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Historic Seascape Characterisation
South West Peninsula

Section 1
Implementing the Method

Historic Environment Projects

Historic Seascape Characterisation South West Peninsula

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Report Structure

The Project Report for 'Historic Seascape Characterisation: South West Peninsula' is divided into three sections for ease of use. The first section outlines the project's method implementation, the second section outlines an applications review and case studies, and the third section contains printed versions of the Character Type text descriptions from national and regional perspectives.

This document comprises Section 1 of the 'Historic Seascape Characterisation: South West Peninsula' Report: Implementing the Method'.

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The views and recommendations expressed in this report are those of Historic Environment Projects and are presented in good faith on the basis of professional judgement and on information currently available.

Freedom of Information Act

As Cornwall Council is a public authority it is subject to the terms of the Freedom of Information Act 2000, which came into effect from 1st January 2005.

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Cover illustration

Surfer walking across Porthcothan Beach, Cornwall (Dave Hooley)

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Executive summary

The South West Peninsula Historic Seascape Characterisation (HSC) Project, funded by National Heritage Protection Commissions Programme, English Heritage, is one of three projects commissioned to complete strategic-level HSC coverage of England's coasts, Inshore and Offshore Regions in accord with the national HSC Method (Tapper 2008, Tapper and Hooley 2012), extending and applying the principles already underpinning Historic Landscape Characterisation (HLC) to a range of areas of the English coast, seas and adjacent waters. In doing so, this project connects two HSC project areas undertaken previously (Taylor *et al* 2011; Dagless and Dellino-Musgrave 2011).

The robust national method for HSC is attribute-led, assessing and defining areas that share similar and recurrent historic character as Historic Seascape Character 'Types', allowing an understanding of historic trends and processes to inform and frame the broader sustainable management of change through marine spatial planning, outreach and research projects.

The HSC approach takes a holistic view of the historic seascape which, among many other benefits, facilitates comparison with other comprehensive environmental databases, gives it greater meaning and connectivity with the landscape and seascape perceptions of others, and allows it to provide context for the often 'point-based' datasets available for the marine zone. The resulting product is designed to enable more culturally-informed management of the marine environment and raise public awareness of the historic cultural dimension of the sea.

This project successfully displays the implementation of the national HSC Method (Tapper 2008; Tapper and Hooley 2012) across an extensive area and provides further effective practical demonstration of the method's operation and capabilities.

1 Introduction

The *South West Peninsula Historic Seascape Characterisation (HSC) Project*, funded by National Heritage Protection Commissions Programme, English Heritage, is one of three projects commissioned in 2012 to complete strategic-level HSC coverage of England's coasts, Inshore and Offshore Regions using the national HSC methodology (Tapper 2008, Tapper and Hooley 2012). In doing so the project also contributes towards a national HSC database to be consolidated for that coverage by English Heritage.

Throughout this Report, 'landscape' is defined, in accordance with the European Landscape Convention as: 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors' (Council of Europe 2000, Article 1). 'Seascape' is defined here as a subset of 'landscape' so defined, one which includes the sea, and/or areas of land whose character is perceived to be distinctly maritime. This includes areas of former land now submerged and existing in a marine context.

The HSC approach takes a holistic view of the historic seascape which, among many other advantages, facilitates comparison with other area-based understandings whether held in the perceptions of those with differing interests or in comprehensive databases relating to other aspects of the environment. This gives HSC greater meaning and connectivity with the landscape and seascape perceptions of others, and allows it to provide context for the often 'point-based' datasets available for the marine zone. The resulting product is designed to enable more culturally-informed management of the marine environment and raise public awareness of the historic cultural dimension of the sea.

The national method for HSC is attribute-led, defining areas that share similar and recurrent historic character as Historic Seascape Character 'Types', allowing historic trends and processes to inform and frame the broader sustainable management of change through marine spatial planning, outreach and research projects.

This Section of the Project report aims to describe the implementation, in close communication with the Project Steering Group, of the revised working draft of the national HSC method (Tapper and Hooley 2012) across the project area.

2 Background

2.1 Historic Landscape Characterisation and Historic Seascape Characterisation

Historic Landscape Characterisation (HLC) is a method of assessing and classifying an archaeologist's view of the historic cultural landscape as an aid to informing the management of the environment overall. The approach brings together historic and natural environmental datasets in a GIS format to enable the interpretative assessment of 'Types' of historic landscape character and the areas in which they are expressed. This method encourages the interpretation of data in a manner transcending their isolated expressions to encourage the identification of recurring trends which characterise the historical and cultural landscape.

The landscape is characterised by HLC according to a series of recurring 'Types' reflecting the dominant historic cultural processes which shape our perceptions of an area's present character. It is designed to inform a broad range of applications including spatial planning, conservation and wider approaches to heritage management

which emphasise the positive advantages for everyone's quality of life in raising understanding and maintaining the cultural legibility of the world we inhabit.

Historic Landscape Characterisation has now been completed across almost all of England's land area. Historic Seascape Characterisation draws on the same core principles as underpin HLC (Tapper 2008, Tapper and Hooley 2012) to characterise the historic cultural dimension of marine and coastal historic landscape.

2.2 Characterising the marine zone

The HSC Method, while maintaining the historic characterisation principles also used in HLC, recognises the need for different expressions of those principles in the coastal and marine environment.

The coastal zone to landward and seaward of mean sea level is an area of overlapping, not abutting, terrestrial and maritime perceptions, demanding assessment of both landward and seaward perspectives, and requiring interoperability between the overlapping HSC and HLC coverage.

The marine environment provides a number of distinct differences from land for historic character assessment. Methods developed and used to apply characterisation principles in terrestrial and near-shore HLC require adjustment in order to apply the principles effectively to offshore areas. Some of the key aspects of the coastal and marine landscape relevant to this include:

- Understanding how marine landscape is perceived in contrast with that of terrestrial landscapes.
- The sea contains several tiers whose historic character can vary greatly for any given area. The character of the sub-sea floor, sea floor, water column and sea surface each needs to be understood in its own right.
- The dynamism of the marine environment: the inter-tidal and marine zone is often highly dynamic and changes due to physical processes such as currents, tidal range and sediment mobility. One of the knock-on effects of that, combined with its tiered three-dimensionality, is to produce complex spatial relationships within and across marine levels, and between the sites of cultural activity and their material imprints.

The pace, scale and range of coastal and marine development are rapidly increasing, as are concerns to bring our relationship with the marine environment onto a more sustainable footing. The UK now has the legislative and policy framework for forward-looking, plan-led sustainable management of the marine and coastal zone with the provisions of the Marine and Coastal Access Act 2009, the High Level Marine Objectives (HM Govt 2009) and the Marine Policy Statement (HM Govt 2011). The Marine Management Organisation (MMO), charged with implementing that framework across England's Inshore and Offshore Regions, amongst other areas, has embarked on a programme of Marine Plan preparation due to complete in 2021, commencing with the East and South Marine Plans (http://www.marinemanagement.org.uk/marineplanning/index.htm). Having HSC in place benefits that process by bringing a comprehensive historic cultural understanding to its necessary seascape and historic environment considerations but through interoperability with other datasets, it also enables a clearer view of how man's activities have shaped present expressions of the natural environment.

A nationally applicable method for HSC was developed through pilot projects, method-review and consolidation, then fully documented in 2008 in a Method Statement (Tapper 2008) and Report (Tapper and Johns 2008). Project-based implementation of the HSC method at a strategic level to England's coastal zone and the English inshore and offshore regions will, by early 2014, complete national coverage by HSC, making it available to inform its range of coastal and marine applications (see Section 2 of this Project Report).

By the start of this HSC project, that national HSC implementation covered approximately 60% of England's coasts, inshore and offshore regions by five ALSF-funded HSC projects (Merritt and Dellino-Musgrave 2009; Oxford Archaeology South 2011; Dagless and Dellino-Musgrave 2011; Taylor *et al* 2011; Newcastle University 2011). Together these offered a substantial body of practical experience to complement the HSC Method Statement as guidance to future projects. Meanwhile, the Method Statement itself, while maintaining its approach and overall structure, has undergone some inevitable updating in the light of the same experience to produce a revised working draft (Tapper and Hooley 2012), reflecting feedback from that practical implementation and the major ongoing developments in marine planning contexts.

Recognising the historic seascape character variation potentially present at differing levels in the marine environment, and the presence of HSC on land, the HSC Method Statement prescribes the following classification within the recorded attributes (Tapper 2008; Tapper and Hooley 2012):

- Sub-sea floor HSC: identifying the dominant historic character beneath the sea floor veneer;
- Sea floor HSC: identifying the dominant historic character within or directly on the sea floor veneer;
- Water column HSC: identifying the dominant historic character across the vertical height of the water column;
- Sea surface HSC: identifying the dominant historic character of the surface of the water;
- Coastal land HSC: identifying those areas of coastal land above Mean Low Water (MLW) which have a distinctly maritime historic character, whether in common with, or differing from, their dominant character from a land-based perspective; and
- Previous HSC (recorded where information bearing on it is available).

The time depth of the assessed historic seascape character is recorded in the attributes in two main ways in the national HSC Methodology: by recording in the 'Period' attribute the date at which an area adopted its present character, and by recording multiple expressions of 'Previous HSC' for a given area where available evidence bears on that (Tapper and Hooley 2012, 3.3.2).

Similarly, the contrast between the spatial expressions of Character Types and the available and appropriate mapping frameworks for the coastal, intertidal and marine zones has been recognised and accommodated within the national HSC Methodology (Tapper and Hooley 2012) by mapping expressions of coastal and intertidal Character Types using polygons, whereas below MLW, Character Type expressions are held in a vector grid mesh. This approach has also encouraged a more seamless transition between HLC and HSC by matching the extents of character polygons between the two datasets above MLW where possible.

3 Aims and objectives

The Aims and Objectives of the HSC South West Peninsula HSC project, as specified in the Project Brief (English Heritage 2011a), are outlined below.

3.1 Overall Aim

The project's overall aim was:

- To contribute to completion of England's national HSC coverage by using the national HSC method to undertake a GIS-based characterisation of specified areas of England's coast, inshore and offshore regions.

3.2 Specific Aims

The project's more specific aims were:

- To implement the national HSC method to create a GIS-based characterisation of the historic and archaeological dimension of the present seascape across the full extent of the project's area and consistent with its seamless integration with outputs from other HSC projects which have already contributed to the national HSC database.
- To demonstrate, through an applications review, how HSC produces a framework of understanding which will structure and promote well-informed decision-making relating to heritage protection and the sustainable management of change affecting the historic environment in the coastal and marine zones.
- To ensure that this project's implementation of HSC produces a GIS-database fully compliant with the principles of HLC, with the present and anticipated user-needs of English Heritage and with available standards for data content, management, inter-operability and accessibility being developed for the effective implementation of the Marine and Coastal Access Act 2009.
- To structure, inform and stimulate future research programmes and agendas relating to the coastal and marine historic environment.
- To create a resource that will improve the awareness, understanding and appreciation of the historic dimension of the coastal and marine environment to its professional and non-professional users.

3.3 Key Objectives

The project's key objectives were:

- To produce a GIS-based characterisation of the historic and archaeological dimension of the present seascape across the full extent of the specified project area, implementing the national HSC method in a manner enabling this project's outputs' consistent and seamless integration with the full range of other HSC project outputs already contributing to the national HSC database.
- To complement the HSC GIS and relational database with structured texts in Word format, documenting each Character Type in the project area from national and regional perspectives, in non-specialist language and supplemented by imagery and references. The texts will build on those already produced by projects contributing to the national HSC database and will be accessible both through links from the relevant GIS polygons and as a stand-alone resource forming a section of the project report.
- To undertake an applications review, analysing and interpreting the project's HSC database to identify from the project areas a range of contexts in which HSC should find application in the sustainable management of change, with particular reference to the protection of the coastal and marine historic

environment; the planning and other provisions of the Marine and Coastal Access Act 2009; advancing integrated coastal zone management (ICZM); meeting UK commitments from the European Landscape Convention; English Heritage's wider curatorial responsibilities, and raising public understanding of the coastal and marine historic environment.

- To produce in its report a reasoned account of those HSC contexts and applications as they apply in the project area, including scenario examples as appropriate.
- To produce an initial analysis and summary of inter-relationships between the project area's historic and natural characteristics and the benefits of having interoperable spatial datasets for each.
- To produce a Project Report and Archive documenting all aspects of the project's implementation of the national HSC method. Included within the Project Report will be:
    - a project method statement detailing the project's practical implementation of the national HSC method;
    - documentation of the project's applications review;
    - the initial summary of the relationships between the project areas' historic and natural environment character (if separate from the applications review);
    - the project's corpus of national and regional perspective Character Type texts, imagery and references.
- To detail in the Project Report's method statement the specific tasks and aspects of implementing the national HSC methodology across the project areas to meet the needs of transparency and to assist future updates against this initial benchmark characterisation. This will include records of the sources and data-sets supporting each stage of the characterisation, highlighting any which have not previously informed the national HSC database projects, and noting the inter-relationship between HSC and HLC where the latter has already been undertaken within the project areas.
- To disseminate information on the progress and results of the project by online web-page(s), a project flyer and, as suitable opportunities arise, through contributions to conferences and by other media.

4 Study area

The Project Area (Figure 1) was defined in the Project Brief (English Heritage 2011a) as follows:

The overall area to which the national HSC method has application comprises England's coastal land and the whole of English inshore and offshore regions as defined in the Marine and Coastal Access Act 2009 Section 322. For HSC, 'coastal land' comprises those areas above Mean High Water (MHW) which possess or possessed a distinctly maritime historic cultural character. Within that overall extent, this project will be limited to a single Project Area:

> The coastal land of, and English inshore and offshore regions off, England's south west peninsula between the areas already covered by two completed national HSC projects: that along the seas and coasts of southern England from Fairlight near Hastings, East Sussex to the Isle of Purbeck, Dorset (Dagless and Dellino-Musgrave 2011), and that along those of the English sector of the Bristol Channel and Severn Estuary (Taylor *et al* 2011).

The seaward and landward coverage by this project will extend to, but not overlap, that of the completed national HSC projects to each side. It is recognised that the boundaries of this Project Area reflect administrative and practical constraints, and do not reflect any division in the continuum of the historic environment.

Along the south coast and in the Bristol Channel, the eastern boundary of the Project Area along waters off the south coast will be defined by longitude W02°00' 00" to the point where it meets the outer boundary of England's offshore region at the junction with French waters. The north eastern extent of this Project Area along the Bristol Channel will be defined by a line from Hartland Point, Devon, at N51.02165, W4.524873 and extending due north west to the point where it meets the outer boundary of England's offshore region. Across the inter-tidal zone and to landward, those boundaries of the project area will be defined by straight continuations of the lines defining its marine extents, except that the project will not include the area of Poole Harbour which has already been covered by the Hastings–Purbeck HSC project.

The landward extent of the Project Area will reach at least the OS-mapped line of Mean High Water (MHW) but in accordance with the national HSC method, its coverage will continue landward beyond that line to accommodate inland areas perceived, from a maritime perspective, as possessing distinctively maritime historic cultural character. This could also result in the inclusion of some inland areas which are discontinuous with MHW, for example to accommodate inland features or areas serving as navigational daymarks, producing HSC polygons separate from the main body of the characterisation.

Subject to accommodation of inland areas perceived as possessing distinctive maritime historic cultural character, the estuaries, rivers and their tributaries within the Project Area will be included at least to their Normal Tidal Limits.

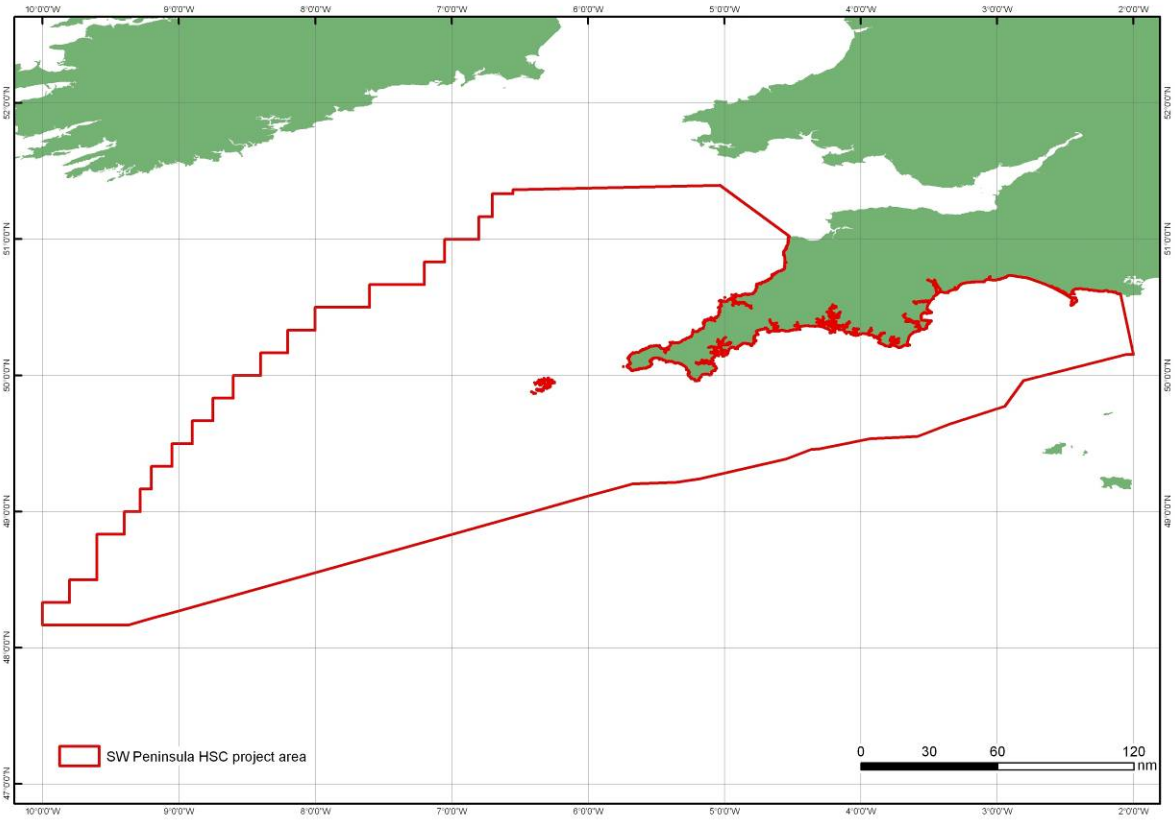

Fig 1 The South West Peninsula HSC project area

5 Interfaces

The project was undertaken in consultation with the English Heritage's Steering Group for this project (see p3 for members), and staff from English Heritage's South West office.

When required, further advice was also sought from those conducting the project officers of the two other HSC projects running concurrently with this one; Oscar Aldred of Newcastle University (the Humber, Lincolnshire and Norfolk) and Andrew Baines and Alan Ford of Cotswold Archaeology (the Thames Estuary and Kent).

Beyond the consultation with those noted above, the project was supplied data, given further guidance and advice from other organisations at various points during the project. These included:

- Cornwall Inshore Fisheries and Conservation Authority;
- Isles of Scilly Inshore Fisheries and Conservation Authority;
- Devon and Severn Inshore Fisheries and Conservation Authority;
- Southern Inshore Fisheries and Conservation Authority;
- ABPmer;
- English Heritage's GIS Team;
- English Heritage's Data Management Team;
- English Heritage Archive Team;
- Cornwall Council's Maritime Team;
- Cornwall Council's Historic Environment Record for Cornwall and the Isles of Scilly;
- Devon County Council's Historic Environment Record;
- Dorset County Council's Historic Environment Record;
- Torbay's Council's Historic Environment Record;
- Plymouth City Council's Historic Environment Record
- United Kingdom Hydrographic Office Archive;
- Falmouth Harbour Commissioners;
- Portland Port and Harbour Authority;
- Devon Maritime Forum; and
- Marine Management Organisation.

6 Methodology

The HSC methodology for the South West Peninsula project area was based upon the revised working draft of the national HSC Method Statement and HSC Character Type Structure (Tapper and Hooley 2012; version 2.4, dated 21/11/2012).

Further guidance was drawn from the HSC projects completed for the Bristol Channel and Severn Estuary area (Taylor *et al* 2011), Hastings to Purbeck (Dagless and Dellino-Musgrave 2011) and the Irish Sea (Newcastle University 2011), with advice also provided by English Heritage's Assessment Team.

The project area was completed in three stages corresponding to different sectors of the project area; the outermost limit of each was defined by the limit of England's offshore region. The three areas and their coastal extents were:

- Trial area (Lizard Point to Nare Head, Roseland, Cornwall; undertaken May to September 2012);
- Dorset and eastern Devon (St Aldhelm's Head, Dorset to Stoke Fleming, Dartmouth, Devon; undertaken January to March 2013); and
- Cornwall, the Isles of Scilly and the remaining parts of Devon (undertaken May to October 2013).

At the request of English Heritage the Dorset-eastern Devon area was completed by March 2013 to feed into the Marine Management Organisation's (MMO) preparation for the production of the South Marine Plan, in particular to inform its Seascape Assessment.

The final stage of the characterisation process amalgamated the three areas together and made final adjustments to the characterisation of the whole project area based upon feedback from the final Steering Group meeting (26 September 2013).

6.1 Methodology outline

Following the outline of the national method statement the description of the methodology employed in this project is discussed under the following sub-headings:

- Data Collation.
- Data Preparation.
- GIS Development.
- Database Development.
- Character Assessment.
- Development of Character-type Text Descriptions.

6.2 Data collation

6.2.1 Core data

The core data included datasets that currently or will, when completed, have consistent national coverage, with further emphasis placed on data available in a digital format. More localised or hard-copy source data available was treated as supplementary data.

The basic requirements for data collated were that:

- Sources were relevant and consistent;
- Core dataset coverage was national (or at least regional);
- Sources were treated in a consistent manner and even-handed way, following a clearly stated workflow in the national method, and were used to reflect time-depth and past change;

- Standard terminologies were used to maintain clarity meeting MIDAS/INSCRIPTION requirements;
- Consistent assessment and capture of historic seascape character was deployed;
- Common 'perception scale(s)' were established — that is, the scale at which characterisation is expected to be read and applied.

A list of core data sources used by the project is outlined below (Table 1) and are based upon those listed in Tapper and Hooley (2012, 15).

English Heritage supplied modern Ordnance Survey and historic Ordnance Survey Landmark data. A majority of data on offshore industry was obtained through SeaZone Hydrospatial via English Heritage.

Data description	Data format	Digital feature types	HSC Broad Types	Data Source(s)
Modern maritime charts	Digital/Hard copy	Polygon, points, polylines, raster images	Navigation, Industry, Ports and docks, Coastal infrastructure, Communications, Military, Recreation	SeaZone Solutions Ltd, Imray paper charts
Historic maritime charts and surveys	Digital and hard copy	Raster images	Navigation, Industry, Ports and docks, Coastal infrastructure, Communications, Military, Recreation	UKHO, Local Museums, Libraries and Record Offices
Modern Ordnance Survey mapping	Digital	Polygons, points, polylines, raster images	Navigation, Industry, Ports and docks, Coastal infrastructure, Communications, Military, Settlement, Recreation, Cultural Topography, Enclosed Land, Unimproved Grazing	OS via English Heritage
Historic Ordnance Survey maps (1st and 2nd OS Editions)	Digital	Raster images	Navigation, Industry, Ports and docks, Coastal infrastructure, Communications, Military, Settlement, Recreation,	Landmark via English Heritage

Data description	Data format	Digital feature types	HSC Broad Types	Data Source(s)
			Cultural Topography, Enclosed Land, Unimproved Grazing	
Digital Themed Chart Data • Bathymetry & elevation • Climate & oceanography • Natural & Physical features • Socio-Economic & marine use • Structures & Obstructions • Unassigned – Metafeatures and Cartography • UKHO (BGS, Military Practice and Exercise Areas, Offshore Installations, Wrecks and Obstructions)	Digital	Polygons, points, polylines	Navigation, Industry, Ports and docks, Coastal infrastructure, Communications, Military, Recreation	SeaZone Solutions Ltd via English Heritage
Adjacent County Terrestrial HLC data	Digital	Polygons		Cornwall Council, Devon County Council, Plymouth City Council, Torbay Council, Dorset County Council
AMIE shipwreck data	Digital	Polygons, points	Navigation	English Heritage Archive
Aerial photographs	Digital	Raster images		Cornwall Council, Channel Coastal Observatory
Fisheries data (offshore coastal	Digital	Polygons	Fishing	CEFAS

Data description	Data format	Digital feature types	HSC Broad Types	Data Source(s)
fishing effort and pressures)				
Environmental data and land classification, (semi-natural, marine habitat and seabed facies/biotope mapping)	Digital	Polygons, points	Woodland, Enclosed Land, Unimproved Grazing	CEFAS, Environment Agency, Natural England
Palaeolandscape mapping	Digital	Polygons	Cultural Topography	ABPmer
Commercial Shipping data	Digital	Raster images	Industry	Maritime and Coastguard Agency (AIS) from Maritime Data website
Commercial Shipping data	Digital	Polygons	Industry	Department for Transport (DfT)

Table 1 List of core data sources

Commercial Shipping data and the ABPmer's palaeolandscape mapping were included as core datasets within this project as they are available digitally, with a national coverage collated and produced with a consistent methodology (see Brooks and Goodwyn 2010).

6.2.2 Supplementary data

Supplementary datasets included local and regional datasets, data not currently available in a digital format, and data not consistently available nationally (see Table 2 below). The supplementary data provided fine-tuning for the interpretation of local and regional character variation and the compilation of supporting text descriptions.

Data description	Data format	Digital feature types	HSC Broad Types	Data source(s)
Discrete Heritage Assets	Digital	Polygons, points, polylines	Navigation, Industry, Ports and docks, Coastal infrastructure, Communications, Military, Settlement, Recreation, Cultural Topography	Cornwall Council HER, Devon Council HER, Plymouth Council HER, Torbay Council HER, Dorset Council HER
Documentary sources	Hard copy	N/A	Navigation, Industry, Ports and docks, Coastal infrastructure, Communications,	Various: Libraries, Record Offices, Museum libraries, UKHO

Data description	Data format	Digital feature types	HSC Broad Types	Data source(s)
			Military, Settlement, Recreation, Cultural Topography	
Fisheries data (inshore coastal fishing effort based on sightings)	Digital	Points	Fishing	Cornwall IFCA, Devon and Severn IFCA, Southern IFCA
Fishing effort	Hard copy	Raster images	Fishing	Isles of Scilly IFCA, Finding Sanctuary project

Table 2 List of supplementary data sources

The collation of further documentary resources provided background to aid decision making, helping to guide time-depth and to establish previous character, and at a later stage, to the development of character-type text descriptions (see Appendix for main sources used).

The data from individual IFCAs has been presented in greater detail to clearly show the differences in the inshore fishing data available to this project. The data provided by Cornwall, Devon and Severn, and Southern IFCAs was consistent in that each was a digital dataset with classifications of effort defined using the same code system ('Specific Inshore SFC description').

6.3 Additional datasets not previously used in HSC

Inshore fishing data supplied by the various Inshore Fisheries and Conservation Authorities (IFCAs) provided an extremely useful source for recent fishing activity within 6 nautical miles of the coast.

6.4 Data preparation

Data preparation was undertaken as outlined in the national HSC methodology (Tapper and Hooley 2012).

Final characterisation was produced to British National Grid co-ordinates (OSGB36). However, as maritime datasets are produced for below MLW they use a WGS84 projection. Therefore the initial data preparation stages for marine datasets used a WGS84 based and Transverse Mercator projected Coordinate Reference System (CRS). The WGS84 / UTM Zone 31N CRS (EPSG: 32631) was suitable for this project.

Datum transformations between OSGB36 and WGS84 were then undertaken using a version of the OSTN02 transformation that has been extended for use beyond its normal 10km offshore limit. All marine datasets were therefore transformed in this way for processing below MLW and were converted back to British National Grid, before integration with the character areas above MLW.

Paper maps and charts were georeferenced and taking account of projections and co-ordinate systems where possible. Those containing limited information of the co-ordinate reference system were digitised by rubber-sheeting the charts using recognisable static reference points along the coastline.

All data has been compiled into a standardised format and CRS as defined above to make it interoperable during the GIS development. The data has been collated to meet English Heritage standards of best practice.

The resolution for data capture was determined by the scale at which the data will be viewed and the scale at which it was originally displayed. All newly digitised data was captured at a scale of at least 1:25,000 as recommended in the "Guidelines for English Heritage Projects Involving GIS" (English Heritage 2011b) and the AHDS GIS guide to Good Practice (http://ads.ahds.ac.uk/project/goodguides/gis/).

MIDAS Heritage complies with this data standard which is used by the GIgateway™ metadata service run by the Association for Geographic Information (AGI) and also to the UK e-Government Metadata Standard (e-GMS) which is based on Dublin Core. It is designed for use in GIgateway™, and for other metadata applications in the UK. All output GIS files were documented using the UK GEMINI Discovery Metadata Standard, and are encoded according to ISO 19139.

6.5 GIS development

The entire characterisation process was managed in ArcGIS 10, service pack 4.

Based upon the HSC Method Statement the topological requirements for the final output were:

- Polygons were to be discrete (no overlaps);
- Polygons were to be contiguous (no gaps);
- All attributes were to be filled in where possible with 'NA' used for empty entries as appropriate;
- Every feature (point, arc, polygon, region, etc) should have at least one attribute record;
- There should be no slivers, dangles, knots or cross-overs;
- Multi-part polygons are acceptable; they should have one set of attributes associated with them.

The methodology applied to the South West Peninsula project area included the use of a 250m^2 grid across the project area (Tapper and Hooley 2012). The grid for the SW project area was produced using the Universal Transverse Mercator (UTM) grid for 30N and 29N in WGS84 projection. The grid was then reduced in size to 1km^2 squares and finally down to 250m^2. The 250m^2 grid was then converted into OSGB36 projection. This was then visually compared with the grids used in the Bristol Channel-Severn Estuary and Hastings-Purbeck project areas, with a small visible displacement observed with the South West Peninsula project area.

6.6 Database development

The entire database was built in ArcGIS based upon the prescribed HSC database fields defined in Tapper and Hooley (2012) which is reproduced in Table 3 below.

Attribute Name	GIS database alias	Description and guidance, terminology	Population Method	Format	Width
ObjectID	FID	Unique reference number for HSC polygon/grid cell.	Automated by GIS software	Numeric	10
Name	NAME	Name of area or topographic identifier, local or	manual	String	100

Attribute Name	GIS database alias	Description and guidance, terminology	Population Method	Format	Width
		popular name.			
Coastal and Conflated Broad Character Type	CC_BDTY	Broad Character Type (present, dominant; national strategic level). Landward (above MHW) this will relate to coastal land HSC, whereas seaward it will relate to the 'conflated' HSC as derived from the marine levels.	automated	String	100
Coastal and Conflated Character Type	CC_TY	Character type (present, dominant; regional level). Landward (above MHW) this will relate to coastal land HSC, whereas seaward it will relate to the 'conflated' HSC as derived from the marine levels.	automated	string	100
Coastal and Conflated Sub Character Type	CC_SBTY	Sub-character type (present, dominant; local level). Landward (above MHW) this will relate to coastal land HSC, whereas seaward it will relate to the 'conflated' HSC as derived from the marine levels.	manual	string	100
Coastal and Conflated HSC Period	CC_PRD,	Benchmark period of origin of the area represented in the polygon or cell. Recorded for present historic character. Landward (above MHW) this will relate to coastal land HSC, whereas seaward it will relate to the	manual	string	50

Attribute Name	GIS database alias	Description and guidance, terminology	Population Method	Format	Width
		'conflated' HSC as derived from the marine levels.			
Coastal and Conflated HSC Source	CC_SRC	Sources used to identify present and previous historic character. Attribute values to record supplier, date, precise GIS file name. To include reference to the scale of original data used. Landward (above MHW) this will relate to coastal land HSC, whereas seaward it will relate to the 'conflated' HSC as derived from the marine levels.	manual	string	250
Coastal and Conflated HSC Confidence	CC_CNF	Degree of certainty/confidence of HSC interpretation of present historic character. Landward (above MHW) this will relate to coastal land HSC, whereas seaward it will relate to the 'conflated' HSC as derived from the marine levels.	manual	string	25
Coastal and Conflated t HSC Notes	CC_NTS	Further background information on history of the polygon. Expansion on information recorded at broad character and sub-character levels.	manual	string	250
Coastal and Conflated HSC Link	CC_LINK	URL hyperlink to **Character Type** texts and multi-media. Landward (above MHW) this	manual	string	250

Attribute Name	GIS database alias	Description and guidance, terminology	Population Method	Format	Width
		will record coastal land HSC, whereas seaward it will record the 'conflated' HSC as derived from the marine levels.			
Sea-surface HSC sub-type	SSRFC_SBTY,	Present and dominant historic character of the sea-surface.	manual	string	100
Sea-surface HSC type	SSRFC_TY,		manual	string	100
Sea-surface HSC broad-type	SSRFC_BDTY		manual	string	100
Sea-surface HSC Period	SSRFC_PRD	Benchmark period of origin of the area represented in the polygon. Recorded for present historic character levels and previous historic character.	manual	string	50
Sea-surface HSC Source	SSRFC_SRC	Sources used to identify historic character. Attribute values to record Supplier, Date, precise GIS file name. To include reference to the scale of original data used.	manual	string	250
Sea-surface HSC Confidence	SSRFC_CNF	Degree of certainty/confidence of HSC interpretation of present historic character.	manual	string	25
Sea-surface HSC Notes	SSRFC_NTS	Further background information on history of the polygon. Expansion on information recorded at broad character and sub-character levels.	manual	string	250
Sea-surface	SSRFC_LINK	URL hyperlink to	manual	string	250

Attribute Name	GIS database alias	Description and guidance, terminology	Population Method	Format	Width
HSC Link		**Character Type** texts and multi-media.			
Water Column HSC sub-type	WTRCL_SBTY	Present and dominant historic character of the water-column.	manual	string	100
Water Column HSC type	WTRCL_TY		manual	string	100
Water Column HSC broad-type	WTRCL_BDTY		manual	string	100
Water Column HSC Period	WTRCL_PRD	Benchmark period of origin of the area represented in the polygon cell.	manual	string	50
Water Column HSC Source	WTRCL_SRC	Sources used to identify historic character. Attribute values to record Supplier, Date, precise GIS file name. To include reference to the scale of original data used.	manual	string	250
Water Column HSC Confidence	WTRCL_CNF	Degree of certainty/confidence of HSC interpretation of present historic character.	manual	string	25
Water Column HSC Notes	WTRCL_NTS	Further background information on history of the polygon. Expansion on information recorded at broad character and sub-character levels.	manual	string	250
Water Column HSC Link	WTRCL_LINK	URL hyperlink to **Character Type** texts and multi-media.	manual	string	250
Sea-floor HSC sub-	SFLR_SBTY,	Present and dominant historic character of the	manual	string	100

Attribute Name	GIS database alias	Description and guidance, terminology	Population Method	Format	Width
type		sea-floor.			
Sea-floor HSC type	SFLR_TY,		manual	string	100
Sea-floor HSC broad-type	SFLR_BDTY		manual	string	100
Sea-floor HSC Period	SFLR_PRD	Benchmark period of origin of the area represented in the polygon cell.	manual	string	50
Sea-floor HSC Source	SFLR_SRC	Sources used to identify historic character. Attribute values to record Supplier, Date, precise GIS file name. To include reference to the scale of original data used.	manual	string	250
Sea-floor HSC Confidence	SFLR_CNF	Degree of certainty/confidence of HSC interpretation of present historic character.	manual	string	25
Sea-floor HSC Notes	SFLR_NTS	Further background information on history of the polygon. Expansion on information recorded at broad character and sub-character levels.	manual	string	250
Sea-floor HSC Link	SFLR_LINK	URL hyperlink to **Character Type** texts and multi-media.	manual	string	250
Sub sea-floor HSC sub- type	SBFLR_SBTY,	Present and dominant historic character of the sub sea-floor.	manual	string	100
Sub sea-floor HSC type	SBFLR_TY		manual	string	100
Sub sea-floor HSC broad- type	SBFLR_BDTY		manual	string	100

Attribute Name	GIS database alias	Description and guidance, terminology	Population Method	Format	Width
Sub-sea floor HSC Period	SBFLR_PRD	Benchmark period of origin of the area represented in the polygon cell.	manual	string	50
Sub-sea floor HSC Source	SBFLR_SRC	Sources used to identify historic character. Attribute values to record Supplier, Date, and precise GIS file name. To include reference to the scale of original data used.	manual	string	250
Sub-sea floor HSC Confidence	SBFLR_CNF	Degree of certainty/confidence of HSC interpretation of present historic character.	manual	string	25
Sub-sea floor HSC Notes	SBFLR_NTS	Further background information on history of the polygon. Expansion on information recorded at broad character and sub-character levels.	manual	string	250
Sub-sea floor HSC Link	SBFLR_LINK	URL hyperlink to **Character Type** texts and multi-media.	manual	string	250
Previous HSC Type	PRVS_SBTY1, 2 etc	Previous historic character for which evidence is available. Recorded for multiple time-slices on basis of source dataset.	manual	string	100
Previous HSC Period	PRVS_PRD1, 2 etc	Benchmark period of origin of the area represented in the polygon. Recorded for present historic character levels and previous historic character.	manual	string	50
Previous HSC Source	PRVS_SRC1, 2 etc	Sources used to identify previous historic character.	manual	string	250

Attribute Name	GIS database alias	Description and guidance, terminology	Population Method	Format	Width
		Attribute values to record Supplier, Date, and precise GIS file name. To include reference to the scale of original data used.			
Previous HSC Confidence	PRVS_CNF1, 2 etc	Degree of certainty/confidence of HSC interpretation of previous historic character.	manual	string	25
Previous HSC Notes	PRVS_NTS1, 2 etc	Further background information on history of the polygon. Expansion on information recorded at broad character and sub-character levels.	manual	string	250
Previous HSC Link	PRVS_LINK1, 2 etc	URL hyperlink to **Character Type** texts and multi-media	manual	string	250
Character Area	CA1, CA2 etc	Unique character area	manual	string	100
Location	LCTN	General location (e.g. Offshore marine, inshore marine, estuary, coast etc)	manual	string	50
Shape_Area	AREA	Area in map units (usually metres square) covered by polygon.	automated	string	9.9
Cell/grid size	CELL_SZ	Size of grid used for marine zone (e.g. 100mx100m, 500mx500m etc)	manual	numeric	5
Creation Date	CRT_DT	Date of dataset /polygon creation/completion	manual	string	10
Creator	CRTR	Name of the person/organisation who compiled the HSC	automated	string	250

Table 3 Attribute field structure as outlined in the National HSC Method Statement (Tapper and Hooley 2012)

6.7 Character assessment

The character assessment was undertaken following the GIS workflow diagram published in the HSC national method (Tapper and Hooley 2012).

Coastal Land and Inter-tidal areas were characterised as polygon and point data, with the points later buffered to create polygon data only. The Inshore and Offshore marine areas were characterised using a 250m^2 grid which was later dissolved and joined with the Coastal Land and Inter-tidal polygons. All intermediate layers characterised against the marine grid were undertaken using an intersect location query.

6.7.1 Descriptive classification

The first stage required 'intermediate' GIS datasets to be interpreted from the core and supplementary datasets (see Tables 1 and 2 for full list of sources). This required the reclassification and reinterpretation of the original data to an historic environment perspective and historic seascape character using the application of HSC Character Type Structure Terms values guided by the descriptive texts supplied in the national method statement (Tapper and Hooley 2012).

Each dataset was assessed individually to determine its value based upon its coverage, resolution, date of publication, comparison with other similar data sources and its ability to define historic character, and thus, its ability to be reclassified from an historic character perspective. If a dataset was judged unsuitable to be taken forward for reclassification it was removed from the HSC workflow with no further role in the characterisation process.

The intermediate layers were then broadly grouped upon their Sub-Type, and compared to resolve their time-depth, their classification of character and the limitations of their use.

For intermediate layers derived from point and polyline data it was necessary to apply a buffer to transform them into polygons so that they could be taken forward to the next stage of the characterisation process. The details of each buffer applied to each Sub-Type are outlined later in this section of the report.

The next stage required the use of the intermediate layers to characterise the marine tiers (Coastal, Sea surface, Water column, Sea floor, Sub-sea floor) with values.

To build the characterisation for each tier in the marine grid the HSC assessor created a hierarchy of intermediate layers of Sub-Types. The hierarchy was then used to build the characterisation for each tier in a layered way using GIS based queries and field calculations. The intermediate layers generated from data which was most generalised in character and greatest in spatial extent were generally placed nearer the bottom of the hierarchy, with character more closely defined and more limited in spatial extent pushed higher up. The final position of a Sub-Type in the hierarchy was also determined on its perceived impact on historic character in the project area (Tapper and Hooley 2012, 3.3.3).

The HSC also contains four previous time-slices whereby previous HSC Sub-Types can be interpreted if available information allows (see Figs 7-10). For each previous time-

slice the HSC Sub-Type can be given along with the period for the historic activity, the source of the interpretation, the confidence of characterisation and any notes (see Table 3 for attribute fields). The intermediate datasets were used to populate these tiers in the same manner as those relating to present character.

This decision making process was greatly influenced by knowledge gained from field visits and the reading of broad documentary sources. Field visits were undertaken for the Weymouth to Salcombe area in November 2012 and for the Bolt Tail to Gunnislake coastline in April 2013. It was also felt that the HSC assessor already had a good working knowledge of Cornwall and the Isles of Scilly.

The hierarchy of assessed predominance produced for each marine tier differed slightly in its order of Sub-Types, as for different tiers certain Sub-Types contribute differently in terms of character.

A hierarchy was also used to build the Conflated HSC with the dominant character between the different marine tiers used to populate it.

Another consideration in the characterisation process for the South West Peninsula project area was the adjoining project areas (Bristol Channel-Severn Estuary and Hastings-Purbeck) for which HSC had already been completed. Anticipating the production of a national HSC database from these various HSC projects contributing to its national coverage, the need to ensure a seamless boundary between the adjoining HSC project areas in part influenced the hierarchy of Sub-Types developed by this project.

Where a suitable Sub-character Type was not already available, a new Sub-Type and definition was circulated to English Heritage and the other concurrent HSC project teams for comment and approval for addition to the HSC Character Type list. In the South West Peninsula project area 'Rope-making' was added as a new HSC Sub Character Type, to the 'Ports and docks' HSC Character and HSC Broad Character Types.

The following sub-headings outline the descriptive attribution process for each HSC Character Type.

6.7.1.1 Navigation

Data relating to navigational activities was collated from a broad range of sources including SeaZone Hydrospatial, historic maps and charts, OS MasterMap and 1:10,000 mapping, Admiralty sailing directions, the ALSF *England's Shipping* database (Wessex Archaeology 2003), the ALSF Navigational Hazards Project (Merritt 2007), and Department for Transport's Shipping Density data. Additional information was provided by Anatec's shipping density and the Royal Yachting Association's (RYA) data viewable on the maritime data website. Data from each source was divided between the following groups of information as follows:

Navigation feature

Navigation channels were identified from SeaZone Hydrospatial data, OS 1:10,000 mapping and historic mapping and charts.

Modern defined navigation channels are recorded under S-57 charting standards and are therefore provided as part of SeaZone Hydrospatial data. All channel-related data including channel marker buoys, navigational lines, recommended route centrelines, and traffic separation zones were extracted from Hydrospatial so that they could be viewed as a group. The features defining the outlines of modern navigational channels and dredged channel areas were separated out, compiled into a single dataset and reattributed. Historic charts were reviewed to identify areas where previous channels could be identified. Where possible, channel outlines were digitised from historic charts or extracted from Hydrospatial depth areas using historic data and documentary evidence as a guide in order to define their extent.

Navigation activity

Anchorages are recorded on modern and historic charts. The anchorage areas recorded in S-57 were extracted from SeaZone Hydrospatial. Modern Imray charts and Admiralty sailing directions were also referred to and where appropriate data digitised as either polygons or point data (and subsequently buffered). Point data was given a 500m diameter buffer before being fed into the grid. Historic charts were used as sources for gathering historical records of anchorages.

Ferry routes recorded in SeaZone Hydrospatial were extracted and reclassified. A number of ferry routes were digitised from the OS 1:10,000 mapping and offshore ferry routes determined from English Nature's *The South Western Peninsula Marine Natural Area* report (2004). Ferry routes no longer in use were digitised from historic charts using modern charting as a reference to accurately reflect the route. Historic records of ferry routes were used in the interpretation of previous historic seascape character.

Navigation hazard

Information on navigational hazards was sourced from a broad range of resources including SeaZone Hydrospatial, Modern Imray charts, historic charts and sailing directions, the ALSF Navigational Hazards Project (Merritt 2007), EHA's AMIE wrecks and obstructions, HER data, and OS MasterMap and 1:10,000 mapping.

Both the UKHO and NMR hold extensive databases of wreck data. The UKHO hold a separate list of wrecks in the UKHO wrecks and obstructions database which also includes maritime debris. The AMIE database hold records of known wrecks, fishermen' fastenings, and reported losses.

Duplicates exist between SeaZone Hydrospatial and the AMIE Wrecks Database. All wreck data therefore had to be viewed together and compared to isolate as many duplicates as possible. To complicate things further there were also significant spatial discrepancies between records in the two datasets. The sifting process was complex and involved several stages of work. This was made more complicated as the records often did not contain enough information to accurately match them. In the first instance a spatial location query was undertaken to weed out certain duplications in the AMIE database, as it was assumed by this project that the SeaZone derived wreck data took priority as the UKHO data is regularly updated as new surveys are undertaken. This was followed by a stage of manual sorting.

Using a series of definition queries on attribute values the obstructions were isolated from the SeaZone Hydrospatial and AMIE database as a separate dataset and attributed differently to the wreck data.

Once a cleaned, single layer of points had been produced for wrecks, the Density Analysis tool in ArcGIS was used to identify areas where densities in wrecks existed. The raster image on which the density scatters was based were produced using a search radius of 2000m, and an output cell size of 250m in line with the output cell size of the project grid. The output raster was then reclassified as polygon data and a field value based on the density value calculated. A further degree of sorting was employed so that only wreck clusters of certain density (<4) were taken forward to the full characterisation stage.

Dangerous wrecks were extracted from SeaZone Hydrospatial and protected wrecks from the NMR protected wreck database.

Rock outcrops, submerged rocks and drying hazards (away from the shore) were identified from modern Imray charts, OS MasterMap and 1:10,000 mapping, and SeaZone Hydrospatial. Historic charts and maps were used to map former hazards.

Maritime Safety

Maritime safety features were identified from a variety of sources including SeaZone Hydrospatial, Imray charts, Admiralty sailing directions, Historic charts and maps and modern OS MasterMap and 1:10,000 mapping.

For the Coastal Land and Inter-tidal areas features were mainly identified from documentary sources such as sailing directions, historic charts and maps and modern charts. These were recorded as point data. Following discussions with English Heritage in March 2013 all landward point data in the South West Peninsula project area was buffered to 125m diameter except for lighthouses which were given a 250m diameter buffer.

Offshore buoys, beacons and further navigation aids were extracted from SeaZone Hydrospatial and used in some cases to demarcate the features they marked such as the edges of navigational channels or navigational hazards. Where there was a high concentration of buoyage marking a navigation channel these were often supplanted by navigation channel (active) to ensure clarity in the resulting characterisation.

Safety areas are provided as part of SeaZone Hydrospatial data and are mapped by the UKHO under S-57 charting standards. The features were therefore extracted from SeaZone Hydrospatial and given descriptive attributes. However, since these areas represented other activities they were more likely to be characterised with these activities in mind.

6.7.1.2 Industry

Data was collated from a range of sources including SeaZone Hydrospatial, OS 1:10,000 and historic mapping and charts.

As the SeaZone data contained a range of industrial features, all features of shared character were extracted into separate datasets using queries on the data values.

For the Inshore and Offshore areas both point and polyline data was buffered to 500m diameter when transformed into polygon data.

Extractive industry (minerals)

Mines and quarries on Coastal Land, where a maritime character was identified, were mapped using OS MasterMap and 1:10,000 mapping, supported by historic maps, HER records, documentary sources, and HLC where available.

No active offshore extractive industry was recorded in the South West Peninsula project area and where previous activity had taken place this was identified through documentary sources which were digitised as an intermediate layer.

Energy Industry

Features were assessed using a combination of OS MasterMap, 1:25000, and historic mapping, HLC (not available for Dorset), and SeaZone Hydrospatial to identify sites.

Offshore and Inshore Marine point and polyline features identified from the SeaZone data were buffered by 500m in diameter when converted into polygon data.

Above chart datum most of the features were characterised as polygons, or as point data. Point data on coastal land and inter-tidal areas was converted into polygon data with a 125m diameter buffer.

Processing industry

The same approach used for Energy Industry features was used to define all the processing industry areas along the coastal zone, including chemical works, production areas, and sewage works.

Where sewage pipelines were identified in Inshore Marine areas from SeaZone Hydrospatial a 500m buffer was applied to the polyline to create a polygon to characterise against the grid.

Spoil dumping grounds are recorded on modern navigational charts to indicate areas where spoil resulting from dredging, drilling or waste has been deposited on the seabed. These areas recorded in S-57 and were therefore extracted from SeaZone Hydrospatial as polygons.

Shipping industry

The assessment of shipping routes mainly drew on information from the high density polygons of the DfT Shipping Density Data. In a selected area off the North Cornish coast (adjoining the Bristol Channel-Severn Estuary HSC project area) it was necessary to use Anatec AIS data to complete some of the lesser shipping routes. This data was observable on the maritime data website plotted as 5km^2 grids. The routes were then manually mapped by the HSC assessor to allow a seamless boundary with the neighbouring Bristol Channel- Severn Estuary HSC project area. The ALSF *England's Shipping* database was also inspected in relation to past shipping activity (Wessex Archaeology 2003).

Within the Coastal Land and Inter-tidal areas Boat and Ship yards were identified from Modern OS mapping and modern and historic charts as polygons.

6.7.1.3 Fishing

Data on fishing activities was drawn from a range of sources, some directly bearing on the extent and character of the fishing industry, with others providing proxy information. This included national CEFAS (Centre for Environment, Fisheries, Fisheries and Aquaculture Science) fishing density data, IFCA sightings data, paper maps supplied by IFCA officers and documentary sources.

It is clear that fishing in the South West Peninsula project area is widespread and historically very important, however, fishing activity, both past and present, is difficult to characterise spatially due to the temporal and spatial shifts in activity (both seasonally and over the long-term) and the paucity of hard data.

However, a range of sources were used by this project for the Inshore and Offshore marine areas.

CEFAS fishing density grid data (2004) was used to give the broadest overview of fishing activity. To ensure that areas of high density effort were treated differently from those of low density, the data was queried and extracted differently based on density values. With high density values the confidence value was 'Certain' and those of low values 'Possible'.

Higher up the hierarchy of fishing data was the mapping created as part of the 'Finding Sanctuary' project (http://www.finding-sanctuary.org/), set up to define and recommend areas for Marine Conservation Zone (MCZ) designation by the end of 2012. The website contains large grained maps of fishing activity within the project area. These were printed off, scanned and polygonised as digital data. The Finding Sanctuary data has certain limitations due to the way in which it was collected for the project (as made clear in discussions at Devon Maritime forum meetings attended by the HSC assessor). As with the CEFAS data, the Finding Sanctuary record of fishing effort was extracted based on different values of fishing effort; the differences noted in the notes field of the data extracted.

Of greatest accuracy and of relevance in the inshore areas was the IFCA data available from the fours IFCAs in the project area; Isles of Scilly, Cornwall, Devon and Severn, and Southern. However, whilst all the IFCA data is based on sightings data each IFCA has collected different levels of digital data available and it is important to consider the differences. Another issue to consider is that sightings data is based on the presence of IFCA boats: where fewer sightings have been recorded this may be due to less IFCA patrolling activity, especially further away from their patrol boat home ports.

Both the Devon-Severn and Southern IFCA areas have collected sightings data as a digital data set since 2005, with sightings identified to the 'Sub-Code Specific SFC description categories' used by IFCAs. In these areas the density of point data was high enough to convert into polygons of fishing effort, with different Sub-Types extractable.

In the Cornwall IFCA area sightings data has, to date, only been recorded as a digital dataset for a year, 2012. This resulted in a dataset with less coverage than that compared to the Devon-Severn and Southern areas. Therefore, to convert it into polygon data a 5km diameter buffer was added to each point. It was noticeable that on the north Cornish coast far less sightings had been recorded and although this is probably impart due to less inshore fishing activity, a limitation of the dataset is that

Cornwall IFCA's patrol boats are based on the south coast and rarely venture to the north coast.

For the Isles of Scilly no digital dataset is currently available. Therefore the HSC assessor contacted Steve Watt, Maritime Officer for the IFCA who kindly produced a paper map of present fishing effort based on personal knowledge. This was scanned, digitised and rectified to extract the data for characterisation purposes.

Likewise, past fishing effort was extremely hard to accurately characterise but it was felt that it was important that the project attempted to characterise past fishing effort where possible.

In this respect two principal documentary sources were used. Firstly, *England's Sea Fisheries, The Commercial Sea Fisheries of England and Wales since 1300* (Starkey *et al* 2003) was used to identify broad fishing patterns and was extremely useful in providing a record of medieval fish landings (buffered as polygons 10km in diameter), certain areas where drift netting occurred in the 19th century (buffered as polygons 30km in diameter), and the depth to which Brixham trawlers could work in the 1880s (inshore areas of modern shellfish dredging were back dated to the early modern period within the Lyme Bay area). For Cornwall, and limited parts of South Devon, Cyril Noall's *Cornish Seines and Seiners - a history of the pilchard fishing industry* (1972) was an invaluable source for fishing stations (buffered as polygons 4km in diameter).

Aquaculture

Areas of shellfish farming were identified from SeaZone Hydrospatial data.

6.7.1.4 Ports and docks

Ports and docks

Formal 'harbour areas' reflect the water on the approaches to a harbour or dock and are essentially an administrative area. These are defined in Hydrospatial under S-57 and were therefore extracted and reclassified as Harbour pool Sub-Type.

Areas of Harbour Sub-Type were identified from Imray charts, OS 1:10,000 mapping and historic maps and charts.

Coastal features relating to the shipping industry, such as docks, dockyards, shipyards, boat yards, etc were defined using a combination of modern and historic OS mapping, and modern and historic harts, to identify the extents and ages of different parts of ports and harbours. Where certain elements on coastal land and inter-tidal areas were recorded as point data these were buffered to 125m diameter polygons.

In the South West Peninsula project area 'Rope-making' was added as a new HSC Sub Character Type, to the 'Ports and docks' HSC Character and HSC Broad Character Types. This was characterised for the Previous tiers using historic OS mapping.

Ancillary infrastructure

No 'ancillary infrastructure' was recorded in the South West Peninsula project area.

Coastal infrastructure

Many aspects of sea and flood defences are difficult to distinguish from the areas and landscapes that they protect, especially at the strategic scale of this project. In some instances areas of protected land were characterised as Reclaimed Land Sub-Types.

Modern and historic mapping was used to identify substantial sea and flood defences which were characterised as polygons.

6.7.1.5 Communications

Transport

Transport systems were documented through analysis of modern and historic OS maps and maritime charts with further review of HLC, NMR, and HER records, and documentary sources to provide further information. All features were characterised as polygons.

Features relating to transport systems were extracted from NMR and HER records using “Like” queries such as "DESCRIPTIO" LIKE '%Canal%' which identify all records containing the word “Canal”. Railways located within 1km of the Mean High Water were brought considered for final characterisation. Those immediately adjacent to the sea, or railways had an important role in relation to past and present maritime activity were characterised. Where they extended inland they were only partially mapped for a short distance and not to their full length – the distance differing depending on the route and perceived importance in terms of character.

Roads were only defined for this project where they were found to dominate the maritime character of an area, or specifically linked to the use of the coast, for example, a sanding way.

Civilian airfields were extracted from the OS 1:25000 and HLCs. Although these may be sited away from the coast in many instances it was felt that since much of the air traffic over the project area originated from these sites, this gave them a maritime character, for example, the Land’s End airport.

Telecommunications

Due to its location the project area contains a large number of important submarine telecommunications cables and these were extracted from SeaZone Hydrospatial data. Historic charts were also inspected for the presence of telecommunication cables and in a couple of instances provided fruitful information for pushing time-depth back to the Early Modern period.

6.7.1.6 Military

Character areas relating to military activity were drawn from SeaZone Hydrospatial and on coastal land and inter tidal areas, from OS 1:10,000 mapping. Previous character was established through historic maps and charts, the ALSF *England’s Shipping* database (Wessex Archaeology 2003), NMR, HER and HLC data and documentary sources.

Military defence and fortification

Military coastal defences and fortifications areas were assessed from HLCs and HERs, and from the OS 1:10,000 and historic mapping, and invaluable documentary sources such as *The Historic Defences of Plymouth* (Pye and Woodward 1996). The ALSF *England's Shipping* database was used to help identify historic naval battlefields for previous time-slices (Wessex Archaeology 2003).

Military facility

Ordnance Dumping grounds and military practice areas in inshore and offshore areas were extracted from SeaZone Hydrospatial. Military practice areas include a range of activities. These were extracted as a single group and differentiated during the descriptive attribution of the areas. Detailed information about the levels of activity of these areas often proved difficult to obtain and following advice from English Heritage only specific well-used military practice areas were taken forward to full characterisation. However, in the distant offshore areas beyond the edge of the continental shelf, where no fishing effort had been recorded by CEFAS, the generalised identification of the 'military practice area' was often the only available positive information on the character of human activity.

These were extracted as a single group and differentiated during the descriptive attribution of the areas. Detailed information about the levels of activity of these areas often proved difficult to obtain and following advice from English Heritage only specific well known military practice areas were taken forward to full characterisation.

Coastal and intertidal military areas such as airfields, military bases, firing ranges, etc were assessed using OS 1:10,000 mapping and HLC polygons (where available).

6.7.1.7 Settlement

Settlement

The extents of towns and villages were partly defined by extracting information from County HLCs but also the manual mapping of their full extent using modern OS 1:10,000 mapping with point snapping to Master Map. Historic OS 1-25 inch mapping was used to define the Early Modern extent of towns and villages. Where further mapping and/or documentary sources existed characterisation was pushed back in terms of time depth. The characterisation of Weymouth for example was greatly aided by English Heritage's publication *Weymouth's Seaside Heritage* (Brodie *et al* 2008). Unfortunately for many settlements such easily available information was not obtainable and the historic OS mapping was the earliest source available.

The concentration in settlement around harbours, estuaries, and industrial or recreational centres along the coast is a significant indicator of the scale of human activity within an area.

6.7.1.8 Recreation

Recreation

Recreational areas on land such as golf courses, holiday parks, or parks and gardens, where a maritime character was assessed, were identified and defined using HLC

polygons and OS 1:10,000 mapping as the primary resource, supported by historical maps, and HER and NMR data.

Offshore recreational types were identified from a combination of SeaZone Hydrospatial internet searches, for example diving websites or personal knowledge of the HSC assessor of surfing and bathing beaches (also aided by the internet). The IFCAs also recorded leisure fishing sightings and this data was extracted into Recreation.

This project accessed generalised RYA data for identifying areas of 'Leisure sailing' using the publically accessible maritime data website. The areas of leisure sailing were broadly identified and polygonised by the HSC assessor.

6.7.1.9 Cultural topography

Cultural topography covers a range of areas whose form appears largely the product of natural processes, where the physical imprint of man's activity is subtle and easily overlooked, but which are also made cultural, and perceived as such by people, to varying extents.

Various environmental and other datasets inform the characterisation of areas of cultural topography which although employing natural environment terminologies for ease of popular recognition and simplicity, have clearly definable human dimensions, often in their evolution to their present expressions but also in their management, uses and perception by people.

Palaeolandscape component

Palaeoenvironmental character for the coastal land and inter-tidal areas was generated from searches of HER data, and from documentary sources, often reports and articles on cores or the regional synthesis of palaeoenvironmental data; often resulting in Sub-Types of either 'Peat deposit' or 'Submerged forest' being characterised.

For the marine and estuarine areas across the entire project area ABPmer's 2010 *Waterlands* project was extrapolated to provide the potential extent and time-depth of the Palaeolandscape component Sub-Type. This included the extent for the land surface at 20,000KBP, 12,000 KBP and 8,000 KBP. Waterlands provides a generalised sea-level curve for the whole of UK Controlled Waters so it was considered a useful core source due to its extensive coverage.

In the inshore waters, close to the coast, and below 10m in chart depth, the sea level curve recently derived for the Isles of Scilly by the Lyonesse Project was used across the South West Peninsula project area. The revised sea-level curve for the Isles of Scilly was produced by the Lyonesse Project and for the date of 4500 cal BC has produced a depth of LAT of 10.13m (Charman *et al* forthcoming). A query of the bathymetry from the SeaZone Hydrospatial data was then used to generate the paleolandscape component polygon for the Neolithic period. It has to be acknowledged that all sea-level curves are in part localised in nature but it was felt that this was the most recent data available and with use of the confidence value appropriately could be extended across the whole South West Peninsula project area. For the Isles of Scilly a 'Probable' confidence level was given, whereas for the remaining project area the level of confidence was 'Possible'. This course of action is beset with many limitations but the risk was considered appropriate as this was the most modern data available.

For limited areas, documentary sources provided material to characterise palaeochannels, and for certain areas where the bathymetry provided a strong and deep channel, it was possible for the HSC assessor to suggest the previous existence of palaeochannel character, for example in the Carrick Roads, Falmouth.

Cultural topography (landward)

Coastal land character areas such as cliff, dunes, etc, were identified using a range of sources including OS MasterMap and 1:10,000 mapping, historic maps and charts, and Google Earth. Google Earth proved particularly useful in identifying current cultural topography.

Cultural topography (inter-tidal)

Inter-tidal areas character areas such as saltmarsh, mudflats, etc were identified using a range of sources including Natural England GIS datasets, OS MasterMap and 1:10,000 mapping, historic maps and charts, and Google Earth.

Cultural topography (marine)

Cultural topography for inshore and offshore areas was assessed using the BGS seabed sediments and bedrock data available through SeaZone Hydrospatial. Characterisation was based upon the extrapolation of HSC Sub-Types from definition queries of the BGS data and in particular the 'Notes' values where sediment descriptions were included.

In the South West Peninsula project area sediments described by the BGS as 'Sand' and 'Mud' were placed with the Fine sediment plains Sub-Type, 'Mud plains' within the Mud plains Sub-Type and 'Gravel' sediments within the Course sediment plains Sub-Type. Where sediments were recorded as a mixture of coarseness these were generally placed in the Mixed sediment plains Sub-Type, for example, those described as Gravelly Mud. However, where both sediment particles described were both fine-grained the sediments were characterised as Fine Sediment plains, for example, Muddy sand.

6.7.1.10 Woodland

Woodland

Areas of Ancient Woodland were derived from Natural England's Ancient Woodland (Version 2.0) dataset. This dataset generally gave a broader coverage of areas of Ancient Woodland than the current countywide HLC available and therefore was used to inform areas of ancient woodland for this project.

Plantations relevant to HSC were derived from historic and modern charts, Admiralty sailing directions and sources in the HERs.

6.7.1.11 Enclosed land

Reclaimed land

For the South West Peninsula project area reclaimed land was identified using modern OS mapping, historic OS mapping, other historic maps (for example, in Cornwall, Martyn's 1748 Survey of Cornwall) and historic charts.

6.7.1.12 Unimproved grazing

Coastal rough ground

Parts of the more exposed coastline of the project area could be classified as Rough grassland or Scrub. This information was extracted from HLCs and OS 1:10,000 OS mapping and verified using Google Earth.

6.7.2 Prescriptive Classification

A prescriptive attribution process was then applied to the whole database to automatically populate the Character Type and Broad Character type based upon grouped Character Sub-Types.

6.7.3 Final process

The HSC for the project area was built one tier at a time and due to its large extent and database size, built separately for three areas, each at a time, with the final database for the whole project area merged and then unioned together to create the final pre-dissolve grid.

The pre-dissolve grid included the final adjustments to the characterisation of the whole project area following feedback from the final stakeholder meeting (26 September 2013). The adjustment phase also included some changes to the HSC for the Dorset-Devon area originally completed in March 2013.

The pre-dissolve grid was then clipped to the South West Peninsula project area and subsequently dissolved. The dissolved grid was then merged with the landward HSC to create an entire HSC.

Once the descriptive texts were completed and agreed the texts were hyperlinked in the HSC database to create the final product.

6.7.4 Development of Character Type Text Descriptions

Brief structured summary texts were written in accessible language relating to the character type hierarchy to inform users of the HSC about the character of the historic seascape at a range of scales. In particular, they are designed to provide a connection and initial stimulus for various future applications of the database, as noted in the national HSC Method Statement (Tapper and Hooley 2012), but above all they are intended to ensure that future HSC users from all backgrounds understand what the terms portrayed on the HSC GIS mapping actually mean, especially where some may have a looser, more colloquial definition. The characterisation of shared trends in the definition, distribution and regional significance of historic cultural character expressions, historic components and features, and their relationships with natural environment expressions are a fundamental output of HSC. The analysis and interpretation of these trends is fundamentally a perceptual process, informed from a combination of baseline information and documentary resources.

A text-based description was developed for each Character Type using the structure proposed in the national HSC Method (Tapper 2008; Tapper and Hooley 2012) under the following headings:

- Introduction: defining/distinguishing attributes and principal locations.
- Historical processes; components, features and variability.
- Values and perceptions.
- Research, amenity and education.
- Condition and forces for change.
- Rarity and vulnerability.

The national and regional texts within this report are developed from those produced for the Bristol Channel and Severn Estuary HSC (Taylor *et al* 2011).

For each Character Type, text descriptions encompassed both a national and a regional perspective. The text descriptions have a hyperlink to the individual character types within the GIS and provide a basis from which a stand-alone interactive multimedia resource may be produced in the future. The text descriptions for each character type are contained within Section 3 of this Project Report.

7 Project Products and Dissemination

The project archive comprises the project leaflet, the webpage, Project Brief, Project Design, Project Report, the GIS and associated structure, and relevant correspondence.

All digital reports will be sent by English Heritage to the Archaeological Data Service (ADS) for dissemination online after the close of the project.

7.1.1 Report

This report is divided into three sections, this first section documenting the project's implementation, the second outlining the System's application review and case-studies, and the third containing the Appendices with character text descriptions.

7.1.2 Project GIS

The HSC GIS generated by this project covers many Character Types, Sub-Types and their attributes, expressed across the entire project area.

The GIS and its associated database are in the form of an ESRI File geodatabase alongside linked character text descriptions. Data is designed to be viewed at 1:50,000. All data is compliant with MIDAS standards, and all metadata is UK Gemini compliant, and encoded according to ISO 19139.

Figures 2 – 10 (see below) illustrate the expression of Character Types at each marine level and in a conflated map. However, as for any GIS, the database can be queried on a multiplicity of combinations of the attributes and generate a range of mapping tailored to suit the needs of the enquirer. The mapping below cannot convey that flexibility in the use of the mapping in conjunction with the linked text descriptions produced by the project.

7.1.3 Character Type Texts

The Character Type texts provide supporting descriptions that outline the attributes, history, value, and potential threats and benefits of each HSC Character Type.

Section Three of the final report for the SW project area contains two sets of Character Type texts; those relevant for the national area and secondly, those relevant to the South West region.

The GIS database includes hyperlinks to the relevant regional texts for each HSC Character Type found at each tier.

7.1.4 Dissemination and Outreach products

The outputs of the project included an introductory leaflet and webpage (http://www.cornwall.gov.uk/default.aspx?page=32970) providing background information on the project.

The project team also attended meetings of the Devon Maritime Forum (November 2012 and July 2013) disseminating copies of the project flyer and discussing the project with the attendees.

At the request of English Heritage the Dorset-Devon area was completed in March 2013 to feed into the Marine Management Organisation's (MMO) consultation process for the production of the South Marine Plan.

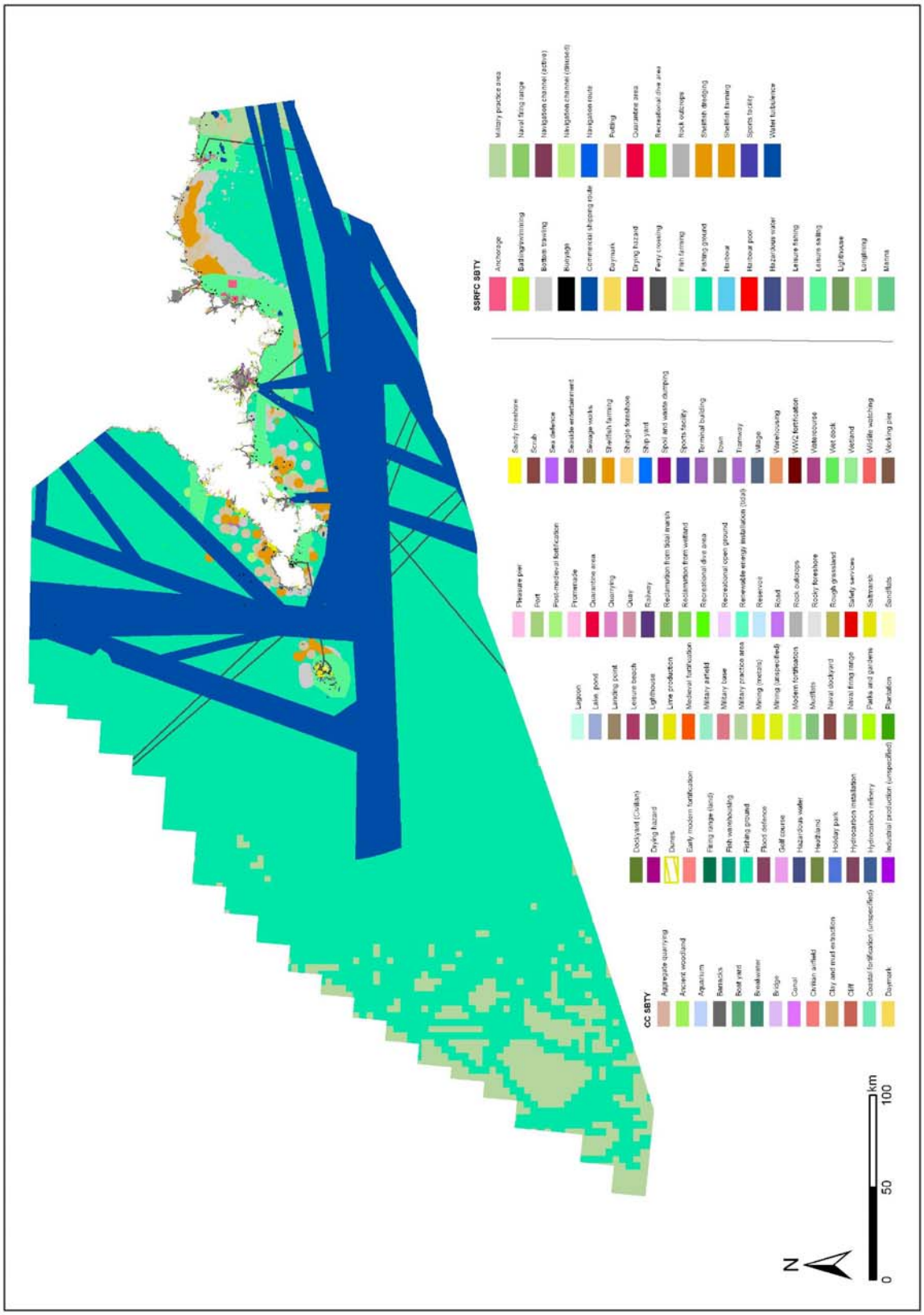

Fig 2 HSC showing Character Types on the Coast and Sea surface

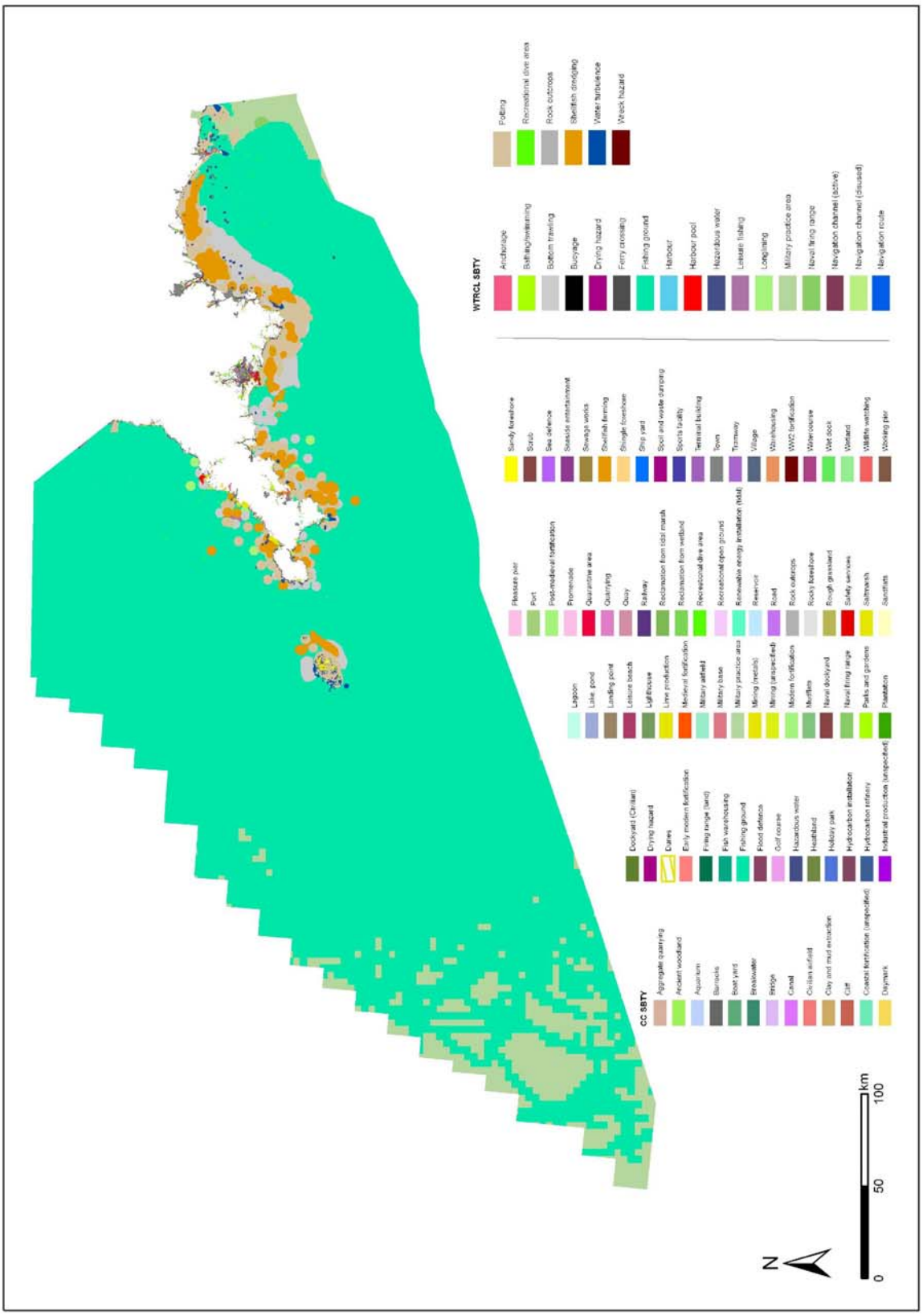

Fig 3 HSC showing Character Types on the Coast and in the Water column

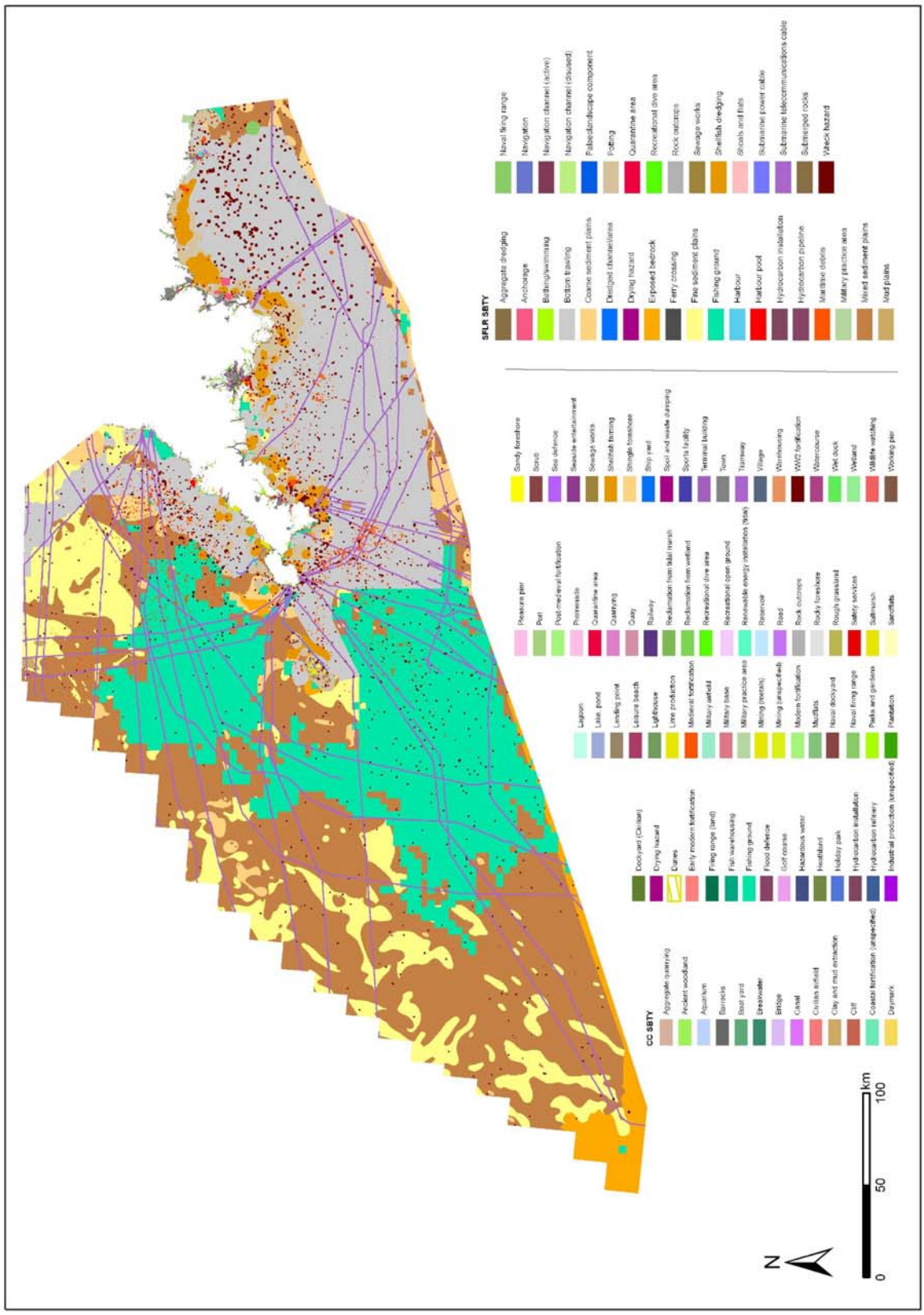

Fig 4 HSC showing Character Types on the Coast and on the Sea floor

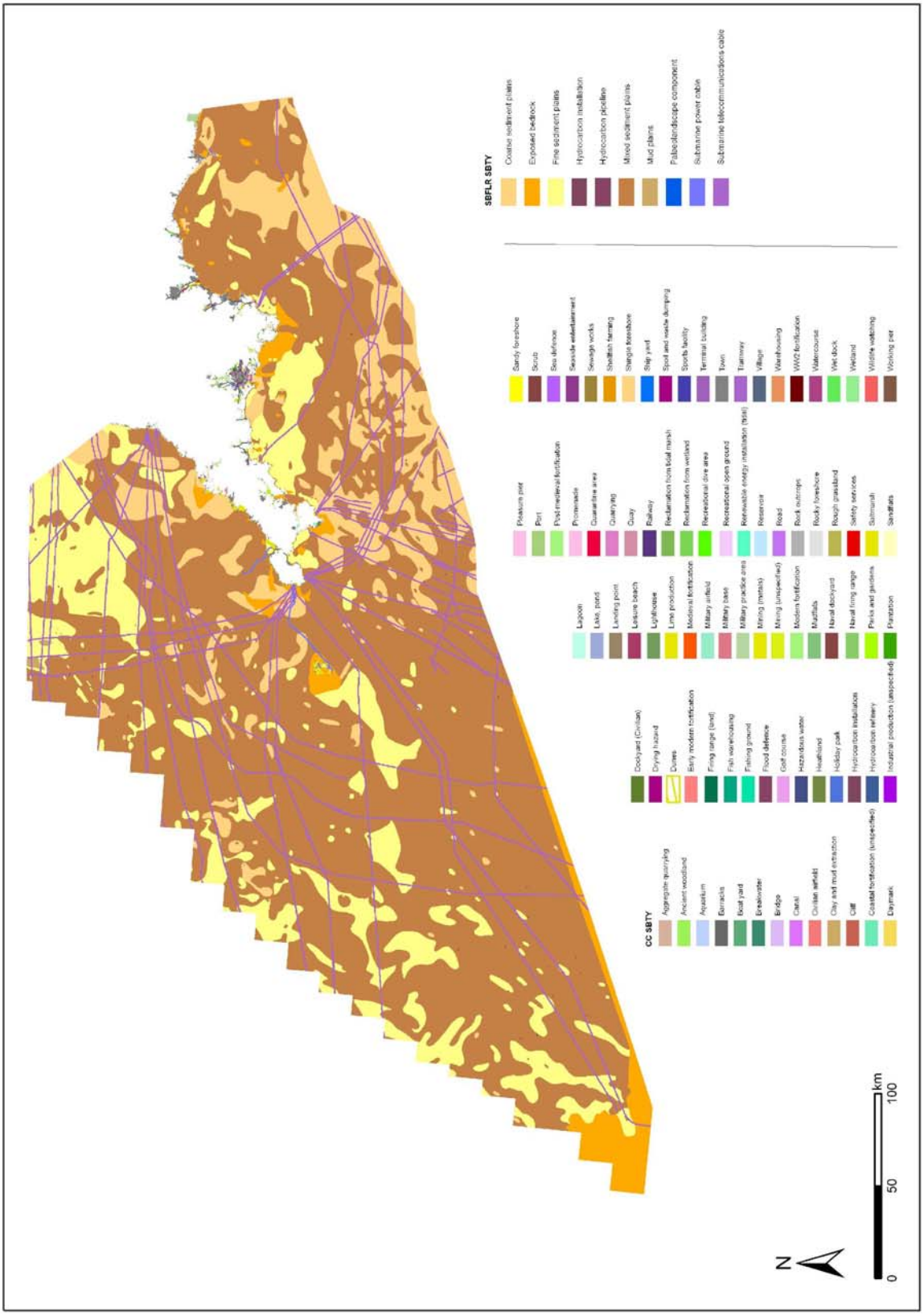

Fig 5 HSC showing Character Types on the Coast and on the Sub-sea floor

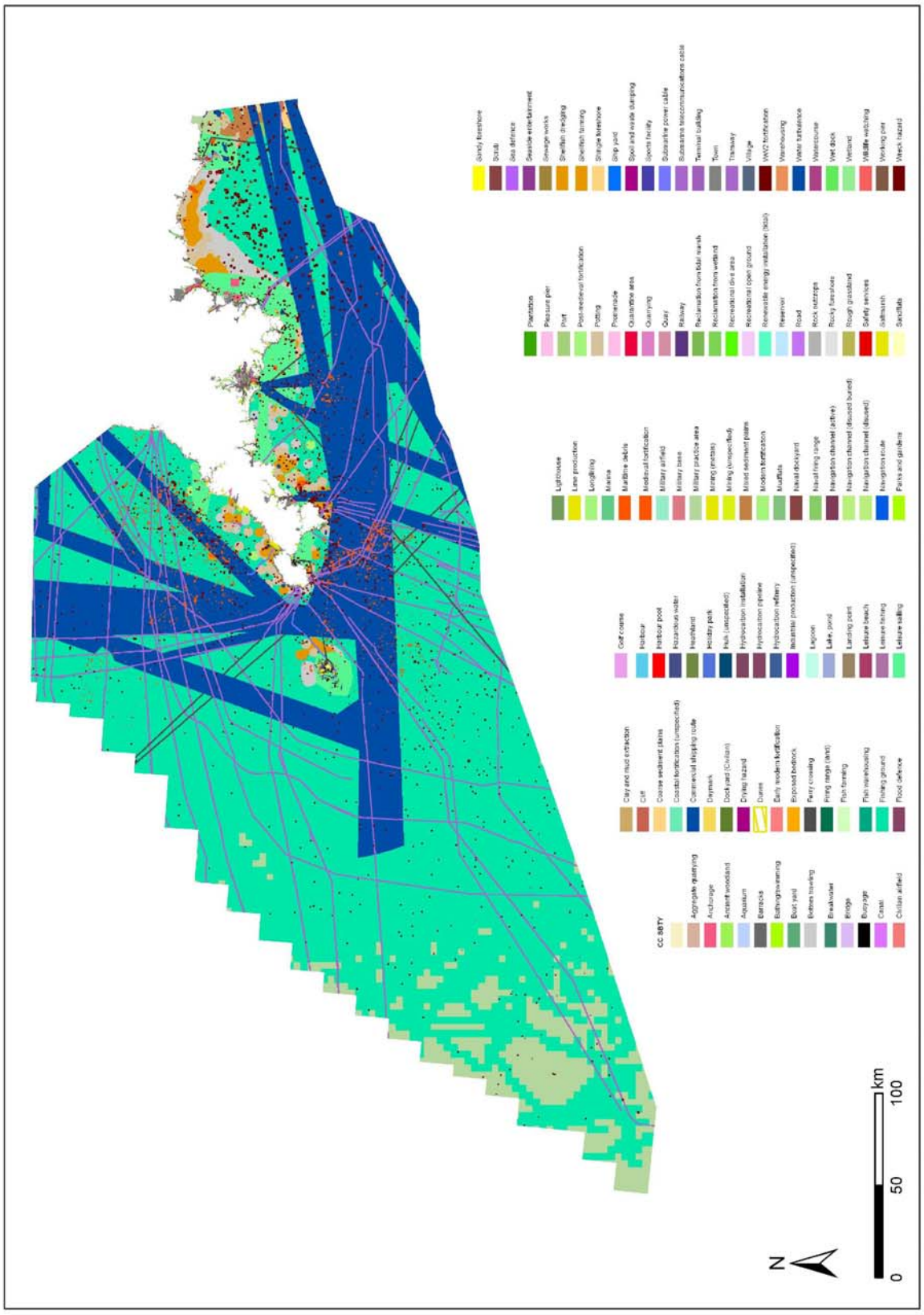

Fig 6 HSC showing Coastal and Conflated Character Types

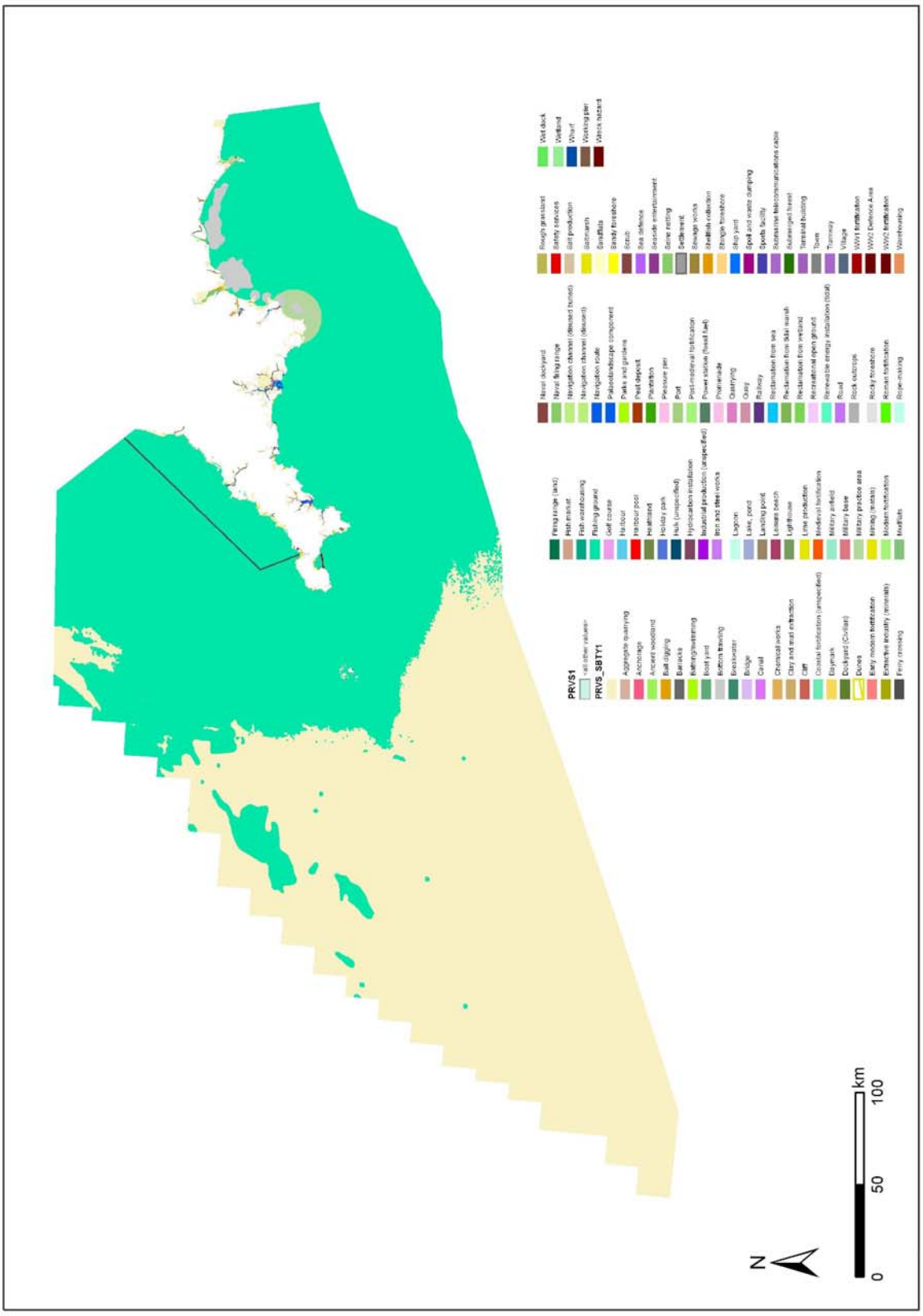

Fig 7 Previous 1 HSC Character Types where information was available (see p29)

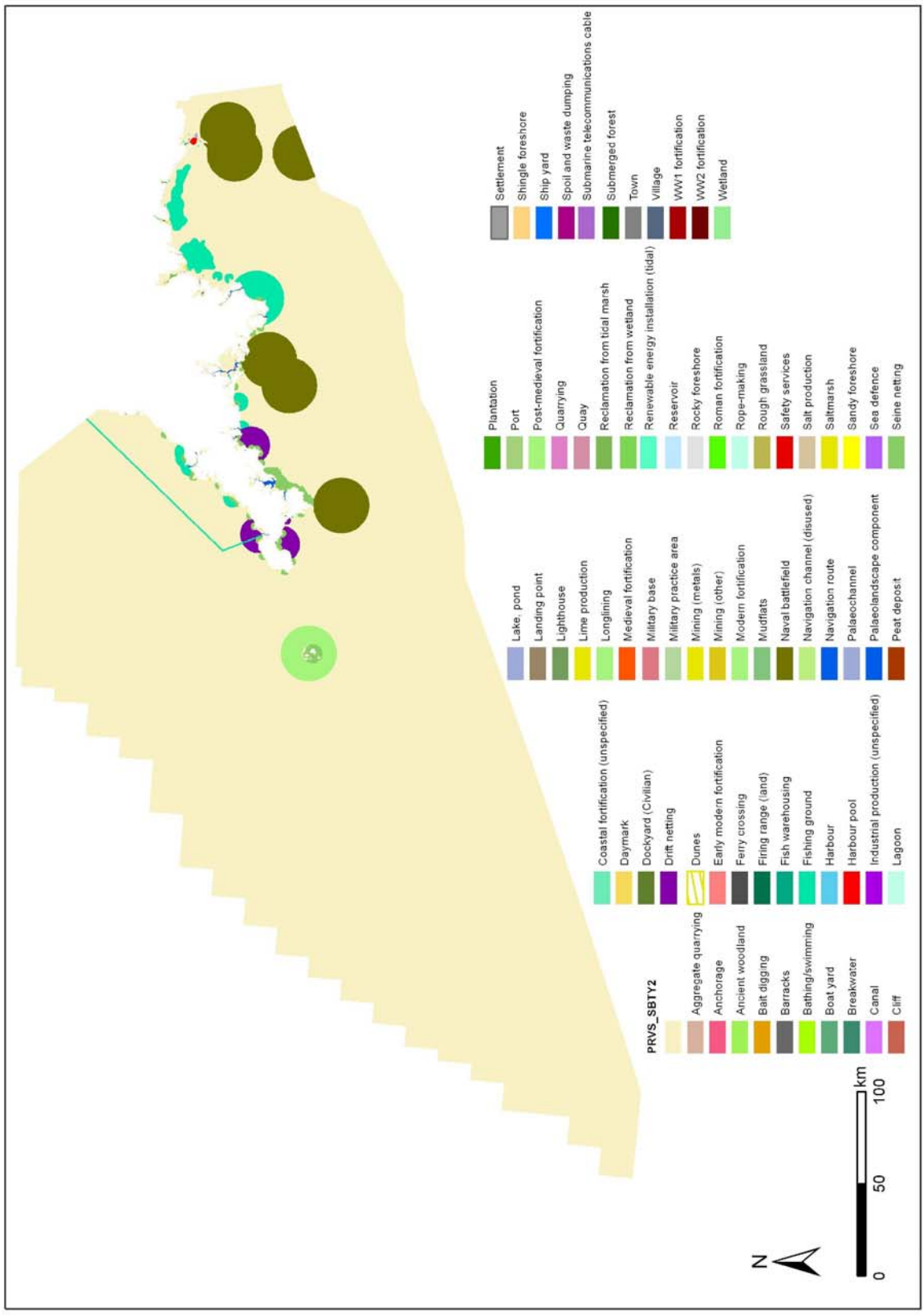

Fig 8 Previous 2 HSC Character Types where information was available (see p29)

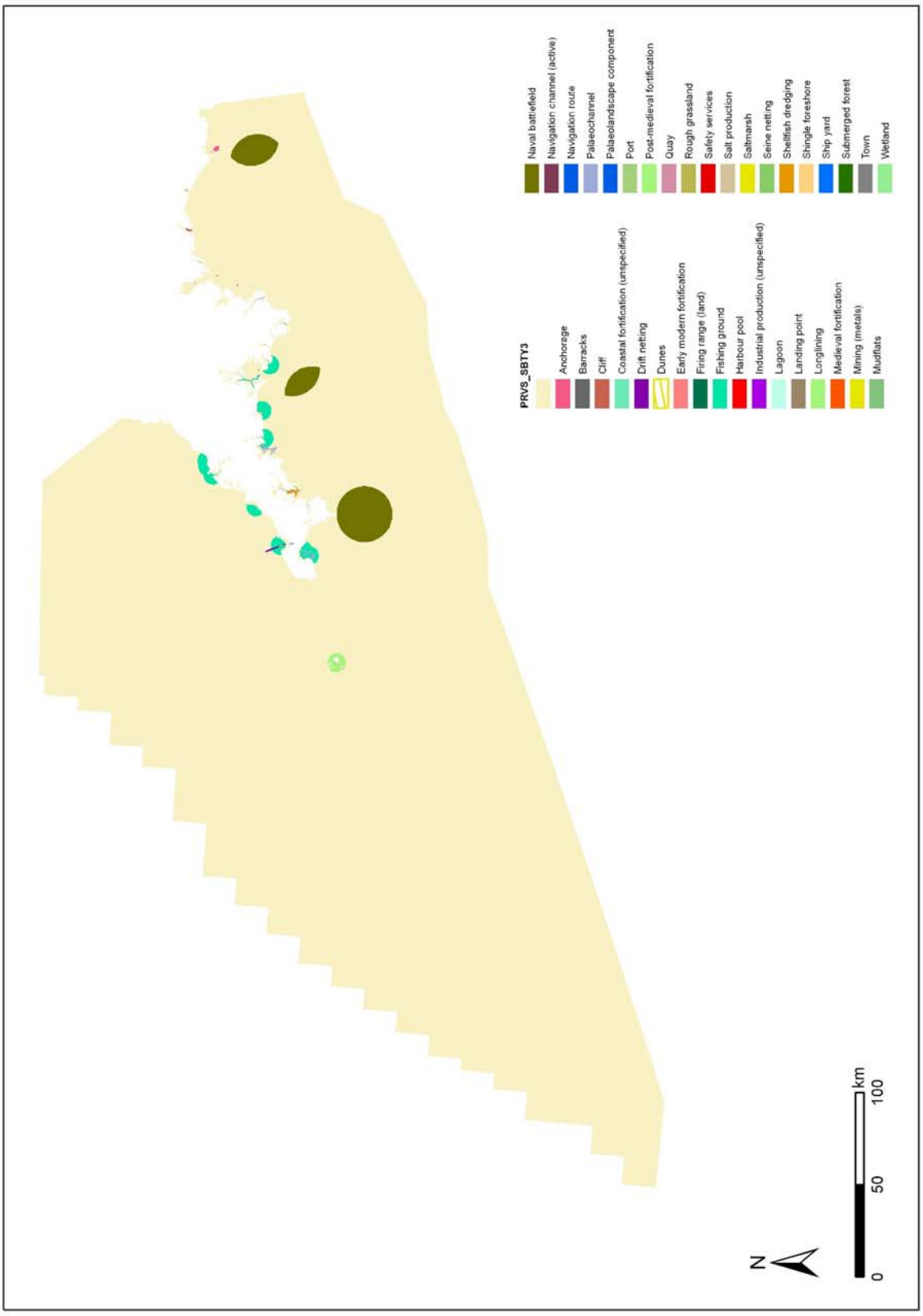

Fig 9 Previous 3 HSC Character Types where information was available (see p29)

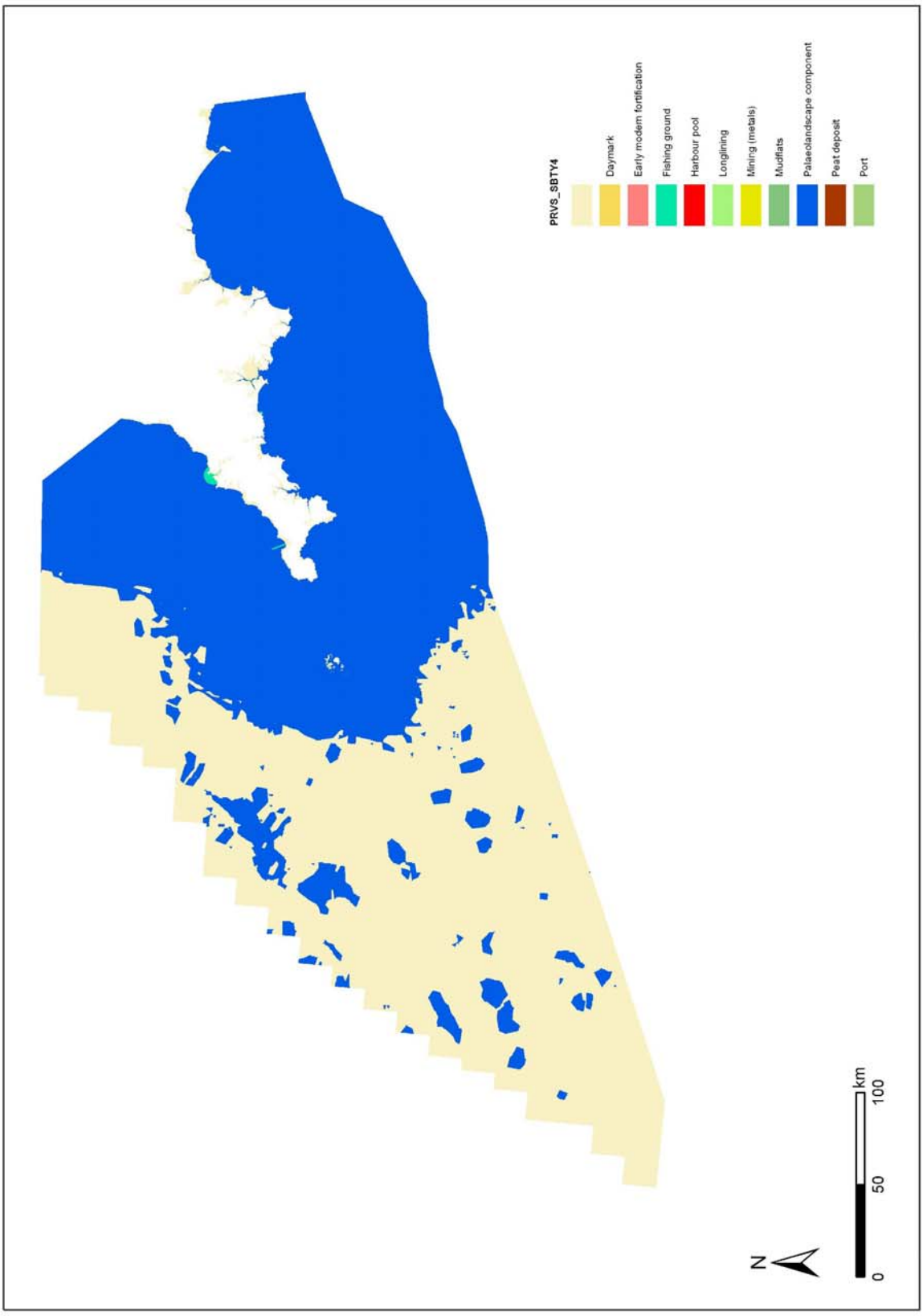

Fig 10 Previous 4 HSC Character Types where information was available (see p29)

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Abbreviations

ADS	Archaeological Data Service, York
AGI	Association for Geographic Information
AIS	Automatic Identification System
ALSF	Aggregates Levy Sustainability Fund
AONB	Area of Outstanding Natural Beauty
ASA	Archaeological Study Area
CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CRS	Coordinate Reference System
DCMS	Department for Culture, Media and Sport
Defra	Department for the Environment and Rural Affairs
DfT	Department for Transport
ELC	European Landscape Convention
EH	English Heritage
EHA	English Heritage Archive
eGMS	(UK) e-Government Metadata Standard
GIS	Geographic information System
HER	Historic Environment Record
HLC	Historic Landscape Characterisation
HSC	Historic Seascape Characterisation
IFCA	Inshore Fishery and Conservation Authority
MCZ	Marine Conservation Zone
MLW	Mean Low Water
MMO	Marine Management Organisation
MoU	Memorandum of Understanding
MPA	Marine Protected Area
MPS	Marine Policy Statement
NHCP	National Heritage Protection Commissions, English Heritage
nm	nautical mile
OS	Ordnance Survey
OSGB	Ordnance Survey Great Britain
RYA	Royal Yachting Association
SMP	Shoreline Management Plan
SSSI	Site of Special Scientific Interest

UKHO	United Kingdom Hydrographic Office
UTM	Universal Transverse Mercator
WGS	World Geodetic System