
- Extensive chalk reef habitat;
- Visual influence of Cromer Ridge;
- Very low lying in places, particularly at the coastal interface of the Norfolk broads;
- Widespread terrestrial and marine habitats supporting a diverse ecosystem;
- Heavily exploited waters, particularly for shellfish species;
- Presence of major offshore shipping routes challenges natural character;
- Much of the coastline is designated as RYA sailing areas;
- Submerged gas pipelines and Bacton Gas refinery associated with North Sea Gas;
- Coastal holiday resorts;
- Remote character strongly influenced in places by concentrated urban settlements, commercial activities and both on and offshore wind farm developments.

13.2 Physical Influences

The bedrock of the area varies across the character area, and is underlain by Upper Cretaceous fine grained limestones (Chalk Group), which extends from north-east Norfolk to Flamborough Head (often referred to as the East Midlands Shelf). It is rarely exposed on the seafloor as it is largely buried under Pleistocene and Holocene sediments and these are composed predominantly of sand with patches of gravel, sandy mud and sandy gravel.

A notable area of exposed chalk reef occurs on the seabed to the north of Cromer which is thought to be one of the most extensive chalk reef habitats in the world and supports an abundance of wildlife.

The landform of the adjoining coast varies from north to south. Between Sheringham and Happisburgh the coast is dominated by cliffs and there is a dramatic drop in level between Bacton and Walcott where the cliffs drop down to almost beach level. From here southwards the landmass is very low and predominantly consist of dune backed beaches.

Seven sections of the cliff along this stretch of the coast are of recognised national geological importance and have been notified as SSSIs.

Cromer ridge although not a major landscape feature in a geographic sense is an unusual landmass within the generally flat landscape of East Anglia. It extends from Holt to Mundesley and is most pronounced in the vicinity of Sheringham where it reaches an elevation of 100m. It has a irregular, undulating and well-wooded form that contrasts the flat open character and can be seen as a land mass from substantial distances. It is thought to have been created by the deposition of glacial till deposits pushed up from the area which is now the North Sea.

Cliffs are of varying composition and heights along this stretch of coast but are generally very unstable due to their soft composition and are generally well vegetated because of their composition from glacial deposits. Erosion from this cliff frontage provides an important source of sediment for areas further to the south.

Erosion occurs gradually in some areas but dramatically and unpredictably in others. Groundwater gullying coupled with large storm waves attack this exposed coastline undercutting cliff faces and causing land slips.

The cliffs created by these processes trace an important part of geological history, exposing material that was laid down over the chalk during the Pleistocene period.

A high drift rate to the east and south combined with strong waves and tidal currents play an important role in shaping the coastline. The natural offshore banks found within the character area and further out to sea have an influence on coastal exposure and wave patterns which result in complex sediment transport patterns leading to points of accretion and coastal sand dunes south of Sea Palling.

Foreshore steepening is a prevalent feature of beaches throughout the frontage and this characteristic has been accentuated by the coastal defences which have been put in place to reduce erosion processes.

Interactions between underlying geology and coastal processes have created a vast array of habitats which support a variety of wildlife. The mobile cliffs between Overstrand and Mundesley include some of the finest soft cliff habitat in Britain.

North of Great Yarmouth lies a key sand dune habitat with nationally scarce vegetation types. The dunes here have a full range of vegetation types and also attract a wide variety of bird

species. The area has two SSSIs; Great Yarmouth North Denes and Winterton-Horsey dunes, with a small section of Winterton dunes classed as a National Nature Reserve.

Phytoplankton blooms are prolific in the waters along this stretch of coastline due to water depth, tidal mixing, temperature stratification and benthic wildlife communities. Waters rich in plankton attract other marine wildlife and therefore create diverse ecosystems.

Rich benthic environments with diverse shallow sub tidal sediment supports spawning and nursery activities for a variety of different fish species and the waters here are heavily exploited for crab and lobster. West Runton also possesses one of the few areas of intertidal rock in East Anglia and the chalk foreshore is an oasis for rock-dwelling life, similar to the communities found on the rocky shores in south-east England and Flamborough Head.

Offshore and north of the Great Yarmouth lies a large ecological 'key zone' comprising two main areas; Haisborough, Hammond and Winterton and the North Norfolk Sand Banks and Saturn Reef. Both are areas of reef habitat and sandbanks slightly covered with sea water all the time. These zones are designated as offshore SAC's in acknowledgement of their Annex I habitats.

13.3 Cultural Influences

These waters are renowned as being inhospitable in bad weather due to the exposed nature of the coastline and the lack of safe havens. Concentrations of wrecks close to shore demonstrate the treacherous nature of these waters.

This exposed and eroding nature has led to many attempts to control the erosion forces, a lot of which are failing or causing cumulative problems elsewhere. Notable among these are the offshore rock reefs at Sea Palling, which act to reduce the energy of storm surges and trap marine sediment.

Occasionally artefacts erode out of the coastline, notably in areas of Suffolk and Norfolk, where the coastal interface is composed of relatively unconsolidated material.

At Happisburgh and at Pakenfield internationally important Palaeolithic material has been recovered eroding from the coastal deposits. Lithic remains associated with animal bones were dated at between 800-700,000 years ago, pushing back the date for the colonisation of Britain.

Within the Norfolk and Suffolk coastal areas relict estuaries and river valleys and gravel terraces laid down by the proto-Thames and its tributaries also provide favourable conditions for preservation of prehistoric artefacts.

The waters along this coastline have been heavily exploited and many of the coastal settlements have been founded on the fishing industry. Rich seabed habitats support a large variety of commercial fish species and the waters are heavily potted.

Offshore commercial shipping routes pass through the northern edge of the area, the influence of which challenges the more natural character aspects of the area.

The waters are crossed by a vast network of submerged pipelines that deliver natural North Sea gas to the large gas terminal at Bacton. Bacton Gas Terminal is one of the largest gas developments in the country which distributes gas via the National Transmission System to meet domestic energy requirements. Additionally it supplies gas to Belgium via the 235 kilometre pipeline Interconnector system which when in reverse mode is used to import gas into the UK facilitating energy trading.

The shallow mixed sediment environment contains some of the UK's most important marine aggregate resources and provides almost half of all the UK's marine construction aggregate. Dredging of sand and shingle also takes place off the coast of Great Yarmouth.

The exposed and open nature of the seascape accentuates the prominence of onshore wind farms which are visible on the skyline above the flat topography. This notably includes a single turbine located in Lowestoft at Ness Point which is visible from great distances. The offshore wind farm at Scroby Sands is also visually prominent and can again be seen from considerable distances. The scale of windfarms is typically at odds with the vast, expansive, low lying nature of the coastline and expansive featureless seascape.

The coastal processes and the presence of beaches and natural, rugged cliffs have led to a long association with tourism. The Norfolk Broads National Park also brings a huge number of visitors to the coastline and small sections of the Park directly abut the coastal interface. The influence and perception of seascape from the Broads is however limited by the nature of the low lying topography.

The waters surrounding the coastline are popular with boat users and the majority of the coastline is designated as a RYA Sailing and racing area.

Coastal holiday resorts concentrate around Cromer and Sheringham and much of the less eroded parts of the coastline have become popular places for caravans and chalets.

Great Yarmouth is a notable settlement along the coastline. Despite beginning as a herring fishing port it became a defended ship building and trade centre with Europe in the post-medieval period. The town developed rapidly as a Victorian seaside resort as its fishing role declined whilst its sandy beaches have ensured it remains a successful tourist destination.

Lowestoft also developed as a fishing port, an industry that continued into the 20th century. The arrival of the railways and the construction of the dock in the mid 19th century resulted in more trade with the continent. The town also flourished as a Victorian seaside resort. Lowestoft is the most easterly point of the UK.

13.4 Aesthetic and Perceptual Qualities

The seascape has a powerful sense of place, largely attributable to the unique and varied coastal interfaces produced by dynamic and destructive coastal forces.

The highly dynamic and temporal nature of the marine character is evident in the erosion processes and dominating sea defences along the coast. The natural forces impose a rugged, natural character to the seascape which is perceived as a largely fragile and vulnerable coastline.

Large slumped cliffs closely met by low sand dune systems create a natural, wild and untamed character to the coastal edge and a largely featureless horizon evokes feelings of remoteness and loneliness.

The exposed nature of the coastline coupled with the temperamental marine character creates an unsettling and uninviting quality.

14 Character Area 10 – Suffolk Coastal Waters

14.1 Key Characteristics

The key characteristics of the area are summarised below. The corresponding baseline data which informs the character definitions has been included in Appendix 4 and the associated field study reference sources have been included in Appendix 8 and Annex 3.

- Suffolk Coast and Heaths AONB and Heritage coast designations recognise a rich mixture of unique and vulnerable coastal lowland landscapes;
- Low-lying coastline dominated by coastal processes and estuarine influences;
- Unified coastal interface with a nationally significant concentration of vegetated shingle structures and coastal lagoon habitats;
- Colourful seafront coastlines lined by brightly painted beach huts;
- Steeply sloping shelved shingle beaches;
- Prolific wildlife value, particularly bird life;
- Dramatic and contrasting developments such as Sizewell nuclear power station, Orfordness transmitting station and commercial dock development at Felixstowe;
- Historically heavily defended coastline;
- Large scale panoramic views of the seascape dominated by busy offshore North Sea shipping waters;
- Perception of seascape is often from the immediate coastal interface due to long estuaries, low landform and coastal shingle structures.

14.2 Physical Influences

The seascape has a powerful sense of place, largely attributable to the coastal processes that shape and influence this low-lying and sedimentary coastline dominated by estuaries.

The geology underlying the coast of Suffolk largely consists of Pliocene-Pleistocene 'Red Crag' formations overlain by a drift cover of glacial tills and sands of variable thickness. These sands and gravels are spread in narrow, discontinuous tracts along the coast from Yarmouth to Aldeburgh, spreading inland and extending over a low plateau past Woodbridge to Ipswich, and giving rise to the characteristic variation in landcover that is such a feature of the area.

Crag is an East Anglian name for the shelly sand that is so characteristic of these sedimentary rocks. Crag is one of the youngest marine rocks found in England and is found only in East Anglia, so its exposures along the coast are of considerable geological interest.

Coastal landform is intimately linked with the coastal processes and geological makeup resulting in erosion and deposition caused by extensive longshore drift.

Southwards from Kessingland the cliff line is interrupted by broad inlets such as Minsmere and the Blyth Estuary, now mostly infilled with Holocene estuarine sediments. In cliff sections at Bawdsey and Felixstowe, below the Red Crag, the most northerly outcrops of the London Clay (of Eocene age) are exposed.

North of Sizewell and Southwold, small mobile cliffs mark a generally receding coastline and fallen material is washed from the base of the cliffs. The southward tidal current carries this sand and shingle eroded from the soft cliffs.

The offshore waters here are generally shallow in nature and highly mobile parallel shoal and sand bank systems formed by tidal influences along the Norfolk and Suffolk coastlines influence wave and current interactions.

The southward littoral drift has a high sand transport and moderate shingle transport and is heavily influenced by the actions of these waves and currents.

Waves transport material southwards from eroding cliffs, providing an important sediment supply for downdrift beaches. Coastal processes are complicated by the tidal flows at the mouths of the Deben, Orwell and Stour Estuaries.

Beaches tend to be shingle and steeply sloping and are often stepped. Beaches are generally part of long sweeping bays, which in turn are a smaller element of a long linear coastline.

Despite offshore Pleistocene and Holocene sediments being generally thin in nature and consisting predominantly of sand with patches of gravel and sandy gravel, the underlying geology is rarely exposed on the seafloor.

The coastal forms created by the interaction between the complex marine processes and geological make up have created some of Britains most important wildlife areas.

The dynamic and evolving Orford Ness is a product of this longshore drift. At approximately 16 km in length and covering approximately 900 ha it is Europe's largest vegetated spit. Approximately half of it consists of shingle with the remaining consisting of tidal rivers, mud flats, sand flats, lagoons, grassland, salt marsh.

The diversity of habitats is reflected in the number of designated wildlife areas which include three National Nature Reserves, many Sites of Special Scientific Interest and the RSPB's Minsmere Reserve.

The low-lying coastal hinterland contains some of England's few remaining areas of ancient open heathland, including the Sandlings whose wild sandy stretches are a vanishing refuge of the nightjar, woodlark, and rare heath butterflies.

The estuaries and grazing marshes support waders and wildfowl in great numbers, reedbeds support breeding bitterns and bearded tits, and saline lagoons support specialist and rare invertebrates.

Offshore, the benthic habitats support extensive spawning and nursery grounds for a variety of commercial fish species, particularly Dover sole and shellfish species such as lobster and brown shrimp. A significant proportion of the waters are designated as a Special Protection Area because of the key bird species they support.

The coastal area is generally low lying and indented with estuaries, with gentle undulations and variation as the river valleys reach inland. Large conifer plantations and general woodland presence in certain locations along the coast denote the rich glacial tills.

14.3 Cultural Influences

The coastal processes which characterise the waters off the Suffolk coast are illustrated by two key examples.

The small town of Dunwich was once one of the largest seaports in Eastern England and the capital of East Anglia. It fell foul of the attack of this coastline by large winter storm surges and was engulfed by the sea in the 14th century.

Orfords relationship with the coast was fundamentally altered by the effects of deposition. Recognised as a strategic port in the 12th century, the deposition that created the long shingle spit of Orford Ness gradually cut off the town from the sea, and today it survives as a small fishing village and holiday centre on the River Alde.

Significant military defence of the coast reflects the importance of the Suffolk coast in national defence strategies over many years. The Suffolk coast is characterised by late 18th century and 19th century Napoleonic defences.

The number of seafront gardens that were built in the developing seaside resorts that flourished from the later 19th century reflect the importance the arrival of the railways had on coastal accessibility.

Languard Fort at the mouth of the River Orwell is a Scheduled Ancient Monument and a popular tourist destination. It was designed to guard the entrance to Harwich as far back as the 1500’s and was an important centre for military operations during early 1900’s.

Orford Castle was built in the 12th century by Henry II in recognition of its strategic importance as a port.

During WWI the Port of Felixstowe was requisitioned as a Royal Navy Destroyer and Mine-sweeper base and in WWII it became a Royal Navy MTB and Air Sea Rescue Base.

The pagodas on the Orford coastline are distinctive and ethereal structures where Britain’s first atomic weapon was developed and tested. Other buildings associated with secretive Cold War testing exist in remote isolation on the shingle.

These waters are subject to much marine activity with productive fishing waters and shipping associated with the Port of Felixstowe and Lowestoft. Views of commercial fishing and

container vessels can be seen on the seaward horizon and the waters are seasonally busy with an influx of recreational boating taking in the wild and diverse estuarine and coastal landscapes. Much of the coastline is designated as a RYA sailing area.

Around the offshore approaches to Felixstowe and the Orwell estuary there are numerous wreck clusters that appear to be unrelated to seabed features and denote the heavily navigated nature of these waters.

The coastline is also subject to some significant large scale developments which are at odds to the scale and natural qualities of the landscape. The Sizewell nuclear power stations are a significant group of structures that are visually imposing from great distances, particularly the white reactor dome of Sizewell B.

Similarly the Port of Felixstowe has an industrial character at odds with the natural seascape. Felixstowe has been strategically important since at least the medieval period and was well defended during Napoleonic times to prevent an invasion force landing on the coast. It became a major port in 1886 and a fashionable tourist resort by the late 19th century. Today the Port of Felixstowe is the largest container port in Britain with a dredged navigation channel and a continuous 2.3km long quay equipped with 25 ship to shore gantry cranes.

The Suffolk Coastline is one of Britain's finest landscapes and a large extent of the land adjacent to these coastal waters is covered by AONB and Heritage coast designations that recognise these undeveloped and natural qualities.

The AONB designation covers 150 square miles and includes wildlife-rich wetlands, ancient heaths, windswept shingle beaches and historic towns and villages. This natural beauty makes this stretch of coastline a very popular tourist destination and the coastal towns of Lowestoft, Kessingland, Southwold, Walberswick, Thorpeness, Aldeburgh and Felixstowe form the focus of tourist activity.

The North Sea is an important focus for fishing activity and this stretch if the coastline is home to one of the most prolific fishing ports in the region, that of Lowestoft. Lobster, brown shrimp and whelk are extensively fished along the coastal waters and the benthic habitats support extensive spawning and nursery grounds for a variety of commercial fish species, particularly Dover sole.

14.4 Aesthetic and Perceptual Qualities

The seascape has a rugged and dynamic sense of place intimately linked with the obvious coastal processes and erosion that is occurring extensively along this coastline. Stepped shingle beaches and low crumbling cliffs contribute to a sense of fragility and vulnerability.

The extensive uniformity of the effects of coastal processes create long, uniform views along the large scale open and exposed coast. Despite the relatively busy nature of the coastal waters the linear brown and murky seascape has a monotonous and uninviting character created by dynamic sediment movements.

The intertidal zone has a natural character influenced by the noise of sea birds and rolling shingle.

The low lying character associated with extensive areas of accretion creates an exposed, remote and inaccessible character. Accessibility to the coastal edge is limited in many places which contributes further to the sense of remoteness and inaccessibility.

The typical shingle and low cliff coastline creates a uniform character which contrasts with significant developments such as Sizewell nuclear power station and associated electricity

pylons. Such large scale man made interventions are at odds with the otherwise natural character and contribute landmark diversity to the seascape environment.

Views from the sea are broadly uniform and significant coastal landmark features become dominant. The heavily indented nature of the coastline is difficult to perceive from the sea leading to a sense of inaccessibility and isolation.

Busy shipping waters characterise the offshore areas, creating a diverse character environment.

15 Character Area 11 – Jurassic Coastal Waters

15.1 Key Characteristics

The key characteristics of the area are summarised below. The corresponding baseline data which informs the character definitions has been included in Appendix 4 and the associated field study reference sources have been included in Appendix 8 and Annex 3.

- Diverse and active coastline united by undulating landform and spectacular visual qualities;
- Distinctive and visually prominent coastline features such as Hope's Nose and Ore Stone, Berry Head, Chesil Beach and the dramatic wedge-shaped peninsula of the Isle of Portland;
- Dramatic and inspiring Jurassic cliffs which vary in colour from vivid red to bright white and which can be seen from distance;
- Temporal marine character, erosion processes and underlying geology create a dynamic and natural character with slumped, mobile cliffs punctuated by prominent, irregular headlands;
- Extensive urban development concentrated within river valleys at the coast, clifftop caravan parks and roads and railways on the lower valleys and coast;
- Visual influence of coastal features is concentrated within 3km of the coastline where detail of marine activity and coastal interface contributes to the character;
- Beyond 5km from the coast a broad association is still retained with the distinctive colourful cliffs and the unique landmark features such as the Isle of Portland;
- Extensive fishing areas and activity, particularly shellfish fisheries;
- Concentrations of sailing activity around Exmouth, Torquay and Portland, coastal areas are associated with coastal recreational activities;
- Extensive featureless seaward horizon.

15.2 Physical Influences

The Jurassic Coastal Waters area includes over 150 km of the most varied, spectacular and ecologically important coastline in England. The variety and interest relates to the complex geology, which is renowned for its layers of Jurassic rock with fossil remains and includes classic examples of landslips and shingle ridges.

The offshore geology is a mixture of Holocene sea bed sediments (unconsolidated sediments laid down since the sea transgressed across the area during the Holocene Epoch, Pleistocene deposits of glacial origin (Devensian) and Solid (pre-Quaternary) rocks which are largely concealed by sea-bed sediments and drift deposits).

The sediment transport within the area coastal cell is generally divided into 2 key sub cells. The first includes the area between Dawlish Warren and Dartmouth (which shows weak northward drift) and the erosion of sandstone cliffs north of Torquay, which provides beach sand. In general terms there is accretion in Tor Bay and cliff erosion and dune erosion between Torquay and Exmouth. The second sub cell covers the area from Portland Bill to Dawlish Warren and generally has an eastward littoral drift with intermittent and low sediment transport. There is a mix of both erosion and accretion occurring within distinct areas within this sub cell.

Along the character area coastal interface, the bathymetric contours are generally shore-parallel. At the eastern end of Lyme Bay, the sea bed deepens rapidly in front of Chesil Beach. At the western end of Lyme Bay, the sea bed remains shallower closer to the coast line. The offshore area of Lyme Bay is a gently sloping featureless seabed.

The wealth of important habitats present along this stretch of coast include shingle ridges, sand dunes, estuaries, brackish lagoons, soft and hard sea cliffs, and woodland. The Fleet, a large saline lagoon, supports several nationally rare and scarce species.

Lyme Bay spans part of the transition zone between the cold Boreal and the warmer Lusitanian provinces of the north-east Atlantic. Hence this Natural Area contains a wide range of habitats and a considerable diversity of communities with a wealth of marine life, including extensive reef and submerged sea cave habitats off the coast.

There are several key areas within the Lyme Bay region which encompass the internationally important areas of Lyme Bay, and contain good examples of most of the key habitats, these being Portland Bill, Chesil Bank and the Fleet and Lyme Bay (Burton Bradstock to Budleigh Salterton). The area contains 4 SAC's, 1 SPA, 1 RAMSAR site and 12 SSSI's.

Concentrations of plankton within the area ultimately form the base of the food-chain upon which the commercial fished species such as mackerel, herring and bass depend. At the larger end of the scale, whales and porpoises frequently occur within the extent of the inshore waters.

15.3 Cultural Influences

The coastline is dominated by agricultural land use and tourist settlements which include centres of tourism, such as Torquay. Extensive but localised developments such as caravan parks are common along the coast and are distinct landscape elements.

The area has a long history of sea-based transport and the navigation of sea-going vessels extends up the Dart Estuary as far as Totnes. The lower reaches of the estuary include Dartmouth Harbour that provides a deep water natural harbour, and has a long history of maritime usage. There are a number of ports and harbours along the coastline (generally associated with the eastern and western extremities) providing facilities for the fishing boats and recreational sailing vessels which tend to utilise the shallower coastal water. These fishing

areas are especially important for shellfish such as crabs, scallops and lobster. The open waters close to the ports and harbours, especially the area stretching from Exmouth to Torbay, tend to have a significant number of mooring buoys present.

The rocky entrance to the mouth of the estuary was defended from medieval times with the construction of Dartmouth Castle and Gomerock Tower opposite. The Napoleonic Wars led to the construction of defensive structures along the south coast, with forts being re-used during WWII and again during the Cold War for monitoring activities. During WWII the estuary was used for the preparations for the D-Day landings and it contains a number of shore-base and supply facilities constructed both before and during the invasion.

The international importance of the coastline between Lyme Bay and the Isle of Portland (and beyond to the east) has been recognised by its designation as a World Heritage Site for its outstanding combination of globally significant geological and geomorphological features. The coast is considered by geologists and geomorphologists to be one of the most significant teaching and research sites in the world.

The significance of the Isle of Portland within the wider area of Lyme Bay is demonstrated by the naming of the weather area of Portland which features within the unique and distinctive BBC Radio 4 shipping forecasts and therefore is generally understood by those navigating at sea.

There is limited exploitation of sea-based resources, with dredging being restricted to navigational dredging and no oil and gas related activities occurring in the area.

15.4 Aesthetic and Perceptual Qualities

The seascape has a powerful sense of place, largely attributable to the unique and varied geological and geomorphological formations which contribute to its classification as England's first natural World Heritage Site. It is known by many as the "Jurassic Coast" because of the unique rock formations on show and is internationally renowned.

The dramatic and inspiring Jurassic cliffs are scenically outstanding when viewed from the sea, though typically direct land based views beyond the foreground shoreline to a large and featureless seascape beyond. Its scenic qualities provide a draw for an active, colourful and busy character with several popular tourist orientated coastal resorts and a diverse variety of activities and uses of the land and sea.

Generally the seascape is heavily influenced by detail and activities at the coastal edge within 3km offshore of the coastline. Beyond this, the character is still heavily determined by land but more limited to prominent and distinctive landmarks such as the Isle of Portland. Beyond this there is a more open water character but the scale and colour of the cliffs remain heavily influential.

Despite the complex and diverse nature of the coastline owed to the variety of geological formations and coastal development the consistency of these elements creates a sense of unity and balance.

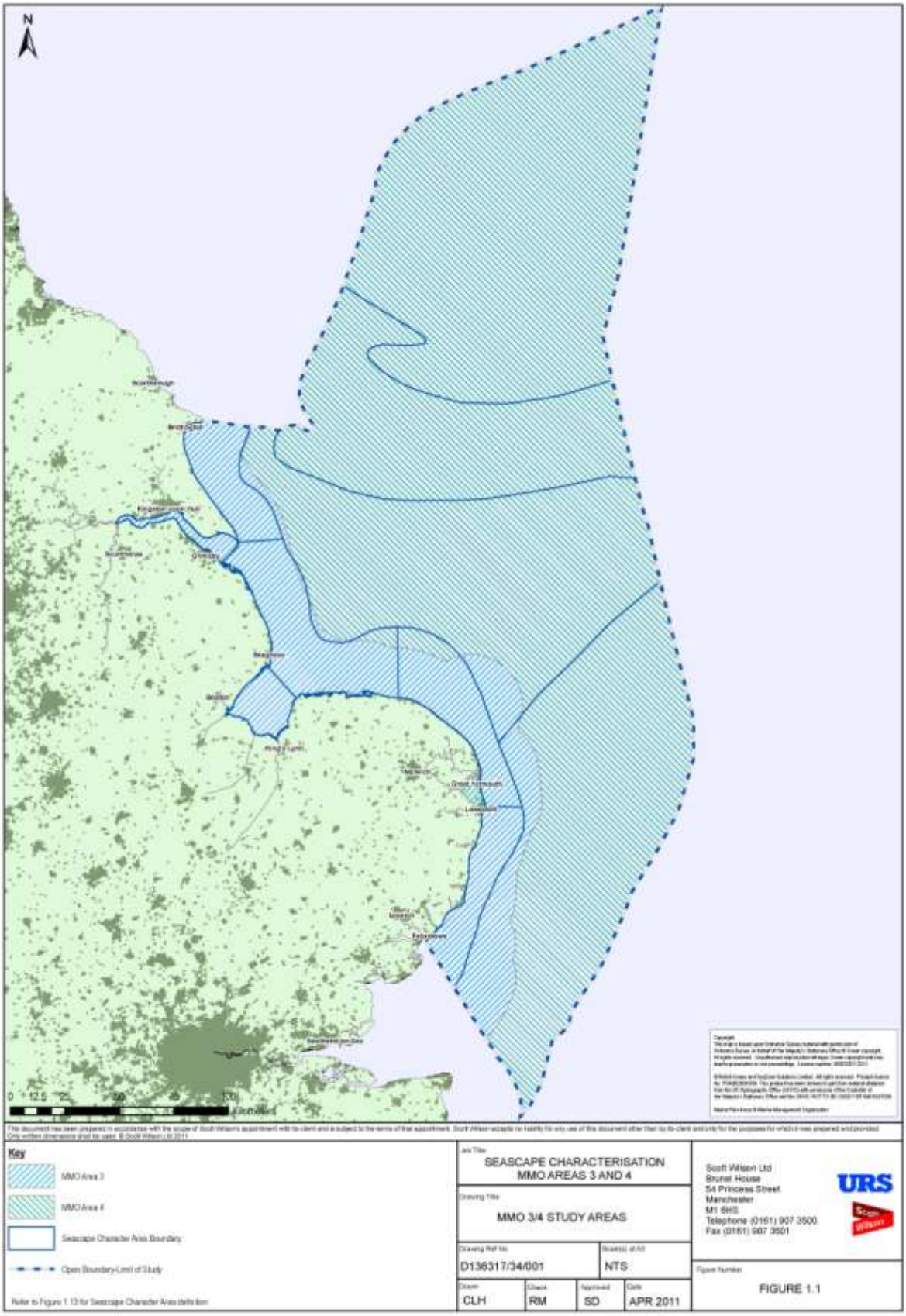
There is an obvious temperamental marine character as evident in the erosion processes and by sea defences along the coast and these natural forces impose a rugged, natural character to the seascape despite development at the coastal interface.

Experience of seascape is highly varied. Open views are panoramic in nature and there are strong interrelationships between different features and settlements along the coastline. By

contrast, elements of enclosing landform and long winding approaches to the coastal interface create more intimate seascape views, heavily dominated by geological features.

Appendix 1 – Figures for MMO Areas 3 and 4

- Figure 1.1 MMO 3/4 study areas
- Figure 1.2 Landscape / seascape visibility assessment
- Figure 1.3 National Landscape Character Areas & Marine and Coastal Natural Areas
- Figure 1.4a Field Survey Locations – northern extent of study area
- Figure 1.4b Field Survey Locations – southern extent of study area
- Figure 1.5 Bedrock and Drift Geology
- Figure 1.6 Sediment Geology
- Figure 1.7 Bathymetry
- Figure 1.8 Ecological Designations
- Figure 1.9 Heritage Assets
- Figure 1.10 Landscape Designations
- Figure 1.11 Sea and Coastal Use – Shipping, recreation, commercial and military activity
- Figure 1.12 Sea and Coastal Use – Resource exploitation
- Figure 1.13 Seascape Character Areas and representative field survey locations


N
Key
MMO Area 3
MMO Area 4
Seascape Character Area Boundary
Open Boundary Limit of Study
Refer to Figure 1.12 for Seascape Character Area definition
SEASCAPE CHARACTERISATION
MMO AREAS 3 AND 4
MMO 3/4 STUDY AREAS
D136317/34/001
NTS
CLH
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APR 2011
FIGURE 1.1
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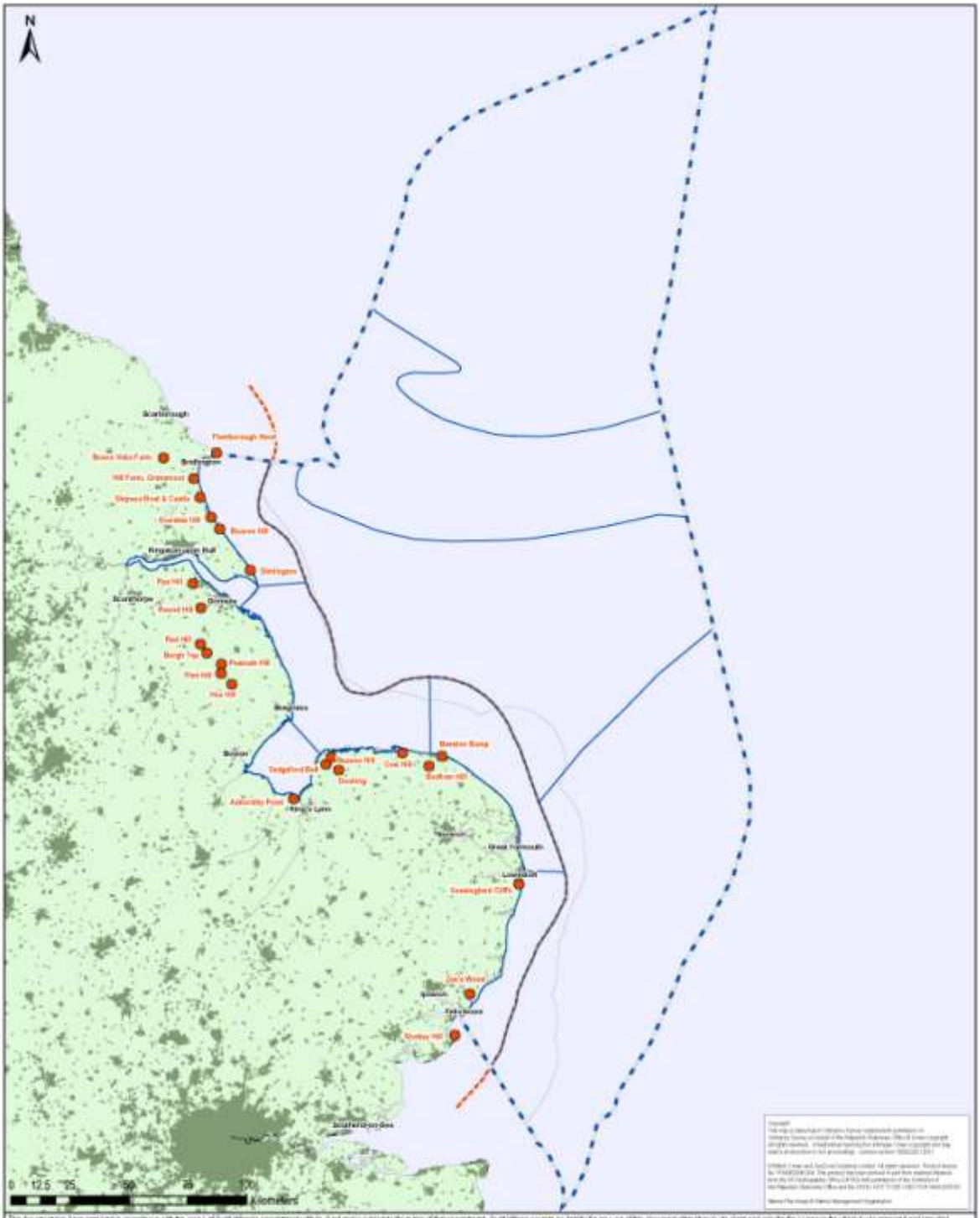
N
0 12.5 25 50 75 100
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary Limit of Study
Geographic high points from which approximate theoretical visual horizon boundary was generated
Approximate theoretical visual horizon
Refer to Figure 1.13 for Seascape Character Area definition
SEASCAPE CHARACTERISATION
MMO AREAS 3 AND 4
LANDSCAPE/SEASCAPE
INTERVISIBILITY ASSESSMENT
D136317/34/002
NTS
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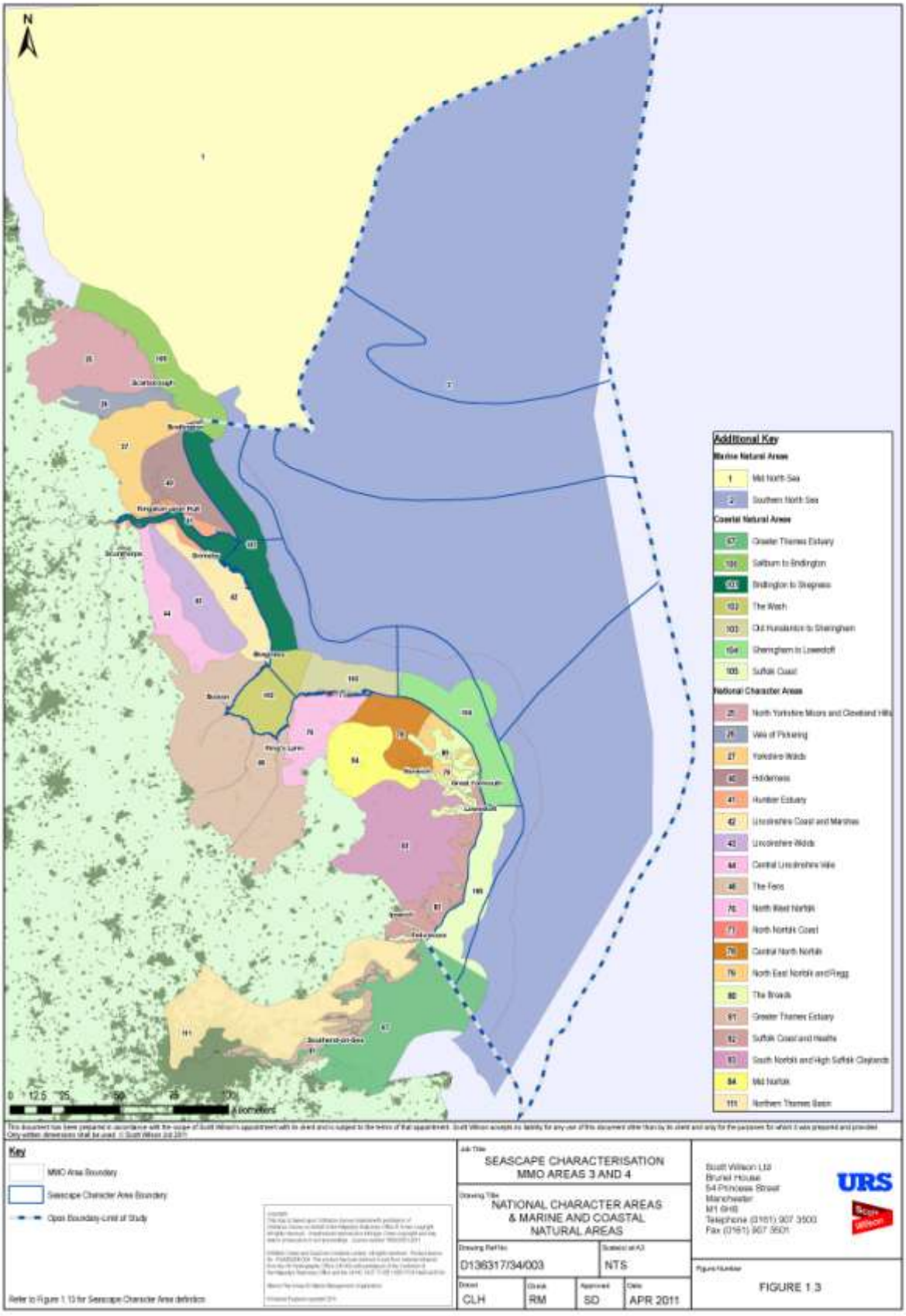
FIGURE 1.2


N
Additional Key
Marine Natural Areas
1 Mid North Sea
2 Southern North Sea
Coastal Natural Areas
97 Greater Thames Estuary
100 Saltburn to Bridlington
101 Bridlington to Skegness
102 The Wash
103 Old Hunstanton to Sheringham
104 Sheringham to Lowestoft
105 Suffolk Coast
National Character Areas
26 North Yorkshire Moors and Cleveland Hills
16 Vale of Pickering
27 Yorkshire Wolds
40 Holderness
41 Humber Estuary
42 Lincolnshire Coast and Marshes
43 Lincolnshire Wolds
44 Central Lincolnshire Vale
46 The Fens
76 North West Norfolk
77 North Norfolk Coast
78 Central North Norfolk
79 North East Norfolk and Flegg
80 The Broads
81 Greater Thames Estuary
82 Suffolk Coast and Heaths
83 South Norfolk and High Suffolk Claylands
84 Mid Norfolk
111 Northern Thames Basin
0 12.5 25 50 75 100 Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary-Limit of Study
Refer to Figure 1.10 for Seascape Character Area definition
SEASCAPE CHARACTERISATION
MMO AREAS 3 AND 4
NATIONAL CHARACTER AREAS
& MARINE AND COASTAL
NATURAL AREAS
D136317/34/003
NTS
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RM
SD
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FIGURE 1.3


N
3-LS-01
3-LS-02
3-LS-03
3-LS-04
3-LS-05
3-LS-06
3-LS-07
3-LS-08
3-LS-09
3-LS-10
3-LS-11
3-LS-12
3-LS-13
3-LS-14
3-LS-15
3-LS-16
3-LS-17
3-LS-18
3-LS-19
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3-SS-05
3-SS-06
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3-SS-12
3-SS-13
3-SS-14
3-SS-15
3-SS-16
3-SS-17
3-SS-18
3-SS-19
3-SS-20
3-SS-21
3-SS-22
3-SS-23
3-SS-25
Grimsby
Wells-Next-The-Sea
0 3.75 7.5 15 22.5 30
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary Limit of Study
Sea Survey Route
Sea Survey Embarkation Points
Representative Field Survey Locations - Land
Other Field Survey Locations - Land
Representative Field Survey Locations - Sea
Other Field Survey Locations - Sea
Refer to Figure 1.13 for Seascape Character Area definition
SEASCAPE CHARACTERISATION
MMO AREAS 3 AND 4
FIELD SURVEY LOCATIONS
NORTHERN EXTENT OF STUDY AREA
D136317/34/004a
NTS
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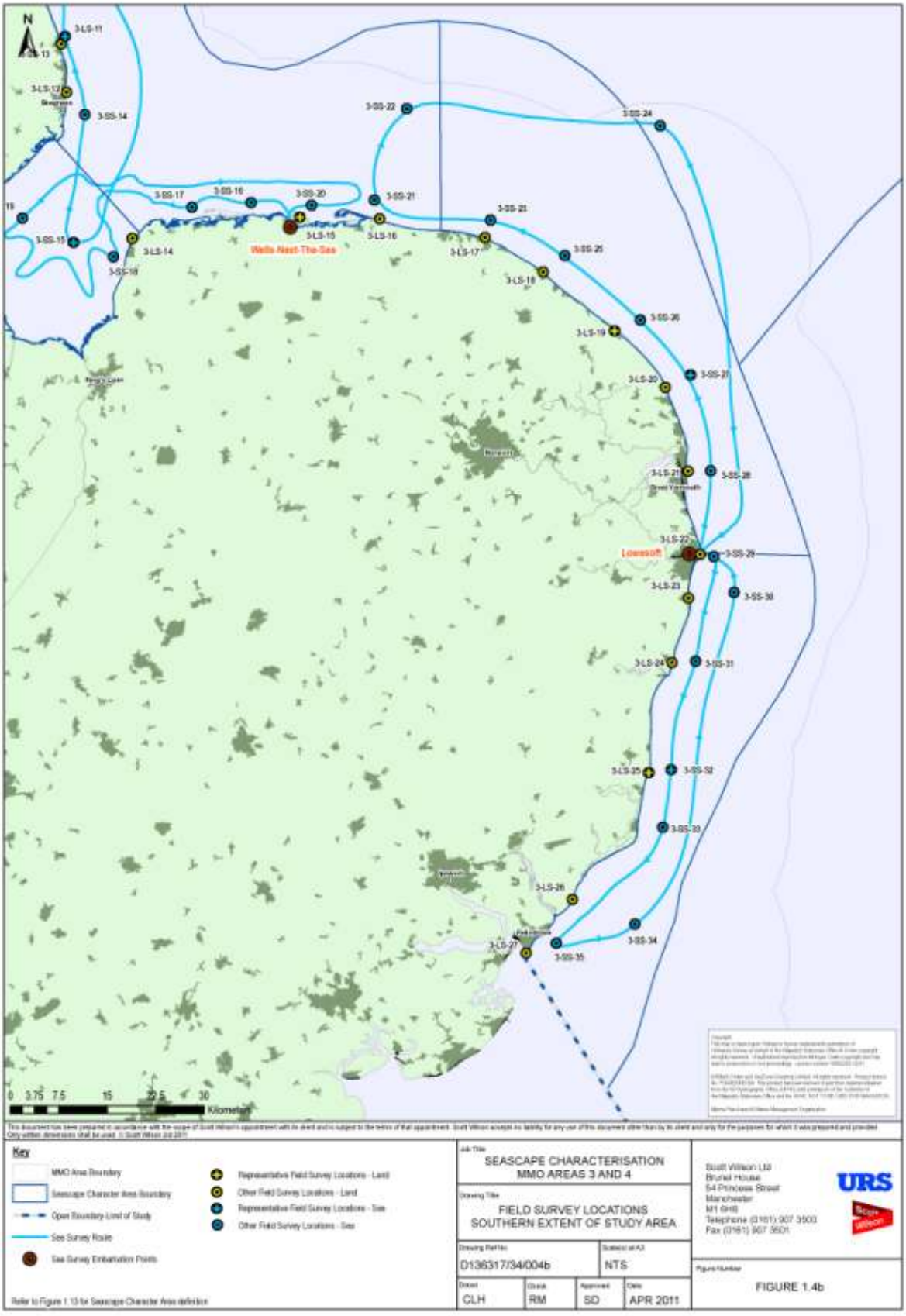
FIGURE 1.4a


N
3-LS-11
3-LS-12
3-SS-14
3-SS-22
3-SS-24
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3-SS-16
3-SS-20
3-SS-21
3-SS-23
3-SS-15
3-LS-15
3-LS-16
3-LS-14
3-SS-18
Wells Next The Sea
3-LS-17
3-SS-25
3-LS-18
3-SS-26
3-LS-19
3-SS-27
3-LS-20
3-LS-21
3-SS-28
3-LS-22
Lowestoft
3-SS-29
3-LS-23
3-SS-30
3-LS-24
3-SS-31
3-LS-25
3-SS-32
3-SS-33
3-LS-26
3-SS-34
3-LS-27
3-SS-35
0 3.75 7.5 15 22.5 30
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary Limit of Study
Sea Survey Route
Sea Survey Embarkation Points
Representative Field Survey Locations - Land
Other Field Survey Locations - Land
Representative Field Survey Locations - Sea
Other Field Survey Locations - Sea
Refer to Figure 1.13 for Seascape Character Area definition
SEASCAPE CHARACTERISATION
MMO AREAS 3 AND 4
FIELD SURVEY LOCATIONS
SOUTHERN EXTENT OF STUDY AREA
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FIGURE 1.4b

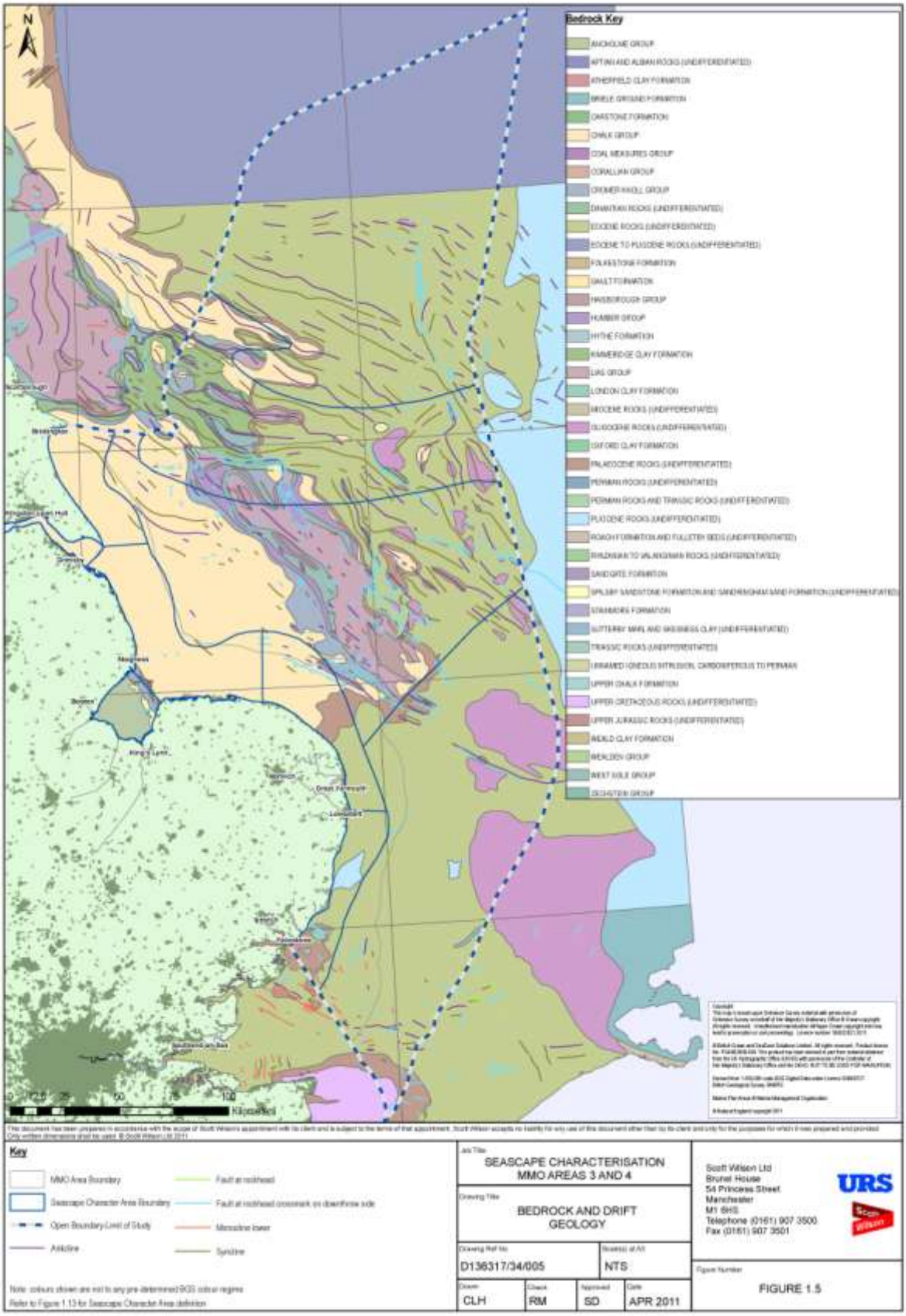
N
Bedrock Key
ANCHOLME GROUP
APTIAN AND ALBIAN ROCKS (UNDIFFERENTIATED)
ATHERFIELD CLAY FORMATION
BRIELE GROUND FORMATION
CARSTONE FORMATION
CHALK GROUP
COAL MEASURES GROUP
CORALLIAN GROUP
CROMER KNOLL GROUP
DANIAN ROCKS (UNDIFFERENTIATED)
EOCENE ROCKS (UNDIFFERENTIATED)
EOCENE TO PLIOCENE ROCKS (UNDIFFERENTIATED)
FULMETONE FORMATION
GAULT FORMATION
HASBOROUGH GROUP
HUMBER GROUP
HYTHE FORMATION
KIMMERIDGE CLAY FORMATION
LIAS GROUP
LONDON CLAY FORMATION
MIOCENE ROCKS (UNDIFFERENTIATED)
OLIGOCENE ROCKS (UNDIFFERENTIATED)
OXFORD CLAY FORMATION
PALAEOCENE ROCKS (UNDIFFERENTIATED)
PERMIAN ROCKS (UNDIFFERENTIATED)
PERMIAN ROCKS AND TRIASSIC ROCKS (UNDIFFERENTIATED)
PLIOCENE ROCKS (UNDIFFERENTIATED)
ROACH FORMATION AND FULLETBY BEDS (UNDIFFERENTIATED)
RHAETIAN TO VALANGINIAN ROCKS (UNDIFFERENTIATED)
SANDGATE FORMATION
SPILSBY SANDSTONE FORMATION AND SANDRINGHAM SAND FORMATION (UNDIFFERENTIATED)
STAMFORD FORMATION
SUTTERBY MARL AND WEALDSTONE CLAY (UNDIFFERENTIATED)
TRIASSIC ROCKS (UNDIFFERENTIATED)
UNNAMED IGNEOUS INTRUSION, CARBONIFEROUS TO PERMIAN
UPPER CHALK FORMATION
UPPER CRETACEOUS ROCKS (UNDIFFERENTIATED)
UPPER JURASSIC ROCKS (UNDIFFERENTIATED)
WEALD CLAY FORMATION
WEALDEN GROUP
WEST SOLE GROUP
ZECHSTEIN GROUP
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary Limit of Study
Anticline
Fault at rockhead
Fault at rockhead crosscreek on downthrow side
Monocline lower
Syncline
Note: colours shown are not to any pre-determined BGS colour regime
Refer to Figure 1.13 for Seascape Character Area definition
SEASCAPE CHARACTERISATION MMO AREAS 3 AND 4
BEDROCK AND DRIFT GEOLOGY
D136317/34/005
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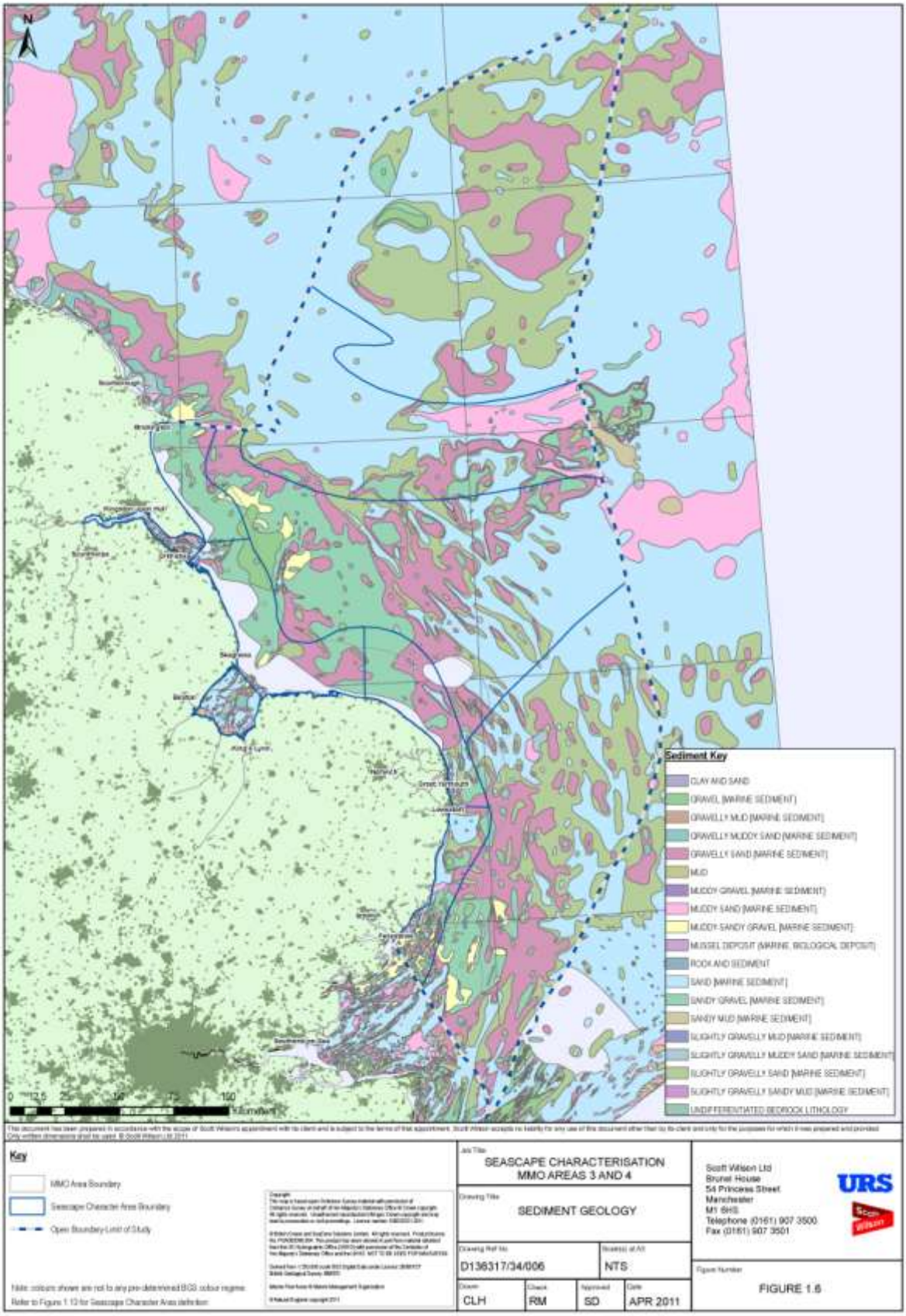
FIGURE 1.5


N
Sediment Key
CLAY AND SAND
GRAVEL (MARINE SEDIMENT)
GRAVELLY MUD (MARINE SEDIMENT)
GRAVELLY MUDDY SAND (MARINE SEDIMENT)
GRAVELLY SAND (MARINE SEDIMENT)
MUD
MUDDY GRAVEL (MARINE SEDIMENT)
MUDDY SAND (MARINE SEDIMENT)
MUDDY SANDY GRAVEL (MARINE SEDIMENT)
MUSSEL DEPOSIT (MARINE BIOLOGICAL DEPOSIT)
ROCK AND SEDIMENT
SAND (MARINE SEDIMENT)
SANDY GRAVEL (MARINE SEDIMENT)
SANDY MUD (MARINE SEDIMENT)
SLIGHTLY GRAVELLY MUD (MARINE SEDIMENT)
SLIGHTLY GRAVELLY MUDDY SAND (MARINE SEDIMENT)
SLIGHTLY GRAVELLY SAND (MARINE SEDIMENT)
SLIGHTLY GRAVELLY SANDY MUD (MARINE SEDIMENT)
UNDIFFERENTIATED BEDROCK LITHOLOGY
0 12.5 25 50 75 100
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary Limit of Study
Note: colours shown are not to any pre-determined BGS colour regime
Refer to Figure 1.12 for Seascape Character Area definition
SEASCAPE CHARACTERISATION
MMO AREAS 3 AND 4
SEDIMENT GEOLOGY
D136317/34/006
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RM
SD
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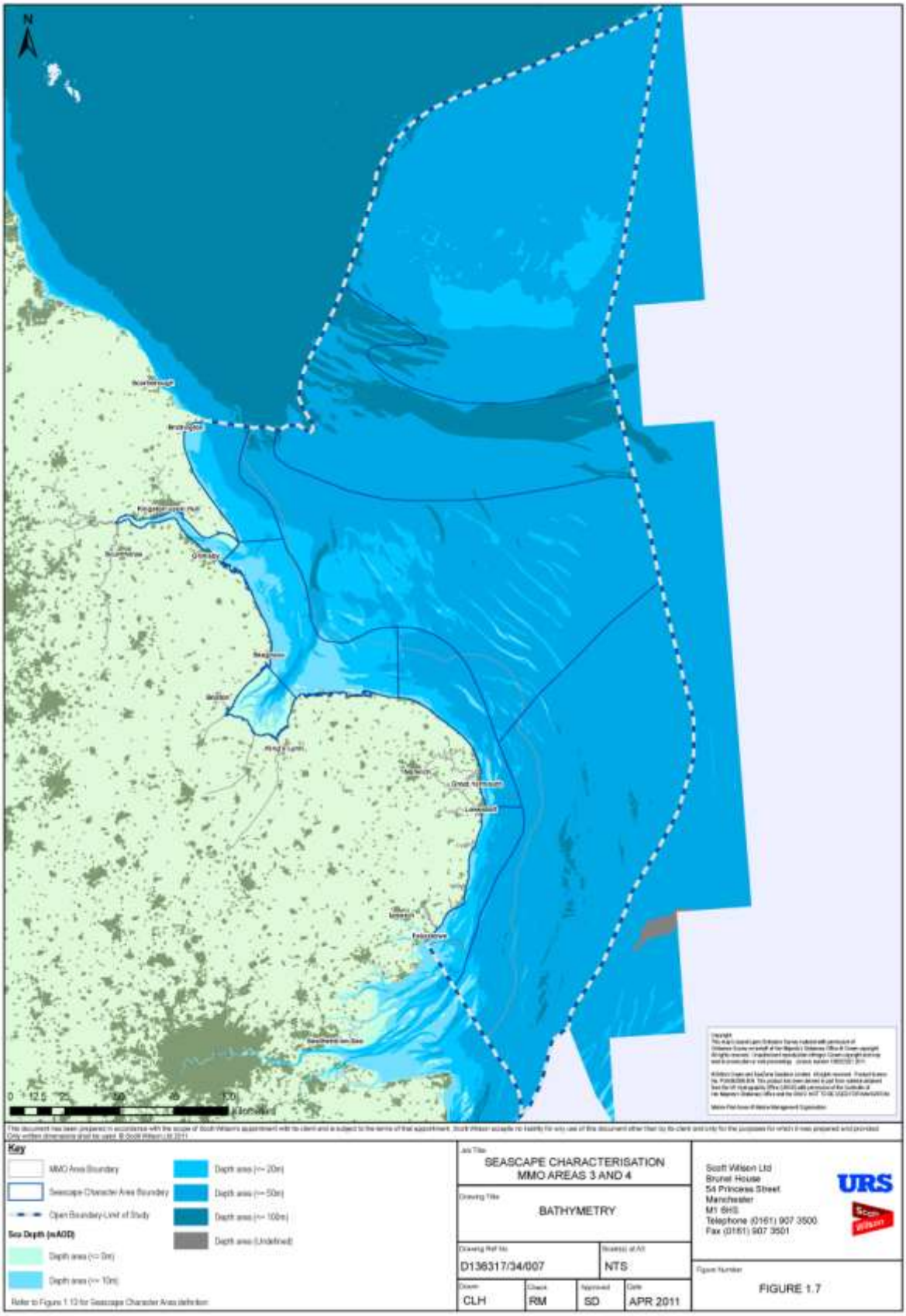
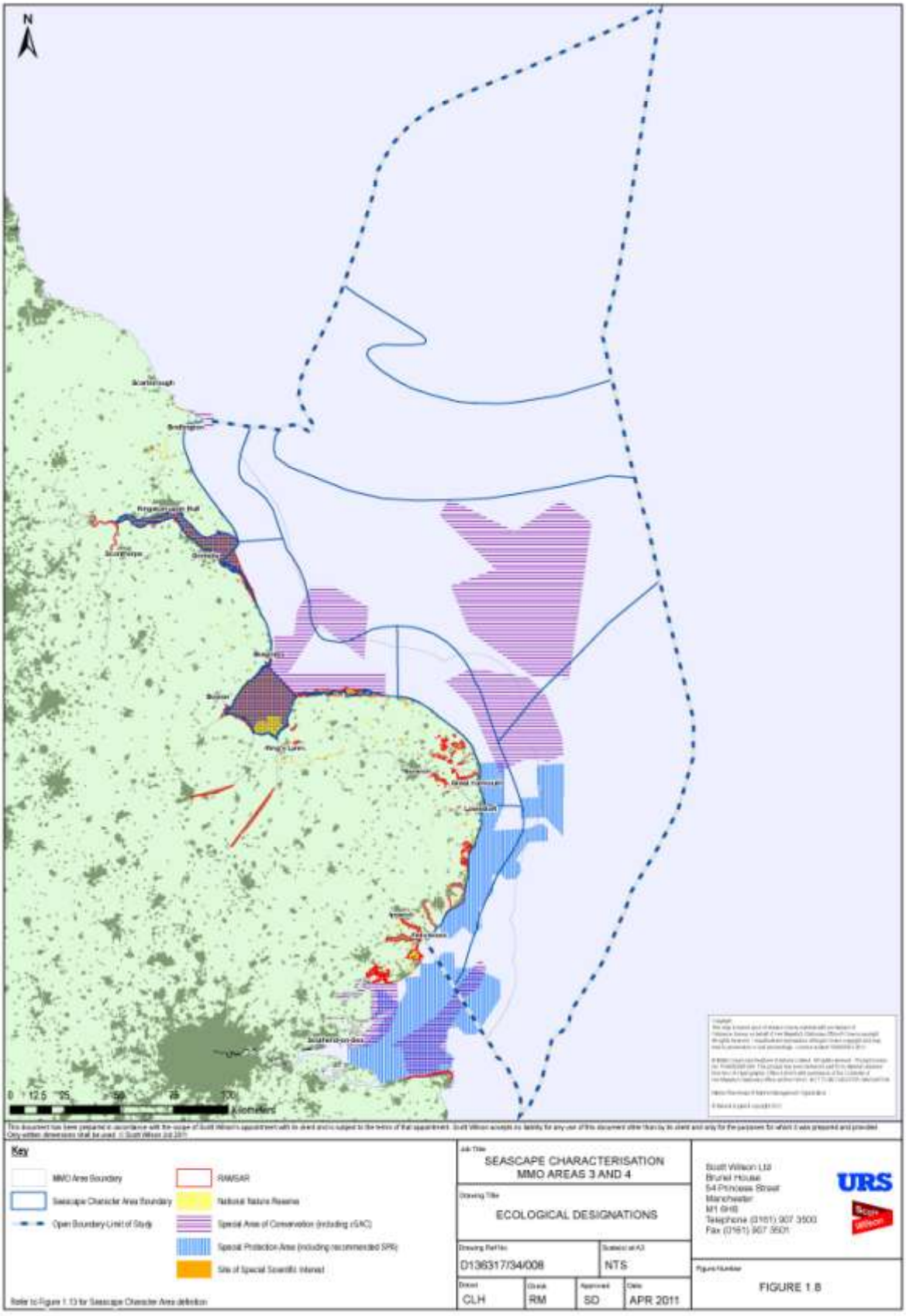
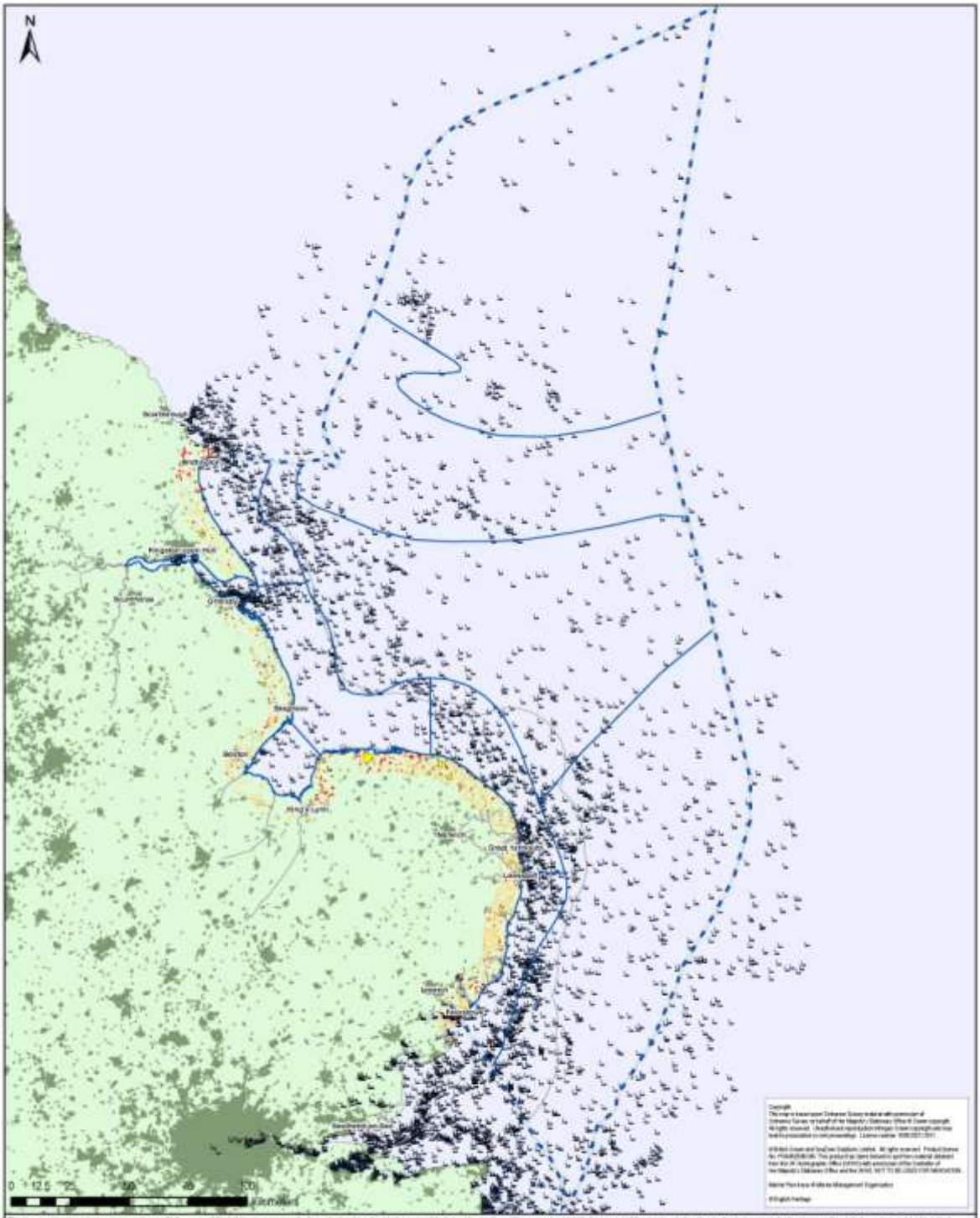
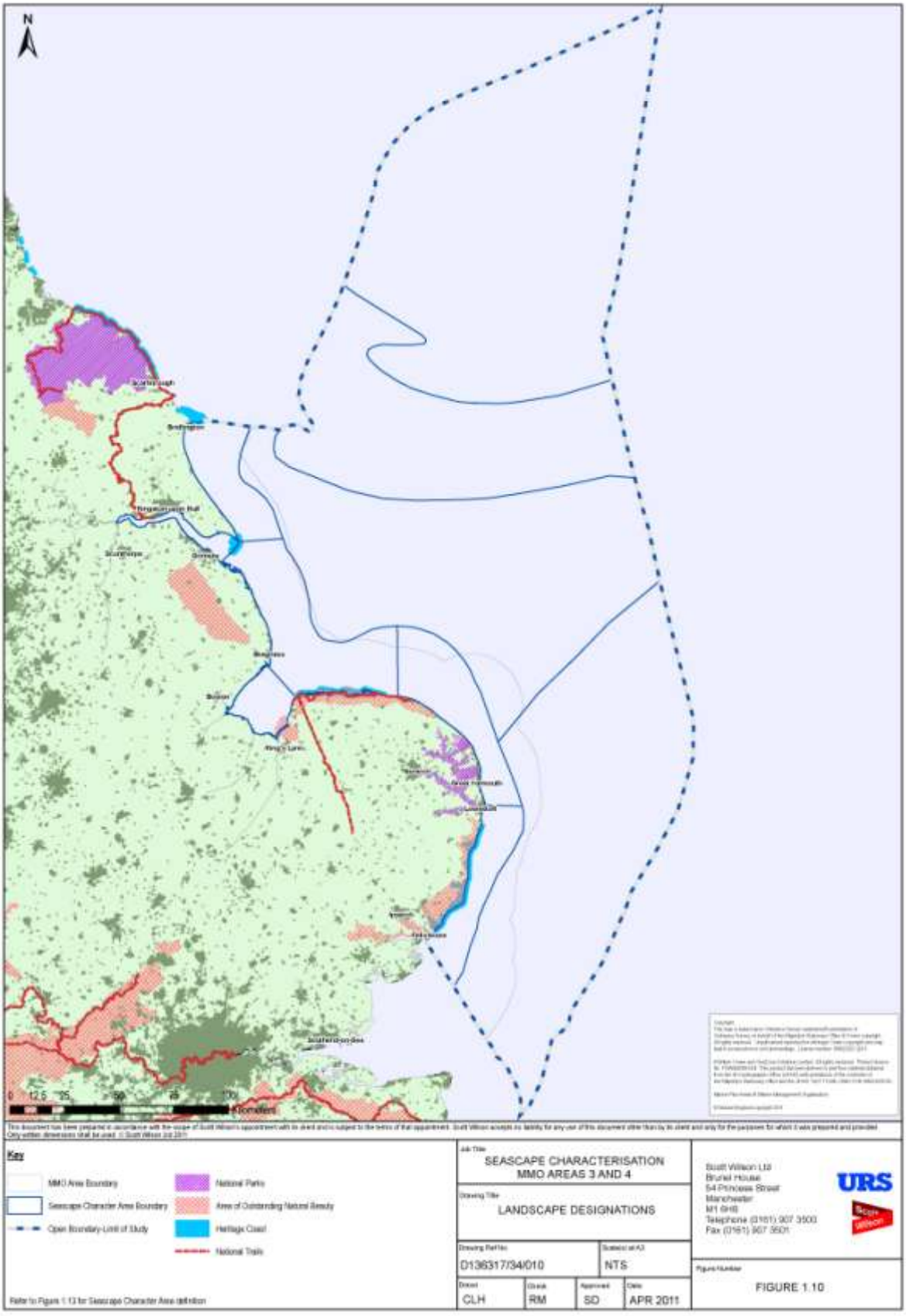
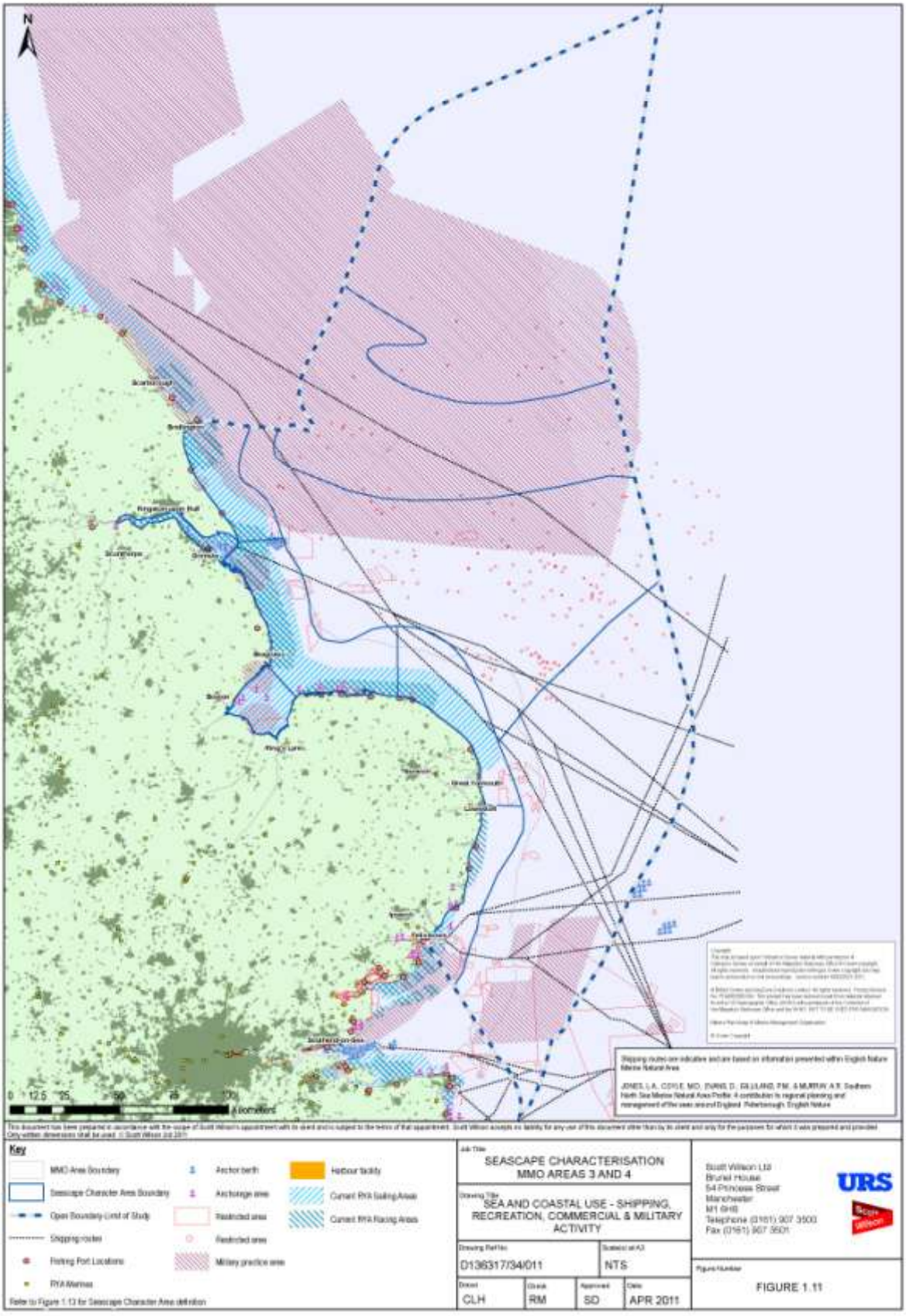
FIGURE 1.6

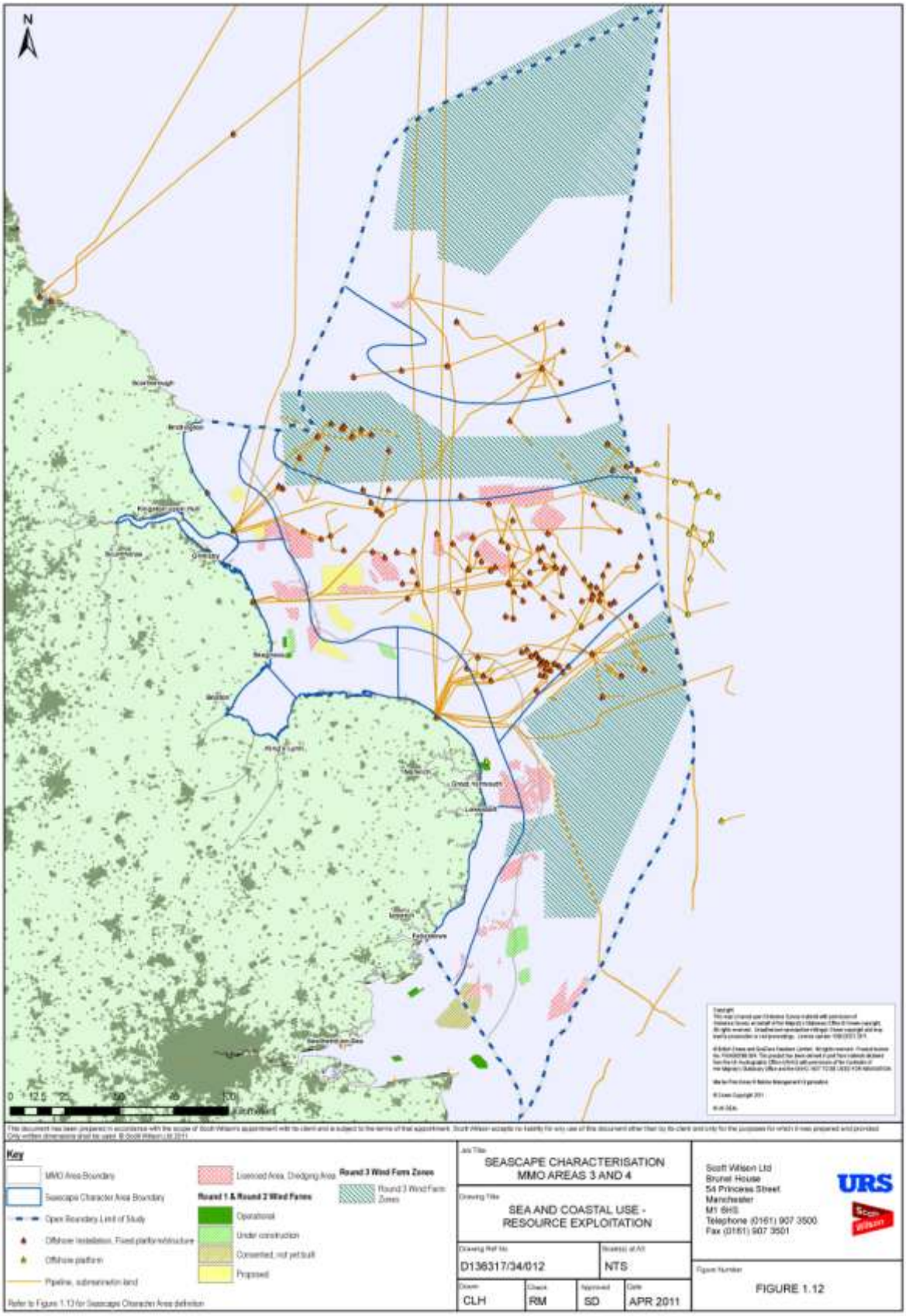

N
0 12.5 25 50 75 100
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary Limit of Study
Sea Depth (mAOD)
Depth area (<= 0m)
Depth area (<= 10m)
Depth area (<= 20m)
Depth area (<= 50m)
Depth area (<= 100m)
Depth area (Undefined)
Refer to Figure 1.12 for Seascape Character Area definition
SEASCAPE CHARACTERISATION
MMO AREAS 3 AND 4
BATHYMETRY
D136317/34/007
NTS
CLH
RM
SD
APR 2011
FIGURE 1.7
Scott Wilson Ltd
Brunel House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501

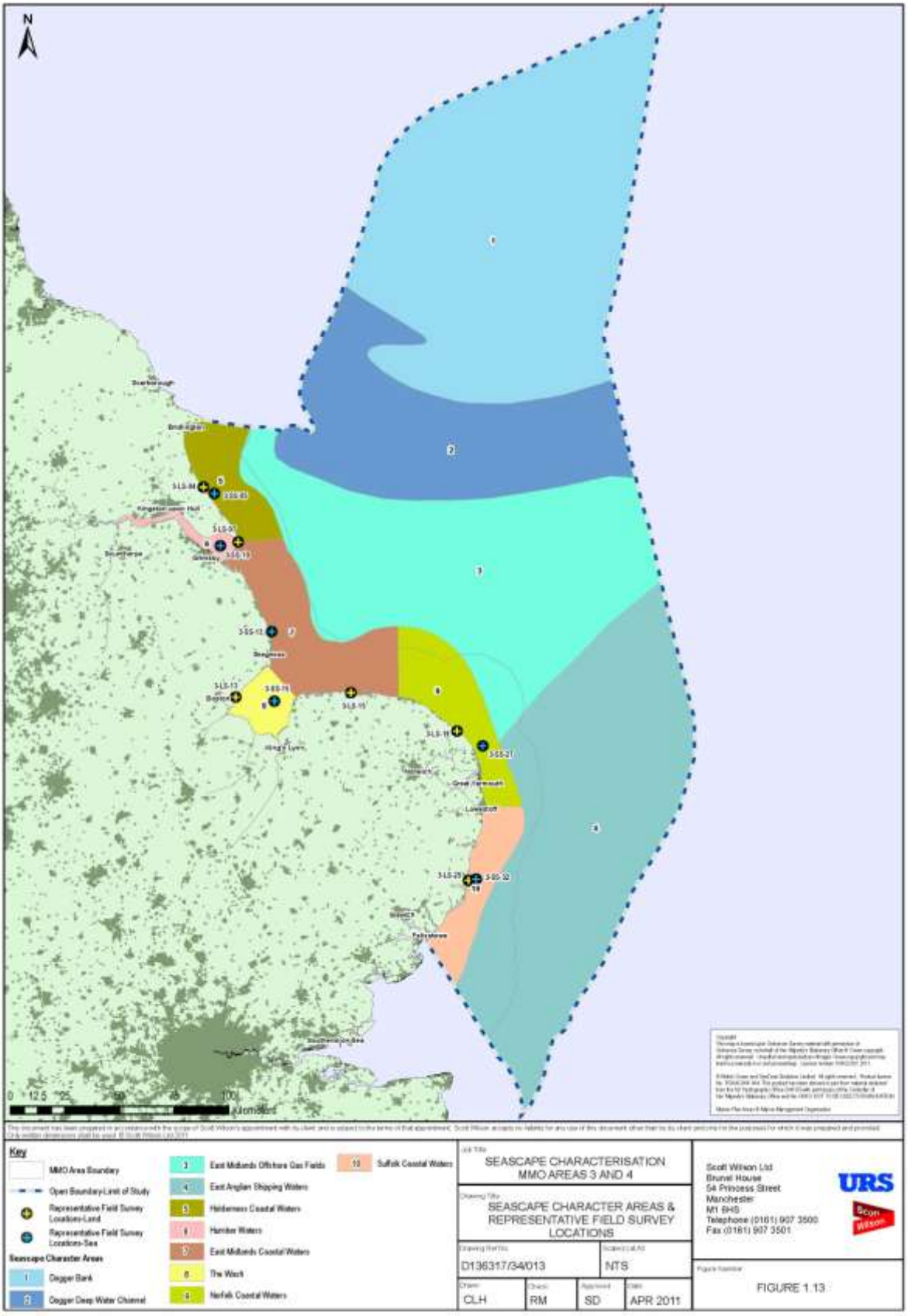

N
0 12.5 25 50 75 100
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary-Limit of Study
RAMSAR
National Nature Reserve
Special Area of Conservation (including cSAC)
Special Protection Area (including recommended SPA)
Site of Special Scientific Interest
Refer to Figure 1.13 for Seascape Character Area definition
SEASCAPE CHARACTERISATION
MMO AREAS 3 AND 4
ECOLOGICAL DESIGNATIONS
D136317/34/008
NTS
CLH
RM
SD
APR 2011
Scott Wilson Ltd
Bruntwood House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
FIGURE 1.8


N
0 12.5 25 50 75 100
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary Limit of Study
Scheduled Monument
Registered Park and Garden
Listed Building
Wreck
Refer to Figure 1.12 for Seascape Character Area definition
SEASCAPE CHARACTERISATION
MMO AREAS 3 AND 4
HERITAGE ASSETS
D136317/34/009
NTS
CLH
RM
SD
APR 2011
Scott Wilson Ltd
Brunel House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
FIGURE 1.9


N
0 12.5 25 50 75 100
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary-Limit of Study
National Parks
Area of Outstanding Natural Beauty
Heritage Coast
National Trails
Refer to Figure 1.13 for Seascape Character Area definition
SEASCAPE CHARACTERISATION
MMO AREAS 3 AND 4
LANDSCAPE DESIGNATIONS
D136317/34/010
NTS
CLH
RM
SD
APR 2011
FIGURE 1.10
Scott Wilson Ltd
Bruntel House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501

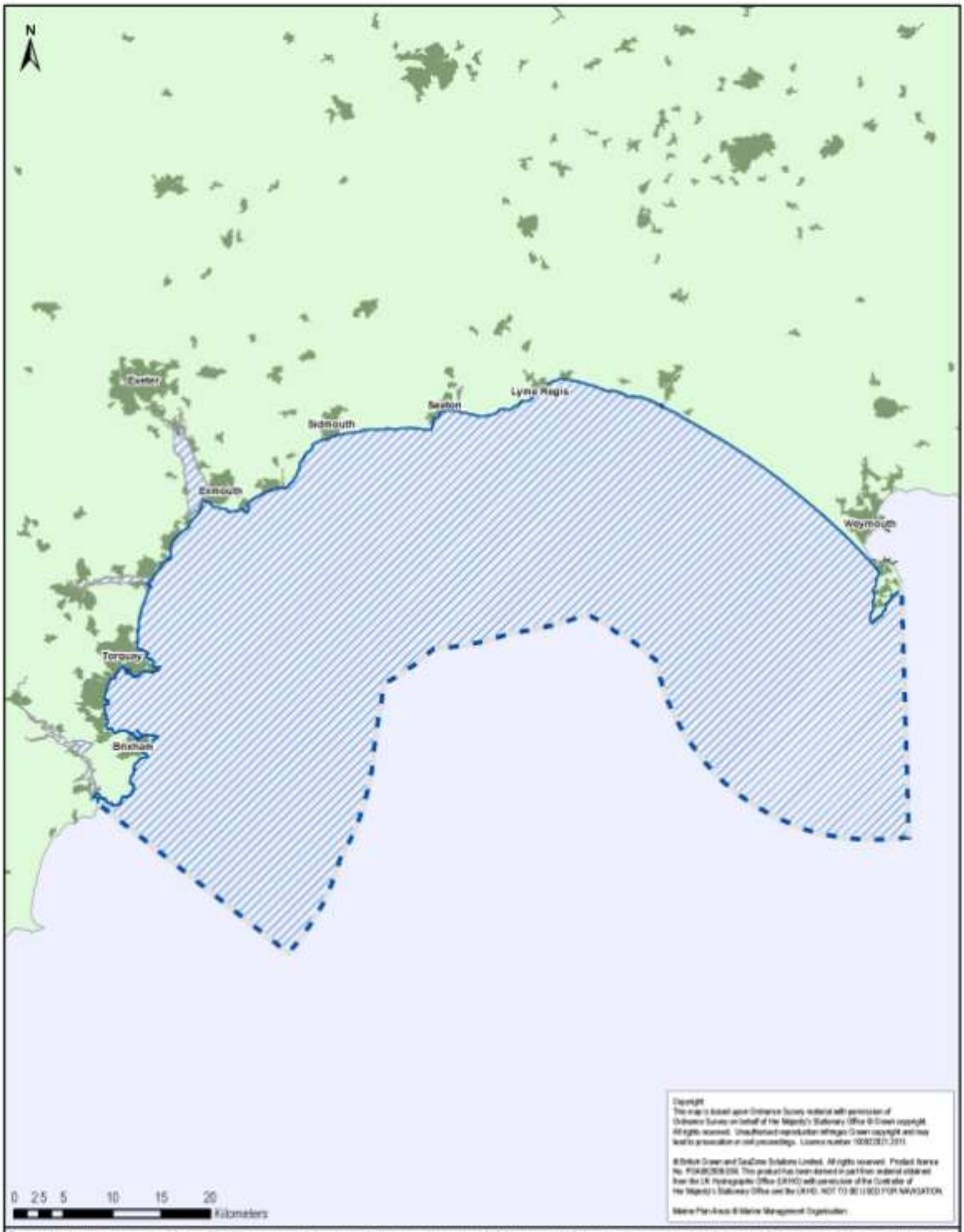

N
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary Limit of Study
Shipping routes
Fishing Port Locations
RYA Marinas
Refer to Figure 1.13 for Seascape Character Area definition
Anchor berth
Anchorage area
Restricted area
Restricted area
Military practice area
Harbour facility
Current RYA Sailing Areas
Current RYA Racing Areas
SEASCAPE CHARACTERISATION
MMO AREAS 3 AND 4
SEA AND COASTAL USE - SHIPPING, RECREATION, COMMERCIAL & MILITARY ACTIVITY
D136317/34/011
NTS
CLH
RM
SD
APR 2011
FIGURE 1.11
Scott Wilson Ltd
Bruntel House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501


N
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary Limit of Study
Offshore installation, Fixed platform/structure
Offshore platform
Pipeline, submarine/in land
Refer to Figure 1.13 for Seascape Character Area definition
Licenced Area, Dredging Area
Round 1 & Round 2 Wind Farms
Operational
Under construction
Consented, not yet built
Proposed
Round 3 Wind Farm Zones
Round 3 Wind Farm Zones
SEASCAPE CHARACTERISATION
MMO AREAS 3 AND 4
SEA AND COASTAL USE -
RESOURCE EXPLOITATION
D136317/34/012
NTS
CLH
RM
SD
APR 2011
FIGURE 1.12
Scott Wilson Ltd
Brunel House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501


N
0 12.5 25 50 75 100
Kilometers
Key
MMO Area Boundary
Open Boundary Limit of Study
Representative Field Survey Locations-Land
Representative Field Survey Locations-Sea
Seascape Character Areas
1 Dogger Bank
2 Dogger Deep Water Channel
3 East Midlands Offshore Gas Fields
4 East Anglian Shipping Waters
5 Holderness Coastal Waters
6 Humber Waters
7 East Midlands Coastal Waters
8 The Wash
9 Norfolk Coastal Waters
10 Suffolk Coastal Waters
SEASCAPE CHARACTERISATION MMO AREAS 3 AND 4
SEASCAPE CHARACTER AREAS & REPRESENTATIVE FIELD SURVEY LOCATIONS
D136317/34/013
NTS
CLH
RM
SD
APR 2011
Scott Wilson Ltd
Brunel House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
FIGURE 1.13

Appendix 2 – Figures for MMO Area 6

- Figure 2.1 MMO 6 Study Area
- Figure 2.2 Landscape / Seascape Visibility Assessment
- Figure 2.3 National Landscape Character Areas & Marine and Coastal Natural Areas
- Figure 2.4 Field Survey Locations
- Figure 2.5 Bedrock and Drift Geology
- Figure 2.6 Sediment Geology
- Figure 2.7 Bathymetry
- Figure 2.8 Ecological Designations
- Figure 2.9 Heritage Assets
- Figure 2.10 Landscape Designations
- Figure 2.11 Sea and Coastal Use – Shipping, recreation, commercial and military activity
- Figure 2.12 Seascape Character Areas and representative field survey locations


N
Exeter
Sidmouth
Seaton
Lyme Regis
Exmouth
Weymouth
Torquay
Brixham
0 2.5 5 10 15 20
Kilometers
Key
MMO Area 6 (western section)
Seascape Character Area Boundary
Open Boundary-Limit of Study
Refer to Figure 2.12 for Seascape Character Area definition
Job Title
SEASCAPE CHARACTERISATION
MMO AREA 6
Drawing Title
MMO 6 STUDY AREA
Drawing Ref No.
D136317/06/001
Scale(s) at A4
1:500,000
Drawn
CLH
Check
RM
Approved
SD
Date
APR 2011
Scott Wilson Ltd
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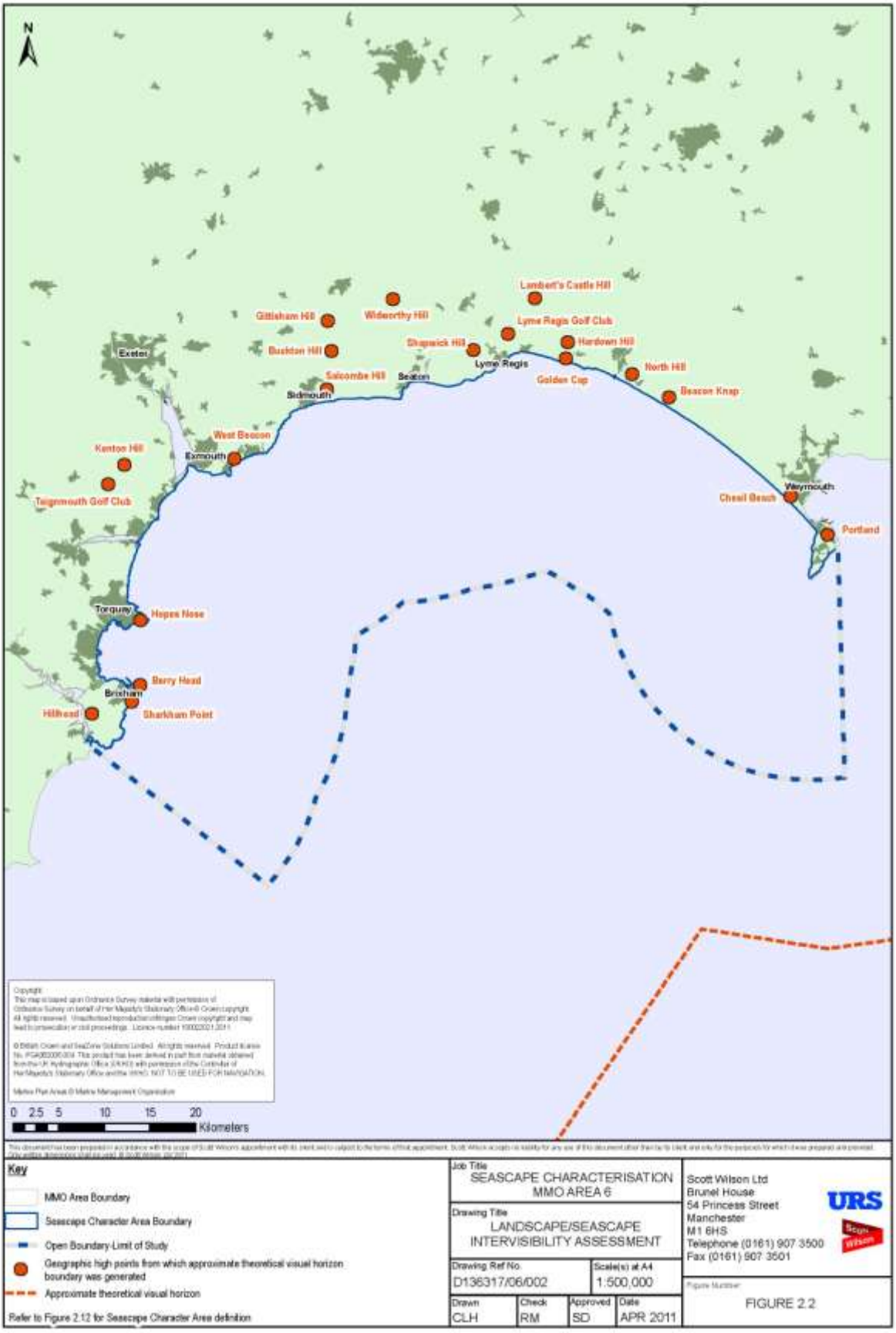
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
Figure Number
FIGURE 2.1


N
Lambert's Castle Hill
Gittisham Hill
Widworthy Hill
Lyme Regis Golf Club
Shapwick Hill
Hardown Hill
Buckton Hill
Exeter
Lyme Regis
North Hill
Salcombe Hill
Seaton
Golden Cap
Sidmouth
Beacon Knap
West Beacon
Kenton Hill
Exmouth
Teignmouth Golf Club
Chesil Beach
Weymouth
Portland
Torquay
Hopes Nose
Berry Head
Brixham
Hillhead
Sharkham Point
0 2.5 5 10 15 20
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary-Limit of Study
Geographic high points from which approximate theoretical visual horizon boundary was generated
Approximate theoretical visual horizon
Refer to Figure 2.12 for Seascape Character Area definition
Job Title
SEASCAPE CHARACTERISATION MMO AREA 6
Drawing Title
LANDSCAPE/SEASCAPE INTERVISIBILITY ASSESSMENT
Drawing Ref No.
D136317/06/002
Scale(s) at A4
1:500,000
Drawn
CLH
Check
RM
Approved
SD
Date
APR 2011
Scott Wilson Ltd
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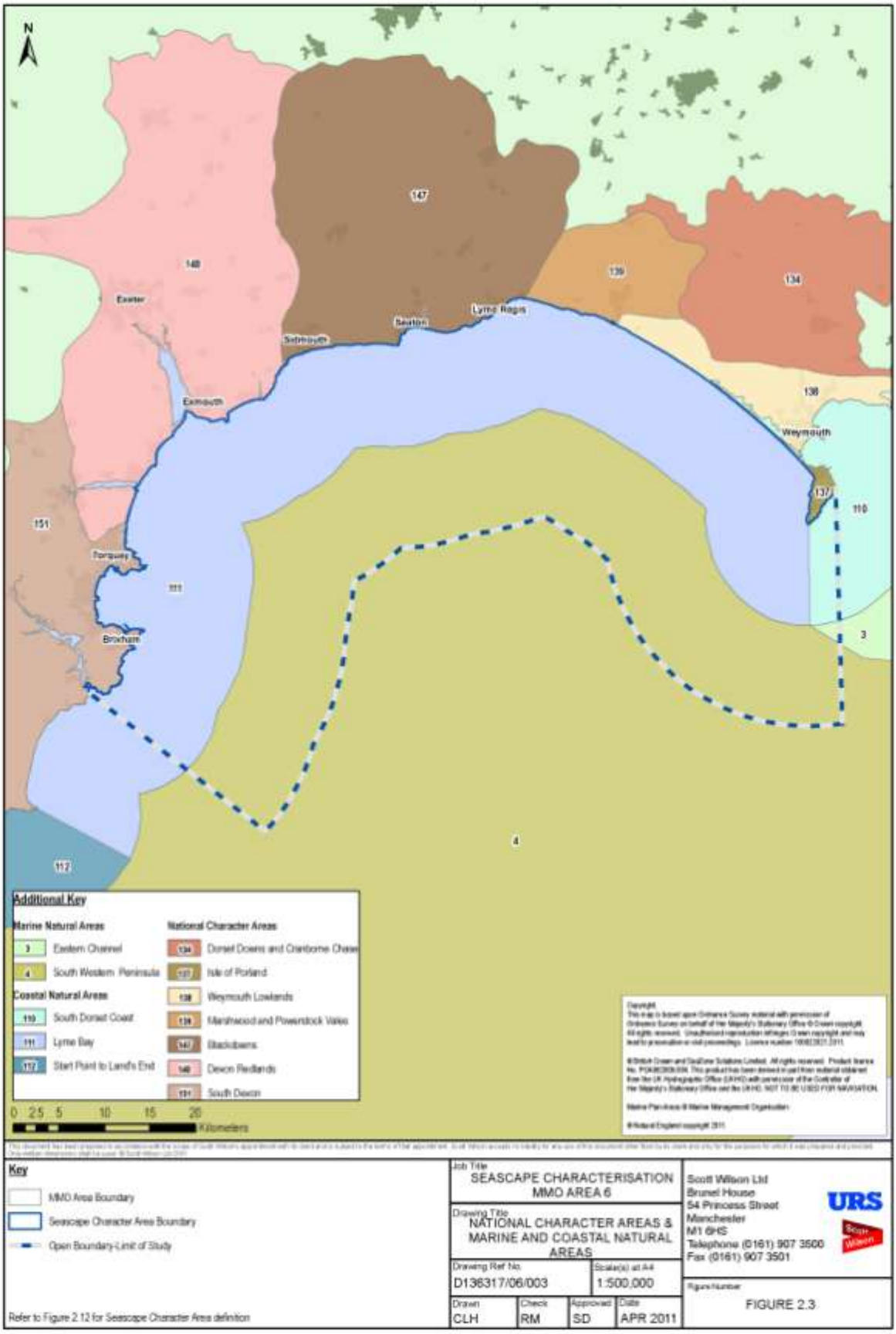
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
FIGURE 2.2


N
147
148
139
134
Exeter
Lyme Regis
Seaton
Sidmouth
Exmouth
138
Weymouth
137
110
151
Torquay
111
Brixham
3
4
117
Additional Key
Marine Natural Areas
3 Eastern Channel
4 South Western Peninsula
Coastal Natural Areas
110 South Dorset Coast
111 Lyme Bay
117 Start Point to Land's End
National Character Areas
134 Dorset Downs and Cranborne Chase
117 Isle of Portland
138 Weymouth Lowlands
139 Marshwood and Powerstock Vales
147 Blackdowns
148 Devon Redlands
151 South Devon
0 2.5 5 10 15 20
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary-Limit of Study
Refer to Figure 2.12 for Seascape Character Area definition
Job Title
SEASCAPE CHARACTERISATION MMO AREA 6
Drawing Title
NATIONAL CHARACTER AREAS & MARINE AND COASTAL NATURAL AREAS
Drawing Ref No.
D136317/06/003
Scale(s) at A4
1:500,000
Drawn
CLH
Check
RM
Approved
SD
Date
APR 2011
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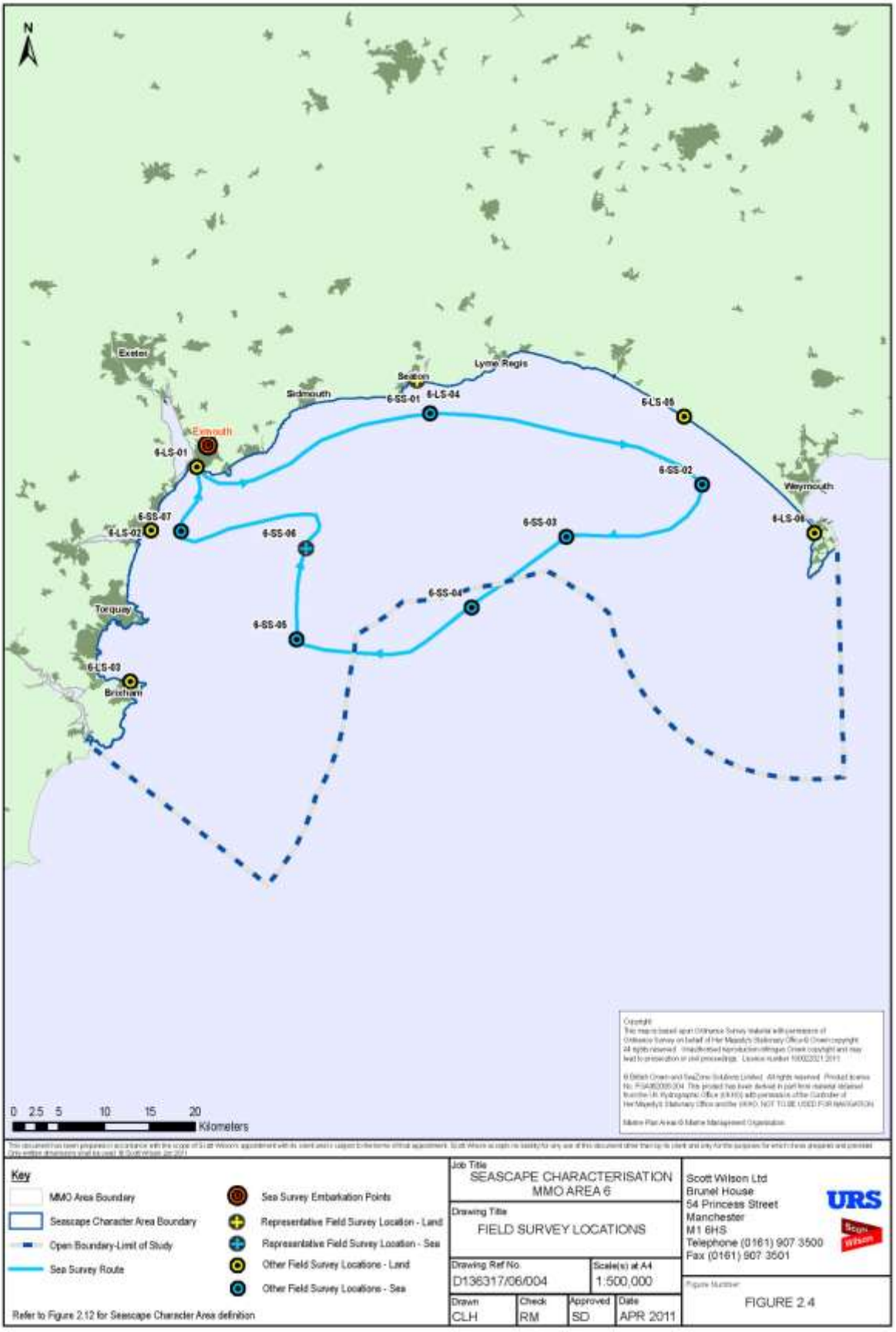
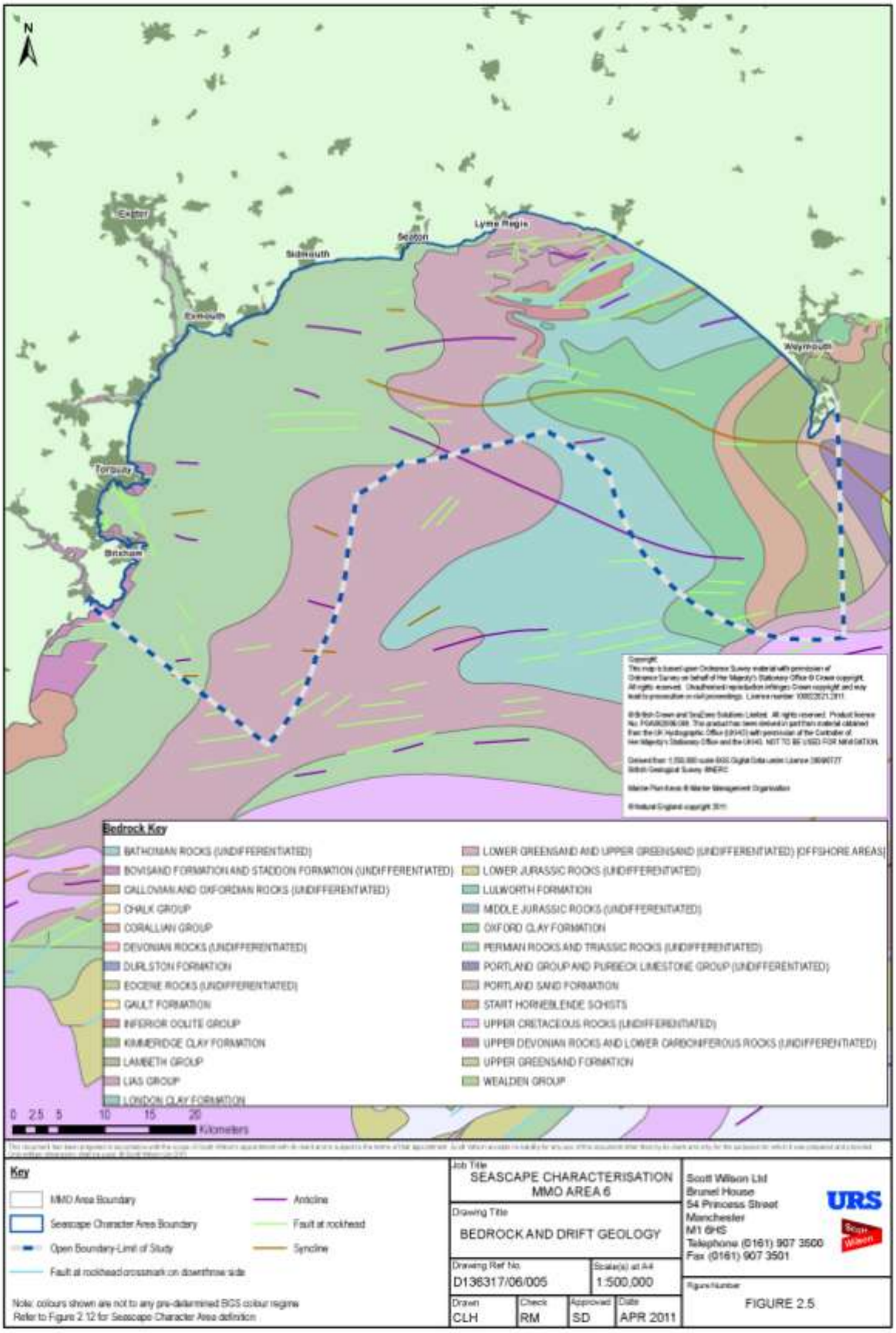
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
Figure Number
FIGURE 2.3


N
Exeter
Sidmouth
Seaton
Lyme Regis
Exmouth
Weymouth
Torquay
Brixham
6-LS-01
6-LS-02
6-LS-03
6-LS-04
6-LS-05
6-LS-06
6-SS-01
6-SS-02
6-SS-03
6-SS-04
6-SS-05
6-SS-06
6-SS-07
0 2.5 5 10 15 20
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary-Limit of Study
Sea Survey Route
Sea Survey Embarkation Points
Representative Field Survey Location - Land
Representative Field Survey Location - Sea
Other Field Survey Locations - Land
Other Field Survey Locations - Sea
Refer to Figure 2.12 for Seascape Character Area definition
Job Title
SEASCAPE CHARACTERISATION MMO AREA 6
Drawing Title
FIELD SURVEY LOCATIONS
Drawing Ref No.
D136317/06/004
Scale(s) at A4
1:500,000
Drawn
CLH
Check
RM
Approved
SD
Date
APR 2011
Scott Wilson Ltd
Brunel House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
FIGURE 2.4


N
Exeter
Sidmouth
Seaton
Lyme Regis
Exmouth
Weymouth
Torquay
Brixham
Bedrock Key
BATHONIAN ROCKS (UNDIFFERENTIATED)
BOVISAND FORMATION AND STADDON FORMATION (UNDIFFERENTIATED)
CALLOVIAN AND OXFORDIAN ROCKS (UNDIFFERENTIATED)
CHALK GROUP
CORALLIAN GROUP
DEVONIAN ROCKS (UNDIFFERENTIATED)
DURLSTON FORMATION
EOCENE ROCKS (UNDIFFERENTIATED)
GAULT FORMATION
INFERIOR OOLITE GROUP
KIMMERIDGE CLAY FORMATION
LAMBETH GROUP
LIAS GROUP
LONDON CLAY FORMATION
LOWER GREENSAND AND UPPER GREENSAND (UNDIFFERENTIATED) (OFFSHORE AREAS)
LOWER JURASSIC ROCKS (UNDIFFERENTIATED)
LULWORTH FORMATION
MIDDLE JURASSIC ROCKS (UNDIFFERENTIATED)
OXFORD CLAY FORMATION
PERMIAN ROCKS AND TRIASSIC ROCKS (UNDIFFERENTIATED)
PORTLAND GROUP AND PURBECK LIMESTONE GROUP (UNDIFFERENTIATED)
PORTLAND SAND FORMATION
START HORNBLENDE SCHISTS
UPPER CRETACEOUS ROCKS (UNDIFFERENTIATED)
UPPER DEVONIAN ROCKS AND LOWER CARBONIFEROUS ROCKS (UNDIFFERENTIATED)
UPPER GREENSAND FORMATION
WEALDEN GROUP
0 2.5 5 10 15 20
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary-Limit of Study
Fault at rockhead crosshatch on downthrow side
Anticline
Fault at rockhead
Syncline
Note: colours shown are not to any pre-determined BGS colour regime
Refer to Figure 2.12 for Seascape Character Area definition
Job Title
SEASCAPE CHARACTERISATION
MMO AREA 6
Drawing Title
BEDROCK AND DRIFT GEOLOGY
Drawing Ref No.
D136317/06/005
Scale(s) at A4
1:500,000
Drawn
CLH
Check
RM
Approved
SD
Date
APR 2011
Scott Wilson Ltd
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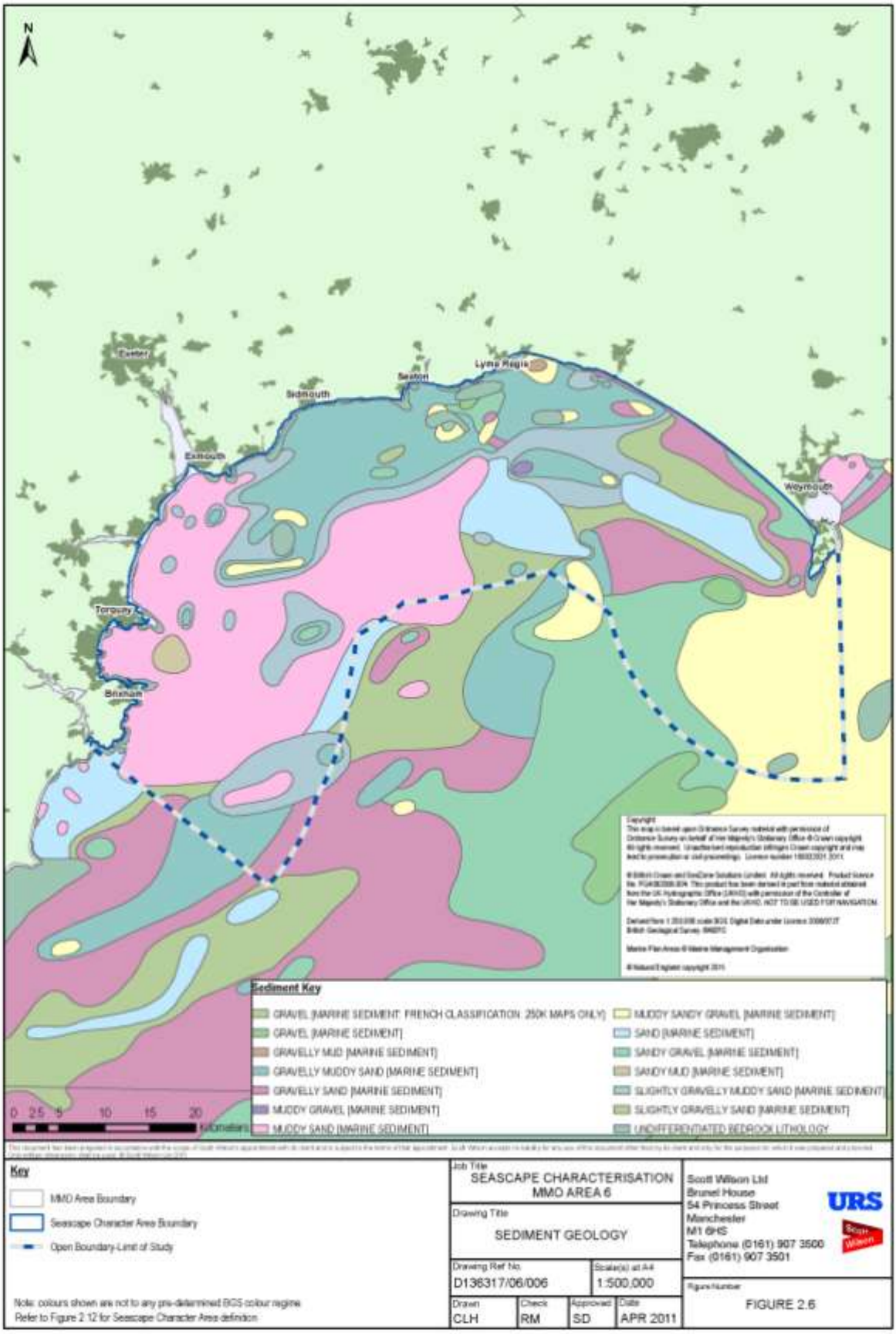
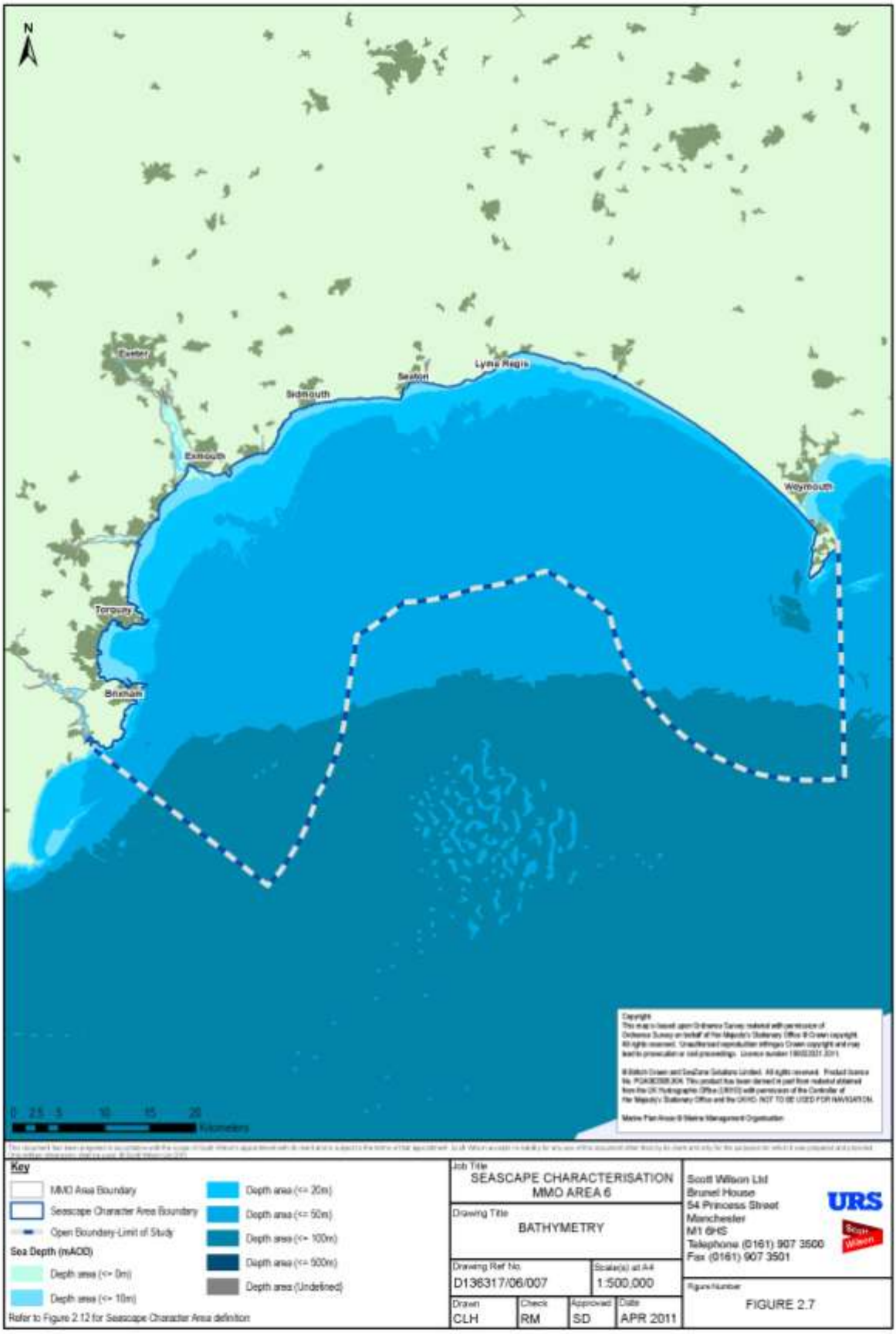
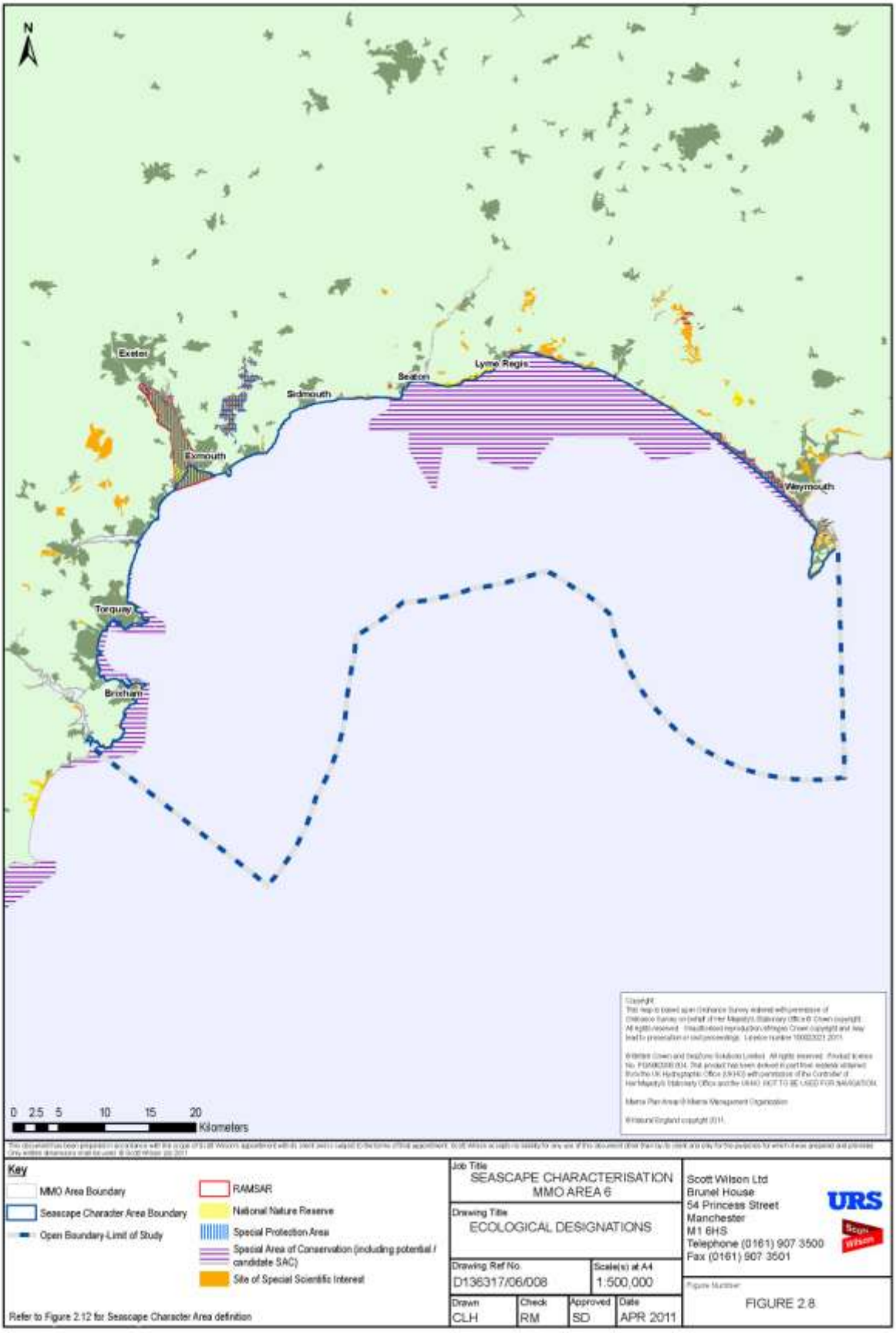
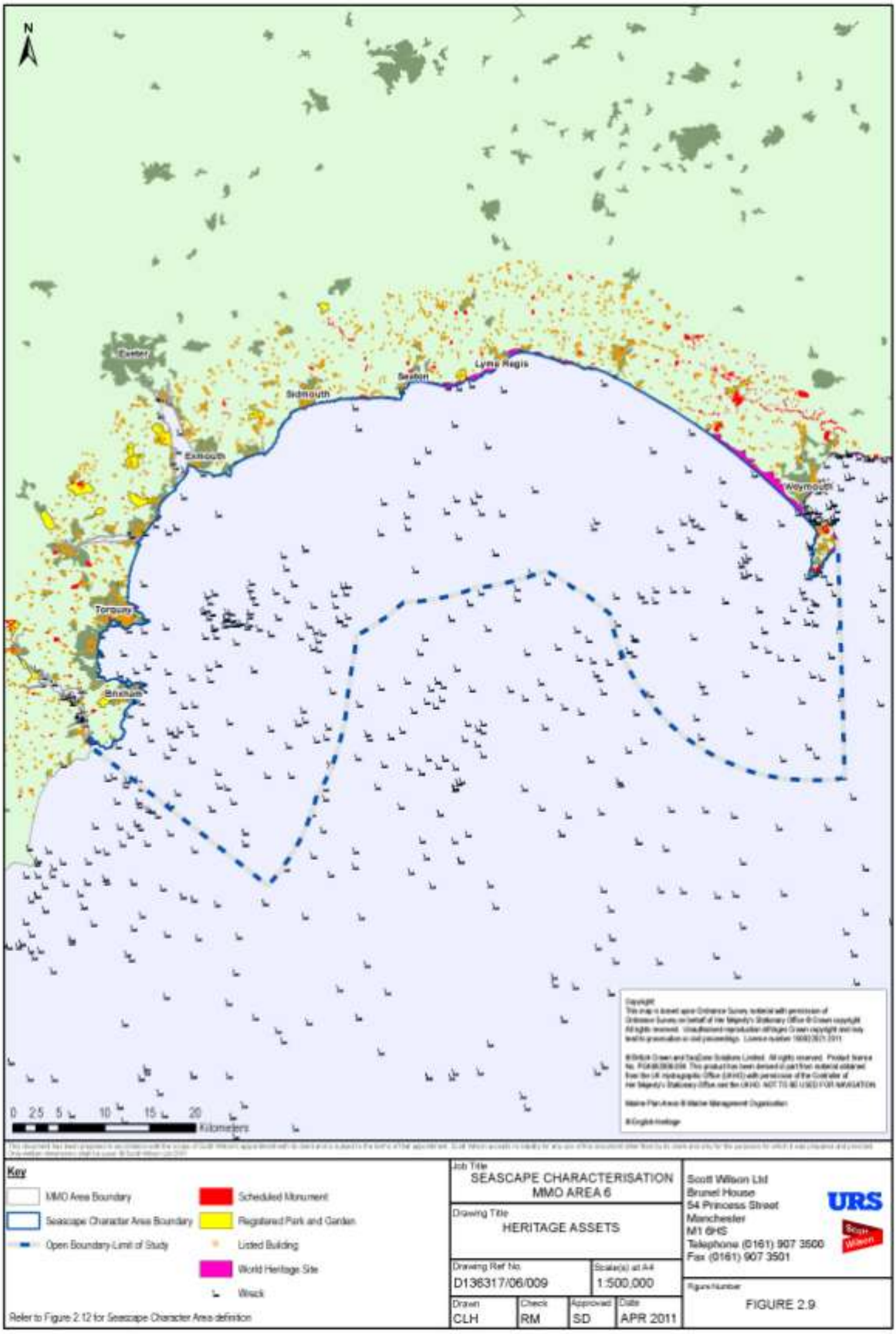
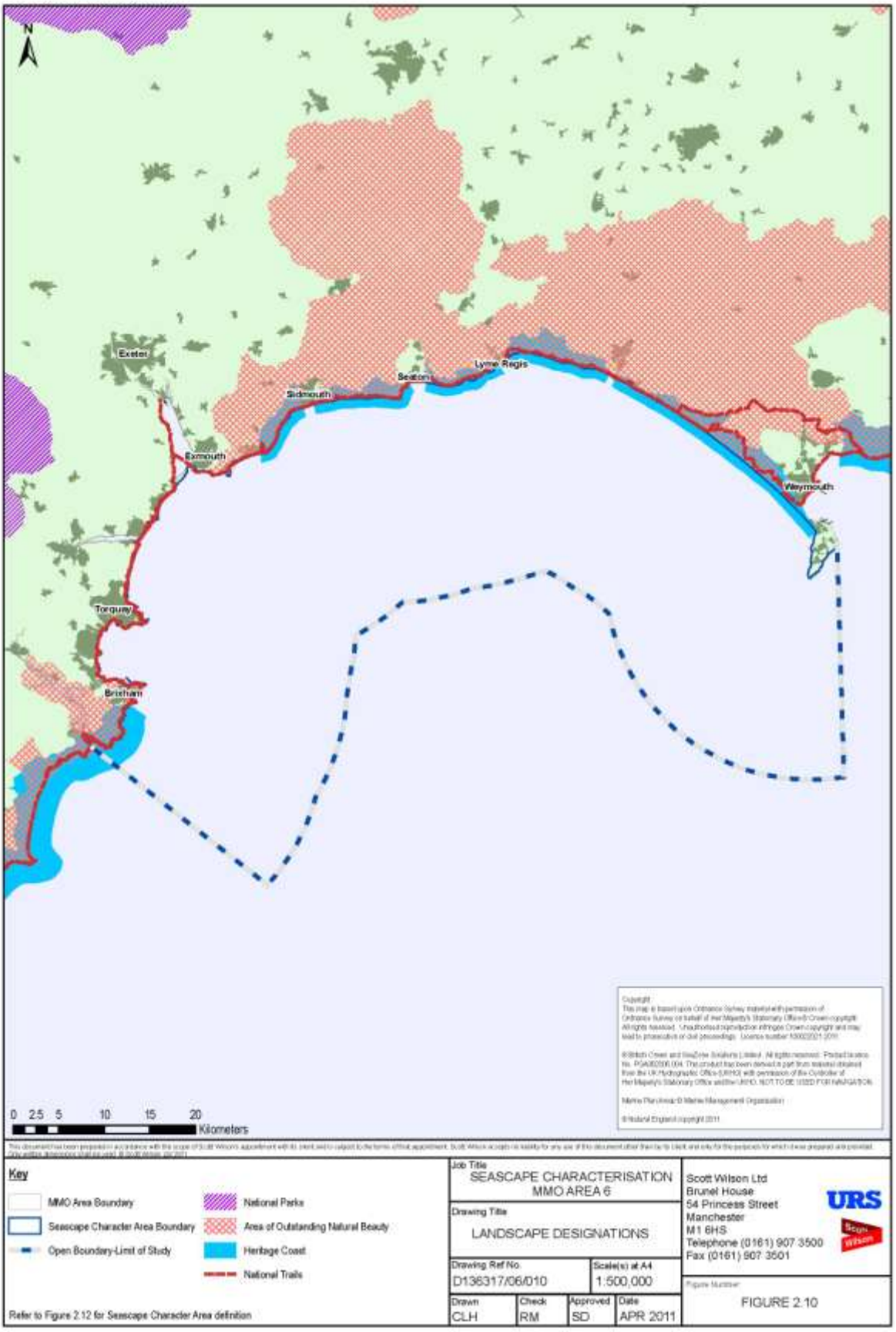
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
Figure Number
FIGURE 2.5

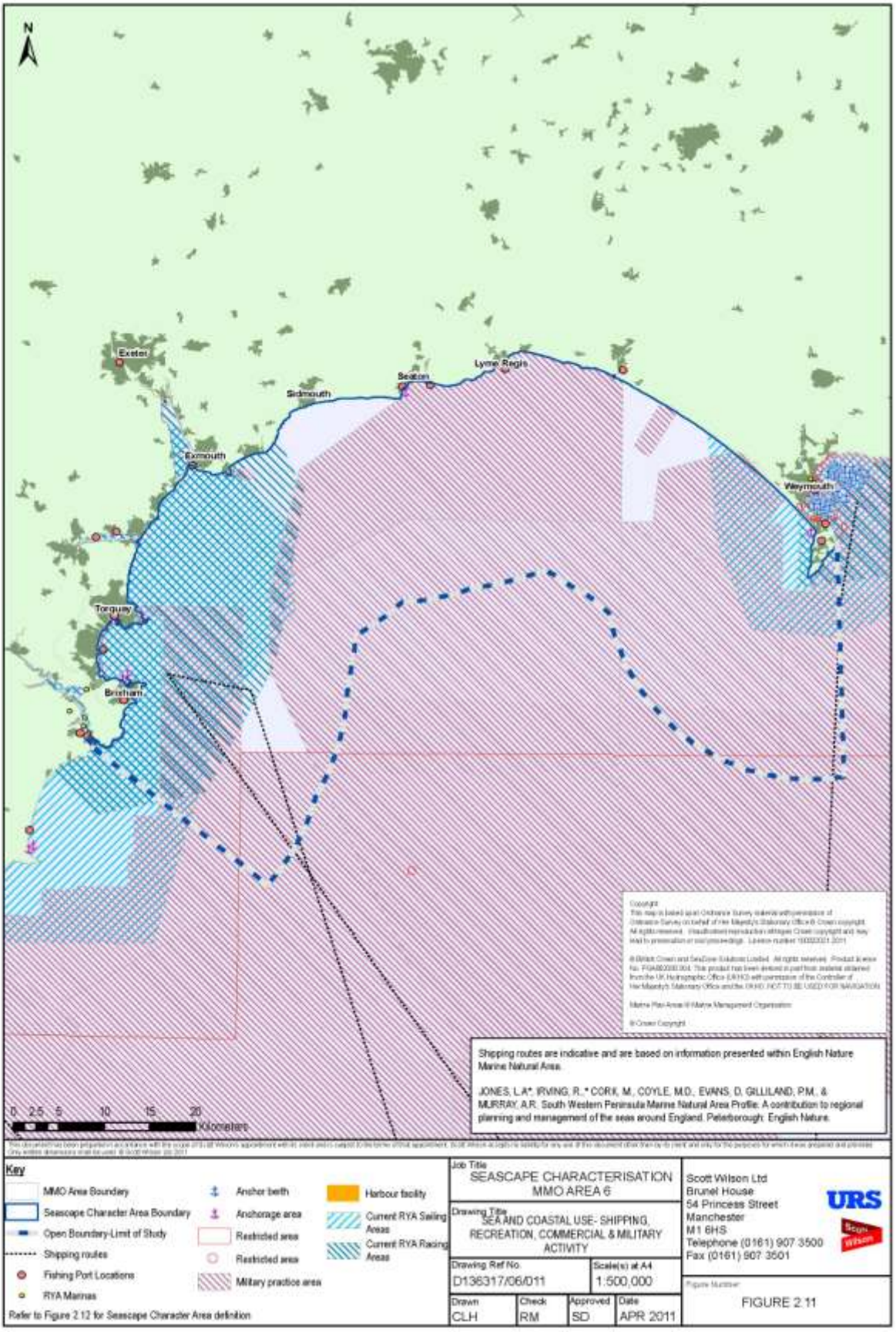

N
Exeter
Sidmouth
Seaton
Lyme Regis
Exmouth
Weymouth
Torquay
Brixham
Sediment Key
GRAVEL (MARINE SEDIMENT. FRENCH CLASSIFICATION. 250K MAPS ONLY)
GRAVEL (MARINE SEDIMENT)
GRAVELLY MUD (MARINE SEDIMENT)
GRAVELLY MUDDY SAND (MARINE SEDIMENT)
GRAVELLY SAND (MARINE SEDIMENT)
MUDDY GRAVEL (MARINE SEDIMENT)
MUDDY SAND (MARINE SEDIMENT)
MUDDY SANDY GRAVEL (MARINE SEDIMENT)
SAND (MARINE SEDIMENT)
SANDY GRAVEL (MARINE SEDIMENT)
SANDY MUD (MARINE SEDIMENT)
SLIGHTLY GRAVELLY MUDDY SAND (MARINE SEDIMENT)
SLIGHTLY GRAVELLY SAND (MARINE SEDIMENT)
UNDIFFERENTIATED BEDROCK LITHOLOGY
0 2.5 5 10 15 20
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary-Limit of Study
Note: colours shown are not to any pre-determined BGS colour regime.
Refer to Figure 2.12 for Seascape Character Area definition
Job Title
SEASCAPE CHARACTERISATION
MMO AREA 6
Drawing Title
SEDIMENT GEOLOGY
Drawing Ref No.
D136317/06/006
Scale(s) at A4
1:500,000
Drawn
CLH
Check
RM
Approved
SD
Date
APR 2011
Scott Wilson Ltd
Brunel House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
Figure Number
FIGURE 2.6

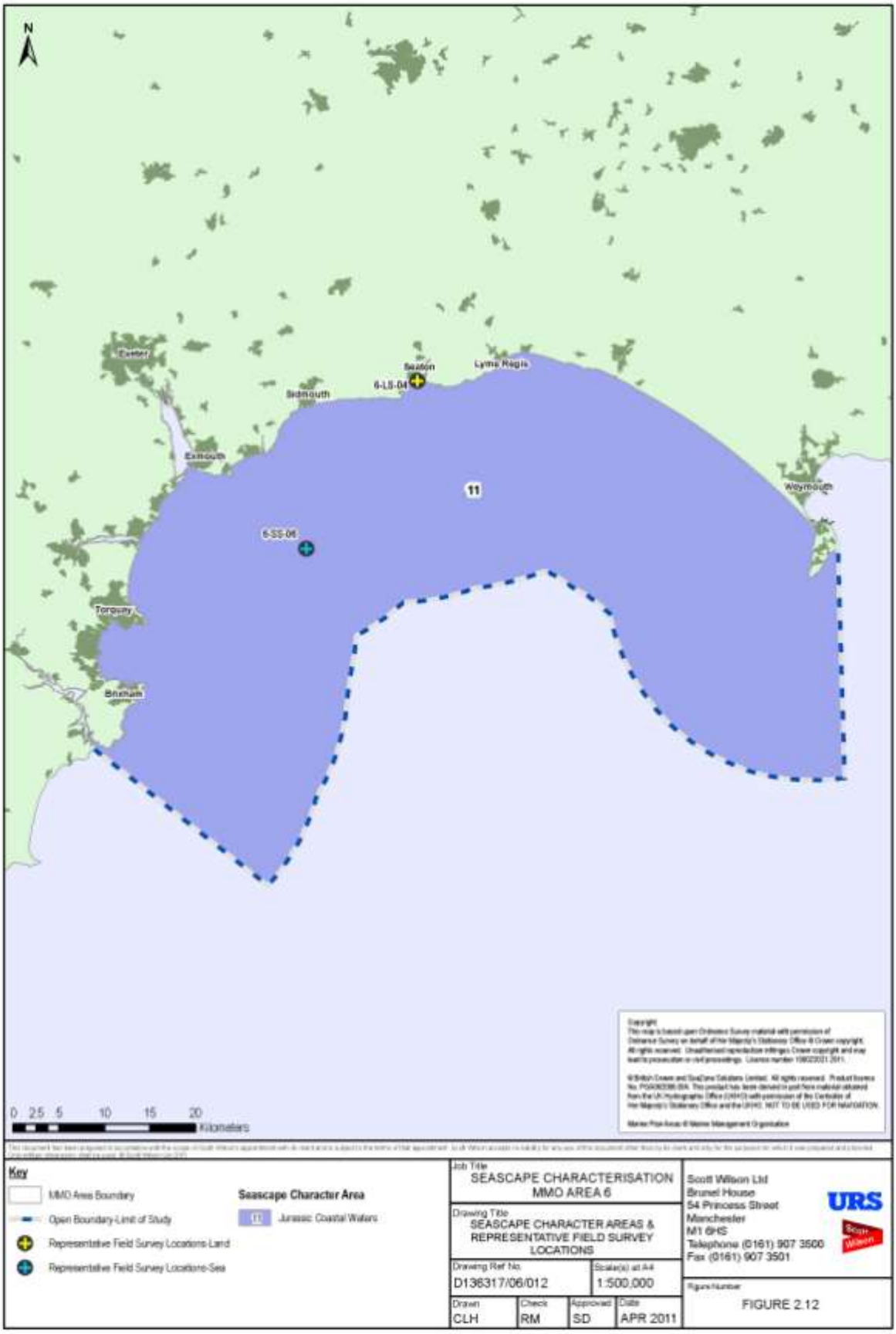

N
Exeter
Sidmouth
Seaton
Lyme Regis
Exmouth
Weymouth
Torquay
Brixham
0 2.5 5 10 15 20
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary-Limit of Study
Sea Depth (mAOD)
Depth area (<= 0m)
Depth area (<= 10m)
Depth area (<= 20m)
Depth area (<= 50m)
Depth area (<= 100m)
Depth area (<= 500m)
Depth area (Undefined)
Refer to Figure 2.12 for Seascape Character Area definition
Job Title
SEASCAPE CHARACTERISATION
MMO AREA 6
Drawing Title
BATHYMETRY
Drawing Ref No.
D136317/06/007
Scale(s) at A4
1:500,000
Drawn
CLH
Check
RM
Approved
SD
Date
APR 2011
Scott Wilson Ltd
Brunel House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
Figure Number
FIGURE 2.7


N
Exeter
Sidmouth
Seaton
Lyme Regis
Exmouth
Weymouth
Torquay
Brixham
0 2.5 5 10 15 20
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary-Limit of Study
RAMSAR
National Nature Reserve
Special Protection Area
Special Area of Conservation (including potential / candidate SAC)
Site of Special Scientific Interest
Refer to Figure 2.12 for Seascape Character Area definition
Job Title
SEASCAPE CHARACTERISATION MMO AREA 6
Drawing Title
ECOLOGICAL DESIGNATIONS
Drawing Ref No.
D136317/06/008
Scale(s) at A4
1:500,000
Drawn
CLH
Check
RM
Approved
SD
Date
APR 2011
Scott Wilson Ltd
Brunel House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
FIGURE 2.8


N
Exeter
Sidmouth
Seaton
Lyme Regis
Exmouth
Weymouth
Torquay
Brixham
0 2.5 5 10 15 20
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary-Limit of Study
Scheduled Monument
Registered Park and Garden
Listed Building
World Heritage Site
Wreck
Refer to Figure 2.12 for Seascape Character Area definition
Job Title
SEASCAPE CHARACTERISATION
MMO AREA 6
Drawing Title
HERITAGE ASSETS
Drawing Ref No.
D136317/06/009
Scale(s) at A4
1:500,000
Drawn
CLH
Check
RM
Approved
SD
Date
APR 2011
Scott Wilson Ltd
Brunel House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
Figure Number
FIGURE 2.9


N
Exeter
Sidmouth
Seaton
Lyme Regis
Exmouth
Weymouth
Torquay
Brixham
0 2.5 5 10 15 20
Kilometers
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary-Limit of Study
National Parks
Area of Outstanding Natural Beauty
Heritage Coast
National Trails
Refer to Figure 2.12 for Seascape Character Area definition
Job Title
SEASCAPE CHARACTERISATION MMO AREA 6
Drawing Title
LANDSCAPE DESIGNATIONS
Drawing Ref No.
D136317/06/010
Scale(s) at A4
1:500,000
Drawn
CLH
Check
RM
Approved
SD
Date
APR 2011
Scott Wilson Ltd
Brunel House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
FIGURE 2.10


N
Exeter
Sidmouth
Seaton
Lyme Regis
Exmouth
Weymouth
Torquay
Brixham
0 2.5 5 10 15 20
Kilometers
Shipping routes are indicative and are based on information presented within English Nature Marine Natural Area.
JONES, L.A*, IRVING, R.* CORK, M., COYLE, M.D., EVANS, D, GILLILAND, P.M., & MURRAY, A.R. South Western Peninsula Marine Natural Area Profile. A contribution to regional planning and management of the seas around England. Peterborough: English Nature.
Key
MMO Area Boundary
Seascape Character Area Boundary
Open Boundary-Limit of Study
Shipping routes
Fishing Port Locations
RYA Marinas
Anchor berth
Anchorage area
Restricted area
Restricted area
Military practice area
Harbour facility
Current RYA Sailing Areas
Current RYA Racing Areas
Refer to Figure 2.12 for Seascape Character Area definition
Job Title
SEASCAPE CHARACTERISATION MMO AREA 6
Drawing Title
SEA AND COASTAL USE- SHIPPING, RECREATION, COMMERCIAL & MILITARY ACTIVITY
Drawing Ref No.
D136317/06/011
Scale(s) at A4
1:500,000
Drawn
CLH
Check
RM
Approved
SD
Date
APR 2011
Scott Wilson Ltd
Brunel House
54 Princess Street
Manchester
M1 6HS
Telephone (0161) 907 3500
Fax (0161) 907 3501
FIGURE 2.11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Exeter
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Weymouth
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Torquay
Brixham
0 2.5 5 10 15 20
Kilometers
Key
MMO Area Boundary
Open Boundary-Limit of Study
Representative Field Survey Locations-Land
Representative Field Survey Locations-Sea
Seascape Character Area
11 Jurassic Coastal Waters
Job Title
SEASCAPE CHARACTERISATION
MMO AREA 6
Drawing Title
SEASCAPE CHARACTER AREAS & REPRESENTATIVE FIELD SURVEY LOCATIONS
Drawing Ref No.
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Date
APR 2011
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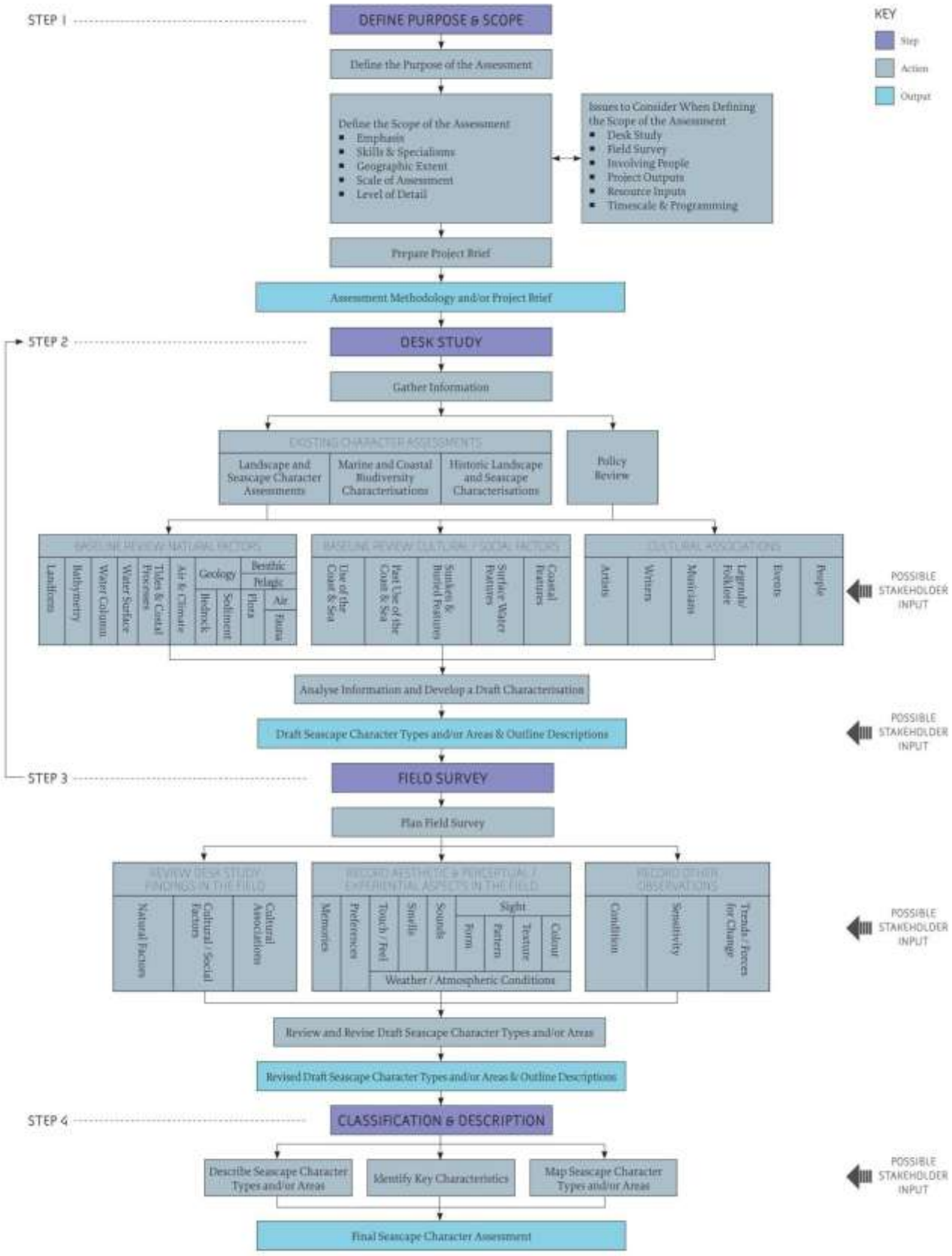
Figure Number
FIGURE 2.12

Appendix 3 – Seascape Character Assessment Methodology

Summary flow diagram extract from 'The Draft Seascape Character Assessment Guidance for Great Britain (2011)'

Flow Diagram of Seascape Character Assessment Methodology



Appendix 4 – Database

Appendix 4.1 – Database for MMO Area 3

Please refer to Appendix 1 for supporting figures.

Base Mapping	Reference Source (s)	Summary
OS Maps	• OS map 1:250,000 • OS map 1:50,000	Review of coastal activity, sea and coastal use and topographical information.
Aerial Photography	• Google earth • Futurecoast CD	Review of coastal and intertidal characteristics where access was limited. Also used in the planning of surveys.
Political and administrative boundaries	• MMO area 3	Reviewed in line with study area parameters. Refer to Figure 1.1

Character Assessment	Reference Source (s)	Summary
Landscape and seascape characterisation	• Natural England National Landscape Character Areas 27, 40, 41, 42, 46, 76, 77, 78, 79, 80 and 82. • East Midlands Regional Landscape Character Assessment 2009	Review of existing NCA documents and draft NCA review to understand key characteristics and key landmarks pertinent to coastal interface. Refer to Figure 1.3

NCA 27

- Large scale landscape of rounded, rolling hills with big skies and long views
- High chalk cliffs where the outcrop reaches the coast at Flamborough Head – 'spectacular'
- *Flamborough Headland Heritage Coast*
- Lightly settled – scattered farmsteads with sheltering woodlands, often occupy prominent positions above villages (Newbold)

NCA 39

- Flat landscape, at or below high-water mark
- Occasional rising ground formed by ridges of sand and outcrops of Mercia Mudstone
- Modern motorways on embankments and large installations, notably power stations which are often prominent in the flat landscape
- Field trees and hedgerows are few
- Views are long and unbroken to distant horizons
- Sky plays an important part
- Limited settlement on higher ground
- Semi-industrial farmsteads with large modern buildings
- Power stations at Drax and Eggborough
- M18 and M62 motorway
- Woods – restricted except for areas to north and south where remnant birch and oak woods and conifer plantations occur
- Important flood meadows (Ings) – habitats for migrating birds

NCA 40

- Low lying
- Woodland cover relatively sparse
- Open landscape, long views
- Soft clay cliffs
- Proximity of sea only apparent along coastal fringes above cliffs
- Strong winds, exposed landscape
- Evidence of coastal erosion

NCA 42

- Flat coastal plains rising gradually in west to more undulating land at foot of Lincolnshire Wolds
- Major coastal dune system and salt marshes and artificial sea defences along coastline (between Mablethorpe and Skegness)
- Extensive shallow beach
- 2 National Nature Reserves – sand dunes and sea buckthorn
- Settlement concentrated on coast – resorts of Skegness, Mablethorpe and Cleethorpes – Edwardian villas, mobile homes, holiday camps, theme parks etc
- Grimsby – large industrial town
- Influence of the North Sea – economic and recreational activities. Ongoing threat of erosion to settlements in the south
- Between Saltfleet and Somercotes, land and salt marshes have been reclaimed in 19th century
- Features: 100m spire of St James' Church, Louth; three windmills at Alford, Burgh Le Marsh and Waltham
- Docks and oil refinery at Immingham dominate the skyline for miles and create a major intrusion
- Sandhills Act of 1932 effectively controlled effectively controlled the expansion of built development on cast at Gibraltar Point and Saltfleetby

- Most of coast between Mablethorpe – Skegness is protected by massive concrete seawalls

NCA 43

- Pronounced scarp edge to north and west (rising to over 150m along the western edge – the Wolds form the highest ground in eastern England between Yorkshire and Kent)
- Intensively farmed arable landscape. The scenery is characterised by a range of varied yet unified features including plateau hilltops, strong escarpments, deep valleys with hanging beechwoods, isolated ash and beech trees on skylines
- Within upland rolling plain are a series of inward facing valleys (Rothwell, Cuxwold). The planting of woodland on the steep slopes emphasised valley features
- Ancient oak and ash woodlands to south east

NCA 46

- Large scale, flat, open landscape with extensive vistas to level horizons and huge skies
- Modestly elevated islands within fens provide isolated higher ground for most settlement. A higher proportion of grassland, tree cover and hedgerows are assoc. with these areas
- Roads and rail links on elevated banks
- England's largest tidal estuary
- Due north, the Lincs Wolds rise to create a dominant 'upland' horizon
- Much of land is below sea-level, exception is the Isle of Ely (+20m)
- Changing weather patterns have a strong influence on the observer
- Townlands: med. For large clusters around Boston, Spalding, Holbeach and Wisbech with many villages having medieval churches (West Walton)
- Ribbon developments of smallholdings, bungalows, large agricultural barns and food processing buildings, e.g. Sutton Bridge
- Features: Ely Cathedral – 83m high Octagonal tower 'Boston stump'
  Wisbech – 18th century merchants' houses
  (Peckover House)
- Light pollution resulting from intensive agriculture and growth of settlement, particularly apparent in the flat terrain

NCA 77

- Variety of coastal habitats: intertidal sand and mudflats, dunes shingle banks, saltmarsh, reedbeds, tidal creeks and harbours
- Wild, remote, open coastal plain with long sweeping views
- Awareness of dynamic nature of the marine landscape
- Settlement – distinctive flint villages strung along the coast road (Holme, Titchwell, the Burnhams, Blakeney)
- Features:
- 30 ft high artificial flood wall of pebbles at Salthouse
  Hunstanton – intriguing multilayered cliffs of red and white chalk and carstone. A major holiday resort
  Wells – harbour with overhead gantries bustling
  Clay – windmill
  Blakeney/Salthouse – churches – St Nicholas' Church
  Holkham estate – significant within coastal area for shelter belts of pine trees that protect the park and give vertical definition to the edge of an enormous sandy beach

  Cromer – North face of Cromer Ridge and coast road – scarp
- Activities: Commercial shipping has been replaced by yachts and pleasure boats while the settlements along the coast road have largely become retirement villages/second homes
- Artists: Local tradition of fishing, wildfowling and samphire gathering have frequently been depicted by amateur and professional artists
- Wildlife – nature reserve, Titchwell, Scott Head Island ad Clay Marshes. Sea colony at Blakeney Point

NCA 76

- Very open, apparently 'high' and remote, contrasting with smaller scale for east
- Greensand Ridge (western edge) marked by villages of Heacham, Snettisham and Dersingham. Extensive plantations around big estates
- Hunstanton's cliffs: famously expose the underlying geology of the area – white and red chalk overlying a layer of brown ferringinous sands. 'Imposing'
- Rolling terrain with frequent long views
- Western most part of area forms a distinctive low scarp of outcropping lower Greensand above the reclaimed coastal marshes
- Farms and related groups of buildings widely dispersed and have little impact
- Features: Castle Rising on banks of Babingley River – best preserved castles in East Anglia
- Wolferton and Hunstanton – carstone feature of the coastal strip

NCA 78

- Cromer Ridge: Steep northern slope, more gentle southern slope.
  Extends from Holt to Mundesley but is most pronounced in the vicinity of Sheringham, where it reaches 100m in height, with an average width of five miles.
  Not a major landscape feature, in natural terms, but an unusual one in East Anglia.

Dramatic feature – contrasts with open, flat coastline

- Coastal holiday resorts of Cromer and Sheringham 19th century developments
  Cromer: busy flint town with beach and pier and holm oak
  Shringham Park: HumphreyRepton incorporated views to sea
  Clement Scott, journalist, popularised area in poems and articles, calling it 'Poppyland'
  Coast thrives as a retirement and holiday area: 20th century bungalows

NCA 79

- Seawall and dune coastal defence systems block views of the sea.
  Distinguished from its neighbours by the extent of coastal influence from North sea. The sea is the energy, hidden behind high sea walls.
  Coastal protection structures are prominent – sea Palling
- Tourist development along coast: 19th century in north, 20th century in south.
  Seaside influence provides a coastal strip with caravan parks, holiday chalets and assoc. facilities (Great Yarmouth on the Flegg)
- Features: Happisburgh lighthouse
  Prominent medieval churches – prominent in open landscape, not especially tall
  Large hall and associated Great Barn at Paston
  Round-tower churches, denoting Saxon origins

NCA80

- Extensive areas of open water, containing a wet, low lying complex of flooded former peat markings
- Wide waterways, often overloaded with hired boats during summer. It is often apparent to see a full sail through a field of corn – so intimate is the mix between land and water
- Features: Wind pumps (69 of them) and isolated farmhouses are most significant artefacts in the marshes. (Berney Arms Mill).
  Boats, birds, cattle, field gates, willow pollards and reed-fringed ditches all important landscape features.
  Burgh Castle: ruins stand overlooking the entrance to the Waveney, built by Romans to defend their lands against coastal raids.
  Yarmouth – developed as a major sea port carrying trade and cultural influences to Norwich.
  Reedham chain ferry – only crossing between Norwich and Yarmouth.
  Medieval bridge at Potter Heigham is a well known landmark.
  Sea Palling - prominent coastal defence.

NCA 82

- Distinctive topography and land cover – geologically different from rest of East Anglia – low sea defences (dunes)
- Large conifer plantations – Scots Pine
- Large commercial ports of Harwich and Felixstowe and seasonal influx of yachts to the rivers and harbours provide interest and variety of scale along the estuaries, with influence of seabirds, mud and intertidal mudflats.
  Felixstowe is the largest container port in the country.
  On the major estuaries, yachtsmen have to be aware of commercial ships carrying cargo to and from Ipswich, Felixstowe and Harwich.
  Pressures on land and sea for mooring facilities in major estuaries.
- Coastal towns/villages from the focus of tourist activity (combined with sailing).
- Features: 'Sandlings' – a land of pine forests, mixed with heathlands (Staverton Park)
  Thorpeness: 1920s holiday resort
  South of Lowestoft: largely undeveloped low crumbling cliffs and steep shingle banks, sweeping in a series of wide bays punctuated by lighthouses, church towers, Mortello towers and Sizewell nuclear power stations.
  Orwell bridge: one of largest concrete structures in Europe.
  Oxford's castle: acts as a landmark for miles around.
  Airfields and military installations (Orford Ness): largest above ground monument to cold war in UK.
  Orford Ness: important coastal feature.

Marine and Coastal Biodiversity Characterisations	• The Southern North Sea Marine Natural Area (English Nature) • Saltburn to Bridlington Coastal Natural Area (CNA) • Bridlington to Skegness CNA • The Wash CAN • Old Hunstanton to Sheringham CNA • Sheringham to Lowestoft CNA • Suffolk Coast CNA	Review of areas to gain an understanding of natural processes and the interaction with geology, wildlife and human activity. Refer to Figure 1.3

101 Bridlington to Skegness

Complex coastal processes link the eroding cliffs of Holderness, the Spurn Peninsula, the intertidal areas of the Humber Estuary, the low Lincolnshire coast and the gently shelving land offshore. The soft cliffs of Holderness are subject to a high and episodic rate of erosion, amongst the fastest in Europe. The freshly eroded cliffs expose important geological sites and provide valuable material to sustain natural and man-made features within this maritime area.

The diverse range of coastal habitats, including saline lagoons, salt marsh, sand flats, mudflats, sand dunes and shingle bars, support an abundance of wildlife. The intertidal system of the Humber Estuary is rich in invertebrate communities and local sea grass beds which provide feeding and wintering areas for over 133,000 waders and wildfowl. The coastal habitats of the Humber also support breeding birds, a colony of grey seals and natterjack toads. The estuary is a major spawning area for Dover sole and supports commercial fisheries for sole, plaice, cod, dogfish and eel.

102 The Wash

The Wash is the largest estuarine system in the UK. It is a large, mostly shallow embayment where the Rivers Ouse, Nene, Welland and Witham drain into the North Sea. Its macrotidal range of 6.5 metres is the highest on the North Sea coast of Britain. Despite its large freshwater input, marine processes dominate its physical and biological character. The Wash plays an extremely important role in relation to the wider coastal and marine environment of the region.

The Wash is of outstanding importance for wildlife and it is a valuable natural resource that people have long exploited. It has the second largest area of intertidal mudflats and sand flats in Britain and supports the largest numbers of migrating waterfowl of any site in the UK. It has the largest colony of common seals in England and is an important nursery ground for flatfish. As well as its large-scale sub tidal and intertidal habitats, The Wash has a number of valuable fringing habitats of conservation significance, such as saline lagoons, shingle structures and dune complexes.

103 Old Hunstanton to Sheringham

This Natural Area consists of the narrow strip of coastline along North Norfolk and the adjacent shallow sea bed. The coastal habitats here are amongst the best in Britain with extensive sand dunes and salt marshes and the biological and geomorphological interest of the barrier island of Scolt Head and the large shingle spit at Blakeney Point is outstanding. The mobile cliffs between Overstrand and Mundesley include some of the finest soft cliff habitat in Britain.

104 Sheringham to Lowestoft

The Sheringham to Lowestoft maritime Natural Area consists of a narrow strip of coastline and the adjacent North Sea. Cliffs between Sheringham and Happisburgh demonstrate the stratigraphy of the area and, through natural erosion, they supply material to the dunes of nature conservation interest further south.

The mobile cliffs between Overstrand and Mundesley include some of the finest soft cliff habitat in Britain. West Runton possesses one of the few areas of intertidal rock in East Anglia, including the only well-developed chalk reef found between North Yorkshire and Kent.

105 Suffolk Coast

The coastal habitats of the Suffolk Coast are of international importance for nature conservation. The estuaries and grazing marshes support waders and wildfowl in great numbers, reedbeds support breeding bitterns and bearded tits, and saline lagoons support specialist and rare invertebrates. The coast is rapidly eroding along much of its length. Cliffs are retreating inland by several metres each year, and salt marshes are steadily shrinking. Gradual erosion of these habitats will occur as long as sea level rise caused by global warming and a slow lowering of land level continues.

The great shingle structures of Orfordness and Benacre Ness are actively moving, through the continual erosion and deposition of shingle. The southern end of Orfordness spit varies rapidly in shape, with new shingle often appearing or being washed onto the shore at Shingle Street. Benacre Ness is slowly moving northwards, as new material accretes on its northern side and shingle erodes from its southern side. As well as their great geomorphological significance, the shingle structures support rare undisturbed vegetation communities and nationally important breeding tern populations

Historic landscape and seascape characterisation	• England's Historic Seascapes: Withernsea to Skegness Pilot Study MoLAS 2009	The content of the historic characterisation assessment hasn't been interrogated at the current scale of study with its subject coverage instead addressed within the Historic Sites and Features section below.
Natural Factors	**Reference Source (s)**	**Summary**
Landform	• OS map 1:10,000 • Natural England National Landscape Character Area descriptions	Review of general coastal topography and identification of topographical high points to inform theoretical horizon buffer. Review of coastal characteristics and land sea interface.
Landcover	• OS map 1:10,000 • Natural England National Landscape Character Area descriptions • Futurecoast	Review of general coastal land uses and land cover and to gain an understanding of the association with the sea.
Landscape Designations	• AONB GIS Dataset • Heritage Coast GIS Dataset • National Parks GIS Dataset • National Trails GIS Dataset	Review of landscape related designations where significant scenic qualities could be important to a perception of seascape and influence interaction of seascape character.
Solid geology/drift geology	• Offshore 1:250,000 scale geological mapping • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 5, 6, 7, 9 and 10, chapters 2.2, 2.4, 9.4, 9.5 and 9.6	Review of offshore rocks and sediments at and below the sea bed. Refer to Figure 1.5 and 1.6

The offshore geology is separated into a number of categories namely;

- Holocene sea bed sediments (unconsolidated sediments laid down since the sea transgressed across the area during the Holocene;
- Pleistocene geology (the extensive deposits of the last (late Devensian) glaciations);
- Solid (pre-Quaternary) geology (rocks deposited before the start of the Quaternary period (1.6 million years ago). In this region the solid geology is largely concealed by sea-bed sediments and drift deposits).

Holocene Sea Bed Sediments

Holocene sediments generally forming a veneer less than 1 m thick. Exceptionally, the sand-rich sediments comprising the Norfolk Banks in the south-east of this region attain a maximum thickness of about 40 m, but the intervening gravelly sand substrate remains thin. Off the cost of Norfolk (Sheringham) an area of sediment free seabed exists. Extensive sheets of gravel and sandy gravel occur off the coasts of Lincolnshire and Humberside. The gravels off the Humber estuary have a varied composition: Carboniferous sandstone and limestones are particularly common, but chalk, Jurassic mudstone, flint and igneous and metamorphic rock types are also found. The gravels are believed to be derived by marine winnowing of glacial moraines and outwash fans deposited during the Devensian glaciation.

Pleistocene geology

The extensive deposits of till (boulder clay) of the Bolders Bank Formation date from the last (late Devensian) glaciation. The till is a stiff, reddish to greyish brown clay containing patches of sand and silt. Its clasts of chalk, red sandstone and grey mudstone are derived from the sedimentary rocks of eastern England. Over much of the region the Bolders Bank Formation is less than 5 m thick, although the till thickens toward the coast of Lincolnshire, where it may be 15-20 m thick. To the north-east of Norfolk, south of the limit of Devensian ice advance, the sediments consist of discontinuous Upper Pleistocene lacustrine sands and muds, and Lower to Middle Pleistocene deltaic sediments (lagoonal clays, sands with plant remains, worn shells and pebbles of the Yarmouth Roads Formation). Further to the south-east, offshore from east Norfolk, Early Pleistocene deposits comprise shelly grey marine sands with silt parings (Red Crag Formation) and grey marine clays and fine-grained sands (Westkapelle Ground Formation), equivalent to the upper parts of the Red Crag Formation onshore. Early to Middle Pleistocene deposits comprise fluviatile or estuarine sands with clay laminae and flint pebbles (Yarmouth Roads Formation). There is also a tongue of Late Pleistocene sediments (the Brown Bank Formation), comprising silty clays and fine sands, deposited in estuarine or fluviatile environments.

Solid (pre-Quaternary) geology

Offshore in this region the solid geology is largely concealed by sea-bed sediments and drift however occasional outcrops do occur at the sea bed. Pliocene Crag deposits, consisting of bioclastic limestones and shelly sandstones deposited under strong tidal conditions in sandbanks and outer estuarine environments, occur off the Suffolk coast. Most of the offshore area extending from north-east Norfolk to Flamborough Head (often referred to as the East Midlands Shelf) is underlain by Upper Cretaceous fine grained limestones (Chalk Group). The Chalk may contain layers of flint, either as nodules or tabular sheets, as well as harder cemented chalk horizons (hardgrounds), but near Flamborough the Chalk it is almost flint-free. Tertiary rocks, mainly Eocene and

Palaeocene sandstones and mudstones, underlie the Quaternary sediments east of the Norfolk coast. A variety of Lower Cretaceous and Jurassic sediments underlie The Wash and form the sea floor north of Flamborough Head.		
Soils/sediments	• URS/SW Bathymetry assessment • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 5, 6, 7, 9 and 10, chapters 2.2, 2.4, 9.4, 9.5 and 9.6	Review of offshore rocks and sediments at and below the sea bed. Refer to Figures 1.5 and 1.6

Sediment transport is described within the context of coastal cells. These divide the coastline into sections within which sediment erosion and accretion are interrelated and largely independent of other cells. The sediment transport in this context relates to sand and gravel bedload, not suspended solids

Flamborough Head to Sunk Island

Along this coast large amounts of sediment derived from cliff erosion are carried seawards and predominantly southwards by waves and tidal currents. However there is small but significant interchange of sediment around Flamborough Headland, between Filey and Bridlington Bays. Erosion in this sub-cell supplies sand to the Lincolnshire coast. From Bridlington to Spurn Head there is rapid and persistent cliff and beach erosion, which has resulted in a long-term retreat of the coastline, causing considerable loss of agricultural land. Where stretches of coast are defended there are erosion problems downdrift, including accelerated cliff retreat. Hornsea and Withernsea are becoming isolated by coastal recession and are therefore at increasing risk of beach erosion. There is little net erosion on the north shore within the Humber estuary, where sediment is accreting and saltmarsh forming.

Immingham to Donna Nook

There is little littoral drift of sand into the Humber estuary from Donna Nook. Waves and tidal currents transport material southwards across the Humber estuary to the Lincolnshire coast. There is extensive open coast accretion of saltmarsh and mudflats around Cleethorpes and Humberston, while to the south of Cleethorpes there is minor local dune erosion. Further south at Donna Nook there are again extensive salt marshes and sand accretion.

Donna Nook to Gibraltar Point

Along this section of coast there is moderate southward littoral drift of sand. Tidal flows in and out of the Humber and Wash estuaries modify sediment transport processes. There is extensive open-coast accretion of saltmarsh at Saltfleet and Saltfleetby, and of dunes at Theddlethorpe. The erosion of the underlying clay unit, resulting from the erosion of the sand beach, is causing beach steepening between Mablethorpe and Skegness. South of Skegness dunes are building and the sand beach is extending seaward.

Gibraltar Point to Snettisham

In The Wash there is no significant littoral drift and fine sands and silts are brought in by tidal action. Tidal currents distribute fine sediments, allowing saltmarsh to expand, particularly on the western and southern margins of the estuary.

Snettisham to Sheringham

This is predominantly an accretionary sub-cell with an offshore supply of sand and silt, together with a supply of pebbles from the east. There is a moderate rate of westward drift from Sheringham to Hunstanton, reducing to near zero at Snettisham. Both waves and currents are important; waves dominate coastal processes east of Blakeney; westwards to Snettisham, tidal flows become increasingly important, particularly on the lower part of the foreshore. Saltmarsh is developing in the lee of shingle spits between

Hunstanton and Blakeney

Between Hunstanton and Holme, sand dunes experience seasonal erosion. Particularly from Cley to Weybourne, there is some evidence of landward retreat of shingle ridges and, east of Weybourne, continued erosion of soft sand/clay cliffs. The eastern boundary of this sub-cell, at Sheringham, is a drift divide that tends to shift position from time to time, owing to minor variations in wave conditions

Sheringham to Lowestoft

Both waves and tidal currents play an important role in changing the coast of this sub-cell, where there is a high drift rate to the east and south. A number of major elongated sand banks are found off the coast and residual currents around these banks are linked with beach processes. The ‘nesses’, such as Winterton Ness, are points of accretion. Cliff erosion is widespread and locally rapid, and during some periods erosion affects the predominantly accreting sand dunes and nesses.

Lowestoft to Harwich

Drift is southward, with high sand transport and moderate shingle transport. Both waves and tidal currents play an important role in coastal change in this sector. Waves transport material southwards from eroding cliffs, providing an important sediment supply for downdrift beaches, and offshore banks are formed by tides. Coastal processes are complicated by the tidal flows at the mouths of the Deben, Orwell and Stour Estuaries. In the north of the sub-cell there is cliff erosion at Covehithe, Easton Bavents and Dunwich. Accretion occurs at Benacre Ness and between Thorpeness and Aldeburgh. South of Aldeburgh and between Felixstowe and Landguard Point beach erosion is prevalent.

Biodiversity (above and below water) and designations	• Joint National Conservation Committee (JNCC) (Marine SAC's and SPA's, Marine Protected Areas, OSPAR Marine Protected Areas, Marine Conservation Zones) • Natural England (Marine Protected areas, Marine Conservation Zones) • Multi Agency Geographic Information of the Countryside (MAGIC) (National nature reserves • DEFRA (Marine Conservation Zones) • UK Marine and Coastal Act 2009 • The Government strategy for Contributing to the Delivery of a UK Network of Marine Protected Areas (DEFRA) • Marine protected areas interactive map (JNCC) • UK Biodiversity Action Plan (Priority habitats and species with key selection criteria.) • Local Biodiversity Action Plans (East Riding of Yorkshire, Lincolnshire, Norfolk and Suffolk.)	• Protected wreck sites • RAMSAR sites • SAC's (Natura 2000 marine sites) • SPA's • SSSI Refer to Figure 1.8

Marine Plan Area 3 covers a stretch of coastline from the high watermark seaward. The zone runs from Harwich to Flamborough head. The area contains 9 SAC's, 9 SPA's, 7 RAMSAR sites, 4 OSPAR MPA's and 16 SSSI's. For the locations of these designations refer to Figure 1.8 in Appendix 1 and for a summary of the designation status refer to Appendix 5.2. Marine plan Area 3 can be divided into 12 key zones listed and discussed in detail below.

- Margate and Long Sands off shore sand banks
- Vegetated shingle
- Deben estuary
- Outer Thames estuary
- Minsmere to Walberswick marshland
- Intermittent sand dunes including Great Yarmouth North Denes, Winterton-Horsey dunes and Gibraltar point
- The Wash and North Norfolk coast
- North Norfolk Sandbanks and Saturn Reef
- Saltfleetby-Theddlethorpe dunes
- Humber Estuary
- The Lagoons
- Flamborough Head chalk

Margate and Long Sands is an offshore area characterised by the Annex I habitat 'Sand banks which are slightly covered by water all the time'. Biodiversity here is at its richest within the sand troughs where many fish have formed spawning grounds and a large variety of other organisms have colonised.

Moving north, Landguard Common SSSI forms a sand and vegetated shingle habitat comprising both local and rare species, together forming a nationally scarce habitat in the UK. The area has great ornithological interest for passage migrants and breeding bird species.

North of Landguard Common sits the urban area of Felixstowe with no coastal designations. Beyond Felixstowe lies the Deben estuary key zone. This is a 12km estuary habitat with SPA, RAMSAR and SSSI designation. The area is important for several nationally scarce plant species and numerous protected bird species.

North of The Deben estuary lies the Outer Thames Estuary. This is a large zone stretching from the coast seaward. The zone is an offshore habitat with SPA designation that extends north along the coastline and encompasses many SAC's, RAMSAR sites, NNR's and SSSI's. The area is designated for its key bird species.

Within the SPA lies an area of shingle with small estuaries, mud flats and lagoons. The area can be viewed from a large section of the east coast surrounding Orford. This area has a fragile mix of habitats including coastal lagoons and perennial vegetation on stony banks, both of which are Annex I habitats. It is for this reason and the presence of rare species that the site is afforded its SAC status. Part of this area has been afforded SAC status as Orfordness shingle street and part has SPA status as the Alde-Ore Estuary site. This area is covered within the outer estuary key zone due to the varied habitats and large number of protected wildfowl utilising the area. The Alde-Ore estuary has also been afforded RAMSAR and OSPAR MPA status.

North of Alde-Ore lies a habitat mosaic dominated by open water and vegetated shingle (Leiston-Aldeburgh). The area supports a diverse array of overwintering birds, dragonfly and scarce plant species which have afforded the site SSSI designation. Beyond this lies another key zone of marshland which is interspersed with other habitats. Two of these are Annex I habitats and this has afforded the Minsmere to Walberswick heaths and marshes site its SAC and RAMSAR status. Just north of the marshland is an area of nationally important vegetated shingle, the area is not large but supports wintering bittern as well as other scarce bird species and nationally rare vascular plants. For these reasons the Pakefield to Easton Bavents area has been afforded SSSI status with some key areas classed as Benacre NNR.

North of the Minsmere site is a large area of coastline surrounding Lowestock which has little ecological interest and only a single SSSI site designated for geological reasons.

Above Great Yarmouth lies a key zone of intermittent sand dune habitat with nationally scarce vegetation types. The dunes here have a full range of vegetation types and also attract a wide assemblage of bird species. The area has two SSSIs; Great Yarmouth North Denes and Winterton-Horsey dunes, with a small section of Winterton dunes classed as a NNR.

Offshore and north of the Great Yarmouth Denes lies a large key zone comprising two main areas; Haisborough, Hammond and Winterton and the North Norfolk Sand Banks and Saturn Reef. Both are areas of reef habitat and sandbanks slightly covered with sea water all the time. These zones are designated as offshore SAC's because they comprise Annex I habitats.

Along the coast north towards Weybourne there is little habitat of interest with four SSSI cliff areas designated for their geology only.

From Weybourne a key zone dominated by estuary, mud flats and sand flat habitats is present. These are designated together along with a mosaic of other Annex I habitats and a wide area of sea inlet. The entire zone is designated as a SAC (The Wash and North Norfolk Coast), designated because of its variety of Annex I habitats. In addition parts of the SAC cover all other marine designations and this is due to the diversity of habitats present along which large numbers of waterfowl are located.

At the northern most point of The Wash sits Gibraltar Point. This key zone consists of sand dune and mud habitats which are unique because they show all stages of colonisation. In addition the site supports many rare waterfowl and it is for these reasons that Gibraltar point has been afforded SPA and SSSI status.

North east of Gibraltar point lies another large offshore area of reef and sand bank. These habitats are both Annex I habitats because they are rare and fragile within the UK and this has given the area its SAC designation named Inner Dowsing, Race Bank and North Ridge.

The habitats between Skegness and Mablethorpe are of little ecological value with two SSSI located here for their geological value.

North of Mablethorpe lies the Saltfleetby-Theddlethorpe dunes. This zone has rich flora and fauna including the rare Natterjack toad and also supports breeding birds. It is for these reasons that the area has SSSI status. Parts of the sand dune system here have been given NNR status because they demonstrate outstanding assemblages of vascular plants.

North of Saltfleetby-Theddlethorpe is the Humber estuary. This large zone is dominated by estuary, mud flats, sand flats and lagoon habitats. The mud and sand flats are an Annex I habitat which has afforded the area its SAC designation. In addition, the area is frequented by sea lamprey and grey seal. The area also has SPA designation for its bird assemblages as well as RAMSAR designation for its wetlands, OSPAR MPA and SSSI designation for its diverse and complex habitat types.

The Lagoons are a small key zone of saline lagoons situated just north of the Humber estuary. The saline lagoons are a nationally rare habitat on which 1% of the British breeding turn colony lives and the nationally rare Spiral tasselweed (Ruppia cirrosa) grows. It is for these reasons that the site has been given its SSSI status. The site is also a RAMSAR site because of its wetland features.

Further north lies the final key zone, consisting of chalk habitat surrounding Flamborough Head. This has created a reef formation along with kelp forests which grow because the waters are exceptionally clear. The reef habitats in the area are an Annex I habitat affording it SAC status. In addition the site is an OSPAR MPA.

Air and climate	• Met Office • Marine weather areas • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 5, 6, 7, 9 and 10, chapters 2.2, 2.4, 9.4, 9.5 and 9.6	General understanding of prevailing weather conditions and significant weather systems or influences.

Shipping forecast zones covering the marine area are Dogger, Humber and Thames. The area Dogger takes its name from Dogger Bank and Humber takes its name from the Humber Estuary.

Wind is seasonally variable. Winter and early summer winds tend to be north easterlies with summer winds tend to be south westerlies. Annual records suggest that westerlies are generally the most common.

Windiest months are between December and January and the least windy months are between May and August.

Marine Environment	Reference Source (s)	Summary
Sea level rise	• UKCP09 – UK Climate projections	Review of UK Climate Projections (UKCP09) and their impact on sea level rise.

The table below combines absolute sea level change and vertical land movements to produce estimates of relative sea level change. UKCP09 reports data for Edinburgh, London, Cardiff and Belfast. Mean sea level rise for Area 3 can be expected to be between the bounds of the figures for Edinburgh and London.

Table showing the central estimates for each decade of relative sea level changes (cm) with respect to 1990 levels for three emissions scenarios. (Taken from http://www.ukcip.org.uk/publications/climate-science/ukcp09-sea-level-change/)

Year	London			Edinburgh		
	High	Medium	Low	High	Medium	Low
2000	3.5	3.0	2.5	2.2	1.6	1.2
2010	7.3	6.2	5.3	4.7	3.5	2.6
2020	11.5	9.7	8.2	7.5	5.7	4.3
2030	16.0	13.5	11.4	10.7	8.2	6.1
2040	20.8	17.5	14.8	14.2	10.9	8.2
2050	25.8	21.8	18.4	18.0	13.9	10.5
2060	31.4	26.3	22.2	22.1	17.1	13.0
2070	37.2	31.2	26.3	26.6	20.6	15.7
2080	43.3	36.3	30.5	31.4	24.4	18.6
2090	49.7	41.6	35.0	36.5	28.4	21.8
2095	53.1	44.4	37.3	39.2	30.5	23.4

Erosion processes and coastal features	• Aerial imagery • Flamborough Head to Gibraltar Point Shoreline Management Plan • Gibraltar Point to Hunstanton (The Wash) Shoreline Management Plan • Hunstanton to Kelling Hard (North Norfolk) Shoreline Management Plan • Kelling Hard to Lowestoft Shoreline Management Plan • Durlston Head to Rame Head Shoreline Management Plan	Analysis of coastal erosion processes and the creation of coastal features such as bays, headlands, cliffs, beaches.

At the northern end of Area 3, the Flamborough Head is composed of 30-50m high near-vertical chalk cliffs. At the foot of the cliffs, there is a rocky shore platform developed in chalk bedrock; this chalk platform extends over 1km from the shore in places.

South of Flamborough Head, the clay cliffs of Holderness extend for some 60km. The cliffs are approximately 15m high on average and are eroding rapidly through repeated landslide activity. The Holderness coastline has retreated by around 2km over the last

1,000 years causing the loss of 26 villages listed in the Domesday survey of 1086. The cliffs are fronted by a sand veneer beach underlain by clay.

At the southern end of the Holderness coastline, the peninsula of Spurn Head extends from Kilnsea Warren. This forms a narrow sand and gravel barrier extending 5.5km into the mouth of the Humber Estuary. Spurn Head is an important morphological feature of this coastline. The mudflats, sand flats and salt marsh of Spurn Bight exist as a result of the shelter provided by Spurn Head. Spurn also provides protection from the dominant north-easterly waves to the Port of Grimsby.

The Humber Estuary is a significant feature in terms of industrial development and environmental designations. The coastline of the outer Humber Estuary is mainly composed of man-made defences and port or industrial development on the south bank of the Humber. On the north bank of the Humber, the coastline is composed of flood embankments fronted by mudflats, sand flats and salt marsh.

South of the Humber Estuary, the East Lindsey coastline is predominantly rural and undeveloped with the coastal defence provided by natural sand dunes fronted by wide sandy beaches. Progressing southwards, the East Lindsey coastline becomes increasingly developed through the towns of Mablethorpe and Skegness where coastal defence is provided by man-made sea walls and revetments fronted by an artificially re-nourished sandy beach.

At the entrance to the Wash, Gibraltar Point forms an important morphological feature consisting of sand dune ridges interspersed with salt marsh.

South of Gibraltar Point is the Wash Estuary, an embayment of approximately 615km². The coastline around the Wash is generally composed of tidal flood embankments protecting the reclaimed land to the rear. Fronting the flood banks are a series of sand banks and large inter-tidal areas of mudflats, sand flats and salt marsh. The Wash Estuary is significant for its environmental designations.

East from the Wash, the North Norfolk hinterland is predominantly low-lying with a wide coastal zone occupied by extensive salt and grazing marsh, mudflats, sand dunes, shingle and sand spits.

The coastline between Cromer and Lowestoft has been retreating and its orientation altering in response to sea level rise since the last glaciation. The coastline in this area is characterised by cliffs, fronted by sandy beaches protected by groynes along much of the frontage.

The coastline between Lowestoft and Felixstowe is predominantly natural and is characterised by low cliffs, sand and shingle beaches and small estuaries. Orford Ness and Benacre Ness are major shingle features along this frontage. Lowestoft and Felixstowe are major towns along this frontage with associated man-made defences.

Tides and Coastal processes	• Flamborough Head to Gibraltar Point Shoreline Management Plan • Gibraltar Point to Hunstanton (The Wash) Shoreline Management Plan • Hunstanton to Kelling Hard (North Norfolk) Shoreline Management Plan • Kelling Hard to Lowestoft Shoreline Management Plan	Analysis of coastal erosion processes and the creation of coastal features such as bays, headlands, cliffs, beaches.

In common with the majority of coastal areas, this frontage is subject to energy inputs from four main 'forcing' processes: waves; tides; wind; and river mouth flows.

The dominant wave direction in this area is from the north-north east and north-east. It has a large swell component (long period waves) and is not fetch-limited. The 1 in 100 year wave height in this area has been calculated to be between 4m and 8m decreasing from north to south.

For the most part, this frontage is characterised by a macro-tidal semi-diurnal tidal regime. Tides enter the North Sea from the Atlantic Ocean, predominantly north of Scotland and progress anti-clockwise around the North Sea. The more southerly frontages within this area will also be influence by tidal propagation northwards from the English Channel. Tidal levels and tidal ranges broadly increase along the Yorkshire and Lincolnshire coastlines from north to south. Tidal levels and ranges are lower across north Norfolk and Suffolk. Astronomical tidal levels and ranges are shown below for various locations along the frontage.

Tidal levels along the coastline taken from UK Hydrographic Office Admiralty Tide Tables (2010)

Location	Mean high water springs (m CD)	Mean high water neap (m CD)	Mean low water neap (m CD)	Mean low water springs (m CD)	Mean spring tidal range (m)	Mean neap tidal range (m)
Bridlington	+6.1	+4.7	+2.3	+1.1	5.0	2.4
Spurn Head	+6.9	+5.5	+2.7	+1.2	5.7	2.8
Grimsby	+7.1	+5.7	+2.6	+1.1	6.0	3.1
Skegness	+6.9	+5.3	+2.5	+0.9	6.0	2.8
Boston	+6.8	+4.8	+1.7	+0.4	6.4	3.1
King's Lynn	+6.8	+5.0	+1.8	+1.0	5.8	3.2
Hunstanton	+7.4	+5.6	+2.5	+0.9	6.5	3.1
Cromer	+5.2	+4.1	+2.1	+0.8	4.4	2.0
Lowestoft	+2.4	+2.1	+1.0	+0.5	1.9	1.1
Orford Ness	+2.8	+2.7	+0.9	+0.5	2.3	1.8

Astronomic tidal levels are modified by meteorological conditions due to variations in wind stress and atmospheric pressure. A typical North Sea surge would be generated in the north and progress southwards as a wave. This propagation of surge will tend to be higher as it travels southwards down the Holderness, Lincolnshire and north Norfolk coasts, increasing further in the southern North Sea as it is funnelled between the landmasses of the UK and the continent.

Fine grained sediments tend to accumulate in sheltered low-energy environments (e.g. the Humber Estuary and Wash Estuary with their inter-tidal mudflats and salt marshes) whereas coarse sediments can be found on the open coast where the energy inputs are higher (e.g. the sand and shingle beaches of Holderness, Spurn Head, Lincolnshire, north Norfolk and Suffolk.) or in seabed sinks and sources (e.g. offshore sand banks at the mouth of the Humber and offshore of Lincolnshire and north Norfolk).

Minor sediment transport is believed to take place around Flamborough Head between Smithic Sand and Filey Bay, particularly under storm conditions.

Along the Holderness coastline, sediment is released from the eroding clay cliffs; sediment transport is typically wave-driven in a southerly direction along the Holderness and Lincolnshire coastlines. The exception to this general trend is near Donna Nook, where sediment is fed in a north-westerly direction into the Humber Estuary.

The strong tidal flows into and out of the Humber Estuary intersect the north-south tidal flow and sediment transport pathway along the open coast. This estuary current acts as a hydraulic groyne, partially blocking the sediment transport pathway and preventing gravels and coarse sands from passing the estuary mouth. This sediment is trapped in banks and shoals adjacent to Spurn Head. Medium and fine sand is able to pass the estuary and move onto the Lincolnshire frontage.

Sediments from the North Sea are transported into the Wash embayment in suspension and as bedload on the flood tide. The asymmetry in the tidal regime means that the net trend is for more sediment to be deposited than removed, so a pattern of growth is generally observed.

The shore-parallel bank systems off the north Norfolk and Suffolk coasts are highly mobile, influencing and altering wave and current interactions which in turn restructure the bank formations. Changes in their position and configuration influence the amount of wave energy reaching the coast.

Bathymetry (including surface water characteristics)	• Danish Hydraulic Institute C-MAP bathymetric data	Analysis of general bathymetric characteristics. Refer to Figure 1.7

Below Flamborough Head, a rocky shore platform of chalk bedrock extends for over 1km in places. Beyond the platform, the seabed deepens relatively rapidly.

To the south of Flamborough Head, the Smithic Sand is a 10km long sand bank at the centre of a tidal circulation.

Along the Holderness coastline, a gently sloping clay platform extends from the shoreline for several kilometres. The bathymetry in this area is relatively simple with shore-parallel bathymetric contours.

Within the Humber Estuary, there is a dredged navigation channel running along the southern edge of the mudflats and sand flats of Spurn Bight. This channel is known as the Hawk Channel to the west of Spurn and becomes the Sunk Channel further west.

There is a deep paleaochannel to the east of Spurn Head; this is believed to have been formed during a fluvial phase of the Humber when glacial sea levels were low. There is a flood tide delta composed of a number of sub-tidal sand and gravel shoals to the south of the dredged navigation channel within the Humber.

The bathymetry off the East Lindsey coastline is reasonably complex with numerous sand and gravel banks which extend into the offshore area. This area includes areas licensed for dredging within the Crown Estate's Humber region.

The bathymetry within the Wash embayment is generally shallow (on average less than 10m) with extensive areas of inter-tidal sand banks and mudflats. There is a natural deep channel running along the axis of the embayment, known as The Well. This reaches 30m below Chart Datum in places and is surrounded by shallow banks.

Extending north eastwards from the Wash are sandbanks known as Burnham Flats and Docking Shoal. These are thought to be the remnants of deposits of peat, salt marsh and inter-tidal sands and muds which were laid down on the south bank of The Well during the early stages of sea level rise following the last glaciation.

Burnham Flats and Docking Shoal merge northwards into the offshore sand banks of The Race Bank, The Ridge and Dudgeon Shoal. These sandbanks have the typically elongated shape of banks in this area of the southern North Sea and display evidence of sand waves. There are believed to be up to 10m of sediment within these banks, representing a large store of sediment.

There is a shore-parallel trough along the north Norfolk coast which has been interpreted as a palaeo-valley, possibly caused by faulting within the chalk which underlies the entire north Norfolk coast.

The nearshore and offshore zones of the coastline between north Norfolk and Felixstowe continue to be dominated by shoals and sand banks. This area includes areas licensed for dredging within the Crown Estate's East Coast and Thames Estuary regions. There is a dredged navigation channel from offshore leading to the Port of Felixstowe, known as the Harwich Deep Water Channel.

Water column	• Charting Progress 2: The State of the UK Seas (Defra, 2010)	Analysis of general characteristics of the water column.

Charting Progress 2 (published by Defra in 2010 providing an assessment of the state of the UK's seas) noted that winter water temperatures (bottom and surface) are typically 4 - 8ºC in the winter and 16-19 ºC in the summer in the southern North Sea. Tidal energy in this shallow coastal area is generally sufficient to keep the water column well mixed through most of the year.

Charting Progress 2 analysed coastal sea temperature data from Spurn Point and Southwold and surface temperature and salinity data from the Harwich-Rotterdam ferry route at 'offshore' and 'coastal' locations. Coastal winter temperatures are lower than offshore and the minimum is typically reached in February.

Salinity shows no clear long-term trend. The coastal salinity data shows a seasonal cycle with on average, the maximum salinity recorded in November and a minimum in May.

Hydrology and Drainage and Flood maps	• Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 5, 6, 7, 9 and 10, chapters 2.2, 2.4, 9.4, 9.5 and 9.6	General overview of coastal areas that are susceptible to flooding. Few data sources were made available.

Cultural/Social Factors	Reference Source (s)	Summary
Historic sites and features	• SeaZone datasets, • MagicMap, • Maritime and Coastguard Agency, • Receiver of Wreck), • naval records (naval-history.net) • SEA 3 (Department of Energy and Climate Change).	General appreciation of Historic period development as well **a**nalysis of designated and non-designated heritage assets. Please refer to Figure 1.9.

Natural influences and asset preservation

Soft and eroding coastline geology has had an important influence upon the preservation of assets of all periods, designated or non-designated. This is particularly noticeable along the Suffolk Coastal area and possibly along the Lincolnshire coastline. Historical mapping has demonstrated the significant loss of land all along the Suffolk coast, including all or parts of historic settlements (e.g. Dunwich). Assets previously located inland with no association with the sea or coastal areas now find themselves threatened with destruction. These assets are particularly sensitive to further erosion of the unstable coastline. In contrast along The Wash the accumulation of sediment and the effect of land reclamation has resulted in historic ports and settlements that were once on the coast (Kings Lynn) being left some distance inland.

Occasionally artefacts erode out of modern coastlines, such as that in Suffolk and Norfolk, which is composed of relatively unconsolidated material. At Happisburgh and at Pakenfield internationally important Palaeolithic material has been recovered eroding from the coastal deposits. Lithic remains were associated with animal bones and were dated at between 800-700,000 years ago, pushing back the date for the colonisation of Britain. Later prehistoric remains have been exposed along the intertidal zone near Holme-next-the Sea (Norfolk) where the remains of prehistoric timber circles have been recorded ('Seahenge') that are late Neolithic and Bronze Age in date.

Fluctuations in the relative height of the sea that has occurred since the end of the last glaciation has had the effect of covering assets under thick layers of accumulated sediment and in places has created its own distinct landscape (the Fens). Extensive areas of alluvial and peat deposits occur along the inland intertidal waterways and elsewhere. Improved drainage, carried out since at least the end of the 17th century and the effect of peat shrinkage has revealed a previously buried landscape that is prehistoric and later in date. The deposits can help reconstruct past environments and provide a greater understanding of the geomorphology of the coastline during the periods of sea level fluctuation. The effect of the build-up of sediment transported by sea and rivers has also impacted the development of historic coastal ports (Great Yarmouth). The supplied datasets did not contain any mapping of the extent and character of buried palaeolandscapes /seacapes. Some of the zones within Area 3 have recently been subject to detailed and extensive palaeo-environmental assessment and research (the Fens and Holderness wetlands, Doggerland) in light of loss of resource caused by intensive farming practices and the effect of climate change. Within the Norfolk and Suffolk coastal areas relict estuaries and river valleys and gravel terraces laid down by the proto-Thames and its tributaries will also provide favourable preservation for prehistoric artefacts.

Historic Coastal Ports

Felixstowe – The town was strategically important since at least the medieval period and was well defended during Napoleonic times to prevent an invasion force landing on the coast. It became a major port in 1886 and a fashionable tourist resort by the late 19th century. During WWI the port was requisitioned as a Royal Navy Destroyer and Mine-sweeper base and in WWII it became a Royal Navy MTB and Air Sea Rescue Base.

Lowestoft – In the Middle Ages it developed as a fishing port, an industry that continued into the 20th century. The arrival of the railways and the construction of the dock in the mid 19th century resulted in more trade with the continent. The town also flourished as a Victorian seaside resort.

Great Yarmouth – In the Middle Ages its prosperity was based on the herring fishing industry. Its importance lead to the construction of defensive stone walls around the town in the 13th century. The present harbour dates from the 17th century. The town quickly prospered in the post-medieval period. The ship-building industry developed and the port was an important centre for trade with Europe. In the 19th century the town grew rapidly. Although the herring fishing industry was in steep decline from the early 20th century, the town developed as a seaside resort from the end of the 18th century, and expanded rapidly after the arrival of the railways in the mid-19th century.

Grimsby – The town developed as a port in the medieval period based upon the fishing industry and trade with Scandinavia and Europe. From the 15th century it declined as The Haven, the river that provided access into the estuary, started to silt up. Decline continued into the post-medieval period. By 1801 The Haven was deepened and the town rapidly expanded as a port and was involved in the export of coal. The railways arrived in 1848 and were responsible for the revival of the town. New docks were built in the mid 19th century and it became home to a large fishing fleet.

Goole – The port was constructed in the 1820's after the construction of the Aire and Calder Navigation that linked the industrial cities of Yorkshire to the coast. Coal from the Yorkshire coalfields was exported through the port. Until the arrival of the railways in 1848 the town was focused around the docks, but after the construction of a new railway station in the late 1860's new development was rapid.

Kingston-Upon-Hull – The town was founded in the late 12th century and during the medieval period its prosperity was based upon the export of wool to the continent. In the late 13th century it was enlarged and became a fishing port. Forts and a castle and town defences were added in the 16th century. The town was involved in the coastal trade. From the 17th century there was a ship-building industry in the town. During the Civil War it was besieged but it remained a Parliamentary outpost. In the late 17th century the fortifications were modernised and by the 18th century the port had become an outlet for manufactured goods. The town grew rapidly and during this period whalers operated from the port. In the early 19th century a new dock was built and Hull prospered. Fishing and ship-building expanded rapidly but by the mid-19th century the whaling fleet declined. In the 1930's the town suffered severely during the Depression with many dockers and fishermen unemployed. It was also badly affected by bombing raids during WWII.

Bridlington – The town developed in two separate areas with distinct identities but as a result of development were joined together. The town developed around the site of the priory but a small port grew up near the coast. Bridlington Quay developed in the 19th century and it became a seaside resort. The arrival of the railways in 1846 lead to further development and the two portions of the town were eventually brought together. Although the fishing industry declined the port remains a popular angling centre and is popular with divers visiting local shipwrecks.

Designated assets

The baseline search of available datasets identified a total of 101 scheduled ancient monuments, and included 10 registered parks and gardens, three protected wrecked vessels and a number of military aircraft wreck sites (number uncertain since type of aircraft not consistently recorded on tables). The assets were overwhelmingly land-based but were included in the assessment since they were judged from contour data to have a visual influence of land looking seaward or along the intertidal estuaries, as defined by the search area polygon.

The only offshore assets identified were one protected historic wreck site and a number of wrecks designated as military remains.

A summary of designated monument types by period is listed in Appendix 5.3.

A. Land based cultural heritage assets

There is a general dispersed scatter of designated assets (scheduled monuments, registered parks and gardens) of all periods, from Iron Age and Roman to WWII, around the coastline including intertidal waterways of Area 3, which will have a visual influence upon the seascape character of the coast.

Areas devoid of assets include land adjacent to The Wash and extensive stretches of the Lincolnshire coastline.

Areas of sensitivity defined by the search include the Suffolk coastal area and North Norfolk coast. The Suffolk coast is characterised by late 18th century and 19th century Napoleonic defences and the whole area included a number of seafront gardens that were built in the developing seaside resorts that flourished from the later 19th century as a result of the arrival of the railways (Felixstowe, Lowestoft, Great Yarmouth, Wells-next-the Sea). Within the historic ports a number of scheduled monuments reflect the importance of the towns in the medieval and later periods.

Medieval Norwich prospered as a result of the trade in wool, particularly with the continent, and there are a cluster of scheduled monuments close to and around the banks of the River Wensum that reflect the wealth and prosperity of the city and also the importance of religious foundations at this time.

In The Fens at the head of the Great Ouse Estuary are a group of prehistoric barrows that indicated an important area of burial, possibly a Neolithic and Bronze Age cemetery that is emerging from the shrinking peat.

Along the Humber Estuary a number of scheduled ancient monuments reflect the historic importance of this estuary since Roman times that faces Europe and the Scandinavian countries. There are defensive sites of the 17th, 19th centuries and WWII that protect the approaches to the port of Hull and industrial sites that reflect the importance of navigation and extractive industries in the 18th and 19th centuries.

B. Maritime Assets

The coastal character of the area is that of an exposed coast with numerous offshore sandbanks which run NW-SE parallel to one another and the adjacent coast, although within The Wash the sandbanks are aligned NE-SW. Sandbanks tend to cluster at the entrance/exit to the major estuaries (Orwell, Waveney/Yare, The Wash and the Humber estuary), and the area is exposed to prevailing winds from the north east during the winter which increases the risk of vessels being blown on to the shallow sandbanks.

A total of 2407 charted wreck sites were listed in the SeaZone datasets within Area 3. Using the Feature attribute listed in the dataset the records were searched into categories based on an identifier as 'Wrecks', 'Aircraft', 'Unspecified', or 'Geological'. Unspecified wrecks are features for which there was no identifier recorded.

SeaZone site types

SeaZone Feature	Total
Aircraft	8
Wrecks	1311
Unspecified	1084
Geological	4
Grand total	**2407**

The general distribution of the wreck sites shows a dispersed, relatively random pattern throughout the area, although there are at least 3 clusters that appear to relate to the location of the historic ports.

Around the approaches to Felixstowe /Harwich and the Orwell estuary are numerous wrecks but these tend to occur mostly offshore (over 10km), and appear to be unrelated to seabed features. The greatest concentration appears off Aldeburgh Napes. Further to the north, around the ports of Lowestoft and Great Yarmouth, the wrecks appear to cluster closer to the shore and are also present

within Oulton Broad (Lowestoft). The third cluster is at the mouth of the Humber where it is possible that vessels floundered on the shifting seabanks associated with Spurn Head. Wrecks locations extend along the Humber Estuary with a noticeable concentration at and around the historic port of Hull.

Protected Wrecks

There is one historic protected wreck site ('Site 42'), 'Dunwich Bank' located just over 700m off the coast SW of Dunwich in an area of seabed known as Minsmere Haven. The wreck is at approximate depth of 11m and it was discovered in 1993 as a result of objects brought to the surface by trawlers. The wreck has been the subject of an archaeological site assessment in 2005 (Wessex Archaeology 2006). The remains are considered to be from a 16th century armed merchant vessel or rare example of an early military transport vessel.

Wrecks designated as military remains

The wreckage of all military aircraft is protected under The Protection of Military Remains Act 1986, in addition 2 WWII ships have been designated. These include HMS Exmoor, that lies approximately 22km off Lowestoft and HMS Vortigern, 18.5km off Cromer.

Full details of designated cultural heritage assets for Area 3 are included in Appendix 5.3.

Palaeolandscape	• SeaZone datasets, • MagicMap, • Maritime and Coastguard Agency, • Receiver of Wreck), • naval records (naval-history.net) • SEA 3 (Department of Energy and Climate Change). • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 6 and 7	General appreciation of the prehistoric landscape.
The supplied datasets did not contain any mapping of the extent and character of buried palaeolandscapes /seascapes. Some of the zones within Area 3 have recently been subject to detailed and extensive palaeo-environmental assessment and research (the Fens and Holderness wetlands, Doggerland) in light of loss of resource caused by intensive farming practices and the effect of climate change. Within the Norfolk and Suffolk coastal areas relict estuaries and river valleys and gravel terraces laid down by the proto-Thames and its tributaries will also provide favourable preservation for prehistoric artefacts.		
Shipping and navigations	• Admiralty Charter Raster – General – 1:150,000 • Admiralty Charter Raster – Overview – 1:500,000 • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 6 and 7 • The Southern North Sea Marine Natural Area (English Nature) • http://www.shipais.com/ • http://www.humberems.co.uk/	General analysis of major passenger shipping routes. Refer to Figure 1.11
The area has localised concentrations of shipping concentrated on providing access to the major ports of Hull, Immingham, Grimsby, Great Yarmouth and Lowestoft.		
Current use of the coast and sea	• Datasets • Ferry Terminals • National Trails • Open Access (CROW) • Army Firing Ranges • Military Practice Areas (sea) • Offshore testing ranges • Submarine exercise areas • Dredging disposal areas • Pipelines • Round 3 Windfarm zones • ICES Fishing Areas • Fish Nursery Areas • Fish Spawning Areas • Sailing routes (RYA)	Review of current land uses and uses of the coast and sea. Review of coastal defences, agriculture and fisheries, tourism and recreation, minerals and oil and gas extraction, landfill and offshore waste, energy including renewable energy, infrastructure and transport, marine and nature conservation, military activities, urban expansion. Refer to Figures 1.10, 1.11 & 1.12
Fishing Apart from the finfish fishery, trawling occurs for shrimp along the Lincolnshire, Norfolk coast and in the Wash. Dredging for mussels		

and suction dredging for cockles takes place within the intertidal area of the Wash.

There are four major fishing ports (as defined by Defra) within this Natural Area - Bridlington, Kingston upon Hull, Grimsby and Lowestoft, as well as numerous other smaller ports that land fish.

Military

The area has a small number of military practice areas, these being at Donna Nook and within the Wash which are locally significant as they tend to be closely associated with the intertidal zone. To the north of the area within the coastal waters of the Holderness Coast is the edge of a much large practice area associated with the wider North Sea.

Windfarms

A number of large wind farms have been approved within coastal water, particularly along the coast of East Yorkshire, North Lincolnshre and Norfolk. Many of these are clearly visible from the coastline and have become significant landmarks in the local and regional seascape.

Recreation and sailing

The majority of the coastline is designated as a RYA Sailing Area, the only section which is not included is the area adjacent to the Suffolk Heritage Coast

Sailing is very popular within the Southern North Sea and this Natural Area provides numerous harbours, marinas and sheltered areas for the ever increasing number of boat owners. Sidaway (1991) recorded six marinas in Suffolk, 11 in Essex, 12 in Kent and one in Norfolk, indicating that much of the sailing activity in this Natural Area is located in the south. Whilst sailing has limited impact on the marine environment, motorboating often has an effect. Within this Natural Area the biggest threat motorboating poses is through noise and visual disturbance to seals at their haul-out sites. This has been recognised as a major threat to seal populations within The Wash and North Norfolk Special Area of Conservation, with populations being highly vulnerable to this kind of non-physical disturbance Marine Aggregate and Waste Disposal.

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Marine Aggregate and Waste Disposal

Licensed commercial dredging

This region is important for the extraction of marine aggregates. Owing to the high mobility of the sediments on this part of the coast, dredging and the disposal of dredge spoil are also important activities in the region

According to the Crown Estates, 11th annual report (Maine Aggregate Dredging 2008) there are large areas licensed for dredging off Spurn Head, Saltfleet, Mablethorpe, Chapel St Leonard's, Great Yarmouth and Lowestoft.

Navigational Dredging

Navigational dredging takes place at discretion of the individual harbour authorities. During the Estuaries Review survey, carried out in 1989, capital dredging was found to be in progress or proposed in the Humber, at King's Lynn and at Burnham Overy Staithe, while maintenance dredging was under way in the Humber Estuary and at Boston, King's Lynn, Wells, Blakeney and Breydon Water (Davidson et al. 1991).

Solid Waste Disposal

A number of sites have been identified which have been used for the dredged material from maintenance dredging and capital disposal. The following sites have been identified in Humberside (MAFF Codes) HU015, HU020, HU025, HU030, HU040, HU041, HU055, HU060, HU080, HU090, HU091, HU110, Lincolnshire, HU116, HU125, HU136, HU138, Norfolk HU140, HU145, HU150, HU161.

Gas Developments

Gas production dominates the area of the southern North Sea adjacent to this region, which is known as the Southern Basin. This activity is reflected in the concentration of gas-related industry along the region's coastline and the large number of pipelines bringing gas ashore. There are ten operational gas terminals in the UK servicing offshore fields, seven of them in this region: one at Dimlington (Humberside), two at Easington (Humberside), one at Theddlethorpe (Lincs.) and three at Bacton (Norfolk). The nearest major gas fields are located about 20-25 km offshore and stretch eastwards into the Dutch sector of the North Sea. There are no commercial oil fields in the Southern Basin. British Gas use underground storage caverns at Atwick near Hornsea, as well as

previously worked fields in the North Sea, to store gas for use in periods of peak demand.		
Surface water features	• Admiralty charts • GIS datasets (oil and gas platforms, wind farm developments and navigation aides) • National character area descriptions	Review of above water features (permanent/semi-permanent) which might influence the character of the perceived seascape. Refer to Figures 1.11 and 1.12
Coastal landmarks	• Admiralty charts • National character area descriptions • GIS datasets	Review of coastal landmarks which would influence seascape character or which prove important for navigation.

	Reference Source (s)	Summary
Cultural Associations	• http://www.suffolkcoastfutures.org.uk • http://twitter.com/AldeOreFutures • Ecology/Heritage designations as provided in dataset	To be validated with stakeholder input and further exploration. General appreciation of designation significance and perceived associated qualities. Refer to Figures 1.8. 1.9. 1.10

Perceptual/Experiential Factors*	Reference Source (s)	Summary
Light pollution	• Admiralty maps regarding lighthouses, beacons, gas platforms etc. • Shipping information and anchorages.	General review of sources of possible light pollution
Tranquillity	• Campaign to Protect Rural England mapping	General overview of mapping to gain an understanding of developed/natural coastal interfaces.
General Perceptual References	• 'Coast' TV Series	Taken as a popular interpretation of some of the 'essence of place' aspects of areas of the coastline.

Reference from the 'Coast' TV series:

- Flamborough Head is the site of many shipwrecks.
- Ferriby at the head of the Humber is a 'gateway to Britain' in terms of sea bourn freight and passengers. The area is also associated with the earliest evidence of seafaring boats in the country (discovery of bronze age boats).
- Grimsby was the largest fishing port in the world in the 1940s (overfishing and fish quotas have since limited its current status to a minimal role.
- Cleethorpes exhibits the highest concentration of caravans in Europe, accommodating around 6.5 million visitors/year.
- Butlins at Skegness defined seaside resort character originating in 1936 to serve the population centres of Nottingham, Doncaster and Leicester but declined in the 1970's with the introduction of cheap package holidays.
- The Wash represents an area where the land and sea boundary is in constant flux – the associated mud flats provide a valuable food source for wading birds. Mythology suggests that King Johns Crown Jewels were lost there in the year 1216.
- The Fens is a 'new' man-made landscape created following draining of the land 500 years ago to create agricultural land. Its future is uncertain with the increasing risk of inundation by the sea.
- The red and white cliffs at New Hunstanton are a distinctive local landmark within an area otherwise characterised by sandy beaches.
- Blakeney Point is an example of where the changing coastline has gradually cut off villages which in the 1600s were next to the sea with their prosperity based on sea trading.
- The hills at Cromer are a product of deposition at a glacial ice sheet edge. This point at the edge of the ice sheet which also coincided with a historic land bridge with what is now the European main land (evidence of animal and human activity in the current sea bed).
- The coastline at Cromer illustrates extensive man made coastal defence intervention.
- The Norfolk Broads is an area sensitive to potential sea water inundation. Sand dunes have been stabilised with concrete to protect the land/sea interface, requiring constant maintenance.
- Great Yarmouth is a significant area of deposition, creating the land mass and beaches.
- Lowestoft is the most easterly point of the UK.
- Orford Ness is a 10 mile long spit (one of the largest in Europe). The area was used as a military establishment between 1913 and 1983 for testing parachutes, aerial photography, radar and the atomic bomb. The area is now a nature reserve.
- Felixstowe is characterised by an area of sea defences.

*** Perceptual and experiential factors – refer to field record sheets in Annex 3 for further detail.**

Appendix 4.2 – Database for MMO Area 4

Please refer to Appendix 1 for supporting figures.

Base Mapping	Reference Source (s)	Summary
OS Maps	N/A	N/A
Aerial Photography	N/A	N/A
Political and administrative boundaries	• MMO area 4	Reviewed in line with study area parameters. Refer to Figure 1.1

Character Assessment	Reference Source (s)	Summary
Landscape and seascape characterisation	N/A	N/A
Marine and Coastal Biodiversity Characterisations	• The Southern North Sea Marine Natural Area	Review of areas to gain an understanding of natural processes and the interaction with geology, wildlife and human activity. Refer to Figure 1.3

Southern North Sea Marine Natural Area

The Southern North Sea Marine Natural Area extends from the 50 metre isobath at Flamborough Head southwards to the Dover Strait. The northern boundary follows the offshore frontal system (the 'Flamborough Front'), which results in a distinct temperature gradient between the waters to the north and south of Flamborough Head. The southern boundary of the Southern North Sea lies at the narrowest section of the Strait that divides the southern North Sea from the English Channel. The inshore boundary is the Mean Low Water (MLW) and the offshore boundary is at the limit of UK jurisdiction.

This Natural Area occurs within the Boreal biogeographic region (Dinter 2001). The biogeographical conditions of the Southern North Sea reflect the movement of water through the Dover Strait, with water from the English Channel providing some of the highest temperatures found throughout England's seas. The seabed here is largely composed of mixed sand and gravel sediments. In some areas these habitats are nationally and internationally important and are protected under the EC Habitats Directive. There is also a UK Biodiversity Action Plan for sublittoral sands and gravels. Areas of chalk substrata present within the Natural Area meet the definition of a reef listed in the EC's Habitats Directive. A Biodiversity Action Plan has also been prepared for Littoral and sublittoral chalk reefs.
Many important species occur within the Natural Area and these include a number of species covered by the UK Biodiversity Action Plan. There is a grouped Action Plan for commercial marine fish, baleen whales and small dolphins. There is also a plan for harbour porpoise and *Sabellaria spinulosa* reefs.

The main commercial activities in the Southern North Sea are fisheries, gas exploration and aggregate extraction. The main species targeted by fisheries are cod, sole, herring, plaice and sprat (Barne *et al* 1995, 1998). Shipping is also widespread, with several major ports in the Area. There is significant interest in offshore wind development in this area.

Historic landscape and seascape characterisation	• England's Historic Seascapes: Withernsea to Skegness Pilot Study MoLAS 2009	The content of the historic characterisation assessment hasn't been interrogated at the current scale of study with its subject coverage instead addressed within the Historic Sites and Features section below.
Natural Factors	**Reference Source (s)**	**Summary**
Landform	N/A	N/A
Landcover	• OS map 1:10,000 • Natural England National Landscape Character Area descriptions • Futurecoast	Review of general coastal land uses and land cover and to gain an understanding of the association with the sea.
Landscape Designations	N/A	N/A
Solid geology/drift geology	• Offshore 1:250,000 scale geological mapping • URS/SW Bathymetry assessment • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 5, 6, 7, 9 and 10, chapters 2.2, 2.4, 9.4, 9.5 and 9.6	Review of offshore rocks and sediments at and below the sea bed.

This section reviews the geology of the rocks and sediments at and below the sea bed. The offshore geology is separated into a

number of categories namely;

- Holocene sea bed sediments (unconsolidated sediments laid down since the sea transgressed across the area during the Holocene Epoch;
- Pleistocene deposits of glacial origin (Devensian);
- Solid (pre-Quaternary) rocks which are largely concealed by sea-bead sediments and drift deposits). Maps showing the offshore solid geology are appended to this document.

Holocene Sea Bed Sediments

The sea bed sediments in the north of this region comprise mainly sands with isolated discontinuous outcrops of gravelly sand and muddy sands. Moving southwards towards the River Humber, the sandy gravels become more extensive. The gravels off the Humber estuary have a varied composition: Carboniferous sandstone and limestones are particularly common, but chalk, Jurassic mudstone, flint and igneous and metamorphic rock types are also found. The gravels are believed to be derived by marine winnowing of glacial moraines and outwash fans deposited during the Devensian glaciation.

Holocene sediments generally form a veneer less than 1 m thick. Exceptionally, the sand-rich sediments comprising the Norfolk Banks attain a maximum thickness of about 40 m, but the intervening gravelly sand substrate remains thin.

Towards the south of the region the sea-bed sediments are mostly relict. Carbonate gravels, were probably reworked from Pliocene Crag deposits similar to those that outcrop onshore in north-east Essex and Suffolk. A discontinuous belt of gravel and sandy gravel extends offshore from Aldeburgh in Suffolk to the vicinity of Clacton-on-Sea in Essex. Shell fragments and whole shells may constitute 30% or more of the gravel fraction off the coast of Suffolk. More than 90% of the gravel fraction in the outer Thames is composed of flint, although quartzite, phosphorite sandstone and carbonate pebbles are locally abundant. Around the margins of the major estuaries, Holocene mudflats occur, with saltmarsh or sand forming the upper beaches. The muds often contain fragmented shell material.

Pleistocene geology

The sea floor of the region is covered by a discontinuous sheet of glacial till (boulder clay) of Late Devensian age, the Wee Bankie Formation; the unit is thin and patchy close to the coast. Although for the main part it forms a thin veneer on the bedrock, the boulder clay locally thickens to 40 m in deep channels. It is red-brown in colour, and may be sandy or silty with a variable clast content, including local rock types such as Carboniferous Limestone, Permian dolomites and mudstones and occasional Quartzite pebbles. Glaciomarine muds (St. Abb's Formation) with sporadic small pebbles occur on the sea bed south from Amble towards the Tees Estuary. Some deposits belong to the Forth Formation, a sequence of interbedded sands, silts and muds deposited in an estuarine to marine environment at the end of the last glaciation.

The extensive deposits of till (boulder clay) of the Bolders Bank Formation date from the last (late Devensian) glaciation. The till is a stiff, reddish to greyish brown clay containing patches of sand and silt. Its clasts of chalk, red sandstone and grey mudstone are derived from the sedimentary rocks of eastern England. Over much of the region the Bolders Bank Formation is less than 5 m thick, although the till thickens toward the coast of Lincolnshire, where it may be 15-20 m thick. To the north-east of Norfolk, south of the limit of Devensian ice advance, the sediments consist of discontinuous Upper Pleistocene lacustrine sands and muds, and Lower to Middle Pleistocene deltaic sediments (lagoonal clays, sands with plant remains, worn shells and pebbles of the Yarmouth Roads Formation). Further to the south-east, offshore from east Norfolk, Early Pleistocene deposits comprise shelly grey marine sands with silt partings (Red Crag Formation) and grey marine clays and fine-grained sands (Westkapelle Ground Formation), equivalent to the upper parts of the Red Crag Formation onshore. Early to Middle Pleistocene deposits comprise fluviatile or estuarine sands with clay laminae and flint pebbles (Yarmouth Roads Formation). There is also a tongue of Late Pleistocene sediments (the Brown Bank Formation), comprising silty clays and fine sands, deposited in estuarine or fluviatile environments.

Solid (pre-Quaternary) geology

North of Newcastle-upon-Tyne, Carboniferous strata outcrop at the sea bed in a belt that extends approximately parallel with the coast. In the offshore area as far south as the Farne Islands, the Carboniferous strata are Dinantian (Lower Carboniferous) in age, comprising rhythmic sequences of limestones as well as shales, sandstones and coals of various thicknesses. Basic igneous rocks have, in places, intruded into the sedimentary sequences. From just south of the Farne Islands to Whitley Bay the Carboniferous strata comprise faulted Westphalian Coal Measures: sandstones and mudstones with coal seams and marine and non-marine fossiliferous bands. Further offshore, the Farne Deeps depression, south-east of the Farne Islands, is underlain by relatively soft Permo-Triassic 'red-bed' sandstones and mudstones which extend in a belt southwards to the coast between Newcastle-upon-Tyne and the Tees Estuary. North of Hartlepool these beds consist largely of Upper Permian Magnesian Limestone comprising dolomitised limestones with intercalated evaporite deposits.

Extending from near the Tees Estuary to north of Filey Brigg, Jurassic strata outcrop at the sea bed. The strata range in age from Rhaetian (Upper Triassic) to Kimmeridgian (Upper Jurassic) and comprise interbedded sandstones, mudstones and limestones deposited in a variety of shallow marine and marginal environments. Lower Jurassic strata are dominant, with Middle Jurassic strata

forming the sea floor in a coastal belt north and south of Scarborough.

Most of the offshore area extending from north-east Norfolk to Flamborough Head (often referred to as the East Midlands Shelf) is underlain by Upper Cretaceous fine grained limestones (Chalk Group). The Chalk may contain layers of flint, either as nodules or tabular sheets, as well as harder cemented chalk horizons (hardgrounds), but near Flamborough the Chalk it is almost flint-free. Tertiary rocks, mainly Eocene and Palaeocene sandstones and mudstones, underlie the Quaternary sediments east of the Norfolk coast. A variety of Lower Cretaceous and Jurassic sediments underlies The Wash and form the sea floor north of Flamborough Head.

Pliocene Crag deposits, consisting of bioclastic limestones and shelly sandstones deposited under strong tidal conditions in sandbanks and outer estuarine environments, occur off the Suffolk coast. Much of the Thames Estuary is underlain by the Eocene London Clay Formation, a monotonous sequence of mudstones with occasional beds of phosphatic and carbonate nodules, and volcanic ash bands. Other Palaeogene formations are thinner, with varied sedimentary rocks occurring offshore of Clacton and Harwich. A broad belt of Upper Cretaceous chalk with flint bands underlies the Straits of Dover, passing westward into Lower Cretaceous sediments.

Soils/sediments	• URS/SW Bathymetry assessment • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 5, 6, 7, 9 and 10, chapters 2.2, 2.4, 9.4, 9.5 and 9.6	Review of offshore rocks and sediments at and below the sea bed. Refer to Figures 1.5 and 1.6

Sediment transport is described within the context of coastal cells. These divide the coastline into sections within which sediment erosion and accretion are interrelated and largely independent of other cells. The sediment transport in this context relates to sand and gravel bedload, not suspended solids.

Flamborough Head to Sunk Island

Along this coast large amounts of sediment derived from cliff erosion are carried seawards and predominantly southwards by waves and tidal currents. However there is small but significant interchange of sediment around Flamborough Headland, between Filey and Bridlington Bays. Erosion in this sub-cell supplies sand to the Lincolnshire coast. From Bridlington to Spurn Head there is rapid and persistent cliff and beach erosion, which has resulted in a long-term retreat of the coastline, causing considerable loss of agricultural land. Where stretches of coast are defended there are erosion problems downdrift, including accelerated cliff retreat. Hornsea and Withernsea are becoming isolated by coastal recession and are therefore at increasing risk of beach erosion. There is little net erosion on the north shore within the Humber estuary, where sediment is accreting and saltmarsh forming.

Immingham to Donna Nook

There is little littoral drift of sand into the Humber estuary from Donna Nook. Waves and tidal currents transport material southwards across the Humber estuary to the Lincolnshire coast. There is extensive open coast accretion of saltmarsh and mudflats around Cleethorpes and Humberston, while to the south of Cleethorpes there is minor local dune erosion. Further south at Donna Nook there are again extensive salt marshes and sand accretion.

Donna Nook to Gibraltar Point

Along this section of coast there is moderate southward littoral drift of sand. Tidal flows in and out of the Humber and Wash estuaries modify sediment transport processes. There is extensive open-coast accretion of saltmarsh at Saltfleet and Saltfleetby, and of dunes at Theddlethorpe. The erosion of the underlying clay unit, resulting from the erosion of the sand beach, is causing beach steepening between Mablethorpe and Skegness. South of Skegness dunes are building and the sand beach is extending seaward.

Gibraltar Point to Snettisham

In The Wash there is no significant littoral drift and fine sands and silts are brought in by tidal action. Tidal currents distribute fine sediments, allowing saltmarsh to expand, particularly on the western and southern margins of the estuary.

Snettisham to Sheringham

This is predominantly an accretionary sub-cell with an offshore supply of sand and silt, together with a supply of pebbles from the east. There is a moderate rate of westward drift from Sheringham to Hunstanton, reducing to near zero at Snettisham. Both waves and currents are important; waves dominate coastal processes east of Blakeney; westwards to Snettisham, tidal flows become increasingly important, particularly on the lower part of the foreshore. Saltmarsh is developing in the lee of shingle spits between.

Hunstanton and Blakeney

Between Hunstanton and Holme, sand dunes experience seasonal erosion. Particularly from Cley to Weybourne, there is some

evidence of landward retreat of shingle ridges and, east of Weybourne, continued erosion of soft sand/clay cliffs. The eastern boundary of this sub-cell, at Sheringham, is a drift divide that tends to shift position from time to time, owing to minor variations in wave conditions

Sheringham to Lowestoft

Both waves and tidal currents play an important role in changing the coast of this sub-cell, where there is a high drift rate to the east and south. A number of major elongated sand banks are found off the coast and residual currents around these banks are linked with beach processes. The 'nesses', such as Winterton Ness, are points of accretion. Cliff erosion is widespread and locally rapid, and during some periods erosion affects the predominantly accreting sand dunes and nesses.

Lowestoft to Harwich

Drift is southward, with high sand transport and moderate shingle transport. Both waves and tidal currents play an important role in coastal change in this sector. Waves transport material southwards from eroding cliffs, providing an important sediment supply for downdrift beaches, and offshore banks are formed by tides. Coastal processes are complicated by the tidal flows at the mouths of the Deben, Orwell and Stour Estuaries. In the north of the sub-cell there is cliff erosion at Covehithe, Easton Bavents and Dunwich. Accretion occurs at Benacre Ness and between Thorpeness and Aldeburgh. South of Aldeburgh and between Felixstowe and Landguard Point beach erosion is prevalent.

Biodiversity (above and below water) and designations	• Joint National Conservation Committee (JNCC) (Marine SAC's and SPA's, Marine Protected Areas, OSPAR Marine Protected Areas, Marine Conservation Zones) • Natural England (Marine Protected areas, Marine Conservation Zones) • Multi Agency Geographic Information of the Countryside (MAGIC) (National nature reserves • DEFRA (Marine Conservation Zones) • UK Marine and Coastal Act 2009 • The Government strategy for Contributing to the Delivery of a UK Network of Marine Protected Areas (DEFRA) • Marine protected areas interactive map (JNCC) • UK Biodiversity Action Plan (Priority habitats and species with key selection criteria.) • Local Biodiversity Action Plans (East Riding of Yorkshire, Lincolnshire, Norfolk and Suffolk.)	• Protected wreck sites • RAMSAR sites • SAC's (Natura 2000 marine sites) • SPA's • SSSI Refer to Figure 1.8

Marine Plan Area 4 is a large off shore area extending from the seaward boundary of marine area 3 out to between 100 and 300km from the coast. This area contains three offshore SAC's and two SPA's. For the locations of these designations refer to Figure 1.8 in Appendix 1 and for a summary of the designation status refer to Appendix 5.2.The area can be divided into the two key zones outlined below.

The first and southern most key off shore zone is the Outer Thames Estuary. This area is a wide expanse of open sea split into three offshore parts. Each of these areas have been designated an SPA site for their wild bird species such as the red-throated diver which is an amber list species.

Directly north of this lies a large key zone comprising of three main areas; Haisborough, Hammond and Winterton; The North Norfolk Sand Banks and Saturn Reef; and Inner Dowsing, Race bank and Ridge. All of these areas comprise reef habitat and sandbanks slightly covered with sea water all the time. These zones are designated as offshore SAC's because they are Annex I habitats.

The remainder of marine plan area has little ecological interest.

Air and climate	• Met Office • Marine weather areas • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 5, 6, 7, 9 and 10, chapters 2.2, 2.4, 9.4, 9.5 and 9.6	General understanding of prevailing weather conditions and significant weather systems or influences.

Shipping forecast zones covering the marine area are Dogger, Humber and Thames. The area Dogger takes its name from Dogger Bank and Humber takes its name from the Humber Estuary.

Wind is seasonally variable. Winter and early summer winds tend to be north easterlies with summer winds tend to be south westerlies. Annual records suggest that westerlies are generally the most common.

Windiest months are between December and January and the least windy months are between May and August.

Marine Environment	Reference Source (s)	Summary
Sea level rise	• UKCP09 – UK Climate projections	Review of UK Climate Projections (UKCP09) and their impact on sea level rise.

The table below combines absolute sea level change and vertical land movements to produce estimates of relative sea level change. UKCP09 reports data for Edinburgh, London, Cardiff and Belfast. Mean sea level rise for Area 4 can be expected to be between the bounds of the figures for Edinburgh and London.

Table showing the central estimates for each decade of relative sea level changes (cm) with respect to 1990 levels for three emissions scenarios. (Taken from http://www.ukcip.org.uk/publications/climate-science/ukcp09-sea-level-change/)

Year	London			Edinburgh		
	High	Medium	Low	High	Medium	Low
2000	3.5	3.0	2.5	2.2	1.6	1.2
2010	7.3	6.2	5.3	4.7	3.5	2.6
2020	11.5	9.7	8.2	7.5	5.7	4.3
2030	16.0	13.5	11.4	10.7	8.2	6.1
2040	20.8	17.5	14.8	14.2	10.9	8.2
2050	25.8	21.8	18.4	18.0	13.9	10.5
2060	31.4	26.3	22.2	22.1	17.1	13.0
2070	37.2	31.2	26.3	26.6	20.6	15.7
2080	43.3	36.3	30.5	31.4	24.4	18.6
2090	49.7	41.6	35.0	36.5	28.4	21.8
2095	53.1	44.4	37.3	39.2	30.5	23.4

Erosion processes and coastal features	• Flamborough Head to Gibraltar Point Shoreline Management Plan • Gibraltar Point to Hunstanton (The Wash) Shoreline Management Plan • Hunstanton to Kelling Hard (North Norfolk) Shoreline Management Plan • Kelling Hard to Lowestoft Shoreline Management Plan • Durlston Head to Rame Head Shoreline Management Plan	Analysis of coastal erosion processes and their influence of the wider offshore seascape.
Tides and Coastal processes	• Flamborough Head to Gibraltar Point Shoreline Management Plan • Gibraltar Point to Hunstanton (The Wash) Shoreline Management Plan • Hunstanton to Kelling Hard (North Norfolk) Shoreline Management Plan • Kelling Hard to Lowestoft Shoreline	Analysis of coastal erosion processes and their influence of the wider offshore seascape.

	Management Plan • Durlston Head to Rame Head Shoreline Management Plan	
Bathymetry (including surface water characteristics)	• Danish Hydraulic Institute C-MAP bathymetric data	Analysis of general bathymetric characteristics. Refer to Figure 1.7

Within Area 4, the bathymetry is generally less complex than in the nearshore zone. The northern boundary of Area 4 broadly follows the -50m CD contour of Dogger Bank. Dogger Bank is a large sand bank approximately 100km offshore of the Middlesbrough area. Water depths over Dogger Bank are in the order of 20-30m, compared with approximately 50m in the surrounding area.

South of Dogger Bank is an area of deeper water, 60-70m deep in places known as Outer Silver Pit.

South of Outer Silver Pit, the bathymetry becomes shallower and there are a series of parallel sand and gravel banks orientated north-west south-east. These extend from the area offshore of the Lincolnshire coast down to the north Norfolk coast. This area includes part of the Crown Estate's Humber region's areas licensed for aggregate extraction.

South of Yarmouth, the offshore bathymetry is less complex with fewer offshore banks and shoals. Water depths in the offshore area are in the order of 30-40m.

Water column	• Charting Progress 2: The State of the UK Seas (Defra, 2010)	Analysis of general characteristics of the water column.

Charting Progress 2 (published by Defra in 2010 providing an assessment of the state of the UK's seas) noted that winter water temperatures (bottom and surface) are typically 4 - 8ºC in the winter and 16-19 ºC in the summer. In the most northern parts of this area, there may be the possibility of some thermal stratification between May and October, but in the majority of the area, tidal energy will be sufficient to keep the water column well mixed.

Charting Progress 2 analysed coastal sea temperature data from Spurn Point and Southwold and surface temperature and salinity data from the Harwich-Rotterdam ferry route at 'offshore' and 'coastal' locations. Offshore winter temperatures are higher than in the coastal area and the minimum is typically reached in March.

Salinity shows no clear long-term trend. The offshore salinity data shows a seasonal cycle with on average, the maximum salinity recorded in February and a minimum in June-July.

Hydrology and Drainage and Flood maps	• Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 5, 6, 7, 9 and 10, chapters 2.2, 2.4, 9.4, 9.5 and 9.6	General overview of coastal areas that are susceptible to flooding. Few data sources were made available.

Cultural/Social Factors	Reference Source (s)	Summary
Historic sites and features	• SeaZone datasets, • MagicMap, • Maritime and Coastguard Agency, • Receiver of Wreck), • naval records (naval-history.net) • SEA 3 (Department of Energy and Climate Change).	General appreciation of Historic period development as well analysis of designated and non-designated heritage assets. Refer to Figure 1.9

Area 4 incorporates a large area of the southern North Sea.

A total of 2177 charted wreck sites were listed in the SeaZone datasets. Using the Feature attribute listed in the dataset the records were searched into categories based on an identifier as 'wrecks', 'aircraft', 'unspecified', or 'Geological'. Unspecified wrecks are features for which there was no identifier recorded.

SeaZone site types

SeaZone Feature	Total
Aircraft	7
Wrecks	1053
Unspecified	1116
Geological	4
Grand total	**2177**

There were a small number of protected wreck sites that consist of at least 7 submerged military aircraft wrecks, but there were no vessels designated as military wrecks and there were no protected historic wrecks of archaeological significance.

The general distribution of the wreck sites shows a dispersed, relatively random pattern throughout the area, although there are more wrecks recorded along the western (landward) side. Clusters are noticeable adjacent to the historic ports, opposite Lowestoft and Great Yarmouth and in a swathe from the north Norfolk coast up to Flamborough Head. There are another two clusters that appear to relate to seabed topography. To the south, the Middle Ground SeaZone cover area contains a total of 28 wreck sites and to the north, the North West Riff, lying adjacent to the Dogger Bank contains 51 wreck sites.

Although there are no designated archaeological assets recorded in this area, an archaeological presence is known from material dredged up during fishing operations. Recently there has been a large survey completed to assess the archaeological potential for early Holocene buried landscapes at Dogger Bank (Gaffney, Thomson, Fitch (eds), 2007).

As a result of seismic survey and an assessment of historic cores recovered from the area, a preserved early Holocene landscape was mapped that is likely to contain evidence of Mesolithic occupation with the potential for earlier Palaeolithic remains. An attempt was made to map the broad landscape character zones identified by survey (Figure 9.5, in Gaffney, Thomson, Fitch (eds), 2007) and some of these; particularly those on the western side of the search area are likely to coincide with the study area.

Gaffney, V, Thomson, K & Fitch, S (eds), 2007, Mapping Doggerland. The Mesolithic Landscapes of the Southern North Sea (University of Birmingham)

Full details of designated cultural heritage assets for Area 4 are included in Appendix 5.3.

Palaeolandscape	• SeaZone datasets, • MagicMap, • Maritime and Coastguard Agency, • Receiver of Wreck), • naval records (naval-history.net) • SEA 3 (Department of Energy and Climate Change).	General appreciation of the prehistoric landscape/seascape.

Although there are no designated archaeological assets recorded in this area, an archaeological presence is known from material dredged up during fishing operations. Recently there has been a large survey completed to assess the archaeological potential for early Holocene buried landscapes at Dogger Bank (Gaffney, Thomson, Fitch (eds), 2007).

As a result of seismic survey and an assessment of historic cores recovered from the area, a preserved early Holocene landscape was mapped that is likely to contain evidence of Mesolithic occupation with the potential for earlier Palaeolithic remains. An attempt was made to map the broad landscape character zones identified by survey (Figure 9.5, in Gaffney, Thomson, Fitch (eds), 2007) and some of these; particularly those on the western side of the search area are likely to coincide with the study area.

Gaffney, V, Thomson, K & Fitch, S (eds), 2007, Mapping Doggerland. The Mesolithic Landscapes of the Southern North Sea (University of Birmingham)

http://www.vista.bham.ac.uk/research/Projects/Marine/North_Sea.htm

Shipping and navigations	• Admiralty Charter Raster – General – 1:150,000 • Admiralty Charter Raster – Overview – 1:500,000 • http://www.shipais.com/ • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 6 and 7.	Analysis of major shipping routes. Refer to Figure 1.11.

Shipping

Commercial

The area contains some of the world's busiest shipping lanes, at any one time there are around 5,000 ships operating throughout the whole of the North Sea (Safetec 2000). Many different types of vessel operate in this area.

Ferries

A proportion of the marine traffic within this Natural Area is composed of ferries that transport cars and passengers across the North Sea. On average 82 ferries pass through this Natural Area per week.

Current use of the coast and sea	• Datasets • Ferry Terminals • National Trails • Open Access (CROW) • Army Firing Ranges • Military Practice Areas (sea) • Offshore testing ranges • Submarine exercise areas • Dredging disposal areas • Pipelines • Round 3 Windfarm zones • ICES Fishing Areas • Fish Nursery Areas • Fish Spawning Areas • Sailing routes (RYA)	Current land uses. Review of coastal defences, agriculture and fisheries, tourism and recreation, minerals and oil and gas extraction, landfill and offshore waste, energy including renewable energy, infrastructure and transport, marine and nature conservation, military activities, urban expansion. Refer to Figures 1.10, 1.11 and 1.12

Fishing

This area of the southern North Sea forms an important focus for fishing activity. The region is an important area for populations of a number of commercial fish species, providing spawning grounds and nursery and feeding areas Consequently, it is an area of considerable importance for fishing activity.

Military

A large area of the Southern North Sea area around Dogger Bank and the deep water channel adjacent are classified as Military Practice Areas.

Windfarms

In April 2001, following a pre-qualification process, companies were given an agreement of lease by the Crown Estate to pursue 15 developments in the first round of offshore wind farms in the UK. Six windfarms within the Southern North Sea MNA from this first round have received development consents and construction is underway at one of these, at Scroby Sands near Great Yarmouth. In July 2003, a second round of offshore wind developments was announced. In this round, leases have only been offered within three 'Strategic Areas' of the UK which have undergone a Strategic Environmental Assessment process. Much of the marine environment within this MNA lies within the Greater Wash Strategic Area where eleven further locations have been leased for windfarm development under Round 2 (including four areas beyond 12NM).

Recreation and sailing

Marine Aggregate and Waste Disposal

Licensed commercial dredging

The marketability of gravel deposits along the coast between Blyth in Northumberland and Sunderland in Tyne & Wear has been affected by many years of colliery waste dumping, which has made the aggregates unsuitable for use in concrete production. No licences were granted in 1994 for dredging sand and gravel in this area. The Lincolnshire and Suffolk coasts are one of the main dredging grounds licensed for marine sand and gravel extraction within the coastal waters off Britain.

Navigational Dredging

Not applicable to this area.

Solid Waste Disposal

A number of sites have been identified which have been used for the dredged material from maintenance dredging and capital disposal. The following sites have been identified in Norfolk HU145, HU161, South Falls TH070.

Gas Developments

Gas production dominates the area of the southern North Sea adjacent to this region, which is known as the Southern Basin with gas fields ranging from 20km to 100km offshore with gas piped further south for treatment. This activity is reflected in the concentration of gas-related industry along the region's coastline and the large number of pipelines bringing gas ashore. There are ten operational gas terminals in the UK servicing offshore fields, seven of them in this region: one at Dimlington (Humberside), two at Easington (Humberside), one at Theddlethorpe (Lincs.) and three at Bacton (Norfolk). There are no commercial oil fields in the Southern Basin. British Gas use underground storage caverns at Atwick near Hornsea, as well as previously worked fields in the North Sea, to store gas for use in periods of peak demand.

The nearshore part of the region is attracting increasing interest from the oil industry, with offshore licensing blocks being defined right up to the coast

Surface water features	• Admiralty charts • National character area descriptions • GIS Datasets (oil and gas platforms, windfarm developments and navigation aides)	Review of above water features (permanent/semi-permanent) which might influence the character of the perceived seascape. Refer to Figures 1.11 and 1.12.
Coastal landmarks	• Admiralty charts • National character area descriptions • GIS datasets	Review of coastal landmarks which would influence seascape character or which prove important for navigation.
Policy	**Reference Source (s)**	**Summary**
Cultural Associations	• http://www.suffolkcoastfutures.org.uk • http://twitter.com/AldeOreFutures • Ecology/Heritage designations as provided in datasets.	To be validated with stakeholder input and further exploration. General appreciation of designation significance and perceived associated qualities. Refer to Figures 1.8, 1.9 and 1.10.
Perceptual/Experiential Factors*	**Reference Source (s)**	**Summary**
Light pollution	• Admiralty maps regarding lighthouses, beacons, gas platforms etc. • Shipping information and anchorages.	General review of sources of possible light pollution and
Tranquillity	• Campaign to Protect Rural England mapping	General overview of mapping to gain an understanding of developed/natural coastal interfaces.

*** Perceptual and experiential factors – refer to field record sheets in Annex 3 for further detail.**

Appendix 4.3 – Database for MMO Area 6

Please refer to Appendix 2 for supporting figures.

Base Mapping	Reference Source (s)	Summary
OS Maps	• OS map 1:250,000 • OS map 1:50,000	Review of coastal activity, sea and coastal use and topographical information.
Aerial Photography	• Google earth • Futurecoast CD	Review of coastal and intertidal characteristics where access was limited. Also used in the planning of surveys.
Political and administrative boundaries	• MMO area 6	Reviewed in line with study area parameters. Refer to Figure 2.1

Character Assessment	Reference Source (s)	Summary
Landscape and seascape characterisation	• Natural England National Landscape Character Areas 137, 138, 139, 147, 148 and 151. • Dorset Coast Landscape and seascape Character Assessment 2010	Review of existing NCA documents and draft NCA review to understand key characteristics and key landmarks pertinent to coastal interface. Refer to Figure 2.2

137 Isle of Portland/ Weymouth Lowlands

Key Characteristics

- Varied area, united by underlying broad ridge and valley pattern and spectacular coastline.
- Exposed, windswept coastal grassland.
- Distinctive coastline of Chesil Beach enclosing the brackish lagoons of The Fleet.
- Dramatic wedge-shaped peninsula of the Isle of Portland with its distinctive untidy character and strong sense of history.
-

139 Marshwood and Powerstock Vales

Key Characteristics

- Distinctive coastline with undulating farmland to cliff edge; slumped, mobile cliffs are punctuated by prominent headlands.

147 Blackdowns

Key Characteristics

- Distinctive coastal landscape of unstable under cliffs, irregular headlands and valley salt marshes.
- Several coastal settlements but remote inland areas.

148 Devon Redlands

Key Characteristics

- Extensive urban development, roads and railways on the lower valleys and coast.
- Open flood meadows with little tree cover in the lower valleys, extending to open salt marsh on the coast.

Marine and Coastal Biodiversity Characterisations	• The South Western Peninsula Marine Natural Area (English Nature) • Lyme Bay Coastal Natural Area	Review of areas to gain an understanding of natural processes and the interaction with geology, wildlife and human activity. Refer to Figure 2.3

The South Western Peninsula Marine Natural Area: General Summary

The South Western Peninsula Marine Natural Area includes the seas around the south west peninsula of England (including the Isles of Scilly), from Portland Bill in Dorset to Brean Down just south of Weston-super-Mare on the southern side of the Severn Estuary. The eastern boundary of the Natural Area follows a division between two biogeographical provinces − the Boreal and Boreal-Lusitanean (Dinter 2001). Further west, the boundary follows the 100-metre isobath (chosen to represent the delineation between the shallow coastal and deep offshore waters) to the west of the Isles of Scilly, with the northern boundary following the mid-line between Wales and England. The inshore boundary of the South Western Peninsula Natural Area is delimited as Mean Low Water (MLW) and the offshore boundary is at the limit of UK jurisdiction.

The marine conditions in the south west are influenced by the Lusitanean-Boreal biogeographical region which, together with the varied geology present, produces a diverse marine community. The plankton is characteristic of temperate shelf sea species, with some influence from the North Atlantic Drift. Species considered to be at the edge of their range and which are more normally

associated with the Mediterranean, such as turtles and some exotic fish species, are occasionally reported within this Marine Natural Area (Pater 1999).

Many important 'key species' occur within this Marine Natural Area, including various cetaceans, grey seal, basking shark and a number of invertebrates of high nature conservation importance. Several of these key species are covered by UK Biodiversity Action Plans (BAPs). There are grouped BAPs for commercial marine fish, toothed whales, small dolphins and marine turtles. There is also a single Species Action Plan for harbour porpoise. Other BAP species that occur within the Marine Natural Area include the pink sea fan. There are also a large number of algae and marine invertebrates present which are considered to be nationally rare or scarce (Sanderson 1996 a, b).

The main commercial activities within the South Western Peninsula Marine Natural Area are fishing and commercial shipping in the Bristol Channel. The main commercial fish species targeted within the area (in order of decreasing tonnage of landings) are mackerel, pilchard, sprat, monkfish, plaice, megrim, hake, lemon sole, Dover sole, horse mackerel, whiting and pollack. There are also important fisheries for crabs, mussels, scallops, lobsters and whelks (Barne et al 1996a, b, c). On land adjacent to the Natural Area, tourism is a major activity, with the region's mild climate, sandy beaches and fine scenery attracting large numbers of visitors, particularly during the summer months.

Coastal Natural Area 111 Lyme Bay

Lyme Bay comprises over 150 km of the most varied, spectacular and ecologically important coastline in England. The variety and interest relates to the complex geology, which is renowned for its layers of Jurassic rock with fossil remains. Classic examples of landslips and shingle ridges are also present.

The wealth of important habitats present along this stretch of coast include shingle ridges, sand dunes, estuaries, brackish lagoons, soft and hard sea cliffs, and woodland. The Fleet, a large saline lagoon, supports several nationally rare and scarce species.

Lyme Bay spans part of the transition zone between the cold Boreal and the warmer Lusitanian provinces of the north-east Atlantic. Hence this Natural Area contains a wide range of habitats and a considerable diversity of communities with a wealth of marine life.

Historic landscape and seascape characterisation	N/A	The coverage of historic characterisation assessment hasn't yet been extended to include the character area but is instead addressed within the Historic Sites and Features section below.

Natural Factors	Reference Source (s)	Summary
Landform	• OS map 1:10,000 • Natural England National Landscape Character Area descriptions	Review of general coastal topography and identification of topographical high points to inform theoretical horizon buffer. Review of coastal characteristics and land sea interface.
Landcover	• OS map 1:10,000 • Natural England National Landscape Character Area descriptions • Futurecoast	Review of general coastal land uses and land cover and to gain an understanding of the association with the sea.
Landscape Designations	• AONB GIS Dataset • Heritage Coast GIS Dataset • National Parks GIS Dataset • National Trails GIS Dataset	Review of landscape related designations where significant scenic qualities could be important to a perception of seascape and influence interaction of seascape character. Refer to Figure 2.3
Solid geology/drift geology	• Offshore 1:250,000 scale geological mapping • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 5, 6, 7, 9 and 10, chapters 2.2, 2.4, 9.4, 9.5 and 9.6	Review of offshore rocks and sediments at and below the sea bed. Please refer to Figure 2.5 and 2.6

Offshore Geology

This section reviews the geology of the rocks and sediments at and below the sea bed. The offshore geology is separated into a number of categories namely:

Holocene sea bed sediments (unconsolidated sediments laid down since the sea transgressed across the area during the Holocene Epoch;

Pleistocene deposits of glacial origin (Devensian);

Solid (pre-Quaternary) rocks which are largely concealed by sea-bead sediments and drift deposits).

Holocene Sea Bed Sediments

An area of sediment-free sea bed occurs off the coast of central Lyme Bay. The sea bed sediments where they do occur consist of a discontinuous cover of coarse 'lag' (i.e. winnowed) deposits less than 0.5 m thick. These deposits are mostly gravels and sandy gravels formed of pebbles of flint, chalk, sandstone, limestone and ironstone, derived from the underlying bedrock. Pebbles and cobbles are heavily encrusted, indicating that they are not being moved about under the present current regime, and that they were probably eroded from the bedrock when sea levels were lower. In some areas longitudinal gravel furrows have formed parallel to the direction of tidal currents. The lag deposits are locally overlain by mobile bodies of sand, in the form of ribbons, sand waves and rippled sand patches. Muddier sediments are found in the inshore areas most sheltered from tidal currents.
Around the mouth of the River Exe sediments greater than 5m in thickness occur and nearshore, thicker sands can occur (and muddy sand in areas most sheltered from strong tidal currents) notably in Lyme Bay.

Pleistocene geology

No buried channels are shown near to the coast to the west of the Isle of Wight with the exception of an area between Exmouth and Dartmouth. Offshore, near the base of submerged cliffs, some rias (A broad, estuarine river mouth or a long, narrow coastal inlet whose depth and width gradually and uniformly diminish inland) can be shown to have once extended to below the 37 m isobath, but these valleys are now infilled and have little topographic expression. Pleistocene infill of sand, clay and gravel may extend to 56 m depth. Sub-aerial and fluvial erosion during the late Pleistocene led to over-deepening of the channel of the River Exe and its extension as far south as Tor Bay.

Solid (pre-Quaternary) geology

Resistant, metamorphosed Devonian sediments, locally intruded by mainly granitic igneous rocks, are present within the Tor Bay area. The rocks include schist, siltstone and limestone. Farther offshore these rocks are overlain by a thick sedimentary basin of Permo-Triassic, Cretaceous and Jurassic sediments - sandstones, siltstones and breccias - which have been subject to later uplift and local deformation. The Permo-Triassic rocks which consist of reddish brown mudstones, non-marine sandstones and breccias meet the coast on the northern shore of Lyme Bay where they underlie Cretaceous sandstones and chalk. Further east they are succeeded by Jurassic rocks, formed of a varied sequence of dark grey fossiliferous mudstones and shales interbedded with sandstone and limestone. Many of the numerous small faults, synclines and anticlines located onshore can be traced offshore.

Soils/sediments	• URS/SW Bathymetry assessment • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 5, 6, 7, 9 and 10, chapters 2.2, 2.4, 9.4, 9.5 and 9.6	Review of offshore sediments. Refer to Figure 2.6

Sediment transport tends to be described within the context of coastal cells. These divide the coastline into sections within which sediment erosion and accretion are interrelated and largely independent of other cells / sub cells. The sediment transport in this context relates to sand and gravel bedload, not suspended solids

Dawlish Warren to Dartmouth

Generally this sub cell shows weak northward drift, however the beaches are subject to strong seasonal changes in drift direction. There is erosion of sandstone cliffs north of Torquay, which provides beach sand. In sand-filled estuary mouths, as at Teignmouth, waves and tidal currents interact to produce very complex and largely unpredictable patterns of movement. In general terms there is accretion in Tor Bay, possible cliff erosion and dune erosion between Torquay and Exmouth.

Portland Bill to Dawlish Warren

Littoral drift is variable but generally eastward in this sub cell and sediment transport is low and intermittent. There is sand and shingle build up at Lyme Regis due to the trapping effect of the harbour wall, and consequent downdrift erosion to the east because of the interruption of sediment flow. Sand accretion occurs at Exmouth, the sand coming from Dawlish Warren and being transported by waves and tidal currents across the bar at the estuary mouth. Between Lyme Regis and Exmouth the cliffs are subject to rapid erosion and slippage. At Lyme Regis the coastline consists of soft, easily erodible cliffs of clay. Waves erode these cliffs and 'rip' currents transport fine sediments seaward in suspension. There is dune erosion at Dawlish Warren. Chesil Beach is receding slowly and is now prone to overtopping. It appears to have no contemporary supply of material, and wave action dominates the evolution of the beach.

Biodiversity (above and below water) and designations	• Joint National Conservation Committee (JNCC) (Marine SAC's and SPA's, Marine Protected Areas, OSPAR Marine Protected Areas, Marine Conservation Zones) • Natural England (Marine Protected areas, Marine Conservation Zones) • Multi Agency Geographic Information of the Countryside (MAGIC) (National nature reserves • DEFRA (Marine Conservation Zones) • UK Marine and Coastal Act 2009 • The Government strategy for Contributing to the Delivery of a UK Network of Marine Protected Areas (DEFRA) • Marine protected areas interactive map (JNCC) • UK Biodiversity Action Plan (Priority habitats and species with key selection criteria.) • Local Biodiversity Action Plans (East Riding of Yorkshire, Lincolnshire, Norfolk and Suffolk.)	• Protected wreck sites • RAMSAR sites • SAC's (Natura 2000 marine sites) • SPA's • SSSI Refer to Figure 2.8

Marine plan Area 6 covers a 50km wide stretch of the south west coastline and off shore waters from the high water mark seaward. The area runs from Weymouth south west to Dartmouth. The area contains 4 SAC's, 1 SPA, 1 RAMSAR site and 12 SSSI's. For the locations of these designations refer to Figure 2.8 in Appendix 2 and for a summary of the designation status refer to Appendix 4.3.

This section of Marine Area 6 can be divided into six key zones, on the basis of its ecological designations. These are:

- The Isle of Portland;
- Chesil beach and The Fleet;
- Several reef habitats grouped together and classed as the third key zone;
- The Otter Estuary;
- The Exe Estuaries; and,
- Beach habitat broken up by streams.

The Isle of Portland's marine habitats consist mainly of shingle and sea cliffs. The area is home to an abundance of bird species as well as nationally rare molluscs and sea lavender which is confined to the island. The Isle has several Annex I habitats which are the main elements in its SAC designation. It also has SSSI designation for its array of habitats and birds.

Moving west along the coastline the dominant habitats present consist of mud and sand flats and the shingle of Chesil beach. This stretch of beach runs for some length along the coastline. It then meets fleet lagoons which in combination with Chesil beach form the second key zone. The area supports several Annex I habitats and a large number of halophilous scrub habitats (Annex I habitat). The fleet is the largest lagoon habitat in England and holds a diverse array of species some of which are rare. This zone has been given SAC designation for its Annex I habitats, RAMSAR designation for the wetland habitat and SSSI status for the number of bird species present.

The reef and submerged sea cave habitats off the coast are extensive and occur in three parts; off the coast of Chesil beach, Torquay and Brixham which combine to create a key zone. The ecological aspects in these areas are submerged and accessible by divers. Both of the habitats present in these areas are Annex I habitats which have given these areas SAC designation.

West of Chesil beach the fleet is an area dominated by shingle and cliff habitats with SAC designation status, however the Annex I habitats of importance are not found below the high water mark. This area also has SSSI and NNR status as the Dorset coast and Axemouth to Lyme Regis undercliffs, identified for geological interest and a number of rare beetles. These areas do not however have any designated marine elements.

The habitat present from Sidmouth to Budleigh Salterton is of little ecological interest, although there is a single SSSI designation present for its geological interest.

Further to the west, the Otter estuary is the next key zone of ecological interest, this is an estuary habitat dominated by saltmarsh which supports large numbers of breeding and over-wintering birds. Because the salt marshes have ecological value for many bird species the area has been designated as a SSSI.

There is a short section of coastline with little ecological value which runs from the Otter estuary to Exmouth where the mouth of the Exe estuary is located. The Exe estuary habitat forms the next key zone. It is important for bird assemblages over the winter months when it becomes a habitat for over 10 000 wildfowl and 20 000 waders. These high numbers mean it supports over 1% of the European population of certain species as well as several rare species. It is for these reasons that the area has SPA, RAMSAR and SSSI designation. In addition a small peninsular at the mouth of the estuary has been given NNR status due to the presence of large numbers of wildfowl.

The coastal zone from Dawlish to Paignton has little ecological interest, the area has several SSSI sites designated for their geological cliff features. Just south of Paignton lies Saltern cove SSSI again this has been given SSSI status for its geological features however has some associated ecological interest as a result of the diversity of algae and other species present within its pools.

Moving south around the coast of Brixham there is little ecological interest, with only a single NNR located at Berry head, however this is above the high water mark.

Further south lies the final key zone; an area of coastline broken up by small stream habitats. This area has a high diversity of bird species and some rare plant species and for these reasons has been designated as Froward Point SSSI.

Air and climate	• Met Office • Marine weather areas • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 5, 6, 7, 9 and 10, chapters 2.2, 2.4, 9.4, 9.5 and 9.6	General understanding of prevailing weather conditions and significant weather systems or influences.

The shipping forecast zone covering the marine area is Portland. The area Portland takes its name from the Isle of Portland.

Prevailing winds are from the south west with the strongest winds occurring in winter. Spring is the nost common season for north eastrlies. Coastal waters, estuaries and harbours are subject to local variations in wind conditions compred with the open sea.

Windiest months are between December and January and the least windy months are between May and August.

Marine Environment	Reference Source (s)	Summary
Sea level rise	• UKCP09 – UK Climate projections	Review of UK Climate Projections (UKCP09) and their impact on sea level rise.

UK Climate Projections (UKCP09) give climate information for the UK up to the end of this century. UKCP09 regional mean sea level rise projections were produced based on results from the Intergovernmental Panel on Climate Change Fourth Assessment Report. The tables below combine absolute sea level change and vertical land movements to produce estimates of relative sea level change. UKCP09 reports data for Edinburgh, London, Cardiff and Belfast. Mean sea level rise for the western part of Area 6 can be expected to be in the same order as the figures for Cardiff and London.

Table showing the central estimates for each decade of relative sea level changes (cm) with respect to 1990 levels for three emissions scenarios. (Taken from http://www.ukcip.org.uk/publications/climate-science/ukcp09-sea-level-change/)

Year	London			Cardiff		
	High	Medium	Low	High	Medium	Low
2000	3.5	3.0	2.5	3.5	2.9	2.5
2010	7.3	6.2	5.3	7.3	6.2	5.3
2020	11.5	9.7	8.2	11.5	9.7	8.2
2030	16.0	13.5	11.4	15.9	13.4	11.4
2040	20.8	17.5	14.8	20.8	17.5	14.8
2050	25.8	21.8	18.4	25.9	21.8	18.4
2060	31.4	26.3	22.2	31.4	26.3	22.2
2070	37.2	31.2	26.3	37.1	31.1	26.3
2080	43.3	36.3	30.5	43.3	36.2	30.5
2090	49.7	41.6	35.0	49.7	41.6	35.0
2095	53.1	44.4	37.3	53.1	44.4	37.3

Erosion processes and coastal features	• Aerial imagery • Durlston Head to Rame Head Shoreline Management Plan	Analysis of coastal erosion processes and the creation of coastal features such as bays, headlands, cliffs, beaches.

At the eastern end of the study area, adjacent to Portland Bill, the coastline is dominated by the 28-km long Chesil Beach. The eastern part of Chesil Beach is a shingle barrier beach while the western part comprises a land-attached shingle beach, backed by cliffs.

To the west, the coastline between Thorncombe Beacon and Otterton Ledge is composed of cliffs which are actively eroding through repeated landslide activity. This is one of the largest and most active landslide complexes in Europe. The coastline has formed a series of mini-embayments separated by headlands as a result of the variations in geological resistance.

The coastline between Otterton Ledge and Hope's Nose consists of cliffs fronted by sections of shingle of sandy beaches. There are a number of estuaries (including the Exe estuary, Teign estuary and Otter estuary) within this frontage which have a significant influence on local coastal processes.

To the south is Tor Bay, a bay formed between the headlands of Hope's Nose and Berry Head formed of Devonian limestone. Within Tor Bay, the geology consists of weaker breccias and mudstones prone to erosion through landslides.

The remainder of the coastline of Area 6 is composed of cliffs fronted in some areas by isolated pocket beaches separated by rocky headlands.

Tides and Coastal processes	• Danish Hydraulic Institute C-MAP bathymetric data.	Analysis of coastal erosion processes and the creation of coastal features such as bays, headlands cliffs and beaches.

The eastern part of this area is dominated by Chesil Beach; its formation is still not fully understood. The most widely accepted theory is that rising sea levels (approx 10,000 years BP) combed up coarse sand and shingle from the seabed of Lyme Bay to form a barrier, thought to extend from the Isle of Portland to Budleigh Salterton. The barrier continued to roll back as sea levels rose through overwashing events during large swell and storm events.

Eventually, the barrier's landward migration became impeded by high topography. Chesil Beach currently consists of 98% flint and chert, a similar composition to the sediments found at Budleigh Salterton, to the west.

The headlands that have formed within Lyme Bay have segmented the once-continuous shingle beach into a series of eroding embayments and the headlands have interrupted the once continuous eastward transport of material.

Notable within this area is Dawlish Warren, a sand spit extending across the western side of the Exe estuary entrance. It is approximately 500m wide along the majority of its length and narrows towards its tip. Dawlish Warren is unique within the region as most other bars and spits are composed of shingle rather than sand. Currently, the spit is accreting at the re-curved tip of the spit while the seaward face of the spit is retreating.

Bathymetry (including surface water characteristics)	• Danish Hydraulic Institute C-MAP bathymetric data	Analysis of general bathymetric characteristics. Refer to Figure 2.7
Along this frontage, the bathymetric contours are generally approximately shore-parallel. At the eastern end of Lyme Bay, the sea bed deepens rapidly in front of Chesil Beach. At the western end of Lyme Bay, the sea bed remains shallower closer to the coast line. The offshore area of Lyme Bay is a gently sloping featureless seabed.		
Water column	• Charting Progress 2: The State of the UK Seas (Defra, 2010)	Analysis of general characteristics of the water column.
Charting Progress 2 (published by Defra in 2010 providing an assessment of the state of the UK's seas) analysed coastal sea temperature data from Weymouth (just outside the study area). The data shows a strong rising temperature trend from low temperatures in 2006. Minimum water temperature is typically reached in February with the peak in August.		
Hydrology and Drainage and Flood maps	• Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 5, 6, 7, 9 and 10, chapters 2.2, 2.4, 9.4, 9.5 and 9.6	General overview of coastal areas that are susceptible to flooding. Few data sources were made available.

Cultural/Social Factors	Reference Source (s)	Summary
Historic sites and features	• SeaZone datasets, • MagicMap, • Maritime and Coastguard Agency, • Receiver of Wreck), • naval records (naval-history.net) • SEA 3 (Department of Energy and Climate Change).	General appreciation of Historic period development as well analysis of designated and non-designated heritage assets. Refer to Figure 2.9

Designated assets

The baseline search of available datasets identified a total of 52 scheduled ancient monuments, 12 registered parks and gardens, 5 protected wreck sites (including 2 historic protected wrecks and 3 designated military wrecks) and a number of submerged military aircraft wrecks (uncertain number since the type of aircraft was not consistently recorded on tables). The assets were overwhelmingly land-based but they were included for the assessment since they were judged from contour data and asset description sheets, to have a visual influence that looked seaward or along the intertidal estuaries, as defined by the search polygon.

A summary of designated monument types by period is listed in Appendix 5.4.

A. Land based cultural heritage assets

The Dart Estuary is navigable to sea-going vessels as far up as Totnes. The lower reaches of the estuary include Dartmouth Harbour that provides a deep water natural harbour, and has a long history of maritime usage. The rocky entrance to the mouth of the estuary was defended from medieval times with the construction of Dartmouth Castle and Gomerock Tower opposite. The harbour itself being defended from the 15th and 16th centuries by Bayard's Cove Castle. During WWII the estuary was used for the preparations for the D-Day landings and it contains a number of shore-base and supply facilities constructed both before and during the invasion.

Upheavels in France at the end of the 18th century, threats from the American War of Independence, and the start of the Napoleonic Wars at the beginning of the 19th century, created fear in England that a foreign invasion could be mounted from France. This lead to the construction of defensive structures along the south coast. At Brixham, Berry Head Fort, Hardy's Head Battery and the Old Redoubt defensive forts were constructed at this time. These forts were also re-used during WWII and again during the Cold War for monitoring activities. A WWII coastal battery was constructed at Battery Gardens to defend the Brixham harbourage and defend the bay against invasion. A WWII pillbox was built into the medieval quarries at St Catherine's Chapel at Abbotsbury. There are also a number of defensive structures on the Isle of Portland that are part of the coastal defences. These were built from the 16th century, including Portland Castle, Rufus Castle, a late 19th century battery defending Portland Harbour, and a Cold War early warning radar station.

During the later 18th, 19th and early 20th centuries the natural beauty of the coastline and intertidal estuaries was recognised by the creation of a number of extensive historic parks and gardens. These were built to enhance and encompass views along the estuaries and coastline, and also out to sea. Seven registered parks and gardens are dispersed around the coast from Brixham to Abbotsbury. Four of the sites (Oldway Mansion, Princess Gardens and Royal Terrace, Watcombe Park and Brunel Manor, and Connaught Gardens) are located in historic towns that became fashionable seaside resorts. These parks and gardens were constructed from the mid-19th century until the early 20th century, in order to develop facilities for the visitors. Three other sites are

located away from the urban centres, either in smaller villages or in isolation along the coast at Coleton Fishacre, Rousdon, and Abbotsbury Gardens), but were constructed over the same period as their urban counterparts. All of the sites were designed to incorporate significant or extensive views along the coast to other historic towns and views out to sea.

Along the Dart Estuary Sharpham House has an extensive view over the Dart and also across the Dart Valley. Similarly Powderham Castle also has wide views, this time along the River Exe and across to the eastern shore that were incorporated into its setting. In the Axe Estuary, Bicton, has extensive views across the valley of the River Otter.

There are numerous dispersed prehistoric sites along the coastline and intertidal estuaries that includes cave sites occupied during Palaeolithic and later prehistoric periods (Ashhole Cavern, Kent's Cavern), defensive hillforts that are likely to be late Bronze Age and Iron Age (Greenway Camp, Berry Cliff Camp), prehistoric or later field systems, and prehistoric burial mounds. One of the hillforts incorporated a possible Roman signal station (Abbotsbury Castle). The burial mounds are the most numerous and they occur either in isolation or in clusters. These are situated in prominent positions and appear to have a significant relationship either to the sea or to one another. They occur most often around the coastal fringe of Babbacombe Bay where they occur in groups suggesting that they were part of cemeteries. Some of the barrows had been reused for a variety of purposes in the recent past. One barrow at Pucknowle had a small stone building built into its top that acted as a 19th century look-out and signal station.

The international importance of the coastline between Lyme Bay and the Isle of Portland (and beyond to the east) has been recognised by its inscription as a World Heritage Site. The inscription notes that it contains an 'outstanding combination of globally significant geological and geomorphological features. The property comprises eight sections along 155 km of largely undeveloped coast. The property's geology displays approximately 185 million years of the Earth's history, including a number of internationally important fossil localities. The property also contains a range of outstanding examples of coastal geomorphological features, landforms and processes, and is renowned for its contribution to earth science investigations for over 300 years, helping to foster major contributions to many aspects of geology, palaeontology and geomorphology. This coast is considered by geologists and geomorphologists to be one of the most significant teaching and research sites in the world…'

B. Maritime Assets

A total of 416 charted wreck sites were listed in the SeaZone datasets. Using the Feature attribute listed in the dataset the records were searched into categories based on an identifier as 'wrecks', 'aircraft' or 'unspecified'. Unspecified wrecks are features for which there was no identifier recorded.

SeaZone site types

SeaZone Feature	Total
Aircraft	6
Wrecks	198
Unspecified	212
Grand total	**416**

The general distribution of the wreck sites shows a dispersed relatively random pattern throughout the area. The majority, however, are recorded offshore, with fewer wrecks along the coast and within the estuaries. Offshore there are two clusters, one to the south and west of Portland Bill and the other toward the approaches to Tor Bay and the Dart Estuary, presumably associated with the historic coastal ports (Brixham, Paignton and Torquay). One other notable cluster occurs along the Dart Estuary reflecting its importance as a deep harbourage and historic inland waterway.

Protected Wrecks

There are two historic protected wreck sites of archaeological significance within the study area: 'Church Rocks' located just off the coast east of Teignmouth, and 'West Bay' located west of the Outer Pollock Reef in the approaches to West Bay harbour, Lyme Bay, approximately 1km offshore. 'Church Rocks' lies on the seabed at a depth of approximately 3-4m and comprises the remains of a lightly armed merchantman that probably dates to the 16th or early 17th century. At present the site is buried in up to 1.5m of sand and is status its monitored regularly. The remains of 'West Bay' lie in approximately 12m of water and comprise of a mound of heavily concreted iron bars and artefacts that are surrounded by generally fine sand. It is likely that the site comprises the remains of a 17th or 18th century merchant vessel.

Wrecks designated as military remains

The wreckage of all military aircraft is protected under The Protection of Military Remains Act 1986, in addition 3 ships of pre-WWII date have been designated. These include HMS M2, that lies approximately 4.7km off Chesil Beach, HMS Fisguard II 10.5km south off Portland Bill, and HMS L24 20km southwest of Portland Bill.

Full details of Designated cultural heritage assets for Area 6 are included in Appendix 5.4.

Palaeolandscape	• SeaZone datasets, • MagicMap, • Maritime and Coastguard Agency, • Receiver of Wreck), • naval records (naval-history.net) • SEA 3 (Department of Energy and Climate Change). • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 9 and 10	General appreciation of the prehistoric landscape.
Shipping and navigations	• Admiralty Charter Raster – General – 1:150,000 • Admiralty Charter Raster – Overview – 1:500,000 • Joint Nature Conservation Committee (JNCC) Coasts and seas of the United Kingdom, regions 9 and 10 • The South Western Peninsula Marine Natural Area (English Nature) • http://www.shipais.com/	General analysis of major passenger shipping routes. Refer to Figure 2.11

Shipping

Commercial

Many different types of vessel operate in this area, according to the nature of the cargo they are carrying. The predominant types of shipping vessels are cargo carriers. Since the mid-nineteenth century the volume of goods transported by sea has grown enormously. The growth of the petroleum industry and the advent of the oil tanker, which is the largest carrier of cargo, had a significant effect on shipping. The carriage of goods by sea inevitably places marine and coastal environments at some risk. Almost any vessel anywhere has the potential to cause a degree of environmental damage, either through routine operations or accidents. The extent of environmental damage following any accident depends on a range of factors, in particular the cargo of the vessel, where the accident occurs, the depth of water, the state of the tides and at what time of year.

Within this Natural Area the predominant types of shipping vessels are cargo carriers. Despite this, shipping is responsible for a relatively small proportion of all marine pollution in the UK, compared to that from land-based sources. Much of the marine pollution may be traced back to centres of population and to industrial and agricultural operations.

Ferries

A proportion of the marine traffic within this Natural Area is ferries that transport cars and passengers across the English Channel to ports in France, Spain, the Channel Islands and the Isles of Scilly. On average 84 ferries pass through this Natural Area per week. Passenger ferries pose little threat to the marine environment when compared with tankers or cargo vessels, as they tend not to carry hazardous chemicals. However, they are likely to be carrying several thousand tonnes of heavy fuel oil during each sailing, and any grounding incident will have an impact on the marine environment. In shallow water, propellers can also cause disturbance. Information taken from Lloyd's Register Casualty Database (Safetec 2000) shows that over the period 1989-1998, only 3% of grounding incidents for the whole of the UK involved ferries.

Current use of the coast and sea	• Datasets • Ferry Terminals • National Trails • Open Access (CROW) • Army Firing Ranges • Military Practice Areas (sea) • Offshore testing ranges • Submarine exercise areas • Dredging disposal areas • Pipelines • Round 3 Windfarm zones • ICES Fishing Areas • Fish Nursery Areas • Fish Spawning Areas • Sailing routes (RYA) • 1:250,000 scale geological mapping (provided in GIS form) • Joint Nature Conservation Committee	Current sea and coastal uses. Review of coastal defences, agriculture and fisheries, tourism and recreation, minerals and oil and gas extraction, landfill and offshore waste, energy including renewable energy, infrastructure and transport, marine and nature conservation, military activities, urban expansion. Refer to Figures 2.10 and 2.11

	(JNCC) Coasts and Seas of the United Kingdom, regions 5, 6, 7, 9 and 10, chapters 2.2, 2.4, 9.4, 9.5 and 9.6. • Crown Estates, 11th annual report (Maine Aggregate Dredging 2008)	

Fishing

The fishing industry plays a major part in the economy of the South West, with many small and large ports scattered along the coast. Populations of a number of commercial fish species occur within the Natural Area, together with their spawning grounds and nursery and feeding areas for the fish. There are four 'major' fishing ports (as defined by Defra) within this Natural Area, all on the south coast: Brixham, Plymouth, Falmouth and Newlyn. There are, though, numerous other smaller ports where fish are also landed.

Military

A significant proportion of the MPA is designated for military practice, which generally extend outside the area to the south.

Recreation and sailing

Water-based recreation is a very important activity within the Natural Area, particularly in inshore areas along the south coast. The coast of south Devon in particular is one of the most important areas for water-based activity in the UK (Fowler *et al* 1996). With the continued growth of sailing and power boating in southern England, the whole of the south west is experiencing demand for additional mooring and marina facilities. Activities include yachting, motor-boat cruising, power-boat racing, dinghy sailing, canoeing, surfing, windsurfing, diving, water skiing, the use of personal water craft, rowing and tourist boat trips. Whilst sailing has only a limited impact on the marine environment, power-boating, water-skiing and jet skiing cause concern in many coastal locations, as these activities often conflict with quieter traditional beach activities and nature conservation objectives. Other concerns include the impact of moorings and anchors on certain habitats (particularly maerl), and the pressure of large numbers of SCUBA divers at key conservation sites.

Marine Aggregate and Waste Disposal

Licensed commercial dredging

According to the Crown Estates, 11th annual report (Maine Aggregate Dredging 2008) there is no dredging for aggregates within the review area. A site with potential for sand and gravel extraction exists as a wedge-shaped area of between 16 nautical miles wide in Lyme Bay in the east and three miles wide in Gerrans Bay to the west.

Navigational Dredging

Navigational dredging takes place at the discretion of the individual harbour authorities in the Exe Estuary, Teignmouth Harbour and the Dart Estuary. Up to 5,000 m3 of sediment is removed from the Exe Estuary every three years.

Solid Waste Disposal

A number of sites have been identified which have been used for the disposal of sewage sludge and dredged material from maintenance dredging. The disposal of sewage sludge at sea was phased out during 1998. Two sites were located in Lyme Bay (MAFF code PO030 and PO050). Sprey Point and Bundle Head (PO070 and PO090) have previously been used for the disposal dredged material arising from channel maintenance.

Oil and Gas Developments

There are no oil and gas related activities in this area.

Surface water features	• Admiralty charts • National character area descriptions • GIS Datasets (oil and gas platforms, wind farm developments and navigation aides)	Review of above water features (permanent/semi-permanent) which might influence the character of the perceived seascape.
Coastal landmarks	• Admiralty charts • National character area descriptions • GIS datasets	Review of coastal landmarks which would influence seascape character or which prove important for navigation.

Policy	Reference Source (s)	Summary
Cultural Associations	• Ecology/Heritage designations as provided in datasets.	To be validated with stakeholder input and further exploration. General appreciation of designation significance and perceived associated qualities. Refer to Figures 2.8, 2.9 and 2.10

Perceptual/Experiential Factors*	Reference Source (s)	Summary
Light pollution	• Admiralty maps regarding lighthouses, beacons, gas platforms etc. • Shipping information and anchorages.	General review of sources of possible light pollution and
Tranquillity	• Campaign to Protect Rural England mapping	General overview of mapping to gain an understanding of developed/natural coastal interfaces.
Coastal landmarks	• Admiralty charts • National character area descriptions • GIS datasets	Review of coastal landmarks which would influence seascape character or which prove important for navigation.
General Perceptual References	• 'Coast' TV Series	Taken as a popular interpretation of some of the 'essence of place' aspects of areas of the coastline.

Reference from the 'Coast' TV series:

- The Jurassic Coast is acknowledged as an attraction to visitors based on its geology and fossils and its designation as a World Heritage Site;
- The Black Death was brought to the UK through Weymouth;
- Portland stone as a notable contributor to British architectural style has been quarried from the Isle of Portland;
- The lagoon behind Chesil Beach was used for testing the Dam Busters bouncing bomb;
- The red cliffs are a distinctive geographical landmark;
- Sir Walter Raleigh embarked from Exmouth on 'New World' exploration prompting the 'outward looking nation'.

*** Perceptual and experiential factors – refer to field record sheets in Annex 3 for further detail.**

Appendix 5 – Database supporting tables

Appendix 5.1 – Sensitivity of ecological context to future developments and/or changes

Area 3

Increases in activity in the vicinity of the Margate and Longsands offshore marine site would conflict with the key spawning grounds for multiple species of fish present throughout the area. An important aspect of the sandbanks here is that they slowly shift with the tidal movement. Increased use of the area has the potential to interfere with this natural process.

The Landguard common area of sand and vegetated shingle north of Margate sands is important because there is very little area of vegetated shingle left in the UK. The area is sensitive because the vegetation may be trampled or eroded by increased use.

The Deben Estuary supports salt marsh habitats and areas where pied avocets breed and the area is designated accordingly. It is these breeding grounds and the birds within them that are considered to be the most sensitive feature of this zone.

Locations within the Outer Thames Estuary where key wildfowl species use the zone are likely to be the most sensitive areas.

Orfordness shingle street SAC, is an important habitat and supports rare species such as the starlet sea anemone *Nematostella vectensis* which would be sensitive to disturbance. Within the same zone lies the Alde-Ore estuary which supports a bird population sensitive to disturbance.

The most sensitive part of Leiston-Aldeburgh SSSI is the areas containing nationally rare species such as Dune fescue (*Vulpia fasciculate*), bur medick (*Medicago minima*), suffocated clover (*Trifolium suffocatum*) and sea pea (*Lathyrus japonicas*).

North of Leiston-Aldeburgh is vegetated shingle which is sensitive to disturbance which may affect nationally rare species such as the sand catchfly (*Silene conica*). The area also supports wintering bittern, a shy bird species which is at high risk of disturbance by increased activities.

Both Great Yarmouth North Denes and Winterton-Horsey Dunes are both sensitive areas due to the fragile shifting nature of the sand dune habitat.

The offshore marine areas of Haisborough, Hammond and Winterton are sensitive reef habitats which are very sensitive to slight changes from siltation and disturbance in the surrounding area. This sensitivity is particularly relevant in respect of diving.

North of this lies another large sensitive area of reef and sandbank called the North Norfolk Sandbanks and Saturn Reef with similar properties to the Haisborough area. This area should be treated in much the same way and with the same level of sensitivity.

The North Norfolk Coast and The Wash includes many sensitive bird species present in large numbers. Very large numbers of migrant birds frequent the area as well as the common seal which is a BAP species.

Joining the Wash is the Inner Dowsing, Race Bank and North Ridge offshore SAC. This falls into the same habitat zone as the Hainsborough site because it consists of sand banks always covered by sea water.The area also includes reef habitats.

Gibraltar Point includes sensitive areas with species at risk from erosion and disturbance through increased activity. The area forms a peninsular meaning species present here are isolated to some degree.

The Saltfleetby-Theddlethorpe dunes site and the Humber estuary form a zone of varying sensitivity. There are areas of lesser sensitivity where rare species and habitats do not occur.

Further north lie the Lagoons, this area has high importance for its saline lagoons and rare species such as tassel weed. The large numbers of breeding tern on the site would be at risk from disturbance.

The reef habitats which have formed at Flamborough are sensitive in nature because they have formed in areas where the water is very clear. Increased siltation may affect this habitat. The kelp forests would be especially sensitive to changes in the siltation dynamics of the area.

Area 4

The parts of the Outer Thames Estuary within Area 4 are of limited sensitivity in landscape use terms due to their large size and location.

The reef and sandbanks zone habitats are sensitive to changes in siltation and disturbance in the surrounding waters.

Area 6

The Isle of Portland is easily accessible from the mainland. There are several habitat types on the island with the most sensitive being the SAC Annex habitats. It also supports certain species confined to the island and not found elsewhere in Britain, which are sensitive to damage by trampling. Groups of migratory birds are also found around the Portland coast and there is potential to disturb key roosting and resting areas such as sea cliffs, shingle and scrub.

Chesil beach has important areas which include the salt marshes and Fleet lagoon. Increased use of the area would risk disturbance to the bird assemblages found within these areas especially as some species are either amber or red list conservation species (such as the Little tern *Sterna albifrons*) affording them high level protection. This zone also contains various important and rare species that would be vulnerable to changes in use. There are however areas of Chesil beach which are relatively robust.

The Lyme bay and Torbay reef habitat is a large habitat that is limited to certain areas around the UK and is sensitive to disturbance, e.g. divers.

The Otter estuary salt marshes are a sensitive area where increased activity may result in conflicts with ecological issues such as bird breeding grounds.

The Exe estuary falls under the same category. However, here large numbers of wildfowl come to over winter and thus the area has a higher level of sensitivity over the winter months. The Exe estuary for this reason is considered more sensitive than the Otter estuary with the river Exe being of particular importance.

Saltern cove has limited sensitivity. It has no designation for its ecological interest, but does contain numerous algae species as well as other diverse species located within its pools and crevices.

Froward point SSSI supports a wide variety of species such as autumn squill *Scilla autumnalis* and hairy birds-foot trefoil *Lotus subbiflorus.* These are rare species and would be at risk of trampling or degredation by erosion if use of the area was to increase. For these reasons the area is sensitive to landscape change.

Appendix 5.2 – Ecological legislation

MMO Area 3

Site	Legislation
Margate and Long Sands	The site contains Annex I habitats meaning proposals here would need to consult and abide by the Conservation of Habitats Regulations 2010.
Landguard Common	The Wildlife and Countryside Act, 1981 (as amended) would need to be consulted regarding the site's SSSI status.
The Deben Estuary	The Wild Birds Directive and the Wildlife and Countryside Act, 1981 (as amended) would need to be consulted regarding the Amber and Red list bird species present onsite. The Suffolk BAP would need to be followed with regards to the key area of salt marsh present.
Outer Thames Estuary	The Wild Birds Directive would need to be followed regarding the site's SPA status. Wildlife and Countryside Act, 1981 (as amended) would also need to be consulted regarding the bird species present on site.
Haisborough, Hammond and Winterton, North Norfolk Sandbanks and Saturn Reef, Inner Dowsing, Race bank and North Ridge.	The site contains Annex I habitats meaning proposals here would need to consult and abide by the Conservation of Habitats Regulations 2010. In addition several habitats present onsite fall into the Norfolk LBAP and would require conservation actions if alterations were to be made.
Orfordness shingle street	The site contains Annex I habitats meaning proposals here would need to consult and abide by the Conservation of Habitats Regulations 2010. The Suffolk BAP must also be followed regarding nationally scarce species.
Alde-Ore estuary	The Wild Birds Directive would need to be consulted and abided by regarding the site's SPA status. The site also contains bird species of moderate to high conservation importance under the Wildlife and Countryside Act, 1981 (as amended).
Leiston-Aldeburgh	The Wildlife and Countryside Act 1981 (as amended) would need to be consulted and abided by regarding the site's SSSI status.
Minsmere to Walberswick Heaths and Marshes	The site contains Annex I habitats meaning proposals here would need to consult and abide by the Conservation of Habitats Regulations 2010. Actions outlined in the Suffolk BAP would also need to be followed regarding several habitats on site.
Pakefields to Easton Bavents	The Wildlife and Countryside Act 1981 (as amended) would need to be consulted and abided by regarding the site's SSSI status. The Wild Birds Directive also needs to be followed.
Great Yarmouth North Denes	The Wildlife and Countryside Act 1981 (as amended) would need to be consulted and abided by regarding the sites SSSI status the Wild Birds Directive also needs to be followed and the Norfolk BAP would need to be consulted as the Dunes are a BAP habitat.
Winterton Horsey Dunes	The Wildlife and Countryside Act 1981 (as amended) would need to be consulted and abided by regarding the sites SSSI status the Wild Birds Directive also needs to be followed and the Norfolk BAP would need to be consulted as the Dunes are a BAP habitat. The BAP would also need to be consulted regarding the Natterjack toad.

The North Norfolk Coast and The Wash	The site contains Annex I habitats meaning proposals here would need to consult and abide by the Conservation of Habitats Regulations 2010. The Norfolk BAP also needs to be consulted because a number of the habitats present in the area have action plans.
Gibralta Point	The Wild Birds Directive would need to be consulted and abided by regarding the site's SPA status. The site also contains bird species of moderate to high conservation importance under the Wildlife and Countryside Act, 1981 (as amended).
Saltflatby-Theddlethorpe Dunes	The Wildlife and Countryside Act 1981 (as amended) would need to be followed and abided by as well as the Wild Birds Directive on the protected and rare bird species present on the site. The Lincolnshire BAP also needs to be consulted with regards to the Natterjack toad.
The Humber Estuary	The site contains Annex I habitats meaning proposals here would need to consult and abide by the Conservation of Habitats Regulations 2010
The Lagoons	The Wildlife and Countryside Act 1981 (as amended) would need to be followed and abided by as well as the Wild Birds Directive on the protected and rare bird species present on the site. The LBAP would also need to be consulted regarding the habitats present onsite.
Flamborough	The site contains Annex I habitats meaning proposals here would need to consult and abide by the Conservation of Habitats Regulations 2010.

MMO Area 4

Site	**Legislation**
The Outer Thames Estuary	The Wild Birds Directive would need to be followed regarding the site's SPA status. The Wildlife and Countryside Act 1981 (as amended) would also need to be consulted and abided by regarding the birds of moderate to high conservation importance onsite.
Haisborough, Hammond and Winterton	The site contains Annex I habitats meaning proposals here would need to consult and abide by the Conservation of Habitats Regulations 2010.
North Norfolk Sand banks	The site contains Annex I habitats meaning proposals here would need to consult and abide by the Conservation of Habitats Regulations 2010.
Inner Dowsing, Race bank and Ridge	The site contains Annex I habitats meaning proposals here would need to consult and abide by the Conservation of Habitats Regulations 2010.

MMO Area 6

Site	Legislation
Portland island	The site contains Annex I habitats meaning proposals here would need to consult and abide by the Conservation of Habitats Regulations 2010. The Wild Birds Directive and the Wildlife and Countryside Act, 1981 (as amended) would also need to be consulted regarding the birds present on the island.
Chesil beach and the Fleet	The site contains Annex I habitats meaning proposals here would need to consult and abide by the Conservation of Habitats Regulations 2010. The Wild Birds Directive and the Wildlife and Countryside Act, 1981 (as amended) would also need to be consulted regarding the birds present on the beach. The Dorset LBAP also needs to be consulted regarding certain habitats and species present on the site.
Lyme bay and Torbay	The site contains Annex I habitats meaning proposals here would need to consult and abide by the Conservation of Habitats Regulations 2010.
Otter Estuary	The site is a SSSI which falls under the Wildlife and Countryside Act 1981 (as amended). Both the Wild birds directive and the Wildlife and Countryside Act 1981 as amended) would need to be consulted and abided by regarding the bird species present on site.
Exe Estuary	The Wild Birds Directive and the Wildlife and Countryside Act, 1981 (as amended) would also need to be consulted with regards to the large numbers of birds present in the area. The site is also protected by RAMSAR designation and has an action plan under the Devon LBAP.
Saltern cove	N/A
Forward point	The Wildlife and Countryside Act 1981 (as amended) needs to be followed because this site is a SSSI and also potentially holds Red and Amber list bird species. The Wild Birds Directive would also need to be consulted in respect of this.

Appendix 5.3 – MMO Area 3 Designated Cultural Heritage assets

Table 1 Area 3 – Designated Cultural Heritage assets (excludes military aircraft sites)

(key: SAM – scheduled ancient monument; RPG – registered park and garden; PWS – protected wreck site)

Designation	EH ref	Description	Date	Location
		A.0 SUFFOLK COASTAL		
SAM	21407	Landguard Fort and associated field works. Situated on a shingle spit & in conjunction with other fortifications on the opposite side of the estuary was designed to protect the harbour and dockyard	c18 & c19, WWI, WWII	Felixstowe, Suffolk Coastal
SAM	SF105	Martello Tower. Overlooks the shoreline on the southern side of Felixstowe	c19	Felixstowe, Suffolk Coastal
RPG	2227	Cliff gardens & town hall gardens. The seafront gardens at Felixstowe lie along the coast, within the town setting of Felixstowe. The site, which is laid out on the face of, and at the base of a cliff, covers c. 3ha. It is divided into three areas	Early c20	Felixstowe, Suffolk Coastal
SAM	SF104	Martello Tower on golf course adjoining Woodbridge Haven. Overlooks the shoreline to the south and the open sea and entrance to the Deben Estuary to the east	c19	Felixstowe, Suffolk Coastal
SAM	SF103	Martello Tower at Felixstowe Ferry. Overlooks the entrance to the Deben Estuary and the open sea to the east	c19	Felixstowe, Suffolk Coastal
RPG	4313	A series of gardens at Bawdsey Manor, incorporating an extensive artificial cliff. It occupies an exposed coastal location beside the North Sea	Late c19 /early c20	Bawdsey, Suffolk Coastal
SAM	SF108	Martello Tower at Rose Cottage, Bawdsey. Situated in a coastal location with open views along the shoreline and out to sea	c19	Bawdsey, Woodbridge, Suffolk Coastal
SAM	SF107	Martello Tower by Bawdsey Beach Situated in a coastal location with open views along the shoreline and out to sea	c19	Bawdsey, Suffolk Coastal
SAM	SF106	Martello Tower SE of Buckanay Farm. Situated in a coastal location with open views along the shoreline and out to sea	c19	Suffolk Coastal
SAM	SF98	Martello Tower at Shingle Street. Situated in a coastal location with open views along the shoreline and out to sea	c19	Suffolk Coastal
SAM	SF160	Rectilinear Enclosures 1km SW of Boyton Hall Farm. Situated in a coastal location with views to the east over the River Ore and out to sea	Unknown	Boyton, Suffolk Coastal
SAM	SF44	Slaughden Martello Tower. Situated in a coastal location with open views along Aldeburgh Bay and out to sea	c19	Aldeburgh, Suffolk Coastal
SAM	21404	Leiston Abbey (first site) with later chapel and pill box. Located on a low island in the coastal marshes on the south side of Minsmere, 250m inland from the present shoreline	Medieval, WWII	Leiston, Suffolk Coastal
SAM	SF40	Grey Friars. Franciscan Friary. Located on the eroding Dunwich Cliffs overlooking the sea	Medieval	Dunwich, Suffolk Coastal
SAM	SF142	Hospital of the Holy Trinity (site of). Located on the eroding Dunwich Cliffs overlooking the sea	Medieval	Dunwich, Suffolk Coastal

Designation	EH ref	Description	Date	Location
PWS		'Dunwich Bank' wreck	c16	Minsmere Haven
		A.1 Deben Estuary		
SAM	SF28	Prehistoric settlement and group of barrows (including site of ship burial) at Sutton Hoo. Located on a low plateau above the Deben Estuary, views partially obscured by c19 evergreen plantation known as 'Top Hat Wood'	Prehistoric, Early medieval	Woodbridge, Suffolk Coastal
		B.0 NORTH NORFOLK		
RPG	5119	Belle Vue Park, Lowestoft. Located at the top of the cliff which leads down to the Denes and the beach. There are fine views along the coast and out to sea from a viewing platform in the north-east corner of the park	c19	Lowestoft
PWS		HMS Exmoor	WWII	Off Lowestoft
RPG	5116	The Venetian Waterways, public seafront water gardens. Seafront water gardens that are along the shoreline	Early c20	Great Yarmouth
PWS		HMS Vortigern	WWII	Off Cromer
SAM	12703	Site of Manorial Complex, Hall Farm, Waxham. Situated in a coastal location with open views across the north Norfolk coastaline	Medieval	Wexham, North Norfolk
RPG	4289	Happisburgh Manor. An Arts and Crafts garden designed by Detmar Jellings Blow in 1900. Coastal location with views to the east over the sea	Early c20	Happisburgh, North Norfolk
SAM	NF169	Broomholme Priory. Enclosed to the north by modern development but with possible views to the southeast out to the sea	Medieval	Bacton, North Norfolk
SAM	NF168	The Great Barn, Paston. Located c.1km inland but with possible open views to the north across the open sea	Medieval	Paston, North Norfolk
RPG	2015	The Pleasaunce, architectural gardens. A clifftop coastal setting with the north front of the house being in view of the sea. The land is generally flat with a slight fall northwards towards the sea. The low boundary wall to the north allows views both into and out of the site (giving glimpses of the sea through shelter-belt trees from the north terrace	Early c20	Overstrand, North Norfolk
SAM	NF110	Beeston Priory. Located c.400m south of the cliffs with possible views out to the north over the sea	Medieval	Sheringham, North Norfolk
RPG	2022	Sheringham Hall landscape park. The site enjoys an open coastal setting with views of the sea to the north	Early c19	Sheringham
SAM	21390	Weybourne Priory. Located 500m south of the coast with possible views of the sea to the north	Medieval	Weybourne, North Norfolk
SAM	21372	Bowl barrow on the north side of Muckleburgh Hill, Weybourne. Located c.650m south of the coast but with possible open views of the sea to the north	Prehistoric	Weybourne, North Norfolk
SAM	21368	Disc barrow SE of Bard Hill. Part of a dispersed round barrow cemetery on and around	Prehistoric	Salthouse, North

Designation	EH ref	Description	Date	Location
		Salthouse Heath. Within a dispersed barrow cemetery that is the largest barrow cemetery in Norfolk. Located c.1.5km south of the coast but with likely open views of the sea to the north		Norfolk
SAM	NF305	Blakeney Chapel (site of), Blakeney. Located next to the shoreline with open views of the sea	Medieval	Blakeney, North Norfolk
SAM	21387	Medieval undercroft known as the Guildhall, Blakeney. Set into the slopes of Mariners Hill and facing the quay with possible views of the sea to the north	Medieval	Blakeney, North Norfolk
SAM	21377	Two bowl barrows on Blakeney Downs, Blakeney Situated on the top of Blakeney Downs overlooking Morston Salt Marshes to the north and with possible views of the sea beyond	Bronze Age	Blakeney, North Norfolk
SAM	NF217	Tumulus on Warborough Hill. Situated in a prominent position with views out over Warham Salt Marshes and the sea beyond	Prehistoric	Wells-Next-The-Sea, North Norfolk
RPG	1430	Holkham Hall, one of the principal landscape parks in England. Large park, the north side faces Holkham Bay with views across to the sea to the north	C18, c19	Wells-Next-The-Sea, North Norfolk
SAM	30531	Iron Age fort 900m north east of Dale Hole Cottage. The site occupies the southern end of a sand and gravel spit which extends southward from Holkham Meals coastal dunes and is surrounded on three sides by salt marshes with likely views out over the sea to the north	Iron Age	Holkham, North Norfolk
SAM	NF208	Roman Fort (Brandodunum). Coastal location overlooking salt marshes to the north and with possible views of the sea beyond	Roman	Brancaster, North Norfolk
SAM	31131	Village cross, 150m south of St Mary's Church. Situated at a cross roads with possible views of the sea to the north along Church Lane	Medieval	Titchwell, North Norfolk
SAM	NF246	Roman Signal Station, Thornham. Situated on a north facing slope with open views of the sea to the north	Roman	Thornham, North Norfolk
		B.1 Blyth Estuary		
SAM	SF215	Blythburgh Priory. Situated close to the head of the estuary with views to the river to the north and possibly to the east	Medieval	Blythburgh, Suffolk Coastal
RPG	1544	Henham. Remains of c19 pleasure ground set in a large C18 landscape park developed from earlier parkland	C19	Blythburgh, Suffolk Coastal
		B.2 Waveney & Yare Estuaries		
SAM	30580	Moated site of Barsham Hall and remains of associated buildings. Situated on low ground on the south side of the Waveney valley but with views to the north across to the river	Medieval, post medieval	Barsham, Suffolk

Designation	EH ref	Description	Date	Location
SAM	NF398	St Olave's Priory. Village location but with possible restricted views to the west across the river	Medieval	St Olave's, Norfolk
SAM	21388	Burgh Castle Roman fort, vicus, pre-Conquest monastery and Norman motte and bailey castle. Located at the north western edge of the Lothingland peninsula, on a low cliff above the east bank of the estuary of the River Waveney	Roman, medieval	Burgh Castle, Norfolk
SAM	NF250	Berney Arms Windmill. Located on the banks of the river with views along the River Yare	c19	Burgh Castle, Norfolk
SAM	31142	Hardley Cross. Located immediately south west of the confluence of the rivers Yare and Chet	c16	Hardley, Norfolk
SAM	NF150	Langley Abbey. Located 500m south of the River Yare but with possible views of the river to the north	Medieval	Langley Green, Norfolk
RPG	4536	Crown Point gardens. Situated on the SE edge of the city and overlooks the valley of the Yare to the north	Mid c19, c20	Norwich
SAM	NF10	City walls and tower. Linear feature that crosses the river on the south and again on the north side of the city with extensive views along the river in either direction	Medieval	Norwich
SAM	NF27	Watergate, The Close. Located at the junction of the river and a former canal with restricted views along the river	Medieval	Norwich
SAM	NF8	Bishop Bridge. Bridge over the River Wensum with views along the river	Medieval	Norwich
SAM	21412	Blockhouse known as the Cow Tower. Situated on the south bank of the river with views along the river	Medieval	Norwich
SAM	NF4	Dominican Friary. Located on the southern banks of the river Wensum with restricted views NE along the river	Medieval	Norwich
		B.3 The Broads		
SAM	NF100	Town walls, Great Yarmouth. Extensive linear feature that extends down toward the River Yare with possible views along the river	Medieval	Great Yarmouth
SAM	NF308	Site of St Mary's Priory, Wey Bridge. Located on the south bank of the River Bure with possible restricted views along the river, obscured by flood defences	Medieval	Acle, Norfolk
SAM	NF154	Potter Heigham Bridge. Across the River Thurne with views along the river	Medieval	Potter Heigham, Norfolk
SAM	NF6	St Benet's Abbey. Located on the north bank of the river with views along the river	Medieval	Thurne, Norfolk
SAM	NF142	St James's Hospital.	Medieval	Thurne, Norfolk

Designation	EH ref	Description	Date	Location
		Located close to the north bank of the river and with possible views south and east across the river		
		C.0 The Fens		
		C.1 The Great Ouse Estuary		
SAM	20806	Long barrow at South Fen, 180m south east of Between Ditches Drove. Located on a gravel terrace to the east of the old course of the River Ouse, extensive views north and south across the course of the river	Neolithic	Sutton, Cambridgeshire
SAM	33373	Long barrow at South Fen, 90m south west of the west end of Rymanmoor Long Turning. Situated on a gravel island along the former course of the River Great Ouse, where it met the Fen edge. Extensive views north and south across the course of the river	Neolithic	Sutton, Cambridgeshire
SAM	33365	Oval barrow and round barrow at Small Fen, 250m north of the junction of Back and Small Fen Drove. Situated on a gravel island along the former course of the River Great Ouse, where it met the Fen edge. Extensive views north and south across the course of the river	Prehistoric	Haddenham, Cambridgeshire
SAM	33364	Long barrow at Foulmire Fen, 140m north west of the junction of Back and Small Fen Drove. Situated on a gravel island along the former course of the River Great Ouse, where it met the Fen edge. Extensive views north and south across the course of the river	Neolithic	Haddenham, Cambridgeshire
SAM	33367	Round barrow at Small Fen, 220m east of the junction of Back and Small Fen Drove. Situated on a gravel island along the former course of the River Great Ouse, where it met the Fen edge. Extensive views north and south across the course of the river	Prehistoric	Haddenham, Cambridgeshire
SAM	33363	Three bowl barrows 450m and 570m east of New England, part of the Haddenham round barrow cemetery. Situated on a gravel island along the former course of the River Great Ouse, where it met the Fen edge. Extensive views north and south across the course of the river	Prehistoric	Haddenham, Cambridgeshire
SAM	33366	Two bowl barrows 370m and 505m south of New England, part of the Haddenham round barrow cemetery. Situated on a gravel island along the former course of the River Great Ouse, where it met the Fen edge. Extensive views north and south across the course of the river	Prehistoric	Haddenham, Cambridgeshire
SAM	33376	Bowl barrow 450m east of Shelford Farm. Situated on a gravel island along the former course of the River Great Ouse, where it met the Fen edge. Extensive views north and south across the course of the river	Prehistoric	Haddenham, Cambridgeshire
SAM	27105	The Bulwark: a Civil War fieldwork and World War II gun emplacement, 150m north of Earith Bridge. Situated between the Old and New Bedford Rivers with extensive views along the rivers	c17, WWII	Earith, Cambridgeshire
SAM	33362	Three bowl barrows 380m south of Brownshill Staunch House, part of the Over round barrow cemetery. Situated on the east bank of the Ouse with views along the river	Prehistoric	Over, Cambridgeshire

Designation	EH ref	Description	Date	Location
SAM	33360	Five bowl barrows 790m north west of Chain House, part of the Over round barrow cemetery. Situated on the east bank of the Ouse with views along the river	Prehistoric	Over, Cambridgeshire
		C.2 The Nene Estuary		
SAM	33379	Bowl barrow immediately north east of Bank Farm. Situated on the edge of a gravel island along the prehistoric Fen edge with possible views south and east across the River Nene (possibly obstructed by flood defence banks)	Prehistoric	Thorney, Peterborough
SAM	33390	Bowl barrow 430m NE of Prior's Fen Farm. Situated on the edge of a gravel island along the prehistoric Fen edge with possible views south and east across the River Nene (possibly obstructed by flood defence banks)	Prehistoric	Thorney, Peterborough
SAM	33391	Bowl barrow 225m NE of Prior's Fen Farm. Situated on the edge of a gravel island along the prehistoric Fen edge with possible views south and east across the River Nene (possibly obstructed by flood defence banks)	Prehistoric	Thorney, Peterborough
		C.3 The Welland Estuary		
SAM	33131	Wykeham Chapel: a moated monastic grange and retreat house. Situated 500m from the east bank of the river and with broad views across the river to the north and SE	Medieval	Weston, Lincolnshire
		C.4 The Haven Estuary		
		D.0 LINCOLNSHIRE COASTLINE		
		E.0 HUMBER ESTUARY		
SAM	34708	Heavy Anti-aircraft gunsite 220m east of West Marsh Cottage. Located c.500m south of the coastline with possible views over the estuary to the north	WWII	Barrow upon Humber, North Lincolnshire
SAM	23802	'The Castles' motte and bailey that controlled the southern landing place of the Humber ferry. The site overlooks the Humber Estuary	Medieval	Barrow Haven, North Lincolnshire
SAM	NL11	Ferriby Sluice that separates the Ancholme Navigation from the Humber. Located close to the estuary shoreline	c19	South Ferriby, North Lincolnshire
SAM	NL8	Old Winteringham Roman Settlement. Located close to the southern shoreline and with open views of the estuary to the north	Roman	Winteringham, North Lincolnshire
SAM	26504	Hall Garth moated site, associated drainage channels and fishpond. Located close to the southern banks of the Humber Estuary and with possible views along the estuary (although may have been reduced as a result of floodbank defences)	Medieval	Ousefleet, East Riding of Yorkshire
SAM	21239	Camera and moated site at Faxfleet Hall. Situated close to the north banks of the Humber with views to the SE over the estuary	Medieval	Blacktoft, East Riding of Yorkshire

Designation	EH ref	Description	Date	Location
SAM	ER178	Weighton Lock, Blacktoft. Separates Market Weighton canal from the Humber. Located close to the estuary shoreline	c18	Blacktoft, East Riding of Yorkshire
SAM	ER98	Brough Petuaria Roman settlement. Situated amongst modern housing development but with possible views over the Humber from the southern side	Roman	Brough-on-Humber, East Riding of Yorkshire
SAM	35485	Tower mill and whiting works 100m south east of the Country Park Inn. Located on the north bank of the Humber with open views along the estuary	c19	Hessle, East Riding of Yorkshire
SAM	34710	Hull Castle, South Blockhouse and part of late 17th century Hull Citadel Fort at Garrison Side. It also includes the buried remains of earlier c16 defences. Situated at the confluence of the River Hull and the Humber. Although mostly enclosed by development along the southern side there are likely to be occasional views of the estuary to the southwest	c17	Kingston Upon Hull
SAM	34713	Paull Point Battery, coastal artillery battery and Submarine Mining Establishment. Coastal location along the north shore of the Humber with extensive views along the estuary to the south and west	c19, c16	Paull, East Riding of Yorkshire
SAM	21175	Paull Holme moated site and tower. Situated very close to the shoreline of the Humber and with extensive views south and southeast along the estuary	Medieval	Paull, East Riding of Yorkshire
SAM	34704	World War II decoys for Hull docks, 1580m south east, 600m west and 90m south west of Little Humber. Located along and adjacent to the estuary and extending below Mean High Water with extensive views along the estuary	WWII	Paull, East Riding of Yorkshire
SAM	32706	Stone Creek Heavy Anti-aircraft gunsite, at Sunk Island Clough. Located close to the northern banks of the estuary with extensive views south and east along the Humber and out to sea	WWII	Sunk Island, East Riding of Yorkshire
SAM	26609	Moated monastic grange 300m south west of Winsetts Farm. Located close to the northern banks of the estuary with extensive views south and east along the Humber and out to sea	Medieval	Skeffling, East Riding of Yorkshire
		E.1 The Trent Estuary		
SAM	32622	Countess Close moated site. Located at the top of the scarp above the River Trent floodplain with views west across to the river	Medieval	Alkborough, North Lincolnshire
SAM	21053	Flixborough Saxon nunnery and site of All Saints medieval church and burial ground. Situated on a low south-facing terrace overlooking the plain of the River Trent.	Early medieval, medieval	Flixborough, North Linclonshire
SAM	NL212	Keadby Lock. Situated at the entrance of the canal and River Trent with views along the river	c18	Keadby, North and NE Lincolnshire
SAM	NT59	Dog Island Moat near Gainsborough.	Medieval	Gainsborough

Designation	EH ref	Description	Date	Location
		Located on the west bank of the river with views along the river (possibly restricted by floodbank defences)		
SAM	29915	Medieval settlement and open field system immediately south east of Low Farm. Adjacent to the former west bank of the River Trent with views east across the river	Medieval	West Burton, Nottingham
SAM	NT145	Segelocum Roman Town. Located on the west bank of the river with views across the river (possibly interrupted by the floodbank defences)	Roman	Littleborough, Nottingham
SAM	LI328	Roman fort. Located 450m north of the east bank with views across to the river (possibly interrupted by the floodbank defences)	Roman	Marton, Lincolnshire
SAM	LI15	Torksey Castle. Located on the east bank of the river overlooking the river	Medieval	Torksey, Lincolnshire
SAM	LI137	Site of medieval town. Located on the east bank of the river overlooking the river	Medieval	Torksey, Lincolnshire
SAM	LI174	Roman fort and camp. Located on the east bank of the river overlooking the river	Roman	Newton on Trent, Lincolnshire
		E.2 The River Don Estuary / Aire & Calder Navigation		
SAM	13220	Thorpe in Balne moated site, chapel and fishpond. Located over 250m west of the river bank but with possible views across to the river	Medieval	Thorpe in Balne, South Yorkshire
		E.3 River Aire		
		E.4 River Ouse, River Wharfe		
SAM	30117	Scurff Hall moated site. Located over 550m to the south of the river but with views north across the river	Medieval	Drax, North Yorkshire
SAM	32628	Drax Augustinian Priory. Sited on an island of higher ground just south of the River Ouse with views north over the river	Medieval	Drax, North Yorkshire
SAM	30130	Medieval settlement and early post-medieval garden earthworks around Barlow Hall. Located over 400m from the river but with views north along the river	Medieval, post medieval	Barlow, North Yorkshire
SAM	NY387	The Abbot's Staithes. Located in the historic town centre with possible limited views north to the river	Medieval	Selby
SAM	20539	Cawood Castle and Castle Garth: residence of the medieval Archbishops of York and associated enclosure containing gardens, five fishponds and a quarry pit. Situated on the banks of the tidal River Ouse with views north and east along the river	Medieval	Cawood, North Yorkshire
SAM	20521	Mote Hill: a moated site, two fishponds and part of an adjacent field system 500m west of Nun Appleton Hall. Located at the northern edge of the floodplain of the lower River Wharfe with views across	Medieval	Appleton Roebuck, North Yorkshire

Designation	EH ref	Description	Date	Location
		the river		
RPG	4207	Moreby Hall. Early c19 formal garden for a country house	Early c19	Stillingfleet, North Yorkshire
SAM	30110	St Andrew's College and moat, 440m north east of College Farm. Sited on a spur of slightly higher ground on the north bank of the River Ouse with views east across the river	Medieval	Acaster Selby, North Yorkshire
RPG	2071	Nun Appleton Hall. Park probably developed in the c18 with c17 or earlier origins and pleasure grounds with mid c19 features. Located on level land on the north side of the River Wharfe with views along the river	c18	Appleton Roebuck
		E.5 The Hull River		
SAM	ER175	Site of deserted village of Eske. Located on the east bank of the river with views north and south along the river (possibly obscured by floodbank defences)	Medieval	Eske, East Riding of Yorkshire
		F.0 EAST YORKSHIRE COASTLINE - HOLDERNESS		
SAM	35496	Two moated sites and associated features 520m north of Grimston Garth. Located 50m inland from the sea with extensive views east over the North Sea	Medieval	East Garton, East Riding of Yorkshire
SAM	35490	Royal Observer Corps underground monitoring post and WW II visual spotting post, 200m north of Southfield House. Located 700m west of the coastline but with possible views to the east over the North Sea	WWII, Cold War	Skipsea, East Riding of Yorkshire
SAM	26524	Deserted medieval village of Hilderthorpe with associated ridge and furrow field system. Located close to the coast and partly enclosed by modern development but with views out to the south over the North Sea	Medieval	Bridlington, East Riding of Yorkshire
SAM	26519	Anglo-Saxon cemetery at Home Farm, Sewerby. Located 300m from the coastal cliffs and overlooks the North Sea to the south	Early medieval	Bridlington, East Riding of Yorkshire
SAM	26505	Section of Danes' Dyke between the Cliff Plantation and the B1255. Long linear feature that extends to the edge of the coast with views over the sea to the south	Prehistoric, Early medieval	Flamborough, East Riding of Yorkshire
SAM	32705	Operation Diver Heavy Anti-aircraft gun sites on Flamborough Head. Coastal location with extensive views over the sea to the east and south	WWII	Flamborough, East Riding of Yorkshire

Table 2 Area 3 - Monument types by period

Period	Monument type	Designation
Prehistoric (incl Neolithic and Bronze Age)	Long barrow, barrow, round barrow	SAM
Iron Age	Fort	SAM
Roman	Fort, settlement, town, camp	SAM
Early medieval	Barrows and ship burial	SAM
Medieval	Friary, hospital, priory, chapel, undercroft, moated site, castle, abbey, town walls, tower, bridge, monastic grange, house, blockhouse, watergate, camera, settlement, field system, town	SAM
C16	Cross	SAM
C17	House, civil war fieldwork, castle	SAM
C18, C19	Fort and fieldworks, Martello tower, landscape park, pleasuance, walled garden, windmill, sluice, lock, tower mill & works, artillery battery	SAM, RPG
Late C19, early C20	Cliff & town hall gardens, gardens, park, seafront water gardens	RPG
WWII	Gun emplacement, heavy anti-aircraft guns, dock decoys	SAM
Unknown	Wreck	PWS

Appendix 5.4 – MMO Area 6 Designated Cultural Heritage assets

Table 3 Area 6 – Designated Cultural Heritage assets (excludes military aircraft sites)

(key: SAM – scheduled ancient monument; RPG – registered park and garden; PWS – protected wreck site)

		A.0 Dart Estuary		
SAM	24234	Dartmouth Castle. A medieval enclosure castle, mansion, chain tower, and post-medieval coastal battery. Situated on a rocky peninsula protrubing into the entrance to the Dart Estuary	Medieval, post medieval	Dartmouth
SAM	33800	Civil War fieldwork known as Gallant's Bower. Overlooks the mouth of the estuary of the River Dart, with views to the north, east and south over the estuary and immediate coastline.	C17	Dartmouth
SAM	22213	Bayard's Cove Castle: a blockhouse in Dartmouth. Part of a series of defensive positions built from c15 to protect the natural harbour at Dartmouth. Situated on the coastline overlooking Dart Harbour	C16	Dartmouth
RPG	1692	Sharpham House. Mid C20 formal terraced gardens by Percy Cane and C19 pleasure grounds surrounding a villa by Sir Robert Taylor, set in late C18 parkland attributed to Lancelot Brown. Situated along the west bank of the River Dart with fine and extensive views over the Dart and across the Dart Valley. The woodland on the eastern bank of the Dart is important for the immediate setting of the asset	C18, c19, c20	Ashprington, South Hams
SAM	22356	Totnes Castle. Situated on high ground commanding the head of the navigable reaches of the River Dart and overlooks Totnes town. Possible views over the head of the Dart Estuary	Medieval	Totnes
SAM	33058	D-Day landing craft maintenance site on the River Dart, 560m south of Waddeton Court. The scheduled area includes remains which extend out from the shore and terminate at Mean Low Water. The monument is complemented by a contemporary watercolour painting of the site	WWII	Waddeton, Stoke Gabriel
RPG	5281	Greenway. Early and mid C19 pleasure grounds laid out in Picturesque style, with late C18 walled gardens and C19 parkland. Located on the east bank of the River Dart and bounded by the foreshore. The site occupies a peninsula surrounded on two sides by the River Dart with extensive views south, west and north across the water	C18, c19	Lower Greenway, South Hams
SAM	33060	D-Day landing craft maintenance site on the River Dart, 270m southeast of Maypool Cottage. Located on the east bank of the River Dart. The scheduled remains extend out into the foreshore	WWII	Oakham Hill, Kingswear
SAM	33793	Bowl barrow 690m north of Longwood House. Situated on a west facing spur overlooking the estuary. The barrow is intervisible with others across the valley to the west	Prehistoric	Oakham Hill, Kingswear
SAM	33792	Hillfort known as Greenway Camp, immediately north east of Cart Wood. Located on a steep south facing promontory overlooking the Dart Estuary	Late Iron Age	Hillhead, Kingswear
SAM	33059	D-Day landing craft maintenance site on the River Dart immediately to the south of Lower Noss Point. Located on the east bank of the River Dart. The scheduled area includes remains that are below Mean Water Level	WWII	Noss Point, Kingswear

		B.0 South West Coastline		
SAM	DV185	Gomerock Tower. Ruined remains of a fortified house. Coastal location opposite Dartmouth Castle that together formed a harbour chain defence across the estuary	Medieval	Kingswear
RPG	1681	Coleton Fishacre. An early C20 Arts and Crafts garden comprising formal terraces around a house. Occupies a coastal location with significant views out toward the coast	Early c20	Coleton Fishacre
SAM	29695	The Old Redoubt and later Victorian Rifle Range Target, 540m south west of Berry Head Fort. Coastal fort that provided seaward defence of the Torquay harbourage	Napoleonic, c19	Brixham
SAM	29694	Berry Head Fort and battery and Hardy's Head Battery. Situated in a prominent coastal location on a promontory at the southern end of Tor Bay	Late c18, Napoleonic	Brixham
		C.0 Tor Bay		
SAM	33026	Ashhole Cavern. Coastal location, overlooking Tor Bay to the north	Prehistoric, Roman	Brixham
SAM	33036	World War II Emergency Coastal Battery and remains of a Victorian practice battery, at Battery Gardens. Coastal location adjacent to Brixham harbourage and sited to defend the bay against the threat of enemy invasion	WWII, c19	Brixham
SAM	33025	Chambered tomb, 630m northwest of Elberry Farm. Situated on the southern slopes of hilly ground overlooking Tor Bay	Neolithic	Galmpton, Torbay
RPG	4025	Oldway Mansion. Early C20 gardens and pleasure grounds. Situated 850m west of the coastline, but high artificial banks on the eastern side that were included in the garden design, create views across Paignton to the sea	Early c20	Paignton
SAM	24840	Torre Abbey. Situated in a wide shallow valley at the sheltered north end of Tor Bay. The scheduled area includes parkland and shoreline	Medieval	Torquay
RPG	4751	Princess Gardens and Royal Terrace Gardens. A group of late C19 seafront public gardens and picturesque terraced cliff walks. Princess Gardens and the promenade gardens occupy level ground reclaimed from Tor Bay, while the Royal Terrace Gardens are constructed on the steep south facing slope of Waldon Cliff. The gardens have extensive views across Tor Bay toward Paignton, Brixham and Berry Head from all parts of the site	Late c19	Torquay
RPG	1027	Castle Tor. A late 1920s terraced garden around a contemporary house. Located c.500m from the coastline the asset is situated on steeply sloping ground that has dramatic views to the sea	Early c20	Torquay
		D.0 Babbacombe Bay		
SAM	10717	Kent's Cavern. Situated in a prominent position on the peninsula at Hope's Nose, with possible views north over the bay	Palaeolithic	Torquay
SAM	33027	Prehistoric field system at Walls Hill.	Prehistoric	Torquay

		Situated on a gently sloping clifftop promontory over looking the sea		
RPG	1038	Watcombe Park and Brunel Manor. Mid C19 parkland, arboretum and gardens. Situated c.500m from the coast, the site occupies a south facing valley which affords views south and east to the sea	Mid c19	Torquay
		E.0 River Teign Estuary		
PWS		'Church Rocks'	C16 or early c17	Off Teignmouth
		***F.0* River Exe Estuary**		
RPG	1689	Powderham Castle. Mid C19 formal terraced gardens and early C19 pleasure grounds and picturesque improvements, set in a deer park landscaped in the mid and late C18. Situated on the western bank of the River Exe and having wide views across the Exe to the east shore, Exmouth and the sea	Mid c19, late c18	Kenton, Teignbridge
SAM	DV953	Earthwork enclosure 220 yds (200m) northeast of Church Path Hill Plantation. Situated on a north facing slope with views further north and east over the head of the Exe Estuary	Unknown	Knowle Hill, Exeter
SAM	33035	Clyst St Mary Bridge and causeway. Situated on a north facing slope with possible views east over the head of the Exe Estuary	Medieval	Clyst St Mary, Exeter
RPG	1677	A La Ronde, and The Point-in-View. A Regency ferme ornée. Ornamental landscape features combined with more practical paddocks, orchards and kitchen gardens creating an ornamented estate. The site has extensive views south across Exmouth to the sea	Late c18 & early c19	Exmouth
		G.0 Lyme Bay		
WHS		England's first natural World Heritage Site - known as The Jurassic Coast. It covers 95 miles coastline from East Devon to Dorset, with rocks recording 185 million years of the Earth's history	Triassic, Jurassic & Cretaceous	Exmouth to Swanage
RPG	1282	Bicton. Early C18 formal gardens with later C18 and C19 structures, set in C18 and C19 parkland and pleasure grounds with a mid C19 arboretum. The site has views south, east and northeast across the valley of the River Otter	C18, c19	East Budleigh
SAM	DV55	High Peak Camp, Sidmouth. The site is situated in a clifftop location overlooking the sea	Iron Age, Roman	Otterton, Sidmouth
RPG	4878	Connaught Gardens. An early C20 public park laid out in 1934. Situated on a coastal heathland. The boundary to the south is formed by the coast and Chit Rocks. It has views east along the seafront to Salcombe Hill Cliff. Although sheltered by walling, openings and an outer promenade walk allow extensive coastal views	Early c20	Sidmouth
SAM	33049	Prehistoric field system on the cliffs above Littlecombe Shoot. Situated on a gently sloping clifftop overlooking Lyme Bay	Prehistoric	Branscombe
SAM	29637	Berry Cliff Camp. Slight univallate hillfort. Located on the cliff edge on Littlecombe Hill	Prehistoric	Branscombe
RPG	4196	Rousdon. Parkland and pleasure grounds laid out in the 1870s, surrounding a mansion of c.1874-8.	Late c19	Rousdon

		The site lies c.500m above sea level and encompasses an area that slopes down in a southeasterly direction toward the Rousdon Cliffs. The site offers extensive views to the south over Charton Bay and the English Channel		
SAM	DO372	St Gabriel's Chapel. Situated c.200m inland from Kitwells Cliff and with views to the south over the sea	Medieval	Stanton St Gabriel, Dorset
SAM	29578	A group of four bowl barrows on Golden Cap 515m southeast and 630m southeast of St Gabriel's House. The site has a clifftop location and overlooks Shorne Cliff with views out over the open sea	Prehistoric	Stanton St Gabriel, Dorset
SAM	29574	Three bowl barrows northeast of Thorncombe Beacon, 160m, 190m & 400m southwest of Down House. Located close to the cliff edge with views to the south over the sea	Prehistoric	Symondsbury
PWS		'West Bay', west of the outer Pollock Reef in the approaches to West Bay Harbour	C17 or c18	Lyme Bay, Dorset
SAM	29576	Bowl barrow on North Hill 750m northeast of Marsh Barn. A hilltop barrow, over 1km inland but with long views south over the coastline and open sea	Prehistoric	Burton Bradstock, West Dorset
SAM	29599	Bind Barrow. Situated in a prominent position on the top of a hill and close to the cliff edge	Prehistoric	Burton Bradstock, West Dorset
SAM	31053	Three bowl barrows on The Knoll 450m northwest of Treetops. The southern of the 3 barrows has been flattened to accommodate a small stone building, a look-out & signal station built c.1800. The asset is situated on a prominent hill with extensive views out to sea	Prehistoric, c19	Puncknowle, West Dorset
SAM	31052	Bowl barrow on Limekiln Hill 650m southeast of Green Leaze. Situated just below the hill crest, just over 1km inland but with views south across to the open sea	Prehistoric	Puncknowle, West Dorset
SAM	31051	Bowl barrow on Limekiln Hill 500m north of Labour-in-Vain Farm. Situated just below the crest of Limekiln Hill, just over 1km inland but with views south across to the open sea	Prehistoric	Puncknowle, West Dorset
SAM	29579	Three bowl barrows on Tulk's Hill 800m north of East Bexington Farm. Located in a prominent position on the top of Turk's Hill, c.1km inland but with views to the south over the open sea	Prehistoric	Puncknowle, West Dorset
SAM	DO88	Abbotsbury Castle (camp). Incorporates a possible Roman signal station that could be linked to a chain of other 'beacons' along the south coast. The asset is situated in a prominent location on the southern slopes of Wears Hill with views to the south over the open sea	Prehistoric, Roman	Abbotsbury, West Dorset
SAM	DO168	Two round barrows on Wears Hill. Located c.1.5km inland from the sea but situated along a ridge on Wear Hill with views to the southeast across to the sea	Prehistoric	Abbotsbury, West Dorset
SAM	DO394	Group of four barrows south of Gorwell Gate. Located along the ridgeway on Windbatch Hill with distant views to the southwest across to the sea	Prehistoric	Abbotsbury, West Dorset
SAM	DO170	Dyke on Wears Hill. Situated on Windbatch Hill with distant views west and southwest across to the sea	Prehistoric	Abbotsbury, West Dorset
SAM	DO169	Group of five round barrows on White Hill. Situated along the South Dorset Ridgeway on White Hill with distant views south and southeast	Prehistoric	Abbotsbury, West Dorset

		across to the sea		
RPG	1698	Abbotsbury Gardens. Mid to late C19 gardens which was also expanded in the late c20. Situated on the Dorset coast in a sheltered valley but with views out to the sea	Mid c19	Abbotsbury, West Dorset
SAM	DO383	Lynchets south of Stavordale Wood. Located on the southern slopes of a hill with short views south along the coast and out to sea	Unknown	Abbotsbury, West Dorset
SAM	29045	St Catherine's Chapel, field system and quarries at Chapel Hill, WWII pillbox. Located on and around the southern slopes of Chapel Hill with views along Chesil Beach and out to sea	Medieval, WWII	Abbotsbury, West Dorset
SAM	DO171	Round barrow 250yds (230m) south of Chapel Copse. An isolated barrow, situated at the foot of Chapel Hill, c.500m from the coast, but with views across Chesil Beach and out to sea	Prehistoric	Abbotsbury, West Dorset
SAM	22961	St Peter's Abbey. Situated in a prominent position with views south toward Chesil Beach and out to sea	Medieval	Abbotsbury, West Dorset
SAM	29046	Duck decoy at Abbotsbury Swannery, 630m SSW of Horsepool Farm. Situated on the edge of West Fleet inlet with open views to the south along Chesil Beach and the sea	C17	Abbotsbury, West Dorset
		G.1 Axe Estuary		
SAM	33042	Axmouth Bridge. The asset crosses the River Axe at the mouth of the river	Late c19	Seaton
SAM	29640	Hawkesdown Camp and associated outwork. A large prehistoric univallate hillfort. Located in a commanding position at the west end of a long spur which overlooks the upper estuary of the River Axe on its eastern bank	Prehistoric	Axmouth
		H.0 Isle of Portland		
WHS		England's first natural World Heritage Site - known as The Jurassic Coast. It covers 95 miles coastline from East Devon to Dorset, with rocks recording 185 million years of the Earth's history	Triassic, Jurassic & Cretaceous	Exmouth to Swanage
SAM	22964	Portland Castle. One of a pair of coastal fortications constructed during the reign of Henry VIII in order to provide protection for the sheltered waters of Weymouth Bay. The two forts are sited on opposite sides of the bay and are inter-visible. Situated on the northern shore of the Isle of Portland, overlooking Portland Harbour to the east and Weymouth Bay to the north	C16	Isle of Portland
SAM	DO780	The Verne Citadel. Prison camp and prison. Situated in a prominent panoramic location overlooking Portland Harbour and Weymouth Bay to the north, and Chesil Beach to the west	Mid c19	Isle of Portland
SAM	35242	RAF Portland, site of Rotor early warning radar station. Situated in a prominent panoramic location overlooking Portland Harbour and Weymouth Bay to the north, and Chesil Beach to the west	Cold War	Isle of Portland
SAM	DO781	Battery 200yds (180m) east of the naval cemetery. A fort that formed part of coastal defences. Situated on a north facing slope below the Verne Citadel and overlooking Portland Harbour to the	Late c19	Isle of Portland

		north		
SAM	DO51	Rufus Castle. Situated on the cliff edge at Church Ope Cave with open sea views east across Weymouth Bay	Medieval, c16	Isle of Portland
SAM	DO163	Portland open fields. Scheduled in 2 areas at the tip of Portland Bill with open views across the sea and Chesil Beach to the west and Weymouth Bay to the east	Unknown	Isle of Portland
SAM	DO773	Mesolithic sites near Culver Well. Located at the tip of Portland Bill with views east over Weymouth Bay and the open sea	Mesolithic	Isle of Portland
SAM	DO803	Portland Bill stone loading quay. Situated on rocks immediately above the sea at the tip of Portland Bill with views east and southeast over the open sea	Early c20	Isle of Portland

Appendix 6 – Dataset Reference Sources

GIS/Mapped Dataset References

Theme	Potential Data Layers	Source
Base Mapping		
Maps and Charts	Admiralty Charted Raster - Approaches - 1:15,000	Seazone
	Admiralty Charted Raster - Berthing - 1:5,000	
	Admiralty Charted Raster - Coastal - 1:50,000	
	Admiralty Charted Raster - General - 1:150,000	
	Admiralty Charted Raster - Harbour - 1:5,000	
	Admiralty Charted Raster - Overview - 1:500,000	
	Hyrdospatial Charted vector features	Seazone
	OS map - 1:250,000	Ordnance Survey(OS)
	OS maps - 1:50,000	
	OS maps - 1:25,000	
	OS maps - 1:10,000	
Boundaries/ Extent of Jurisdictions	Mean High Water Mark	OS Open Data
	Mean Low Water Mark	
	12 nautical mile territorial sea limit	SeaZone
	UK Continental Shelf Limit	SeaZone
	Renewable Energy Zone	SeaZone
	Harbour limits	SeaZone
	Ports	SeaZone
Character Assessment		
Biodiversity Character	Terrestrial Natural Areas	Natural England
	Coastal Natural Areas	
	Marine Natural Areas	
Landscape/ Seascape Character	National Landscape Character (England)	Natural England
	National Landscape Typology (England)	
	Regional Landscape Character (England)	Natural England
	County/ District Landscape/ Seascape Character	Local Authority
Natural Factors		
	Seazone Bathymetry and Elevation	SeaZone
	Seazone Digital Survey Bathymetry	
	DiGMapGB-50	
	DiGMapGB-250	
	DiGMapGB-625	
	DigBath250 (DigRock250 & DigSBS250)	BGS/ Seazone
Air and Climate	Hydrospatial Climate and Oceanography	Seazone
Cultural/Social Factors		
	Wrecks	SeaZone
	Anchorages, Anchor berths and bad weather refuge anchorages	SeaZone
	Ferry Terminals	
	National trails	Natural England
	Sailing areas	RYA
Military Activity	Army Firing Ranges (land and sea)	SeaZone
	Military Practice Areas (sea)	
	Offshore testing ranges	
	Submarine exercise areas	
	Dredging disposal areas	SeaZone
	Shoreline Construction	
	Pipelines	

	Licensed / leased aggregate extraction areas	Crown Estate/BMAPA
	Oil and Gas Wells drilled	Oil & Gas UK DEAL
	Round 3 Windfarm zones	The Crown Estate
Fishing	Aquaculture Sites	CEFAS, Seazone
	Classified Bivalve Mollusc Harvesting Areas	CEFAS
	Fish Nursery Areas (various species)	CEFAS
	Fish Spawning Areas (various species)	CEFAS
Landscape Designations	AONB	Natural England
	Heritage Coast	
	National Parks	Natural England / Scottish Natural Heritage
	Historic Parks and Gardens	Historic Scotland/ English Heritage
	Listed Buildings	
	Protected Wreck Sites	
	Scheduled Monuments	
	World Heritage Sites	
Biodiversity Designations	Marine Conservation Zones	Natural England
	Marine Special Areas of Conservation (mSAC)	
	National Nature Reserves (NNR)	
	Ramsar sites	
	Site of Special Scientific Interest (SSSI)	
	Special Areas of Conservation (SAC)	
	Special Protection Area (SPA)	
Perceptual/Experiential Factors		
Light pollution	Night Sky (England)	Campaign to Protect Rural England
	Tranquillity Map of England (England)	Campaign to Protect Rural England

Appendix 7 – Field Work Pro-formas

Land based field form
Sea based field form
Field prompt sheet

Digital Field Survey Form: Land Based surveys

1 - Housekeeping

Surveyor name		Date	Time	Representational photograph
				Photo to be 4.42cm x 6.72cm
Survey no.	Location			
GPS Grid Reference				
E:				
N:				
Digital photograph numbers				

1a Weather conditions	
1b Visibility	
1c Sea conditions	

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape
2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness
2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
3b Natural/human influences - Hydrological features, natural processes and human interaction

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 2					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 3					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 4					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 5					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 6					Notes:
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 2					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 3					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 4					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	

Digital Field Survey Form: Sea Based surveys

1 - Housekeeping

Surveyor name		Date	Time	Representational photograph
				Photo to be 4.42cm x 6.72cm
Survey no.	Exit Harbour	Distance from shore		
GPS Grid Reference				
E:				
N:				
Digital photograph numbers				

1a Weather conditions	
1b Visibility	
1c Sea conditions	

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape
2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness
2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
3b Natural/human influences - Hydrological features, natural processes and human interaction

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 2					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 3					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 4					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 5					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 6					Notes:
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 2					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 3					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 4					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	

NE Seascape Assessment Prompt Sheet

1a Weather	Wind	Strength	Direction	Temperature			
	Sunny	Overcast	Dark cloud	Windy	Raining	Fog	Snow
1b Visibility	General assessment	Excellent	Good	Poor	Minimal		
	Distance	Distance cues	Land visible	Horizon sharp	Horizon blurred	No horizon	
1c Sea conditions	Water surface	Calm	Waves visible	Choppy	Rough	Very rough	Turbulent
	Tidal state	Incoming	High tide	Going out	Low tide	Spring	Neap

2a Aesthetic	Texture	Smooth	Textured	Rough	Very Rough		
	Scale	Intimate	Small	Large	Vast		
	Variety	Uniform	Simple	Diverse	Complex		
	Unity	Unified	Interrupted	Fragmented	Chaotic		
	Enclosure	Expansive	Open	Enclosed	Confined		
	Form	Vertical	Sloping	Rolling	Horizontal		
	Colour	Monochrome	Muted	Colourful	Vivid		
	Balance	Harmonious	Balanced	Discordant	Chaotic		
	Movement	Dead	Still	Calm	Busy		
2b Perceptual and Distinctiveness	Sound	Loud	Intermittent	Distant	Quiet	Natural	Manmade
	Smell	Natural	Manmade	Salty	Seaweed	Industry/fisheries	Fumes
	Security	Intimate	Safe	Unsettling	Threatening		
	Marine character	Settled	Temperamental	Threatening	Destructive		
	Stimulus	Non-descript	Monotonous	Interesting	Inspiring		
	Tranquillity	Inaccessible	Vacant	Remote	Busy		
	Naturalness	Natural	Tamed	Managed	Artificial		
	Pattern	Random	Organised	Regular	Formal		
	Scenic quality	Outstanding	High quality	Moderate	Low	Poor	
	Rarity	Single example	Rare	Frequent	Common		
	Views	Panoramic	Wide	Channelled	Narrow	Filtered	
2c Major landmarks	Notable onshore features	Harbour/port/marina	Pier	Wind turbines	Electricity pylons	Radio masts	Houses
		Power station	Industrial buildings	Road/rail	Holiday homes	Golf course	Coastal path
		Church spires	Castle/fort	Monument/ruin	Topographical feature	Vegetation	
	Notable offshore features	Oil rigs	Lighthouses	Wind turbines	Fishing buoys	Navigational buoys	Sea defences

NE Seascape Assessment Prompt Sheet

3a Coastal form	Coastal aspect	North facing	East facing	South facing	West facing		
	Scale of the coast	Extensive	Large	Small	Intimate		
	Coastal Geometry	Linear	Large bays	Small bays	Indented	Heavily Indented	Estuaries/inlets
3b Topography and Geology	Landform profile	Flat	Gently undulating	Sloping	Steep	Vertical	
	Landform Features	Bay	Headland	Terrace	Estuary	Spit	Cliff
		Stacks	Archway	Dunes			
	Landform scale	High	Intermediate	Low			
	Geology (visible rock)	Limestone	Shale	Chalk	Mudstone	Sandstone	Granite
	Geology(Drift)	Alluvium	Boulder clay	Gravel	Sands	Muds	Shingle/pebbles
	Geology (Soils)	Sandy	Clay	Loam	Deep	Thin	Stony
	Intertidal zone	Broad	Moderate	Narrow			
	Shore	Sandy beach	Shingle	Pebbles	Rock/boulders	Bedrock	
3c Natural/human influences	Hydrology	Main river	Tributary	Stream	Tidal features		
	Colour of the water	Brown	Graded	Azure blue	Green/blue	Blue	Deep Blue
	Clarity of the water	Clear	Murky	Sediment laden			
	Predominant nature of shore	Mud	Sand	Shingle	Boulders/pebbles	Solid bedrock	Not visible…
	Coastal defences	Harbour wall	Breakwater	Groynes	Offshore reefs	Rip rap	
	Coastal development	Heritage remains	Tourism	Residential	Fishing	Military	Industry/commercial

4a Coastal activity	General	Settlement	Residential	Agriculture	Tourism		
		Recreation	Beach activities	Walking	Sightseeing	Driving	
		Commercial	Harbouring	Heavy industry	Ferry activity	Container storage	
4b Marine activity	General	Recreation	Water sports	Sailing	Sightseeing	Cruising	Fishing
		Shipping	Commercial	Cruise	Private	Fishing	Fish farming
		Commercial	Extractive oil/gas	Extractive mineral	Power wind	Mussel beds/rafts	

Appendix 8 – Representative Field Survey Record Sheets

Please refer to Figure 1.13 in Appendix 1 and Figure 2.12 in Appendix 2 for the locations of representative field survey locations. Note that field survey records are not available for character areas 1 to 4 as areas were too remote to be accessed by the survey boat.

Character area 5 - Holderness Coastal Waters - Representative land survey

1 - Housekeeping

Surveyor name			Date	Time
Richard Bassindale			Tuesday 8th March	12.06
Survey no.	Location			
3-LS-04	Aldborough Leisure Park			
GPS Grid Reference				
W: 000 05.107				
N: 53 50.360				
Digital photograph numbers				
DSC_0069	to	DSC_0103		

Representational photograph

Aldborough Caravan Park from cliff looking north

1a Weather conditions	Sunny, dry
1b Visibility	Good, clear horizon
1c Sea conditions	Calm

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

This is a large scale landscape dominated by high (approximately 20m), vertical and rapidly eroding glacial till cliffs with a rolling hinterland above which is dominated by agriculture and dispersed settlements. This is a textured, large scale and diverse landscape which appears fragmented due to the severe erosion affecting the coastal settlements and populations.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

The area is quiet and dominated by the sound of the sea, with a background noise of human activity from the caravan park. The unsettled and threatening nature of the erosion dominates the coastline both physically and emotionally. However, this is not a locally distinct issue and is ongoing along much of the Holderness coastline (Bridlington to Spurn Point). The high cliffs offer long distance and panoramic views across both the land and sea with views of Hornsea to the north and the rolling agricultural land to the west. Due to the heavy indentation of the cliffs views to the south are limited to built landscape elements on the cliff tops.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

The caravans on the cliff top are clearly visible along the coastline.
A large vertical structure is prominent off-shore (less than 1 km) to the south.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
The coast is east facing and is largely a long linear/curving bay which is heavy indented by coastal erosion. Inland to the west, the landscape is of medium scale and dominated with agriculture and small settlements.
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
The shoreline is dominated by rapidly eroding high cliffs which have resulted in a heavily indented shoreline and a wide flat sandy beach. Inland the landform is low and rolling.
3b Natural/human influences - Hydrological features, natural processes and human interaction
The erosion of the cliffs dominates the coastline, there is little or no intervention along much of the coast. The cliff top at this location is dominated by a caravan park which is receding inland leaving derelict caravan pitches, buildings and roads along the cliff edge.

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
Along the cliff tops residential and tourist development is clearly visible, along with infrastructure such as power transmission poles and telecommunications masts. Views from the beach are restricted to views along the shoreline and out to sea, however access to the shoreline is physically restricted along much of the coastline due to the unstable cliffs.
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
No marine activity was visible on the day of the survey.
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed
The coastline has historically been subject to erosion with the loss of many coastal settlements and infrastructure.

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1		Beach			Notes: Wide open and flat sandy beach
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 2		Cliffs			Notes: Rapidly eroding cliffs are depositing large amounts of material at the base of the cliffs creating a visually distinct coastline
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 3		Caravan Parks			Notes: Cliff top development (caravan park) is being lost to the receding coastline
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 4					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 5					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 6					Notes:
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1		Erosion			Notes: Rapid erosion along the coastline, many dead-end roads and derelict buildings and remnants of infrastructure at the cliff face.
Implications on character / key characteristics					
May result in a reduction of caravan parks along the coastline, which are a significant elements of the landscape.					
Widespread	Yes	Localised		Limited	
Seascape dynamic 2					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 3					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 4					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	

Character area 5 - Holderness Coastal Waters - Representative sea survey

1 - Housekeeping

Surveyor name		Date	Time
Mark Salisbury		Tuesday 08.03.11	10.11
Survey no.	**Exit Harbour**	**Distance from shore**	
3-SS-05	Grimsby	1.6NM	
GPS Grid Reference			
W: 000° 00.80			
N: 53° 48.67			
Digital photograph numbers			
IMG_0390 to IMG_0408			

Representational photograph

View looking west towards Aldborough

1a Weather conditions	Cold light SW wind, clear skies.
1b Visibility	7-10km moderate, sea haze blurring views of land, lifting gradually.
1c Sea conditions	Calm

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

Large scale because of the long and low nature of the coast and limited land influence. Unified, consistent, simple character by merit of interspersed settlements and few landmark features. Very open and colourful character i.e. blue sea and exposed cliffs.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

Quiet, natural, settled character. Unsettling feel in that there are few safe havens. Temperamental marine character evident by visible erosion and sediment in the water closer to shore leads to a rather neglected character. Low scenic quality and views are panoramic because of the large scale of the coast.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

Onshore Beacon Hill marker is an obvious monument but very little noticeable. Seaward the horizon is featureless.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
East facing extensive linear coastline
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
Relatively flat and low lying. Sea interface comprises a soft eroding cliff. Details of the intertidal area are not clear.
3b Natural/human influences - Hydrological features, natural processes and human interaction
The water was a clear Green/Blue colour.

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
Small clusters of settlement, noticed but generally very sparse. Caravan parks noticeable recurring element.
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
Fishing, predominantly crab/lobster fishermen close to shore. Lots of pot fishing buoys were noticed.
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed
The linear clusters of wrecks offshore between the 6 and 12 mile fishing limits were as a result of old navigation techniques and the general principle that the 6-12 mile region was deep and safe. New technology allows dynamic underwater sediment migration to be read.

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1		Cliffs			Notes: Eroding heavily, leads to a rather neglected character.
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1		Erosion and deposition			Notes: Colour of the water also changes due to sediment mobility which changes the character of the sea.
Implications on character / key characteristics					
Changing the profile of the coast and requirements for further erosion protection					
Widespread		Localised		Limited	
Seascape dynamic 1		Tourism			Notes: Popularity creates pressures for facilities and infrastructure as well as increased activity at coastal edge
Implications on character / key characteristics					
Further development at coastal fringe					
Widespread		Localised		Limited	
Seascape dynamic 3		Fishing Industry pressures			Notes: Caused by increased fuel prices, fishing quota regulations etc.
Implications on character / key characteristics					
Reduction in marine activity					
Widespread		Localised		Limited	

Character Area 6 - Humber Waters - Representative land survey

1 - Housekeeping

Surveyor name			Date	Time
Richard Bassindale			Tuesday 8th March	9.39
Survey no.	Location			
3-LS-07	Spurn Point			
GPS Grid Reference				
E: 000 08.772				
N: 53 36.501				
Digital photograph numbers				
DSC_0001	to	DSC_0025		

Representational photograph

View from Spurn Point facing south

1a Weather conditions	Overcast
1b Visibility	Moderate, Horizon Blurred
1c Sea conditions	Calm

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

A large scale complex and textured landscape dominated by water, with the North Sea to the eastern side and the Humber estuary to the west. The area is expansive and remote with a wild and natural feel although there are some significant discordant elements in the landscape, including electricity poles along the length of the spit and a lighthouse and other buildings at the head of the spit. Remnants of abandoned sea defences are evident along the coast.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

The area is quiet and dominated by the sound of the sea, giving a natural and safe feel to the space. The remote and exposed nature of the place results in an inspirational quality to the environment. There is clear evidence of the highly dynamic nature of the environment with abandoned roads routes and derelict material along the shore. The environment is rarely found elsewhere. Long distance views are available across the Humber estuary and to the open sea which increase the feeling of remoteness and exposure.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

The lighthouse at the head of Spurn Point is highly visible.
The vertical structures of the electricity poles are highly visible along the whole length of the spit.
Buildings on the low cliffs at the beginning of Spurn Point are clearly visible from the eastern beach.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
The long and narrow sand spit of Spurn Point extends into the Humber estuary, to the west there are shallow mud flats within the Humber estuary, to the east a narrow beach extends along the coast rising towards Kilnsea.
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
The long spit consists of a low, sparsely vegetated dune, rising gently towards the north. In general the width reduces as you move south and widens at the end of the land to create a large 'bulbous' point. The spit is low lying along its full length, only rising gently at the northern end.
3b Natural/human influences - Hydrological features, natural processes and human interaction
The area has clear evidence of a human presence with electricity poles, lifeguard station and lighthouse at the head of the spit, a road along the full length of the spit and buildings its landward end.

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
There is small scale tourism along the coast, residential development and extensive agriculture inland.
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
The area is well use by commercial container ships, fishing and sailing boats. Spurn Point lifeguard station is located at the end of the spit.
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed
Spurn Point is a designated a SSSI, Heritage Coast and forms part of the Humber Estuary SAC, SPA and RAMSAR site.

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1		Beach			Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 2		Lighthouse			Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 3		Pier			Notes: Pier into the Humber estuary
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 4		Sea defences			Notes: Remnants of 1950's sea defences.
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 5					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 6					Notes:
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1		Erosion			Notes: The dead end roads suggest the erosion of the seaward side of the spit.
Implications on character / key characteristics					
Breaching of the spit will result in the erosion of the existing land and ultimately the reforming of a spit slightly to the west.					
Widespread		Localised		Limited	
Seascape dynamic 2					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 3					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 4					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	

Character area 6 - Humber Waters - Representative sea survey

1 - Housekeeping

Surveyor name		Date	Time
Mark Salisbury		Thursday 24.03.11	15.52
Survey no.	**Exit Harbour**	**Distance from shore**	
3-SS-10	Grimsby	1.5NM	
GPS Grid Reference			
W: 000° 01.30			
N: 53° 35.67			
Digital photograph numbers			
IMG_0682 to IMG_0701			

Representational photograph

Looking south towards Grimsby

1a Weather conditions	Misty, high cloud, cool, no wind.
1b Visibility	5-6km, decreasing due to late afternoon sea mist
1c Sea conditions	Flat calm

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

Large scale enclosed environment. Industrial development and activity creates a very textured, diverse character. Relatively busy environment with contrasting elements creating a discordant character i.e. residential/commercial/tourism/industrial activity.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

Identifiable built development and enclosure creates a strong sense of place. Settled marine character with an interesting, busy coastal edge and marine traffic corridor. Tamed/managed character by merit of development at coastal edge but imposing natural features such as mudflats and spurn head emphasise natural environment. Wide, moderate quality scenic views.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

Haill/Bull Sand forts guard the mouth of the estuary alongside Spurn Head. The iconic Grimsby dock tower is prominent on the skyline. Industrial and commercial development along the south side of the river with several stacks featuring heavily on the skyline. Grimsby Town FC also visible. Offshore, several navigation buoys and navigation boats mark treacherous shallow waters. Topography fairly consistent.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
Large estuary, land on either side creates containment.
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
Consistent low topography, undulating in places. From the sea little detail of intertidal areas were observed but these are extensive in places and largely determined our route back to harbour.
3b Natural/human influences - Hydrological features, natural processes and human interaction
Fishing, industry, commercial port. Tourism (Cleethorpes) and residential function associated with developed area.

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
Fishing, industry, commercial port. Tourism (Cleethorpes) and residential function associated with developed area.
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
Shipping, commercial freight, cruise port, private fishing boats (recreational fishing).
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed
Renowned as a large estuary guarded from the sea by Spurn Head.

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1					Notes:xxx
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1		Erosion and deposition			Notes: Creates the need for dredging.
Implications on character / key characteristics					
Creates access issues due to sedimentation of navigable channels					
Widespread		Localised		Limited	
Seascape dynamic 2		Fishing Industry pressures			Notes: Caused by increased fuel prices, fishing quota regulations etc. Grimsby fishing port once held berths for 700 commercial fishing boats. Now as few as 6 regularly work out of Grimsby. Dock areas are in complete decline.
Implications on character / key characteristics					
Reduction in marine activity, increases susceptibility to sedimentation blocking channels.					
Widespread		Localised		Limited	

Character Area 7 - East Midlands Coastal Waters - Representative land survey

1 - Housekeeping

Surveyor name			Date	Time	Representational photograph
Richard Bassindale			Friday 4th March	10.45	
Survey no.	Location				
3-LS-10	Mablethorpe				
GPS Grid Reference					
E: 000 16.176					
N: 53 20.123					
Digital photograph numbers					
DSC_1309	to	DSC_1333			
					Views from beach looking north east

1a Weather conditions	Sunny, dry
1b Visibility	Good, clear horizon
1c Sea conditions	Calm

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

This is a large scale landscape dominated by sea defences along the length of the visible coastline. The coastline is widely developed with residential and tourist development directly behind the sea defences and generally below sea level. The area has a general feel of a slightly run down resort.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

The beach is wide and open and heavily influenced by the sea defences along much of the coastline. The beach is natural, safe and settled, although quite monotonous in places.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

Off shore wind farms are clearly visible.
Coastal defences are a dominant element along much of the coastline.
Residential and tourism development along the coastline including beach huts, houses and caravan parks.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
The coast is east facing and flat and generally linear, the beach is flat and gently sloping.
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
The coastline is low lying and flat with the sea defences separating the sea from the developed land, much of which is below sea level.
3b Natural/human influences - Hydrological features, natural processes and human interaction
The area is heavily developed and influenced by the sea defences, coastal road and urban development around Mablethope. Wind farms are clearly visible. Coastal defences including sea walls and timber groynes are present along much of the coastline.

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
The sea defences also provide use as a coastal path. Beach huts and small commercial outlets lie close to the centre of the settlement. Views from the beach are restricted to views along the shoreline and out to sea. However access to the shoreline is restricted due to the unstable cliffs.
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
No marine activity was visible on the day of the survey.
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1		Beach			Notes: Wide open and flat sandy beach
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 2		Sea defences			Notes: All defences appear well maintained
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 3					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 4					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 5					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 6					Notes:
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1					Notes:
Implications on character / key characteristics					
Widespread	Yes	Localised		Limited	
Seascape dynamic 2					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 3					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 4					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	

Character area 7 - East Midlands Coastal Waters - Representative sea survey

1 - Housekeeping

Surveyor name		Date	Time	Representational photograph
Mark Salisbury		Thursday 24.03.11	14.10	
Survey no.	Exit Harbour	Distance from shore		
3-SS-13	Grimsby	0.75NM		
GPS Grid Reference				
E: 000° 21.32				
N: 53° 14.10				
Digital photograph numbers				
IMG_0625 to IMG_0644				View looking west.

1a Weather conditions	No wind, sunny, clouds in distance over land.
1b Visibility	Excellent, 20km+
1c Sea conditions	Flat calm

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

Smooth, horizontal character by merit of consistent low landform and panoramic views. Simple in variety, natural, remote, exposed feel to the seascape. Expansive but non-imposing, monochrome land influence which creates a sense of balance.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

Settled marine character. Natural character with natural features such as sand dunes. Non-imposing and relatively sparse human influence. Panoramic views of generally moderate scenic quality.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

To the north onshore wind turbines and to the south a fairground roller coaster as part of Butlins resort, Offshore, extensive offshore wind farm in distance. Dunes and dune vegetation limit a lot of views of hinterland.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
Large scale linear extensive coastline. Extremely low, very little hinterland visible.
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
Very flat and low topography with a moderate sandy intertidal zone.
3b Natural/human influences - Hydrological features, natural processes and human interaction
Brown sediment laden water, sand dunes suggest sediment deposition.

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
Wind power, tourism, beach activities.
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
Seals were prolific. Private fishing observed. Wind power.
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed
None recorded.

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1		Dunes			Notes: High quality natural feature which appears well appreciated (walkers observed).
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1		Erosion and deposition			Notes: Dunes create a dynamic and wild character which changes with weather conditions and seasonal variations.
Implications on character / key characteristics					
Influences nature of the coastal interface					
Widespread		Localised		Limited	

Character Area 8 - The Wash - Representative land survey

1 - Housekeeping

Surveyor name			Date	Time
Richard Bassindale			Thursday 3rd March	15.38
Survey no.	Location			
3-LS-27	Butterwick			
GPS Grid Reference				
E: 000 05.904				
N: 52 58.242				
Digital photograph numbers				
DSC_1224	to	DSC_1246		

Representational photograph

Views from sea wall looking south east

1a Weather conditions	Grey, overcast, windy
1b Visibility	Poor/ Moderate, Horizon Blurred
1c Sea conditions	Not visible

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

The landscape is dominated by the expansive salt marshes within the intertidal zone, which create a textured, vast and uniform landscape dominated by the horizontal plane with no significant vertical elements between the sea defences and the sea. Inland the area is dominated by agriculture with large fields, virtually no hedgerow and small woodland blocks which create a balanced and calm landscape.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

The sea banks which separate the agricultural land from the salt marshes offer long and expansive views in all directions. Views of the sea are difficult due to the significant distances involved, especially at low tide. The area is isolated and very quiet, giving a feeling of exposure in an inspiring landscape. Although the presence of the sea banks creates a sense of safety for the low lying inland areas, the area is subject to 'managed realignment' of the flood defences to reduce the potential for a breach of the defences. The salt marshes are of high scenic quality and is a rare UK habitat.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

Ships are visible within the Wash and distant views of the coastline to the south east are just visible.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
The area faces the Wash and is extensively defined by salt marsh and mud flats.
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
The location and surrounding environment is dominated by reclaimed land and intertidal areas of mud flats.
3b Natural/human influences - Hydrological features, natural processes and human interaction
The estuary is large and open with an extensive intertidal zone of salt marshes. The shoreline was barely discernable on the horizon.

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
There is a large car park on the on the edge of the sea banks, which appears to be used by local dog walkers and bird watchers. Inland intensive agriculture dominates the land use.
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
Commercial shipping was visible on the horizon within the Wash.
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed
An area of land between the previous sea bank (now purposely breached) and the new sea banks has been allowed to develop as salt marsh and is designated a Nature Reserve (Freiston Shore). The area inland of the sea defences has historically been subject to land reclamation

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1		Sea Bank			Notes: Large earth sea bank along the landward edge of the salt marsh.
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 2					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 3					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 4					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 5					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 6					Notes:
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1		Port/ Harbouring			Notes:
Implications on character / key characteristics					
Existing area heavily influenced by port activities					
Widespread		Localised		Limited	
Seascape dynamic 2					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 3					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 4					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	

Character area 8 - The Wash - Representative sea survey

1 - Housekeeping

Surveyor name		Date	Time
Mark Salisbury		Thursday 24.03.11	11.03
Survey no.	**Exit Harbour**	**Distance from shore**	
3-SS-15	Grimsby	4NM	

GPS Grid Reference
E: 000° 21.69
N: 52° 59.13
Digital photograph numbers
IMG_0575 to IMG_0591

Representational photograph

View looking south.

1a Weather conditions	Sunny, very cold and calm.
1b Visibility	Excellent, 20km+ but landward difficult to determine, low sea mist.
1c Sea conditions	Flat calm

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

Very smooth, still water and flat topography. Large scale but a feeling of enclosure i.e. sliver of land surrounding. Fairly uniform and monochrome. Balanced and calm.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

Natural character by merit of few dominant human influences. Vacant and inaccessible feel. Monotonous and non-descript by nature of few visual cues. Low scenic quality with panoramic views induced by nature of a low horizon.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

Windfarm turbines in the distance on land (to the north). Navigation buoys (Roaring Middle) and fishing buoys. Offshore wind turbines (inner dowsing) to the north are still perceptible.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
Large estuary, land very difficult to distinguish to the north.
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
Extremely low lying, very little land could be seen. To the east elevated ridge was noticeable as a muted land mass.
3b Natural/human influences - Hydrological features, natural processes and human interaction
Low band of sea mist (common) prevents a majority of views. Currents/surface water colouration noticed with sediment disturbance appearing as "mud clouds". Very shallow waters precluded access.

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
Very limited views of land. Onshore wind energy developments.
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
Fishing boats, fishing buoys, container vessels and commercial shipping observed. Offshore wind energy developments.
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed
Treacherous waters in places. Known as "The Wash" between Hunstanton and Gibraltar point. Navigation outside the main channel is difficult and relies on all the main instrumentation. Known for its wildlife.

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1					Notes:
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1		Tide			Notes: Tides determine whether mud/sand flats are visible. This affects the perception of seascape as either extensive mudflats or open water.
Implications on character / key characteristics					
State of the tide determines the exposure of mud flats					
Widespread		Localised		Limited	
Seascape dynamic 2		Weather			Notes: Low bands of sea mists are common over land and sand flats and these preclude a majority of views of land.
Implications on character / key characteristics					
Southerlies create extremely rough waters, sea mists common over land areas create a more remote character.					
Widespread		Localised		Limited	
Seascape dynamic 3		Wildlife activities			Notes: Wildlife flocking creates a very natural, remote, wild character. Migration/seasonal variation affects this. Heavily fished area because of lobster/crab populations. Seasonal variation because of boat activity.
Implications on character / key characteristics					
Presence of wildlife i.e. large flocks of birds and shellfish proliferation determine natural character/fishing character					
Widespread		Localised		Limited	

Character Area 9 - Norfolk Coastal Waters - Representative land survey

1 - Housekeeping

Surveyor name			Date	Time
Richard Bassindale			Thursday 3rd March	9.21
Survey no.	Location			
3-LS-19	Sea Palling			
GPS Grid Reference				
E: 001 35.602				
N: 52 47.667				
Digital photograph numbers				
DSC_1047	to	DSC_1076		

Representational photograph

Views from the crest of the dunes, looking east.

1a Weather conditions	Overcast, windy
1b Visibility	Moderate, Horizon Blurred
1c Sea conditions	Choppy, waves visible

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

The shoreline is backed by a large dune which prevents views of the sea from inland and vice versa. Views from the crest of the dune are long and expansive, with large flat and expansive areas inland including scattered settlements and agriculture clearly visible. The dunes are heavily managed and protected by off-shore rock reefs which are resulting in sand accretion. The beach side of the dunes are intimate due to the development of a series of bays. The rock reefs have resulted in the creation of a series of sandy bays at the base of the dune, giving the local area a sense of intimacy.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

The beach is very quiet, with the sound of the sea being the only sound audible. This has created an intimate and remote yet safe feeling environment where views are limited to the near distance by the small bays along the shoreline and seawards views are dominated by the rock reefs and navigational lights.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

Views are contained by the dunes, groynes and rock reefs, from the crest of the dune church spires are major landmarks in the landscape to the south.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
The east facing beach consists of small bays, rock reefs and a low sea wall constructed along the base of the dune system, the wider landscape behind the dune is generally low and flat.
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
The sandy beach is relatively narrow with numerous small bays along the extent of the area protected by the off shore rock reefs. The accretion of sand along the shoreline between the reefs is extending the beach and dunes seawards. The 'wrap around' nature of these bays gives a perception of being lower than the horizon when stood at the waterline.
3b Natural/human influences - Hydrological features, natural processes and human interaction
The sea defences dominate the shoreline causing the deposition of sand along the beach, resulting in the extension of the dune system. The settlement of Sea Palling lies approximately at the middle point of the length of sea defences, extending inland. The sea water is brown and murky.

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
The coastline along this point has a mix of tourism and residential development, agriculture and small woodland blocks. The dune crest shows evidence of being used for walking.
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
None visible
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed
None

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1		Dune			Notes: Condition based on visual condition only
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 2		Rock reefs			Notes: Large vertical structure locally prominent from the beach
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 3		Navigation Beacons			Notes: condition unknown due to distance from shore, it is presumed they are operational.
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 4					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 5					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 6					Notes:
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1		Dunes			Notes: Sea defences suggest dunes are at risk of erosion, although the beach is now expanding due to sand accreting between the rock reefs
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 2					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 3					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 4					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	

Character area 9 - Norfolk Coastal Waters - Representative sea survey

1 - Housekeeping

Surveyor name		Date	Time
Mark Salisbury		Friday 04.03.11	11.11
Survey no.	**Exit Harbour**	**Distance from shore**	
3-SS-27	Lowestoft	2.5NM	
GPS Grid Reference			
E: 001° 45.680			
N: 52° 43.687			
Digital photograph numbers			
IMG_0194 to IMG_0217			

Representational photograph

View looking West.

1a Weather conditions	Light NE wind, cloudy, very cold
1b Visibility	8nm, cranes in Lowestoft visible
1c Sea conditions	Calm

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

Large scale expansive seascape with a uniform character due to the relatively consistent low landform. Relatively balanced despite varied elements and features protruding above a low landward horizon.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

Quiet, natural coastal interface. Remote, wild character with dunes demonstrating a temperamental wild sea. High quality panoramic views.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

Water tower visible as a horizon feature to the south. Scroby Sands wind farm also very noticeable. Onshore wind farm also notable behind a dominant church tower. Sand dunes and small linear woodland belts notable consistent elements. Features on the seaward horizon are just about perceptible but very distant (probably shipping but may be gas platforms). Horizon clearer and less interrupted.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
Extensive east facing linear coastline.
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
Very flat, low sandy/muddy cliffs and sand dunes at the coastal interface.
3b Natural/human influences - Hydrological features, natural processes and human interaction
Green and fairly clear water. Natural character to the coastal interface with little noticeable human influence.

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
Beach activities (dog walking etc.) Wind power
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
Wind power. Commercial ship also noted.
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1					Notes:
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1		Wind power developments			Notes: Several farms noticed, influencing coastal and marine activities i.e. construction transportation, cable laying etc.
Implications on character / key characteristics					
Wind farm developments creating a cumulative wind farm character					
Widespread		Localised		Limited	

Character Area 10 - Suffolk Coastal Waters - Representative land survey

1 - Housekeeping

Surveyor name			Date	Time
Richard Bassindale			Thursday 3rd March	2.28
Survey no.	Location			
3	Thorpeness			
GPS Grid Reference				
E: 001 37.035				
N: 51 10.759				
Digital photograph numbers				
889	to	917		

Representational photograph

View from beach, looking north.

1a Weather conditions	Overcast/ occasional sun, Windy
1b Visibility	Moderate, Horizon Blurred
1c Sea conditions	Choppy

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

Wide shingle beach with a distinctive series of steps which slope sharply towards the waterline. The views along the coast, both north and south are unified, with no obvious changes in the character of the beach evident. The views are large scale with the sea dominating and muted colours along the shoreline. There is distinct development along the coastal edge, with well maintained and colourful properties standing out from the clapper board and clay pan tile roofs properties elsewhere within the village of Thorpeness. There are a relatively high number of high quality properties which give the village a feel of exclusivity.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

The intertidal zone is a generally quiet are with the dominating noise being the sea. The range of properties and facilities within the village and along the sea front gives a feeling of high quality to the area. The marine environment appears settled and safe at first glance, however, stepped shingle beach also suggests that the environment is highly dynamic. The lack of other development along the coastline adds to the feeling of remoteness during the site visit, however, the facilities available within the village suggest the area would be busy during the summer months.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

There is distinct colourful sea front development with brightly coloured concrete/ rendered houses.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
The east facing beach part of a long shallow bay, which is part of a larger generally linear coast.
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
Steeply stepped shingle beach, backed by sloping dunes/ low cliffs generally vegetated by grass and scrub. Along the shoreline the shingle is replaced by sand.
3b Natural/human influences - Hydrological features, natural processes and human interaction
The water is brown and murky. Thorpeness is a designed village generally constructed c.1920 and is a significant tourist attraction which includes a golf course, country club, the mere (a large man-made boating lake) and 'The House in the Clouds'

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
Settlement/ tourism within the small settlement of Thorpeness, the surrounding landscape is low lying and generally dominated by agriculture and small blocks of woodland.
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
None visible
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed
Thorpeness designed village

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1		Beach			Notes: Extensive shingle beach
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 2		Sea Front properties			Notes: Very well maintained high quality housing and small number of hotels and a country club.
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 3					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 4					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 5					Notes:
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 6					Notes:
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 2					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 3					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	
Seascape dynamic 4					Notes:
Implications on character / key characteristics					
Widespread		Localised		Limited	

Character area 10 - Suffolk Coastal Waters - Representative sea survey

1 - Housekeeping

Surveyor name		Date	Time	Representational photograph
Mark Salisbury		Thursday 03.03.11	10.05	
Survey no.	Exit Harbour	Distance from shore		
3-SS-32	Lowestoft	1.75NM		
GPS Grid Reference				
E: 001º 39.919				
N: 52º 11.279				
Digital photograph numbers				
IMG_0104 to IMG_0115				
				View looking west towards Sizewell Power Station

1a Weather conditions	Heavily overcast, sea mist and NE moderate wind.
1b Visibility	Poor visibility, 6-8km maximum (Aldeburgh landmarks).
1c Sea conditions	Rough, 1-2m swell

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

Textured, diverse activities at coastline contrasting with the large scale marine character. Typically uniform appearance of water becomes more fragmented further out to sea because of boat/ship activity and is influenced close to shore by the diversity of built form on land. Very open and monotonous colour.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

Land barely discernable but large landmark features can be seen as monochrome blocks. Loud natural noise created by wind/water action. Natural character broken by presence of boats and man made infrastructure. Unsettling feel with turbid water and gloomy atmospheric conditions and blurred view of land. Low scenic quality and panoramic views because of low uniform horizon.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

Sizewell power station and associated electricity pylons. White dome is prominent despite gloomy conditions. Seaward, there are no permanent landmarks but fishing activity was recorded.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
East facing extensive linear coastline.
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
Flat topography with no real high points. Detail of intertidal zone is not distinguishable. No exposed geology visible.
3b Natural/human influences - Hydrological features, natural processes and human interaction
Water brown and sediment laden. Port/harbouring noticeable as was a tourism/residential function.. Nuclear power station is also a very imposing feature.

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
Small coastal settlement. Nuclear power station.
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
Fishing. Bird activity much more concentrated.
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed
Nuclear power station is a well known feature of the coastline and fishermen would use it as a visual cue.

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1		Power station			Notes: Although detail wasn't discernable, the character of the structures created a very disjointed feel to the seascape character.
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1		Fuel prices/economic activity			Notes: Ship activity within the sea view.
Implications on character / key characteristics					
Influences the number of tankers at anchor and business of shipping lanes.					
Widespread		Localised		Limited	
Seascape dynamic 2		Fishing Industry Pressures			Notes: Caused by increased fuel prices, fishing quota regulations etc.
Implications on character / key characteristics					
Reduction in the marine activity					
Widespread		Localised		Limited	
Seascape dynamic 3		Winds/weather conditions			Notes: NE winds create unpredictable weather. Rough water changes perception and experience.
Implications on character / key characteristics					
Visibility of land minimised and experiential qualities worsened					
Widespread		Localised		Limited	
Seascape dynamic 4		Energy & communication			Notes: Further infrastructure would further impose of the natural character.
Implications on character / key characteristics					
Addition/removal of infrastructure					
Widespread		Localised		Limited	

Character Area 11 - Jurassic Coastal Waters - Representative land survey

1 - Housekeeping

Surveyor name	Date	Time	Representational photograph
Mark Salisbury	Friday 25.02.11	15.11	
Survey no.	Location		
6-LS-04	Seaton Bay beach front		
GPS Grid Reference			
W: 003º 04.143			
N: 50º 42.207			
Digital photograph numbers			
IMG_0060 to IMG_0063			
			View looking west towards Beer.

1a Weather conditions	Light drizzle, overcast and strong southerly wind.
1b Visibility	Poor, no visual cues.
1c Sea conditions	Moderate, waves choppy close to shore.

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

Rough texture created by the cliffs/shingle. Intimate, enclosed, isolated character created by enclosing landform. Colourful character with exposed cliffs and shingle. Active, busy coastal frontage. Consistency in activities and features creates a sense of balance.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

Intimate, safe character created by enclosure but prevailing sea winds, a temperamental marine character and natural noise caused by waves crashing close to shore creates an open and exposed quality. Inspiring Jurassic cliffs at close quarters are scenically outstanding and these channel views to a large featureless seascape horizon.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

Onshore, the chalk cliffs to the west and the red/black vegetated slumped cliffs to the east are landmark features. The cliff top Caravan park at Beer to the west is also a very prominent feature. Seaward the horizon is featureless.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
South facing moderate sized bay. Visibility poor, but landform channels views.
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
Steep cliffs at the edges of the bay project into the sea. White chalk cliffs to the west and red/black vegetated slumped cliffs to the east. There is a relatively narrow intertidal zone which consists of a shingle upper shore and sandy foreshore.
3b Natural/human influences - Hydrological features, natural processes and human interaction
Water is brown / blue close to shore and murky green beyond. Sea defences include a concrete sea wall, riprap around the base of cliffs. The sea frontage is marked by tourism and residential development and this is generally sprawling in nature with concentrations at the waters edge.

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
Tourism orientated sea frontage. Activities observed included dog walking, running and sightseeing. Settlement sprawls up the hillsides. Large cliff top caravan park to the west. Agriculture/forestry observed on hillsides.
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
Marine activities observed included fishing boats on the horizon.
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1		Beach			Notes: The beach was well kept, very clean and well used
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 2		Seafront promenade			Notes: Well maintained and popular. High quality materials and provisions available.
Excellent	Good	Declining	Poor	Derelict	
Seascape feature 1		Cliffs			Notes: Although suffering from erosion, the characteristic cliffs which add to the character and sense of place is the result of the erosion
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1		Erosion and deposition			Notes: Erosion is visible by some exposed rock faces.
Implications on character / key characteristics					
Potential to dictate further sea defences.					
Widespread		Localised		Limited	
Seascape dynamic 2		Tourism/residential			Notes: Suburban sprawl visible on higher ground promotes the further loss of wild characteristics.
Implications on character / key characteristics					
Popularity puts pressure for further development and increased activity at the coastal edge.					
Widespread		Localised		Limited	

Character Area 11 - Jurassic Coastal Waters - Representative sea survey

1 - Housekeeping

Surveyor name		Date	Time
Mark Salisbury		Thursday 24.02.11	15.45
Survey no.	**Exit Harbour**	**Distance from shore**	
6-SS-06	Exmouth	5.5NM	
GPS Grid Reference			
W: 003° 14.261			
N: 50° 32.184			
Digital photograph numbers			
IMG_0028 to IMG_0032			

Representational photograph

View north towards cliffs at Budleigh Salterton

1a Weather conditions	South westerly 4-5, sunny, very cold, low clouds
1b Visibility	Good, land clear and some development visible as patches of colour
1c Sea conditions	Choppy/rough

2 - Aesthetic Qualities - refer to prompt sheet

2a Aesthetic qualities - Record the aesthetic qualities of the seascape

Textured seascape. Land/horizon elements starting to influence the scale and unity of the seascape. Fairly simple character with land detail and colour beginning to become apparent.

2b Perceptual qualities and Local Distinctiveness - Record perceptual qualities of the seascape and the degree of local distinctiveness

Temperamental marine character, but the presence of boats and visual connection with development on land creates a sense of security and enclosure. Moderate scenic quality with wide views. Remote character, but glimpses of red colour on the cliffs add interest.

2c Major landmarks - Inland/coastal/seaward landmark features and positive/neutral/negative contributions to character

Buddleigh Salterton and Sandy Bay caravan park very clear. Land generally muted in colour and detail except when light catches the red cliffs. Fishing buoys common. Seaward horizon is featureless.

3 - Physical Influences - refer to prompt sheet

3a Coastal form - Coastal aspect, scale of the coast and coastal geography
South facing large bay.
3b Topography and Geology - Landform, Geological observations and nature of intertidal zone/shoreline
Rolling hinterland beginning to become apparent. Red exposed cliffs perceptible in good light.
3b Natural/human influences - Hydrological features, natural processes and human interaction
Water is green/blue and murky. Coastal towns and caravan parks visible.

4 - Activity - refer to prompt sheet

4a Coastal activity - Describe visible activity at the sea/land interface and receptors of the seascape character
Caravan parks and coastal towns visible but detail isn't easy to make out.
4b Marine activity - Describe visible activity on the sea and receptors of the seascape character
Fishing. Scallop trawlers and sprat boats noticed. Bird life was also prolific with Guillemots, Gannets and gulls noticed.
4c Cultural associations - Record details of any incidental associations with the sea/coastline observed
Scallop and fishing grounds.

5 - Seascape Condition and Seascape Dynamics

5a Seascape condition - Assess the condition of the seascape by reference to named features and determine overall condition					
Seascape feature 1		Cliffs			Notes: Interesting feature that creates red flashes on the horizon when light permits.
Excellent	Good	Declining	Poor	Derelict	

5b Seascape Dynamics - Identify dynamics which are influencing the character of the seascape					
Seascape dynamic 1		Fishing Industry Pressures			Notes: Caused by increased fuel prices, fishing quota regulations etc.
Implications on character / key characteristics					
Reduction in the amount of fishing activities and potentially birdlife					
Widespread		Localised		Limited	

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Appendix 10 – Glossary

Biodiversity Action Plans BAP and Local Biodiversity Action Plans LBAP

The UKBAP describes the biological resources of the UK and provides detailed plans for conservation of these resources, at national and devolved levels. Action plans for the most threatened species and habitats have been set out to aid recovery, and reporting rounds show how the UKBAP has contributed to the UK's progress towards the significant reduction of biodiversity loss called for by the CBD. LBAP's are county specific action plans for habitats and species

National Nature Reserves

Many of the finest sites in England for wildlife and geology are National Nature Reserves. There are currently 224 across the country and almost all are accessible and provide great opportunities for people to experience nature.

RAMSAR sites

Ramsar sites are wetlands of international importance designated under the Ramsar Convention. Sites proposed for selection are advised by the UK statutory nature conservation agencies, or the relevant administration in the case of Overseas Territories and Crown Dependencies, co-ordinated through JNCC. In selecting sites, the relevant authorities are guided by the Criteria set out in the Convention

Sites of Special Scientific Interest

SSSIs are the country's very best wildlife and geological sites. They include some of the most spectacular and beautiful habitats; wetlands teeming with wading birds, winding chalk rivers, flower-rich meadows, windswept shingle beaches and remote upland peat bogs. There are over 4,100 Sites of Special Scientific Interest (SSSIs) in England, covering around 8% of the country's land area. More than 70% of these sites (by area) are internationally important for their wildlife (Natural England 2011).

Special Area of Conservation

The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds). Of the Annex I habitat types, 78 are believed to occur in the UK. Of the Annex II species, 43 are native to, and normally resident in, the UK.

Special Protection Area's

Special Protection Areas (SPAs) are strictly protected sites classified in accordance with Article 4 of the EC Birds Directive, which came into force in April 1979. They are classified for rare and vulnerable birds (as listed on Annex I of the Directive), and for regularly occurring migratory species.

Further clarification of acronyms and terminology relating to marine, nature and fisheries is referenced in the following document: Anon. 2001 *A glossary of Marine Nature Conservation and Fisheries. Countryside Council for Wales*, Bangor which can be found at http://jncc.defra.gov.uk/pdf/glossary.pdf

Annex 1 – Limitations and Scope for Further Work

Please refer to supporting document.

Annex 2 – Lessons Learnt and Methodology Development

Please refer to supporting document.

Annex 3 – Field Survey Record Sheets and Maps

Please refer to supporting document.