HSC - Demonstrating the Method

Section 3: Character Text Descriptions

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Section 3: Character Type Descriptions

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1.1.1.1 Character Type: Energy Industry

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Energy Industry includes the following Sub-types:

- Hydrocarbon field (Oil);
- Hydrocarbon field (Gas);
- Hydrocarbon field (Coal)
- Hydrocarbon installation;
- Hydrocarbon cable and pipeline
- Hydrocarbon refinery;
- Power stations;
- Renewable energy installation.

The Character Type Energy Industry includes Hydrocarbon Fields (oil, gas and coal); associated installations, pipelines, cable lines, refineries and other related infrastructure linking this Character Type with land. Power stations of all fuel types are also included as are Renewable energy installations such as wind farms and wave hubs (see Tapper & Johns 2008).

Hydrocarbon is an organic compound consisting entirely of hydrogen and carbon. Hydrocarbon is one of the Earth's most important energy resources. The predominant use of hydrocarbon is as a combustible fuel source as well as raw material for plastic production and lubricants (http://en.wikipedia.org/wiki/Hydrocarbon).

Oil processing is grouped into three categories: light distillates (LPG, gasoline, and naphtha), middle distillates (kerosene, diesel), heavy distillates and residuum (fuel oil, lubricating oils, wax, and tar). This classification is based on how crude oil is distilled and separated into fractions. Although oil and natural gas reserves are declining, there are a number of oil terminals in England with examples in Merseyside, and Hertfordshire.

Most of the gas for domestic consumption comes from the UK Continental Shelf. As that resource is in decline, it is expected that England will increasingly depend on imported gas (www.parliament.uk/post).

Coal is the largest source of energy for the generation of electricity worldwide although other renewable sources, especially in England, are currently becoming more popular

such as the development of offshore wind farms (http://www.thecrownestate.co.uk/our_portfolio/marine/offshore_wind_energy.htm).

Hydrocarbon field (oil) refers to an offshore production area for reserves of oil grouped on, or related to, the same individual geological structural feature or stratigraphic condition. When organic-rich rock such as oil shale or coal is subjected to high pressure and temperature over an extended period of time, hydrocarbons form (Tapper & Johns 2008).

Hydrocarbon field (gas) refers to offshore production areas for reserves of natural gas grouped on, or related to, the same individual geological structural feature or stratigraphic condition. When organic-rich rock such as oil shale or coal is subjected to high pressure and temperature over an extended period of time, hydrocarbons form (Tapper & Johns 2008).

Hydrocarbon field (coal) refers to a production area for reserves of coal grouped on, or related to, the same individual geological structural feature or stratigraphic condition. Coal is a fossil fuel and is extracted from the ground by mining, either underground or in open pits.

Hydrocarbon installation is an installation involved in the extraction of oil, natural gas and coal. Associated structures include pipelines, platforms, tanker moorings, storage containers, warning signals and lights. Unauthorised navigation is prohibited within 500m of all such structures (Tapper & Johns 2008).

Hydrocarbon cable and pipeline refer to installations involved in the transport of oil and natural gas (Tapper & Johns 2008). Some of them are linked to renewable energy since generally turbines are connected to the step-up transformers located in the offshore substation via a network of array cables that are laid between wind turbines and offshore substations. These cable lines are used to connect the offshore substation with the onshore substation.

Hydrocarbon refinery is a building or structure that refines oil and gas, such as a gas works. An oil refinery converts petroleum crude oil into its distillates for a range of uses. A gas refinery purifies and converts raw natural gas into residential, commercial and industrial fuel gas (Tapper & Johns 2008).

Power stations, fuelled by coal, gas or nuclear fusion, are industrial facilities that generate electric power for domestic and industrial uses.

Renewable energy installations are built to generate energy from natural resources such as wind and water. These installations include wind farms and wave hubs. They are central to the current UK government's objectives to secure diverse energy supply and to reduce carbon dioxide emissions. With onshore wind farms making an increasing contribution in the UK, larger scale developments are now taking place offshore (http://www.thecrownestate.co.uk/offshore_wind_energy).

England’s offshore oil and gas originate from two sources: 1) from subsidence and burial of marine limestones under thick accumulations of basin sediments approximately 140 million years ago which have generated gas from coal source rocks; and 2) from deeply-buried mudstone source rocks from approximately 65 million years ago. Thus

commercial petroleum reservoirs occur in almost every sedimentary succession ranging in age from approximately 410-36 million years (BGS 2001).

By 2001, approximately 280 platforms on the UK Continental Shelf were producing around 2.3 million barrels per day of oil and 100 million m^3 per day of gas (CEFAS 2001).

Coal occurs in the form of layers ('seams') in sequences of sedimentary rocks. Almost all onshore coal resources in England occur in strata of the Carboniferous system approximately 356-299 million years old. In England, coals of Mesozoic and Tertiary age are insignificant onshore but occur over large areas offshore (BGS 2001). In general, extensive re-landscaping is undertaken after the end of mining at a site with the aim to gain back the productive use of land, moulding past Character Types expressed in today's landscape. For example, the impact of coal mining on the coastal dimension is significant in some areas such as the North East (Co Durham) and Cumbria. It produced 'black beaches' formerly covered with sand impacting on large coastal topographic changes.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical historical components include:

- coal, oil and gas fields;
- mine workings, including open-cast and pit workings;
- slag heaps and offshore spoil dumping grounds;
- coal staithes;
- sub-sea wells and wellheads;
- fixed platforms and drilling rigs;
- large, sprawling industrial complexes;
- cooling towers, chimneys;
- distribution depots and customer service centres; and
- associated transport systems (such as railways, roads, ships, docks and tanker terminals). It is important to note that transport links are covered by the relevant Transport Sub-types.

Whilst coal fuelled the Industrial Revolution during the 18th and 19th centuries, oil and gas were the most important natural fuel resources to be discovered in England during the 19th and 20th centuries. They provide energy and essential chemicals for the home, industry, and the transport system as well as earning valuable export and tax revenues to support the UK economy.

The demand for coal was relatively low until the 1700s. During this period, coal production increased because of the first Industrial Revolution (1750) in England. By the early 1800s, over 10 million tonnes of coal was being mined annually. Coal production continued to increase, reaching its peak in the early 1900s when over 250 million tonnes were being produced each year. Since then production has declined and today annual output is approximately 30 million tonnes (www.coal.gov.uk).

In the 1960s, while coalmines and railways were closing, oil and gas refineries were opening, both having impacts on the communities they were supporting.

Natural gas from land-based reservoirs has been utilised to provide heating and lighting since the late 18th century. However, the situation changed in the 1960s and 1970s when a national conversion programme from 'town' gas to natural gas took place.

The first full scale nuclear power station was opened in 1956. The news expressed that 'the Queen has opened the world's first full-scale nuclear power station, at Calder Hall in Cumberland'. The Lord Privy Seal, Richard Butler, described the event as "epoch-making" (www.news.bbc.co.uk).

VALUES AND PERCEPTIONS

This Character Type is generally linked to varied and complex feelings, differing across regions and places. Some people think that this Character Type provides a way forward in terms of generating energy in a 'clean', 'safe' and 'reliable' way. Others feel that the energy production is an 'eyesore', 'noisy' and not fully environmentally friendly. Others may link this Character Type, especially its coal industry expressions, to a hard labouring life, with many workers who suffered illnesses. It is also represented by the artificial landforms of reclaimed spoil heaps and post industrial communities with no obvious economic base after the mines closed.

The use of nuclear power has always been controversial, not least because of the problems of storing radioactive waste for indefinite periods. The potential for severe radioactive contamination by accident or sabotage, and the possibility that its use could indirectly lead to a proliferation of nuclear weapons are also issues for some communities.

Renewable sources of energy may be perceived as benign, symbols of hope. However, renewable energy complexes are often highly visible features impinging on familiar and highly valued landscape and may add to levels of noise, smell and activity. These aspects generate strong and sometimes polarised views.

RESEARCH, AMENITY AND EDUCATION

This Character Type has developed relatively recently. Therefore, the extent of research on the development of this Character Type and its typical components could be considered as fairly limited. Decommissioning of plants may provide opportunities to undertake research, enabling further understanding of its current impact on the landscape/seascape and the discovery of previous historic Character Types which may still be well-preserved beneath some of these complexes. Considerable numbers of these industrial areas are founded on reclaimed land, often drained saltmarsh and mudflats, infilled from the late 19th century onwards. These buried deposits may have considerable potential for preserving palaeoenvironmental material and artefacts and features associated with estuarine environments. This provides crucial baseline information to enable the understanding of previous landscape/seascape uses contextualised within current impacts of this Character Type.

Public amenity may be limited due to health and safety restrictions but other possibilities could be explored such as virtual and interactive displays.

General policy trends show an expansion of renewable energy with an encouragement of wind power, especially in offshore locations where more consistent strong wind speeds

are available. Within this context, some recognition of the historic environment in planning future wind farms is expressed, for example, by the Collaborative Offshore Wind Research Into The Environment (COWRIE), a company set up by The Crown Estate to raise awareness and understanding of the potential environmental impacts of the UK offshore wind farm programme. COWRIE recently published a guidance note for best practice in survey, appraisal and monitoring of the historic environment during the development of offshore renewable energy projects in the UK (Oxford Archaeology & George Lambrick Archaeology and Heritage 2008; Wessex Archaeology 2007). Historic Seascape Characterisation (HSC) will now be able to complement that for future planning with information on the typical historic character of areas under consideration for renewable energy developments, adding area-based context to the more traditional point-based records of the historic environment.

CONDITION AND FORCES FOR CHANGE

Output from the largest producers – the UK and Norway - has peaked and entered a period of long term decline. In 2001, around 500 platforms and 10,000 kilometres of rigid and flexible oil and gas pipelines were running between offshore production wells and terminals on land (CEFAS 2001).

Increasing concerns relating to the finite nature of hydrocarbons and the burning effect these resources have on global warming places is increasing pressure on the energy industry sector. Nuclear power has been the main form of alternative energy production with renewables increasing as a share of overall UK energy production. Renewable energy is an essential element of the UK Government's programme of action to tackle climate change. Recent debates suggest that new nuclear power stations are unlikely to make a significant contribution to current needs. However, it has been stated that even though '*the share of renewables will grow, it is likely that fossil fuel generation will meet some of these needs. Given the likely increase in fossil fuel generation…, it is important that much of this nuclear capacity is replaced with low carbon technologies. New nuclear power stations could make an important contribution to meeting our needs for low carbon electricity generation and energy security…'* (BERR 2008; for further details also see http://www.decc.gov.uk; http://www.defra.gov.uk/environment/radioactivity/mrws/waste/new-nuclear-power-stations.htm).

RARITY AND VULNERABILITY

Oil, gas and coal working installations are found in coastal expressions within the overall English mainland and territorial and continental waters. If any remains of installations are found, statutory designation for modern structures exists in the form of designated safety zones around them. The purpose is to protect the safety of people working on or in the immediate vicinity of the installation and the installation itself against damage. They also provide the additional benefit of protecting fishermen and other mariners by reducing the risk of collision with the installation and preventing loss of gear which can become snagged on underwater equipment (Val Baker et al 2007).

An environmentally responsible approach will continue to be encouraged within this sector. There is government legislation that ensures consistent standards throughout the offshore industry (e.g. DEFRA 2002, 2008, DEFRA & House of Lords 2008). Relevant archaeological guidance notes regarding the energy industry sector are also publicly

available (Oxford Archaeology & George Lambrick Archaeology and Heritage 2008; Wessex Archaeology 2007). Since their publication, Historic Seascape Characterisation (HSC) has emerged providing a broader context of historic character.

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1.1.1.2 Character Type: Extractive Industry (Minerals)

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Extractive Industries (minerals) includes the following Sub-types:

- Aggregate dredging;
- Spoil dumping;
- Quarrying;
- Mining;
- Works

Extractive industry (minerals) refers to industrial activities at sea or along the coast that continuously disrupts and impacts on the coastal and marine environment (particularly the seabed) through time. It includes coastal and marine mining and quarrying, aggregate dredging and spoil dumping.

Aggregate dredging involves sand and gravel removal through mining and quarrying of sand, gravel, clays, ceramic and refractory minerals, including the associated facilities required for washing, screening, and preparing the mined aggregates. The principal activity of this industry is the production of sand and gravel for use as aggregates in the construction of buildings and infrastructure (e.g. roads). The removal of sediment can also involve capital dredging which is carried out to create a new harbour, berth or waterway, or to deepen existing facilities in order to allow larger ships access. Maintenance dredging allows deepening or maintaining navigable waterways or channels which are at risk of silting-up, due to sedimented sand and mud, potentially making them too shallow for navigation.

Spoil dumping covers areas used for dumping or depositing dredging spoil, drilling waste and cuttings, treated sewerage and other land waste.

Quarrying involves the open cast mining for stone and other minerals, this is often located near the coast due to outcrops and ease of access and transport (Tapper & Johns 2008).

Mining generally involves subterranean mining for stone and other minerals but excluding hydrocarbons which are covered by the 'Energy Industry' Character Type. Mining is often coastal due to outcrops and ease of access and transport (Tapper & Johns 2008).

Works covers all extractive, processing and closely associated infrastructure relating to the exploitation of a specific stone or other mineral. For example, alum works covers all extractive, processing and closely associated infrastructure relating to the exploitation of a specific chemical compound and a class of chemical compounds called alum, and is useful for a range of industrial processes. Today, alum is used in vaccines as an adjuvant. Alum is also commonly used as a coagulant (usually termed a flocculant in this context) in water treatment and purification (http://en.wikipedia.org/wiki/Alum). Ironstone works covers all extractive, processing and closely associated infrastructure relating to the exploitation of the fine-grained, heavy and compact sedimentary rock called ironstone. It is an abundant and widespread source of iron. Historically, most of English iron originated from ironstone, but it is now rarely used for this purpose. Ironstone is used as a component in some ceramics, commonly known as 'ironstone china' (http://en.wikipedia.org/wiki/Ironstone). Jet works covers all extractive, processing and closely associated infrastructure relating to the exploitation of the fossilised wood called jet. Jet was particularly fashionable in Victorian times and its extraction gave rise to a significant local industry in north-east Yorkshire. Occurrences of precious and semi-precious stones are generally rare in England (BGS 1999). Salt and Potash works covers all extractive, processing and closely associated infrastructure relating to the exploitation of salt and potash, two of England's important indigenous industrial non-metallic minerals.

Mining, quarrying, and works develop through time, usually leaving traces of earlier technologies, plant, and dumps. In some cases, such as quarries, earlier features could be partially impacted by later workings. In other cases, traces of earlier features from the exploited land could be identified such as remains of earlier settlements and fields within industrial complexes.

This Character Type is usually superimposed onto other Types due to the historical phasing of this Character Type's activities in most character area sequences. This is because extractive industries and their components are generally determined by the location of its object. Therefore, mines and quarries could potentially be found in most Character Types.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Overall, the typical historical components of this Character Type include:

- mines;
- quarries;
- office, storage and factory buildings;
- waste tips, dumps, and spoil heaps;
- specifically associated transport systems (such as tunnels, railways and harbours).

Marine aggregate deposits (MADs) are sands and gravels of economic value that can be found on the seabed. Marine aggregates are used primarily for building and construction

purposes and a substantial proportion of the United Kingdom's need for aggregates is obtained from the seabed. Using marine resources reduces the pressure to work minerals on land where resources are constrained in areas of agricultural, environmental or development value (ODPM 2005). It is known that there are very extensive deposits of soft aggregates (i.e. sand and gravel) in the English waters. Their distribution is uneven with variable thickness, illustrating the complex geological history of the seabed (ODPM 2005). Two main areas of maximum MADs potential have been identified: the southern North Sea and the English Channel (Wenban-Smith 2002). Processes like climate change and fluctuation of sea levels over the last 2 million years contributed to the deposition of sand and gravels which now lie on the seabed (Gubbay 2005). These materials were originally deposited by river systems that are now submerged (BMAPA 2000; ODPM 2005). Therefore, these processes periodically exposed seabed as dry land, creating a space for human occupation and the potential for associated past human remains on those landscapes. Over the last twenty years the growth and development of the offshore extraction and construction industries have increasingly threatened the submerged archaeological resource. Knowledge of the archaeological potential of submerged environments, both in terms of historical and prehistoric remains, has been recognised at national and international levels by both heritage organisations and seabed developers (see www.jnapc.org.uk). As a result, initiatives promoting an environmentally friendly extraction have been developed. For example, the Aggregates Levy Sustainability Fund (ALSF) demonstrates how this scheme has enabled English Heritage to support a range of timely initiatives, providing new insights into mitigation, assessment, evaluation and potential of the marine historic environment through remote survey and field investigation. Historic Seascape Characterisation (HSC) has contributed to develop our understanding of the historic character of the marine zone for the key licensed aggregates extraction areas to the median line with UK neighbours. Typical components include quarries, offshore licenced areas, wharves, office buildings, and specifically associated transport systems (such as tunnels, railways and harbours).

Alum was imported into England mainly from the Middle East before the 15th century, and, from the late 15th century onwards it was imported from the Papal States for hundreds of years. Alum was primarily used in the textile industry as a dye-fixer (mordant) for wool. England's most important medieval industry, the wool trade, relied upon a steady supply of alum since the value of the cloth depended on how well it was dyed. However, these sources were unreliable and there was a push to develop a source in England especially as imports from the Papal States were ceased following the excommunication of King Henry VIII. With state financing, attempts were made throughout the 16th century, but without success until early on in the 17th century. (http://en.wikipedia.org/wiki/Alum). During this time, the attention was centred upon North East Yorkshire due to the discovery of a Jurassic Upper sequence of rock strata that outcropped in a thick band in the coastal cliffs to the north and south of Whitby (and in certain inland locations) and which contained aluminium sulphate (the vital ingredient of alum). The production of English alum was concentrated in this region for the next 250 years, stimulating the development of other industries and helping to lay the foundations for the Industrial Revolution that followed in the 18th century. In general, alum quarries and their associated spoil tip represent the first stages of the manufacture process. The next stage in the process was to extract the aluminium sulphate from the calcined rock by soaking it in water. This was undertaken in large stone tanks called steeping pits requiring a constant supply of fresh water. The secondary processes were undertaken in a purpose-built factory called the alum house. These were often some distance from the quarry, so the raw liquid had to be

transported. Once at the alum house, the raw liquid was boiled and concentrated to a point where the aluminium sulphate would crystallise with the addition of an alkali. The crystals were then purified through a sequence of washing and re-crystallising cycles. The details of this process were a closely guarded secret, and no contemporary accounts survive. Typical components include: quarries; steeping tanks; alum houses; storage and office buildings; reservoirs; waste tips, dumps, and spoil heaps; and specifically associated transport systems (such as tunnels, railways and harbours).

Ironstone works have had a long history in England. Ironstone is used as a component in some ceramics, commonly known as 'ironstone china' (a hard white earthenware). Most early ironstone was made in Staffordshire because of the abundance of clay and the proximity of a seaport for shipping the finished wares to North America and Europe. During the 17th century, several Staffordshire potteries produced a ceramic ware that they called 'stone china'. Josiah Wedgwood manufactured a 'stoneware' china in the 19th century that could be mass-produced. It was commonly used for heavy-duty dinner services in the 19th century. Charles Mason took out a patent for 'Mason's Ironstone China' in 1813 as a cheap alternative to porcelain. Ironstone china was also very popular during the 1970s (http://en.wikipedia.org/wiki/Ironstone). In some areas, ironstone deposits have been strip mined, resulting in deep linear quarries known as 'gullets', surrounded by extensive areas of spoil. Some of these former workings have been returned to agriculture, but others (e.g. Twywell Gullet) support limestone grassland rich in plant species such as orchids (http://www.naturalengland.org.uk/ourwork/conservation/geodiversity/englands/counties/area_ID25.aspx). Typical components include mines; quarries; bloom furnaces and slags; office and factory buildings; waste tips, dumps, and spoil heaps; and specifically associated transport systems (such as railways and harbours.

The use of Jet has a long history, going back to the early fourth millennium BC in England. Best known for its use as a symbol of mourning in Victorian times, jet has been accorded a special status during many periods in the past. Its rarity and aesthetic appeal have led to its use as a prestige commodity. Its extraction gave rise to a significant local industry. Occurrences of precious and semi-precious stones are generally rare in England (BGS 1999). Jet deposits vary in quality from region to region, largely dependent on the levels of trace elements such as aluminium, silicon and sulphur. The most famous deposits of Jet are in North Yorkshire. These particular deposits have high levels of aluminium and this produces Jet of extremely high quality. Typical components include: mines and adits, which are a type of entrance to an underground mine (in both cliffs and foreshore); waste tips, dumps, and spoil heaps.

Potash is used worldwide in almost every major agricultural industry. It is used as a fertilizer on grain crops such as corn, soybeans, oil palms, coffee, sugar cane, cotton, fruit and vegetables. The majority of potash production goes into fertilizer, but it is also used in commercial and industrial products (e.g. from soap to television tubes) (BGS 2006). Potash is worked by underground mining methods. Waste products include the discharging of clays and salt. Boulby Mine is the only potash mine in operation in England. Typical components include mines and exploration boreholes; office and factory buildings; and specifically associated transport systems (such as railways, roads, ships and docks).

England is essentially self-sufficient in salt. Historically, salt extraction has been carried out since at least the medieval period with exports having exceeded imports at times. Trade is currently roughly in balance (BGS 2004). England has huge resources of salt (BGS 2004). Office and factory buildings were usually set up adjacent to the extraction sites and brine reservoirs were built. Rock salt mining produces no waste. Salt is now produced in only two areas in England: Cheshire and the North York Moors National Park (BGS 2004). Minor quantities of sea salt are produced by the evaporation of seawater in Essex. Typical components include mines; office and factory buildings; and specifically associated transport systems (such as railways, roads, ships and docks).

Building stone quarries are very important since England has been a producer of building stone for hundreds of years. The country posses a varied geology, so a wide range of building stone types are available. The use of these various types of stone has influenced architectural style throughout the Nation (http://www.bgs.ac.uk/mineralsuk/minequar/stones/home.html). Sandstone has also been in demand since it hardens when weathered. This quality makes sandstone resistant to the effects of immersion, and therefore useful in harbour works. Typical components include quarries and pits; waste tips, dumps, and spoil heaps; and specifically associated transport systems (such as railways, roads, ships and docks).

VALUES AND PERCEPTIONS

There are many tangible and non-tangible reminders of England's industrial past expressed for example in alum quarrying, ironstone and jet mining. The remains of these industrial processes on the present landscape/seascape can sometimes generate complex feelings in different regions and places which are probably dependent on people's closeness to these industries.

RESEARCH, AMENITY AND EDUCATION

In a marine context, further research has taken place within the development of Regional Environmental Assessments, which are non-statutory and marine aggregates industry led initiatives, designed to identify sensitivities at a regional scale that can then be addressed at a local level as appropriate through the relevant Environmental Impact Assessments (EIAs) (http://www.cefas.co.uk/media/126642/rea%20framework%20guidelines_final.pdf). Through the Aggregates Levy Sustainability Fund (ALSF) Regional Environmental Characterisation (REC) surveys have taken place, collecting baseline information on large areas of the seabed to enable better informed environmental assessments (http://www.alsf-mepf.org.uk/projects/rec-projects.aspx).

A wealth of research has been produced on Extractive Industries addressing issues such as reducing the environmental footprint of quarrying and the sustainable provision of aggregates (see http://www.sustainableaggregates.com/index.htm). Furthermore, geophysical surveys are a requirement for offshore aggregate extraction to enable, amongst others, the assessment of the impact of these developments on the historic environment. These surveys also allow the potential to increase knowledge of the historic environment for an area. This information will feed into the local and national monuments records and inform future curatorial decisions, providing an opportunity for beneficial cumulative knowledge regarding marine archaeology.

Extensive research has also been undertaken regarding coal mining in England. It would be useful to explore further links of this industry with the marine environment to provide a deeper understanding of this industry as a whole nationally and internationally.

Further research on industrial archaeology in England would be beneficial to enable public access to, and appreciation and enjoyment of, the historic environment for present and future generations.

Today's impact of this Character Type in England can be seen through the wide range of museums and abandoned queries use for amenity and educational purposes (e.g. The National *Coal Mining* Museum for *England*). The Aggregates Levy Sustainability Fund (ALSF) has also provided a wide range of educational initiatives including two Derek the Dredger children's books, emphasising aspects of aggregate extraction, marine archaeology, marine biodiversity and how such industries work together and the Aggregates to Outreach Teaching Pack with curriculum linked lesson plans and handling collections (see www.hwtma.org.uk).

CONDITION AND FORCES FOR CHANGE

The condition of this Character Type is variable since some features related to this industry have been almost entirely destroyed whilst others are very well preserved. Some industrial areas have also experienced some depredation.

Coastal remains from these industries are prime targets for public awareness initiatives in the context of the forthcoming coastal access requirements. This access will need to be carefully routed to avoid increased visitor erosion of surviving features.

Derelict land has been gradually tidied-up by farmers or expanding housing developments and in certain areas the remains of early industry have been either damaged or destroyed by cliff falls or by subsequent industrial activity.

Coal mining can represent a force for change in itself since surface mining of coal, for example, completely eliminates existing vegetation and destroys the genetic soil, altering current land uses, and to some extent permanently changes the general topography of the area mined. This often results in a scarred landscape, though rehabilitation can mitigate some of these concerns.

In general, indirect effects of extractive industry are often unrecognised, such as the development of towns and the generation of wealth.

RARITY AND VULNERABILITY

In terms of rarity, extractive industries (minerals) exist, of course, where the resource lies. Jet mines and alum works are nationally confined to North East, in particular North Yorkshire. Ironstone mines, however, can be found in other parts of England. In terms of vulnerability, raising awareness of the significance and unique value of industrial remains in England will make them more sustainable as a resource and accessible to present and future generations. The vulnerability of the landscape due to the impacts of these industries can be summarised as follows: areas that have been worked and restored; industrial areas that are under pressure from dereliction, packhorse routeways under pressure from by-passes, mines vulnerable to collapse; and old ironstone mines

which colour the water in streams brown. Regarding salt mining, for example, there is a visual impact on the landscape from buildings and storage mounds and the effects of wind-blown salt.

Natural recolonisation of chalk and limestone quarries has led to the development of attractive and species-rich communities in many parts of the United Kingdom. These communities have a basic similarity in floristic composition wherever they occur. They also show significant individual variation resulting from differences in the location, history and variability of the quarry itself and in the nature of the surrounding habitats. This is one of the reasons why there are also several areas that are now designated, especially Areas of Outstanding Natural Beauty (AONB) and Sites of Special Scientific Interest (SSSI).

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1.1.1.3 Character Type: Processing Industry

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Processing Industry includes the following Sub-types:

- Production areas;
- Warehouse;
- Sewage and water works.

Production area is a general industrial area where materials and goods are produced and/or processed (Tapper & Johns 2008).

Warehouse is a building or part of a building used for the storage of goods or merchandise (http://thesaurus.english-heritage.org.uk).

Sewage and water works are group of buildings in which local sewage and water is filtered and purified in large rectangular or circular tanks, including associated outfalls, pipelines and diffusers (http://thesaurus.english-heritage.org.uk).

This Character Type is directly related to the process of production and manufacture and, indirectly, to the consumption of goods. For example, iron is the most widely used of all the metals. Its low cost and high strength make it indispensable in engineering applications such as the construction of machinery and machine tools, automobiles, the hulls of large ships, and structural components for buildings. Since pure iron is quite soft, it is most commonly used in the form of steel (http://en.wikipedia.org/wiki/Iron). Timber has been mainly used for shipping and building industries, as well as fuel. Brick, tile and clay have been generally used in the building industry as well as the production of pottery. When different types of clay are used in combination with different minerals and firing conditions, earthenware, stoneware, and porcelain can be produced. Typical examples are tin-glazed earthenware which was the first white pottery (often painted) manufactured in England during the 17th century. In the 18th century, industrial and technological developments enabled standardised productions and mould-made sets, amongst others. It is widely known that press-moulded creamware and saltglaze types were manufactured in England. Earthenware and stoneware types, particularly

creamware and saltglaze, were manufactured in press-moulds with relief decoration, Josiah Wedgwood being an example (Draper 1984; Gaimster 1997; Gesner 2000; Noël Hume 1970). It has been argued that the interplay of people and objects was driven by interests, motives and intentions (Gosden & Marshall 1999; Hall 2000). It is through this interplay that the material projection of English identities took place, having a profound impact on the character of the society at that time as a way of differentiating from other Europeans for example, assuring power and authority as well as lifestyle and good manners.

This Character Type developed through time, usually leaving traces of earlier technologies. In some cases, such as production areas, earlier features could be partially impacted by later workings. In other cases, traces of earlier features could be identified such as remains of earlier settlements and fields within industrial complexes.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of the Sub-type production areas include:

- iron and steel works;
- timber yards;
- brick, tile and clay works;
- potteries;
- chemical works;
- glassworks,
- mills;
- lime kilns;
- cement works;
- roperies; and
- engine and boiler works.

English society experienced a period of transformation during the 18th century, especially between 1750 and 1800, when industrial developments, inventions and new scientific discoveries were taking place within the context of a growing capitalist system. This period contained complex social dynamics and 'revolutionary' movements of ideas that had an important impact on local, regional, national and international scales. These changes were expressed on, for example, the 1st 'Industrial Revolution' (1750) which was a product of acceleration in economic growth caused and illustrated by the economic and social transformations occurring at that time (Hobsbawn 1999: 12).

Patterns of production and consumption were transforming at the end of the 18th century, and English society demanded more of certain goods, with quality standards being maintained. Industrial and technological developments enabled standardised productions and mould-made sets, amongst others, being the material expression of standardisation. The industrialisation process stimulated changes in cultural attitudes, ideas, world-views, work practices and life styles in different areas of England. In other words, it has changed relationships between people, and between people and material things (including use of landscape/seascape) impacting on the character of past and present societies.

Iron and steel industries were particularly significant during the 1st and 2nd Industrial Revolutions. These industries were used in the production of machinery, tools, ships, weapons and buildings. Iron allowed the development of accurate machines and steam engines and steel allowed the construction of railways (Appleton 1929).

From a maritime perspective timber yards and roperies were particularly important for shipbuilding. The second half of the 17th century experienced a great demand for timber, especially within the growth of the shipping and house building industries.

Brick and tile works are generally poorly documented but there is evidence of the industry dating as far back as the Romano-British period, with indications that it was introduced to England by the Romans (Rowe 2000). For example, Roman tile kilns have been found in Southern England (e.g. Hamble). Tile remains are extremely numerous on areas inhabited by Romans so extensive local manufacturing could be inferred around these areas.

Warehouses are used by manufacturers, importers, exporters, wholesalers, transport, businesses, and customs amongst others. They are usually large plain buildings in industrial areas of cities and towns. Historically, warehouses load and unload goods, sometimes directly from railways or seaports. For example, Albert Dock (Liverpool) is a complex of dock buildings and warehouses. It was opened in 1846, and was the first structure in England to be built from cast iron, brick and stone, with no structural wood. As a result, it was the first non-combustible warehouse system in the world. At the time of its construction, the Albert Dock was considered a revolutionary docking system because ships were loaded and unloaded directly from the warehouses.

Overall, the typical components of the Sub-type sewage and water works include:

- sewage treatment works;
- water treatment works;
- sewage pipelines;
- diffusers;
- outfalls;
- pumping stations; and
- reservoirs.

There was no controlled method for disposing of liquid waste effluent until Victorian times. Before then, rivers, streams, tidal estuaries and the sea provided the means for carrying away waste. By mid 19th century, the growth of towns and cities and the development of industry caused a major impact on the landscape and its inhabitants regarding waste disposal (e.g. cholera and typhoid fever being some examples). From 1850s, London controlled disposal problems by constructing interceptor sewers. Treatment at sewage farms was also taking place in some towns, being a land consuming system. By the end of the 19th century, sewage farms became overloaded due to the continuing growth in population. As a result, more intensive handling methods were devised, the infrastructure of which still required large areas of land. These methods were gradually replaced by the more space-efficient activated sludge technique (developed in the 1910s). By World War II, land in connection with sewage farms was redundant and was subsequently used for housing, leisure facilities and industry (Department for the Environment Industry Profile 1995).

VALUES AND PERCEPTIONS

Generally speaking, this Character Type is meaningful for society as a whole as they represent places of work where people can earn a living. However, they can be perceived as functional, often smelly and therefore detracting from the beauty of an area.

Sewage and water works are also functional and often odorous. However, they are accepted as essential public amenities. At a national level, opposition to new works and pipelines is increasing, for aesthetic, environmental and heritage reasons.

Although conservationists have opposed the construction of some reservoirs due to the potential impact on local flora and fauna, in general, reservoirs are highly valued since they offer a space for recreation, tourism and leisure activities, often providing water sport facilities for wind surfers, canoeists, water skiers, anglers and yachtsmen.

RESEARCH, AMENITY AND EDUCATION

Research on this Character Type has been undertaken from both archaeological and historical perspectives. In general, links between land and sea have often been disregarded. Although this situation has started to change in the last few years, these links should be further explored to enable a more comprehensive understanding of this Character Type.

Some features of this Character Type, such as mills and limekilns, are suitable for presentation having amenity value. Although not directly related to the historical landscape/seascape, the amenity potential of reservoirs is also extensive for fishing and water sports as well as areas of natural beauty and wildlife havens.

CONDITION AND FORCES FOR CHANGE

The condition of this Character Type is variable since some features related to this industry have been almost completely destroyed whilst others are very well preserved. Some industrial areas have also experienced some depredation.

Coastal remains from these industries are prime targets for public awareness initiatives in the provision for the coming coastal access requirements. This access will need to be carefully routed to avoid increased visitor erosion to their surviving features.

Some production areas are being preserved due to their historic value. Those in close proximity to the coast are facing challenges for long-term preservation with global warning and rising sea levels.

Across the country, large reservoirs are generally carefully maintained, enabling good survival of their historic features. However, smaller reservoirs are generally disregarded. There is specific legislation which ensures that risks to the public and workforce are minimised.

RARITY AND VULNERABILITY

In terms of rarity, processing industries exist, of course, where the resource lies. For example, Staffordshire in England was of primary importance due to the quality of its clay, but the North East was also significant (Baker 1984).

In terms of vulnerability, raising awareness of the significance and unique value of industrial remains in England will make them more sustainable as a resource and accessible to present and future generations. Of course, these industries also impact on their surrounding landscape and many areas that have been worked and restored are now under threat of dereliction.

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1.1.1.4 Character Type: Shipping Industry

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Shipping Industry includes the following Sub-types:

- Shipyards;
- Boatyards;
- Commercial shipping route/area.

Shipping is the physical process of transporting goods and cargo by fresh or sea water (online Oxford Dictionary).

Shipyard is a place where boats or ships are built or repaired (http://thesaurus.english-heritage.org.uk).

Boatyard is a place where boats are built and stored (http://thesaurus.english-heritage.org.uk).

Commercial shipping route/area refers to a non intrusive offshore industry and area where ships travelling through are principally related to commerce or trade (Tapper & Johns 2008).

The shipbuilding and repair industry employs about 25,000 people. It has a turnover of £1.95 billion, with Gross Value Added (GVA) standing at £912 million (2004 statistics, Annual Business Inquiry (ABI) 2005). Strong competition from Eastern Europe and the Far East has made commercial shipbuilding a highly challenging market for European shipyards, and there are few remaining large English shipyards operating in the commercial sector. However, there is a large naval shipbuilding programme expected in future years for the Royal Navy. Large Royal Navy yards can be found in Portsmouth, Plymouth, the Clyde, Barrow and Rosyth. (http://www.BERR.gov.uk).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- docks;
- basins;
- wrecks;
- wharfs, quays, jetties and slipways;
- warehouses, offices, depots and travelling cranes;
- dockworkers cottages;
- specifically associated transport systems (such as railways, roads, tramways).

Docks are places to load and unload goods and supplies as well as areas to undertake ship repair and maintenance. Wooden ships required frequent attention to the caulking

between the planks. In the days before wire rigging, the heavy hemp rope needed regular adjustment and replacement. Dry docks are particularly suitable for the purpose of ship repair, as ships can be floated on high tide and propped. When the tide falls, the dock gates are closed and the ship is left dry for work to be carried out. Constant wear and tear on wooden hulls meant a steady demand for dry dock facilities (White 2004: 96).

Evidence for prehistoric and early medieval vessels in England is sparse. This is primarily due to the perishable nature of the materials from which these vessels were constructed. It is believed that log boats (canoes made from hollowed out tree trunks) and skin boats were common, and used during this period as ferries, fishing boats, trading or war vessels (Friel 2003: 22; McGrail 2001).

Although ships and boats made from wooden planks have a better survival rate than log boats, few early medieval examples have been found in England. One of the most famous examples is the Sutton Hoo ship, discovered in an Anglo-Saxon burial mound near Woodbridge (Suffolk). Research has shown that it was double-ended and clinker built, the hull was built up from a shell of overlapping planks, fastened at the edges by nails (Friel 2003: 24). Another important example of an early wooden vessel is the Dover Bronze Age boat dated to c. 1300 BC. The boat, constructed with stitched planks, was found in the axis of a fairly steep-sided portion of the Dour Valley. It was found in freshwater sediments with associated peat layers about 30m from the course of the modern River Dour. A long sequence of channel narrowing puts the original context of the Bronze Age boat in a riverside location, with direct access to the sea. This indicates some use of the area as a refuge or landing place for that period (for further details see Clark 2004). These remains illustrate the historic potential of landscapes/seascapes in some areas of England today.

It is difficult to find evidence of established shipyards in England's medieval landscape. The location of shipbuilding sites seems to have been rather haphazard. The sites themselves were rudimentary, although ships were being built in simple docks from at least the 1330s (Friel 2003). Accounts from between the late 13th and early 15th centuries state that shipbuilding was still based on clinker construction. Seagoing ships in England were clinker-built until the late 15th or early 16th century (Friel 2003; McGrail 1998, 2001).

Changes in European shipping during the 15th century were influenced by the skeleton-built Portuguese caravels. Skeleton construction involved nailing hull planks to a pre-erected skeleton of strong frames; the planks did not overlap, but were laid against each other, giving the hull a smooth exterior (Friel 2003; McGrail 1998, 2001). Other 15th century shipping changes included the introduction of two- and three-masted ships and the decline in the number of large ships. The latter may have been due to changes in the demand for goods being transported. Merchant ships of more than 100 tons were uncommon in England until the late 16th century, when they were constructed for long-distance bulk trade and war (Friel 2003; McGrail 1998, 2001).

The rapid development of the shipping industry and trade in the middle decades of the 18th century was linked to the increased competition among the expanding European powers as well as processes such as capitalism and colonialism (see Davis 1962; Dellino-Musgrave 2006; Staniforth 2003). The English shipping industry underwent a particularly rapid development following the Seven Years War against France (1756-63),

and the rate of English naval construction rapidly increased (see Parry 1971: 113-129). Before the war, French warships were considered to be better designed and faster than the English ships (see Lavery 1983; Parry 1971: 119). Subsequently, the English shipping industry promptly flourished since they based their ship designs on those of the French, the English becoming a maritime power from the end of the 18th century onwards. In contrast, after the declaration of war, the French shipping industry remained steady, and after some time declined.

During the 2nd Industrial Revolution (around 1850), technological and economic progress gained momentum with the development of steam-powered ships and railways, and later the internal combustion engine and electrical power generation. England led the way. During this time, steamships gradually replaced sailing ships for commercial shipping. Many new demands on transport were made. These could be more speedily met by steam-powered vessels, especially from the 1840s when iron hulls and the screw propeller were introduced (Hobsbawn 1999; Pearsall 1985).

In the 1900s, the internal combustion engine and gas turbine replaced the steam engine in most ship applications. Trans-oceanic travel, transatlantic and transpacific, was a particularly important application, with steam powered Ocean liners replacing sailing ships, culminating in the Superliners such as RMS Titanic.

U-boats (military submarines) were operated by Germany in particular during World War I and II. In practice, U-boats were most effectively used in an economic-warfare role, enforcing a naval blockade against enemy shipping. Remains of U-boats are present in English waters, in particular on the east coast. These remains are the material expression of these two major wars that left profound impacts that are still present on European societies.

Although the historic importance of sea travel for passengers has decreased due to the development of automobiles and aviation, it is still very effective for short trips and pleasure cruises. Sea transport remains the largest carrier of freight in the world. Ship transport is often international by nature. However, it can be accomplished by barge, boat, ship or sailboat frequently undertaken for purposes of commerce, recreation or military objectives.

VALUES AND PERCEPTIONS

Historically, the development of new technologies in shipbuilding has been perceived as a means of linking distant regions, places and people. Overall, shipbuilding has inspired many artists and writers. In general, the imprint that the shipbuilding industry has left on today's landscape is accepted and valued as part of England's heritage.

Today, the shipping industry is commonly perceived as a means for leisure and recreation. It is less obvious for the general public that shipping could be perceived as an expanding global business, offering the opportunity for commercially competitive shipping industries to share in this growth providing significant inward investment opportunities and, principally, wider economic benefits in England.

RESEARCH, AMENITY AND EDUCATION

Although further research is needed, from an archaeological perspective, shipbuilding traditions have recently been explored as a social product (Adams 2003). This has helped to contextualise shipbuilding within its significance at national and regional levels.

This Character Type contains amenity value which is linked to recreational and leisure activities such as sailing. Other amenity and educational values can be seen through the range of museums and historic shipyards (e.g. Portsmouth Historic Shipyard and the National Maritime Museum (Greenwich)). In addition the study of ship building, associated infrastructure and wreck sites offers a wealth of cross-curricular opportunities incorporating science, maths, English, history and environmental studies.

CONDITION AND FORCES FOR CHANGE

The condition of the shipbuilding industry in England is expressed through its components such as docks; basins; wrecks; wharfs, quays, jetties and slipways; warehouses, offices, depots and travelling cranes; dockworkers' cottages; and specifically associated transport systems (such as railways, roads, tramways). At certain locations, these components have now been transformed into marinas or commercial centres, Albert Dock (Liverpool) being an example (http://www.albertdock.com/).

The impact of this Character Type has been mainly economic, providing employment, income resources and, in a way, affecting the manufacturing industry in England.

RARITY AND VULNERABILITY

In terms of rarity, this Character Type is linked to major ports such as London and Liverpool. Its impact is seen on the links to international trade and the British Empire with many British ships having sunk overseas.

The vulnerability of this Character Type is exemplified by historic shipbuilding areas that have been transformed into marinas or commercial centres.

Today, the shipping industry could be seen as an expanding global business and the opportunity for commercially competitive shipping industries. This potential growth offers significant inward investment opportunities as well as wider economic benefits in England.

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1.1.2 Broad Character: Navigation

1.1.2.1 Character Type: Navigation Activity

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type includes the following Sub-types:

- Anchorage area
- Ferry route
- Harbour area
- Navigation route/area
- Port quarantine area
- Shipping lane
- Waterway

This Character Type identifies areas of historical and modern navigation activities. Therefore, the distinguishing attributes, apart from known wrecks, could be considered of high potential as far as the historic environment is concerned, especially around anchorage and harbour areas since they reflect many centuries of use. However, these areas have been scarcely studied from an archaeological perspective.

Anchorage area refers to an area of sea or coast where ships, vessels and craft anchor. Anchorage areas are often located along coastlines within bays or areas sheltered from predominant winds, strong currents and turbulent waters, which are known and regularly re-used by vessels for safe anchoring and sheltering. They could potentially be areas where archaeological potential is higher than usual, demonstrated by the 'Dive onto Victory' project (see http://www.hwtma.org.uk/index.php?page=hms-victory). The regular use of these sites increases the likelihood that vessels have sunk in the area in bad weather despite seeking shelter. There is the potential for finding remains of these vessels as well as debris discarded or dropped from ships (Tapper & Johns 2008).

Ferry route is related to a route across a river, lake or area of port, dock or harbour. It often includes associated buildings for passengers and vehicles and customs control; and embarkation and disembarkation areas. It may also include fixed chain-link ferry crossings.

Harbour area is an area of water adjacent to port or harbour that falls under the jurisdiction of the port/harbour authority. It includes traffic areas and restricted navigation areas.

Navigation route/area identifies areas of navigation activity as opposed to those areas that have been actively dredged or managed. Navigation routes or areas could be associated with areas of archaeological potential, especially if routes have been actively used from historical times.

Port quarantine area is a historical area linked to a port where a period of detention was imposed on travellers or voyagers before they were allowed to enter a country or town.

Shipping lane is related to commercial and trade shipping routes.

Waterway refers to a course or passage of water related to any navigational practice, such as a river or estuary.

English waters have been navigated since prehistoric times with navigational activities representing a significant aspect of the character of the marine landscape/seascape. However, these activities leave no permanent mark on the sea surface. Instead, they are represented by the presence of wrecks and related materials that survive on the seabed across the UK Controlled Waters.

The distribution of wrecks is very densely recorded along the English coast. However, this information could be biased reflecting English Heritage's statutory remit which runs up to the English Territorial Waters (12 nautical miles).

Historic anchorage areas occur in many places along the English coast. For example, there have been a number of stone anchor finds around the English coast especially off Dorset, providing some indications of earlier seafaring. Historic anchorage areas can

usually be found in sheltered bays or in the lee of headlands. Mooring vessels and craft would have dropped anchor in these areas, potentially disturbing or revealing material remains in, on or under the seabed. Consequently, there is the potential for encountering associated artefacts and debris at these areas. Some anchorage areas are characterised by having been dredged or cleared of sediment to provide enough draught for safe harbour.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type mainly include: shipping routes; wrecks and associated materials; quays and docks; warehouses; and landing points.

The sea and rivers provided a significant means of transport before the time of roads and railways. There is evidence for long-distance seafaring in the first half of the 2nd millennium BC. Sewn-plank boats have been found in England with evidence that could indicate long-distance exchange networks during the Bronze Age (McGrail 1998, 2001). The sewn-plank boats of the Bronze Age are unique to England, and it is possible that this type of craft was used principally for seafaring. Their distribution shows a distinctive pattern with sewn-plank boats principally found within coastal and estuarine environments, or in the lower reaches of rivers near estuaries (Van De Noort 2006).

A new phase of contact between England and continental Europe was developed during the Roman Catholic influence in the late 6th century, impacting on commercial activities. Political stability stimulated commercial activities, and the 8th and 9th centuries saw the greatest resurgence of European trade since the fall of the Roman Empire. Most of this trade relied on water transport and, as a consequence, urban settlements began to grow along rivers and near to the coast, changing the character of the landscape/seascape (Clarke 1985).

Between the 8th and the 11th centuries, Viking presence is found in Europe as well as overseas. They travelled long distance using longships, designed as open, clinker-built vessels which could be propelled both by oars and sail. Modifications of the hull shape and the addition of a sail meant that by the 9th century the Viking ship was capable of sailing long distances on the high seas and was not limited to coasting (Binns 1985). This period of Viking expansion is known as the Viking Age, which had social, political and economic impacts in Scandinavia, England and Europe in general.

During medieval times, most of the routes followed by English mariners involved either comparatively short journeys across open sea or coastal sailing. Medieval coastal shipping and coastal trade flourished despite the threat from piracy and warfare. The only route that required long distance navigation, using a magnetic compass, was as a result of the Icelandic cod trade. England's trade with Iceland appears to have begun in the early 1400s and was first developed by the ports along the east coast (Friel 2003: 67).

Piracy was endemic in medieval Europe. The division between pirate and sea trader was sometimes blurred. It was common that the people who committed piracy were generally traders in their own right and usually the same people that medieval governments relied on when waging naval war. The distinction between piracy and privateers is that the latter involved individuals licensed by a government to attack the ships of state enemies. Despite the fact that piracy was essentially theft, often

accompanied by threats and violence or sometimes murder, in England, piracy was a civil and not a criminal offence until the 16th century (Friel 2003: 82-83).

During post medieval and early modern periods, England lived in a period of transformation where industrial developments, inventions and new scientific discoveries were taking place. As a result, the expansion of navigation activities on a global scale took place characterised by a large moment of goods, people and ideas (e.g. Triangular trade). During this time, global expansion together with the rise of England as a world maritime power had profound impacts in English society, some of which still survive today, Liverpool Docks being an example.

VALUES AND PERCEPTIONS

Most people observing the sea from land are unlikely to perceive the scale of navigation and shipping activities that occur offshore. Vessels can be perceived as specific points on the horizon. However, inshore fishing activities and leisure craft can be perceived as more directly linked to coastal communities and the use of the sea.

There are often large cities around ports and so the population gets used to seeing shipping traffic which becomes part of the landscape/seascape and their daily living (e.g. Southampton). There are also aspects such as ships' horns which sometimes can be heard inland, particularly when it is foggy and these act as a reminder of that local shipping traffic and maritime links.

There are a large number of people engaged in a range of shipping activities, either on board or at the port. Therefore, navigation activities are perceived as a source of income and employment.

For some people, the sea will always hold special meaning as it is a reminder of hidden stories that are submerged in its waters. This has encouraged several creative and artistic responses. For example, during prehistoric times**,** long-distance journeys may have been essential for aspiring members of the elite classes. The sea may have also acted as a 'magical' space where, through a long-distance journey, one would disappear from view and enter a different world. The activity of seafaring would have had the power to create specific social identities, binding crews into closely knit groups (Van De Noort 2006: 284).

RESEARCH, AMENITY AND EDUCATION

English waters have been navigated since prehistoric times. Historically, vessels generally 'coasted' (i.e. hugged) the coastlines they were navigating on their journeys. This was probably the case for most of the 14th century and even later into the early modern period.

Wrecks can give an indication of navigation and shipping activities. The distribution of wrecks is very densely recorded along the English coast. However, this information could be biased reflecting English Heritage's statutory remit which runs up to the English Territorial Waters (12 nautical miles). This potential bias in the information should be considered when researching this Character Type as well as establishing comparative case studies, and seeking complementary information with other sources which will contribute to shed new light on this issue. In addition to wrecks, distributions of

artefacts lost or thrown overboard can indicate anchorages, shipping routes or battle sites. The potential for anchorage areas, even in what are now busy modern harbours, has been demonstrated by the 'Dive onto Victory' project (see http://www.hwtma.org.uk/index.php?page=hms-victory).

Amenity and education potential in this Character Type could be seen as limited due to the characteristics of navigation activities. However, initiatives integrating research into Information and Communication Technologies (ICT) could be a way of bringing this Character Type into schools to raise awareness about the English maritime legacy and its characteristics. Furthermore, HSC aims to raise public awareness in order to engage people with the scale of navigation and shipping activities in their local areas, providing a new perspective about offshore activities that are often unnoticed from an onshore perspective.

CONDITION AND FORCES FOR CHANGE

The impact of this Character Type on today's landscape/seascape could be considered as on going since navigation and shipping activities change through time as shipping techniques evolve. It could be expected that navigation activities would reflect the dominant industries of the time. Therefore, documenting these industries and activities (including fishing and recreational activities) will enable a greater understanding of navigation areas and routes associated with them.

Another condition and forces for change that would impact on the historic character of this Character Type is the natural environment and how people make use of that environment. For example, the material preservation of this Character Type varies considerably, depending on several factors which include, amongst others, materials used for the construction of the vessels, type of cargo, local environmental conditions, currents, water temperature, whether the wreck is exposed or buried, whether the environment is aerobic or anaerobic and current activities in the area.

RARITY AND VULNERABILITY

The rarity and vulnerability of this Character Type is related to people's changing activities through time which is expressed, for example, in long history of London navigation activities.

HSC aims to raise public awareness in order to engage people with the scale of navigation and shipping activities in their local areas, providing a new perspective about offshore activities that are often unnoticed from an onshore perspective.

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1.1.2.2 Character Type: Navigation Feature

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type includes the following Sub-types:

- Navigation channel;
- Disused navigation channel;
- Disused buried channel;
- Dredged channel or area.

This Character Type has a distinctive navigational aspect mainly related to the passage of shipping traffic. This Character Type is usually found where active management has been undertaken, maintaining the accessibility of a stretch of water for safe passage. It has close associations with the Character Types Navigation Activity and Navigation Hazards (Tapper & Johns 2008).

Navigation channel includes active historic navigation channels, active modern channels and disused historic navigation channels. It also includes navigational watercourses or channels used in the past and which are currently in use by modern commercial traffic. Time-depth will reveal if the channel is modern having not been in use before the 1900s (Tapper & Johns 2008).

Disused navigation channel involves navigation channels that are no longer in use.

Disused buried channel involves a navigational watercourse or channel used in the past, which is currently buried and therefore no longer in use.

Dredged channel/area refers to the removal of accumulated sediments from harbour channels and berths. This ensures a safe depth of water for navigational purposes. Similar maintenance works which aim to remove sediment to restore an adequate flow of water (thereby mitigating risk of flooding or protecting a sensitive habitat) are also included in this sub-type. Maintenance dredging refers to the dredging of channels used by shipping entering or leaving the port in order to ensure that a minimum depth of water is maintained. Capital dredging aims to increase the depth of water in the channel (http://www.mfa.gov.uk/).

English waters have been navigated since prehistoric times with navigational activities representing a significant aspect of the character of the marine landscape/seascape. However, these activities leave no permanent mark on the sea surface. Instead, they are represented by the presence of wrecks and related materials that survive on the seabed across UK Controlled Waters.

Navigational channels are found in many areas of English waters. Several navigational channels, especially those that are prone to silting, are often dredged or cleared of sediment to provide enough draught for safe harbour (e.g. Thames and Mersey Rivers).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include active, disused and buried navigation channels, dredged channels and entrances to harbours.

Navigable channels have been used since prehistoric times in the United Kingdom. Natural rivers and lakes were used as waterways for the transportation of people and goods. These were then improved to make navigation more reliable, by the construction of artificial channels and flash locks (i.e. designed with a single gate). The introduction of the pound lock (a lock almost exclusively found nowadays on canals and rivers) enabled more ambitious waterways to be built. The Industrial Revolution required the transportation of large quantities of raw materials and finished goods. This led to the construction of a large network of canals in the United Kingdom. The decline of many canals and, in some cases their abandonment, started with the competition first from railways and later from road transport. The latter, during the 1950s, saw the development of recreational boating and the restoration of many disused waterways. Because of this, navigable river channels are also included in this Character Type.

VALUES AND PERCEPTIONS

Navigation channels and dredged areas are important since they form part of working ports or harbours. Dredging craft are often found moored in harbours ready for service, becoming part of the landscape/seascape of coastal communities. For mariners the importance of maintaining a safe draught is imperative to their livelihoods and safety.

RESEARCH, AMENITY AND EDUCATION

The history of navigation channels and dredging is an important aspect of the history of the human past and how these navigable routes have been utilised. Many navigable

channels are now lost or buried. They may offer the potential for understanding associated features, such as wrecked craft, wharves, pilings, jetties, artefacts and palaeo-environmental evidence.

This Character Type offers limited use for amenity usually because the channels are actively worked. Nevertheless recreational watercraft, small boats and anglers will make use of these channels.

The educational potential of this Character Type is considerable. For example, the 'Solent Aggregates to Outreach' project has successfully demonstrated the direct educational potential of dredging related subjects and the historic environment (Hampshire & Wight Trust for Maritime Archaeology 2007; also see http://www.hwtma.org.uk/index.php?page=aggregate-to-outreach; http://ads.ahds.ac.uk/project/alsf/). Therefore, further educational tools could be developed raising awareness to schools about our common historic environment whilst demonstrating that collaboration between regulators, the heritage sector and the aggregates industry (in this case) is highly beneficial.

CONDITION AND FORCES FOR CHANGE

Dredging has impacted on the historic character of the waters in the United Kingdom. For example, the British Marine Aggregates Producers Association (BMAPA) and English Heritage put in place a Protocol for Reporting Finds of Archaeological Interest (BMAPA & English Heritage 2005). This protocol applies to the wharves and vessels of all BMAPA companies and requires that any finds discovered at a wharf, onboard vessel or on the seabed are reported to ensure that our common submerged heritage is understood and protected. This positive initiative is an example of a collaborative approach that could be taken as an example to be applied in other marine industry sectors.

In the United Kingdom, dumping of industrial waste at sea has been prohibited since 1994. The bulk of the material eligible for sea disposal now comes from port and navigation channel operations, as well as coastal engineering projects. Nevertheless, dumping of dredged materials can introduce contaminants to the marine environment (Department of Trade and Industry 2002a, b).

Sandbanks also impact on the historic character of this Character Type, since sandbanks are mobile entities. Due to their mobility, the course of channels close to sandbanks need changing resulting in some occasions in disused or buried channels which are no longer used (e.g. approached to Mersey River)

In general, the survival of river channels is fairly good even if most components are no longer used or have been developed by industry. Quays and wharves were substantial structures, and many still survive, being the foci of activities as open spaces towards which roads, streets and lanes run.

RARITY AND VULNERABILITY

This Character Type has a wide variety of well preserved components from the early modern period onwards. In areas that are continually dredged today, the potential of encountering prehistoric or historic remains could be considered low due to dredging

having an intrusive impact on the seabed and river banks. However, in some places, there may be remnants of historic dredging activities.

Marine dredging activities could impact on the historic character of a region. However, dredging companies who have been successful in a tender round run by The Crown Estate must obtain a Dredging Permission (DP) from the government, a procedure which includes the submission of Environmental Impact Assessments (EIA). If a favourable DP is granted, The Crown Estate will issue the applicant with a production licence (www.thecrownestate.co.uk). This procedure allows the assessment of the potential of prehistoric and historic remains and secondary impacts of dredging and dumping prior and during any further works through, for example, desk based assessments and Written Scheme of Investigations amongst others.

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1.1.2.3 Character Type: Navigation Hazard

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Navigation Hazards includes the following Sub-types:

- Caution areas;

- Dangerous wreck;
- Drying area;
- Maritime debris;
- Obstruction;
- Rocky outcrop;
- Shoals and flats;
- Submerged rocks;
- Water turbulence;
- Wreck cluster;
- Protected wreck.

This Character Type can be defined as features that represent a risk of collision, stranding and foundering, leading to damage or complete loss of a vessel (Tapper & Johns 2008).

Caution area is an area requiring considerable care to be taken during navigation indicating natural hazards or restrictions imposed by shipping traffic and military exercise and practice (Tapper & Johns 2008).

Dangerous wrecks in shallow water are those either exposed and/or found above 10m below the sea-level (based on UKHO definition).

Drying area or sandbank. Historic charts show drying areas or sandbanks as surveyed at the time the chart was produced. Drying areas are subject to change and they are generally exposed at low tide due to the mobility of sediments (Tapper & Johns 2008).

Maritime debris includes an area dominated by obstructions and fouls that may not be directly associated with a wreck (Tapper & Johns 2008).

Obstruction is an area dominated by obstructions and fouls that may not be associated with a wreck (Tapper & Johns 2008).

Rocky outcrop refers to an area dominated by submerged rocks rising above the general level of the seabed and which breaks the surface of the water posing a risk for navigation (Tapper & Johns 2008).

Shoals and flats are shallow areas of sandbanks, shoals, bars and spits as surveyed at the time the chart was produced. These areas are subject to change and they are generally exposed at low tide due to the mobility of sediments.

Submerged rocks are areas dominated by submerged rocks rising above the general level of the seabed, but do not break the surface of the water, which poses a risk for navigation.

Water turbulence refers to areas of heavy swell and breaking waves exacerbated by prevailing winds.

Wreck cluster is an area dominated by submerged wrecks representing a hazard or risk for navigation.

Protected wreck refers to wrecks protected under the Protection of Wrecks Act (1973) which allows the UK Government to designate a wreck to prevent uncontrolled interference. Designated or protected sites are identified as being likely to contain the remains of a vessel, or its contents, which are of historical, artistic or archaeological significance.

This Character Type is characteristic throughout the English waters, with some areas more typically recognised as 'hazards' for navigation such as Goodwin Sands (off the coast of Kent in the English Channel). Historical navigation hazards were represented in nautical and maritime charts, showing the mobility of sandbanks and how they significantly changed through time. However, consideration should be given to the limitations that early charts have. For example, early charts produced before the development of the mercator projection remain extremely inaccurate since many of these charts were drawn using crude methods for measuring distance such as numbers of oar lengths (Merritt et al 2007). Some early foreign charts (e.g. the Portolan charts and *Waggoners*) contained a high level of navigational detail, allowing a more comprehensive characterisation of that past landscape/seascape. These, along with early sailing directions, will be crucial in dating the earliest recording of navigational hazards in nautical documentation (Merritt et al 2007).

Consequently, the accuracy of the charts evolved along with improvements in surveying and charting techniques. Before the creation of the Admiralty as an official hydrographic branch in 1795, only a small number of independent surveyors such as Greenville Collins and Murdoch Mackenzie have undertaken surveys covering substantial areas of English waters in a standardised manner (Merritt et al 2005).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- Historic and modern sandbanks and sand ridges
- Bars, shoals, scars and scarps
- Wrecks and obstructions
- Rocky areas, including exposed rocky coastlines with rocky outcrops, underwater/awash rocks, and maritime debris
- Wreck clusters
- Areas of heavy swell and breaking waves, prevailing winds, and tidal range amongst others

Historically, the sea has been a dangerous place sometimes due to its unpredictable nature and other times due to human factors. Therefore, sea voyages have often resulted in ship losses. Some of the factors contributing to these losses are:

- poor design or failure of the ship's equipment or excessive pressure on the hull
- instability, due to poor design and improperly stowed cargo, amongst others
- navigation errors and other human errors, leading to collisions (with, for example, another ship, rocks and icebergs) or running aground
- bad weather
- warfare, piracy, mutiny, or sabotage including: guns, fire, torpedoes, depth charges, mines, bombs and missiles

- fire
- overloaded with cargo
- intentional sinking (scuttling)
- to form an artificial reef
- use as a target ship for training or testing weapons
- as a blockship to create an obstacle to close a harbour, river, etc. against enemy ships
- to prevent a ship from falling into an enemy's hands (e.g. *Graf Spee*)
- to destroy a derelict ship that poses a menace to navigation
- as part of an insurance scam

Especially from mid 18th century onwards, the development of shipbuilding techniques has contributed to reduce some of these unfortunate occurrences. The creation of nautical and maritime charts has helped to record the knowledge of previously unknown areas as well as their 'hidden' hazards, providing tools to enable safer navigation.

VALUES AND PERCEPTIONS

Navigation hazards have been on sailors' minds since prehistoric times but it is only those that had experienced them who understood their danger. Whether the hazards were exposed or hidden depended on the time that sailors approached the harbour (i.e. either at low or high tide). These hazards became visible in people's consciousness due to the danger associated with them. Very often, tales and myths were associated with them, evoking old rhymes and songs.

The creation of nautical and maritime charts generally expressed and recorded the knowledge of the surveyed area but they also represented a tool for recording hazards and other dangers associated with the sea.

Wrecks are unfortunate events for those who could not reach their destination. Therefore, they could be perceived as the material evidence of the adventures, piracy and hazards faced in their incomplete sea journey.

RESEARCH, AMENITY AND EDUCATION

Through the Aggregates Levy Sustainability Fund (ALSF) distributed by English Heritage, Bournemouth University undertook the 'Mapping Navigational Hazards as Areas of Marine Archaeological Potential' project. The project offers a methodology for identifying and mapping areas of maritime archaeological potential by characterising areas exhibiting trends in ship losses due to environmental, structural and meteorological navigational hazards, which have been described in historical sources such as charts and pilotage documents (Merritt et al 2005, 2007). Further research like the Navigational Hazards project would be highly beneficial to further develop quantitative systems for assessing the archaeological potential for wreckage material in the marine environment.

Wrecks serve as important habitats for aquatic life since they act as artificial reefs for entire and unique ecosystems. In this sense, wrecks are seen as beneficial sites of increased biodiversity by marine ecologists. Therefore, further collaborative work between marine biologists and archaeologists would be beneficial to enable a deeper

understanding of species living in wreck sites, how they contribute to the wreck preservation, and contextualising this information within broader sea dynamics.

Wrecks can also be used as useful tools for amenity and educational initiatives. Shipwrecks often attract divers. Respect Our Wrecks is a campaign which educates divers about preserving our common underwater cultural heritage, whilst also demonstrating the environmental value of those sites. Wrecks provide the opportunity of exploring the past and by respecting them, present and future generations can enjoy and learn from them (http://www.projectaware.org/english/global_initiatives/respect_our_wrecks.aspx). Wrecks are therefore not only recreational tools but also educational ones, allowing a more comprehensive understanding of the different uses and dangers of the sea.

In terms of formal education, wrecks provide excellent cross-curricular case studies on which to base investigations covering a range of curriculum subjects.

CONDITION AND FORCES FOR CHANGE

This Character Type is mainly impacted by potential changes due to global warning and sea level change. Variations on sediment distribution and oceanographic conditions (e.g. sea level, wave height and direction and storminess), which are difficult to predict with accuracy (BGS 2002), will also impact on this Character Type. The response of the coastline to scenarios of climate change was considered by a consortium led by Halcrow Maritime working on a DEFRA-funded project called 'Futurecoast'. Futurecoast provides predictions of coastal evolutionary tendencies, which are to be considered in the updating of Shoreline Management Plans (SMPs) and other strategic plans targeted at determining broad-scale future coastal defence policy throughout the open coast shoreline of England and Wales (http://www.halcrow.com/html/our_projects/projects/futurecoast.htm).

The preservation of wrecks will depend, amongst other factors, on the construction materials and the natural environment where they wrecked. For example, exposed wooden components will generally decay quickly. In general, the survival of wooden parts of ships are those that were buried in silt or sand soon after sinking. An example of this is the Mary Rose (Portsmouth Historic Dockyard). Steel and iron, depending on their thickness, may retain the ship's structure for decades. As corrosion takes place, sometimes helped by tides and weather, the structure collapses.

Natural factors, such as climate change which is affecting, for example, water temperature, is changing the microclimate where wrecks are and hence their preservation. At national and regional levels**,** there are also records of casualty losses which are generally known from documentary references. These casualty records show the potential of wrecks in an area but not necessarily show their existence. This is the case for the Named Locations (NLOs) at the National Monuments Records (NMR)-English Heritage. Today's prevalent marine conditions will also affect the degree of survival of wrecked vessels and casualty losses, especially regarding sediments movements or scouring by currents.

Natural hazards, such as banks, shoals and rocky outcrops amongst others, are subject to natural erosional processes. However, their rate of change and extent may be influenced by human-made activities or constructions that change the marine conditions.

The changing nature of sandbanks and shoals means the character of the landscape/seascape is in continuous change. This changing nature often reveals material remains that are being covered and uncovered (e.g. Protected Wreck *Stirling Castle*, off Kent) or embedded within such bedforms. The latter will only be revealed after seismic surveys (e.g. see Gaffney et al 2007).

Sea dredging and beam trawling may impact upon known seabed obstructions and unknown wrecks. This would take the form of both direct damage to wreck structure contents and setting, and the destabilisation of sites resulting in renewed corrosion and potential decay (Val Baker et al 2007). Initiatives such as the Aggregates Levy Sustainability Fund (ALSF) distributed by English Heritage has demonstrated that collaboration between regulators, the heritage sector and the aggregates industry is beneficial and necessary to encourage an environmentally friendly extraction and ensure the preservation of the historic environment for present and future generations (see Dellino-Musgrave 2007).

RARITY AND VULNERABILITY

Navigation hazards, whether natural or human-made, represent a resource for characterising the time-depth of regional landscape/seascape due to their intrinsic dynamic nature. There may be a link between the occurrence of natural obstacles and the presence of wrecked craft, lost gear or accumulated prehistoric or historic deposits. Environmental conditions will also indicate whether there is potential for preservation of prehistoric or historic materials.

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1.1.2.4 Character Type: Maritime Safety

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Maritime Safety includes the following Sub-types:

- Daymarks,
- Lighthouse;
- Buoyage;
- Safety area (offshore)
- Safety Services (including coastguard stations, coastguard cottages, and lifeboat stations amongst others).
- Quarantine areas

The Character Type Maritime Safety includes structures usually erected at important or dangerous points on or near the coast for the warning and guidance of mariners, but can also be erected inland for the guidance of travellers (Tapper & Johns 2008).

Daymarks include lighthouse towers, fog stations, and impromptu landmarks such as churches, beacons, chimneys and prominent hills. Numerous landmarks were often used to sight and survey and navigate from, often providing the basis for maritime charts, triangulation and folios showing the 'view from sea' (Tapper & Johns 2008).

Lighthouse is a tower or structure, with a powerful light or lights at the top, usually erected at an important or dangerous point on or near the sea-coast for the warning and guidance of mariners, but can also be erected inland for the guidance of travellers (http://thesaurus.english-heritage.org.uk/).

Buoyage refers to marine navigation aids such as areas of buoys, beacons and lights. The entrance to estuaries and rivers, submerged hazards and foul areas are often demarcated by tracks of posts, buoys, lights, beacons, bells and topmarks.

Safety area (offshore) refers to some areas of the sea itself. Safety areas are 'restricted navigation areas' and are in place to facilitate navigation. Other areas may include exclusion zones for safety reasons, for example around offshore oil or gas installations.

Safety services refer to coastguard and lifeboat stations and National Coastwatch Institution (NCI) lookouts dotted strategically along the coast to monitor the coastline.

Quarantine area is a voluntary or compulsory isolation area.

This Character Type has close associations with Navigation Feature and Navigation Activity Character Types. The entrance to estuaries and rivers often contain submerged hazards and foul areas that are demarcated by tracks of posts, buoys, lights, beacons, bells and topmarks. The sites of some navigation aids have a long history being continually represented on Admiralty charts and maps.

Landmarks were often used to sight, survey and navigate from, often providing the basis for maritime charts, triangulation and folios (*i.e*. hand drawn profiles of the coast with prominent features annotated).

In general, along the English coast, coastguard and lifeboat stations and lookouts are strategically spread along the coastal landscape to ensure maritime safety.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components include:

- marine navigation aids such as areas of buoys, beacons and lights;
- land-based navigation aids such as lighthouses, fog stations, landmarks (e.g. churches, beacons, chimneys, hills), daymarks, topmarks, distance marks and lights.
- coastguard stations;
- lifeboat stations

The majority of the features associated with this Character Type are typically found on or immediately adjacent to the coast.

Mariners have always faced the challenges presented by the sea, not only the inherent ones (e.g. storm conditions, obstacles and natural hazards such as sandbanks) but also those posed by invaders. For example, Roman signal stations along the south and east coast of England were built to warn against attacks. Conversely, the sea has also brought opportunities to farm, trade, export and import, emigrate or immigrate.

From early times until the medieval period, non-instrumental methods were generally used for navigation during sea voyages. For example, stars were used for course steering and orientation, distances were estimated in terms of a standard day's sail, direction of winds and currents were used, and the influence of the moon's phases on tides were known (McGrail 1998, 2001). There is evidence for the use of sounding leads from around 2nd century BC in the Mediterranean (*ibid.*). The use of magnetic compasses is known from medieval times (around 12th century) and sandglasses were used from around 13th century. Navigational instruments improved in the 15th century with the development of astrolabes, quadrants and cross-staffs in southern Europe. These devices were used to measure the altitude (angle in the sky), which made it possible to calculate latitude, a crucial step for transoceanic navigation. Therefore, prior to the 1600s, seamen used their experience and knowledge for sea voyages and safety at sea, known as Environmental Navigation (McGrail 1998, 2001).

Determining a course relied in part on the recognition of coastal features, such as headland shapes, church spires, and other landmarks. It was preferred to approach the destination in daylight so any hazards could be recognised in good time. At night, of course, such features could often not be seen, so in some places rudimentary lighthouses were erected. Some lights were funded by local shipping tolls and at least thirteen lighthouses are thought to have existed in medieval England (Friel 2003: 85-6). During this time, buoys and poles were also used to mark sea channels, so mariners could avoid shallow water, although very little is known about it. The evidence for seamarks becomes clearer in the 16th century, with the appearance of buoyed channels laid and maintained by organizations such as Trinity House of Deptford. Founded in 1514, Trinity House survives today as the body responsible for lighthouses and other navigation features in England and Wales (http://www.trinityhouse.co.uk/).

Sea-charts were first developed in 13th century Italy, but were probably not used in northern Europe until the 16th century. The earliest known English sea-chart dates from the 1530s. Sea-charts are practical and visual tools to enable a safe navigation. Historically, they were used not only for this purpose but also for colonial policy, serving as a guide for exploration and material conquest (Mrozowski 1999: 154). Maps and charts were the result of the ways the world was perceived and experienced and were an analogue for the acquisition, management and reinforcement of knowledge and power (Bender 1999: 32; Colwell-Chanthaphonh & Hill 2004).

In 1824, the National Institution for the Preservation of Life from Shipwreck was formed. The change of name to the RNLI took place in 1854, which is still being used today.

Today, the Maritime and Coastguard Agency (MCA) provides a response and co-ordination service for maritime search and rescue (SAR), counter pollution and salvage. The SAR role is undertaken by His Majesty (HM) Coastguard, which is responsible for the initiation and co-ordination of civil maritime SAR. This includes the mobilisation, organisation and tasking of adequate resources to respond to people either in distress at sea, or in inland waters, or to people at risk of injury or death on the cliffs and shoreline of the UK. As part of its response, HM Coastguard provides Coastguard Rescue Teams for cliff and shoreline search and rescue purposes (MCA 2008).

VALUES AND PERCEPTIONS

Maritime safety features form part of the coastline or shoreline and are generally easy to recognise having a visual impact on today's landscape/seascape. Lighthouses, beacons, and daymarks are iconic monuments bridging the boundary between land and sea. However, some sites are less obvious. For example, church spires and towers, or other buildings and monuments were not originally designed for maritime safety but, in some cases, had a secondary use for that purpose.

RESEARCH, AMENITY AND EDUCATION

Considerable documentary evidence exists regarding this Character Type. Further research would be beneficial through archaeological fieldwork and landscape approaches to shed new light to documentary sources as well as the history and chronology of maritime safety monuments and features that no longer exist**.** This would also enable further insight into people's perceptions regarding this Character Type.

Further research into historical charts and coastal profiles would enable the identification of landmarks and navigation aids that no longer exist, contributing to our knowledge and understanding of the history maritime safety and how it affects the use of the landscape/seascape.

Lighthouses are often used as amenity resources, open to the public. Further educational initiatives could be developed to enable a better understanding of the development of maritime safety in England.

This Character Type lends itself well to local, regional and national case studies appropriate for the Secondary National Curriculum especially geography which looks at how places and landscapes are formed and how people and their environment interact.

CONDITION AND FORCES FOR CHANGE

Although navigation aids, particularly those at sea, are often replaced and renewed, their mooring sites may still hold evidence of successive use and re-use. This is exemplified in the use of fixings, piles and other materials to anchor these features to the seabed.

Terrestrial markers are increasingly becoming out of use, since these traditional methods are being replaced with radio, satellite navigation, digital marine charts and seismic technologies. The same is occurring with the automation of lighthouses.

RARITY AND VULNERABILITY

Navigational aids are vulnerable due to their location as well as technological advances. Technology is replacing traditional methods, therefore, the monuments and features associated with these methods are becoming obsolete. Many features have already disappeared and may be discernible only through the archaeological studies and interpretations.

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1.1.3 Broad Character: Port, Docks and Harbours

1.1.3.1 Character Type: Port, Docks and Harbours

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Port, Docks and Harbours includes the following Sub-types:

- Port;
- Dockyard;
- Harbour;
- Landing point;
- Pier;
- Quay;
- Terminal building;
- Hards;
- Warehouse.

This Character Type is related to the functioning of ports, docks and harbours such as dock and port related industry.

A port is a settlement area that combines a harbour and terminal facilities at the interface between land and water transportation systems (http://thesaurus.english-heritage.org.uk).

Dockyard is an enclosure in which ships are built and repaired, and all sorts of ships' stores are brought together (http://thesaurus.english-heritage.org.uk).

Harbour is a sheltered port for ships (http://thesaurus.english-heritage.org.uk).

Landing point is a place where vessels can land passengers and goods (http://thesaurus.english-heritage.org.uk).

Pier is a structure of iron or wood, open below, running out into the sea and used as a promenade and landing stage (http://thesaurus.english-heritage.org.uk).

Quay is an artificial paved bank or solid landing place built parallel to, or projecting out from, the shoreline to serve in the loading and unloading of vessels (http://thesaurus.english-heritage. org.uk).

Terminal building is a building within a transport terminal, often associated with the registration and clearing of incoming and outgoing passengers or freight (http://thesaurus.english-heritage.org.uk).

Hard refers to a firm beach or foreshore used for landing and loading of ships and other vessels (http://thesaurus.english-heritage.org.uk). Hards are often used interchangeably with quays and landing places.

Warehouse is a building or part of a building used for the storage of goods or merchandise (http://thesaurus.english-heritage.org.uk).

Port areas involve human-made coastal or riverine facilities where boats and ships can load and unload. Ports often have cargo-handling equipment such as cranes and forklifts for use in loading/unloading of ships. Often, ports may have warehouses for storage of goods and a transport system for transporting goods inland (e.g. railway, road transport or pipeline transport facilities). Harbour pilots, barges and tugboats are frequently used to manoeuvre large ships in tight quarters as they approach and leave ports (http://en.wikipedia.org/wiki/Port). The presence of deep water in channels or berths, the provision of protection from the wind, waves and storm surges and access to intermodal transportation such as trains or trucks are critical to the functioning of ports.

Ports sometimes become redundant. For example, Rye (East Sussex) was an important English port in the medieval period, but the coastline changed and it is now 2 miles (3.2 km) from the sea. Also in England, London, on the River Thames, and Manchester, on the Manchester Ship Canal, were once important international ports, but changes in shipping methods, such as the use of containers and larger ships, put them at a disadvantage (http://en.wikipedia.org/wiki/Port).

In the past, there were smaller hards, quays and landing places all around England used as means for transferring goods since marine transport was faster and more efficient than via road. Some examples have been identified in the Hamble area (south England) (see Hampshire & Wight Trust for Maritime Archaeology 2008 downloadable from http://www.hwtma.org.uk/index.php?page=project-3).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Type include:

- landing stages, wharfs, jetties, pontoons, slipways, terminals;
- Port administration and regulation areas;
- Slipways with cranes or ramps.
- cargo-handling equipment, storage facilities;
- custom areas, quarantine areas;
- pilot stations, small craft facilities;
- wrecks;
- lighthouses, batteries;
- specifically associated transport systems (such as railways, roads, tramways).

The first English towns began to appear in the 7th and 8th centuries when settlement and centralized political control became more established. A significant number of these English towns were sea and river ports (Friel 2003: 25). The growth of ports was occurring at an international level, since ports trade with other ports. This period is marked by the development of settlements on both sides of the North Sea and the English Channel, with the Germanic word-element *wic,* meaning 'trading place', incorporated into their names (e.g. Runswick, Saltwick, *Lundenwic* (London), and *Eorforwic* (York)). These towns were located on navigable rivers or in good coastal harbours. A *wic* or *wyke* is also a place on the shoreline where a boat can be landed and there is a way up from the beach. However, not all port names incorporated the *wic*

element and coin finds scattered around the coast suggest that trading occurred on an ample scale (Friel 2003: 25-26).

During the 8th century sea trade, and its prosperity, operated as a major fuel of economic growth in England. The growth of ports was generally stimulated deliberately by local rulers and, from early times, it seems that the government was involved in trade. The link between trade and wealth underpinned its regulation and protection.

Customs are the duties, tolls, or imposts imposed by the sovereign law of a country on imports or exports and are enforced by customs agencies, establishments, or procedures. In England, customs duties were traditionally part of the *customary revenue* of the king, and therefore did not need parliamentary consent to be levied, unlike excise duty, land tax, or other forms of taxes.

Quays or wharfs (structures built along or at an angle from the shore of navigable waters) were necessary components of ports. These structures allowed ships and other vessels to load and discharge cargo and passengers. Wharves along rivers were generally served by small craft which could get through the bridge arches carrying coastal shipments or cargos off-loaded from bigger ships. 'Creeping waterfronts' were often formed as silt built up against the waterfront, making it difficult for larger vessels to tie up. Therefore, a new quay had to be built further out, to provide sufficient depth of water allowing the circulation of these larger vessels.

Most medieval ports were smaller than creeks, meaning that they were too small and too poor to be able to afford or need harbour facilities. Although ports could grow, sometimes due to natural factors such as silting up of estuaries, storms and flood damage, these ports could become obsolete. Other times, cultural factors were the cause such as wars, raiding, and abandonment (Friel 2003: 70-71).

Piers (often use as landing places, promenades or to protect or form a harbour) are also essential components of ports. Piers range in size and complexity from a simple lightweight wooden structure to major structures extending over a mile out to sea. Lightweight piers are supported by widely spread piles or pillars allowing tides and currents to flow almost unhindered. In England, the term pier is principally associated with the image of a Victorian cast iron pleasure pier but many also function as port landing places and as harbour breakwaters.

Shipping and maritime trade are important elements of the UK economy and, in 2002, it was estimated that around 95% of the UK's international trade by volume was transported by sea (DTI 2002). In general, major ports and 'sea ports' handle ocean-going vessels, and 'river' ports are mainly related to river traffic, such as barges and other shallow draft vessels. Some ports on a lake, river, or canal have access to a sea or ocean, and are sometimes referred are 'inland ports'.

VALUES AND PERCEPTIONS

Ports could be perceived by visitors and locals in different, and even contradictory, ways. This is because they can be perceived as highly competitive commercial entities, commercial centres, or recreational places of historic importance such as Albert Dock (Liverpool).

Ports can be perceived as areas that allowed connecting distant regions, places and people. However, they can bring to mind aspects that can be seen as more controversial in history such as slave trade and smuggling.

Ports have also inspired many artists and writers. The imprint that the ports, docks and harbours have left on today's landscape is generally accepted and valued as part of our common heritage.

RESEARCH, AMENITY AND EDUCATION

In general, histories around ports and harbours as well as work on coastal wrecks are well documented. However, further archaeological research on the study of harbours and their material remains would be highly beneficial to shed new light on past human activities. In this way, by considering both documentary sources and the material evidence, official historical versions can be challenged by the analysis and interpretation of material culture within its landscape/seascape context.

Overall, there has not been particularly extensive archaeological work on English ports apart of some exceptions, Liverpool being an example. In relation to the rapidly changing nature of industry in England there has been a rapid decline in manufacturing and hence exports, which has altered some ports. It is likely that much of the industrial archaeology associated with ports may have been lost and what is left should be prioritised for recording.

This Character Type contains amenity value which is linked to recreational and leisure activities such as sailing. There is also potential for educational and outreach activities such as visits to harbours, local history courses in schools and in further education as well as a source of inspiration to historians and writers.

CONDITION AND FORCES FOR CHANGE

Ports and harbours in England experienced several changes that involve long, complex and dynamic histories that have been built through time. There are many of these ports and harbours that still remain active (e.g. London, Southampton, Portsmouth), others that have been reused for other activities such as commercial and recreational centres or marinas (e.g. Liverpool waterfront declared a UNESCO World Heritage Site in 2004) and others that have been abandoned expressing what was once flourishing and thriving industries.

RARITY AND VULNERABILITY

In terms of rarity, this Character Type is linked to the shipping history in England and its maritime legacy as a maritime nation. Major ports such as London and Liverpool had impacted not only at regional and national levels but also internationally with their links to international trade and the development of the British Empire.

The vulnerability of this Character Type can be seen on port areas that have been transformed into commercial and recreational centres or marinas**.**

The recently published Marine and Coastal Access Bill (DEFRA 2008, DEFRA & House of Lords 2008) highlights that the current approach to authorising marine works in or near

port or harbour areas is often complicated (DEFRA & House of Lords 2008: 25-26). It recommends that wherever possible a straightforward and consistent system of regulation applies in future. Within this approach, the Marine Bill White Paper clearly states that complicated provisions are particularly prevalent in local harbour acts and it is important that local navigational provisions meet modern regulatory standards (DEFRA 2007; DEFRA & House of Lords 2008). Out of date local rules need to be modernised to include operations outside harbour areas as well as works within them where they are all part of the port infrastructure or operations. This will reduce the overlap of harbours and environmental legislation and the duplication of licensing. It also recognises that where local powers to control the environmental or navigational impacts of works in a port or harbour are in place and effective, they should remain unchanged (*ibid*).

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1.1.4 Broad Character: Coastal Infrastructure

1.1.4.1 Character Type: Sea Defences

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Sea Defences includes the following Sub-types:

- Sea Defence
- Flood Defence
- Breakwater

A sea defence can be defined as a structure protecting the coast, a port or settlement from storm events, erosion and flooding.

A flood defence can be defined as a structure protecting the coast and settlements from flooding.

Breakwaters are generally used to protect ships and shipping from poor weather and sailing conditions with the aim of maintaining navigability into ports, rather than for preventing erosion and flooding.

In England, this Character Type is administered under the Coast Protection Act 1949. The Department for the Environment, Food and Rural Affairs (DEFRA) generally gives maritime District Councils grant aid for undertaking works on the coastline provided it can be shown that the works are technically sound and are environmentally, socially and economically justified. The Environment Agency (EA) is an Executive Non-departmental Public Body responsible to the Secretary of State for Environment, Food and Rural Affairs and an Assembly Sponsored Public Body responsible to the National Assembly for Wales. The EA is the authority responsible for implementing and managing flood defence schemes in England and Wales. The EA also plays an important role in warning people about the risks of flooding, and establishing and maintaining flood-warning systems. Today, the Agency provides and maintains more than 34,000km of river and coastal defences in England and Wales (http://www.environment-agency.gov.uk/aboutus/default.aspx).

In England, the Shoreline Management Plan (SMP) exists to promote the management of the coastline in a sustainable manner (see http://www.defra.gov.uk/Environ/Fcd/guidance/smp.htm). A SMP is a large-scale assessment of the risks associated with coastal processes and helps reduce these risks to people and the developed, historic and natural environments. The SMP brings together information pertaining to coastal issues such as flooding, erosion, coastal processes and human and environmental needs (http://www.environment-agency.gov.uk/research/planning/104939.aspx; http://www.defra.gov.uk/Environ/Fcd/guidance/smp.htm).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Type can include:

- breakwaters;
- groynes;
- sea walls;
- dykes;
- embankments

Coastal management is used throughout the world for many different purposes, but it is predominantly used to reduce coastal erosion and flooding. There are many techniques of coastal management including 'hard' and 'soft' construction and planning approaches. Hard construction is the more traditional response to erosion and involves the construction of structures which absorb and reflect or stop wave energy reaching the shore. These have often caused problems themselves, such as increasing erosion elsewhere. Soft construction techniques have become more popular because of this. Soft construction techniques involve promoting natural systems such as beaches and salt marshes which protect the coast, and are usually cheaper to construct and maintain than hard construction techniques.

Sea walls are one of the most traditional methods used in coastal management. In some cases, sea walls have caused the loss of beach material *in situ* or elsewhere along the coast, exposing and undermining the base of the wall.

This Character Type has had an essential role in creating and maintaining vast areas of land reclamation around the English coasts from the Roman period onwards, especially, but not exclusively, in the Fens during the post medieval period.

England, like other countries, has a long history of defending coastal flood plains and extensive areas of reclaimed land with hard construction techniques like dykes and embankments. Over the past 10-20 years, this has been brought into question. 'Softer' approaches to coastal defence, which work with nature rather than against it, have been introduced, the Environment Agency (EA) and Shoreline Management Plan (SMP) initiatives are some examples. For example, the EA recognises that current coastal management objectives are often widely accepted and embedded in local planning policy. Therefore, wholesale changes to existing flood and erosion defence management practices may not always be appropriate in the very short term. Hence, the second generation of SMPs will provide a 'route map' for local authorities and other decision makers to move from the present situation towards meeting our future needs, and will identify the most sustainable approaches to managing the risks to the coast in the short term (0-20 years), medium term (20-50 years) and long term (50-100 years) (for other examples also see Rupp & Nicholls 2002).

VALUES AND PERCEPTIONS

Sea and flood defences are generally seen as essential for the preservation of the English coastal settlements as well as for the safety of the people who live in them. However, some people view the more recent sea defences as having a detrimental effect on the picturesque character of some of the smaller villages of England. There are also some conflicts between SMP coastal protection policy/resources and the perceived interests of some coastal communities, the high profile debates at Happisburgh (Norfolk) are some examples.

Breakwaters are often highly visible features lending distinctiveness to coastal ports, large and small. They often feature in depictions of these places and become cultural reference points (e.g. 'The Cobb' at Lyme Regis, the breakwater at Bude).

RESEARCH, AMENITY AND EDUCATION

Sea and flood defences have been used in England for many centuries and as such some of the early coastal defence systems are now the focus of historical and archaeological interest (Fulford et al 1997: 190).

Breakwaters in particular often feature in paintings and photographs of ports and harbours providing a pictorial history. They often form very popular leisure walks.

Sea and flood defences provide a stimulating and relevant focus for cross-curricular educational topics, including case studies looking at the environment, landscape, coastal change and sustainability. Case study resources related to flood defence schemes are freely available online, for example from Met Office Education and the Geographical Association.

CONDITION AND FORCES FOR CHANGE

Shorelines constantly change due to waves and tides. The amount of physical change depends on several things, and these changes happen over timescales ranging from seconds to centuries. The changing coastline has also been influenced by people's activities over time, particularly in attempts to stop the effect of erosion or flooding. In some cases, this has taken place without an appreciation of the effect these actions could have on other places along the coast (see http://www.environment-agency.gov.uk/research/planning/104939.aspx).

Sea defence policy is also undergoing radical change, particularly arising from the recognition of the need for sustainability (Val Baker et al 2007). This has resulted in significant alterations in the types and locations of sea defences being implemented.

Coastal erosion has been increasingly affecting English coastal communities, and more widely, aspects of both the natural and historic dimension of our environment. This in turn has impacted on England's future commercial development opportunities. Consequently, sustainable coastal defence is now high on the UK Government agenda. In response to this, DEFRA have made significant progress in understanding and mapping coastal processes to inform the development of Shoreline Management Plans (SMPs). These provide a large-scale assessment of the risks associated with coastal processes and present a long term policy framework to reduce these risks to the communities. They also aim to a sustainable management of both historic and natural environments. In the first generation of SMPs, many operating authorities adopted SMP recommendations as a basis for production of individual strategic plans, monitoring programs and studies for all or part of their coastline (Murphy 2006). The second generation of SMPs (SMP2s), in covering the entire coastline in England and Wales, provide a 'route map' for local authorities and other decision makers to move towards identifying the most sustainable approaches to managing the risks to the coast in the short term (0-20 years), medium term (20-50 years) and long term (50-100 years) (http://www.environment-agency.gov.uk/research/planning/104939.aspx).

In addition, the current Environment Agency (EA) policy on sea defences involves strategic planning to make decisions about maintaining and building new flood defences, as well as raising public awareness of people living in vulnerable areas. They also advise local, regional and central government on the building of sea defences and their environmental impacts (http://www.environment-agency.gov.uk/research/planning/104939.aspx).

The threat of flooding along the English coasts and rivers is also an issue of increasing importance. The number of people at risk is likely to increase as development continues to take place on floodplains and low lying coastal regions, and the threats associated with global warming, such as sea level rise and storm events, continue to intensify. Planning policies are in placed in England to manage flood risks. For example, PPS25 is part of the holistic approach to managing risk set out in the cross Government programme taking forward the developing strategy for flood and coastal erosion risk management in England, *Making Space for Water* (http://www.defra.gov.uk/environ/fcd/policy/strategy.htm) (Department for Communities and Local Government 2006, 2008). In line with this policy, Shoreline Management Plans (SMPs) aim to understand and map coastal processes, providing large-scale assessment of the risks associated with coastal processes. SMPs present a long term policy framework to reduce these risks in a sustainable manner. English Heritage stresses that adequate and properly interpreted information should be integrated into all stages of the SMP to ensuring proper consideration of the historic environment within the SMP process (see English Heritage 2003; Murphy 2006). Currently SMPs consider the 'special historic assets' to be affected by future coastal erosion. HSC contributes to such an approach by characterising the cultural context behind the present, bringing the area dimension and common characteristics of the landscape/seascape (see Dellino-Musgrave & Oxley 2007; Hooley 2004, In press; Fairclough 2003, 2006).

RARITY AND VULNERABILITY

In general, coastal defences are fairly common and their associated structures are usually not designated.

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1.1.5 Broad Character: Fishing and Mariculture

1.1.5.1 Character Type: Fishing

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Fishing includes the following Sub-types:

- Pelagic trawling;
- Demersal trawling;
- Seine netting;
- Set netting;
- Bait digging;
- Cockling;
- Longlining
- Potting;
- Shellfish dredging;
- Fishing grounds.

Fishing and mariculture involves the exploitation and/or cultivation of marine species within coastal and offshore waters, including fish farming, oyster beds, mussel scalps and cockling. In England, shellfish for human consumption must be harvested from designated production areas. In 2000, there were 112 shellfish farm sites active (CEFAS 2001: 28).

Fishing, by definition, takes place in a fishery, which is an area where fish are naturally present (http://thesaurus.englishheritage.org.uk). Areas of the sea are exploited by fishermen using specific methods and techniques targeting particular species. It includes demersal (species that live on or near the seabed) and pelagic (species that live in the water column, not on seabed) fisheries as well as inshore shellfish dredging and fish farming.

Pelagic trawling refers to in-water or pelagic trawls which are towed at the appropriate level in the water column to intercept shoaling fish such as mackerel, herring or sprats.

Demersal trawling refers to the act of catching flat fish species that mainly live on or near the seabed through fishing methods that involve trawling the bottom of the sea and often results in the disturbance of the sea floor itself.

Seine netting is carried out for demersal and pelagic species. Fish are 'herded' into the path of the net as the gear is hauled. Seining for pelagic species uses purse seiners that capture shoaling fish that aggregate into large, dense concentrations near the surface by surrounding the shoal with a deep curtain of netting supported at the surface by floats. The net is then pursed under the shoal by heaving on a wire that runs through rings attached to the bottom edge of the net. Seine nets cannot be used over rocky areas of seabed. Beach seine nets are much smaller in size and exclusively used inshore, often around estuaries (for further details on this method see Gray 1995).

Set netting refers to walls of netting up to 3m high and 70m long used singly or as a series joined end to end moored on the sea bottom. Fish are caught either by gilling or entanglement. This type of activity is mostly confined to inshore vessels (for further details on this method see Gray 1995).

Bait digging takes place in 'bait digging areas' used to acquire bait for fishing including sandy and rocky foreshores. It is important to note that digging for bait involves the disturbance of seabed and/or foreshore deposits.

Cockling takes place in 'cockling areas' where bivalve molluscs are exploited (Tapper & Johns 2008)

Longlining is a demersal fishing method. In long-line fishing a number of strings, each consisting of a main line with baited hooks on branch lines, are connected end to end and placed on, or just off the seabed, with an anchor and marker buoy at each end. Vessels engaged in this type of fishing are typically small inshore vessels generally operating on grounds near their home port (Starkey et al 2003).

Potting takes place in 'potting areas' and uses trunks and pots with small traps baited with fresh or salted bait and set on the sea bed in coastal waters to catch lobsters, crabs, etc.

Shellfish dredging involves the use of shellfish trawls which differ very little from demersal trawl gear. This activity also includes the use of scallop dredges.

Fishing grounds refers to areas named as such on charts and other documentary sources, stating where fishing activities are performed.

Sea fishing is an ancient and unique activity. Although it can be classified as industry, agriculture or transport, it exhibits characteristics of all three (Starkey et al 2003: 9). Historically, huge varieties of fish have populated the northern seas, with two species in particular, cod and herring, being heavily exploited in North West Europe. Herring and related types are 'pelagic', and mainly caught in the upper layers of the sea. Such fish are normally taken during their spawning season, when they shoal in great numbers on breeding grounds. In contrast, cod, like haddock, hake, whiting, and many flat fish species mainly live on or near the seabed. Such 'demersal' fish are caught most of the year round (Starkey et al 2003).

Gear and nets often become snagged on the rocky bottom and on wrecks and obstructions. These features occur more frequently in those areas identified as 'hazardous foul grounds', being 'catchy', 'sharp' or 'rough'.

A number of trawling practices have been, and are still, employed. Bottom trawling is a widely used method. Trawlers range in size from small inshore vessels to large factory ships. The main device used is the beam-trawl. The trawl bags anything in the way as it sweeps by, which has generated complaints by inshore fishermen against this activity. This fishing method is widely used by Dutch, Belgian and English fishermen for species such as sole and plaice (Frank 2002: 21-22).

Most of the fishing restrictions applying to trawlers also apply to seining vessels, although in some areas of England seining of any type is prohibited (Gray 1995; Rogers 1997).

The fishing industry also has an associated onshore infrastructure, which of course utilises a whole range of port and landing facilities, but specific to this Character Type are storage and market facilities.

The Marine and Fisheries Agency of England and Wales controls sea fishing in seas around England and Wales. Responsibilities include enforcement of sea fisheries legislation, licensing of UK commercial fishing vessels, sampling of fish catches, management of UK fisheries quotas, an advisory role and general liaison with the fishing industry.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- Shellfish and fish farming
- Herring fisheries
- Line and trawl fisheries
- Longlining and netting
- Trawling
- Trunking and Potting
- Mariculture which includes cockling
- Whaling
- Fish market
- Fish warehouse
- Fish trap

Fishing is an ancient practice and has been an integral part of human activity since at least the Paleolithic (c. 40,000 years ago). Archaeological features such as shell middens, discarded fish bones and cave paintings show that sea foods were important for survival and consumed in significant quantities. During this period, most people lived a hunter-gatherer lifestyle and were, of necessity, nomadic (i.e. constantly on the move). Most known early sites are now from submerged settlements (see Fischer 2004). The Neolithic culture and technology spread worldwide between 4,000 and 8,000 years ago. With the new technologies of farming and pottery came basic forms of all the main fishing methods that are still used today (http://en.wikipedia.org/wiki/History_of_fishing).

One of the world's longest trading histories is the trade of dry cod, which commenced during the Viking period or before, and has therefore been practiced for more than 1000 years.

In the medieval period, Brixham was the largest fishing port in the South-West of England. Brixham is also famous for being the town where the fishing trawler was invented in the 19th century. These wooden boats were used all over the world, influencing fishing fleets everywhere. Brixham's boats sailed round the English coasts and helped to establish the fishing industries of Hull, Grimsby and Lowestoft.

The English fisheries were declining by the early 17th century as a result of competition from foreign vessels, especially the Dutch herring fleets. In 1609, foreigners were prohibited from fishing in all the fisheries off the coasts of England, unless they bought licences: the seas were no longer free (Starkey et al 2003).

In the mid 18th century, trawling in English waters was mainly confined to stretches off the south west and south east coasts. Devon sailing trawlers worked out of Brixham and Plymouth, while Barking was the centre for craft trawling in the Thames approaches (Starkey et al 2003). The widespread introduction of bottom and beam trawling had a revolutionary impact on the fishing industry in England as a whole. By the last quarter of the 19th century the most dynamic sector of the English fisheries was trawling in the North Sea.

At the beginning of the 1900s, gas powered boats were beginning to make an appearance, and by the 1930s, the row-sail boat had virtually disappeared. In the 1930s, the first powered drum was created, allowing nets to be drawn in faster. Along with the faster gas powered boats, fisherman were able to fish in areas they had previously been unable to go into, thereby revolutionising the fishing industry.

During World War II, navigation and communication devices, as well as many other forms of maritime equipment (e.g. depth-sounding and radar) were improved and made more compact. These devices became more accessible to the average fisherman, thus increasing their range. During the 1960s, the introduction of fine synthetic fibres (e.g. nylon) in the construction of fishing gear marked an expansion in the commercial use of gillnets. The new materials were cheaper and easier to handle, lasted longer and required less maintenance than natural fibres. Nylon is highly resistant to abrasion, hence the netting has the potential to last for many years. This 'ghost fishing' is of environmental concern, however it is difficult to generalise about the longevity of ghost-fishing gillnets due to the varying environments in which they are used.

Today, the North Sea is one of the world's most important fishing grounds. Major UK and international fishing fleets operate in the southern, central and northern North Sea and target both pelagic and demersal fish stocks. One of the most characteristic fisheries in the North Sea is the mixed demersal fishery that targets cod, haddock and whiting in the central and northern parts of the region (see CEFAS 2001).

VALUES AND PERCEPTIONS

Modern fisheries are increasingly coming to the attention of the wider general public with a concern over fish stocks and sustainable practice. Therefore, modern perceptions of fishing are often related to the destruction of fish stocks and the seabed. However, fishing is still deeply engrained in the perception and economy of many communities in England. As such, it is valued for the distinctiveness it affords such areas and as an important element in the local economy.

RESEARCH, AMENITY AND EDUCATION

There is considerable potential for further research into the history of fishing, in particular its early development and the various catching, storing and processing techniques employed. Such research could inform strategies for sustainable fisheries, utilising the historic environment to complement the identification of patterns, trends

and materials used. The potential for socio-economic research also exists. Archaeological finds associated with wrecks, inshore fishing and coastal potting areas may further inform the nature and more comprehensive understanding of the history of this industry.

Society's need for the fishing industry, the practicalities, logistics and issues associated with the different fishing practices and the conflicts and compromises with other marine industries, provides an interesting cross-curricular educational case study.

CONDITION AND FORCES FOR CHANGE

One of the main forces for change regarding this Character Type is related to sustainability issues. In general, there is more knowledge about the fishing practice rather than the location of specific areas of activity. Some fishing practices will impact on the historic character of an area more than others. For example, trawling methods have a more intrusive impact on the seascape than pelagic netting and long-lining methods. The material evidence left by trawling activities includes trawl scars on the seabed itself.

The condition and drivers for change affecting historical aspects of the character of an area include, for example, pressures from the tourist industry on historic fishing settlements including developments such as hotels, marinas, caravan parks, and their associated roads and services. Economic and environmental pressures on the present fishing industry addressing issues of sustainability also need to be taken into account.

To date the impact of fishing activity on historic assets has not been fully quantified. However, fishing has had large-scale character impacts on coastal settlement patterns as a whole as well as on the formation of coastal fishing villages, affecting the historic character that people value about such places.

RARITY AND VULNERABILITY

Traditional fishing practices such as long-lining have been declining since the advent of trawling. Generally, fisheries are in a period of retrenchment and quotas. Restrictions on fishing grounds are impacting on the scale, range and economic sustainability of the present industry.

Continued control over exploitation of fish stocks is necessary to enable their sustainability, with European Union (EU) reforms and measures progressing towards that end. This has implications for the people whose livelihoods depend on the fruits of the sea and on the character of places that accommodate those livelihoods. Understanding historic practices and their impact on the fishing resource may contribute to the long-term sustainability of sea fisheries. Consumer pressure might also encourage more sustainable fishing practices.

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1.1.5.2 Character Type: Mariculture

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Mariculture includes the following Sub-types:

- Shellfish and fish farming;
- Fish market;
- Fish warehouse;
- Fish trap.

Fishing and mariculture involves the exploitation and/or cultivation of marine species within coastal and offshore waters, including fish farming, oyster beds, mussel scalps and cockling. In England, shellfish for human consumption must be harvested from

designated production areas. In 2000, there were 112 shellfish farm sites active (CEFAS 2001: 28).

The Character Type Mariculture, in particular, refers to the cultivation of marine species within coastal waters and includes fish farming, oyster beds, mussel scalps and cockling where the beds are 'seeded' and 'cultivated' with young mussels/oysters which are managed over several seasons until they are big enough to harvest. Fish traps are, strictly speaking, a form of fishing but are included here as their locational expressions are similar to areas of mariculture (Tapper & Johns 2008).

Shellfish and fish farming refer to a farm with a pond, river, lake or tanks where fish are kept and bred for commercial purposes (http://thesaurus.english-heritage.org.uk). For example, this could involve beds where oyster beds, mussel scalps and cockling are 'seeded' and 'cultivated' with young mussels/oysters which are managed over several seasons until they are big enough to harvest.

A fish market is a market where fish are sold (http://thesaurus.english-heritage.org.uk). For example, in the North East of England, Grimsby Fish Market, owned by Grimsby Fish Dock Enterprises Ltd, is a unique partnership of the local fishing industry delivering one of the most advanced facilities in England (http://www.grimsbyfishmarket.co.uk/index1.html).

A fish warehouse is a large building where fish are stored before sale (http://thesaurus.english-heritage.org.uk)

A fish trap is a device for catching fish, sometimes a fence or enclosure of stakes made in a river, harbour, etc (http://thesaurus.english-heritage.org.uk).

Mariculture, cockles in particular, are a popular type of edible shellfish in both Eastern and Western cooking. They are still collected, as they have been since time immemorial, by raking them from the sands at low tide. Many of the cockles sold in England are from the Thames estuary. In some parts of England, cockles are sold freshly-cooked as a snack (e.g. Essex).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- Shellfish farming;
- Oyster beds;
- Fish quays and wharfs;
- Warehouses;
- Markets

The exploitation of oysters has a long history in England, and prehistoric shell middens containing oysters are known around the country. These oysters were collected with other shellfish by groups of hunter gatherers who exploited the rich resources of the coast. The gathering of oysters for food was probably quite common in coastal areas throughout prehistoric times. However, prehistoric evidence of oyster 'farming' is scarce and the evidence for oyster consumption is limited to shell middens such as those dating to the Mesolithic period, found at West Voe, Shetland (Melton & Nicholson 2004). They

were probably a subsistence food. The coastal area would have been the most productive area of Mesolithic England due to the relative abundance of food, which would almost certainly have included oysters (Hunter & Ralston 1999). There is also historical reference concerning the exploitation of existing natural oysters beds in England during Roman occupation (Eyton 1858). Oyster shells have been found in many of the English Roman villas, including Fishbourne and Barton Court Farm (Potter & Johns 1992). The town of Whitstable (Kent) is particularly noted for oyster farming from beds on the Kentish Flats that have been used since Roman times. By the 18th century, oyster fishery was certainly flourishing in England (Whitfield 2005).

The preservation, storage and sale of fish at various ports and harbours have been vital components of the fishing industry in England. Ancient methods of preserving fish included drying, salting, pickling and smoking. These methods are still used today, although the more modern techniques of freezing and canning have taken on greater importance.

VALUES AND PERCEPTIONS

Modern mariculture is increasingly coming to the attention of the wider general public with a concern over sustainable practice. Therefore, modern perceptions of mariculture are often related to the destruction of the fish resource and the seabed. However, mariculture is still deeply engrained in the perception and economy of many communities. As such, it is valued for the distinctiveness it affords such areas and as an important element in the local economy.

RESEARCH, AMENITY AND EDUCATION

Overall, the lack of systematic investigation into the archaeology of coastal shellfish fisheries has been identified in the past as a serious omission and a weakness in archaeology (Fulford et al 1997). Therefore, there is considerable potential for further research into the history of mariculture, in particular its early development and the various techniques employed from catching to processing. Such research could inform strategies for the sustainability of this Character Type, utilising the historic landscape/seascape to complement the identification of patterns, trends and materials used.

Further research, being undertaken by the Common Fisheries Policy (CFP), is also taking place on the current fishing industry addressing socio-economic impacts (http://ec.europa.eu/fisheries/cfp_en.htm).

From an educational perspective, issues of over-exploitation of fish stocks are helping raise public awareness of sustainability issues surrounding this Character Type.

Society's need for the mariculture, the practicalities, logistics and issues associated with the different types of mariculture and the conflicts and compromises with other marine industries, provides an interesting cross-curricular educational case study.

Furthermore, paintings and historic photographs relating to this Character Type could be used as educational tools to raise public awareness about the history and development of mariculture.

CONDITION AND FORCES FOR CHANGE

One of the main forces for change regarding this Character Type is related to sustainability issues. In general, there is more knowledge about the fishing practice rather than the location of specific areas of activity.

Shellfish is still popular mainly as food consumption. Therefore, shellfish farming is still undertaken utilising traditional methods (i.e. by hand) and/or by being sucked up by a machine similar to a large vacuum cleaner, the latter having a more intrusive impact on the seascape.

Recent research has shown that global warming is likely to uncouple and alter the phase relationship between temperature and photoperiod (the period of time per day that an organism is exposed to daylight) and this is likely to have significant consequences for the reproduction of shellfish. Although this is unlikely to lead to extinctions, it may cause species to disappear completely from particular areas. However, this will depend on speed of adaptation in relation to climate change and the degree of mixing between populations across the range of species (Lawrence & Soame 2004).

The condition and drivers for change affecting historical aspects of the character of an area include, for example, pressures from the tourist industry on historic fishing settlements including developments such as hotels, marinas, caravan parks, and their associated roads and services. Economic and environmental pressures on the present fishing and mariculture industry addressing issues of sustainability also need to be taken into account.

Fishing and mariculture has had large-scale character impacts on coastal settlement patterns as a whole as well as on coastal fishing village forms, affecting people's values about the historic character of such places.

RARITY AND VULNERABILITY

Restrictions on fishing grounds are impacting on the scale, range and economic sustainability of the present industry.

Traditional shellfish farming methods (i.e. by hand) and/or by the use of a machine similar to a large vacuum cleaner are still being used today.

Continued control over exploitation of fish stocks is necessary to enable their sustainability, with European Union (EU) reforms and measures progressing towards that end. This has implications for the people whose livelihoods depend on the fruits of the sea and on the character of places that accommodate those livelihoods. Understanding historic practices and their impact on the fishing and mariculture resource may contribute to their long-term sustainability.

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1.1.6 Broad Character: Military

1.1.6.1 Character Type: Military Defences

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Military Defences includes the following Sub-types:

- Military coastal defence
- Fortification

This Character Type is commonly grouped as part of larger systems of defences including buildings, sites and structures which are commonly associated with defence along the coastline to prevent invasion from sea (http://thesaurus.english-heritage.org.uk/).

Military coastal defences include buildings, sites and structures commonly associated with defence along the coastline to prevent invasion from sea (http://thesaurus.english-heritage.org.uk/).

Fortification is usually a permanent defensive place (http://thesaurus.english-heritage.org.uk/).

This Character Type includes anti-landing defences, decoy sites and other fortifications. During the First World War (WWI) the Defence of the Realm Act 1914 enabled vast tracts of land to be requisitioned for camps, airfields, munitions production, and storage. At the outbreak of the Second World War (WWII) in 1939 a similar act was passed, the Emergency Powers (Defence) Act 1939, and coastal defences were greatly extended.

Fortifications are found along the English coast. Many military installations are known as forts, although they are not always fortified. The word fortification can also refer to the practice of improving an area's defence with defensive works. City walls are another example of fortifications.

This Character Type is commonly located in strategic areas providing good sea views to spot an approaching enemy and mainly concentrated around ports since these are generally areas vulnerable to foreign attack.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type can include:

- Anti-tank defences;
- Artillery;
- Fortifications;
- Anti-landing features;
- batteries and gun emplacements;

- castles and forts;
- moats and dikes;
- town walls and gates;
- minefields;
- pillboxes;
- battlefields and sites of battles;
- naval warships, submarines (including wrecks) and military aircraft crash sites

Since human populations became more sedentary, there has been the occasional need to protect resources from others. However, it is in the Late Bronze Age and Iron Age that settlements appear, surrounded by substantial ditches and banks, suggesting that there was some kind of 'planning' in their construction. An increase in population, pressure on resources and changes in society may have created the need to demarcate and defend property (see Hegarty & Newsome 2007). There are impressively defended prehistoric sites in southern England, built over 2.500 years ago. These forts, with their large enclosing banks and ditches, are thought to have been constructed to emphasise wealth and status as well as being used for defence (Hegarty & Newsome 2007). Although the English population at this time had contact with people from Europe, it is unlikely that coastal attacks were of any significance. It is more likely that the defences, if that was their intended function, were constructed as protection from other locales (*ibid*.).

In the early years of Roman influence in England, the construction and location of coastal installations was not related to defence alone, rather they were related to supply routes, the transportation of goods and the harbouring and maintenance of the Roman naval fleet (see de la Bedoyere 2006; Laycock 2008;). Some of these installations were in Kent and on the South coast.

The Norman Conquest of 1066 saw the beginning of a new phase of war and conquest in England (Friel 2003: 49). The Norman Conquest was a pivotal event in English history because it largely removed the native ruling class, replacing it with a foreign, French-speaking monarchy, aristocracy, and clerical hierarchy. This in turn brought about a transformation of the English language and the culture of England. By subjecting the country to rulers originating in France it re-orientated England toward continental Europe and away from the Scandinavian world. It also had a significant impact on the landscape with the erection of majestic castles not only for defence purposes but also as a symbol of their power, which still acts as a reminder of these events today.

In the late 13th century the naval defence of England was divided into the Northern and Western Fleets. The Northern fleet normally covered the coast from Thames to Scotland and the Western one covered the seaboard from the Thames to Bristol. The naval expedition, the sea patrol and the coastal raid were the commonest types of naval operations that English ships undertook in the medieval period (Friel 2003: 57).

Large-scale naval battles were very rare during the medieval period. However, the Hundred Years War took place near the coast (http://en.wikipedia.org/wiki/Hundred_Years_war). Attacking a fleet in an anchorage or a restricted waterway, or intercepting a fleet passing close to the coast was favoured. It was not until the addition of shipboard guns that sea battles became more common as a form of naval warfare. Shipboard guns were used in small numbers by the English and

others from the 1330s, but they were essentially small anti-personnel weapons (Friel 2003: 58).

Defensive castles were appearing on ships by the late 12th century. These were at first rather makeshift-looking structures. Medieval sea battles were normally resolved by boarding actions. Through time, defensive castles became a normal part of the structure of some vessels, particularly warships, although many medieval merchant people may have sailed without them (Friel 2003: 80). The number of guns on ships significantly increased in the second half of the 15th century. By the end of the 15th century, large warships had multi-stage castles, a change possibly dictated by the massive increase in the number of guns carried by large combatants. However, most warships did not carry large guns until the 16th century (Friel 2003), the *Mary Rose* being an example. During the 16th century, England was more vulnerable to invasion. Therefore, a modern national strategy for invasion defences was developed. It involved the protection of key anchorages such as the Humber and the Thames, which if captured could be used to launch a full scale invasion.

The 17th century saw the effect of the Anglo-Dutch wars for control over the seas and trade routes. The first war (1652-54) took place in the English Channel and North Sea. During the second war (1665-67) most of the fighting took place in the Southern North Sea. A flotilla of Dutch ships broke through the defensive chains guarding the Medway and burned part of the English fleet docked at Chatham. The third war (1672-74) took place along the coast of East Anglia. The Glorious Revolution of 1688 ended the 17th century conflict by placing Prince William III of Orange on the English throne as co-ruler with his wife Mary. The Dutch merchant elite began to use London as a new operational base but the Dutch economic growth slowed. In the 17th century, the commercial success of the Dutch had fuelled English rivalry. The late 18th century saw the growth and establishment of the English maritime power. Some of the Dutch impact still survives in today's coastal landscape on the 'Dutch-like' building found in some areas of London and East Anglia.

The early 19th century saw the effect of the Napoleonic wars (1803-1814). England remained at war throughout the period of the Napoleonic Wars. Having lost most of its colonial empire in the preceding decades, French efforts were focused mainly in Europe. Consequently, Napoleon Bonaparte saw an invasion of England as the key to supreme control over Europe. In response, England decided that a new coastal defence strategy was needed. This would include a chain of forts to be built along the coast, which in turn prompted a survey to assess potential locations and vulnerable points. It was therefore suggested that forts should be squat, circular towers, known as Martello Towers. In England, they were built along the south and east coast and there are still remains surviving in today's landscape.

By the 20th century, the impact of warfare in England was considerable. Fifty years prior to World War I (WWI), England's defences concentrated on the protection of naval bases, since the main defence of the country was considered to rest with the Royal Navy. Military structures were confined largely within the ports and the garrison towns, although some fortification of vulnerable expanses of coastline was performed (English Heritage 2003).

At the beginning of World War II (WWII), England was ill-prepared to defend against an expected invasion by Germany. Defence policy in England was based on maintaining a

'coastal crust' of beach defences, through the deployment of the few mobile columns available combined with static defended lines extending over a wide area of the country. Their purpose was to obstruct and contain the advance of an enemy from the coast or an inland airborne landing, both by the use of obstacles and by fire from troops on the ground, thus allowing time for relief by a mobile reserve (e.g. fortification of the east coast) (English Heritage 2003). Beaches were to be made impenetrable by erecting scaffolding. Thousands of mines were placed behind the scaffolding. Behind the mines was barbed wire and behind the wire were more land mines. Finally, still on the beach, anti-tank blocks were also placed (13 ton concrete blocks designed to impede the movement of the tanks). Behind the beach area, pillboxes were built to house machine guns (Green 2006; Whaley et al 2008). WW II defences were later dismantled and 1956 saw the formal end of the military coastal defence policy in England. However, some abandoned pillboxes can still be seen in today's landscape (e.g. coast of Weymouth).

VALUES AND PERCEPTIONS

Nowadays, both public and official opinion has largely turned against the idea that military defences are an open wound and inconvenience on the landscape. On the contrary, they are perceived as part of the overall historic legacy of the landscape. More specifically, in the case of the WWII, they are seen as significant in terms of their place in the front line of the fight for freedom.

RESEARCH, AMENITY AND EDUCATION

In general, there is scarce interest in research of this Character Type from a maritime archaeology perspective. For example, the built environment (e.g. castles and other fortifications) have been researched but often omitting the 'maritime perspective' (e.g. Johnson 2002). Castles and other fortifications along the English coast also act as a point of attraction for tourism and educational initiatives. For example, the educational resources developed for Tintagel Castle (Cornwall) (see http://www.english-heritage.org.uk/server/show/nav.15393).

WWI and WWII remains are found underwater but are generally understudied, a contributing factor being that some of them could be considered as dangerous due to the potential presence of munitions. These submerged remains often have amenity value due to their popularity with sports divers. Educational value could be further explored through interactive web-interfaces.

Overall, there is a wide and on-going research interest in 20th century military defences. For example, WWI and WWII military remains have been one of the most active areas of research for special interest groups in recent years. The larger coastal defence batteries from WWI are relatively well known apart from practice trenches and early industrial sites. In general, the material remains of WWII have attracted the greatest interest, reflecting the greater number of surviving features and illustrating the active living memory of this event in some members of the population (Petts & Gerrard 2006: 190).

A result of an increased public interest in surviving military remains was the Defence of Britain Project (DOB) (1995-2002), which ran under the auspices of the Council for British Archaeology. The purpose of the project was to record the 20th century militarised landscape of the United Kingdom, and to inform the responsible heritage

agencies at both local and national level with a view to the future preservation of surviving structures (http://www.britarch.ac.uk/cba/projects/dob).

In England, there are military vessels (including aircraft) which are protected as war graves under the Protection of Military Remains Act 1986. The primary reason for designation as a 'war grave' is to be the last resting place of UK servicemen (or other nationals). However, the act does not require the loss of the vessel to have occurred during war (also see Character Type 'Navigation Hazard').

CONDITION AND FORCES FOR CHANGE

The physical evidence of this Character Type left on the landscape/seascape, especially for WWI and WWII, is a rapidly disappearing resource due to the effects of time, erosion and vandalism.

It has been suggested that some hillforts, on relatively flat landscapes, would have been less visually impressive (see Hegarty & Newsome 2007). Additionally, erosion and saltmarsh reclamation in later periods may have affected the survival of historical features on large defended coastal areas.

RARITY AND VULNERABILITY

In terms of rarity, this Character Type is present in what could be considered strategic areas that enables both control over land and sea.

In terms of vulnerability, raising awareness of the significance and unique value of coastal military remains in England will make them more sustainable as a resource and accessible to present and future generations. The vulnerability of this Character Type on the landscape could be mainly due to onshore and offshore industrial developments as well as natural erosion processes. However, these could be identified through Environmental Impact Assessments (EIA) enabling an assessment of the possible impact (positive or negative) that a proposed project may have on the environment; considering natural, historical, social and economic aspects.

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1.1.6.2 Character Type: Military Facility

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Military Facilities includes the following Sub-types:

- Barracks;
- Firing range;
- Military practice areas;
- Military bases;
- Ordnance dumping;
- Naval dockyard;
- Military airfields.

Barracks are buildings which are used to house members of the armed forces (http://thesaurus.english-heritage.org.uk)

Firing range involves a piece of ground on which small arms or large artillery may be fired at targets (http://thesaurus.english-heritage.org.uk)

Military practice areas are areas used by the army, navy or air force for training purposes (Tapper & Johns 2008).

Military bases are buildings or groups of buildings, often surrounded by a system of fortifications, used as residential and training sites by members of an armed force (http://thesaurus.english-heritage.org.uk).

Ordnance dumping is an area of military ordnance dumping usually found on the sea floor (Tapper & Johns 2008).

Naval dockyard is a naval base that builds, repairs, docks or converts warships. It is manned by civilian engineers and workers and administered by engineer duty officers (http://thesaurus.english-heritage.org.uk).

Military airfields are landing or taking-off areas for military aircraft often including associated buildings, equipment and other installations (http://thesaurus.english-heritage.org.uk).

Military facilities are buildings, structures or areas used for varied military functions. They may include or be demarcated by physical structures or may simply be an area of designated status.

Barracks are typically very plain and all of the buildings in the housing unit are often uniform structures.

Most military bases are restricted to the general public and usually only authorised personnel may enter them (be it military personnel or their relatives and authorized civilian personnel). Military bases usually provide housing for military personnel, a post office and dining facilities. They may also provide support facilities such as snack bars, a petrol station, chapels, schools, a hospital or clinic (dental and/or health clinics), shopping and convenience retail stores. Sometimes facilities such as fitness centres, libraries, athletic fields, and nurseries, amongst others can be found. Military bases provide accommodation for one or more units, but they may also be used as a command centre, training ground or providing ground.

Naval dockyards are often characterised by dry docks, basins, and tidal berths. Other facilities may include naval training establishments and bases for the Royal Marines (e.g. Plymouth). Often, some dockyards are open on certain days to enable visits by locals and tourists (e.g. Plymouth). Those that have museums are generally open most of the year (e.g. Portsmouth and Chatham).

Along the English Territorial Waters there are several designated Military Practice and Exercise Areas (PEXAs) which are in use or available for use by the Ministry of Defence (MoD) for practice and exercises. These include Royal Air Force (RAF) practice areas, submarine exercise areas and firing danger areas.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- army bases and barracks;
- radar bases and listening posts;
- firing/rifle ranges;
- naval docks and bases;
- submarine bases and exercise areas;
- RAF bases.

During World War I (WWI), the Defence of the Realm Act enabled vast tracts of land to be requisitioned for camps, airfields, munitions production, and storage. Half a million people were stationed in England as a home defence force, and coastal defences were greatly extended. Much of the training of the army took place across the English Channel, or on battle fronts. Some troops practised the construction of fieldworks for trench warfare, which left distinctive features on the landscape which can still be found today.

At the outbreak of World War II (WWII), under the Defence Regulations, the power to requisition and make use of land was given to service and civil departments. In 1944, at the peak period of the militarisation of the landscape in England, around 11½ million acres (4.6 million hectares) was under some form of military control.

VALUES AND PERCEPTIONS

This Character Type controls specific areas across the country dominating the landscape physically (through warning signs and security devices like fences) as well as psychologically. For example, there are some areas of the English coast where access is restricted due to firing, Dorset being an example.

From a sea perspective, the components of this Character Type may be perceived as 'not being there' due to the lack of visible features and/or boundaries.

RESEARCH, AMENITY AND EDUCATION

As defence installations, active modern components are generally secret or confidential. However, military features from earlier periods have received considerable attention from military historians. Military installations and their history are part of the nation's local, regional, national and international past and present. The inherently competitive nature of warfare means that features change rapidly in this particular sphere of human activity. Therefore, there is scope for further detailed and comprehensive archaeological research complementing both land and maritime perspectives. While operational, there will be little or no potential for amenity use but once decommissioned, military sites have considerable potential, being dramatic and 'exotic' at the same time.

In terms of formal education, this character type is particularly appropriate in the context of the Secondary National Curriculum for history, providing local, regional and national foci for studies of British, European and World History.

CONDITION AND FORCES FOR CHANGE

Military installations are normally impositions by the State on the landscape for national strategic reasons. Interaction with other Character Types could be considered minimal beyond service relationships (victualling, recreation and some accommodation).

The modern components, being in use, are well maintained. As these are active installations, the condition of earlier features may be impaired. Earlier features could be vulnerable to alteration or removal by changes in current installations. However, the armed forces take active responsibility on maintaining historic features on buildings. Defence cuts at government level threaten the existence of current installations. Decommissioning could potentially involve the removal of sensitive features.

A particular issue identified by the Ministry of Defence (MoD) is the disposal of litter, rubble, spoil, and military equipment. The excavation of pits to dispose rubbish could be considered as an intrusive activity which may cause the potential extraction and exposure of prehistoric and historic material (Fulford 1999).

RARITY AND VULNERABILITY

This Character Type contributes to landscape character disproportionately due to its scale and has considerable research and amenity potential once installations are decommissioned.

From a sea perspective, very little is known about the physical signatures of this Character Type in the marine zone, hence challenging to enable an assessment of its rarity and vulnerability.

As military installations have become more centralised, they have become rarer.

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1.1.7 Broad Character: Communications

1.1.7.1 Character Type: Telecommunications

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Telecommunications includes the following Sub-type:

- Submarine cables

The Character Type Telecommunications refers to historic and modern telegraph stations and associated cables, together with civic listening devices. Modern cables also transfer mass media such as the internet, and telephone systems amongst others (Tapper & Johns 2008).

Submarine cables refer to cables or pipes used to transmit or communicate by submarine telegraph (Tapper & Johns 2008).

In general, modern telecommunications systems still require the use of submarine cables in addition to satellites. British Telecommunications plc is the principal body laying and operating submarine communications cables around England (Fulford et al 1997).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

In the 1850s, John Watkins Brett's Anglo-French Telegraph Company laid the first line across the English Channel. It was a copper wire coated with gutta-percha, without any other protection. In 1851, a protected core, or true cable, was laid from a government hulk, the *Blazer*, which was towed across the Channel. In 1852, a cable laid by the Submarine Telegraph Company linked London to Paris for the first time. In 1853, England was joined to the Netherlands by a cable across the North Sea, from Orford Ness to The Hague (http://en.wikipedia.org/wiki/Submarine_communication_cable).

The first submarine communications cables carried telegraphy (written communication) traffic. Later generations of cables carried first telephony (voice communication) traffic, and then data communications traffic. All modern cables use optical fibre technology to carry telephone traffic as well as Internet and private data traffic (http://en.wikipedia.org/wiki/Submarine_communication_cable).

The unprecedented popularity of the Internet and the development of e-commerce have brought about a considerable increase in global electronic data transmission over the last few years. As a consequence, the number of cables linking England with mainland Europe has grown considerably.

Generally speaking, cables are trenched to a depth of 40-90cm with rock-dumping used as a last resort to anchor cables. However, older redundant cables are more likely not to be trenched (Department of Trade and Industry 2002a, b).

VALUES AND PERCEPTIONS

The presence of submarine telecommunications cables in the marine environment is likely to be largely unnoticed. However, their importance cannot be underestimated especially for those millions of internet and phone users.

RESEARCH, AMENITY AND EDUCATION

Works undertaken during cable laying and or maintenance offer an opportunity to further investigate historic environment baseline data, enabling development of landscape/seascape characterisations. Palaeoenvironmental evidence has been unearthed during such works, uncovering deposits rich in pollen taxa and macrofossils that can further inform our knowledge of the evolution of past environments, landscape/seascape and marine transgressions.

There is the potential that some cables in English waters are of historic importance offering further insight into the early development of telecommunications in the 20th century. Further research would need to clarify this as it is an area that has had scarce attention from maritime archaeologists.

In one sense, submarine telecommunication cables represent a means to an end as far as amenity and education values are concerned. These cables provide the means to allow internet and phone access, opening up a varied range of educational and amenity tools accessible to the general public.

The need for submarine telecommunication cables and the logistics, practicalities and issues associated with their installation and maintenance provides an interesting cross-curricular educational case study.

CONDITION AND FORCES FOR CHANGE

Offshore development impacts on the character of the landscape/seascape as a result of preliminary survey work, laying and maintenance of cables and the removal of disused cables. Preparatory investigation may involve intrusive survey of the sea bed, disturbing and exposing archaeological deposits, but also providing detailed knowledge of seabed conditions. Cables are replaced fairly regularly as technology develops. Laying the cables involves burying them where they cross the foreshore and in shallow waters, potentially disturbing historic environment assets. In deeper waters, submersible ploughs running on tracks or skis and towed by surface vessels are used for trenching, laying cable, and subsequent inspections. Consequently, the use of such machinery has significant impact on the historic character (see Fulford et al 1997).

Although relatively uncommon, trawling and anchoring can cause breaks in cables (Fulford et al 1997).

RARITY AND VULNERABILITY

The laying of telecommunications cables is likely to increase. However, the development of wireless technology will eventually lead to the redundancy of many of these cable routes.

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1.1.7.2 Character type: Transport

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Transport includes main physical communication methods, which are as follows:

- Canal;
- Railway/Tramway;
- Roads
- Air transport

The Character Type Transport consists of areas characterised as communication routes linking other areas such as industry, recreation and settlement, amongst others. At a strategic level of characterisation, only major, extensive areas of this type can be mapped.

Canals are artificial navigable waterways used for the transportation of goods. Nowadays they are also used for recreational purposes (http://thesaurus.english-heritage.org.uk).

Railways/tramways: railways involve a line or track consisting of iron or steel rails, on which passenger carriages or goods-wagons are moved, usually by a locomotive engine. Tramways refer to a track inlaid into a surface, on which tram cars run for the conveyance of passengers and/or goods or raw materials (http://thesaurus.english-heritage.org.uk).

Roads are a way between different places, used by horses, travellers on foot and vehicles (http://thesaurus.english-heritage.org.uk). Within a HSC context roads will be

those related to coastal areas, coverage of ports, shipping routes, ferry crossings and ferry routes, for example.

Air transport refers to areas, including airports, airfields and customs houses, where air passengers embark and disembark.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Canals were important components for industrial development since they met the need for cheap transport of raw materials and manufactured items. In Europe, particularly England, inland canals preceded the development of railroads during the earliest phase of the Industrial Revolution. In the 1760s, the opening of the Bridgewater Canal (North West England) halved the price of coal in Manchester. This triggered a period of "canal mania" in England and between 1760 and 1820 over one hundred canals were built.

In the 19th century, England was the leading country in the development of railway steam traction which transformed lifestyles not only at a national but also an international level. In the early 19th century, various fundamental technical advances were made by engineers such as Richard Trevithick, George Stephenson and his son Robert Stephenson, leading to the development of the steam locomotive. During this time, the first passenger horse-drawn railway was opened between Swansea and Mumbles in Wales. In 1811, John Blenkinsop designed the first successful and practical railway locomotive - a rack railway worked by a steam locomotive between Middleton Colliery and Leeds on the Middleton Railway. The locomotive, *The Salamanca*, was built a year later. In 1830, the first commercial passenger steam railway, the Liverpool and Manchester Railway, opened.

Steam locomotives required large investments in labour to clean, load, maintain and run. After World War II, labour costs increased dramatically in developed countries, making steam an increasingly costly form of transport. At the same time, the war had forced improvements in internal combustion engine technology that made diesel locomotives cheaper and more powerful. This caused many railway companies to initiate programs to convert from steam to diesel locomotion.

After World War II, there was a period of large-scale construction of motorways. This was a deliberate policy shift from railways to roads, as England's primary means of transporting goods and people. As a consequence, rail transport became less popular for commuting, and air transport took higher of transport from long-haul passenger trains. Where roads in towns had contained tramways, most were replaced by buses, while high trans-shipment costs caused short-haul freight trains to become uncompetitive. In 1962, with the introduction of the Shinkansen high-speed rail in Japan, trains once more gained a dominant position in intercity travel. During the 1970s, the introduction of automated rapid transit systems allowed cheaper operation. The 1990s saw an increased focus on accessibility and low-floor trains. Many tramways have been upgraded to light rail, and many cities that closed their old tramways have reopened new light railway systems. For example, the Channel Tunnel is the longest undersea tunnel in the world, linking Folkestone in Kent (England) to Coquelles in Pas-de-Calais (France). Eurotunnel shuttles, Eurostar and national freight trains run in the two single track and single direction tunnels at a maximum speed of 160km/h.

Road transport has largely developed over the centuries from foot transport to motorways and their related service points. Packhorses, for example, were heavily used in the transport of goods in England until the 18th century. Away from main routes, their use continued into the 19th century. This usage has left a history of old paths across wilderness areas called *packhorse roads*, and narrow and low stone arched packhorse bridges in various areas (e.g. Hacketty Way Bridge, Somerset). Today, typically, packhorses are used to cross difficult terrain, where the absence of roads prevents the use of wheeled vehicles, as well as for recreational purposes. Foot transport was and still is a popular means of transport over short distances for commuting, recreational purposes and maintaining a healthy lifestyle. England contains the vast majority of the UK's motorways, dating from 1958 (part of the M6) to the most recent (M6 Toll). Today, the Department for Transport is the government department responsible for the English transport network.

VALUES AND PERCEPTIONS

Canals are a lasting imprint on the present-day landscape of a 19th century period of prosperity and success. At the same time, they are an integral part of the social and cultural landscape, with a range of current uses, including leisure. In general, the early narrow industrial canals have ceased to carry significant amounts of trade. Many have been abandoned to navigation. In other cases, railways have been built along the canal route (e.g. Croydon Canal). In some cases, abandoned canals have been restored and are currently used for pleasure boaters, the Kennet and Avon Canal being an example. Recently, in England, canalside housing has become relatively popular. Another recent use of canals in the 21st century is as wayleaves (right of way in return for payment) along the towing paths for fibre optic telecommunications networks.

The imprint of rail and roads on the present landscape/seascape is expressed in the advent of coastal ribbon development because people can easily reach the coast as well as having access to goods and services.

RESEARCH, AMENITY AND EDUCATION

Generally, in England, research has focused on canals from an 'industrial' and 'historical' point of view. Further research from archaeological and maritime perspectives will contribute to a greater understanding of canals contextualised regionally, nationally and internationally. Today, canals are largely used for leisure purposes. As such, education and outreach initiatives bringing together leisure and exploring the insights of the 'industrial heritage' of canals would be highly beneficial in terms of educating and raising public awareness. This could also be the starting point of promoting and seeking further economic benefits.

Further research on early long distance routeways would be highly beneficial at national, regional and local levels, by looking at the developing relationships through time between coastal populations, trade, transport and topography.

Communication routes are largely facilitators for the appreciation of other parts of the historic landscape/seascape. However, they also possess interesting features which are an expression of people's past activities. Bridges, viaducts, stations, roadside services and other infrastructure are also interesting elements which need to be contextualised within their landscape/seascape. Due to the intrusive nature of the work involved in the

construction of new communication routes, the removal or disturbance of historic assets in coastal and foreshore areas could be considered as significant. In addition, construction may also have indirect effects as a result of alterations to existing patterns of drainage, water flow in rivers, or tidal currents, thus creating the possibility of removal or exposure of historic assets through erosion (Fulford et al 1997).

Consequently, this Character Type could be further explored through the way it takes people across the wider historic landscape/seascape (e.g. canal, railway and road features). In addition, the disused canals and railway lines offer routes for public access and enjoyment.

CONDITION AND FORCES FOR CHANGE

In general, European barge canals continue to operate for cargo transportation. However, the narrow early industrial canals have ceased to carry significant amounts of goods. Several have been abandoned to navigation and become derelict and overgrown. Railways have been built along the canal route (e.g. Croydon Canal) in other cases. In some instances, abandoned canals have been restored and are currently used for pleasure boating.

Railways are an important aspect of the nation's heritage, since England was the leading country in introducing railways systems. These have undergone several changes since their introduction in the 19th century with steam power locomotives. These were later abandoned for road transport and several railway lines are now abandoned and derelict. Today, rail transport is an energy-efficient and capital-intensive means of mechanised transport, which had endured post-World War II underinvestment in favour of promotion of road for transport of goods and people (e.g. Eurotunnel).

Construction of communication routes at or near the coast frequently involves major engineering projects since coastal areas are generally unstable environments (e.g. Eurotunnel). New communication routes are needed because of several factors: increased traffic to the coast, changing configuration of the coastline, rising sea-levels, or coastal defence initiatives, amongst others. The direct impact of these projects on the landscape/seascape needs to be assessed according to UK Government standards (e.g. Environmental Impact Assessments).

RARITY AND VULNERABILITY

Today, the scale of change has affected the size and frequency of key nodal transport points. It has also affected the differing frequencies of expression of past and present transport infrastructure along the coast as well as the low, easily overlooked (and therefore vulnerable) profile of much early transport related character.

Development works in transport infrastructure are going to continue and will affect the expression of this Character Type.

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1.1.8 Broad Character: Palaeolandscape

1.1.8.1 Character Type: Palaeolandscape

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Palaeolandscape includes the following Sub-types:

- Palaeochannel
- Submarine forest
- Peat deposits
- Prehistoric landsurface

The Type Palaeolandscape includes ancient landscapes and palaeo-environmental deposits now submerged beneath the sea, buried beneath post-transgression sediments or buried deep in the muds and silts of estuaries and rivers. It also includes submerged forests exposed in the inter-tidal zone (Tapper & Johns 2008).

Palaeochannel refers to the course or channel of a river or stream preserved as a geological feature (http://thesaurus.english-heritage.org.uk/).

Submarine forest refers to tracts of submerged land with evidence of forests, woodland and other vegetation cover. Submerged forests are strong indicators of submerged early land surfaces and contain important information relating to past human activity and habitats (Tapper & Johns 2008).

Peat deposits are exposures of unconsolidated semi-carbonised plant remains formed in freshwater-saturated environments. Peat deposits contain important information relating to past human activity and habitats (Tapper & Johns 2008).

Prehistoric landsurfaces are often preserved below the peat, representing the horizon on which people were undertaking activities.

This Character Type is only recorded as 'Previous Character' in the HSC database. Because of its importance and fragility, this Character Type needs to be described and explained as the other HSC Character Types.

There is evidence for human activity across England and mainland Europe from 700,000 BP. For all glacial periods there is potential for archaeological material deposited in sediments on the continental shelf. For example, Pleistocene fluvial, glacial and periglacial and beach gravels form much of the Palaeolithic archaeological record. Furthermore, Late Devensian and Holocene gravels provide much of the buried archaeology of valley landscapes (Brown 2004). Processes such as climate change and the fluctuation of sea levels over the last 2 million years have contributed to the deposition of sand and gravels which now lie on the seabed (Gubbay 2005). These materials were originally deposited by river systems that are now submerged (BMAPA 2000; ODPM 2005). Therefore, these processes periodically exposed the seabed as dry

land, creating a space for human occupation and the potential for associated archaeological evidence. Hence, the potential of survival of palaelandscapes in marine deposits in England is immense. Fulford et al (1997) mention that 'recent interest in the potential of underwater landscapes around England was stimulated in part by an audit of the English coastline in 1997 which recorded coastal prehistoric peat deposits that were seen to follow ancient river systems extending offshore' making reference to the rich source of Mesolithic material from the Solent area (e.g. Bouldnor Cliff) and the large number of finds found in Essex (Flemming 2004; Fulford et al 1997: 108; Momber 2004). More areas have been discovered since then, off Humber being an example. Furthermore, there are confirmed examples of prehistoric sites in the intertidal zones from Neolithic and Bronze Age in England (e.g. Wootton Quarr and Langstone Harbour) stressing the historic character of these submerged landscapes.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- paleoenvironmental evidence;
- morphological evidence;
- flora and faunal remains;
- human occupation evidence such as structures and stratified cultural remains

Features and variability of this Character Type is difficult to assess at a national level as investigations on this Character Type are only in their infancy.

Following Dix et al (2004), the following points should be considered when understanding the components, features and variability of this Character Type:

- There is a spatial and temporal diversity of archaeological material that potentially exists in the submerged areas of the UK continental shelf
- Large scale patterns of land use are evident in the terrestrial record which are likely to be applicable to the submerged regions
- The present seabed is not an exact analogue of the lowstand land surface
- The submerged prehistoric material is likely to exist in one of the following states of preservation: primary, secondary or tertiary context
- The research potential of secondary contexts for the Upper Palaeolithic and Mesolithic and tertiary contexts for all periods needs to be further examined
- The prehistoric potential of the submerged material goes beyond interpretations referring to 'landbridges' or migration corridors
- Areas identified for further research include the antiquity and importance of coastal exploitation, and human response to sea level change
- Effective interrogation and exploitation of the submerged archaeological resource will require secure and accurate landscape reconstructions

- A significant quantity of archaeological material will be reworked by marine processes. Understanding the processes behind this is crucial to our understanding of submerged landscapes and future work should address these processes in detail.

- A more secure understanding of marine taphonomic processes may aid our understanding of the potential and location of marine secondary and tertiary contexts

VALUES AND PERCEPTIONS

The archaeological community has started to recognise that maritime archaeology is not only about shipwrecks but also about prehistoric submerged landscapes. The archaeological potential that exists on the continental shelves has been recognised in the UK, especially through the Aggregates Levy Sustainability Fund (ALSF) (see http://ads.ahds.ac.uk/project/alsf/), due to the recent expansion of industrial concerns onto the shelf. It is therefore important, from both academic and cultural resource management perspectives, to locate and investigate this archaeological resource which otherwise will be irretrievably lost. However, for the wider community, the archaeological potential of these submerged landscapes is still mainly unknown.

RESEARCH, AMENITY AND EDUCATION

Processes which periodically exposed the seabed as dry land created a space for human occupation and the potential for associated archaeological evidence. The archaeological potential of these marine deposits is therefore immense, and there is a need to enhance our understanding of these drowned landscapes and palaeoenvironments which are still relatively poorly understood. The significance of this potential is emphasised by the discovery of the stratified Mesolithic occupation site at Bouldnor Cliff (Momber 2004). To date, this is the only stratified prehistoric occupation site identified in UK waters. Additionally, there are submerged prehistoric landscapes and associated palaeoenvironmental material dating to the Neolithic and Bronze Age both off the Isle of Wight coast and off the New Forest, running for kilometres along the coast (HWTMA 2006, 2008). Today, these provide baseline information about the time-depth of those now submerged landscapes.

Since the peak of the last glacial, rising sea levels resulted in the inundation of many coastal areas that were once terrestrial habitats. These submerged landscapes are now a major focus of underwater archaeological investigation because they potentially contain a large proportion of the prehistoric record of human settlement on coasts (Flemming 2004; Quinn et al 2000; Sonnenburg & Boyce 2008). The UK continental shelf is under intensive developmental pressure from a range of threats including mineral extraction and the direct impact of construction (Dix et al 2004). Because of these threats, it is imperative that further research is undertaken to enable a deeper understanding of this Character Type before it is lost forever, not only due to human action but also natural erosion processes. Public awareness should also be raised through dissemination programmes which focus on the importance of these unique submerged landscapes.

The nature and scale of palaeogeographic and palaeoenvironmental change of the UK continental margins is of particular importance to the process of reconstruction, as it can

alter radically prehistoric and historic timescales. Therefore, there is a need to understand the nature of the UK continental margins and the short- and long-term processes that affect them. In an ideal world research into submerged prehistoric landscapes would proceed on very small, "local", spatial scales (studies in the order of 10's metres through to a few kilometres), thus allowing very fine details to be observed. These smaller scale studies could then be fed into larger "regional" overviews (10's to 100's km's). In practice, the realities of underwater work render such a bottom-up approach sometimes difficult to undertake mainly due to lack of funding invested in this type of research. Dix et al (2004) suggest that the majority of research on continental shelf archaeology will be undertaken on the regional scale, with only occasional, more detailed analyses of local scale studies being possible. In this sense, the adoption of a top-down approach could be used to maximise the regional data and, through appropriate analysis, utilise it to effectively target local detailed surveys (Dix et al 2004). A combination of both 'regional' analysis of prehistoric environment utilising predictive modelling with investigation of currently known sites would contribute to test some aspects of predictive modelling as well as develop a further understanding of 'local' scale studies in context with 'regional' ones. This will also help developing expertise and techniques of archaeological investigation which are currently lacking in the profession.

In terms of formal education, palaeolandscapes provide excellent case studies for cross-curricular work looking at environmental change and how it affects populations over time.

CONDITION AND FORCES FOR CHANGE

Since the last glacial maximum, rising sea levels submerged many coastal areas that were once terrestrial habitats. These submerged landscapes are now a major focus of underwater archaeological investigation because they potentially contain a large proportion of the prehistoric record of human settlement on coasts (Flemming 2004; Quinn et al 2000; Sonnenburg & Boyce 2008). The UK continental shelf is under intensive developmental pressure from a range of threats including mineral extraction and the direct impact of construction. Specific threats range from the laying of pipelines to, more recently, the development of wind farms, the wider issues of mineral extraction and the extensive, generalised, impact of fishing and commercial trawling (Dix et al 2004). The cumulative knowledge that such developments are producing through Environmental Impact Assessments (EIAs) will enable a deeper understanding of this Character Type before it is lost forever, not only due to human action but also natural erosion processes.

The loss of unconsolidated cliffs from around many stretches of the English coastline is not uncommon, but the change from wide-scale sedimentation to active erosion is less widespread. Threats to this Character Type are also increasing since there have been deposits eroded from drowned soils that were once habitable land.

RARITY AND VULNERABILITY

Submerged Palaeolithic and Mesolithic landscapes are relatively rare in England, Bouldnor Cliff being an example (see Momber 2004). As such, these deposits are regarded as of national, and even international, importance. Wherever possible, these deposits should be left undisturbed due to the fragility of peat deposits and associated faunal remains (and potential human occupation evidence such as structures).

Furthermore, Neolithic and Bronze Age submerged landscapes are also uncommon in England. Several examples have been found in the Solent as well as in tidal rivers and estuaries in England (e.g. Wootton Quarr (Isle of Wight), and Humber Estuary, amongst others). Prehistoric landscapes in the intertidal zone are generally exposed to eroding processes. Therefore, it is important to emphasise the high priority need to monitoring these eroding prehistoric landscapes, Wootton Quarr and Langstone Harbour being some examples.

Prehistoric landscapes and their associated components represent a nationally and internationally important archaeological resource, and if possible, finds' context and location needs to be recorded.

Natural erosion processes occur along the English coast. However, some places are more severely affected than others (e.g. the coast of East Anglia). These processes appear to be the biggest threat to the nature of this fragile Character Type. Furthermore, with increasing offshore aggregate extraction, oil and gas drilling and the construction of offshore wind farms, there is an urgent and growing need for further research into submerged palaeolandscapes, palaeoenvironments and palaeogeographies.

Understanding the submerged prehistoric landscapes of the UK continental shelf is an essential part of understanding the prehistory of Europe. Submerged prehistoric landscapes can survive with sufficient integrity to provide evidence for settlement patterns, working sites, fish weirs, hearths, food remains, craft and burials (see Flemming 2004; Momber 2004).

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1.1.9 Broad Character: Semi-natural Environment

1.1.9.1 Character Type: Cliff

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type includes the following Sub-types:

- Cliff

Landscape/seascape areas, whose Broad Character is identified as being semi-natural, are the result of the interaction of past or present natural and cultural processes. In this sense, nature becomes cultural in the ways that people use it or perceive it (Friedman 1994: 34). It is important to note that the Sub-types and descriptions given below may be subject to future change and refinement as further evidence for cultural processes within them become apparent from detailed studies.

Cliff refers to a high steep face of a rock or other geological deposit; largely unvegetated. In coastal areas typical components of this type include military defences and structures, maritime safety aids, and industrial mineral works (Tapper & Johns 2008). Cliffs can also offer a space for recreational activities such as country walks, enjoyment of picturesque views and nature reserves.

Cliffs are formed as erosion landforms due to due to the processes of erosion and weathering that produce them. Cliffs are common on coasts, mountainous areas, escarpments and along rivers. In England, cliffs are usually formed by sedimentary rocks such as sandstone, limestone and chalk, the White Cliffs of Dover (chalk) are an example.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- military defences (e.g. pillboxes, anti-tank cubes, signal stations, fortifications, radar stations);
- maritime safety services (e.g. coastguard lookouts);
- navigation aids (e.g. lighthouses, fog stations, landmarks);
- industrial extraction and processing sites (e.g. quarries, mines, lime kilns, railway tunnels).
- Recreational features (e.g. nature reserves, walk trails)

Clifftops with strategic sea views have been important for military, coastguards and fishing purposes, from at least the 16th century onwards. Military sites found on clifftops include look-outs, pill-boxes, batteries, radar stations, castles and forts. Coastguard look-outs and lighthouses can also be found.

Prehistoric remains in the form of peat deposits could also be found within this Character Type. The early Lower Palaeolithic sites on the East Anglian coast (specifically at

Happisburgh and Pakefield) are some examples. These sites lie within sediment units exposed on beaches and the bases of cliff sections. Recent marine geophysical and geoarchaeological work has demonstrated that some sediment units be traced offshore, specifically, off Pakefield (Murphy 2007).

VALUES AND PERCEPTIONS

In England, some cliffs could have symbolic value. For example, those that face towards Continental Europe, where invasions have historically threatened and against which the cliffs form a symbolic guard, the White Cliffs of Dover being an example.

RESEARCH, AMENITY AND EDUCATION

Archaeological and historical research has been carried out on alum, jet, ironstone and other industries that took place in this Character Type, as well as on the Roman signal stations, prehistoric flints, and smuggling/excise activities. The geological history of cliffs has also been extensively researched. However, a broader perspective is needed from point of view, integrating these different aspects of human activities on the landscape/seascape.

In terms of amenity and educational purposes, cliffs are frequently visited by walkers and climbers, amongst others. Therefore, there is potential to enhance the understanding, appreciation and enjoyment of the heritage encountered by these people on the cliffs.

CONDITION AND FORCES FOR CHANGE

This Character Type will continue experiencing the gradual erosion by natural forces as well as the long-term threat of sea level rise along the English coast. Human forces for change include the construction of sewerage schemes and coastal defences, amongst others. The impact of these construction processes as well as the movement of water and sediments could damage the potential historical and archaeological remains in this Character Type. Therefore, the potential existence of buried archaeological features within cliffs should be considered when dealing with cliff falls and coastal developments.

RARITY AND VULNERABILITY

In terms of rarity, along the English coasts some cliffs fall within Sites of Specific Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar Sites (which are wetlands of international importance designated under the Ramsar Convention), and in some occasions they are designated as a Heritage Coast. For example, Tintagel Cliffs (Cornwall) are a SSSI (http://www.naturalengland.org.uk/ourwork/conservation/designatedareas/sssi/default.aspx) and the area of Tintagel is also of historic significance with nearby Tintagel Castle and the associated legends surrounding King Arthur and the knights of the Round Table.

In terms of vulnerability, several cliffs contain historical and archaeological features but due to erosion processes these cliffs are becoming more dangerous and therefore less accessible to the general public. Therefore, it would be important to record these features and encourage their preservation where possible.

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1.1.9.2 Character Type: Dunes

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type includes the following Sub-types:

- Dune

A dune is a hill or ridge of unconsolidated wind-blown sand (Tapper & Johns 2008). Some coastal areas have one or more sets of dunes running parallel to the shoreline directly inland from the beach. Dunes are generally important in protecting the land against potential ravages by storm waves from the sea. Although the most widely distributed dunes are those associated with coastal regions, the largest complexes of dunes are found inland in dry regions and associated with ancient lakes or seabeds. Dunes also form under the action of water flow (known as alluvial processes), on sand or gravel beds of rivers, estuaries, and the seabed. In coastal areas, typical components of this type include military defences and structures, and recreation facilities amongst other buildings and features, along with buried prehistoric and historic land surfaces.

Dunes systems can be found along the English coast as well as offshore. For the case of the west coast of the Outer Hebrides, the legacy of glacial processes is complex. The main effect has been to over-deepen sea lochs and inter-island straits (e.g. Sound of Harris) and deposit great masses of glacial debris, especially sands, on the shallow continental shelf to the west, where extensive beaches were formed in this post glacial period. Large quantities of organic sand (crushed shells) were added to this volume. As a consequence, some of the larger beach and sand dune systems in England are found along the west coast. These extensive blown sand systems provide unique

environmental and ecological systems with very high conservational status at European and international levels (for further details see University of Aberdeen 2006).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Components of the Character Type Dunes include:

- Military defence structures;
- Recreation facilities.

Dunes are areas of wind-blown sand and shell deposits along low-lying stretches of shoreline. Some dune systems along the English coast are designated sites. For example, Winterton Dunes is an extensive dune system on the east coast of Norfolk, which has been designated as a National Nature Reserve and is within the Norfolk Coast Area of Outstanding Natural Beauty (AONB). Winterton Dune supports well developed areas of dune heath, wet 'slacks' between dunes and dune grassland which grades into grazing marsh and birch woodland. Winterton has suffered from extensive coastal erosion and is threatened by sea level rise.

In general, dunes are post-glacial creations. They are dynamic features and their development is due to the succession of periods of sand movements and stabilizations. For example, a stabilised land surface may be used for pasture, cultivation and settlement before being affected by further sand blow. Later on, this sand surface may become stabilised and re-used again for pasture, cultivation and settlement.

Prehistoric and historic remains can be buried within dune systems. Therefore, the time-depth within this Character Type should not be disregarded.

VALUES AND PERCEPTIONS

Sand dunes can impact humans negatively when they encroach on human habitats causing desertification. Therefore, sand dune systems could be perceived negatively by some people.

In England, sand dunes could be perceived as having a motivating wilderness which is often tainted by housing and golf course developments. Public perception seems to have forgotten their relationship with local economies and the dune systems' history which is often linked to the marine environment.

RESEARCH, AMENITY AND EDUCATION

There is a potential for research and documentation within this Character Type. Archaeological sites could often be buried under dune systems. Therefore, the archaeological potential and the time-depth that these represent within this Character Type should not be disregarded. Dunes are likely to contain well preserved and stratified buried prehistoric and historical remains. The study of the formation of dunes and their link to the marine environment and climate history could provide an important contribution to the understanding of past human activities. Hence, further research on the geomorphology of sand dunes would be beneficial. Due to the dynamic nature of dune systems, there is a need to ensure regular surveys, particularly after major storm events, to identify material remains.

Recreation has used dunes mainly as adjuncts to desirable beaches or as bunker-filled golf courses. However, there is potential for encouraging the appreciation of the dunes, their flora and some of the historic features that they contain via, for example, developing further displays boards.

CONDITION AND FORCES FOR CHANGE

Fixed dunes and dune heath are particularly threatened habitats and are regarded as priorities under the European Community (EC) Habitats Directive (www.ukbap.org.uk). The Sand Dune Survey of Great Britain (1993-1995) gives the total area of sand dunes as 11,897ha in England. Major dune systems are widely distributed, being found around the English coast (except the English Channel (other than Sandwich Bay) and the Thames Estuary).

Dune systems are complex and dynamic entities prone to instability and sudden large-scale shifts. This can have significant impacts on the surrounding environment as well as important consequences for recognising, dating, and conserving archaeological remains within these areas.

The main threat to dunes appears to be from the expansion of recreation facilities as well as natural erosion processes and sea level rise.

This dynamic and complex environment will naturally change and develop through time. However, human impact both directly upon this Character Type and around it could have the effect that dune environments are unlikely to evolve in that same way as they have done in the past.

RARITY AND VULNERABILITY

Today, a large proportion of the sand dune resource in England is designated as Sites of Specific Scientific Interest (SSSIs), Special Area of Conservation (SAC), Special Protection Areas (SPAs), and/or National Nature Reserves (NNR). For example, Winterton Dunes is an extensive dune system on the east coast of Norfolk, which has been designated as a National Nature Reserve and is within the Norfolk Coast Area of Outstanding Natural Beauty (AONB).

Dunes are generally rich in buried prehistoric and historical archaeological deposits. These are usually well-preserved since dunes offer a non-acidic environment. Industrial and early recreation sites could also survive well within this environment. Dunes are relatively rare formations, and the prehistoric and historic features found within them and other associated remains could also be rare.

The combined geological, ecological and historical value of dunes needs to be considered when evaluating initiatives for recreation sites or other developments within this Character Type.

Sand dune systems are vulnerable to natural forces such as coastal erosion and sea level rise as well as developments such as golf courses and other recreational facilities.

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1.1.9.3 Character Type: Coastal Rough Ground

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Coastal Rough Ground includes the following Sub-types:

- Rough ground
- Salt marsh
- Wetland

Rough ground is defined as the unenclosed sloping ground beyond enclosed fields and above precipitous cliffs.

Salt marsh is a type of marsh that is a transitional zone between land and salty or brackish water (eg, sloughs, bays, estuaries). It is characterised by halophytic (salt tolerant) herbaceous plants. Historically, salt marshes have been used for grazing and wildfowling. Sometimes they have been treated as 'wastelands', along with other wetlands. The tide is the dominating characteristic of a salt marsh. The salinity of the tide defines the plants and animals that can survive in the marsh area. They usually develop on a sinking coastline, originating as mudflats in the shallow water of sheltered bays, lagoons, and estuaries, or behind sandbars. In the present landscape their area may be restricted by 'coastal squeeze', unable to expand inland due to fixed sea defences while losing extent to an encroaching sea (Tapper & Johns 2008).

Wetland is represented by a lowland area, such as a marsh, swamp or bog, that is saturated with moisture either permanently or seasonally. Wetlands are often regarded as natural habitats for wildlife. The water found in wetlands can be saltwater, freshwater or brackish.

Historically, these Sub-types may have been mostly used as common grazing. These semi-natural habitats are, to an extent, the product of thousands of years of human activity, particularly summer grazing and extractive industry. Long distance coastal footpaths often pass through this Character Type.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The Typical components of this Character Type include:

- military defences (e.g. pillboxes, anti-tank cubes, Roman signal stations, fortifications, radar stations);
- prehistoric and historic sites;
- finds and field systems (flint scatters, barrows, coin hoards, settlements);
- maritime safety services (e.g. coastguard lookouts);
- navigation aids (e.g. lighthouses, fog stations, landmarks);
- industrial extraction and processing sites (e.g. quarries, mines, limekilns);
- recreational facilities (e.g. caravan and chalet parks, golf links).

This Character Type is characterised mostly by vegetation that has developed after several decades of neglect. Until its abandonment by farmers, vegetation would generally have been herb-rich rough grassland. The variability of archaeological sites could be considered lower than in upland rough ground as this has always been marginal land.

Salt marshes develop on depositional coasts, shorelines, bays, and estuaries where tidal action is relatively gentle and erosion no more than intermittent and light enough to allow vegetation to take hold. They are common on low-energy coasts such as estuaries and enclosed bays, amongst others.

This Character Type would have previously been dependent on other neighbouring Historic Landscape/Seascape Character Types, principally medieval and post-medieval enclosures. As summer grazing and fuel grounds, it formed an essential element of the mixed farming landscape.

VALUES AND PERCEPTIONS

This Character Type is mostly visited through coastal paths representing a recreational and leisure space for locals and visitors. However, much of the history behind this Character Type remains uncovered by the general public.

RESEARCH, AMENITY AND EDUCATION

In recent years, research and documentation of this Character Type has increased. However, there are still gaps to be addressed such as connections between land and sea from a maritime archaeology perspective.

The Character Type has shaped people's landscape and seascape perceptions, especially where there is coastal access and footpaths. This Character Type is also highly valued by both local people and visitors providing a space for recreation and leisure with potential for research and educational initiatives. Furthermore, it is relevant to mention that there

are also provisions to improve open air recreation on foot to the English coast under the Marine and Coastal Access Bill approaching its final stages in Parliament (http://www.defra.gov.uk/environment/marine/legislation/index.htm).

CONDITION AND FORCES FOR CHANGE

This Character Type is generally used by walkers and other visitors and this is likely to continue to increase. Some erosion problems could arise from these visits, tourism impacting on this landscape if it is not carefully and strategically managed.

Waterfowl that winter, for example on estuaries, are vulnerable to land claim and other developments that could disturb or damage the existing ecology of these sites. Other human influences, such as recreational disturbance, commercial exploitation of shellfish and worms, and oil and industrial pollution, are also potentially impacting on this Character Type.

The Marine and Coastal Access Bill, which is now approaching its final stages in Parliament, makes provision to improve access, creating a right to walk around the coast; to address uncertainty arising from lack of consistency, security and clarity in rights of public access to foreshore, beaches and coastal land. This will contribute clarify, simplify and extend access through the creation of a coastal access corridor to which the public has right of access on foot for outdoor recreation. It is also stated that access will be resilient to coastal change (http://www.defra.gov.uk/environment/marine/legislation/index.htm).

RARITY AND VULNERABILITY

Along the English coast, this Character Type is subject to Sites of Specific Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar Sites (which are wetlands of international importance designated under the Ramsar Convention), and in some occasions they are designated as a Heritage Coast. Salt marshes, for example, are one of the most biologically productive habitats, rivalling tropical rainforests. The daily tidal surges bring in nutrients, which tend to settle in roots of the plants within the salt marsh. The natural chemical activity of salty (or brackish) water and the tendency of algae to bloom in the shallow unshaded water also allow for great biodiversity.

This Character Type is vulnerable to reclaimed land impacting on the historic features surviving within it.

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1.1.9.4 Character Type: Foreshore

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Foreshore includes the following Sub-types:

- Sandy foreshore;
- Rocky foreshore.

This Character Type refers to the part of the shore between the high water mark and low water mark. Foreshore comprises the sandy, silty or rocky areas which can contain archaeological remains either at its surface (e.g. quays, breakwaters, industrial workings) or sub surface (e.g. buried land surfaces, overwhelmed quays). The present extent of foreshores and their constituent Sub-types have often been considerably influenced by human activities through the erection of groynes or by the impact of fixed sea walls (Tapper & Johns 2008).

Sandy foreshore refers to the part of the shore between the high water mark and low water mark comprising fine sediments. Typical historical components of this type are often ephemeral such as kelp harvesting areas, shellfish and bait gathering activities, alongside features such as sewage outfalls and pipelines, sea defences and military defences, landing places, recreational areas and potential areas for buried palaeo-environmental deposits. The sand itself can be quarried for use in building construction (Tapper & Johns 2008).

Rocky foreshore refers to the part of the shore between the high water mark and low water mark comprising rocky outcrops. Typical components of this type include shellfish and bait gathering activities, industrial extractive remains, sewage outfalls and pipelines, sea defences and military defences, landing places and recreational areas (Tapper & Johns 2008).

The English foreshore contains a rich and diverse legacy of prehistoric and historic remains which are vital to enable a deeper understanding of the long-term relationship with the sea and of those maritime influences which have contributed to the forging of England as a major mercantile, industrial and imperial nation. This important resource is increasingly threatened by pressure for development along the coast, and by the natural processes of coastal evolution. The Government has identified a need for an integrated approach to coastal zone management and planning which seeks to reconcile conflicting interests where they arise. For example, the Shoreline Management Plan (SMP) exists to promote the management of the coastline in a sustainable manner (see http://www.defra.gov.uk/Environ/Fcd/guidance/smp.htm). A SMP is a large-scale assessment of the risks associated with coastal processes and helps reduce these risks to people and the developed, historic and natural environments. The SMP brings together information pertaining to coastal issues such as flooding, erosion, coastal process and human and environmental needs (http://www.environment-agency.gov.uk/research/planning/104939.aspx; http://www.defra.gov.uk/Environ/Fcd/guidance/smp.htm).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- kelp and kelp harvesting areas;
- shellfish and bait gathering areas;
- industrial extractive remains (rutways, ironstone and jet mines);
- sewage outfalls and pipelines;
- sea defences (groynes, breakwaters);
- military defence structures (anti-tank cubes, batteries, minefields, pillboxes, trenches and weapons pits);
- landing places (quays, jetties, access tracks for carts);
- potential buried palaeo-landscapes;
- fossils;
- recreational fishing areas.

This Character Type contains remains of maritime human activities. Prehistoric remains in the form of peat deposits can also be found within this Character Type. The early Lower Palaeolithic sites on the East Anglian coast (specifically at Happisburgh and Pakefield) are some examples. These sites lie within sediment units exposed on beaches and the bases of cliff sections. Recent marine geophysical and geoarchaeological work has demonstrated that some sediment units have been traced offshore, specifically off Pakefield (Murphy 2007). Buried prehistoric land surfaces are fragile by nature and can contain unique palaeoenvironmental evidence (as well as artefacts and ecofacts) that can clarify issues regarding past human activities. Furthermore, palaeoenvironmental evidence can relate to an area's vegetational history or to the processes of submergence and coastal or estuarine change. These are examples illustrating the time-depth that this Character Type contains in some areas of England.

Trackways are generally ancient routes of travel for people and/or animals. Several cases have been found in England mostly in a foreshore context. For example, the Neolithic trackways on the Isle of Wight at Wootton Quarr (Waller 2006); a Hightown Neolithic trackway near the mouth of the Mersey River with radiocarbon dating of 3960-3690BC (Gonzalez & Cowell 2007); and Formby prehistoric footprints (Merseyside) (Huddart et al 1999). These trackways are relatively uncommon providing information about past trading and migration routes.

Most features within this Character Type relate to the use of the coasts and estuaries for fishing, shipping and industry. Some can still be used (e.g. quays, piers) but others would have been abandoned, visible only as low footings of walls or lines of rotting timbers. Piers, jetties, sea defences and breakwaters are some examples. Wrecks or hulks of ships and boats can survive on sandy foreshores and rocky headlands but, in the latter, they will mainly be fragmented. The wreck of the Amsterdam sunk in 1749, for example, is located on the foreshore near Hastings. At low tide, remains of the hull are exposed with local people walking around the area 'almost ignoring' its presence.

Coastal infrastructure such as ports, harbours and sea defences are another component of the foreshore. Archaeological remains on the foreshore can be affected by the construction and maintenance of this infrastructure, as well as by the indirect impact of the sea or flood defences.

VALUES AND PERCEPTIONS

In England, the foreshore is valued as a place for recreational activities such as fishing, sunbathing and sea-bathing.

Foreshores have been regarded as transitional areas of land and sea and they have often been ignored.

Intertidal studies have often been encouraged from a maritime archaeology point of view due to the richness they represent from a historic environment perspective (see Fulford et al 1997). Perspectives that integrate 'land' and 'maritime' views would shed new light about past human activities within this Character Type.

RESEARCH, AMENITY AND EDUCATION

Further research and surveys integrating archaeological features and the landscape that contains them will offer a broader view and understanding of this Character Type. This will provide a seamless approach breaking down the dichotomy between land versus sea.

Further research into this Character Type would be beneficial to enable a deeper understanding of the historic environment it encompasses and initiatives such as Shoreline Management Plans (SMPs) are contributing to this. A more comprehensive understanding of the foreshore area will also allow putting in place fit-for-purpose management strategies as well as their implementation through integrated management plans, SMPs being some examples. Both natural and historical interests should be considered in a holistic manner. As well as protecting vulnerable but important remains, these plans should aim to improve the interpretation of this Type and thus increase public awareness and enjoyment. Provisions to improve open air recreation on foot to the English coast under the Marine and Coastal Access Bill approaching its final stages in Parliament have also been made (http://www.defra.gov.uk/environment/marine/legislation/index.htm).

CONDITION AND FORCES FOR CHANGE

This Character Type will continue experiencing the gradual erosion by natural forces as well as the long-term threat of sea level rise along the English coast. Human forces for change include the construction of sewerage schemes and coastal defences, amongst others. The impact of these construction processes as well as the movement of water and sediments could damage the potential prehistoric and historic remains within this Character Type. Therefore, the potential existence of buried archaeological features within the foreshore should be considered when dealing with coastal developments. Human activities such as salvage, the random recovery of archaeological 'souvenirs' and some fishing activities could be extremely damaging to the non-renewable and fragile nature of prehistoric and historic remains.

The Marine and Coastal Access Bill, now approaching its final stages in Parliament, makes provision to improve access, creating a right to walk around the coast; to address uncertainty arising from lack of consistency, security and clarity in rights of public access to foreshore, beaches and coastal land. This will contribute clarify, simplify and extend access through the creation of a coastal access corridor to which the public has right of access on foot for outdoor recreation. It is also stated that access will be resilient to coastal change (http://www.defra.gov.uk/environment/marine/legislation/index.htm).

RARITY AND VULNERABILITY

Along the English coasts some foreshore areas fall within Sites of Specific Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar Sites (which are wetlands of international importance designated under the Ramsar Convention), and in some occasions they are designated as a Heritage Coast.

This Character Type is vulnerable to erosion processes, intrusive fishing activities, and developments such as expansion of ports and harbours, and wind farms and their associated cable routes and pipelines, all of them impacting on the historic features surviving within the foreshore**.**

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1.1.9.5 Character Type: Marine Features

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Marine Features includes the following Sub-types:

- Coarse sediment plains
- Fine sediment plains
- Sand banks with sand waves
- Reclaimed land
- Exposed Bedrock
- Mud plains
- Mixed sediment plains

Coarse sediment plains are extensive areas of seabed containing predominantly different grades of pebbles, rocks and boulders with low sand and very low silt and clay contents. This sub-type includes sediments that contain more than 5% gravel. The predominant archaeological interest is likely to be isolated wrecks, and as yet unconfirmed potential for submerged landscapes to be preserved beneath later Holocene deposits. Also this sub-type could provide spawning grounds for some commercial fish species (Tapper & Johns 2008).

Fine sediment plains refer to large areas of seabed containing predominantly different grades of sand and very low silt and clay content. The predominant archaeological interest is likely to be isolated wrecks and as yet unconfirmed potential for submerged landscapes to be preserved beneath later Holocene deposits. Also this sub-type could provide spawning grounds for some commercial fish species (Tapper & Johns 2008).

Sand banks with sand waves refer to a ridge of sand that is partially or totally submerged and may pose a hazard to shipping, often with extensive wavelike structures formed by rapidly moving currents of water on their surface. The predominant archaeological interest is likely to be isolated wrecks and as yet unconfirmed potential for submerged landscapes to be preserved beneath later Holocene deposits. Also this sub-type could provide spawning grounds for some commercial fish species (Tapper & Johns 2008).

Reclaimed land refers to new land created from where there was once water such as sea, river beds or wetlands amongst others (Tapper & Johns 2008).

Exposed bedrock refers to unburied solid bedrock deposits which are not conducive to burial and *in situ* preservation of archaeological remains. For example, the combination of rocky foreshore areas, potentially dangerous sea conditions, and overfalls could be conducive as having high potential of ship losses which in general would be fragmented and scattered.

Mud plains refer to large areas of seabed containing predominantly soil, silt and clay. The preservation of archaeological remains in these types of sediments could be considered as high potential due to their anaerobic characteristics.

Mixed sediment plains are defined as a mixture of muddy gravel, muddy sandy gravel, gravelly mud and gravelly muddy sand (Connor et al 2006). The archaeological potential

within these sediments could be considered as variable and any surviving archaeological remains are likely to be broken or scattered.

This Character Type varies considerably in the UK continental shelf. Its variability will be linked to the survival of prehistoric and historic features within it. Therefore, its understanding will enable to assess the archaeological potential that it could offer as well as its historic character. For example Lizard Point (Southern England) is a headland highly exposed to sea conditions. It is characterised by a rocky foreshore with a rapidly dropping bathymetry, creating overfalls off the tip of the Lizard. Hence, Lizard Point is therefore considered as having a high potential for ship losses based on the combination of rocky foreshore, potentially dangerous sea conditions, and overfalls. The seabed around the headland is bedrock, producing a very low potential for preservation of archaeological material due to its rocky nature. This would encourage scattered preservation within gullies rather than the presence of large segments of wreck material (for further details see Merritt et al 2007). Another example is Hurst Spit which is a gravel spit running into the Western Solent. The area is exposed to prevailing winds and the seabed is characterised by gravels. The archaeological potential for the western side of the spit is low due to a high density of gravel. However, the eastern side is characterised by fine grained estuarine silts running out from the Lymington River and is therefore characterised by a high potential for preservation. The only stratified Mesolithic site in England (Bouldnor Cliff) has been discovered in this area (Momber 2004).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type are either submerged or partially submerged and include:

- Prehistoric submerged landscapes and associated material remains;
- Remains of abandoned or disused ports, docks and harbours and their associated components;
- Wrecks;
- Aircraft crash sites;
- Remains of disused or abandoned transport systems (such as railways, roads, tramways)

Prehistoric and historic deposits exist on the UK continental shelf. Understanding the characteristics of the geological deposits (age and origin) including the geological processes that have formed the sediment deposits can provide an insight into the potential type and location of any associated historic features within the landscape/seascape. Understanding the geological characteristics of the deposit therefore provides the essential foundation for the evaluation of archaeological or palaeoenvironmental potential. Depending on the mode and age of formation, for example, sand and gravel deposits may seal, contain and/or underlie single or multiple-episode archaeological deposits. Soft aggregates are mostly derived from the Middle and Late Pleistocene, which is contemporary with the first human colonisation and subsequent occupation of England and North-west Europe until the end of Last Ice Age (i.e. Palaeolithic period) (see Wenban-Smith 2002). Pleistocene fluvial, glacial and periglacial and beach gravels form much of the Palaeolithic archaeological record. Furthermore, Late Devensian and Holocene gravels provide much of the buried archaeology of valley landscapes (Brown 2004). Processes such as climate change and fluctuation of sea levels over the last 2 million years contributed to the deposition of

sand and gravels which now lie on the seabed (Gubbay 2005). These materials were originally deposited by rivers systems that are now submerged (BMAPA 2000; ODPM 2005). These processes periodically exposed seabed as dry land, thereby creating a space for human occupation and the potential for associated archaeological deposits. The archaeological potential of these marine deposits is immense, and there is still a need to enhance our understanding of these drowned landscapes and palaeo-environments which are still relatively poorly understood.

Areas of mud and silt deposits can generally be found within estuarine contexts such as the entrances to Foulness in the Crouch Estuary and around the entrance to the Swale, stretching out towards Margate. Another case is the Wash estuary, which has a predominantly sandy seabed, with fine grained silts and mud along the foreshore surrounding the river entrances. The approaches are characterised primarily by a gravel seabed although the areas where the banks have formed tend to be sand or gravely sand. The preservation of archaeological remains in these contexts could be considered as high although in gravely contexts remains could be scattered and/or broken. For example, the seabed on the approaches to the Severn Estuary, although wide and exposed, is characterised by solid bedrock deposits which are not conducive to burial and *in situ* preservation.

VALUES AND PERCEPTIONS

This Character Type is highly valued ecologically due to its biodiversity. For example, the Wash (Norfolk), on the east coast of England, consists of extensive fine sands and drying banks of coarse sand. This diversity of substrates, together with a variety in degree of exposure, means that there is a high diversity relative to other east coast sites (http://www.jncc.gov.uk/ProtectedSites/SACselection/habitat.asp?FeatureIntCode=h1140).

Lately, this Character Type has received some attention by archaeologists due to the archaeological potential that it could represent and therefore contributing to the understanding of past communities' dynamic and varied use of the landscape they inhabited.

RESEARCH, AMENITY AND EDUCATION

The English Heritage-Aggregates Levy Sustainability Fund (ALSF) Enhancing Our Understanding: Navigational Hazards project aimed to use the UK's extensive hydrographic archives, including charts, sailing directions and pilotage notes, and modern seabed geology mapping to identify and map Areas of Maritime Archaeological Potential (AMAP), areas where high potential for shipwreck losses coincide with areas of high preservation potential (Merritt et al 2007). This project provided the foundations for the development of a quantitative system for assessing the archaeological potential for shipwreck material in the marine environment according to different sediment types. Further research similar to the Navigational Hazards project needs to be encouraged and tested to different areas and case studies. Application to shipwrecks as well as other archaeological deposits such as submerged prehistoric landscapes would be highly beneficial to enable a deeper understanding of the archaeological potential of the marine environment.

The Submerged Palaeo-Arun River Project funded through English Heritage-ALSF has reconstructed the palaeo-morphology of submerged and buried landscapes of palaeo-Arun valley on the northern English Channel, integrating geophysical, geomorphological and sedimentological investigation of offshore river systems (Gupta et al 2004). This research facilitated the development of models which allow complex submerged landforms and buried subsurface variations that have extensive archaeological potential to be better understood. The new data provided by this study has contributed to the emerging field of submerged prehistoric archaeology, as well as developing procedures to assess the potential of the archaeological resource in offshore areas.

Collaborative projects between industry and the heritage sector through the analysis of further geophysical data and sediment characteristics and dynamics will contribute to clarify issues regarding archaeological potential and its preservation in the marine environment.

The amenity value of this Character Type could be further explored through, for example, interactive CDs and web resources. This Character Type also offers potential for educational initiatives to raise public awareness about the connection between both the natural and historic environment within a marine context.

CONDITION AND FORCES FOR CHANGE

The historic character of this Character Type is being threatened by offshore development activities. Depending on the industrial activities, geophysical surveys (and in some cases core sampling and diver inspections) are a requirement for offshore developments (e.g. wind farms and aggregates extraction, amongst others). These surveys can potentially increase the knowledge about the historic environment of a regional and local area. Furthermore they could enable the construction of detailed palaeo-environmental and palaeo-geographic reconstructions. Models (on local and regional scales) could then be developed for the location of particular types of site, for example. In an ideal world, this information will then feed into the local and national monuments records and inform future curatorial decisions. This will provide the opportunity for beneficial cumulative knowledge regarding the marine zone.

RARITY AND VULNERABILITY

Some prehistoric and historic features within this Character Type could be considered rare where time-depth is visible (e.g. Bouldnor Cliff submerged landscape, off the Isle of Wight).

This Character Type is under threat from environmental processes such as erosion, sea level rise and global warning. As ecosystems, this Character Type is potentially under threat from human activities such as intrusive fishing activities (e.g. trawling) and offshore developments (e.g. wind farms, and aggregate extraction amongst others). The impact of these activities as well as the movement of water and sediments could damage the potential prehistoric and historic features present within this Character Type and therefore should be mitigated accordingly.

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WEBSITES

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1.1.9.6 Character Type: Sand and Mudflats

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type includes the following Sub-types:

- Sandflats

- Mudflats

Sandflats refer to a sandy tidal flat, barren of vegetation (Tapper & Johns 2008)

Mudflats are coastal wetlands that form when mud or muddy sediment is deposited by tides or rivers. They are found in sheltered areas such as bays, lagoons and estuaries. They result from the deposition of clays, estuarine silts and marine animal detritus (which includes bodies or fragments of dead organisms) (www.ukmarines.org,uk; Tapper & Johns 2008).

This Character Type is found in the intertidal zone and is generally submerged at high tide and exposed at low tide. They form a major component of the estuaries and large shallow inlets and bays in England but also occur extensively along the open coast and in lagoonal inlets (http://www.jncc.gov.uk/ProtectedSites/SACselection/habitat.asp?FeatureIntCode=h1140). For example, Morecambe Bay is a large bay in northwest England and is located south of the Lake District National Park. It is the largest expanse of intertidal mudflats and sand in England, covering a total area of 310 km².

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- buried prehistoric or historic land surfaces
- quays
- breakwaters
- wrecks

Intertidal mudflats and sandflats are generally located in tidal estuaries and can contain important archaeological remains either at the surface (e.g. quays, breakwaters, wrecks) or buried (e.g. prehistoric or historic land surfaces, overwhelmed quays). Most human activities that have left remains in these areas were connected with the marine environment. There is also potential for the presence of prehistoric remains on land that is now intertidal but which used to be dry ground.

VALUES AND PERCEPTIONS

This Character Type is highly valued ecologically due to its biodiversity. Many examples are now nature reserves or have been given national or county nature conservation designations. For example, the Wash (Norfolk), on the east coast of England, is the second largest area of intertidal flats in England. The sandflats in the embayment of the Wash include extensive fine sands and drying banks of coarse sand. This diversity of substrates, together with variety in degree of exposure, means that there is a high diversity relative to other east coast sites. Sandy intertidal flats predominate, with some soft mudflats in the areas sheltered by barrier beaches and islands along the north Norfolk coast (http://www.jncc.gov.uk/ProtectedSites/SACselection/habitat.asp?FeatureIntCode=h1140).

Scarce attention has been given by historians or archaeologists despite contributing to the understanding of past communities' varied use of the landscape they inhabited.

RESEARCH, AMENITY AND EDUCATION

Some survey, excavation and analysis of the well-preserved archaeological sites has been undertaken in some areas of England providing valuable information about past human activities. Archaeological research of the coastal peat bogs has also been carried out providing invaluable palaeo-environmental information. The largest remaining raised peat bogs in England can be found in the Humber Head Levels (CPRE 2007).

The English coastline is invaluable from both historical and natural perspectives. Therefore, information boards could be further used to convey these historical and natural interests.

CONDITION AND FORCES FOR CHANGE

The maintenance of mudflats is important in preventing coastal erosion. However, mudflats worldwide are under threat from predicted sea level rises, land claims for development, and chemical pollution, amongst others. Other human influences, such as recreational disturbance, and commercial exploitation of shellfish and worms are also potentially damaging the historic features within this Character Type.

As ecosystems, this Character Type is under threat from human activities such as oil and industrial pollution. This Character Type can also be impacted by events far upstream, and concentrate materials such as pollutants and sediments. Contaminants can be introduced which do not disintegrate rapidly in the marine environment, such as plastics, pesticides, furans, dioxins, and heavy metals.

RARITY AND VULNERABILITY

This Character Type represents typically important regions for wildlife. They are often of particular importance to migratory birds. In England mudflats, for example, have been classified as a Biodiversity Action Plan priority habitat. A Biodiversity Action Plan (BAP) is an internationally recognized program addressing threatened species and habitats and is designed to protect and restore biological systems.

As ecosystems, this Character Type is under threat from human activities such as recreational disturbance, commercial exploitation of shellfish and worms, and oil and industrial pollution. This Character Type can also be impacted by events far upstream, and concentrate materials such as pollutants and sediments. Contaminants can be introduced which do not disintegrate rapidly in the marine environment, such as plastics, pesticides, furans, dioxins, and heavy metals.

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WEBSITES

http://www.jncc.gov.uk/

1.1.9.7 Character Type: Water

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Water (fresh) includes the following Sub-types:

- Lakes, Ponds;
- Lagoons
- Reservoirs
- Watercourses

Lake, pond refers to an inland body of fresh water or salt water (Tapper & Johns 2008).

Lagoon is a body of comparatively shallow salt or brackish water separated from the deeper sea by a shallow or exposed sandbank, spit, reef or similar feature.

Reservoir refers to a large natural or artificial body of water sometimes covered, used to collect and store water for a particular function (http://thesaurus.english-heritage.org.uk).

Watercourse is a flowing body of water such as a river or stream.

Fresh water is a crucial resource for life and therefore critical for survival. One of the most important uses of water in agriculture is for irrigation, which is a key component for food production. Today, many of these Sub-types are used not only for subsistence but also as recreational spaces.

The impact of watercourses in today's landscape is visual although flooding in some areas could be an issue.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components include:

- Specifically associated infrastructure related to industry
- Specifically associated infrastructure related to recreation
- Specifically associated infrastructure related to fishing
- Settlements

There are a number of natural processes that can form lakes. Tectonic uplift of a mountain range can create bowl-shaped depressions that accumulate water and form lakes. The advance and retreat of glaciers can scrape depressions in the surface where water accumulates. For example, the Lake District features (North West England) are a result of periods of glaciation. These features include the ice-carved wide U-shaped

valleys, many of which are now filled with the lakes that give the park its name. The higher fells are rocky, with lower fells being open moorland.

Reservoirs generally refer to an artificial lake which is used to store water for different uses. Reservoirs are often created by building a sturdy dam. Once the dam is completed, the stream fills the reservoir. When a reservoir is predominantly human-made (rather than being an adaptation of a natural basin) it may be called a cistern. In England, Thames Water has many underground reservoirs beneath London built in the 1800s by the Victorians, most of which are lined with thick layers of brick.

Watercourses have been used since prehistoric times in England and settlement patterns have been found close to freshwater sources. Recent evidence from dried up channels of major rivers like the Thames suggests that prehistoric burial in rivers and lakes may have been funeral areas in later Bronze Age and Iron Age.

Natural rivers and lakes were used as critical sources for survival as well as waterways for the transportation of people and goods. These were then improved to make navigation more reliable, by the construction of artificial channels and flash locks (i.e. designed with a single gate). The introduction of the pound lock (a lock almost exclusively found nowadays on canals and rivers) enabled more ambitious waterways to be built. The Industrial Revolution required the transportation of large quantities of raw materials and finished goods. This led to the construction of a large network of canals in England. The decline of many canals and, in some cases their abandonment, started with the competition first from railways and later from road transport.

VALUES AND PERCEPTIONS

People use water as a critical resource for survival as well as for many recreational activities, exercising and sports. Some of these include swimming, waterskiing, boating, surfing, and diving. Lakesides, beaches and waterparks are popular places for relaxing and enjoying recreational activities. Many people find the sound of flowing water to be calming. Some keep fish and other life in aquariums or ponds for show, fun, and companionship. Water fountains have also been created for public or private decorations.

RESEARCH, AMENITY AND EDUCATION

The effect of water quality (pollution) on the historic environment may be a factor affecting the preservation of terrestrial, inter-tidal, and submerged prehistoric and historic features. Pollution alters the chemical composition of water and soil, often making them more acidic and therefore more likely to damage prehistoric and historic features. However, scarce research has been undertaken on water pollution and its effect on archaeological sites (Fulford et al 1997).

The English coastline is invaluable from both historical and natural perspectives. Therefore, information boards could be further used to convey these historical and natural interests.

CONDITION AND FORCES FOR CHANGE

Water supply is critical for inland areas. However, there are also concerns along coastal areas especially regarding discharge of water and sewage, and maintenance of water quality.

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RARITY AND VULNERABILITY

As ecosystems, this Character Type is under threat from human activities such as recreational disturbance, and oil and industrial pollution. This Character Type can also be impacted by events far upstream, and concentrate materials such as pollutants and sediments.

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WEBSITES

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1.1.9.8 Character Type: Woodland

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Woodland includes the following Sub-types:

- Ancient woodland;
- Plantations.

This Character Type refers to land that has had continuous woodland cover since at least 1600 AD.

The Sub-type ancient woodland may be an:

Ancient semi-natural woodland: ancient woodland sites that have retained the native tree and shrub cover, although it may have been managed by coppicing or felling and allowed to regenerate naturally.

Ancient replanted woodland: ancient woodland sites where the original native tree cover has been felled and replaced by planting, usually with conifers, a process that has taken place during the 20th century (http://www.englishnature.org.uk/pubs/gis/tech_aw.htm).

Plantation refers to recent plantations, often cyclically-replanted conifer woods and forests created to supply industrial and domestic demands for wood (Tapper & Johns 2008).

Although woodlands are not an obviously maritime type, they are included where they are connected to the water's edge in tidal rivers or on the coast where they have been established on the cliffs and former coastal rough ground, often managed to minimise erosion (Tapper & Johns 2008). Woodlands were important places, providing timber and other materials for boat and ship building and other activities carried out by local coastal communities.

This type comprises mainly the remnants of traditionally managed woodlands, usually found in the steep-sided valleys extending inland from rivers or, in some cases, via tributaries. It also incorporates ancient woodland and plantations. Two typical traditional techniques are coppicing (harvesting wood by cutting trees back to ground level) and pollarding (harvesting wood at about human head height to prevent new shoots being eaten by grazing species such as deer). Both techniques encourage new growth while allowing the sustainable production of timber and other woodland resources. During the 20th century, the use of these traditional management techniques declined whilst the large-scale mechanised forestry technique increased. These changes in management methods resulted in changes to ancient woodland habitats, and a loss of ancient woodland to forestry. During this period, many of the ancient woods were replanted with conifer plantations.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Components of this Character Type include:

- banks, tracks and paths;
- drainage ditches;
- fences.

The term semi-natural ancient woodland is applied to those woodland areas which are considered to have been in existence from at least AD 1600. These woodland areas remain to the present day without having been cleared at anytime for uses other than wood or timber production.

The surviving ancient woodlands would have been managed and have formed important elements of the working landscape for many centuries. Medieval farmers and craftsmen would have exploited them as pasture grounds, sources of fuel, coppice wood and timber.

VALUES AND PERCEPTIONS

Plantations are sometimes perceived as threatening since they have either obscured or damaged the ecologically varied and historic features of the landscape/seascape.

Some woodlands have public access and are appreciated by those who visit.

RESEARCH, AMENITY AND EDUCATION

Woodlands in general have been neglected areas. They could potentially contain well preserved historic features. Therefore, further archaeological studies from both 'land' and 'maritime' perspectives could clarify this.

From amenity and educational points of view, access to certain woodlands could be increased and the presentation of their historical and educational aspects could be improved through, for example, interpretation boards. However, in general terms, the constraints of topography and property boundaries make the presentation of features in this Character Type challenging.

Plantations contribute to the present landscape character and they also have amenity value.

CONDITION AND FORCES FOR CHANGE

Woodlands are habitats for biodiversity. Major issues, such as the cessation of traditional management techniques (e.g. coppicing and pollarding), sheep grazing, coniferisation, lack of regeneration and invasion of non-native species, are threatening that biodiversity.

There is increasing pressure for the replanting of woodlands in England. This could be a positive force for change if this initiative is guided by an understanding of the known or likely areas of earlier woodlands. A recent change of policy by the Forestry Commission now favours restructuring plantations through their gradual transformation from conifer to broad-leaf (www.forestry.gov.uk).

RARITY AND VULNERABILITY

For many species of animal and plant, semi-natural ancient woodland areas provide the sole habitat, and for many others, conditions on these sites are much more suitable than those on other sites. This is because they have had a long time in which to acquire a diversity of species and to form stable floral and faunal communities. In England, ancient woodland is typically the home to more rare and threatened species than any other habitat. For these reasons, ancient woodland is often described as an irreplaceable resource or critical natural habitat (http://www.forestry.gov.uk/).

Plantations contribute to the present landscape character. However, as a whole, the survival of historical features within them in England could be considered as relatively low.

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WEBSITES

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1.1.10 Broad Character: Recreation

1.1.10.1 Character Type: Recreation

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Recreation includes the following Sub-types:

- Aquarium
- Bathing/swimming area
- Dive site
- Golf course
- Holiday park
- Leisure fishing area
- Leisure sailing area
- Marina
- Parks and gardens
- Seaside entertainment
- Sports site

Recreation involves areas where human activities are undertaken for pleasure or amusement in a refreshing and diverting manner.

Aquarium refers to a zoo building containing artificial ponds or tanks in which aquatic plants and animals are kept alive for purposes of observation and study (http://thesaurus.englishheritage.org.uk/).

Bathing/swimming area is an area used by people to bathe and swim (Tapper & Johns 2008).

Dive site is an area used by recreational divers, sometimes concentrated on wreck sites and other areas of natural environment or historic environment interest (Tapper & Johns 2008).

Golf course is a prepared area of ground used to play the game of golf on (http://thesaurus.english-heritage.org.uk/).

Holiday park refers to recreational holiday parks, caravan parks, chalets etc used by visitors to the coast (Tapper & Johns 2008).

Leisure fishing area is an area used for recreational fishing and angling (Tapper & Johns 2008).

Leisure sailing area refers to an area used for recreational sailing, yachting, and other small craft pursuits.

Marina is a dock or basin, often inland, used for mooring yachts and other small pleasure craft (http://thesaurus.english-heritage.org.uk/).

Parks and gardens refer to public parks and gardens for the use of the public for entertainment and relaxation (Tapper & Johns 2008).

Seaside entertainment refers to arcades and fun fairs used for public entertainment and relaxation (Tapper & Johns 2008).

Sports site is a place that involves buildings, areas and structures associated with sporting activities including watersports (Tapper & Johns 2008).

Tourism is an important source of income and employment for many coastal regions in England, Blackpool or Brighton being some examples. The coastline attracts many people in pursuit of open-air leisure activities and many of these places have been visited historically for such purposes. Blackpool, for example, has been historically visited because of the famous Blackpool Tower, its piers and seaside entertainment fun parks. Coastline recreational areas are typically characterised from small villages and high cliffs, to clear water and sandy areas offering a wide range of open-air leisure activities.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type involve, amongst others, walking, bird watching, sunbathing, golfing, climbing, camping, wildfowling, sea bathing, sailing, surfing, diving, leisure fishing, angling, water and jet-skiing.

Outdoor swimming pools were a recreational feature in some English coast resorts. These pools were seen as a modern day replacement for the 'health-giving' dips in the sea which first became popular with the aristocracy, but later used by the wider population.

Other coastal amenities in England include beach donkey rides, aquariums, pleasure gardens and parks. The cliff gardens and parks, with their walkways, boating lakes, fountains, flowerbeds and bowling greens, were appreciated for their peace and tranquillity. For example, in the 19th century, Southport (Merseyside) grew as a refined seaside resort with beach donkeys taking holidaymakers for a donkey ride.

The 20th century saw the development of the heritage industry. A 'heritage coast' classification scheme was initiated in 1972 to protect coastlines of special scenic and environmental value from undesirable development. Coastal heritage sites and facilities in England, such as abbeys**,** castles**,** cathedrals and churches, the countryside**,** historic houses, Roman remains and museums, are increasingly being used to promote tourism as well as increasing awareness about our common heritage.

VALUES AND PERCEPTIONS

The value of coastal recreation and water related activities has a number of positive outcomes, including health benefits, social inclusion and quality of life, environmental protection and economic benefits (Church 2008). For example, recreational activities such as swimming, rowing, canoeing, dinghy sailing and other activities that require sustained physical exertion are highly beneficial to achieve a healthy lifestyle.

Social inclusion can be achieved through developing social networks, acquiring knowledge and skills and gaining a sense of achievement whilst having fun. Communities also reap rewards as people take part in common activities and some individuals are diverted from crime and antisocial behaviour (Church 2008).

In some regions of England, local authorities, the Broads Authority and other organisations successfully manage a high level of water related recreation activity in very sensitive environmental sites using a wide range of tools such as permits, short closures and codes of conduct (e.g. the counties of Norfolk, Suffolk, and Essex, amongst others). Therefore, well managed water related recreation can contribute to significant environmental improvements. For example, angling organisations, landowners and private sector operators have all worked in partnership with the Environment Agency to contribute to a significant increase in the availability and quality of riverine game fish habitat (Church 2008: 7).

The economic benefits of this Character Type are related to the increase of tourism which is beneficial as a source of income as well as employment. This Character Type also stimulates consumer spending of sport related goods.

Therefore, it could be said that this Character Type is perceived as a source of income and employment but also as a means of providing a better lifestyle, hence being highly valued as an important contribution to the society as a whole.

RESEARCH, AMENITY AND EDUCATION

Tourism has had a profound impact on recent economy, infrastructure and social structure of England. However, the potential for further research of this Character Type could be limited to understanding the Nation's tourism history, understanding historic environment assets to better inform future developments and creating tools to enable the prediction of tourism impacts with appropriate mitigation measures in place where appropriate. Although this Character Type is an amenity for many people, for others it reduces the amenity value of the coastline due to the massive impact that tourism has in certain places.

CONDITION AND FORCES FOR CHANGE

Coastal recreation is an increasingly significant and varied element for tourists and for local residents. Today, tourism is one of England's most important industries. However, cheaper and more attractive climatic conditions overseas offered by the package holiday to the Mediterranean and beyond have threaten some seaside towns, although many of them are now beginning to reinvent and re-launch themselves.

There is a national priority to promote sport and recreation as a means of improving people's quality of life. The promotion of coastal recreation, sports in particular, and the active promotion of the tourist industry in recent years have originated a need for access

to the coast. The recreation and tourist industries require an infrastructure to be in place to enable their access and success, such as roads, footpaths, car parks and hotels. The development of these infrastructures and the activities of tourists, for example, can impact on historic landscape/seascape in two ways: 1) a positive way by having tools in place to increase public awareness, respect and enjoyment; 2) a negative way through the physical removal or disturbance of sites (Fulford et al 1997: 188).

RARITY AND VULNERABILITY

Within this Character Type, refurbishment, and updating represent a threat to some early features. For example, the creation of golf courses and caravan parks involve the dismantling of existing landscape features and the creation of new ones. Furthermore, constraints on development initiatives in some coastal areas are beginning to exert control on the locations and forms of recreation complexes.

Diving clubs that dive on unknown wrecks could potentially provide local archaeologists and historians with a wealth of new and valuable information on these sites. Collaboration between divers, archaeologists and historians should be encouraged and opportunities to continue developing general public awareness should be promoted, the Nautical Archaeology Society initiatives are some examples (see http://www.nasportsmouth.org.uk/index.php).

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1.1.11 Broad Character: Settlement

1.1.11.1 Character Type: Settlement

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Character Type Settlement includes the following Sub-types:

- Cities;
- Towns;
- Villages;
- Hamlets

Settlement involves nucleated areas of built environment where people live, including historic and modern towns, coastal villages and hamlets.

City is a relatively large and permanent settlement. It is a large urban settlement in particular. There are no agreed definitions to distinguish a city from a town. However, many cities have a particular administrative, legal, or historical status, for example, historically in Europe an urban settlement which has a cathedral is deemed to be a city (http://en.wikipedia.org/wiki/City).

Town is an assemblage of public and private buildings, larger than a village and having more complete and independent local government (http://thesaurus.english-heritage.org.uk/).

Village is a collection of dwelling-houses and other buildings, usually larger than a hamlet but smaller than a town with a simpler organisation and administration than the latter (http://thesaurus.english-heritage.org.uk/).

Hamlet is a small settlement with no ecclesiastical or lay administrative function (http://thesaurus.english-heritage.org.uk/).

The term settlement is used in general in disciplines such as archaeology, landscape history and other subjects to define a permanent or temporary community in which people live. A settlement can therefore range in size from a small number of dwellings grouped together, to larger cities with surrounding urbanized areas. Settlement development can be based on analysis of historic Ordnance Survey maps; aerial photographs and local history.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Typical components of this Character Type include:

- roads and trackways;
- enclosures;
- field systems;
- boundary banks and ditches;
- ponds, parks and woods;

- mills;
- manor houses, moats and churches, amongst others.

This is a complex Character Type with different and numerous historical trajectories contributing to its present form. Therefore, change and complexity characterise this Character Type. The variability of this Character Type is extensive. It varies from region to region throughout the English coast with major cities such as London, to small villages providing shelter for boats during stormy weather.

During the Neolithic period, the introduction of domesticated crops and animals to the English landscape had a profound effect on the development of settlement, land use and the landscape. Pollen analysis has indicated phases of clearance, regeneration and further clearance. In some places, clearance was followed by soil deterioration initiating a process of degradation that was never reversed. The open moorlands of Cornwall, Devon, Somerset and Yorkshire are a product of this human mismanagement, particularly from the Bronze Age onwards (Aston 2000: 23).

During the Roman conquest, several new features were introduced to the landscape and new types of settlement were built. Roads were built with military precision. Military forts were an innovation to the English landscape. Most Roman towns and cities seem to have developed from earlier forts, representing Roman strategic and tactical decisions. The introduction of the monetary system and the existence of markets in towns contributed to develop a more commercial economy in some areas. In late and post-Roman periods, this commercial economy was disrupted and abandoned, returning to its former subsistence level (see Aston 2000).

In England, medieval coastal towns and villages generally had harbours and fishing populations, while others on tidal rivers (often now silted) were trading centres. Most extant buildings (except churches) are post medieval or modern.

During post medieval times, settlements grew slowly. However, in the 18th century, these settlements started to rapidly expand due to increased mining activity and the growth of commercial activities. As a result, several new towns and industrial villages also grew up along the coast. The development of ironstone mining contributed to the formation of many of the small villages. The housing in these small communities was normally provided by the mine owners who also built schools, hospitals, and chapels. The houses were often built in terraces with an allotment to the rear of the house. A number of terraced houses can still be seen in many English villages today.

In the 20th century, most settlements in this Character Type also expanded through the provision of housing estates for local families and new residences for a growing population of retired people and people wanting second or holiday homes (e.g. Cornwall). There are many settlements that are largely residential now since most of their original industrial, harbour and commercial functions have died out.

Before the end of World War II, many settlements lacked basic, modern, sanitary amenities. Many of them were tenement buildings erected in the second half of the 18th century to accommodate the influx of labour to work in the shipyards, graving docks and ironstone mines (Frank 2002).

Today, some settlements are simpler than others (e.g. post medieval industrial and harbour villages) but all of them have a variety of building types from a range of periods, different sectors for residence, commerce, industry, storage, recreation, burial and ceremonial uses. Some settlements also have military remains (from medieval castles to 20th century pillboxes). Most settlements have rich subsurface remains with the footings of buildings and features of medieval or even earlier periods.

VALUES AND PERCEPTIONS

There is an abundance of documentary sources and material remains of at least three hundred years in most English settlements reflected in the street plans, market places, and surviving medieval buildings (e.g. castles and churches). Street names may also reveal now lost features or activities (e.g. Far Jetticks, Friarage Field, Iron Scar, Whale Hill, amongst others). The discovery of artefacts and features encountered during developments and roadworks in towns represent a reminder to the observant dwellers of the richness of their town's past.

RESEARCH, AMENITY AND EDUCATION

Settlement patterns have been researched from several perspectives and these studies vary immensely. For example, sociologists and historical geographers have researched patterns of urban regeneration but scarce attention has been paid to the architecture and landscapes, which have been severely modified as part of this process. Smaller settlements have also seen dramatic changes throughout the 20th century. Lack of work on villages reflects an absence of research on the 20th century rural landscape in general (e.g. Petts & Gerrard 2006: 190).

In rural settlements, extant buildings and the layout of surviving features will benefit from further studies. In some cases, it is likely that there will be a wealth of subsurface settlement remains, some probably dating back into later prehistory. The study of documentary resources will complement archaeological studies, both shedding light on the history of the development of settlements in England.

Towns and villages are generally important as features of the landscape, having a wealth and great variety of historical and archaeological components, demonstrating considerable time-depth and contributing to the area's appearance and character. This has potential for further archaeological and historical research as well as the development of education and outreach initiatives. Education and outreach initiatives for this Character Type can be particularly popular when based within local communities, focusing on their own town or village. Towns and villages are also attractive amenity elements, being often used by the tourist industry.

CONDITION AND FORCES FOR CHANGE

Although settlements, as hubs of human activities, go through continuous change, the layouts and historic fabrics of most of them in general are relatively well preserved, shedding light about the history and development of these settlements.

As places where people live and undertake their business, settlements will always have a dynamic nature. The creation of new means of transport such as roads and railways is a

key area for large scale developments, often changing the character of towns and their immediate surroundings.

Today, the decline of the commercial centres of many towns in England, as out-of-town superstores take their toll, is perceived by most people as a negative force for change, removing traditional businesses and gradually taking away the meaning from these places.

RARITY AND VULNERABILITY

Towns and villages are generally important as features of the landscape, having a wealth and great variety of historical and archaeological components, demonstrating considerable time-depth and contributing to the area's appearance and character. For those towns suffering the effects of the erosive nature of the sea, high priority surveys and recording should also be undertaken, the English Heritage Rapid Coastal Zone Assessment Surveys initiative being an example.

Layouts and features of, for example, buildings relating to commercial, social and religious concerns, are important for maintaining links with settlement origins and development as well as for enhancing local distinctiveness.

In general, settlements containing historically and architecturally important structures are registered Listed Buildings and receive statutory protection. Conservation Areas also exist in most towns, generally in the historic cores. Local Plans reinforce these planning controls. The Historic Environment Record (HER)/Sites and Monuments Record (SMR) for towns are gradually improving but HER/SMRs require a systematic reassessment of urban archaeological remains. Some settlements will fall within areas covered by broader designations.

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1.2 Regional Perspective

1.2.1 Broad Character: Industry

1.2.1.1 Character Type: Energy Industry

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Principal oil and gas locations are generally concentrated offshore in the east and south east part of the region, to the south of Dogger Bank, with some pipelines and features extending inshore to Teesmouth and Redcar.

There are oil and gas refineries in the region, especially in Hartlepool and Middlesbrough. Oil is refined into more useful petroleum products, such as gasoline, diesel fuel, asphalt base, heating oil, kerosene, and liquefied petroleum gas. Gas is stored, canistered or piped onwards to provide heating, lighting and energy for both homes and industry.

The coal fields of County Durham extend both inland and out from the coast under the seabed. County Durham is one of the oldest intensive coal mining districts in England (British Coal Opencast 1991; http://www.dmm.org.uk/mindex.htm). The exploitation of coalfields had a dramatic impact, leading to large-scale landscape disturbance and poor preservation of historic assets (see Passmore et al 2002; Petts & Gerrard 2006).

Figure 1: View of industrialised coastal area with Teesside power station (near Hartlepool) in the centre of the image (© Maritime Archaeology Ltd and English Heritage)

Coal-fired power stations are found in Northumberland and Yorkshire. One nuclear power station operates near Hartlepool (www.british-energy.com).

Wind farms have already been built in the following areas: Northumberland, Easington, Western Rough, Durham, and Teesside Offshore (http://www.offshore-sea.org.uk; http://www.thecrownestate.co.uk/our_portfolio/marine/offshore_wind_energy.htm). Further offshore wind farms are expected to be built in the region as part of Round 3 UK offshore wind farm development. Further to Department of Energy and Climate Change (DECC) announcement on the plan for UK offshore energy in June 2009, The Crown Estate is currently working to complete appropriate assessment for Round 3 zones (http://www.thecrownestate.co.uk/our_portfolio/marine/offshore_wind_energy.htm).

Figure 2: Wind Turbines off Blyth, Northumberland (© English Heritage, NMR)

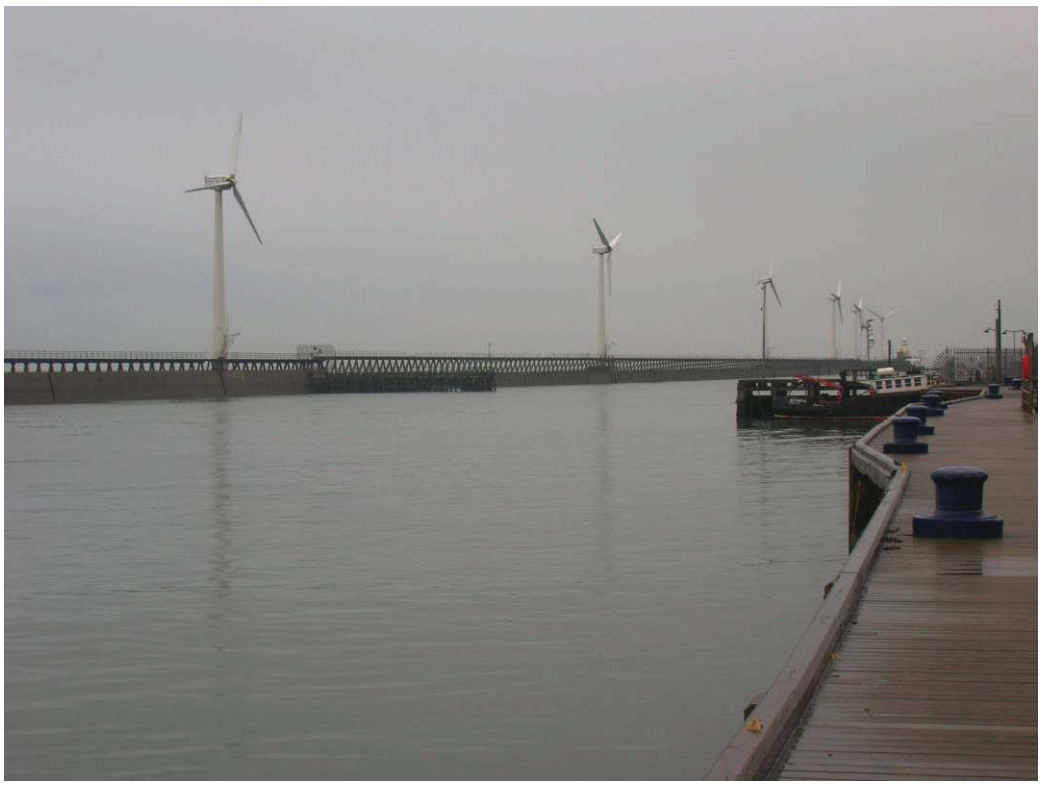

Figure 3: A view of Blyth Harbour and wind turbines (© Dave Hooley, English Heritage)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

This Character Type is usually superimposed onto other Types due to the historical phasing of this Character Type's activities in most character area sequences. Sub-type components such as oil-gas drilling rigs, pipelines, wells, mines and wagon-ways have impacted, for example, fisheries and palaeolandscapes offshore, and on agricultural land and shorelines along the coast. Earlier examples of this Character Type, such as coal mining bell-pits in Northumberland, are superimposed by agricultural Types.

Gas is the dominant hydrocarbon found in the southern North Sea, with oil more abundant further to the north in the central and northern North Sea areas. Many of the wellheads and sub-sea installations in the region are abandoned, suspended, lifted or not currently in use. As resources decline, the numbers falling out of use are likely to increase.

Figure 4: This gasometer in Durham is fully retracted, allowing a close-up view of its domed top. It would rise in telescopic sections, the water helping to create a seal (© English Heritage, NMR)

Onshore coal resources occur in strata of the Carboniferous system approximately 356-299 million years old, extending into the North Sea basin in the region. Coals of Mesozoic and Tertiary age occur over large areas offshore, the North Sea basin being an example (BGS 2001). The exploitation of coalfields had a dramatic impact on the County Durham and Northumberland coasts, leading to large-scale landscape disturbance and poor preservation of historic assets. In both upland and lowland areas, there has been quarrying, gravel extraction and opencast mining, potentially threatening several areas of high archaeological importance, particularly the Milfield Basin in north Northumberland (see Petts & Gerrard 2006). Projects, such as the Milfield-Geoarchaeology and the Till-Tweed projects, have created a management guidance framework based on bringing together geomorphological mapping of landforms and their archaeological associations (Passmore et al 2002). This work has highlighted the threats from gravel extraction in specific areas, and will act as a management tool for archaeological curators in the region (see Passmore et al 2002; Petts & Gerrard 2006).

Figure 5: Woodhorn Colliery (Northumberland) closed in the 1980s. It is now a museum (© English Heritage, NMR)

Millions of tonnes of coal lie buried off the North East coast, for example, at Amble and Seaburn. In March 2009, the National Union of Mineworkers called on the UK Government to undertake a feasibility study on work needed to open two new drift mines off the coast at Amble and Seaburn which could bring significant resources into the region.

The North Sea oil and gas industry has been a major economic activity since the late 1960s. The North East coast has played an important role in providing infrastructural support. There are a number of oil and gas installations on the North East coast, including terminals, storage facilities, refineries and tanker terminals (DTI 2002). These installations have generally been built on large tracts of reclaimed land (Le Guillou 1979). However, these resources are now in decline.

In the 1960s, while the coalmines and railways were closing, oil and gas refineries were opening in Hartlepool. From 1964 to 1968 three oil refineries were built in this area to supply the chemical industry as well as the local demand for fuels for heating and transport.

The Teesside Refinery (also known as the Port Clarence Refinery) is located south of Seaton Carew on the River Tees. The refinery is connected to the crude oil pipeline from the Ekofisk field (Norwegian sector of the North Sea). Its capacity has been increased over the years to meet the changing market conditions. In addition, the refinery now supplies the majority of the UK's bio-diesel blend.

From the late 1960s and early 1970s, safer and cleaner natural gas began to be extracted from the North and Irish Seas. During this time, there was a national conversion programme from 'town' gas to natural gas.

Two coal-fired power stations were built in the region during the late 1950s and 1960s. Blyth A opened in 1958 and was the first power station in England to be fitted with the new standard 120 Mega Watts (MW) sets. Blyth B opened in 1962 and was the first power station to have the new 275MW sets installed (http://sine.ncl.ac.uk/view_structure_information.asp?struct_id=301). These stations were significant at all levels when they won a place in the Guinness Book of Records by setting a world record, for a plant of its size, when all four generating units achieved 200,000 running hours. During 2002 and 2004, these power stations were demolished (http://sine.ncl.ac.uk/view_structure_information.asp?struct_id=301).

Figure 6: Coal staithes at Blyth Power Station (© English Heritage, NMR)

There are both coastal and offshore wind farms in the area. For example, the coastal Blyth Harbour Wind Farm, the seventh wind farm built in under the NOFFO scheme (the non-fossil fuel obligation), having been built in 1992 (http://www.northumberlandenergy.co.uk/). The Blyth Offshore wind farm was opened in 2000, and is the first offshore wind farm which consists of two 2MW turbines erected 1km offshore from Blyth harbour, Northumberland (http://www.power-technology.com/projects/blyth/). Forthcoming offshore wind farm proposals are expected following the announcement of a Strategic Environmental Assessment (SEA) to examine 25GW of additional UK offshore wind energy generation capacity by 2020

(Round 3). This follows the 8GW planned for Rounds 1 and 2 (see http://www.thecrownestate.co.uk/offshore_wind_energy; http://www.offshore-sea.org.uk/site/scripts/news_article.php?newsID=39).

Today, the region is a relatively high-cost producer since oil and gas extraction requires the use of a sophisticated offshore technology because of the inhospitable climate of the North Sea. However, the region has played a major role in international oil and natural gas markets because of the high quality and low sulphur content of its output, together with its political stability and proximity to major European consumer markets (Val Baker et al 2007; http://www.nesteoil.com). Five countries operate crude oil and natural gas production facilities in the North Sea: Denmark, Germany, the Netherlands, Norway, and the United Kingdom.

VALUES AND PERCEPTIONS

The male-dominated workforce is exposed to demands and constraints over and above those experienced in comparable jobs onshore. Employment peaked at 90,000 in the mid 1980s, with fluctuations in oil prices. Cost-reduction measures have included widespread down-manning (particularly on older platforms) and increased job insecurity (Val Baker et al 2007). There are no longer coal mines in the region and the boom years for the hydrocarbon industry are now over.

Because of the finite nature of hydrocarbon resources, and limited extent of those present in the North East region, the decline in this industry was inevitable. This Character Type has a strong cultural significance in the area but faces increasing controversy relating to the effect of using these resources on global warming. Consequently, the attitudes in the region towards this industry are mixed. For example, aspects such as the coal-strewn black beaches of County Durham have left strong emotional feelings, since these beaches have been cleared up at a high cost removing what many perceived as evidence of their recent hard times. It has also been noted that '*the creation of new identities in the Durham coalfield, based on the selective usage of folk memory and practice, and the rededication of objects like banners, is at an early stage. These new identities are only beginning to form, but show clearly a move towards the idea of creating places where communities exist through the work of the individual community, rather than communities that exist because of the industry of coal mining*' (Scott 2009: 66).

RESEARCH, AMENITY AND EDUCATION

This Character Type has generated a wealth of geophysical data profiling the nature and form of the seabed. This information is invaluable to archaeologists researching submerged palaeolandscapes and assessing historic environment potential. For example, recent research has been undertaken in the North Sea area regarding the potential of submerged palaeolandscapes. This work aimed to understand the human use of early landscapes that were once exposed and are now submerged underwater (Gaffney et al 2007). Whilst of undoubted inherent archaeological significance, this research also has implications for the management of cultural resources. Furthermore, Palaeolithic hand-axe finds found in the Hanson Aggregates Ltd Dredging Area 240 were reported through the BMAPA-EH Protocol for Reporting Finds of Archaeological Significance. Therefore, these initiatives and HSC demonstrate the importance of understanding submerged

landscapes both offshore and onshore because of the potential of historic assets that they encompass (Dellino-Musgrave & Oxley 2007; Gaffney et al 2007; Hooley 2004).

There is also a wealth of written information on the industrial and social history of coalfields. Museums in the region have been actively disseminating this knowledge to the public developing people's awareness about their historic environment. This dissemination has also encouraged people's enjoyment of this unique, fragile and finite resource. However, there is scarce information about the extent of workings predating the Coal Mines Regulation Act (1872) that detailed plans of underground working required by law. Further research would be useful in this field, as this knowledge would enhance our understanding of the hydrocarbons industry as well as enabling an assessment of risk to structures in the vicinity of old mines (Tuck 1993a, b).

The creation of memorials, heritage trails and the replication of miners' lodge banners could be considered as a discernible phenomenon within the communities of the former colliery villages of Durham (see Scott 2009). These memorials, heritage trails and banners could be explored as new educational and recreational tools to promote further understanding of our common heritage as well as raise awareness about local and regional values regarding coal mining, for example.

From an educational perspective, society's need for sustainable sources of energy and the conflicting issues associated with satisfying this need constitutes a stimulating case-study for schools in this area, where the issues can be related to the local environment, economy and historic cultural landscape/seascape.

CONDITION AND FORCES FOR CHANGE

In general, extensive re-landscaping is undertaken at a site when mining activity has ceased, with the aim of re-establishing the productive use of land, moulding past Character Types expressed in today's landscape. For example, the impact of coal mining on the coastal dimension is significant in some areas (e.g. North East (Co Durham) and Cumbria). It produced 'black beaches' formerly covered with sand impacting on large coastal topographic changes.

Renewable alternatives are growing fast and, as a result, there are likely to be significant changes in the generation of energy in the region. Potential sources of renewable energy of relevance to this area include wind, wave and tidal power. A proposition has already been made for a potential offshore wind farm with 30 wind turbines at Hartlepool (specifically at Tees Mouth). The Tees Valley's status as a centre for the development of new, cleaner energy technologies has received a major boost in recent years and has acquired an option to participate in what would be the UK's first complete clean coal power generation project (Val Baker et al 2007).

The Dogger Bank area has been proposed as a draft Special Area of Conservation (dSAC), which includes areas of existing oil and gas activity (JNCC 2008). Therefore, the impact of human activities in this area such as aggregate extraction, installation of petroleum and renewable energy industry infrastructure and cables, pollution from oil and gas industry, sewage from oil and gas rigs and demersal trawling will be dependent upon the nature, scale, location and timing of events (JNCC 2008: 2). It has also been advised that the management of human activities will be within their remit so that they do not result in deterioration of the habitat (*ibid.*).

RARITY AND VULNERABILITY

Although oil, gas and coal working installations are declining, their remains will be found in the North East region. Their remains could potentially be vulnerable due to present and future coastal and offshore developments in the area. However, in the North East region there are several Sites of Special Scientific Interest (SSSIs) because of their flora, fauna, geological or physiographical features. Durham Coast, Tyne and Wear, and Northumberland Shore are some examples. If any remains of this Character Type are present within these SSSIs their vulnerability would, of course, be considerably reduced. Therefore, further research is needed to enable informed assessments of the rarity and vulnerability of historic assets in the region. It could be expected that this will be further developed as part of the licensing process for coastal and offshore developments.

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1.2.1.2 Character Type: Extractive Industry (Minerals)

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Due to the intrusive nature of this Character Type, this type can be dominant in the region, with examples of all Sub-types of mines and quarries present.

A number of other HSC Character Types have been impacted by processes associated with extractive industries in this region. Conversely, some woodland and coastal rough ground has developed on abandoned industrial ground, or derelict land. Some disused quarries have been reused as military practice areas.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Alum works were generally built close to a water supply so that reservoirs could be built to supply the steeping tanks (Frank 2002). The manufacturing processing produced significant waste of raw materials. The remaining calcined waste, soil and rock overburden was generally left close to the quarrying site, on beaches and cliff-tops where it survives to this day (White 2004). The manufacture of alum required large quantities of coal. Therefore, fleets of colliers sailed every year from the Tyne and Wear where coal was produced from the coalfields of Northumberland and County Durham to Whitby.

Figure 7: Easington Colliery Monument, Durham (© English Heritage, NMR)

As a consequence the alum industry provided the main stimulus needed for successful growth of the shipping industry in the region (Frank 2002). Despite the scarce archaeological evidence found, there are abundant documents that illustrate the interdependence of the alum and shipping industries (Buglass 2002). For example, the coal and alum trades contributed to establish early shipyards such as those at Stockton and Whitby. With increased competition from new works elsewhere in the country from 1766, the alum industry in Yorkshire began to decline at the end of the 19th century (Pickles 2002). In several coastal areas mining for alum has left the cliffs and foreshore cut and tunnelled. Some moor tops could reveal reservoirs of water currently covered with heather. Discarded spoil and red burnt shale heaps still exist in the North East.

Iron ores, mainly sandstones, underneath limestones and clays, were laid down in the Jurassic period approximately 140 million years ago. The deposits stretch in a broad arc from North East England through Lincolnshire, Leicestershire, Northamptonshire, Rutland and into Oxfordshire. Iron ores are widely distributed throughout the North East region and scatterings of early bloom furnaces have left traces of their slags throughout the region indicating that they have been worked since at least the Roman-British period (Owen 1986). However, it was not until the early 19th century that the Cleveland ironstone industry really flourished, this led to Middlesbrough growing from a hamlet into a major industrial town in only a few decades. The Cleveland Hills, in the southern part of the district, were key suppliers of the ironstone that was essential to the running of the blast furnaces alongside the River Tees. In 1825, the Stockton and Darlington Railway opened up the Cleveland ironstones with its ability to handle large quantities of mineral traffic (Owen 1986). The economic downturn that followed WWI, and

subsequent government policies led to the eventual decline of the ironstone industry, the last mine closing in 1968. Middlesbrough's Teesport is still one of the United Kingdom's main ports and the area between Middlesbrough and Redcar is still populated by many heavy industrial plants. There are also remains of ironstone workings along the cliffs and foreshore in the region. Groundwater from ironstone mines has also discoloured many of the streams in the area leaving present reminders of what was once a flourishing industry.

Figure 8: View of the docks, Middlesbrough (©English Heritage, NMR)

Jet has been worked in the region from at least the Bronze Age to make amulets and jewellery (McMillan 1992). The Romans and Vikings also made great use of it, making items such as jewellery, hair pins, spindle whorls and knife handles (White 2004). The jet industry flourished during Victorian times and the most notable is 'Whitby Jet' (BGS 1999). However, this industry collapsed very quickly. This was due to changes in taste and supply of cheaper substitutes such as vulcanite or glass (BGS 1999; Frank 2002; Muller 2009; White 2004). It survives today as a small craft industry. Antique jet is still a highly valued commodity (White 2004). The jet industries heritage also attracts many visitors to the North York Moors area (Whitby in particular).

Potash was discovered in North East England in the 1930s (Val Baker et al 2007). Potash is found within the sedimentary strata above the Permian evaporates in this area. The depth involved can prevent underground exploration and trial mining in some places. There is one potash mine operating in this region, located at Boulby, opened by Cleveland Potash Ltd in 1973. It is the deepest shaft mine in Europe harvesting potash and salt deposits from beneath the North Yorkshire Moors and under the North Sea. It is also used for research into neutrino impacts on the earth. To transport the potash, a ship/road/rail terminal was constructed at Tees Dock. The potash deposit is worked

using a variation of a mining technique known as room and pillar. This system allows for areas to be extracted (rooms) leaving pillars to support the workings. Since 2003, a system for pumping tailings slurry has also been in operation (Val Baker et al 2007).

Extraction of salt from seawater has taken place in this region from at least the medieval period. Coal was a major factor influencing the growth of many towns in the North East, South Shields being an example. For over two hundred years, coal was used in the process of making salt. It is said that South Shields was once the most important salt making town in England, having taken over this status from Greatham, which had been the salt making 'capital' in the 15th and 16th centuries. For centuries salt making gave South Shields a dense eye- watering environment and the fumes from the salt pans could be seen from Durham. At the beginning of the 18th century, Blyth was also extracting salt, exporting over 1,000 tons of salt annually. However, Blyth's salt industry closed in 1876 with the destruction of the last salt pan. In Billingham, salt making probably had early origins as an ancient salter's track ran through this area. Salt exploitation was not specifically mentioned in documentary evidence for this area until the 13th century. However, Cowpen, near Billingham, is believed to have been an important centre of the salt making industry in the 14th century (Rowe 2000: 26). Large salt pans were used in the production of salt through the evaporation of sea water. Often, office and factory buildings were set up adjacent to the extraction sites and, in some cases, brine reservoirs were built. Although some buildings still remain, most are either disused or have been reused for other industrial purposes.

The region has a long history of quarrying (which has taken a range of forms) due to its diverse geology. Small quarries were utilised for building-stone and are found across the region. In building dry-stone walls and farm buildings, it was common practice to obtain stone from areas nearby. Therefore, small pits are common alongside walls, or near farms or hamlets. Significant exports of stones for building, in particular sandstone, are known in the region. Sandstone is easily workable but it also hardens as it weathers making it resistant to the effects of immersion and therefore useful in harbour works (e.g. Whitby) (http://www.northumberlandnationalpark.org.uk/understanding/geology/minesandquarries/abandonedquarries.htm).

Figure 9: Sandstone quarrying site in Durham which is now a derelict (© English Heritage, NMR)

Stone was also used for a range of other products including millstones and troughs. Many millstone quarries are known (e.g. Beanley Moor and Harbottle Crags), and semi-completed millstones are still visible. Limestone was also often burnt for field lime. Thus, it is common to find quarries associated with limekilns (e.g. near Walltown and at Crindledykes). Quarrying of limestone appears to have started relatively early, particularly in Hartlepool. A Roman limestone quarry and kiln have been identified near Greenlee Lough. Improved communications and transportation made local kilns uneconomic but limestone was still being burnt in the 1950s in the Redesdale Limestone quarries (Buteland). Walltown Quarry, on the Whin Sill (tabular layer of igneous rock) opened in 1876 and was the largest 'whinstone' quarry on Hadrian's Wall. It has been restored and landscaped while maintaining faces exposing the Whin Sill and adjacent rocks (http://www.northumberlandnationalpark.org.uk/understanding/geology/minesandquarries/abandonedquarries.htm). Some of them, such as Hart Quarry, are still in use for extracting dolomite aggregate. Limestone from the excavation of the docks at Hartlepool was also used for building purposes (Rowe 2000: 24). Other quarries have been abandoned, which could be regarded as distinguishing features of the present day landscape acting as reminders of the region's long history of quarrying.

Coal mining has also had a significant impact on this region. The collieries that once dominated several parts of North East England have now disappeared. The pit heaps have been reclaimed and naturalised into the landscape. However, the influence that coal mining has had upon shaping the modern character of North East England should not be disregarded. It is probable that the North East is the oldest intensive coal mining district in England. Although Romans burned and excavated coal in the region, it was not until the 13th and 14th centuries that it became more widespread due to expanding towns and increasing population.

The early coal mines of the region were along the banks of the Tyne where seams were shallow and easily mined. For example, as well as a seaport, Newcastle had accessible

coal close to the Tyne. Other ports in the region include Hartlepool and Stockton, but they lay outside the coalfield. Sunderland's coal lies deep underground (http://www.englandsnortheast.co.uk/CoalMiningandRailways.html; also see Character Type Transport). By the early 19th century coal mining dominated most of lowland County Durham and south Northumberland. The development of technology both within the coal industry and its associated infrastructure (mainly waggonways and railways) was fundamental to the industrial and social development of the North East. The coal legacy of physical dereliction and social deprivation was addressed by a succession of reclamation and infrastructure projects which saw substantial areas of derelict land reclaimed for new housing, industry, agriculture and forestry. Some elements of the industrial landscape survive and are preserved as part of the region's industrial heritage (see Petts & Gerrard 2006).

Figure 10: Newbottle Colliery Co, Tyne & Wear (© English Heritage, NMR)

Figure 11: A wrecked coal barge in a staithe (loading installation) built to ship coal from Ashington Colliery Co's pits in North Blyth, Northumberland. These remains act as a reminder of the coal industry and trade in the area (© English Heritage, NMR)

VALUES AND PERCEPTIONS

There are many tangible and non-tangible reminders of past industrial employment and the great days in the history of the North East, expressed for example in alum quarrying, ironstone and jet mining.

People's interests in industrial history and archaeology are strongly rooted in the North East. Many of these interests are now expressed in the different types of designated status that protect these past industrial reminders present in today's landscape. The Durham Coast, for example, has been the subject of a major reclamation initiative in the Turning the Tide project and much of it is now designated as a Heritage Coast (see http://www.turning-the-tide.org.uk/).

Coalfields are now generally perceived as a predominantly rural landscape with a rich industrial heritage, which is preserved and celebrated, for example in The North of England Open Air Museum at Beamish and the Timothy Hackworth Victorian and Railway Museum at Shildon.

Abandoned quarries are commonly seen as eyesores or convenient sites for waste disposal in the region. Overgrowth of vegetation may spoil, or eventually totally obliterate, geological and other historical features. Reclamation schemes aimed at remediation of land affected by mineral extraction may damage geological and other historical features

(http://www.northumberlandnationalpark.org.uk/understanding/geology/minesandquarries/abandonedquarries.htm).

RESEARCH, AMENITY AND EDUCATION

In general, there has been an emphasis on research into technical and economic aspects (e.g. mine yields). A deeper understanding is needed by exploring the social aspects of the North East extractive industries in both medieval and modern periods.

Early mineral extraction is less well understood in the region. Information on coal mining prior to the 13th century is scarce. Although documentary evidence for medieval collieries exists, there is minimal evidence on the landscape, since most early workings could have been destroyed by later mining (Petts & Gerrard 2006).

Systematic archaeological studies have been recently undertaken on 19th and 20th century industrial sites and landscapes in the North East (Petts & Gerrard 2006). Important features have been discovered and their recording, interpretation and preservation are crucial to enable a sustainable management of these assets (White 2004).

This Character Type has had a substantial impact on the character of the North East landscape/seascape and the way it has been perceived. The industrial landscapes and communities of the coalfield have inspired many local artists and writers. With the decline of traditional industries perceptions of the landscape have slowly changed. In general, the scars of lead mining and quarrying have become accepted and valued as part of the region's heritage. Due to the widespread dereliction left by the coal mining industry and major reclamation programmes, there is scarce evidence of coalmining on the region's landscape/seascape. Those features that still survive (e.g. old waggonways, viaducts and coke ovens) are now valued as part of the region's mining heritage and as a result several amenity and educational initiatives have taken place.

The present impact of this Character Type in aspects such as amenity and education are expressed through the role of Whitby's jet industry heritage as a major visitor attraction, the neutrino research at the Boulby potash mine, the outreach leaflets and trails by Natural England and North Coast AONB on whinstone quarrying, and the survival of medieval agricultural features largely around whinstone outcrops along the Northumberland coast as they have been obliterated from better soils elsewhere. Industrial 'heritage' is becoming an attractive element of the North East tourist industry, which needs handling with care, as sites are potentially hazardous.

Educational programmes have enabled children to learn more about the region's industrial past. This process will only continue to increase with bodies like The North York Moors National Park, local authorities and the National Trust. All these bodies have been engaged in promoting the understanding, preservation and presentation of industrial monuments and landscapes. For example, Northumberland National Park utilises disused quarries as useful tools for amenity and educational purposes. The exposed rock units allow a deeper understanding of the unique geological units within this area.

Overall, further archaeological recording and research should continue to be encouraged to raise awareness in local communities about this Character Type.

CONDITION AND FORCES FOR CHANGE

There are some relict industries in the region, such as alum quarries, ironstone and jet mines, which are now disused. Many of them are still visible in today's landscape and others are hidden by overgrown scrub and woodland or are barely distinguishable from other areas of the rocky foreshore. However, some of them are still in operation such as Boulby Potash Mine. Some building stone quarries in the region are also active and at least one of the jet mines still serves the small modern jet jewellery industry in Whitby.

Condition is extremely variable since some sites have been almost entirely destroyed, and others are virtually intact with most features except equipment still in place (e.g. Sandsend and Boulby Alum quarries). Furthermore, some extractive industry complexes have seen some depredation. In some areas, such as cliffs and rocky foreshores, industrial complexes from the medieval period or beyond can survive in excellent condition. Elsewhere, derelict land has been gradually tidied-up by farmers or expanding housing developments, damaging or removing remains of early industry. In other areas, remains of early industry have been either damaged or destroyed by cliff falls or by subsequent or still active workings.

Extractive industry (minerals) remains are part of the most distinctive landscapes along the North East coastline, including the cliff alum workings and many semi-derelict or overgrown industrial buildings, yards, lanes, and tramways. 'The effect of this heavy industrialisation is often so great that in some cases we may not even recognise the magnitude of the scale. Whole cliffs have been changed beyond recognition. Access ways to the shore and landing places have altered the shape of the coastline' (White 2004: 122). For example, along the Durham coast, coal lay deep underground, but in Northumberland, where the coal measures outcropped along the coast, coastal erosion would have caused much coal to be naturally washed ashore.

RARITY AND VULNERABILITY

Many of the surviving alum working sites play a key role in understanding the development of the industry and to protect these unique remains (Val Baker et al 2007).

The interest of old quarries can be enhanced by the presence of individually rare or local species and especially by their refuge status in relation to the loss of semi-natural calcareous grassland in the district. It is suggested that some sites play an important role in wildlife conservation and that this factor should be considered in any programme of land reclamation. Indeed many quarries have now been designated as SSSIs by virtue of this.

As in other regions, the archaeology of ironstone mining is still relatively under-recorded, and in many cases has probably gone unrecognised (Petts & Gerrard 2006; Val Baker et al 2007).

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1.2.1.3 Character Type: Processing Industry

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

In the North East, this Character Type developed through time, varying throughout the region and changing the character of what was once leading production centres. For example, Newcastle was a leading centre for coal mining and manufacturing. Office, service and retail employment are now the city's staples. Beadnell is now a tourist base, the town consisting largely of holiday homes, with some small-scale fishing. Near the harbour some historic limekilns can be found, which are now owned by the National Trust. In the 19th century, Durham was well-known as a carpet making and weaving centre until the factory was forced into administration in 2005. Middlesbrough's landscape/seascape is still dotted with symbols of its steelworks, chemical plants, shipbuilding industry and fabrication yards.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The iron and steel industries have formed a significant part of the history and character of the region for more than 160 years. Exploitation would have taken place utilising the rich iron ores on the North York Moors and fuel from the Durham coalfields. Ports in the area would have allowed the exportation of the products (Rowe 2000). By 1877, ironstone works were in crisis in the region, and in Cleveland in particular.

In 1879, a new process was developed for making steel with Cleveland ironstone and this revolutionised steel-making throughout the world. The post-war boom saw

England's premier steel-making centre remaining in the North East and by 1967 it became part of the nationalised British Steel Corporation. British Steel later became CORUS which has been taken over by TATA, making around 3.5 million tons of steel a year in 2002 (DTI 2002).

Before iron ore could be properly handled, timber was 'the most essential raw material in almost all human activities' (Brujin 1985: 127). The second half of the 17th century experienced a great demand for timber, especially with the increase of the shipping and house building industries (particularly after the Great Fire of London in 1666). In addition, English forests were shrinking. Therefore, the import of timber into England from Norway and the Baltic Sea trade increased considerably (Brujin 1985: 133). Interaction with the landscape/seascape was therefore mediated by some form of technology, such as the development of shipping technology. For example, the banks of the Wear were popular for shipbuilding during the 17th and 18th centuries. However, from 1990, the banks of the Wear experienced a massive physical regeneration with the creation of housing, retail parks and business centres on former shipbuilding sites changing the character of the area.

Figure 12: Ironstone fire chimney at Sparwood Mine (Cleveland), demolished in 1997 (© English Heritage, NMR)

Figure 13: Engine house (Durham), which became a characteristic of coalfields in the North East during the nineteenth century (© English Heritage, NMR)

Transport in bulk of building materials over long distances was rare before the age of canals, railways, roads and heavy goods vehicles. Before this time, bricks and tiles were generally made as close as possible to their point of intended use. Bricks were often used even in areas where stone was available, since brick production was more cost and time-effective. For example, buildings during the 1st and 2nd Industrial Revolutions in England were largely constructed of brick and timber because of the demand for rapidly and cheaply built accommodation for local workers. Clay is also a predominant geological mineral for most of north Yorkshire deriving mainly from the glacial deposits. Clay exploitation in this area is relatively ubiquitous with transport costs dictating the approximate spacing between brick and tile works. The typical components of brick and tile works in the region were rectangular tile kilns built of red brick with fire brick floors and tunnel-vaulted roofs (Rowe 2000). Brick making was a prominent and much-needed industry in the rapidly expanding towns of 19th century Teesside. Some of the clay used in Stockton's brick works was also a useful material for the local pottery industry. Today, most of this industry has disappeared and the survival of associated remains is generally poor.

The first industrial potteries developed on sites that had easy access to clay and coal. Although in England Staffordshire was of primary importance due to the quality of its clay, the North East was also significant (Baker 1984). Although the North East potteries emulated from those of the south whose products were imported to the region, they never matched the finest ceramics. Economics meant that as the industry grew, many new potteries were established on the banks of the Wear, which allowed access to coal and boats for export to London, Europe and the British Colonies (Baker 1984). The quantity of waste was a real problem for most potteries and it was often used as an aggregate (Baker 1984; Rowe 2000).

The chemical industry of the North East today is most closely associated with Teesside but the early chemical industries of the 18th and 19th centuries were centred on Tyneside. The making of alkali was predominant in this area. When mixed with fat, alkali

could be used to make soap, and mixed with lime and sand could be used to make glass. Alkali-making started to develop in the 1700s and was linked to increasing production of industrial products like cloth. Chemical products like soap, dyes and bleach were increasingly in demand and the need for glass also encouraged the industry. Alkali works were established at Walker-on-Tyne in the 1800s and at Tyne Dock, Felling Shore, and Friars Goose (Gateshead) in the 1820s. Such works also produced soda, alum and Epsom salts. However, one of the biggest problems associated with the alkali works was pollution, mainly from emissions of hydrochloric acid fumes which devastated the neighbouring countryside. One solution was to build tall chimneys to drive the fumes further away (e.g. Friars Goose Alkali Works). Due to its visual impact, these tall chimneys changed the character of the landscape/seascape of the area.

Glassmaking was established in England in the 12th century, when French and Italian glassmakers worked in Surrey and Sussex. Fuel was needed for furnaces and wood was easily obtained from the forests of South Eastern England. However, in 1615, the use of wood as a fuel for glass production was banned to protect the diminishing forests. North Eastern England, however, had a supply of cheap coal to offer to the glass industry. During the 17th century, the glass industry in England was dominated by Sir Robert Mansell who bought the exclusive right to glass-making in Tyneside and established glassworks in Newcastle (Frank 1982; Mortimer 1995).

Figure 14: Early picture of glass works giving an impression of the pollution created by the factory. The works were situated at Lemington-on-Tyne (west of Newcastle) (© English Heritage, NMR)

Medieval windmills in the North East often had to be replaced, not only because of the intrinsic instability of post mills, but their exposed positions made them obvious targets for the many raiders regularly coming from the North. Gradually, tower mills developed, giving greater stability and strength, thus allowing more height to be added**.** Fulling mills were also used in the cloth-making industry (e.g. Durham). After wool was woven it was cleaned and thickened. This was done by pounding it in a mixture of water and special

clay called fuller's earth. The pounding was done by wooden hammers worked by a water mill. In Durham, the Old Fulling Mill, formerly a mill operating as part of the Cathedral estates, now houses the Museum of Archaeology. During the post medieval period the main sources of power were animals, wind and water. Newcastle was known as an area with many windmills spread across its landscape. Some examples of surviving windmills include Fulwell Windmill, Sunderland (Tyne and Wear), Whitburn Windmill (Tyne and Wear) and Woodhorn Mill (Northumberland). An unusual example of a surviving windmill is the 18th century mill on Shackleton Beacon, Heighington (Durham), which was converted into a folly in the 19th century (see Petts & Gerrard 2006). The economy of North East Yorkshire was mainly agricultural prior to the mid 1830s and milling was amongst the earliest industries in this area. Windmills, being noticeable landscape features, could have often been viewed from rivers, the coast or the sea, frequently serving as useful landmarks (Rowe 2000). Many of these mills are now identified by local place names such as Millfield or Windmill Hill. Some have been adapted for use as private accommodation, whilst a few have been restored. Watermills, although no longer operational, can be found along streams and rivers within the region. These watermills were used, from at least medieval times, in grinding grain. They are now found as ruins or converted into dwellings.

Figure 15: Old Mill (Durham) was the site of a 14th century fulling mill before this textile-spinning mill was built towards the end of the 18th century (© English Heritage, NMR).

Limestone was used as building stone. For example, the limestone in the area of Durham is of a type called Dolomite and contains calcium and magnesium deposits. It has been used in the past as building material, most notably to cement together the bricks of Durham Cathedral. Today it is an important raw material in the chemical industries of Teesside. Limestone was also burnt and mixed with sand to produce lime mortar. Lime-burning kilns were in use from the medieval period and an example dating to the late 13th century was excavated at Hart. Individual kilns are shown on the 1st Edition OS maps but it is likely that they soon became obsolete with the growth of

cement manufacture in the 1860s and the increased use of cheaper South American imported lime.

Figure 16: Lindisfarne Castle lime kilns (© Dave Hooley, English Heritage)

Cement works are also present in the region's landscape. Modern hydraulic cements developed since the Industrial Revolution. They were driven by three principal needs: 1) hydraulic renders for finishing brick buildings in wet climates, 2) hydraulic mortars (for masonry construction of harbour works) in contact with sea water, and 3) the development of strong concretes. Good quality building stone became more expensive during periods of rapid growth. Therefore, it became common practice to construct prestige buildings using the new industrial bricks, and to finish them with a stucco to imitate stone. The need for a fast set-time encouraged the development of new cements. The use of concrete in construction grew rapidly from 1850 onwards.

From Medieval times, ropes were constructed in walks which were long buildings or yards where strands of rope were spread out and then twisted together. In general, there is scarce evidence for rope-making in the major shipbuilding ports of the region. However, rope-making, associated with Stockton's role as a shipbuilding centre, was an industry of significance, cotton being made at Stockton from a Cotton Mill established in late 1830s. Rope-making, shipbuilding and glass-making were amongst the early trades to develop in Newcastle but, historically, the most prominent industries of Newcastle were mining and the export of coal. A ropery opened in Throston in 1855, which consisted of a linear rope walk with a turning house at the eastern end (Rowe 2000: 37). There were also five roperies at Whitby in the early 19th century (White 2004: 95).

Figure 17: Former Rope Works, Newcastle upon Tyne, Tyne and Wear. Photo taken in 1989 (© English Heritage, NMR)

The Industrial Revolution was stimulated by the expansion of trade in the 18th century and by a series of discoveries, inventions and developments that were to transform industry and the landscape in future years. These increased a demand for ship and locomotive engines, including the development of later steam engines. In the region, this demand was initially dealt with on a small scale by local ironworks and smithies. By the late 19th century, separate engine works began to emerge in the region, such as Tees engine works and Hartlepool (Rowe 2000: 21). These developments impacted on transport too, as in the development of floating dock systems, an extensive turnpike road network and the canal network. Craft industries prospered alongside, and indeed were symbiotic with, the new power-driven industries of the Industrial Revolution: factory scale production, although dominant, did not command a monopoly over industrial production (see English Heritage 2007).

During the 19th century, expansion of the towns and villages in the region meant that water supplies needed to be rationalised. Previously water had been obtained from local wells and springs. There were water works at Sunderland such as Low Humbledon Hill pumping station and engine house which were later turned into homes. Water works were also at Hartlepool but the only remains left of this site today are the iron wave-effect railings (Rowe 2000: 30).

Reservoirs are primarily located in uplands or in steep river valleys. They were mainly built in the second half of the 20th century to ensure supply for domestic, agricultural (irrigation), and industrial use. For example, in the uppermost reaches of the River North Tyne, the large dam of Kielder Water can be found. The construction of the dam started in 1976. The lake, which opened in 1982, was built to supply heavy industry and

domestic users on Tyneside, Wearside and Teesside. The landscape of Kielder is rich in natural beauty, although it is almost entirely human-made, being Kielder Water surrounded by the human-made Kielder Forest. Cow Green Reservoir, a two mile long reservoir, was built between 1967 and 1971 to also supply the industries of Teesside. The reservoirs at Hartlepool were built in 1865 and survive in particularly good condition (Rowe 2000: 30). Alum works have a water supply network based on reservoirs and open or buried channels for the water to be routed to where it is needed. Iron and steel plants also need a good water supply (Appleton 1929). Therefore, consideration of these supply networks is needed within the context of the region.

VALUES AND PERCEPTIONS

Overall, people's interests in industrial history and archaeology are strongly rooted in the North East. Many of these interests are now expressed in the different types of designated status that protect these past industrial reminders present in today's landscape.

There are several production areas within the region where different activities took place, such as iron and steel production in Cleveland and exploitation of clay in north Yorkshire amongst others. These can generate mixed feelings according to the impact that the activities can cause on the landscape/seascape.

Sewage and water works are regionally accepted as essential public amenities. However, opposition to new works and pipelines has recently been increasing due to aesthetic, environmental and heritage reasons.

The primary role of reservoirs is generally to supply water to the local industry and domestic users. However, this primary role is generally forgotten and their secondary role as recreational grounds is perceived as a primary role. Therefore, reservoirs are highly valued because they offer the possibility of undertaking activities such as sailing, fishing, or water skiing (e.g. Kielder Water and the reservoir at Scaling Dam).

RESEARCH, AMENITY AND EDUCATION

Overall, further research on this Character Type is required to enable a better understanding of the processing industries and their changes through time. Their links between land and sea have often been disregarded. Furthermore, this region has a long tradition of metalworking and non-ferrous manufacture. Further research would be highly beneficial on these areas in order to gain a better understanding of these metalworking processes, in particular those undertaken on domestic or craft scale (Petts & Gerrard 2006: 224).

Some of the features of this Character Type, such as mills and limekilns, could be explored as suitable areas for educational and amenity purposes.

Further historical research of reservoirs may shed new light on the methods of selection of sites. In this sense, the historical coastal landscape/seascape are relevant for providing links to production and processing industries via waterways. The amenity potential of reservoirs should be further explored, offering opportunities for fishing and water sports as well as areas of natural beauty and wildlife haven.

CONDITION AND FORCES FOR CHANGE

Condition is extremely variable since some sites have been almost entirely destroyed, and others are virtually intact with most features still in place. Furthermore, some processing industry complexes have been exposed to some depredation. In some areas, such as cliffs and rocky foreshores, industrial complexes from the medieval period or beyond can survive in good condition. Elsewhere, derelict land has been gradually tidied-up by farmers or expanding housing developments, damaging or removing remains of early industry. In other areas, remains of early industry have been either damaged or destroyed by cliff falls or by subsequent or still active workings.

Some historic mills are still visible in today's landscape and are being preserved for their historic, amenity and educational values. For example, the Old Fulling Mill (Durham), formerly a mill operating as part of the Cathedral estates, is now a museum.

In the region, large reservoirs are generally carefully maintained, enabling good survival of their historic features. Smaller reservoirs and ancillary features, when in good condition and regularly maintained, have added value as amenity areas.

RARITY AND VULNERABILITY

The interest of old production works can be enhanced by the presence of individually rare or local species and especially by their refuge status in relation to the loss of semi-natural calcareous grassland in the region.

Many of the surviving production areas also play a key role in understanding the development of the industry and should be understood in conjunction with the Extractive Industry Character Type.

Reservoirs are very important as recreational spaces. They are also a dramatic contributor to the landscape character.

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1.2.1.4 Character Type: Shipping Industry

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The shipbuilding industry that once dominated both Wearside and Tyneside suffered a decline during the second half of the 20th century. Tyneside is now re-inventing itself as an international centre of art and culture and, through The Centre For Life scientific research. The Wearside is becoming an area for science and high technology.

The North Sea has been a main shipping route since medieval times (if not earlier). Principal dock and basin locations today include Tyne and Wear, Middlesbrough, Hartlepool, Haverton Hill, Teesside, and Seaton Carew. Port of Tyne facilities include docks, quays and ferry terminals and a car terminal. There is a dry dock still in operation at Teesside. There is also a boatyard at Middleton, although this is generally used for boat storage and maintenance rather than shipbuilding.

Figure 18: Tyne shipyard (© English Heritage, NMR)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Overall, the development of shipbuilding in the North East needs to be contextualised within extractive industries. These extractive industries, such as extraction of alum and coal, provided the stimulus needed for successful growth of the shipping industry in the region (Frank 2002). Shipbuilding also had an impact on trade and migration/immigration.

The prehistoric landscape/seascape in the region is represented by a number of logboats. For example, a logboat located in mud under 8 feet (2.4m) of water opposite to Thornaby High Wood (NMR site 26887) was found in 1926, dating from about 1600-1400 BC. Although not directly present in the North East region, the Brigg logboat is another example found in the Humber estuary (near where the Ferriby boats were found) dating to the transitional period between the Bronze Age and the Iron Age (McGrail 1981, 1994, 1998, 2001). Another important discovery includes the Ferriby boats which are three Bronze Age sewn plank-built boats, discovered at North Ferriby in the East Riding (Yorkshire). The Ferriby boats are one of the earliest known boats to be found in Europe. The Ferriby boats date between 2030-1680BC. These boats were built and used in estuaries and coastal waters around England from Early Bronze Age times, possibly surviving for a thousand years going into the Middle and Later Bronze Age.

These logboats represent the historic potential of the North East and East Riding (Yorkshire) landscape/seascape. They also indicate how the landscape/seascape was used and exploited since logboats were used for fishing and basic trade. It is also believed that these boats were seaworthy enough to ply the seaways of the North Sea coasts and the English Channel (see Wright 1990, 1994).

During the Viking era, Vikings explored Europe by its oceans and rivers through trade and warfare. However, during this time, there is scarce evidence for specific types of ships used in England. In some areas, local wooden shipbuilding traditions were replaced by Scandinavian ones. As late as the 1290s, the technical terminology used by shipwrights in Newcastle and York had a distinctively Scandinavian flavour when compared with that used in East Anglia or further south in England (Friel 2003: 45).

Figure 19: Tynemouth priory overlooking at 'Short Sands', area of recorded Viking raids (© Maritime Archaeology Ltd and English Heritage)

Shipping was important along the North East coast of England during medieval times. Shipping was used to supply the domestic needs of villages, towns and abbeys with goods such as coal, fish and probably heavier goods that were difficult to bring by road. The development of the alum trade acted as a major spur to growth in the shipping industry (Frank 2002: 4). Alum production required large quantities of fuel and every year vast fleets of colliers sailed from the Tyne and Wear to the Thames bearing the produce of the coalfields of Northumberland and County Durham. Much of this collier fleet was owned at Whitby and Scarborough (White 2004: 103). Tyne grew as a port from medieval times onwards, and shipbuilding techniques developed alongside (Kirkby 1980). Shipyards can still be found in Tyne, Jarrow being an example.

In the Tyne and Wear, Newcastle was the most important medieval port in the region as demonstrated by the establishment of the Society of Masters and Mariners of Newcastle at Trinity House in 1492. Newcastle was trading mostly coal and the town was building ships from at least late 13th century.

Figure 20: Ships in Newcastle (© English Heritage, NMR)

Sunderland also grew as a port, trading coal and salt and ships began to be built on the Wear in the 14th century. By the mid 18th century Sunderland was one of the chief shipbuilding towns in England. During the 19th century, the industry in the region became globally significant. This is materially expressed in the 24 shipyards that Sunderland had by 1814, a figure which had risen to 65 shipyards by 1840. Besides, the Port of Sunderland was significantly expanded in the 1850s with the construction of Hudson Dock. By the mid 20th century, the town produced more than a quarter of the nation's total tonnage of merchant and naval ships for World War II (WWII). Although Sunderland was widely regarded as the largest shipbuilding town in the world, competition from overseas caused a downturn in demand for Sunderland built ships toward the end of the 20th century. The last shipyard in Sunderland closed towards the end of the 1980s (http://www.englandsnortheast.co.uk/Sunderland.html). The North dock is now a marina and the South dock remains as a small commercial port.

Figure 21: A view of the port, Sunderland (© Maritime Archaeology Ltd and English Heritage)

The port of Blyth (Northumberland) dates from the 12th century, but the development of the modern town began in the first quarter of the 18th century. The main industries which helped the town prosper were coal mining and shipbuilding, with the salt trade, fishing and the railways also playing an important role. These industries have largely vanished, but the port still thrives, shipping paper and pulp from Scandinavia for the newspaper industries of England.

Shipbuilding on the Tees dates back to the medieval period. However, it was in the mid 19th century that the industry achieved a position of significance (Le Guillou 1975: 85). The 1860s saw the establishment of a shipyard at Hartlepool's West Harbour, known locally as 'the Harbour Yard' (Rowe 2000: 20). In the 1870s, shipbuilding provided a market for manufactured iron and by 1883 was 'one of the most prosperous trades in the district' (Le Guillou 1975: 85). Conditions in the industry greatly improved in the 20th century when, once again, the trade press spoke of the prospects of the district depending largely on shipbuilding (Le Guillou 1975: 85-86). In 1920 work began on the construction of a new village and dock facility at Graythorpe, which ultimately took the work away from the existing yards at West Hartlepool and Middleton (Rowe 2000).

Whitby also has a long history of shipbuilding. On both sides of the River Esk, and on staithes and mudflats from Dock End to Larpool, ships were built and launched from the 17th century onwards. Sizes varied from fishing vessels and trading sloops of 20-30 tons up to ship-rigged vessels of 500-600 tons, limited only by the width of the bridge which divided the harbour into two parts. In the 18th century a dry dock was built at Green Lane on the east side of the harbour (White 2004: 95). Probably the best known of Whitby's shipbuilders was Thomas Fishburn, who built the *Endeavour, Resolution* and

Adventure, which were acquired by the British Admiralty and used by Captain Cook on his voyages of discovery (White 2004: 92). Eventually large shipbuilding ceased altogether at Whitby because the County Council would not widen the bridge (White 2004: 89-90). Smaller shipbuilding continued until the 1980s.

Figure 22: A view of Whitby Harbour (© Dave Hooley, English Heritage)

Whitby specialised in the construction of coal vessels. Other vessels (from Whitby, or elsewhere) were timber ships, bringing back a cargo of shipbuilding timber and tar from the Baltic. As demands changed so did the ships. For example, whalers were specially strengthened for Artic conditions; privateers were armed against French and American ships; transports were built for maximum load capacity in the wars with France; and convict ships were commissioned to Australia. When steam propulsion became established paddle steamers were added to the repertoire. The shipbuilding industry also made a successful transition to iron when that replaced wood and when steel replaced iron (White 2004: 89).

In the 19th century steamships gradually replaced sailing ships for commercial shipping. This was the time of the 2nd Industrial Revolution, a time of great economic development, especially in North East England. New demands on transport were made, which were more speedily met by steam-powered vessels, especially from the 1840s when iron hulls and the screw propeller were introduced. As numbers of routes and sailings across the North Sea increased, so did the size of the ships and ports which served them. By 1914 ships had become larger, faster, more comfortable, and efficient (Pearsall 1985: 200).

In the first decade of the 20th century one quarter of the global output of the shipbuilding industry was produced on the banks of the North East region's three principal rivers: the Tyne, Wear and Tees (Hudson 1989). World War I (WWI) saw shipbuilding geared towards the building and repairing of warships and merchant vessels. Trade inevitably declined and so did the demands for shipping services and new ships. The onset of rearmament before World War II (WWII) helped to revive the industry for a while. However, shipping and shipbuilding industries were severely damaged by bombing during WWII. Many shipyards, ports and inland waterways needed extensive overhauling and merchant fleets suffered heavy losses. Reconstruction after WWII fundamentally changed the traditional economic and transport patterns of the North Sea region. The transition from steam to motor propulsion, the increasing competition and growing demands for efficiency, the specialisation and the cost reductions in North Sea trade were particularly noticeable after 1945 (Hudson 1989).

Figure 23: Wallsend Dry dock, Tyne and Wear (© English Heritage, NMR)

With a shortage of many of the essential raw materials required for shipbuilding, especially steel, very few new ships designed for North Sea trade were made in the early post-war years. Gradually the situation in the shipbuilding industry improved. Shipping of traditional North Sea cargos, such as coal, ores, fish and timber, resumed although quantitative changes took place. Transport of coal declined due to a drastic fall in production and, as a consequence, domestic and industrial use of oil and gas increased. Expansion in the iron and metal industries, however, led to an increased demand for transport of aluminum and ferro-products. The fishing industry was modernised and

made more efficient. Nevertheless, coal and timber remained the most important North Sea cargoes well into the 1950s (see Hudson 1989).

During the 1950s, competitive problems in the shipbuilding industry were becoming evident in England and it was brought under state control. As a result, shipbuilding industries in the North East contracted. Shipping became more specialised, demanding special types of ships, cargo handling, and regularity which only liners or long-term charters could offer. A tonnage limit was gradually imposed and in response to this, *Paragraph* ships, which had specified tonnages but whose loading capacities were as great as possible, were introduced in 1951 (Thowsen 1985: 247-255). This decline was further fuelled by competition from cheaper vessels built in German and Asian shipyards. Although dry-cargo ships, tankers and ferries still play a significant part in the shipping industry of the North East and few traces now remain of the shipbuilding industry that once thrived in the region (Thowsen 1985: 258).

Today, only a small number of shipyards are in operation in the region, focussing on specialised, highly skilled aspects of ship building such as the outfitting of Floating, Production, Storage and Offloading (FPSO) vessels and more recently attracting Naval contracts. There are still several small boatyards building and repairing the traditional vessels of the region as well as building new modern vessels such as leisure crafts and rigid inflatable boats (RIBs).

VALUES AND PERCEPTIONS

In the North East region, there are very few surviving features from the once thriving shipbuilding yards. Therefore, shipbuilding could be regarded as a 'lost' or 'forgotten' industry. Dockyards are still significant components of ports in the region and for many people they are reminders of past employment and glorious days in the history of the North East. In some cases, docks are adopting new roles as recreational facilities such as marinas or as coastal and maritime heritage centres (e.g. Sunderland North Dock (now a marina) and Hartlepool's Historic Quay).

RESEARCH, AMENITY AND EDUCATION

Coalmining has been a the primary focus for community history in the region, with less interest in the history and surviving remains of the region's shipyards (Petts & Gerrard 2006: 191).

There are several documentary sources referring to the shipbuilding industry in the region, with surviving historic maps, charts and photographs. Numerous publications and TV documentaries have also been produced on this industry. Depictions of boats in medieval art, with stained glass and manuscript illuminations and the Bayeux Tapestry are some examples. A critical analysis of these documentary sources, in combination with archaeological landscape studies, is needed in the region to shed new light on the history of the shipbuilding industry.

Further archaeological research into all surviving remains of shipbuilding in the North East is needed to record the surviving shipyards, and their associated industries and facilities. There is still also a surviving, but inevitably diminishing, workforce who used to be directly involved in the shipbuilding industry, and there is scope to combine research into the historic remains of shipbuilding with a programme of oral history (Petts &

Gerrard 2006: 191). Further study of the products of these shipyards would also be facilitated by researching post medieval, early modern and modern wrecks along the coast of this region (*ibid.*).

CONDITION AND FORCES FOR CHANGE

The shipbuilding industry in the region is generally characterised by limited surviving features on the landscape/seascape. The docks where ships were once built have now become marinas, attracting small sailing vessels from overseas.

RARITY AND VULNERABILITY

In terms of rarity, the shipbuilding industry in the North East region has impacted at national and international levels. The ships from the North East were integral to the international trade links of the British Empire and other globalising institutions (Petts & Gerrard 2006: 191). Besides, historically, shipbuilding was also geographically concentrated in its nature, increasingly focused on the North East of England. Because surviving elements of this industry have mostly disappeared, any surviving elements could be considered rare.

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1.2.2 Broad Character: Navigation

1.2.2.1 Character Type: Navigation Activity

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Coastal and offshore areas, especially in the south of the North East region, experience very heavy shipping pressures (>20,000 ships per annum), in particular southern shipping routes from the Humber and the eastern entrance to the English Channel (Department of Trade and Industry 2002b).

Most of Europe's largest ports are situated on North Sea coasts and rivers (e.g. Hamburg, Bremen, and Rotterdam), probably because the North Sea has been a main shipping route since medieval times (if not earlier). Approximately half of the shipping activity in the North Sea consists of ferries and roll-on/roll-off vessels on fixed routes. In the region, Tyne port forms the focus for many of these ferry routes (Department of Trade and Industry 2002b). Modern ferry routes also include Newcastle to Ijmuiden and Rosyth to Zeebrugge crossings.

Figure 24: A view of the Tyne (© Maritime Archaeology Ltd and English Heritage)

Today, some of the largest ports in England are located along the east coast of England. There are several ports in the region (e.g. Berwick, Blyth, and Sunderland). The main ones include Tees and Hartlepool, Grimsby and Immingham. These ports form the focus for many of the major shipping routes throughout the North Sea (Department of Trade and Industry 2002b). The ports of Grimsby and Immingham on the south bank of the Humber handled over 47 million tonnes of cargo in 1999. Grimsby has developed into a major vehicle-handling centre while Immingham handles dry-bulk cargoes. The latter is

also one of the largest steel-handling ports in the country (Department of Trade and Industry 2002a). The main shipping routes are plied by oil and shuttle tankers between the Teesside oil terminal and other ports in the UK and Europe (Department of Trade and Industry 2002a, b).

In North East Yorkshire, the name 'wyke', Scandinavian in origin, is a place on the shoreline where a boat can be landed and there is a way up from the beach, hence, Sandsend Wyke north of Whitby. Other landing places are also found, such as the small cuts for landing cobles at North Bay (Scarborough). Places for docking and loading ironstone are found at Saltburn.

Figure 25: A view of North Bay, Scarborough (© Dave Hooley, English Heritage)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

There is evidence for long distance seafaring in the first half of the 2nd millennium BC. Sewn-plank boats have been found in England with evidence that could indicate long-distance exchange networks during the Bronze Age (McGrail 1998, 2001). Three boat fragments have been found at North Ferriby, nearby in the intertidal Humber, and more recently a single boat-fragment has been recovered from Kilnsea on the East Yorkshire coast. A possible plank boat was found in 1969 in the submerged forest of Hartlepool (Van De Noort 2006: 267). In the region, a log boat of possible prehistoric date was found around the 1850s during the construction of the railway at Yarm (NMR: 874047).

A possible prehistoric dugout canoe was also found in the 19th century in Middlesbrough (NMR: 874059). These finds are material expressions of the use of that past landscape/seascape and its maritime history.

The North East region was traversed by vessels during the Iron Age and Romano-British periods. A number of Roman signal stations along the North East coast demonstrate the importance of navigation and communication during this time as well as finds related to trade and exchange such as imported luxury Roman items and exported items such as Jet (see Tees Archaeology 2004).

Between the 5th and 9th centuries, the North Sea history developed through invasions, immigration and mostly trade (e.g. documentary sources record Frisian merchants in York in the 8th century). The withdrawal of Roman control from England left a disorganised administration and defence which was quickly exploited by the Germanic people (the Jutes, Angles and Saxons) and later the Scandinavians and traders from the Baltic and Mediterranean. During the main Anglo-Saxon immigration, the ships used were probably the clinker-built type propelled by oars. However, there is scarce evidence about the size or the carrying capacity of these ships. Although it is difficult to accurately identify the most favoured sea-routes, it is likely that coastal routes with the shortest possible open-sea crossings were the most frequently used (Clarke 1985).

Viking presence is found in the region, in particular in the city of York. The Vikings invaded York in the 9th century and the city became known as *Jorvik*. The invasion of York probably allowed the Vikings easier access to the North Sea shipping routes which, from the 11th century, involved great distances. The Northern route ran from west Norway between Bergen and Stavanger to the Shetlands and thence via the Western Isles and down the Irish Sea to the French Atlantic coast, or more rarely down the east coast of England to the Humber. The southern route ran from Denmark, through Limfjord and down the coast via the Frisian Islands and the Rhine delta to the Thames Estuary (Binns 1985: 50). The types of craft used by the Vikings were varied including merchantmen, warships and coasters. During the period of Viking influence, York also experienced a history of trade where different and exotic goods were exchanged in its markets (Clarke 1985).

Medieval coastal shipping and coastal trade flourished despite the threat from piracy and warfare. The only route that required long distance navigation was the Icelandic cod trade. In the 13th century, Berwick (under Scottish rule) was one of the wealthiest trading ports in Scotland. Amongst the town's exports were wool, grain and salmon, while merchants from Germany and the Low Countries set up businesses in the town in order to trade. Today, a small seaport at Tweedmouth facilitates the import and export of goods, but provides no passenger services.

England's trade with Iceland probably begun in the early 1400s and was first developed by the ports along the east coast but it was later dominated by Hull and Bristol (Friel 2003: 67).

During the later medieval period, the North East coal trade began to rapidly expand alongside the alum industry. Coal was being shipped from Newcastle from around the 1290s (if not earlier). Some of the coal was unloaded in English ports along the east and south coast. The rest of the coal was exported to Scotland, Holland, Zeeland, Flanders and France. Newcastle customs accounts of the period 1377-91 suggest that much of

the export trade was run in ships from Holland, Zealand, Flanders and the Baltic (Friel 2003: 68).

From the 11th and 12th centuries onwards, the River Tees provided an important trade route. There were at least three different main channels (Le Guillou 1975: 1). Navigation from Stockton to Yarm was possible only for small vessels (60 tons or less) (Le Guillou 1975: 2-3).

In the age of sail (16th to mid-19th century), getting a ship into or out of a harbour could be one of the most challenging parts of the voyage. In general, larger vessels would put out boats to tow them down harbour by oar, while capstans and rubbing strips on the piers were used for warping vessels out. Ships often had to enter narrow gaps between piers which could be challenging. If the tide was running across, this gap could be easily misjudged leading to accidents or even catastrophes. In the harbours, there were other obstacles such as bridges and it was common for ships to foul their rigging or topsails on these. The arrival of paddle steamers made things easier. They were independent of the wind and could tow sailing vessels in and out of a harbour in relative safety. Therefore, paddle steamers had a double function acting as tugs in the harbour and carrying parties of holiday-makers out to sea or along the coast (White 2004: 107).

In the 16th century, salt was produced in Sunderland. Coal was required to heat the salt pans, and a coal mining community began to emerge in the area. Only poor quality coal was used in salt panning; quality coal was traded via the port, which subsequently began to grow. However, the volume of exports both overseas and coastwise was retarded by competition from the Newcastle trade. During the English Civil War Parliament blockaded the River Tyne, crippling the Newcastle coal trade and allowing the Sunderland coal trade to flourish. By the end of the 17th century, the export of coal starts taking off and by the 19th century, Sunderland was a main trading port in the region. However, Sunderland was struck by the 'Indian cholera' epidemic and therefore, it was put under quarantine, and the port was blockaded. Due to the growth of the coal mining and shipbuilding industries, the Port of Sunderland was significantly expanded in the 1850s with the construction of Hudson Dock. Due to overseas competition, the coal mining and shipping industries declined after World War II, with the last shipping yard and coal mine closing at the end of the 20th century. Today, the former shipyard areas along the Wear have been transformed with a mixture of residential, commercial and leisure facilities.

Figure 26: A view of Sunderland Port, Tyne and Wear (© Maritime Archaeology Ltd and English Heritage)

Although the port of Blyth dates from the 12th century, by the 18th century, a coaling quay, a ballast quay, a pilots' watch house and a lighthouse had been built at Blyth harbour. Later in the 18th century, a breakwater and a staith with an elevated loading point were constructed. By the mid-19th century, a quarter of a million tons of coal was being shipped from Blyth. By then, the construction of a railway line, connecting Blyth to collieries at Seghill allowed the port of Blyth to rapidly expand. In the 1850s, the Blyth Harbour and Docks Board was formed. In 1858 the Harbour Act was passed allowing dredging of the harbour to begin. The formation of the Blyth Harbour Commission led to the building of new coal loading staiths, as well as the construction of the South Harbour.

Figure 27: A wrecked coal barge in the North Blyth (Northumberland) illustrating the sea transport for the coal industry (©English Heritage, NMR)

Throughout the 18th century, Whitby grew steadily since, at high tide, it possessed one of the best harbours of refuge on the east coast. Even in the 1690s, it was said that at Whitby up to one hundred vessels were known to have entered on one tide alone and that it could hold '500 sail of ships'. In the 1840s, around 600 ships passed Whitby in one day (White 2004: 103).

By the mid 19th century, the trade of the North East, especially Tees, began to reflect more closely the characteristics and trends of the industries on its banks. The exports of coal tended to fall after 1850, whilst iron and, later, steel increased rapidly. Scotland remained Teesside's best customer, whilst the leading foreign markets were France, Italy, Belgium, Germany, Holland, Scandinavia, North America and the Far East (Le Guillou 1975: 91).

Figure 28: View of industralised coastal area in the Teesside (© Maritime Archaeology Ltd and English Heritage)

By World War I (WWI), the ports in the River Tees were handling a considerable volume of trade. Besides the shipments of pig iron and steel, other exports included coal, coke, manufactured iron and steel for railway bridges and shipbuilding machinery, and varied engines. Imports included, amongst others, foreign ores (iron, manganese and chrome), iron and steel, chemicals and chemical products, timber and various building materials. Very few English ports did not have vessels in the coasting trade with the Tees, and an extensive foreign trade was undertaken throughout most countries around the world. Considerable trade markets had grown with places as far a field as India, Japan, South America, Australia and Africa (Le Guillou 1975: 90).

During World War I, the North Sea was a particularly dangerous place for shipping due to the U-boats operating in this area. More than 100 ships were sunk with torpedoes and by mines, and at least another 80 merchant ships were also lost between the Tees and the Tyne during this time (Young 2000: 19).

Since World War II, North Sea shipping has been dominated by six principal nations - England, Denmark, Norway, Sweden, Germany and the Netherlands. Since the mid 20th century, the North Sea shipping trade has declined in terms of tonnage (Thowsen 1985). Shipping engaged in ocean transport can be divided into: a) short sea trades, and b) deep sea trades. The short sea trades of the North Sea can be considered amongst the most important and representative, serving one of the world's most densely populated and industrialised areas (Thowsen 1985).

Today, the North East region contains a number of ports which handle significant quantities of foreign and domestic traffic. In 2000, Tees and Hartlepool was the largest port in the North East region and the second largest in England. The Tees and Hartlepool port authority includes the ports of Middlesbrough, Billingham, Redcar and Hartlepool (Department of Trade and Industry 2002a, b). In general, the ships employed in North Sea shipping are closely linked with the export and import industries of the country of registration (Thowsen 1985). The main shipping routes in the region are plied by oil and shuttle tankers between the Teesside oil terminal and other ports in England as well as continental Europe. There is also movement of bulk cargoes between Tees, Hartlepool and continental Europe and the ferry routes from Tyneside to northern Europe are also major shipping routes (Department of Trade and Industry 2002a, b).

VALUES AND PERCEPTIONS

Historically, navigational activities in the North Sea have served as a means of linking different places and people. The people living along its coasts exploited the sea as a means of communication and were culturally, economically and possibly politically linked closely together (Clarke 1985).

RESEARCH, AMENITY AND EDUCATION

The 'England's Shipping' project utilised historical sources to identify historic routes and navigation activity areas followed by vessels prior to the 1730s, aiming to facilitate a fuller appreciation of maritime potential through the development of a digital atlas of historic shipping patterns (Wessex Archaeology 2003, 2004). Although documentary-led, this type of work could provide useful tools to target future fieldwork to help identify unknown or undocumented wrecks in the North Sea area.

Amenity and education potential in this Character Type could be seen as limited due to characteristics of navigation activities. However, initiatives integrating research into Information and Communication Technologies (ICT) could be a way of bringing this Character Type into schools to raise regional awareness about the England's maritime legacy and its characteristics. Furthermore, the 'England's Historic Seascape Demonstrating the Method: North East' project has aimed to raise public awareness in order to engage people with the scale of navigation and shipping activities in their local areas, providing a new perspective about offshore activities that are often unnoticed from an onshore perspective.

CONDITION AND FORCES FOR CHANGE

Today, Tees Bay is dominated by tankers and ships associated mainly with the hydrocarbon, steel and chemical industries. The restricted navigation area and harbour administration traffic the shipping in and out of the estuary.

RARITY AND VULNERABILITY

The rarity and vulnerability of this Character Type is related to people's changing activities through time which is expressed, for example, in Blyth or Sunderland navigation activities.

Wrecks provide an indication of navigation activities in the region. For example, there are numerous wrecks in the North Sea waters. There is a high concentration along the region's coast with wrecks deriving mostly from the early-modern period (1750-1900) related to coastal trade and fishing. Further offshore, they become more dispersed although clusters do occur in some areas over foul grounds and off the Dogger Bank in particular.

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1.2.2.2 Character Type: Navigation Feature

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Trade increased along the North East coast from the 19th century onwards. This part of the country saw greater volumes and larger vessels seeking access to what had been traditionally hazardous and restricted river and estuary channels. Industrialisation forced port authorities to improve and maintain navigation access by dredging, and the spoil was often dumped out to sea. Creating channels also involved the reclamation of adjacent land, sandbanks and saltmarsh, and the construction of retaining walls.

In the region, navigation channels also take the form of rock cuts. In the ironstone and alum producing areas many smaller cuts allowed vessels to dock and load their cargoes. Other cuts would have allowed landing places for the small and distinctive fishing craft of North Yorkshire known as the 'coble'.

This Character Type is found across the region, in particular, in the rivers Tweed, Tyne, Wear, and Tees. The Tees Estuary and entrances to the harbours at Hartlepool and Whitby are characterised by dredged channels/areas since dredging works provide a safe approach to these maritime active areas.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

With its proximity to coalfields, the Tyne was an important navigable route for the export of coal from the 13th century until the mid 20th century with the decline of the coal mining industry in North East England. The largest coal staithes (a structure for loading coal onto ships) were located at Dunston, Gateshead Hebburn and Tyne Dock, South Shields. The wooden staithes at Dunston were built in 1890. These staithes were preserved until 2006 when fire partially destroyed them (http://news.bbc.co.uk/1/hi/england/tyne/3222530.stm). Today (in 2009) Tyne Dock, South Shields is still involved with coal.

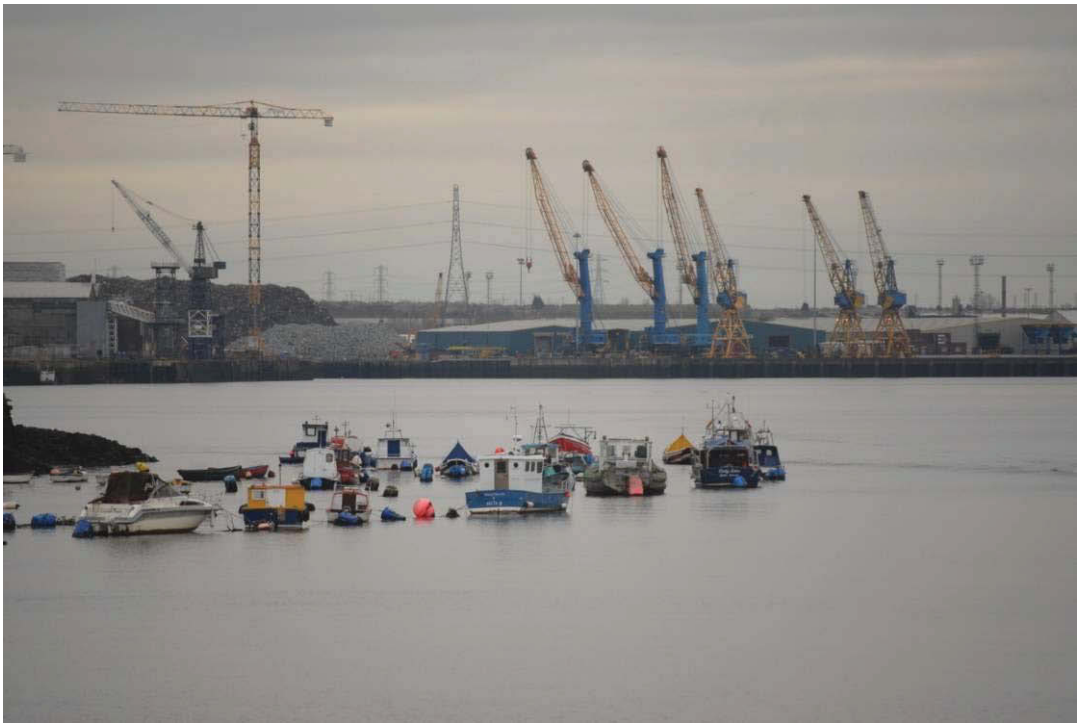

Figure 29: A view of Tyne Docks (© Maritime Archaeology Ltd and English Heritage)

In the late 19th and early 20th century, the lower reaches of the Tyne was one of the world's most important centres of shipbuilding, and there are still shipyards in South Shields and Hebburn to the south of the river. During the second half of the 19th century, the lower reaches of the river were remodelled, which involved the removal of islands and meanders to support the shipbuilding and export industries of Tyneside.

Banks of rivers such as the Tees and Esk, experienced frequent river traffic during medieval and post medieval times which brought life and busy activities to this area. Quays and wharves fronted riverside villages, with warehouses, industrial furnaces, and processing factories serving industrial and agricultural hinterlands. From at least medieval times, ferries crossed rivers linking banks such as the one at Hartlepool. A 19th century route is recorded across the Tees before the Transporter Bridge was built (Lewis 1991).

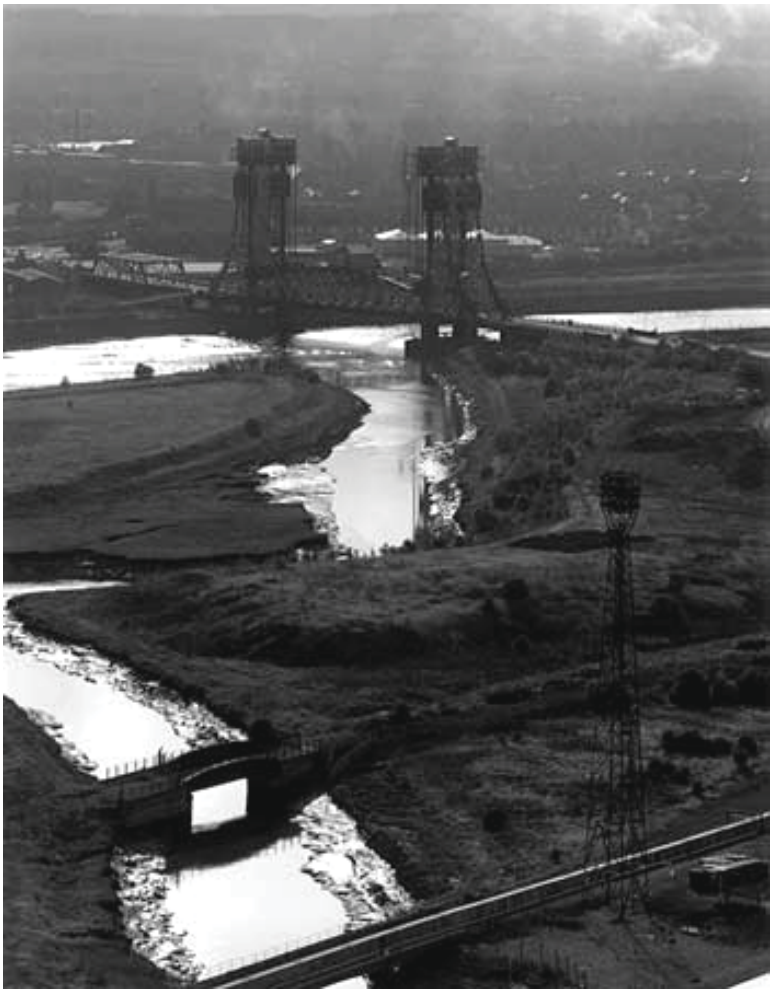

Figure 30: A view of the River Tees, Middlesbrough (© English Heritage, NMR)

The River Tees, in particular the estuary, has undergone radical dredging, realignment and maintenance. For example, between the 1760s and 1850s, the sea advanced upon the Tees Estuary and the Bar was then upwards of a mile than it had been in previous years (Le Guillou 1975: 2). In the 1800s, the Tees Navigation Company was created through an Act of Parliament. Around this time, the Company extended its dredging activities to divert the river to make it straighter with the aim of saving money and time in navigation. Two 'cuts', the Mandale and the Portrack cut, were made to straighten its course (the Portrack cut being considerably longer than the Mandale cut). Developments such as the opening of the Stockton to Darlington Railway and the gradual growth in coal shipments from the Railway Company's staithes at Stockton encouraged these dredging activities (Le Guillou 1975). Ships of only 150 tons or under could be handled at those staithes, mainly due to the number of shoals in the river (*ibid.*). Since the cuts were made, the river has continued to undergo alterations to make it deeper and more navigable. Maps prior to 1900 show that between Stockton and Middlesbrough the river flowed in a channel up to 300m wide in places, with many shoals and sandbars (see Pattenden 2001).

In the 1850s, at Whitby, constant complaints were made about the silted state of the harbour. Vessels carrying more than 60 tonnes of cargo had difficulty sailing from the port. Therefore, the harbour was dredged in the 1870s (Owen 1986).

Figure 31: A general view of Whitby looking up the River Esk (© Dave Hooley, English Heritage)

In summary, major rivers of the region have undergone extensive re-routing and today they continue to be dredged.

VALUES AND PERCEPTIONS

Navigation channels and dredged areas form an important part of working ports or harbours in the region. Dredging craft are often found moored in harbours ready for service becoming part of the landscape/seascape of the North East local coastal communities.

RESEARCH, AMENITY AND EDUCATION

The history of navigation channels and dredging is an important aspect of the history of the human past and how these navigable routes have been utilised. Many navigable channels are now lost or buried in the region, for example beneath industrial developments such as in the Tees Estuary.

Several features such as cuts, rutways, coble landings and 'wykes' exist along the North East coast and would benefit from further detailed survey and recording.

This Character Type offers limited use for amenity usually because the channels are actively worked. Nevertheless recreational watercraft, small boats and anglers use the channels in the region (e.g. such as recreational angling in the River Tyne).

The educational potential of this Character Type is considerable. For example, the River Tees in particular became an industrial port because the dredging that took place in the 19th century allowed vessels to navigate its further reaches. Dredging cleared the river and estuary for navigation allowing the focus of trade and industry to move gradually downstream, from early centres like Yarm and Stockton to Middlesbrough today.

CONDITION AND FORCES FOR CHANGE

Climate change effects are seen in the study area. For example, the Humber is now an estuary and some of this area is included in the North East region. However, during the Ice Age, when the sea level was lower than today, the Humber had a long freshwater course across the dry bed of the North Sea, providing a potential navigable route but principally a critical resource for survival: fresh water.

Dredging has impacted on the historic character of the region, in particular, dredging of the Tees and Whitby (Esk) rivers. Finds of archaeological interest have been revealed by these dredging activities. At Whitby, the historical river banks could still be preserved under subsequent structures since dredging here has not been consistent (Val Baker et al 2007).

Regarding the dumping of dredged materials which introduce contaminants to the marine environment (Department of Trade and Industry 2002a, b), for example, at Whitby, dredging is unlikely to introduce contaminants to the marine environment. As for the Tees, sediments contain industrial contaminants but these sediments can also display the chronological history of the industrial development of the upper Tees valleys since Roman times (see Val Baker et al 2007).

RARITY AND VULNERABILITY

This Character Type has a wide variety of well preserved components from the early modern period onwards in the region. In areas that are continually dredged today, the potential of prehistoric and historic remains is low due to dredging having an intrusive impact on the seabed and river banks. However, in some places, they may be remnants of historic dredging activities, such as Whitby.

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1.2.2.3 Character Type: Navigation Hazard

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Major navigation hazards have figured on the earliest Admiralty charts and are often mentioned in historic sailing directions for the North East. Early charts are less accurate than modern charts due to the survey methods used. The majority of features associated with this Character Type are typically found on or immediately adjacent to the coast, although wrecks have a wider distribution in the region.

The region is typically represented by the tempestuous nature of the North Sea with many hidden hazards. Typical offshore shoals and drying areas in the region include East Bank Ridges, Dogger Bank and Sand Hills. The East Bank Ridges and Sand Hills sandbanks are typically characterised by elongated accumulations of sandy sediment formed primarily by the action of, and subparallel to, the dominant tidal currents (BGS 2002: 24). Dogger Bank is not a sandbank but a large shoal area characterised as a relict erosional landform which was exposed as dry land approximately 18,000 years ago (BGS 2002: 24-25).

The rocky North Yorkshire coast and the Tees Estuary have been historically dangerous areas to navigate, with few places of refuge. The estuary is associated with submerged scours and inundated rocks along the foreshore and inter-tidal areas, and the shoals, sandbanks and drying areas.

Historic areas and routes of navigation faced notorious local hazards, people often being alerted to their presence by landmarks, navigation aids and by innovative life-saving institutions, such as the Longstone Lighthouse famous rescue of survivors of the *Forfarshire* shipwreck by the Lighthouse Keeper and his daughter, William and Grace Darling, in 1838.

Figure 32: A view of Farne Islands where the *Forfarshire* wreckage took place (© English Heritage, NMR)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Mariners have been faced with the tempestuous nature of the North Sea since prehistoric times. Most maritime activities in this region focused on coastal navigation, probably due to the nature of the North Sea and/or limited nautical knowledge.

With the development of urbanisation and trade through the medieval to early modern periods, the southern North Sea evolved into the busiest maritime area in the world. Therefore, in comparison with other regions in England, high numbers of vessels have

been lost in the region, including aircraft. Wrecks of considerable stature located within 10m of water have been generically categorised in the UKHO dataset as dangerous. This is because these wrecks present a greater threat to current shipping and fishing vessels than those in deeper waters. These records illustrate the historic character of the region, including shipping routes or battle areas.

There are two protected wreck sites identified in the region: the *Bonhomme Richard* and the Seaton Carew wrecks. The *Bonhomme Richard* is believed to be an 18th century American warship located in North Yorkshire (Wessex Archaeology 2003). Seaton Carew is a post medieval wreck site (possibly 18th century) located at Hartlepool in the intertidal area (http://www.english-heritage.org.uk/server/show/conWebDoc.6612).

Figure 33: Image of Seaton Carew taken in 2002 illustrating the loss of sand revealing the vessel's internal structure (© Tees Archaeology 2002)

From mid 13th century onwards, coal was being exported from the River Tyne. The early pits from which coal was exported were near the riverside so it was relatively easy to haul the coal to the banks of the river. At this time, both the Tyne and the Wear were not easily navigable for ships of any significant draught. The mouth of the Tyne was obstructed by Herd Sands and Bellehues Rock, as well as by a bar that ran across the mouth of the river. Further up river there were various shallows on which a ship might ground. In addition, the stone bridge at Newcastle prevented colliers from reaching coal deposits further up the river. The Wear was similarly difficult for ships to access. Both rivers were very shallow near the banks, which made it difficult for ships to approach for

loading. As a result of these navigation hazards, it was necessary to load the coal into shallow-draught keels and transport it downriver to where the colliers were waiting.

During the mid 18th century, coal production increased. Because of the shallowness of the Tyne, the use of coal staithes did not entirely obviate the need for keels. The amount that the staithes projected into the river was limited to avoid obstructing river traffic. Hence, the staithes ended in shallow water. As colliers were loaded their draught would deepen until often they were no longer able to continue loading from the staithes. In such circumstances, the colliers would have to move into deeper water and the loading would be completed using keels. Due to the navigation hazards of the Tyne and Wear, colliers were often arriving at the river mouth with a ballast of sand that had to be disposed of. The sand was deposited on specified areas on the Tyne riverbank provided for that purpose or by depositing the sand in the sea. The Wear had ballast keels that were used to unload the ballast from colliers and take it out to sea. The result was that the riverbed became silted up, causing even more navigational difficulties. Additionally, industry on the riverbanks often deposited its waste products in the river.

In the 1850s, the Tyne Navigation Act was passed, giving control of the river to the Tyne Improvement Commission. This body began an extensive programme of dredging to substantially deepen the riverbed. This programme was completed in 1888 so that the largest colliers could pass right up to Newcastle and beyond. This deepening of the river meant that colliers could load coal from the staithes without the need for keels to complete the work.

The Wear Improvement Bill was passed in 1717, creating the River Wear Commission. Building on the south and north piers started with the intention to improve the flow of water and prevent the river from silting up. The river was dredged in late the 1740s to improve access, but the use of keels continued undiminished until the introduction of coal staithes in 1813. In the 1830s, a new harbour was opened at Seaham, diverting much of the Durham coal away from Sunderland. In the late 1830s, a North Dock was completed at the mouth of the Wear to load colliers and in the 1850s a South Dock was completed with room for 250 vessels. These loading facilities obviated the need for keels except for at inaccessible pits far up river. On the Tyne, three large docks were also constructed for loading coal: Northumberland Dock in 1857; Tyne Dock in 1859; Albert Edward Dock in 1884.

Figure 34: Looking west along the Wear River (© Maritime Archaeology Ltd and English Heritage)

In the region, the Tees estuary and river were also particularly hazardous. In the 16th century, Trinity House had marked the approaches of the Tees with wooden buoys. Even then, it was very difficult to establish the correct deep-water channel (Le Guillou 1975). Three navigable channels are known from historic UKHO charts and it was the changing nature and locations of these channels that challenged sailors to sail this area safely. The situation was compounded by an extensive bar running from Hartlepool to Redcar out into Tees Bay. The extent of this bar varied considerably according to weather conditions. Therefore, the whole character of the Tees would change as a result of prevailing strong winds (Le Guillou 1975: 1). Before the Tees was dredged to reach the important medieval ports of Stockton and Yarm, vessels had to proceed slowly up river as there was no clear or unobstructed channel, and extensive deposits of sand and stones occurred frequently in very shallow waters (Le Guillou 1975: 3). Dredging in the 1850s resulted in a small increase in the Tees river depths, but the major obstacles were removed in the 1870s (Le Guillou 1975: 40).

Figure 35: Seaham Harbour (© English Heritage, NMR)

At Whitby, the physical obstacle was the harbour bar. With either a northerly or easterly gale, the harbour bar is still one of the most dangerous hazards on the east coast. Although nowadays the channel is dredged regularly, in the early 1900s, it was silted up (Frank 2002: 187). Sometimes, vast deposits of sand and mud impeded the channel, making it almost impossible for fishing boats to reach the quays and discharge their cargoes (Frank 2002: 36-37).

VALUES AND PERCEPTIONS

Navigation hazards have been on sailors' minds since prehistoric times and these hazards were only perceived by those who knew about them. However, the state of the tide affected whether or not those hazards were exposed or hidden. These hazards became visible in people's consciousness due to the danger associated with them. Very often, tales and myths will be associated with them, evoking old rhymes and songs.

The creation of nautical and maritime charts generally expressed and recorded the knowledge of the surveyed area but they also represented a tool for recording hazards and other dangers associated with the sea.

These hazards, in some cases, brought employment such as the keelmen working on the Tyne and Wear rivers. The second half of the 19th century was a time of rapid industrial growth on Tyneside and Wearside, so that the keelmen would be readily absorbed within other industries. They are now just a distant memory with little to remind us of them, apart from the Keelmen's Hospital that still stands in Newcastle and the well known local song, 'The Keel Row' (see Finch 1973).

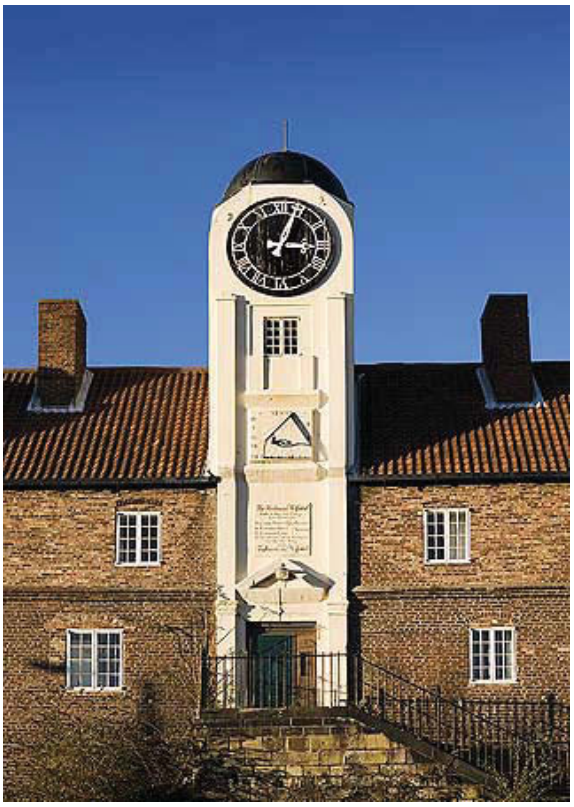

Figure 36: Keelmen's Hospital, Newcastle (© English Heritage, NMR)

RESEARCH, AMENITY AND EDUCATION

Thousands of wrecks have been recorded in the region. Wrecks are fragile and non-renewable resources serving as exceptional opportunities to discover our common past as well as important habitats for aquatic life since they act as artificial reefs for entire and unique ecosystems. In this sense, wrecks are seen as beneficial sites of increased biodiversity by marine ecologists. Therefore, further collaborative work between marine

biologists and archaeologists would be beneficial to enable a deeper understanding of species living in wreck sites, how they contribute to wreck preservation, and contextualising this information within regional sea dynamics.

Shipwrecks also attract divers, representing unique recreational tools as well as educational ones, allowing a more comprehensive understanding of the different uses and dangers of the sea. Shipwrecks could also be understood as tools linking different places and people providing unique knowledge about our past. This knowledge could be exploited as educational and recreational tools, bringing a distinctive insight to regional and national history.

CONDITION AND FORCES FOR CHANGE

Thousands of vessels have wrecked over the past centuries on the North East coastline. Their preservation will depend, amongst other factors, on the construction materials and the natural environment where they wrecked. For example, exposed wood will have a tendency to decay quicker than iron or steel. Today's prevalent marine conditions will also affect the degree of survival especially regarding the movement of sediments or scouring by currents.

Natural hazards, such as banks, shoals and rocky outcrops amongst others, are subject to natural erosional processes. However, their rate of change and extent may be influenced by human-made activities or constructions that change the marine conditions. The changing nature of sandbanks and shoals means the character of the landscape/seascape is in continuous change. This changing nature often reveals material remains that are being covered and uncovered or embedded within such bedforms. The latter will only be revealed after seismic surveys (e.g. see Gaffney et al 2007).

RARITY AND VULNERABILITY

Navigation hazards, whether natural or human-made represent a resource for characterising the time-depth of regional landscape/seascape. There may be a link between the occurrence of natural obstacles and the presence of wrecked craft, lost gear or accumulated prehistoric or historic deposits. Regional environmental conditions will also indicate whether there is potential for preservation of prehistoric or historic materials.

The vulnerability of this Character Type is that sandbanks in shallow areas near coastal settings are known to be extremely mobile and may require frequent survey in the vicinity of ports to ensure the safety of navigation (BGS 2002).

Although maritime transport has been an important form of communication since prehistoric times, most of the known wrecks from this region are of post medieval date or later (also see Petts & Gerrard 2006: 201). Inshore there are significant concentrations of wrecks on the approaches to ports and harbours and in shallow areas illustrating the hazardous nature of these areas. For example, there are numerous wrecks off the Tyne and Wear, Tees, Flamborough Head and the North Yorkshire coast and most of these derive from the early modern period (AD 1750-1900). Further offshore, no significant wreck patterns have been identified.

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1.2.2.4 Character Type: Maritime Safety

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The majority of features associated with this Character Type are typically found on or immediately adjacent to the coast. Historically, this region is characterised by the tempestuous nature of the North Sea. For example, the rocky North Yorkshire coast and the Tees Estuary have been notoriously dangerous areas to navigate. This is due to submerged scars and inundated rocks that are strewn along the foreshore and inter-tidal areas.

Lighthouses can be found in Northumberland (e.g. Longstone Lighthouse), Tyne and Wear (e.g. Souter and St Mary's Lighthouses), Hartlepool, South Gare, Whitby and Scarborough. Most of these lighthouses have a permanent visual impact on today's landscape. They are also used as amenity resources, being open to the public. For example, the Longstone Lighthouse is famous for the daring rescue of survivors of the Forfarshire shipwreck by the Lighthouse Keeper and his daughter, William and Grace Darling, in 1838. Visitors can view Grace's tiny bedroom from where she spotted nine survivors desperately clinging to the rocks. Despite a storm, the Darlings launched the lighthouse boat and rescued the survivors, caring for them in the lighthouse until the storm subsided.

There are Royal National Lifeboat Institution (RNLI) Stations throughout the region. For example, Sunderland RNLI Lifeboat Station is considered to be the oldest operational Lifeboat Station in England. It was established in 1800 and taken over by the RNLI in 1865. The commonality of these stations is that they are equipped with lifeboats, which are specialised shore-based vessels manned by volunteers, intended for quick dispatch, launch and transit to reach a ship or individuals in trouble at sea. The endurance of these boats and the lifeboat crews is generally determined by the vessel size. In general, characteristics such as capability to withstand heavy weather, fuel capacity, navigation, and communication devices carried, range etc. will all vary with size.

Figure 37: St Mary's Lighthouse and adjacent keeper's cottages (© Maritime Archaeology Ltd and English Heritage)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The use of landmarks to guide ships safely along the coast and into ports and harbours is another common aspect of maritime safety and probably the oldest method of navigation. These can be either natural (for example, hills or prominent landscape features (e.g. Roseberry Topping)), or human-made features (for example, church spires and chapels (e.g. Rose Window at Whitby Abbey), windmills, beacons, chimneys, cooling towers, lighthouses, masts, trig stations and towers). Prehistoric monuments were probably used for this purpose such as the barrow at Snape (Suffolk) (Friel 2003).

Roman signal stations are located along the region's coast. Generally found on cliff-tops, there are possible Roman stations located at Seaham Headland or Beacon Hill (Durham). Other Roman signal stations have been found at Ravenscar, Scarborough, Filey, Huntcliff and Whitby with some visible remains still surviving in today's landscape (see Tees Archaeology 2004).

During medieval times, rudimentary lighthouses were erected in some places to aid navigation, and they were usually maintained by religious houses (e.g. Whitby Abbey's Rose Window).

Figure 38: Sunderland Lighthouse in Rocker Cliff Park. Built in 1856 and originally located on Sunderland's South Pier. The lighthouse was dismantled and re-erected in 1983 to allow harbour improvements (© Maritime Archaeology Ltd and English Heritage)

The North East coast also experienced some of the earliest developments in the institutional provision of life-saving facilities. Early coastguard stations, rocket posts and lifeboat stations are shown on the OS map editions.

Figure 39: Old lifeboat cottage (Berwick) (© Maritime Archaeology Ltd and English Heritage)

In general, lifeboats along the North East coast were manned by local fishermen because they had local knowledge and because very often members of their community were in danger. Eventually motor lifeboats were introduced. In recent years, the inshore inflatable lifeboat has become increasingly important because it can travel fast and rescue people more efficiently (White 2004: 110-12).

Figure 40: Life brigade watchhouse, South Shields (© English Heritage, NMR)

A number of lifeboat stations have been identified around England. In the region, for example, Bamburgh (Northumberland) could claim to be the world's first lifeboat station, being set up in 1786. Another lifeboat station in the region is the one in River Tyne. Sunderland RNLI Lifeboat Station is considered to be the oldest operational lifeboat station in England. It was established in 1800 and taken over by the RNLI in 1865.

Pilotage, the guiding of ships into harbour by a local experienced sailor, is another feature of maritime safety from at least the medieval period and today, it still remains a vital function. For example, pilots are recorded for the Tees in 1752 (Friel 2003: 87).

In 1838, Grace Darling, whilst at Longstone Lighthouse, saw the wreck and survivors of the ship SS *Forfarshire* on Big Harcar (Farne Islands, Northumberland). Grace helped rescue nine people from the shipwreck, becoming an English Victorian heroine as a result of this celebrated maritime rescue. The recently renovated RNLI Grace Darling Museum re-opened in December 2007 in Bamburgh (Northumberland).

Figure 41: Grace Darling tomb (© Maritime Archaeology Ltd and English Heritage)

In 1848, a coble manned by seven local men was taking a pilot to a ship bound for South Shields when it capsized, with the loss of all lives aboard. Their graves can be seen in the cemetery in the grounds of Tynemouth Priory. This disaster affected the Duke of Northumberland, who owned much of the land around Cullercoats. The Duke provided funds so that the RNLI could establish a lifeboat station at Cullercoats. In 1849, a greater disaster occurred on the River Tyne, when 20 of the 24 crew of the lifeboat 'Providence' were lost, prompting the sponsoring of a competition for a new design of lifeboat which would right itself if capsized (http://www.cullercoatslifeboat.co.uk/).

Figure 42: Cullercoats Lifeboat Station and Watchhouse (© Maritime Archaeology Ltd and English Heritage)

VALUES AND PERCEPTIONS

Navigation aids out at sea, such as buoys, lights, and beacons, are perhaps less obvious to anyone who does not sail, although at night they have more visual impact on the landscape/seascape. However, those that employ sound, such as fog horns and bells, have an immediate effect alerting about the dangers ahead.

Coastguard and lifeboat stations are an integral part of the North East coast often being manned by local fishermen because they had local knowledge and because very often members of their community were in danger.

RESEARCH, AMENITY AND EDUCATION

Further research would be beneficial through archaeological fieldwork and landscape approaches to shed new light on documentary sources as well as the history and chronology of monuments and features that no longer exist in the region. This will also enable further insight into people's perceptions regarding this Character Type.

The use of landmarks and navigation aids facilitated the development of surveying techniques and the drafting of maritime charts and coast profiles. Further research into these sources would be beneficial to identify features that no longer exist, windmills in the region being an example. These features may be the only mapped record available constituting an important resource for landscape/seascape studies.

Lighthouses in the region are also used as amenity resources, being open to the public. For example, the Longstone Lighthouse is famous for the daring rescue of survivors of the Forfarshire shipwreck by the Lighthouse Keeper and his daughter, William and Grace Darling, in 1838. Visitors can view Grace's tiny bedroom from where she spotted nine survivors desperately clinging to the rocks. Despite a storm, the Darlings launched the

lighthouse boat and rescued the survivors, caring for them in the lighthouse until the storm subsided. The story of the Darlings is used as an educational case-study within schools.

CONDITION AND FORCES FOR CHANGE

In the region, questions are being raised about the relevance of lighthouses since we are currently living in a society that is using Global Positioning Systems (GPS). The use of these systems has become standard especially as far as maritime activities are concerned.

Today, in the region, Navtex (Navigational Telex) transmissions for the western North Sea area are broadcast from North Tyneside (Cullercoats).

RARITY AND VULNERABILITY

Navigation aids can be understood as linking 'the gap' between land and sea. As such, navigation aids are fundamental to understanding the present and past human-use of the sea. They are considered to be under-represented in the region. Therefore, it would be beneficial to research, document and map these features whether they are topographical, human-made or accidental. The latter in particular offer a new perspective to our understanding of maritime safety. Plotting the location and understanding the development of coastguard stations along the coast would give valuable information about the development of hazards and preventative methods for coastal trades of all types (Val Baker et al 2007).

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1.2.3 Broad Character: Port, Docks and Harbours

1.2.3.1 Character Type: Port, Docks and Harbours

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Newcastle upon Tyne's sea port developed in the 16th century and, along with the shipyards lower down the river, was amongst the world's largest shipbuilding and ship-repairing centres. These industries have since experienced severe decline and closure, and the city today is largely a business and cultural centre, with a particular reputation for nightlife.

Figure 43: Tyne shipyards, Newcastle (© English Heritage, NMR)

Port of Tyne facilities include docks, quays and ferry terminals and a car terminal. There is a dry dock still in operation at Teesside. Some ports, such as Scarborough or Whitby, have facilities particularly suitable for landing and distributing fish.

Modern ports are more compact compared to historical ports. For example, the administrative area of Newcastle extended to include the port of Whitby, which stretched from Saltburn to Peasholm. The adjacent modern port of Scarborough was historically part of the port of Hull (Val Baker et al 2007).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The accounting entities of medieval English customs ports were based around a major head port and its creeks or lesser ports where trade revenue was collected. Custom ports' administrative authorities often encompassed large areas, for example, the customs port of Newcastle stretched as far as Whitby (Friel 2003: 71). By about 1000 AD, the English government had developed a relatively complex list of harbour dues charged on merchandise reaching ports (Friel 2003; Lewis 1991).

Imposition of customs duties also gave rise to smuggling. It is believed that the term derives from either the early English word *smuckle* or the Scandinavian word *smuggla*, both of which mean 'to hide' or 'to creep' (Labistour 1996). Throughout the 18th and

early 19th centuries, this black economy flourished as a constituent part of everyday life along the North East coast. Luxury goods which attracted high rates of duty (such as spirits, silks and tobacco) found a ready market in the towns and ports in the study area. Smuggling activities were individual like the ports and harbours in which they developed. These activities were dependent on trade patterns, coastal traffic and the areas they serviced (Smith 1994: 8). Cobles, the traditional fishing boats of the Yorkshire coast, were renowned for their use in smuggling (Smith 1994: 37).

During the 2nd century, the Romans established a port on the Tyne to trade grain, wood, hides, salt, lead, wool and fish for wine, leather, cloth, tiles and metal wares imported from North Europe, Iberia and Italy. Trade in later medieval times centred on the export of wool, hides, grindstones and lead with coal increasing in importance from 1600 onwards (http://www.portoftyne.co.uk/sitepage.aspx?id=59). The growth of trade and industry, fuelled by the 1st and 2nd Industrial Revolutions and an expanding railway network, marked a growing need for improvements to the river. Protests and demands for change led to an Admiralty enquiry, culminating in the River Tyne Improvement Act being passed by Parliament in 1850. This marked the commencement of dredging numerous shoals and sandbanks between Shields and Newcastle to deepen, straighten and widen the channel for the increasing number and size of ships using the river and encouraging the establishment of many docks, quays and shipyards having a significant impact on the landscape/seascape of that area. Furthermore, the Act effectively ended Newcastle's ancient monopoly and provided for a sharing of the conservancy responsibilities of the river apportioned between Newcastle, Gateshead, Tynemouth, South Shields, and the Admiralty. After 1850, there was a rapid increase in ships using the river, particularly colliers loading coal. The Tyne has a long and distinguished tradition of handling coal, with as much as 23.6m tonnes being exported from its banks in one year alone at its peak during the mid-1800s (Wilson 2006). To provide more space to handle the increased traffic, Tyne Dock was created in 1859 and Northumberland Dock was officially opened in 1857 (http://www.portoftyne.co.uk/sitepage.aspx?id=59). During the 19th century, the Tyne was England's busiest river after the Thames (Kirkby 1980: 44). The port also handles a wide variety of cargoes other than coal. These include non-ferrous metal, grain, steel plate, aluminium, peat, timber, paper and project cargo (Wilson 2006). During the early 2000s, the port was listed as the 10th largest car terminal in Europe.

Sunderland grew as a port, trading coal and salt. Ships construction began on the river around the 14th century. By the 19th century, the port of Sunderland had grown to absorb Bishopwearmouth and Monkwearmouth.

Figure 44: North Hudson Docks, Sunderland, Tyne & Wear. The warehouses on the right were demolished in 1992 (© English Heritage, NMR)

In the 11th and 12th centuries, vessels of small draught could go to the ports of Coatham, Billingham or Portrack - 'the harbour of trading vessels' (Le Guillou 1975: 2). By the 12th century, Yarm had become the principal port of the Tees, and following the building of the bridge there in 1400, it remained the lowest crossing point for the next 400 years (Le Guillou 1975: 2-3). By the mid 17th century, however, Stockton had become the most important port of the region, surpassing Yarm and even Hartlepool. Its greater access to agricultural and industrial hinterlands gave it an advantage over other coastal ports, and its newfound importance was demonstrated by the moving of the Customs House from Hartlepool to Stockton. The principal trade at Stockton was English coasting which continued throughout the first quarter of the 18th century. It was also growing as a port for foreign trade with the Baltic and the Low Countries, and by the mid 18th century, Stockton was firmly established as the leading port of the North East region after Hull. However, the port was already beginning to feel the adverse affects of the river's shortcomings, in particular the problems of navigation. Lead mined in the Yorkshire Dales was being directed towards York and Hull and products from Lake District counties were going to Newcastle for shipment (Le Guillou 1975: 6-9). A number of smaller ports that were also used include Coatham, Dabholme, Cargo Fleet (Caldecoates), Portrack, Newport and Billingham. As many of the larger ships could not get up the river, goods were transferred to smaller ships at these ports (Val Baker et al 2007).

The port of Blyth (Northumberland) dates from the 12th century, but the development of the modern town began in the first quarter of the 18th century. The main industries which helped the town prosper were coal mining and shipbuilding, with the salt trade, fishing and the railways also playing an important role. These industries have largely vanished, but the port still thrives, shipping paper and pulp from Scandinavia for the newspaper industries of England. From mid 19th century, the port of Blyth to rapidly

expand due to industrial developments such as the railway line that was constructed, connecting Blyth to collieries at Seghill. As trade in Blyth continued to grow, so did the population. Industry in Blyth reached its peak in the first half of the 20th century. During this time, it boasted one of the largest shipbuilding yards on the North East coast, with five dry docks and four building slipways. During the World Wars I and II, the Blyth shipyards built many ships for the Royal Navy. Blyth also served as a submarine base during both wars. During the 1960s, Blyth entered a period of steep decline (Balmer & Smith 2004).

The port at Hartlepool has been important since the medieval period, when the Bishop of Durham used it to import his supplies of food and wine. The harbour silted up around the 16th century. Its importance as a port increased again by the end of the 18th century, since due to the 1st and 2nd Industrial Revolutions, the demand for coal increased. In 1833, a railway was constructed at Port Clarence, to the south of Hartlepool, enabling coal to be transported more easily to the town. A new harbour was soon built, opening in 1835, and by 1850 there were eighteen collieries shipping coal from Hartlepool. The channel into the harbour had a tendency to silt up and regular improvements such as dredging and repairs to the piers were required over the years (Rowe 2000: 10).

Figure 45: Customs Office (Hartlepool) had the duty of overseeing the collection of tax revenue at the dock (© English Heritage, NMR)

The harbour at Whitby naturally divides into an upper and a lower half. The upper harbour was used as a safer anchorage in storms, for laying up ships and for shipbuilding. The lower harbour was not as safe for mooring before the present piers were completed because of the deep swell that could enter the harbour. Nevertheless the lower harbour was satisfactory in good weather and was used by many fishing boats. In the upper harbour two large mud banks, High and Low Bell, were exposed at half ebb. However, recent changes in the harbour and the building of new wharves have rearranged the channel of the Esk and moved the mud banks around. A considerable tract of land has been recovered from the harbour over the last two centuries and buildings and car parks now cover the former Walker and Langborne Sands, where shipbuilders once worked. Even today, the harbour needs constant dredging to maintain the deep-water channel (White 2004: 46).

Figure 46: View of Whitby Harbour. Photograph taken in 1966 (© English Heritage, NMR)

The history of the harbour of Scarborough can be traced back to at least medieval times. Its history was an 'almost constant struggle to improve and maintain the quays and piers, which are vulnerable to attack by sea and to decay' (Waters 2005: 28). In the 1250s, Henry III granted Scarborough the right to construct a new port with timber and stone (*ibid*). Ships could then safely arrive and depart at both low and high water. The harbour was paid for through tolls, or quayage, imposed upon both sea-borne trade and fishing. The flourishing import and export trade at Scarborough saw groceries coming from London and coal from Newcastle, while ships from the Baltic brought timber and cloth. Wines and spirits arrived from other European ports. Some of Scarborough's chief exports included farm products and salted fish (*ibid*). Recent excavations at Scarborough have uncovered evidence of the medieval harbour area. Domestic refuse was deliberately dumped to consolidate land behind the quay. This helped support the quay wall, protecting Scarborough's early waterfront from the North Sea tides, and allowed land to be gradually reclaimed from the sea's grasp for building. Today, although Scarborough still functions as a fishing port, leisure boats moor in the area and provide

sightseeing trips for visitors and locals (Scarborough Archaeological and Historical Society 2003).

Figure 47: Scarborough old harbour, looking towards the West Pier from Vincents Pier. Fishing boats are moored around the harbour. Photo taken in 1959 (© English Heritage, NMR)

Today these ports are still important elements of the economy in England and form the focus for many of the major shipping routes of the North Sea (Lewis 1991). For example, in 2000, Tees and Hartlepool was the largest port in the North East region and the second largest in the UK (DTI 2002). Smaller ports developed serving local communities or a local landowner, institution or dignitary, Seaham Harbour (County Durham) being an example.

VALUES AND PERCEPTIONS

Dockyards are still significant components of ports in the region and for many people they are reminders of past employment and glorious days in the North East history. In some cases, docks are adopting new roles as recreational facilities such as marinas or as coastal and maritime heritage centres (e.g. Sunderland North Dock (now a marina) and Hartlepool's Historic Quay).

Several ports in the region could be perceived as recreational since they are predominantly used by pleasure boats, such as at Seahouses (which serves the Farne Islands).

The Tyne, Hartlepool and Tees are still valued as active port areas and are fundamental to the employment of many people living in the area.

Smuggling could be perceived as an exciting and romantic aspect of the history of the North East coast, with its suggestion of hidden contraband, secrecy, and suspicion.

RESEARCH, AMENITY AND EDUCATION

There has not been particularly extensive archaeological work on ports in the region. In relation to the rapidly changing nature of industry in England there has been a rapid decline in manufacturing and hence exports, which has altered the character of some ports. It is likely that much of the industrial archaeology associated with ports may have been lost and what is left should be prioritised for recording. For example, Gale (1992) mentions that museum collections have failed to keep pace with the demise of the North East shipping and port activities and, for example, large pieces of machinery, amongst others, have been scrapped without any recording or examples being retained (Gale 1992).

Although there are numerous ports and harbours from Berwick in the north to Scarborough in the south, there may have been other landing places that remained undeveloped. Therefore, further research would contribute to a more comprehensive understanding into these regional and local histories.

Further research is needed in the North East region. Knowledge of levels of investment into structures, together with their capacity and mode of use, amongst others, can inform maritime histories. These histories have great potential for educational and outreach activities such as visits to harbours, local history courses and foci for cross-curricular case studies in schools and in further education as well as a source of inspiration to historians and writers.

CONDITION AND FORCES FOR CHANGE

In the North East region, there are many ports that are still in use. They possess long, complex and dynamic histories that have been built up through many centuries. There are also a few that are now abandoned, serving as a reminder of some of the once thriving industries in the region. Others may survive inland from the existing wharves.

RARITY AND VULNERABILITY

In terms of rarity, ports, docks and harbours in the North East region have impacted at national and international levels. The ships from the North East were integral to the international trade links of the British Empire and other globalising institutions (Petts & Gerrard 2006: 191).

Many of the features associated with this Character Type are connected with the alum, coal, jet, ironstone, and shipbuilding industries, which are particular to this region and therefore nationally rare.

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1.2.4 Broad Character: Coastal Infrastructure

1.2.4.1 Character Type: Sea Defences

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Sea and flood defences are in place in different forms at almost all the coastal settlements and other vulnerable areas along the coast of the North East.

Between the Tweed and Tyne, sea defences are sparse but of key importance where they occur. They are sparse due to relatively stable beaches and due to extensive land-claim of the beach and the coastline (dunes) (Guthrie & Lane 2007). However, they are more common from the Wear, south and beyond the Tees, and towards the Humber where the coastal geology is more easily eroded.

One of the most significant breakwaters in the region is at Berwick (Northumberland). Berwick breakwaters are significant from historic, military and civil perspectives due to Berwick's strategic position on the English-Scottish border during centuries of war between the two nations. Some breakwaters along the North East coast are commonly used for recreational purposes (e.g. North and South Gare breakwaters at Teesmouth).

Figure 48: View of Berwick defences (© Maritime Archaeology Ltd and English Heritage)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

One of the most significant breakwaters in the region is at Berwick (Northumberland). Berwick breakwaters are significant from historic, military and civil perspectives due to Berwick's strategic position on the English-Scottish border during centuries of war between the two nations. Soldiers of the garrison were for many years billeted in local taverns and private houses, placing a heavy financial burden on the people of the town. Therefore, in the early 18th century, the building of the first purpose-built infantry barracks in England commenced, these were completed in the 1720s. Today, Berwick ramparts are known as one of the finest surviving 16th century artillery fortifications in northern Europe. Based on ideas developed in Italy, the ramparts consist of strong curtain walls and gateways, defended by projecting bastions which housed artillery. The walk around the ramparts presents outstanding views of the River Tweed, the Northumberland coast and Berwick town.

Figure 49: Berwick defences which have been often modified and re-used (© Maritime Archaeology Ltd and English Heritage)

Another significant breakwater in the region is the South Gare Breakwater, which extends outwards from Tees Mouth. This was opened in 1888 and its construction was prompted by the wrecking of over 60 ships near the mouth of the River Tees. The purpose of the breakwater was to improve and protect the navigation of the River Tees, and afford shelter and refuge to shipping of the North East coast (Le Guillou 1975: 47). A tramway was used to bring in nearly 5 million tonnes of slag from the local steelworks for its construction (*ibid*). At the opening of the South Gare a time capsule was placed inside the foundation stone and contains copies of local newspapers for that day and a scroll with the names of all the Tees Commissioners.

Although groynes are increasingly viewed as detrimental to the aesthetics of the coastline and face strong opposition in many coastal communities, the general popular opinion in this region is in favour of groynes.

Sea walls are the most traditional methods used in coastal management within the region and examples can be found today all along the coast.

Figure 50: Concrete sea defences with a view of Tynemouth Priory and Castle and Coastguard station (© Maritime Archaeology Ltd and English Heritage)

VALUES AND PERCEPTIONS

Sea and flood defences are generally seen as essential for the preservation of settlements along the North East coast. However, some local people perceive the more recent sea defences as having a detrimental effect on the picturesque character of some of the smaller fishing villages in the region.

Breakwaters are generally used for recreational purposes such as bird and seal watching as well as walking, North and South Gare breakwaters at Teesmouth being some examples. However, the fishing community and other ship and boat users will perceive them as functional places that enable them to undertake their marine related activities.

RESEARCH, AMENITY AND EDUCATION

The components of this Character Type could be further explored as tools in creating regional distinctiveness, developing wider education and raising public awareness of the region's links with the sea.

Historic assets can be affected by development works as well as by the indirect impact of the defences. In Hartlepool Bay patterns of sand movement and accumulation have changed in recent years with the growing extent of the sea defences. Therefore, there are now substantial depths of modern beach sand covering the underlying deposits of peat and clay which formerly had been exposed from time to time (Waughman 2005; 42).

Consequently, when developing future sea defences, it is important to consider aesthetics and historic character, as well as the effect they are likely to have on historic assets. Managed retreat is one favourable action which may counter the effect of sea defences on the historic environment. The benefits of managed retreat include the re-submergence of deposits which were formally periodically wet, providing an enhanced environment for preservation of fragile, organic material, and increased deposition of material on the surface of sites, providing protection against mechanical weathering (Fulford et al 1997: 192*).*

CONDITION AND FORCES FOR CHANGE

The main forces for change in the region are the continuous 'battle' with the sea, intensified by the effects of climate change impacting on flooding and coastal erosion. These impacts include sea level rise and the potential increase in intensity, severity and frequency of coastal storms, and rainfall events affecting flooding in fluvial catchments and urban surface water systems (DEFRA 2006).

Sea defence policy is also a major force for change. Modifications in such policy have produced significant alterations in the types and locations of this Character Type, particularly arising from the recognition of the need for sustainability (Val Baker et al 2007).

RARITY AND VULNERABILITY

Regional coastal defences are fairly common and their associated structures are usually not designated. The vulnerability of this Character Type could be intensified if erosion rates increase.

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1.2.5 Broad Character: Fishing and Mariculture

1.2.5.1 Character Type: Fishing

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Primary fishing methods include single demersal trawl, pair trawl, potting, dredging, hand gathering, demersal gill netting and netting for salmonids. The commercial fishing industry operates from seven principal ports and 22 minor harbours and launching sites located along the North East coast from the River Tyne to the Humber estuary (MacDonald 2008). There are several fishing ports in the region, and according to Starkey (2003) the principal ones in the North East today are: Berwick, Seahouses, Beadnell, Craster, Newbiggin, Blyth, North Shielfds, Sunderland, Hartlepool, Staithes, Whitby, Scarborough, and Bridlington. Fishing has impacted on some places as a tool for tourist attraction and recreational purposes. For example, the Tyne is now regarded as one of the most improved rivers in its water quality and this is reflected in the excellent salmon catches. After recovering from decades of pollution in its lower reaches, even the River Tees is now seeing increasing numbers of salmon and sea trout (Environment Agency 2009).

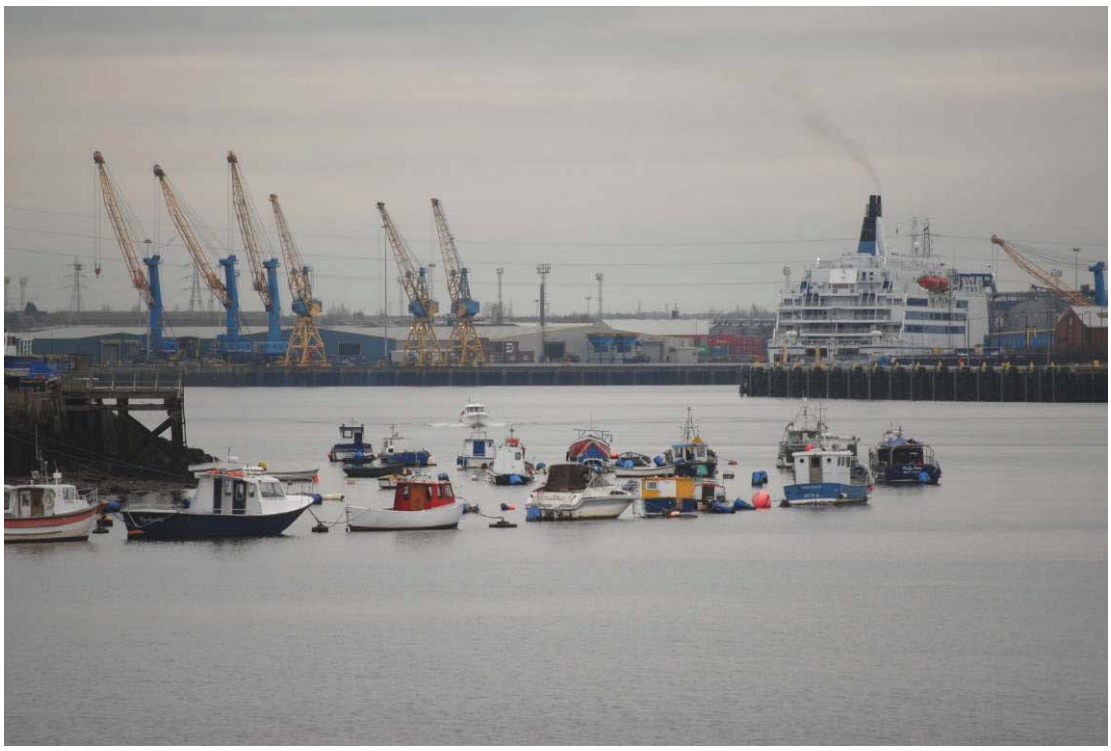

Figure 51: Fishing boats on the River Tyne (© Maritime Archaeology Ltd and English Heritage)

Figure 52: Remains of 'stell batts' associated with fisheries at Meadow Heaven (Berwick), 'stell' meaning netting station and 'batts' meaning slopes up which nets are hauled (© Maritime Archaeology Ltd and English Heritage)

Pelagic fisheries, such as herring, are generally located off the east coast and demersal fisheries, such as cod and haddock, are located at Whitby Ground and further offshore around the Dogger Bank and Farn Deeps (Starkey et al 2003: 19). Historically, fishing activities occurred in the North Sea, from at least medieval times, if not before. The early fisheries used to be inshore and were farmed by small craft. Offshore fisheries were also farmed and it was during the 19th century with the improvement of fish curing techniques that extensive and intensive fishing took place.

Today, the main North Sea demersal fisheries target a mixture of roundfish species (cod, haddock, and whiting) and flatfish species (plaice and sole). Pelagic fisheries mainly target herring and mackerel. These are predominantly for human consumption, although a proportion of the pelagic fisheries are used for fishmeal and fish oil production. There are also industrial fisheries for sprat, sandeel, and Norway pout which are used in the production of fishmeal. There are also fisheries for the crustaceans *Nephrops*, *Panadalus borealis* and brown shrimp, where trunks and pots are used as small traps and set on the sea bed in coastal waters. England, Norway, Denmark, and The Netherlands are the major North Sea fishing nations.

Scottish pair trawlers and seiners frequently base themselves in Blyth. The static gear fleet uses pots, fixed-pots and drift nets. Some of the boats work pots the entire year for brown crabs and lobsters, whilst others switch to cod netting from autumn and use tangle nets for flatfish from spring onwards (Gray 1995). In North Shields, the name of which derives from *schele* meaning 'temporary sheds or huts (used by fishermen)', the area is, even today, synonymous with fishing and other trades associated with seafaring. The static gear fleet set nets for cod and pots for brown crabs and lobsters in this area. Cod nets are used from autumn and in addition to cod, smaller amounts of whiting, pollack, saithe, ling and catfish are also landed. Several cobles (type of open fishing boat developed on the North East coast of England) set pots throughout the year and brown crabs provide the mainstay at the beginning of the season, followed by lobsters and velvet crabs (Gray 1995).

Figure 53: Fishing vessels at North Shields (© Maritime Archaeology Ltd and English Heritage)

Line and trawl fishing is now undertaken on a very small scale and most local vessels are used for potting. Shellfish farming is the only form of mariculture activity currently undertaken in the region. Today, designated bivalve production areas within the region are at Lindisfarne, and Blyth. The only mariculture operation in the region is the cultivation of Pacific oysters at Ross Links, close to Holy Island (DTI 2002).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Scarce direct evidence is known about prehistoric fishing activities in the region.

In the North East, between the 12th and 18th centuries, there were several small settlements and some industrial activity in the north part of the region. The principal industries during this period were coal mining, fishing and the salt trade. For example, Sunderland was a small fishing village from at least the 12th century. Over the centuries, Sunderland grew as a port trading coal and salt. Fishing also took place in Blyth from at least medieval times.

Figure 54: View of Sunderland port and fish quay (© Maritime Archaeology Ltd and English Heritage)

By 1300 AD England's east coast fisheries were a complex, highly regulated and widely dispersed industry. They were of international importance, supplying local demand as well as supporting a major export trade. By then, the North Sea, Norwegian coast, and Baltic were known to English fishermen. However, it is probable that inshore fishing grounds were the most frequently exploited at this time. Common practice was to land catches quickly at seasonal stations for immediate salting and barrelling. By the 15th century, the trend shifted from inshore to distant-water fishing as a result of the improved curing techniques that allowed vessels to stay at sea longer. England was integrated into a network of European trade routes stretching from the Baltic to the Mediterranean, within which fish was an important commodity (Starkey et al 2003).

In the 14th century, the main fishing centres were generally distinct from the main trading ports. For example, in the North East, Scarborough led in fishing whilst Hull (East Riding of Yorkshire) was the principal trading port. Although a wide variety of species was caught, the main fishing trade concentrated on herring, which proliferated off the east coast, and cod, which was found around Dogger Bank (Starkey et al 2003). Many foreign vessels, such as Dutch boats, also fished in the region (Starkey et al 2003; also see Sea Fish Industry Authority 1990).

Historically, longlining for white fish from cobles was the most common activity, forming the backbone of the fisherman's year. Boats often had both herring nets and long lines on board. In the summer, most Whitby boats followed the main herring fishery to East Anglia which lasted through to the end of autumn, when the winter line fishing came around (Frank 2002: 86). This basic pattern seems to have remained unchanged from 1650s to mid 19th century (for more details see Starkey et al 2003). Longlining is also

recorded off Whitby and the Farne Islands in maps such as Close's Fisherman's Chart of the North Sea 1953 held by the United Kingdom Hydrographic Office (UKHO).

In the 18th century, fleets were deployed from the Yorkshire coast, Scarborough and Staithes are some examples. These fleets were fitted out to follow the great-line fishery for cod and ling off the Dogger Bank. A proportion of the catch was then dry-salted on shore, and later sold for consumption. Exports provided a further valuable outlet. The 1830s saw the resurgence of coastal fisheries in the region (Frank 2002; Starkey et al 2003).

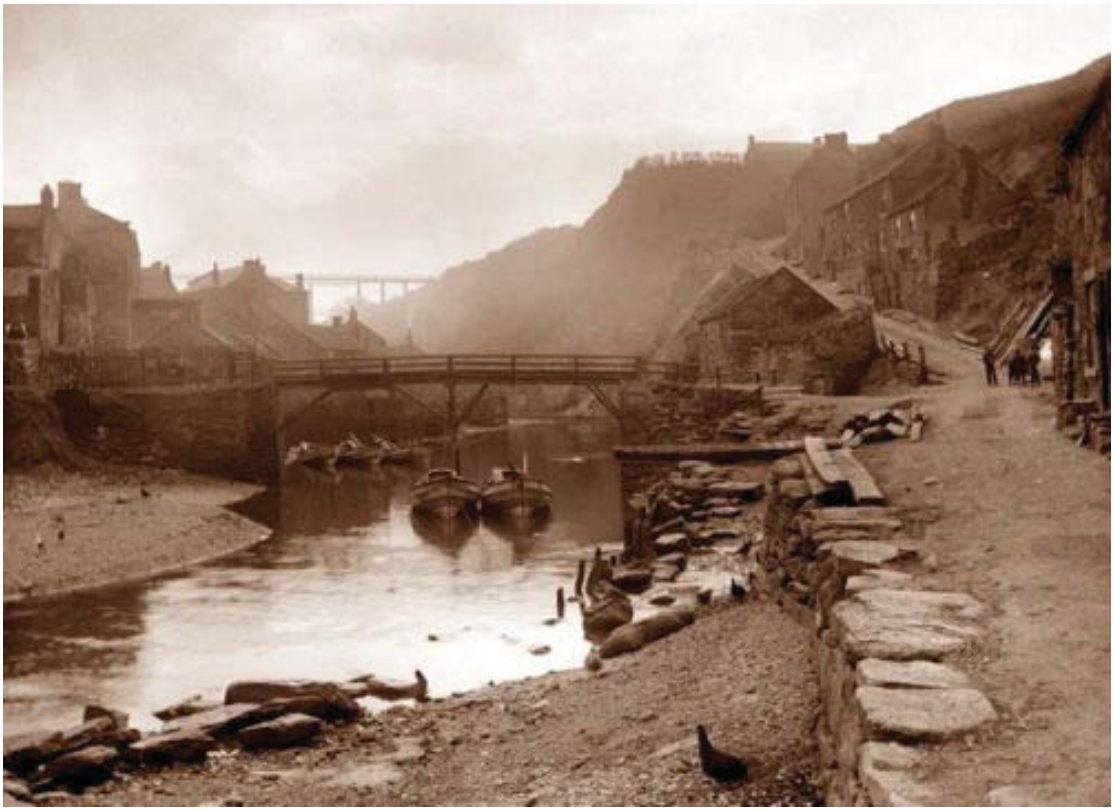

Figure 55: Fishing boats at Staithes (© www.sutcliffe-gallery.co.uk)

Between the 1750-1850s, the North East of England was one of the most important centres for whaling. From Berwick in the north to Whitby in the south, whaling ships sailed annually to the Arctic grounds in search of the Greenland whale. Their voyages sustained a shore-based processing and distribution industry of considerable value (Barrow 2001). In the mid 18th century, the *Henry and Mary* and the *Sea Nymph* sailed from Whitby to Greenland. With the increasing demand for oil for industrial use, whalebone for corsets and umbrellas, and seal skins for clothing, the number of vessels involved in whaling multiplied rapidly. By the late 18th century, Whitby had proportionately more people involved in the trade than any other place in England, including Hull (Dykes 1980).

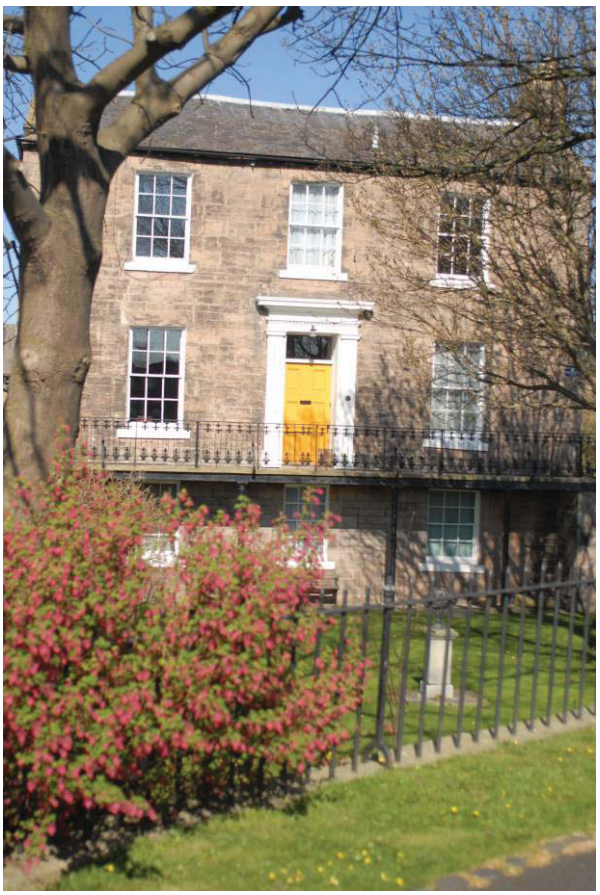

Figure 56: The Old Whaling House (Berwick) acting as a reminder of the once thriving whaling industry (© Maritime Archaeology Ltd and English Heritage)

Figure 57: A view of Whitby Headland from whales jawbone monument (© Dave Hooley, English Heritage)

In mid 18th century, trawling activities occurred mainly along the south west and south east coasts. During the mid 19th century, trawling activities rapidly expanded further north along the east coast of England, overhauling lining as the principal means of capturing white fish. This led to the rise of the new fishing ports of Hull and Grimsby. By the mid 1870s, sailing trawlers had opened up the North Sea (Frank 2002; Starkey et al 2003).

Before 1850, catching crabs and lobsters was carried out through a method called trunking, a form of fishing which had virtually died out by the 1860s (Frank 2002: 110-111). The Yorkshire coast is one of the best crabbing grounds in England. The introduction of pots around the 1850s and the expanding national market had profound economic consequences. Potting is still an important activity for Yorkshire coblemen and the crews of some of the smaller keel-boats (Frank 2002: 113-116).

The changes that transformed the offshore fishing industry between the 1840s and 1870s could be considered as revolutionary. The region's coastal ports enjoyed a considerable expansion of inshore fishing and also of increased offshore line fisheries. The two most notable areas of expansion were the herring and trawl fisheries (Starkey et al 2003). The key factor was the construction of the railway network, which radically transformed markets and distribution networks. From the 1880s, steam propulsion and other technological advances took place allowing the enhancement of fishing activities in terms of range and productivity, with trawling increasing volume and distances even further (Starkey et al 2003). One of the factors for enabling such growth was the introduction of trawling as a new method of catching fish. Trawling was destroying spawn and fry, with a consequent depletion of fish stocks; and the trawl-smacks were interfering with the gear of the inshore fishermen. Therefore, the livelihoods of traditional inshore fishing communities were being threatened. The worst affected stretch of coastline in England was that between Berwick and the Humber (Frank 2002: 21-22).

From about 1880 onwards, the fishing industry was shaping to its present day character. Around the English coastline, there were still thousands of small craft propelled by sail and oar; but in the North Sea fleets of steam-powered trawlers were operating (Frank 2002). The North East fisheries were of international importance, since fishermen supplied a commodity for local consumption as well as a commodity that, when preserved, sold very well in foreign markets (Starkey et al 2003).

During the 20th century (and possibly even earlier), bait digging, mainly for lugworms, has been taking place on the Berwickshire and North Northumberland Coast. These areas have been the subject of extensive study and legal regulation in the Lindisfarne National Nature Reserve and Boulmer Haven. Additionally, almost every accessible intertidal reef is exploited by commercial and recreational users who collect winkles, mussels and crabs by hand. Several environmental concerns have been raised in relation to this activity impacting the landscape in different ways such as impact on bird populations, damage to commercial mussel beds operated under licence, and the mobilisation of heavy metals (lead and cadmium) in the deep sediment (http://www.ukmarinesac.org.uk/activities/bait-collection/bc11.htm). As a small amount of bait digging still occurs on the foreshore at Newton Haven. The National Trust leases land and foreshore in this area and a proposal for management of this activity has been received. The National Trust will consider this in consultation with anglers and with other recreational, nature conservation and local authority representatives (http://www.ukmarinesac.org.uk/activities/bait-collection/bc11.htm).

Figure 58: Upturned boat used as fisherman's hut at Lindisfarne (© Maritime Archaeology Ltd and English Heritage)

The impact of this Character Type in the North East today can be seen in places such as Seahouses (Northumberland), which is still a working fishing port which also serves the tourist trade, being the embarkation point for visits to the Farne Islands. Another example is Craster, a small fishing village within the Northumberland Coast Area of Outstanding Natural Beauty. For many years, the village has had a herring-curing business, Craster kippers, which are well known in England. The local herrings are still smoked in a traditional manner. Whitby (North Yorkshire) still shows influence from the dynamic history of fishing in the North East, tourism and fishing being the mainstay of the town's current economy.

Figure 59: A view of Seahouses harbour (© Dave Hooley, English Heritage)

VALUES AND PERCEPTIONS

Fishing communities' livelihoods are intimately tied to the productivity of the seas. For example, today in Staithes, it is possible to see local women wearing the traditional bonnet or fishermen wearing ganseys (heavy, oiled wool jersey) with its locally distinct pattern.

There are deep cultural attachments associated with fishing, especially in Whitby, Staithes and Scarborough. Story and superstition are still prolific. Even today, some local fishermen will not set sail if, while going down to their boat, they meet a woman or someone mentions a pig!

The infrastructure associated with this Character Type can be an important part of the character of small towns and villages, attracting tourists and day trippers who congregate around seafood stalls at many of the coastal destinations of the region.

RESEARCH, AMENITY AND EDUCATION

Trawling provided one of the first indicators of the wealth of the submerged prehistoric archaeology of the North Sea. Trawling and dredging have recovered material that otherwise would have gone undetected. Initiatives like the British Marine Aggregate Producers Association (BMAPA)-English Heritage (EH) Protocol for Reporting Finds of Archaeological Interest have raised the public and professional profile of submerged archaeology and demonstrated that collaboration between industry and regulators is possible and beneficial (BMAPA & English Heritage 2005).

Research has been on-going since the mid 19th century, with a strong focus on issues such as over-exploitation of fish stocks. Research into the historical Northumberland fisheries is on-going (K. Pederesen pers. com. 2009). Further research, being undertaken by the Common Fisheries Policy (CFP), is also taking place on the current fishing industry addressing socio-economic impacts (http://ec.europa.eu/fisheries/cfp_en.htm).

From an educational perspective, issues of over-exploitation of fish stocks are contributing to raise public awareness of sustainability issues surrounding this Character Type.

Fishing is also popular from a recreational perspective. The role of the tourist industry in characterising fishing in the North East is mainly targeted to increasing the number of tourists in the region since the region offers a wide variety of excellent fishing 'against a backdrop of spectacular scenery' (Environment Agency 2009). All major rivers in the North East (e.g. the Tyne, Coquet and Wear) have good runs of salmon and sea trout. The Tyne is an improved river in terms of water quality and this is reflected in the excellent salmon catches. After recovering from decades of pollution in its lower reaches, even the River Tees has seen an increase in numbers of salmon and sea trout. Wild brown trout are found in most streams in the area and many reservoirs provide excellent sport-fishing for both brown and rainbow trout. The number of stillwaters offering excellent coarse fishing opportunities for beginners and experienced anglers alike has increased markedly in recent years. Many now offer coaching for novices as well as the chance to catch some quality specimens (Environment Agency 2009).

CONDITION AND FORCES FOR CHANGE

Modern fishing methods have greatly reduced many fish stocks putting several species at risk of extinction. For example, herring is no longer abundant in the North Sea. The massive catches during the 1940s and 1950s depleted stocks, which fell to a dangerously low level (Frank 2002: 152). It is hoped that as a result of bans and restrictions on fishing, the North Sea herring stocks will recover. However, strict

international legislation to prevent herring being decimated again should be considered (Frank 2002: 154).

The effects of fisheries in the North Sea are widespread and ecologically important, and the removal of target species impacts the whole North Sea ecosystem. There is concern about the stocks of herring, cod, haddock, whiting, saithe, plaice and sole which are close to or outside Safe Biological Limits. Safe biological limits are defined by a minimum safe stock size and a maximum exploitation rate. These are known as reference points. The stock size is measured in terms of the total weight of spawning fish each year (SSB). The exploitation rate is called the 'fishing mortality (F)' which measures the rate at which fish are removed from the stock by fishing. If the stock is either below the minimum safe SSB or above the maximum safe F, the stock is said to be outside safe biological limits (http://www.ices.dk/indexfla.asp). Catch levels for many fish stocks are almost certainly not sustainable (CEFAS 2001). The restrictions on both cod and plaice have caused the displacement of fishing activity away from traditional grounds. Further causes of decline have been pollution in rivers, and the construction of weirs and other obstructions that have denied access for spawning fish (CEFAS 2001).

Tourism has risen lately in the North East region together with diving and leisure fishing, representing a source of income and employment for this area. However, this has placed pressures from tourism on the character of historic fishing settlements. For example, the Seahouses Festival (Northumberland), an annual cultural event which began in 1999 as a small Sea Shanty festival, has grown into a more broadly based cultural celebration. Furthermore, hotels, marinas, caravan parks, and their associated roads and services, have transformed the character of historic fishing settlements in the North East.

RARITY AND VULNERABILITY

Fishing in the North East region has a long and complex history and contributes to a distinctive and important aspect in the history of fisheries in England. Traditional fishing practices such as long-lining have been declining since the introduction of trawling. This Character Type is in a period of remittance, quotas and restricted fishing grounds impacting on the scale, range and sustainability of today's industry.

The vulnerability of the historic character in the North East (e.g. historic fishing settlements fishing harbour facilities, fish markets, etc) on this Character Type is due to pressures from the tourist industry, current marine human activities as well as environmental processes.

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1.2.5.2 Character Type: Mariculture

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Today, in the North Sea, there are fisheries for the crustaceans *Nephrops*, *Panadalus borealis* and brown shrimp, where trunks and pots are used as small traps and set on the sea bed in coastal waters. England is one of the major North Sea fishing nations.

Shellfish farming is the only form of mariculture activity currently undertaken in the region. Today, designated bivalve production areas within the region are at Lindisfarne, Blyth and Humber. The only mariculture operation in the region is the cultivation of Pacific oysters at Ross Links, close to Holy Island (DTI 2002).

Figure 60: Shellfishing at Lindisfarne (© Maritime Archaeology Ltd and English Heritage)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Mariculture activities were limited in the region during historical times. Although historical fishing areas can be found across the region with an emphasis on the Tyne and Wear, exploitation of shellfish seems to be limited to the Tees area. For example, the area of Cockle Gait, near Haverton Hill, in the River Tees was farmed for cockles in the early part of the 19th century (Val Baker et al 2007).

Before 1850, catching crabs and lobsters was carried out through a method called trunking, a form of fishing which had virtually died out by the 1860s (Frank 2002: 110-111). The Yorkshire coast is one of the best crabbing grounds in England. The introduction of pots around the 1850s and the expanding national market had profound economic consequences. There was an over-fishing crisis and consequently a serious depletion of crab and lobster stocks. Potting is still an important activity for Yorkshire coblemen and the crews of some of the smaller keel-boats (Frank 2002: 113-116).

Figure 61: Gathering shellfish in the North Yorkshire coast (© www.sutcliffe-gallery.co.uk)

The preservation, storage and sale of fish at various ports and harbours in the region have been vital components of the fishing industry. Almost every coastal community in the North East salt-cured fish in the 18th century (Starkey et al 2003).

In the 15th century, North Shields had 14 fish quays and the fishermen of the port ventured as far as Iceland in boats and cobles (type of open fishing boat developed on the North East coast of England). Its name derives from Middle English *schele* meaning 'temporary sheds or huts (used by fishermen)' (Mills 1991). Still today, the area is related to fishing and other trades associated with seafaring. Clifford's Fort, located on the Fish Quay, was originally built in the 17th century as a coastal defence against the Dutch and it also played a role during the Napoleonic Wars. The site of the fort was used to build new fish processing facilities and now there are scarce remains of the original fort.

Today, there is still limited mariculture in the region. A modern shellfishing area exists along the coast from Scarborough to Cayton Bay extending offshore.

Figure 62: A view of North Shields, Fish Quay (© Maritime Archaeology Ltd and English Heritage)

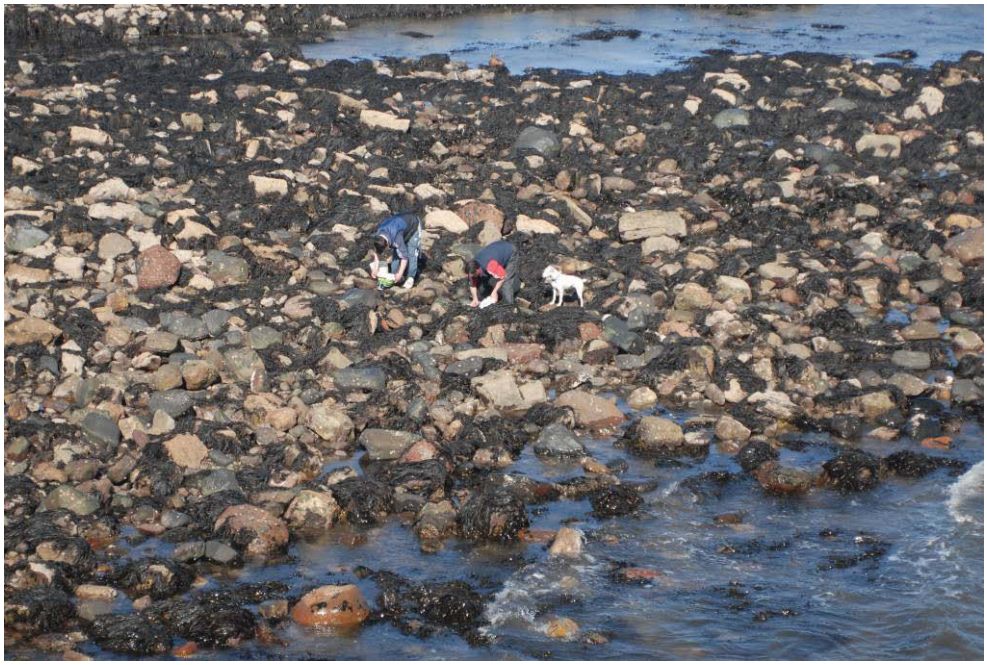

Figure 63: Gathering shellfish near Berwick (© Maritime Archaeology Ltd and English Heritage)

VALUES AND PERCEPTIONS

This Character Type can be an important part of the character of small towns and villages, attracting tourists and day trippers who congregate around seafood stalls at

many of the coastal destinations of the region.

In the region, there is still a sense of continuity within some of the fishing communities of kippering, salting and curing.

RESEARCH, AMENITY AND EDUCATION

Research has been on-going since the mid 19th century, with a strong focus on issues such as over fishing in its broader sense. Research into the historical Northumberland fisheries is on-going (K. Pederesen pers com 2009).

Further research, being undertaken by the Common Fisheries Policy (CFP), is also taking place on the current fishing industry addressing socio-economic impacts (http://ec.europa.eu/fisheries/cfp_en.htm).

From an educational perspective, issues of over-exploitation of fish stocks are contributing to raise public awareness of sustainability issues surrounding this Character Type.

Fishing and mariculture is also popular from a recreational perspective. The role of the tourist industry in characterising this Character Type in the North East has been targeted, in terms of socioeconomics, at increasing the number of tourists in the region.

CONDITION AND FORCES FOR CHANGE

The effects of fisheries and mariculture in the North Sea are widespread and ecologically important, and the removal of target species impacts the whole North Sea ecosystem. However, it has been recognised that shellfish farming is relatively environmentally benign compared to an intensive finfish farming industry that is reliant upon inputs of feed and chemicals and discharges contaminated wastes (Staniford 2002). Pollution and the effects on the North Sea fisheries is an increasing concern in today's communities.

There is also a concern that by supporting the farming of carnivorous fish species such as salmon, sea bass, sea bream, tuna, turbot, cod and halibut the net result is a negative impact on the wild fisheries and shellfish farming sectors (Staniford 2002).

RARITY AND VULNERABILITY

Fishing and mariculture in the North East region has a long and complex history and contributes to a distinctive and important aspect in the history of fisheries in England.

In the region, traditional shellfish farming methods (i.e. by hand) and/or the use of a machine similar to a large vacuum cleaner are still being used today.

This Character Type is in a period of remittance, quotas and restricted fishing grounds impacting on the scale, range and sustainability of today's industry.

The vulnerability of the historic character in the North East (e.g. historic fishing settlements, fishing harbour facilities, fish markets, etc) on this Character Type is due to pressures from the tourist industry, current marine human activities as well as environmental processes.

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1.2.6 Broad Character: Military

1.2.6.1 Character Type: Military Defences

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Military coastal defences can be found along the North East coast. However, there is a tendency to find them densely concentrated around the main ports, in particular around the Tees and Hartlepool, probably because ports were vulnerable areas for foreign attack. There are also pillboxes and tank defences throughout the region exemplified by Reighton Sands defences which were possibly re-used as civil defences, Bridlington, Ulrome and Lindisfarne tank defences.

This region is characterised by defensive military positions rising on defensive headlands and peculiar military listening devices, which are dotted on some of the region's cliff tops.

A number of other HSC Character Types have been altered by historical processes associated with extractive industries in this area. Some disused quarries have even been reused as military practice areas, Sandsend Alum Quarries being an example.

In general, military sites are found on cliff-tops including lookouts, pillboxes, batteries, radar stations, castles and forts. There are also coastguard lookouts and lighthouses. The cliffs at Scarborough are dominated by Castle Hill within which Scarborough Castle is situated, as well as a former site of a Roman signal station. Roman signal stations were also located on other cliff-tops along the North East coast. It is possible that some are located at Seaham Headland or Beacon Hill (Durham). Other Roman signal stations have been found at Filey, Ravenscar, Huntcliff and Whitby with some visible remains still surviving in today's landscape.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The North East region has a long history of violence and conflict. From the Roman period, it has been an important border zone, and its east-facing coast has been seen as a vulnerable area, open to attack from other parts of England and from across the North Sea (Petts & Gerrard 2006: 211).

Preventing attacks of a seaborne nature was very difficult within a pre-industrial context. The Romans built military lookouts (signal stations) along the North East coast, especially at Scarborough, Goldborough, Ravenscar and Huntcliff. Scarborough's military lookout was subsequently built upon and used for defensive purposes by the Saxons. Many of the sites and monuments included on the Tyne and Wear County Historic Environment Record (HER) are associated with defence and conflict. For example, the remains of a defensive structure can be found in Tyne and Wear at Washingwells, where a Roman Fort was constructed. This represents the advance of the Roman army into northern England, a move that was consolidated with the construction of Hadrian's Wall, built in the early 2nd century A.D. and occupied until the beginning of the 5th century A.D. (HER 196). In addition to its use as a military fortification, it is thought that the

gates through the wall would also have served as customs posts to allow trade taxation. The impact of Hadrian's Wall still survives on today's landscape despite the fact that large sections have been dismantled over the years and the stones used for various nearby construction projects. Four Roman forts also sit on or close to the line of the wall within Tyne and Wear, at South Shields (HER 198), Wallsend (HER 197), Newcastle (HER 204) and Benwell (HER 208).

Figure 64: Whitley Castle Roman fort, Northumberland (© English Heritage, NMR)

When the Vikings began attacking the east coast in the late 8th century, there was generally no warning until their sails appeared over the horizon. Although some beacon systems did exist to alert those living inland (chains of fire beacons set on hilltops within sight of each other), it was impossible to concentrate naval forces to intercept a fleet already in sight of the shore. However, destroying a fleet already known to be on its way was a possibility (Friel 2003: 35).

Few remains of defence and conflict survive from the early medieval period, but with the arrival of the Normans in the late 11th century, the region saw the beginning of a new phase of war and conquest. In an attempt to increase the security of the region and as a projection of the Norman king's power in the region, the Normans built motte and bailey castles on their estates. One of them is Durham Castle, originally built in the 11th century. Durham Castle represents a surviving example of the early motte and bailey castles favoured by the Normans. Today, it forms the University of Durham. Another example is the original New Castle upon Tyne, founded in 1080. The present castle keep at Newcastle is a 12th century Norman rebuild of the original earth and timber motte and bailey type structure. Tynemouth castle is also known to have been established by the late 11th century. A substantial stone-built castle in the region was also built at Scarborough around the 12th century.

Figure 65: A view of Hadrian's wall (© English Heritage, NMR)

Some common features of the medieval landscape in the North East are the magnificent group of castles. There are 12 examples within Northumberland, as opposed to 2 in Durham. In addition to these major fortifications, the newly emergent boroughs of Hartlepool, Newcastle, Alnwick and Berwick-upon-Tweed also acquired town walls. For example, Berwick's town walls are protected by ditches and strengthen by bastions and they began to be built in the mid 16th century. Hartlepool's earliest defences were the medieval town walls, from which the Sandwell Gate remains. Gun batteries to protect the shore were added in 1650, which were regularly rebuilt or replaced during the 18th century. As part of the Palmerston defence programme, the batteries were replaced by Heugh Gun Battery (1860, rebuilt 1898), Lighthouse Battery (1860), Cemetery Battery (1894) and South Gare Battery (1891), the latter on a breakwater protecting the entrance to the River Tees. They were all decommissioned by 1956 and Cemetery and Lighthouse Batteries have been completely demolished. Heugh and South Gare have been partially demolished although some structural remains still survive in today's landscape.

The early post medieval period saw the emergence of England as a nation state. Against the background of gradual change in the landscape, major conflicting events were taking place. Throughout the 16th century the Anglo-Scottish border remained an area of

conflict. During the reign of Henry VIII's daughter (Elizabeth), the construction of the Spanish Battery at Tynemouth and the extensive remodelling of the defences of Berwick-upon-Tweed took place, these being referred as one of the finest renaissance fortifications in northern Europe. In the 17th century, the warfare between these two nations eased. Evidence that times were changing is expressed by the replacement of the peel tower at Belsay (Northumberland) by a fine Jacobean house, which was then replaced in the early 19th century by a Greek rival mansion (Tolan-Smith 2008).

Figure 66: Berwick defences and town (© Maritime Archaeology Ltd and English Heritage)

The North Sea has been the site of several naval actions during the 17th and 18th centuries, being the Anglo-Dutch wars and the conflict between the Royal Navy and Dutch squadrons in 1781, the latter known as the Battle of Dogger Bank. Conflicts also occurred in the North Sea during the 20th century. For example, during the Russo-Japanese War, Russian naval ships opened fire on English fishing boats in 1904, mistaking them for Japanese torpedo boats. In WWI, the area saw the Battle of Dogger Bank (1915), a naval engagement between the Royal Navy and German ships which were intending to shell the towns of Scarborough, Whitby and Hartlepool.

A massive reorientation of defences in England occurred in the first decade of the 20th century, when the industrial centre at Hartlepool made it a key target for Germany in WWI. The first German offensive against England was mounted at Hartlepool in 1914, bombarding Hartlepool, Whitby and Scarborough (Waters 2005). Few WWI features survive probably because several sites and installations were also occupied during WWII. Boulby Barns is an expression of surviving WWI features with a 'U' shaped concrete

structure. There are remains of a trench at the front of this structure, which was built in 1916 and was designed to give early warning of approaching enemy Zeppelins, other aircraft and attacks from ships threatening the industrial complexes in the region. Besides, the Boulby Barns sound mirror was part of a chain of acoustic devices located on the North east coast extending from the Tyne to the Humber.

The stretch of water between the Humber and the Tees was a particularly dangerous place for shipping during WWI, as at least forty-two U-boats operated in the area during this time. Around 120 ships were sunk and around 80 merchant ships were also lost between the Tees and the Tyne during that conflict (Young 2000: 19).

During WWII, in order to bolster defences, earlier fortifications were reused, such as the Heugh Gun Battery at Hartlepool. In addition, large numbers of pillboxes and anti-tank obstacles were constructed. Attention was paid to defending the sandy beaches to the north and south of the River Tees. Pillboxes, barbed wire and minefields were erected, supported by a range of anti-tank obstacles, including ditches, iron rails, wooden posts and railway sleepers (Green 2006: 4).

Figure 67: Beal saltmarshes (opposite to Lindisfarne) with surviving WWII anti-tank cubes (© Dave Hooley, English Heritage)

The steelworks and the port at Teesmouth were vital during WWII for the supply of steel for war machinery. This made the South Gare a prime target for enemy attack. The site was heavily defended with barracks, gun batteries and range-finding towers. To protect other valuable industrial complexes in the region, a number of Night Bombing Decoy

sites were also constructed. The remains of some structures are still visible today such as those at the end of South Gare and near to Fishermen's Crossing. Minefields were also laid in many parts of the North Sea during WWII. The vast majority of historic minefields in the North Sea have now been cleared as a result of an extensive mine clearance effort since WWII (Green 2006).

Today, there are numerous military defences south of Bridlington. These defences are under threat since the coast is now receding (e.g. pillbox on beach at Fraisthorpe (Yorkshire)). Similar structures are being inundated by dunes at Low Newton (Northumberland). An interesting pillbox survives in good condition at St Mary's Island (Whitley Bay) (Whaley et al 2008).

A remarkable imposing feature in the North East landscape is Bamburgh Castle (Northumberland) and what remains today is a relatively recent structure. Built on a basalt outcrop, the castle was known to the native Britons as *Din Guardi* and had been the capital of the British Kingdom of Bryneich, the Anglo-Saxon kingdom established by Anglian settlers of the 6th century. This area now comprises southeastern Scotland and North East England. First written reference to the castle was made in 547. The Vikings destroyed the original fortification in the 10th century. Later, the Normans built a new castle on the site, which forms the core of the present one. This impressive English outpost was the target of occasional raids from Scotland. The castle deteriorated but was restored by various owners during the 18th and 19th centuries. It was finally bought by the Victorian industrialist William Armstrong, who completed the restoration (see http://pastscape.english-heritage.org.uk/default.aspx).

Figure 68: Bamburgh Castle (© Dave Hooley, English Heritage)

VALUES AND PERCEPTIONS

Both public and official opinion has largely turned against the idea that military defences are an open wound and inconvenience on the landscape. On the contrary, they are perceived as part of the overall historic legacy of the landscape in the North East. More specifically, in the case of WWII, they are seen as significant in terms of their place in the front line of the fight for freedom.

RESEARCH, AMENITY AND EDUCATION

Castles and other fortifications along the North East coast act as points of attraction for tourism and educational initiatives. Bamburgh Castle (Northumberland) is a clear exemplar having won a bronze award in the 2008 North East Large Visitor Attraction Awards. The Bamburgh Research Project runs a training dig for 10 weeks every summer for students to learn more about archaeological techniques and to conduct further research into the Castle.

In the region, this Character Type is commonly represented by sites which are on private property. However, a number of military sites are accessible to the public for amenity and educational purposes, Heugh Gun Battery at Hartlepool being an example. The Heugh Gun Battery is a restored 19th century coastal defence battery which is open to the public, showing the original barrack room which is now a visitors' centre, underground magazines, costal artillery and an observation tower (see http://www.heughbattery.com/).

Figure 69: Heugh Gun Battery at Hartlepool (© Maritime Archaeology Ltd and English Heritage)

Military structures, such as pillboxes, are well represented in the region. However, civilian defences are rare. To address this issue and to commemorate and celebrate the 60th anniversary of the end of WWII, Tees Archaeology in partnership with Hartlepool Arts & Museums Services and Redcar & Cleveland Museums Services, launched the 'Dig for History' Project, which was a public appeal for information on an often-overlooked archaeological aspect of WWII – the 'Home Front'.

Further local studies would be valuable, using documentary resources complemented with detailed fieldwork, which will then enable this information to be put within a broader landscape perspective. This could also be developed via a programme of oral testimony - elderly inhabitants of an area may well have many memories of the defence works and the soldiers manning them, particularly in towns and villages that were nodal points. Therefore, there is a need to collect this information before the WWII generation completely dies out (Petts & Gerrard 2006: 211).

Scarce research has been undertaken on the setting of fortified sites, the survey of the re-used earlier sites by later defences and the analysis of the impact of changing military technology on the design and location of fortifications (Petts & Gerrard 2006).

Detailed modelling of networks of signal stations and beacons for all periods is also likely to be a productive line of research, both for exploring the inter-visibility between known sites and as a predictive tool to locate gaps in the distribution of known sites (Petts & Gerrard 2006: 211), as well as enabling further landscape interpretations.

CONDITION AND FORCES FOR CHANGE

The physical evidence of this Character Type from WWI is a fast disappearing resource. Although events from this war may not have had the same impact on the region's environment as those of WWII, there are still many surviving remains, ranging from the batteries to rifle ranges and practice trenches. These features are often ephemeral, and in many cases their origins have been forgotten (Petts & Gerrard 2006: 190).

There are still remains of WWII pillboxes and gun emplacements scattered along the beaches and dune systems. Many of these remains are suffering the effects of time, erosion and vandalism. For example, the gun emplacements located in West Coatham are now visible as an area of raised ground and spread of rubble. Other recognisable WWII structures which survive today include reinforced concrete anti-tank cubes at, for example, North Gare Breakwater.

There are few historic minefields that remain uncleared in the North Sea. Although these minefields are considered safe for surface navigation, there is danger of encountering unexploded historic ordnance with regard to anchoring, demersal trawling or any form of submarine or seabed operations. This could also be the case for some minefields located along onshore areas in the region. Conventional and chemical munitions may also still be encountered both onshore and offshore. Collectively these may include buoyant mines, seabed (ground) mines, torpedoes, depth charges, bombs, missiles, artillery shells and gas cylinders. These munitions are dangerous and sensitive, particularly to shock or vibration. For example, these weapons are sometimes picked up in trawls, or

as a result of other seabed operations, particularly dredging, often in waters distant from where they were originally laid, fired, dropped or dumped (Val Baker et al 2007).

RARITY AND VULNERABILITY

The Defence of Britain Project (DOB) highlights that there are still significant examples that survive in good condition, and that it is important to preserve them for their historic and unique importance as well as for their educational potential (http://www.britarch.ac.uk/cba/projects/dob). Many defence structures that have good public access could be enhanced by appropriately positioned information boards, and incorporated into 'heritage walks', so that their place in history can be understood more comprehensively. This would also be in line with the provisions made to improve open air recreation on foot to the English coast under the Marine and Coastal Access Bill approaching its final stages in Parliament (http://www.defra.gov.uk/environment/marine/legislation/index.htm).

There is now a growing business in 'heritage tours' looking at WWII military sites. They are currently confined to places associated with the British and North American air forces, but important points of the defended landscape such as groups of pillboxes, anti-tank obstacles and coastal forts would also be valuable additions to itineraries (Foot 2000).

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1.2.6.2 Character Type: Military Facility

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The closest large-scale military base in the region is RAF Fylingdales in the North York Moors National Park. Offshore, there are several designated Military Practice and Exercise Areas (PEXAs) within the region which are in use or available for use by the Ministry of Defence (MoD) for practice and exercises. These include RAF practice areas, submarine exercise areas and firing danger areas.

The North East Aircraft Museum can be found in the region, which comprises aircraft of various types, both civilian and military.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Offshore, there are several designated Military Practice and Exercise Areas (PEXAs) within the region which are in use or available for use by the Ministry of Defence (MoD) for practice and exercises. These include RAF practice areas, submarine exercise areas and firing danger areas.

On land, the closest large-scale military base in the region is RAF Fylingdales in the North York Moors National Park. Musketry and artillery practice used to take place at designated firing ranges. Firing ranges existed at Sunderland, Thornaby, Saltholm and Scarborough Castle. Today, these practice areas tend to be located within military bases themselves.

Figure 70: RAF Fylingdales (North Yorkshire) (© English Heritage, NMR)

Barracks (military houses) were formally located at Berwick upon Tweed, Scarborough Castle and Scalby Mills. For example, Berwick Barracks were built in the 18th century and are one of the first purpose-built barracks in England. They were designed by Nicholas Hawksmoor, a famous Baroque architect. Berwick upon Tweed has always been an area of conflict between Scotland and England, and the Barracks are one of the biggest reminders of military heritage in today's landscape. The Barracks are now managed by English Heritage.

Figure 71: A view of Berwick upon Tweed Barracks (© Dave Hooley, English Heritage)

There are still remains of a Zeppelin listening post at Boulby and a radar base at Ravenscar. A WWII radar station was also located at Kettleness.

Today, South Gare Marine Club is located in a former WWII submarine base. This was a submarine mining establishment between 1887 and 1922, housing submariners who helped to defend the mouth of the River Tees by electrically-fired underwater mines.

VALUES AND PERCEPTIONS

This Character Type controls specific areas across the region dominating the landscape physically (through warning signs and security devices like fences) as well as psychologically.

From a sea perspective, the components of this Character Type may be perceived as 'not being there' due to the lack of visible features and/or boundaries.

RESEARCH, AMENITY AND EDUCATION

MoD landscape managers could inform on the history of the regional military bases. Close consultations on decommissioning these places would ensure the best possible re-use of these complexes.

Some military facilities have been converted in museums. For example, the Yorkshire Air Museum used to be the RAF Elvington airbase. Originally a grass airfield, RAF Elvington was completely rebuilt with three hardened runways in 1942, as a sub-station of RAF Pocklington. RAF Elvington closed in 1992. Much of the airfield and its buildings had been left derelict and overgrown throughout the 1980s. During this time, its potential as a memorial museum was developed with the Yorkshire Air Museum opened to the public for the first time in 1986 (http://www.yorkshireairmuseum.co.uk/).

Figure 72: RAF Elvington headquarters/fire section, viewed from the south-east (© English Heritage, NMR)

CONDITION AND FORCES FOR CHANGE

Unless re-using former military sites (e.g. Scarborough Castle), the evidence for time-depth is confined to features such as hedges and tracks captured within secure fencing.

The impact of military activity on the landscape/seascape in the region is linked to the level of use. Direct impacts are a product of construction and operations, such as the use of tracked vehicles, trench digging and explosions. These activities can cause the removal, disturbance or exposure of prehistoric and historic remains. Artillery and bombing ranges could also have a significant impact on the inter-tidal and sub-tidal zones.

RARITY AND VULNERABILITY

This Character Type contributes to landscape character disproportionately due to its scale and has considerable research and amenity potential once installations are decommissioned.

As military installations have become more centralised, they have become rarer.

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1.2.7 Broad Character: Communications

1.2.7.1 Character Type: Telecommunications

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

There are two principal submarine cables routes through the region:
1) PANGEA1 runs from the foreshore between Redcar and Marske and follow a north-easterly route to Denmark
2) UK-GER6 and TGNNEUROPE run from Filey before sweeping north into the central part of the North East region where they separate, one continues towards Denmark, and the other veers east over the Dogger Bank towards Germany.

Two redundant cables are recorded lying in Cayton Bay (North Yorkshire).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

In 1853, England was joined to the Netherlands by a cable across the North Sea, from Orford Ness to The Hague (http://en.wikipedia.org/wiki/Submarine_communication_cable).

The first submarine communications cables carried telegraphy (written communication) traffic. Later generations of cables carried first telephony (voice communication) traffic, and then data communications traffic. All modern cables use optical fibre technology to carry telephone traffic as well as Internet and private data traffic.

Figure 73: The laying of a cable in Whitby (© www.sutcliffe-gallery.co.uk)

Due to the unprecedented popularity of the internet and the development of e-commerce over the last few years, cable numbers have grown through the North Sea linking England with mainland Europe.

Overall, the submarine telecommunication cables in the region are modern impositions onto other Character Types.

VALUES AND PERCEPTIONS

The presence of submarine telecommunication cables in the marine environment is likely to be largely unnoticed. However, its importance cannot be underestimated especially for those millions of internet and phone users.

RESEARCH, AMENITY AND EDUCATION

Works undertaken during cable laying and or maintenance offer an opportunity to further investigate historic environment baseline data, therefore enabling further regional landscape/seascape characterisations. Palaeoenvironmental evidence could be unearthed during such works, uncovering deposits rich in pollen taxa and macrofossils that can further inform our knowledge of the evolution of past environments, landscape/seascape and marine transgressions.

The submarine telecommunication cables provide the means to allow internet and phone access, opening up a varied range of educational and amenity tools accessible to the general public.

The need for submarine telecommunication cables and the logistics, practicalities and issues associated with their installation and maintenance provides an interesting cross-curricular educational case study.

CONDITION AND FORCES FOR CHANGE

Overall, the submarine telecommunication cables in the region are modern impositions onto other Character Types.

Offshore development impacts on the character of the landscape/seascape arising from preliminary survey work, laying and maintenance of cable, and removal of disused cables. Preparatory investigations may involve intrusive survey of the sea bed, disturbing and exposing archaeological deposits, but also providing detailed knowledge of seabed conditions. Cables are replaced fairly regularly as technology develops. Laying the cables involves burying them where they cross the foreshore and in shallow waters, potentially disturbing historic environment assets. In deeper waters, submersible ploughs running on tracks or skis and towed by surface vessels are used for trenching, laying cable, and subsequent inspections. Consequently, the use of such machinery would have significant impact on the historic character of the region (see Fulford et al 1997).

RARITY AND VULNERABILITY

The laying of telecommunications cables is likely to increase. However, the development of wireless technology will eventually lead to the redundancy of many of these cable routes.

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1.2.7.2 Character type: Transport

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The communications infrastructure in the North East region is generally driven by two broad aspects: 1) serving needs generated within the region; and 2) serving needs beyond the region, including transport passing through the region without stopping on the Anglo-Scottish road and rail routes. The locations established and routes taken are determined by complex factors including geographical (e.g. topography) and residential.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The East Coast Main Line cuts through the region with stops at Newcastle, Durham and Darlington, providing fast connections to London and Edinburgh. It was built by three railway companies, each serving their own area but with the intention of linking up to form the through route that became the East Coast Main Line. From north to south the three railway companies were:

- The North British Railway, from Edinburgh to Berwick-on-Tweed, completed in 1846,
- The North Eastern Railway from Berwick-on-Tweed to Shaftholme; the North Eastern Railway was mostly complete in 1871, and
- The Great Northern Railway from Shaftholme to Kings Cross, completed in 1850.
- In the 1860s, realising that through journeys were important parts of their business, the companies established special rolling stock on a collaborative basis, called the "East Coast Joint Stock". In 1923 the three companies were grouped into the London and North Eastern Railway (LNER). Several alterations to short sections of the original route have taken place, such as the opening of the King Edward VII Bridge (Newcastle upon Tyne) in 1906 and the Selby diversion, built to by-pass anticipated mining subsidence from the Selby coalfield and a bottleneck at Selby station. Steam locomotives were replaced by diesel traction in the early 1960s, when the purpose-built Deltic locomotive was developed by English Electric. The prototype was successful and locomotives were built to handle express traffic. They were powered by engines originally developed for fast torpedo boat purposes, and the configuration of the engines led to the Deltic name. Just after the Deltics were introduced, the first sections of the East Coast Main Line were upgraded to officially allow 100 miles per hour (160 km/h) running. In the 1950s, the line featured in the 1954 documentary short *Elizabethan Express*. Later, the 1971 British gangster film *Get Carter* features a journey from London Kings Cross to Newcastle in the opening credits.

The region is also served by the Durham Coast Line, connecting Newcastle upon Tyne with Middlesbrough via Sunderland and Hartlepool. The lines which make up the route were originally part of the North Eastern Railway. The Tyne Bridge, linking Newcastle and Gateshead, had tram lines built on it. Although these were later removed, there are still some vestiges such as redundant fixings for overhead power lines. This Bridge also carried the A1 road, although following the opening of the Tyne Tunnel in the late 1960s, the A1 was diverted. There are other iconic bridges over the Tyne such as the High Level Bridge, which is a road and railway bridge built for the York, Newcastle and Berwick Railway, having a significant visual impact on the area.

Figure 74: Photograph of Tyne Bridge in the 1950s with locomotives in the background (© English Heritage, NMR)

In the 19th century, with the development of railway steam power, expansion was rapid, leading to the extension of the original Stockton and Darlington railway in 1825. This was extended across the River Tees to Port Darlington (now Middlesbrough) in 1830. In 1836 the Whitby and Pickering Railway was constructed. Whilst later changes were made to these railway routes, they are still recognisable from Eaglescliffe across the River Tees to Middlesbrough and along the Esk Valley Line through Grosmont to Whitby. The main line of the Stockton and Darlington Railway is still operational. However, many of the ancillary lines have been abandoned and are now earthworks or have been reused as footpaths, some still with traces of sleepers and railbeds. Railways also provide access to the history of the landscape for passengers. For example, when travelling by train people can see abandoned halts and viaducts as well as early bridges such as Whitby Bridge.

Figure 75: Willington viaduct (Tyne and Wear) (© English Heritage, NMR)

In 1845, the York to Scarborough line was opened. This event caused mixed reactions from Scarborough, which was already a watering place and seaside resort with over 100 years of experience of receiving visitors drawn by health reinvigoration or pleasure reasons. However, Scarborough has continued to maintain its position as a major seaside resort throughout the railway age and into the modern era (Morfin 1991). By the late 1840s, Scarborough, which was one of the largest towns on the Yorkshire coast, had been connected to the expanding national railway systems with lines to both York and Hull (Morfin 1991).

Trams were also a popular means of public and industrial transport (Waters 2005: 11). Cliff lifts were constructed to carry passengers up the face of steep cliffs, Scarborough and Saltburn being examples (Waters 2005). They were popular with visitors who did not want to climb the alternative routes by steep steps, footpaths or roadways.

Figure 76: Saltburn Cliff Railway (© English Heritage, NMR)

In the region, the east-west valleys along the coast have presented significant obstacles to the roads which mainly run north-south and there are important fording and bridging points across the rivers. With motor traffic, roads previously rutted by horse-drawn carriages were resurfaced (Waters 2005). Roads running along medieval and earlier lines provide access to the history of the area. The integrated approaches that older roads make to medieval settlements also signify their age and underline the link between the historic and natural environments. The rapid expansion of the road network has also had a profound effect on the landscape of the 20th century (Petts & Gerrard 2006).

Figure 77: Road transport in the 1950s along a country road, Northumberland (English Heritage, NMR)

Today, the two main arterial carriageways in the region, the A1 and the A19, mirror railway trajectories with stunning views across the region's coastal landscapes. The two main airports are Newcastle Airport and Durham Tees Valley Airport. As part of the national transport planning system, the Regional Assembly is required to produce a Regional Transport Strategy to provide long term planning for transport in the region.

VALUES AND PERCEPTIONS

In the North East region, canals could generate mixed feelings. They offer an area for leisure and they also act as a reminder of the 'industrial' past. In some cases, the 'industrial heritage' is sometimes very apparent. Although several canals were identified in southern Yorkshire, outside the region, no canals were identified in Northumberland and Durham.

Cars generally travel to places where people used to walk, with regular travellers developing particular affection for the landscape/seascape views as well as accessibility, resulting in coastal caravan sites and golf courses and visitor service facilities, amongst others. Railways provide more leisurely and elevated views over the historic landscape/seascape.

Access to cars has significantly changed patterns of contemporary life, including the spread of out-of-town shopping and leisure centres, the decline of some local shops and the design of housing (Petts & Gerrard 2006: 194). Furthermore, road transport has revolutionised freight and distribution networks, with significant character impacts on ports, towns, and big-shed distribution depots in rural settings.

RESEARCH, AMENITY AND EDUCATION

Transport routes are largely facilitators for the appreciation of other parts of the historic landscape/seascape. They have considerable character impacts on the landscape/seascape, directly and indirectly through, for example, the establishment of new coastal settlements and trade. However, they also possess interesting features which are an expression of people's past activities. Bridges, viaducts, stations, roadside services and other infrastructure are also interesting elements which need to be contextualised within their regional landscape/seascape.

Research on the 19th century railway network has been undertaken in the region. However, scarce attention has been paid to 20th century railways, particularly for the period following the end of steam power. Furthermore, impacts on the seascape of new coastal roads are still awaiting assessment. The recording of related infrastructure of these transport routes, for example, bus shelters, petrol stations and road signage should also be taken in consideration. In general, it is only the earliest examples of such remains that have been researched or protected (Petts & Gerrard 2006: 189).

Consequently, this Character Type could be further explored through the way it takes people across the wider historic landscape/seascape (e.g. canal, railway and road features). In addition, the disused canals and railway lines offer routes for public access and enjoyment.

CONDITION AND FORCES FOR CHANGE

Railways are an important aspect of the more recent heritage in this area. However, an on-going reduction in the extent of the network and the removal of trackside infrastructure occurred during the 20th century (Petts & Gerrard 2006).

Scarce attention has been paid to the long-term continuities of this Character Type in the North East region. However, the basic network of roads appears to illustrate significant levels of consistency over history (Petts & Gerrard 2006).

Roads are regularly upgraded and early features are often removed or disturbed, with a resulting change in medieval, post medieval and modern landscapes along the Northumberland, Durham and North Yorkshire coasts.

Construction of transport routes at or near the coast frequently involves major engineering projects (e.g. Port of Seaham (Durham); Marine Drive (Scarborough)) since coastal areas are generally unstable environments. New transport routes are needed because of several factors: increased traffic to the coast, changing configuration of the coastline, rising sea-levels, or coastal defence initiatives, amongst others. The direct impact of these projects on the landscape/seascape needs to be assessed according to UK Government standards (e.g. Environmental Impact Assessments). Construction may also have indirect effects as a result of alterations to existing patterns of drainage, water

flow in rivers, or tidal currents, thus creating the possibility of removal or exposure of sites through erosion (Fulford et al 1997).

RARITY AND VULNERABILITY

The Stockton and Darlington Railway was the world's first operational steam railway. However, the ordinary nature of some of the surviving communication resources together with constant redevelopment means that this infrastructure is increasingly threatened.

The routes and relationships between prehistoric communications, Roman and later roads is poorly understood in the region, which could be vulnerable due to coastal developments (Petts & Gerrard 2006).

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1.2.8 Broad Character: Palaeolandscape

1.2.8.1 Character Type: Palaeolandscape

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

There is evidence for human activity across England and mainland Europe from 700,000 BP. There is potential for prehistoric material deposits in sediments on the continental shelf for all glacial periods. For example, there is low probability that submerged prehistoric remains *circa* 12,000 years ago, Palaeolithic, Mesolithic and Neolithic, could occur in the northern part of the North East region (Flemming 2004b). The existence and possible survival of prehistoric deposits is complicated by the rapid and continuing uplift of the east coast of Scotland and the immediately adjacent shelf in the Moray Firth, the fact that ice sheet covered part of the seabed obliterating most artefacts earlier than about 20,000 BP, and that the seabed towards the median line has subsided, and was associated with extensive sea-water lakes and floating sea ice during the glacial maximum (Flemming 2004b: 1). The combination of post-glacial sea level rise, which finished *circa* 5,000 years ago, and the continuing subsidence of the outer shelf, with uplift of the mainland, creates a complex sequence at coastal areas, some of which may have been dry land over 5,000 years ago, then covered by the rising sea, and now uplifted again relative to a constant sea level. Known submerged prehistoric deposits have been found in Orkney, Shetland, Viking Bank, the Yorkshire coast, and Denmark, demonstrating that prehistoric submerged landscapes from at least 5-10,000 BP can survive marine transgression. The strong current conditions in the northern part of the region, the exposure to North Atlantic storms, the thin sediment cover in several areas, and the large areas of exposed bedrock, make the exposed areas of the continental shelf statistically poor prospects for the survival of prehistoric deposits *in situ*, other than in submerged caves and gullies (Flemming 2004b).

Material not much older than 100,000 years is likely to have survived the Wolstonian glaciation (*circa* 330,000-135,000 BP) in the central and southern North Sea (Flemming 2002). Most sands and gravels in the area are likely to be late Devensian (18,000-10,000 BP), deposited after the melting of the ice sheets. During this period, sea level was lower than today and most of the North Sea was dry land (Coles 1998). This landscape, now submerged, is often known as 'Doggerland', referring to a time when England was still connected to the rest of the European Continent (*circa* 9,000-6,400BC) (Coles 1998). The North Sea Basin was extensively populated by humans and, at specific periods, may well have been a core habitat at a European level (Coles 1998; Flemming 2004c; Gaffney et al 2007). This region therefore contains one of the most extensive and presumably best preserved prehistoric landscapes in Europe (Fitch et al 2007; Gaffney et al 2007).

There is also potential for Pleistocene flora and faunal remains across the central and southern North Sea. Early or Lower Palaeolithic potential is scarce but there is greater likelihood of Middle and Later or Upper Palaeolithic remains. Holocene deposits may hold Mesolithic archaeological potential, both *in situ* and in secondary contexts, providing baseline information to enable interpretations about the historic character of this submerged landscape. The Dogger Bank was isolated and inundated by *circa* 5,500BC, therefore its prehistoric and historic potential is mostly confined to the marine environment (Flemming 2002, 2004c; Gaffney et al 2007; Mithen 2004). Recent discoveries of hand axes reported through the BMAPA-EH Protocol for Reporting Finds of Archaeological Interest in the area have further underlined the significance of these submerged landscapes. Following Flemming (2002, 2004a, 2004b), areas of particular potential include those favourable for occurrence and preservation of submerged prehistoric sites, which include:

- 'Fossil' estuaries and river valleys.

- The flanks of submerged banks and ridges proven to have peat layers, or which are likely to have peat layers.
- Valleys, depressions, or basins with wetland or marsh deposits.
- Wetlands, estuaries, nearshore creeks, intertidal mudflats and peat deposits.
- Low gradient beaches with constructive onshore wave action.
- 'Fossil' archipelago topographies where sites were sheltered by low-lying islands as the sea level rose.
- Deposits of sediments formed within, or washed into rocky gullies and depressions.
- Cliff coasts of unconsolidated glacial drift which may contain artefacts which are eroded onto the shore (the rocky Yorkshire coasts present such potential).
- Caves and rock shelters in re-entrant bays, fossil erosional shorelines, submerged rocky shores protected by other islands.

Although a wealth of Pleistocene faunal remains have been recovered and reported by fishermen from Doggerland, little is known about their stratigraphic context or spatial patterning (see Murphy 2007).

A more likely environment for the origin and preservation of prehistoric submerged landscapes and their associated material remains would be the vast lagoon or sea basin which existed to the south of Dogger Bank from 8000-7000 years BP. In the Mesolithic period, occupation was more likely in the lower valleys. Settlements would have been in the lee or shelter of ridges and headlands, although hunting could have taken place on the higher ground. The lowland of marshes and coastal wetlands would have provided Mesolithic people with rich and varied resources (Flemming 2002). Some prehistoric remains have been identified by seismic surveys undertaken in an in-filled river valley at a depth of 45-50m in the eastern part of Dogger Bank (see Fischer 2004).

The area close to the Yorkshire coast was subjected to ice erosion during the Devensian period. Although there are few thick sediment layers which might contain archaeological materials, a submerged forest is known south of Hartlepool. Early Mesolithic worked flints have been excavated from the peat beds associated with this forest. The famous Mesolithic site of Star Carr lies in North Yorkshire, five miles south of Scarborough (Clark 2009). Consequently, further potential of prehistoric deposits is likely along this coast to and within the Tees Estuary and further south along the Humber area (for example, see Sheppard 1898).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The North Sea area was transformed during the Holocene period, after the last Ice Age. However, few changes occurred in the North East coast of England. At the beginning of the Holocene, the North Sea coastline ran from the area of the Norwegian Trough to a western embayment, inundated before 10,000 BP, extending south to the latitude of Flamborough Head. The coastline of North East England was only a little further east of the present day coast line (Shennan et al 2000a, Shennan et al 2000b). The earliest sea-level index point from the river Tees shows the coastline of northern England very close to the present day, with tidal waters extending into the estuary (Shennan et al 2000a, Shennan et al 2000b).

The palaeogeography of 8,000 BP indicates that, during this period, the North Sea was connected to the English Channel via a narrow strait east of Norfolk and west of Texel

(now in the Netherlands). Dogger Bank became the cut off from the European mainland during high tides (Shennan et al 2000a). By 7,500 BP the coast of northern Europe ran directly from eastern England to Denmark. By 7,000 BP, Dogger Bank was only exposed at low tide and by 6,000 BP it was submerged at all stages of the tide and the western margins of the North Sea were either close to or inland of the present coastline (*ibid.*). From 5,000 BP to the present, relative sea-level increased gradually in the western North Sea south of the River Tyne, but rose above present levels to the north (Shennan et al 2000a: 311).

The Doggerland landscape represented a living space connecting England to mainland Europe (Coles 1998). The topography of the Danish archipelago could be considered comparable to the low relief of the central North Sea. It is possible to envisage the rising sea penetrating river valleys, inlets and creeks into marshes (Flemming 2004a). The variation in rate of sea-level rise, standstill and fall combined with local topography, meant that land loss probably occurred in fits and starts. These periods of minimal change may have occasionally been followed by periods of continual change, or dramatic change (*ibid.*). Therefore, the history of this area should be seen as dynamic and continuously changing.

Archaeological evidence from Denmark indicates that settlements are the most numerous type of submerged site likely to be found. This may also be the case for the English areas of the central and southern North Sea floor. The majority of Mesolithic sites on the South Scandinavian sea floor were originally located close to water – rivers, lakes, and especially the sea – often sited along the seashore itself next to places where people could exploit the resources immediately available (Flemming 2002). Some believe that once sea levels rose beyond the confines of river valleys, large areas of the landscape would have 'suddenly' flooded. Events like this would have had a dramatic impact on people's perceptions and communal memory of the landscape during the Mesolithic (Chapman & Lillie 2004: 67; Edwards 2005).

The Early Mesolithic (10,000 to 8,500BP) record from the North Sea region is essentially blank but the terrestrial record provides some insight into what might be expected within the area, such as the utilisation of a range of resources primarily focused upon animals and plants. For example, the Mesolithic site on the Northumberland coast at Howick which interestingly indicates that a wide range of terrestrial fauna was being used on this coastal site. Palaeoenvironmental data analysed from the time the Mesolithic site was occupied, has indicated that the valley contained a freshwater environment but that soon after, as sea-levels rose following the complete melting of all the glaciers from the last ice-age, the river became brackish (a mix of sea and freshwater) and so would have been unsuitable as a source of drinking water. This illustrates the changing and dynamic nature of coastal environments. Furthermore, erosion is a serious problem at Howick. The violent nature of the North Sea has led to the erosion of a large portion of the coast. This process is ongoing, and is particularly acute on the Northumberland coast. The site at Howick was, however, discovered because of this erosion, as it revealed flint in the cliff edge. There is no way of knowing how much of the coast has been lost, but it is suspected that the rocky foreshore area exposed at low-tide was probably land when the Mesolithic hut at Howick was occupied (see http://antiquity.ac.uk/projgall/waddington/waddington.html; http://www.ncl.ac.uk/howick/).

Figure 78: Howick coastline (© Dave Hooley, English Heritage)

On the contrary, there is not as yet a record for the use of marine resources for this period (Gaffney et al 2007). The Later Mesolithic (8,500 to 5,500BP) has often been interpreted as a time of economic change and increasing divergence from cultural developments in Europe (*ibid.*)

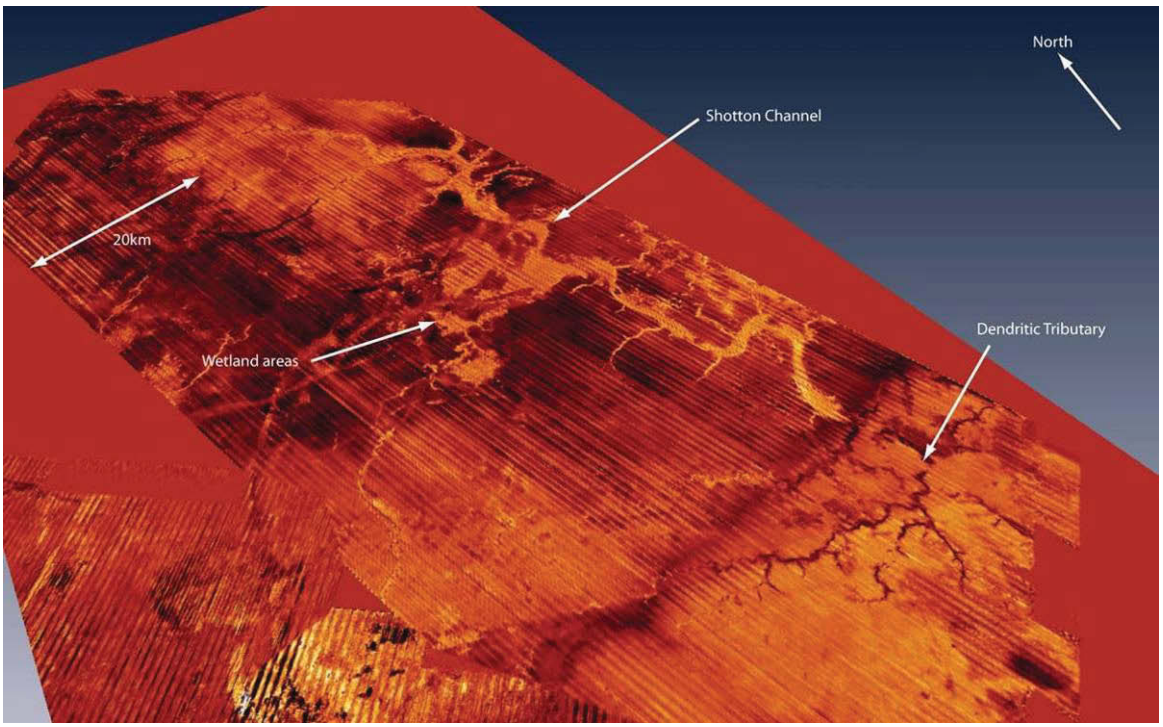

Figure 79: Image illustrating buried landscapes in the Southern North Sea (Image provided by the North Sea Palaeolandscape Project (VISTA, University of Birmingham). This project was funded by the Marine ALSF and Administered by English Heritage)

Several settlement sites have revealed organic-rich midden deposits including fragments of wickerwork, log boats, discarded tools and food remains; habitation areas with hearth remains, flint knapping workshops and graves. Votive sites from the Neolithic period (4,000BC–2,500BC) are also common phenomena in the Danish archipelago, usually found close to the present shore, and typically in protected areas such as fjords or narrow straits. The types of finds most frequently seen are late Neolithic flint daggers, flint axes, shaft-hole axes and pottery (Fischer 2004: 27-28).

The northern part of the study area has a low potential for the conservation of submerged prehistoric remains (see Flemming 2004b). This is partly because of the complexity of its late Pleistocene history, and its spatial variability. As the ice retreated any population which had been living further south on the plains of the North Sea basin could have moved northwards first to have access to the sea lake, and then along the borders of the sea lake towards the open Atlantic. This is consistent with the discovery of a flint on the Viking Bank, dating from about 11,000 BP (see Flemming 2004b). Any cultural remains based in this northern part of the study area before 9,000 BP are likely to be offshore (Flemming 2004b). The occurrence of prehistoric remains in this northern part of the region is more difficult than the central and southern North Sea. The close proximity of the Viking flint is important, as are the various pieces of circumstantial evidence from northern England, Germany and Denmark. The rich coastal prehistoric remains of Orkney and Shetland also lend credibility to the hypothesis that there could be further submerged artefacts in this northern section of the North East region (Flemming 2004b).

VALUES AND PERCEPTIONS

Today, the submerged landscape of the North Sea offers just a glance of a drowned culture that is lost and is still waiting to be discovered. This area has a high archaeological potential which will offer a window for further understanding of our past as well as a link to a period when England was part of mainland Europe. The wider public community is not generally aware of this potential.

For some people, Dogger Bank will always be associated with several naval actions. For example, in 1781, during the War of American Independence, a Royal Navy squadron fought a Dutch squadron in the Battle of Dogger Bank. During the Russo-Japanese War, Russian naval ships opened fire on English fishing boats in the Dogger Bank incident in 1904, mistaking them for Japanese torpedo boats. Later, during the First World War, the area saw the second Battle of Dogger Bank, a naval engagement between the Royal Navy and the German High Seas Fleet.

Dogger Bank may also be remembered by some people as the site of the largest earthquake ever recorded in the United Kingdom, which took place in 1931. The earthquake was felt in countries around the North Sea, causing damage across eastern England.

Recently, the central area of the North Sea has been covered by the Shipping Forecast on BBC Radio 4. The Shipping Forecast is provided by the UK Meteorological Office on behalf of the Maritime and Coastguard Agency, is broadcast four times a day and consists of reports and forecasts of weather for the seas around England. Because of its distinctiveness, the broadcasts have an appeal beyond those interested in nautical weather.

RESEARCH, AMENITY AND EDUCATION

The potential submerged palaeolandscapes of the North Sea are important for at least the following four reasons:

- The potentially rich preservation of organic materials. Peat deposits, for example on Dogger Bank, are important as they provide both an archaeological resource of palaeoenvironmental evidence and also evidence of marine transgression.
- They complement and shed new light on the settlement patterns of coastal regions, offering a wider understanding of their nature and extent, which might allow estimations of late Pleistocene and early Holocene human population size and distribution.
- They potentially represent a more varied array of subsistence, manufacturing, and ceremonial activities than the adjacent inland sites from the same regions (Fischer 2004).
- They inform our understanding of the timing, manner and direction of early post-glacial Mesolithic settlement of the present British Isles.

Following Flemming (2002), prospective sites to be considered for high resolution geophysical survey and mapping in the region should primarily include:

- Depressions, large lagoons, channels (e.g. Dogger Bank)
- Palaeo-coastlines, headlands, bays, coastal lagoons (e.g. Dogger Bank)
- Modern coastlines including caves and cliffs (e.g. Yorkshire cliffs, and other cliff coasts of Northumberland which are important erosional features with artefacts

occasionally being revealed)
- Present inter-tidal mudflats and wetlands (e.g. Tees Estuary)
- Lee of islands and archipelagos (e.g. Tees Bay and Estuary)
- Estuaries, wetlands, marshes, peat (e.g. Tees Estuary)

Sites that are buried to a sufficient depth of sediment have a greater chance of surviving *in situ*. However, this reduces the possibility of their discovery compared to exposed material. Recently exposed material may also have the advantage that the spatial relationships between artefacts are not too disturbed (Dix et al 2004: 194). If the archaeological deposit is buried under 5 to 10m of mud or sand, it will not be discovered, except in very unusual circumstances. Thus, following Flemming (2002), the final requirements for survival and discovery of this Character Type are:
- Low net modern sediment accumulation rate so that the artefacts are not buried too deeply
- No fields of sand waves or megaripples over the site
- Ideally, a slight change in oceanographic conditions so that the site is being gently eroded to expose deposits when visited by archaeologists.

Geophysical and geotechnical survey methods can be used in combination to address prehistoric deposits. Bathymetric survey, using single beam or multibeam systems, can be used to establish the basic framework for gauging the presence of prehistoric material. The height of the seabed, in conjunction with secondary sources relating to sea-level rise, sets the broad parameters for when an area of seabed might have been exposed, and therefore inhabitable (Wessex Archaeology 2007).

Recent research such as the 'North Sea Palaeolandscapes project', undertaken by Birmingham University and funded through the ALSF, has employed existing 3D seismic datasets acquired on the UK continental shelf for providing a mitigation map for the area of the Southern North Sea. The advantage of seismic data is that it can penetrate through recent sediments to the underlying bedrock geology identifying a series of superimposed original land surfaces and features such as river channels, lakes, basins and marine estuaries. The results of this project have allowed the establishment of the 3D architecture of Late Quaternary and Holocene systems. The use of 3D seismic data has provided an efficient way of generating a regional model for the Late Quaternary and Holocene. It has also provided a framework to integrate shallow borehole, environmental and shallow (high resolution) geophysical data for the purposes of geological and archaeological landscape interpretations (see Gaffney et al 2007). Studies such as this will allow better models of archaeological potential for submerged landscapes, providing a tool to assess threats and how to mitigate them.

Amenity and educational potential for this Character Type need to be explored through initiatives that encourage public awareness through dissemination programmes which focus on the commonality and uniqueness of these submerged landscapes.

CONDITION AND FORCES FOR CHANGE

In terms of mineral and natural wealth the North Sea basin is a strategic resource for England and all the countries around it. Its geographical position ensures that this extensive region also functions as a key infrastructural and communication locus (Flemming 2004c: 113-117). The area is therefore under intensive developmental pressure from a range of threats including mineral extraction, the laying of pipelines,

wind farms development, and impact of fishing and commercial trawling (Dix et al 2004). Some sources of funding and commercial site investigation and sediment coring have already provided beneficial new archaeological data, the ALSF being an example (see http://ads.ahds.ac.uk/project/alsf/).

The survival or destruction of prehistoric deposits, whether originally inland or on the coast depends on the local topography. Following Flemming (2002), factors favourable for survival include the following:

- Very low beach gradient and offshore gradient so that wave action is attenuated and is constructional.
- Minimum fetch so that wave amplitude is minimum, wavelength is short, and wave action on the seabed is minimum.
- Original deposit is embedded in peat or packed deposits to give resistance and cohesion during marine transgression. Modern marine sands, sand waves, and sand sheets cloak many of the archaeological strata, but movement of these deposits, or periodic erosion can expose sites.
- Where deposits are in cave or rock shelters; roof falls, accumulated debris, concretions and conglomerations all help to secure the archaeological strata.
- Local topography, comprising localised shelter from dominant currents, wind fetch and surf type at the time of transgression

Along the foreshores of the region, Holocene deposits are likely to be irregularly preserved and, if they are not exposed at low tide, they could potentially be present under modern sediments. Natural erosion could have also reduced the spatial extent of the sediments available for analysis (Waughman 2005). Developmental pressures along the coastline, such as port and harbour constructions and sea defences or offshore industry related structures such as hydrocarbon drillings, cables or pipelines may have an intrusive impact on the survival of such remains.

It has been argued that archaeological material exposed in the intertidal zone is often likely to have been moved by wave action and therefore is generally unlikely to survive in primary contexts (Dix et al 2004). Secondary and tertiary assemblages are likely to be more common, occurring as patches of material sorted by size and type (Dix et al 2004). However, modern eroding foreshores are areas likely to reveal this Character Type such as Hartlepool submerged forest and the submerged peat beds on Tunstall Mere (Sand-le-Mere)).

RARITY AND VULNERABILITY

Submerged Palaeolithic and Mesolithic landscapes are relatively rare in England. As such, these landscapes are regarded as of national, and even international, importance. Wherever possible, these deposits should be left undisturbed due to the fragility of peat deposits and associated faunal remains (and potential human occupation evidence such as structures).

In terms of rarity, the North Sea is an area that historically has brought people together, being the focus of interactions between several European countries.

Although not directly in the North East region, areas such as the Humber and East Anglia are severely affected by coastal erosion processes, demonstrating the

vulnerability of this Character Type along the east coast of England. These processes appear to be the most significant threat to this fragile Character Type. Furthermore, with increasing offshore aggregate extraction, oil and gas drilling and the construction of offshore wind farms, there is an urgent and growing need for further research into submerged palaeolandscapes, palaeoenvironments and palaeogeographies (Petts & Gerrard 2006).

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1.2.9 Broad Character: Semi-natural Environment

1.2.9.1 Character Type: Cliff

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

There are several stretches of sea cliffs along the North East shore, mostly formed of hard rock which extends into the sea to form subtidal rocky reefs. At several locations the cliffs have weathered to form sea caves, tunnels and arches, both in the intertidal and subtidal zone. The partly submerged sea caves in the limestone at Howick

(Northumberland) and the submerged sea caves, tunnels and arches in the volcanic rock of the Farne Islands are of international importance (English Nature 1999), and are a designated Special Area of Conservation (SAC) (see http://www.jncc.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0017072).

Cliffs can be found at Flamborough Head, where the sea has carved bays decorated with dripping caves and pillars of chalk rock. An RSPB bird reserve offers a fascinating place especially for those interested in bird-watching. Another example is Saltburn Cliffs, which offer country walks including one of the region's best vantage points to marvel at Boulby Cliffs, the highest cliffs on the east coast of England. The cliffs north and south of historic Tynemouth are also worth mentioning due to their link with the fishing and coal industries (see this Character Type: Historical Processes; Components, Features and Variability section).

Figure 80: Chalk cliffs at Flamborough Head (© Maritime Archaeology Ltd and English Heritage)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The cliffs along the North East coast are formed of sedimentary rocks of the Jurassic and Cretaceous periods. These cliffs are topped with glacial tills, sand and gravel (Jones 1977). The rocks are stratified and are composed chiefly of shales, sandstones and limestones, with some iron mineral (Beaumont 1970; Owen 1986). Coal spoil can also be found, on and around these cliffs.

Clifftops have been utilised since prehistoric times as areas of summer grazing, sources of fuel, military lookouts and navigational aids. These uses continued through the medieval and post-medieval periods and into the first decades of the 20th century.

Whin Sill is a tabular layer of igneous rock or sill in County Durham and Northumberland. This east-west running geological formation lies partly in the North Pennines Area of Outstanding Natural Beauty and partly in Northumberland National Park. Lindisfarne Castle is strategically positioned to take advantage of a high, rocky cliff line formed by the sill.

The limestone cliff formations that dominate much of the coast between Hartlepool and the River Tyne are much in evidence at Marsden to the north of Whitburn. Most notable of the limestone features is the Marsden Rock (Tyne and Wear). This was once within jumping distance of the coast, but is now an isolated limestone stack providing a natural refuge for wildfowl.

Tynemouth Priory and Castle are strategically located on a rocky headland between the Tyne River and the North Sea, overlooking Tynemouth. Tynemouth Priory has been a fortress as well as a religious site. The Priory is linked to the history of North Shields since the latter was created as a fishing port to provide fish to the Priory. The quays in North Shields were also used to ship coal from local collieries owned by the Priory.

Figure 81: View of Tynemouth Priory and the cliff beneath it (© Maritime Archaeology Ltd and English Heritage)

Roman signal stations are significant clifftop features along the North East coast with some possible examples located at Seaham Headland or Beacon Hill (Durham). Other Roman signal stations have been found at Filey, Ravenscar, Huntcliff, Scarborough and Whitby with some visible remains still surviving in today's landscape. The cliffs at Scarborough are dominated by Castle Hill, a cliff promontory where Scarborough Castle is situated. This is also a former site of a Roman signal station.

Boulby cliff (North Yorkshire) exhibits a wide variety of rock types and coastal features associated with them such as a large potash mine. For a brief period Boulby cliff was mined for alum. This mining was relatively short lived as a cheaper method was developed soon after the boom in alum mining. The ruined remnants of the mines can still be seen from the cliff top. To the south east of Saltburn, the coast changes rapidly from the low-lying cliffs and sand dunes at Hartlepool and Tees Mouth to high irregular cliffs with narrow defiles and small valleys. From Staithes to Port Mulgrave shales and ironstones of the Cleveland Ironstone Formation can be found. Ironstone is of economic importance and extensively mined. Of further economic importance, especially in the Victorian times, is the Jet Rock in the cliffs at Port Mulgrave, Sandsend and Saltwick Bay where the shale rocks of the Upper Lias are exposed along the cliffs and also contain many fossils (Val Baker et al 2007). From at least the 17th century, the shale in these cliffs was worked for alum (e.g. Sandsend, Boulby, Loftus, Peak, Stoup Brow, Saltwick Bay and Kettleness). The upper part of the alum shales was exploited to make cement.

Around the 19th century, learned societies devoted to natural history, science, literature and philosophy were flourishing around England. During this time, the new science of geology was also becoming a popular subject. New theories were being proposed and new finds were helping to test those theories. Discoveries included skeletons of fossil marine reptiles. These were found along the Yorkshire coast and were discovered due to the excavation of industrial quantities of alum shale (Osborne 1998). In some places, the alum quarries have significantly altered the cliffs and, as a result, they are often unstable and prone to collapse in some areas. Natural erosive forces have also uncovered prehistoric and Roman remains in the area.

There is a generally accepted theory stating that cliffs along the North East coast have eroded up to three miles in some places. This is based on the assumption that cliffs erode at an average rate of approximately 10cm per year (Agar 1960). This theory has recently been challenged by Cleveland Potash Ltd in collaboration with Durham University (Department of Geography). Their research has been looking at coastal processes at a higher resolution, utilising newly available monitoring technology. The work includes the historic and contemporary land-surface deformation, the development of a subsidence model for predictive use, the scale and extent of historical activity, and cliff development, evolution and recession. This research has noted that rates of cliff retreat are of a lower magnitude than previous estimates, with relatively ancient cliffs remaining in similar positions in the post glacial period (Val Baker et al 2007).

VALUES AND PERCEPTIONS

In the North East coast, cliffs are visited and enjoyed through coastal paths. There is a rich history waiting to be discovered on cliffs, which is sometimes uncovered by natural erosion processes. For some people, the boundary between the sea and land cliffs has psychological and mythic meaning and value. Buildings and structures related to sea views (e.g. lighthouses, military installations) are dotted along the cliff-line forming part of the historic seascape of the North East region.

Figure 82: Lighthouse (Roker Cliff Park) which was originally built on Sunderland's South Pier in 1856. This structure was moved to its current location in 1983 to allow harbour improvements (© Maritime Archaeology Ltd and English Heritage)

The rocks found along these cliffs have provided a fertile ground for study to generations of geologists and fossil collectors. The interesting rock outcrops and the fossils they contain were the basis of many theories proposed by scientists like James Hutton ('the father of modern geology') and George Young, amongst others. Therefore, cliffs in the North East region could be considered of significant value in terms of their contribution to the development of modern geology.

RESEARCH, AMENITY AND EDUCATION

In addition to their pioneering work on cliff development, evolution and recession, Durham University and Cleveland Potash Ltd have also mapped detailed extents of massive coastal landslides from Saltburn to Whitby. Most of the recent landslides are suggested to have been caused by instabilities resulting from alum works. Present day processes have been monitored using high resolution terrestrial laser scanning and digital photogrammetry. The research is also studying the nature of this rock fall activity in order to create a predictive model for analysing scenarios of future change (Val Baker et al 2007).

In terms of amenity and educational purposes, cliffs in the North East region are frequently visited by walkers and climbers, amongst others, contributing to shape people's landscape and seascape perceptions. Therefore, there is potential to enhance the understanding, appreciation and enjoyment of the heritage encountered by these people on the cliffs.

CONDITION AND FORCES FOR CHANGE

This Character Type will continue experiencing the gradual erosion by natural forces as well as the long-term threat of sea level rise along the North East English coast. Today, erosion is evident and variable along the North East coast, especially in the Yorkshire area.

Human forces for change include the construction of sewerage schemes and coastal defences, amongst others. The impact of these construction processes as well as the movement of water and sediments could damage the potential historical and archaeological remains in this Character Type.

RARITY AND VULNERABILITY

Magnesian limestone rarely appears close to the surface in England and it is even rarer for such outcrops to exist near the sea. These factors lead to a very rare set of conditions for both plants and animals. The North East of England boasts most of this important wildlife habitat (www.turning-the-tide.org.uk).

Much of the cliff line along the North East coast falls within Sites of Specific Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and RAMSARs, as well as being designated as a Heritage Coast from Scarborough to Saltburn and as part of North York Moors National Park.

Roman signal stations are significant clifftop features along the North East coast with some possible examples located at Seaham Headland or Beacon Hill (Durham). Other Roman signal stations have been found at Filey, Ravenscar, Huntcliff, Scarborough and Whitby with some visible remains still surviving in today's landscape. However, some of these features are being eroded. Due to these erosion processes, these areas are becoming more dangerous and therefore less accessible to the general public. English Heritage has highlighted a number of considerations involved in managing these areas, including agriculture, coastal defence, tourism, transport, public and private property interests and ecology, as well as the monument itself (Fulford et al 1997).

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1.2.9.2 Character Type: Dunes

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Dunes are a localised habitat. They can be found in the region with the largest areas of dunes in Northumberland, and smaller areas in Tees Valley and Tyne & Wear. The coast of County Durham is mostly backed by high cliffs and has a single dune system at Crimdon, near to the county boundary with Hartlepool.

Figure 83: Dune system at Crimdom, near Hartlepool (© Maritime Archaeology Ltd and English Heritage)

Dunes are prominent in the North East region between Tweed and Tyne. Elsewhere, cliffs are the dominant Character Type. The Dunes Character Type may include and impact on Sub-types such as pillboxes (e.g. at Beadnell (Northumberland) dunes are engulfing pillboxes and concrete blocks). A number of dunes have covered peat bed deposits which could contain evidence of prehistoric occupation in the area. At Low Hauxley, Bronze Age remains (e.g. cairns) have been found within this dune context. Also, dunes can be found within an urban setting in the region, Tynemouth (now a Site of Special Scientific Interest (SSSI)) being an example.

Figure 84: Tynemouth sands. The dunes are now being reclaimed (© Maritime Archaeology Ltd and English Heritage)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

In some areas of the region, dunes are locally called warrens (e.g. Hart Warren and Warrenby). Marram grass holds the seaward sides of dune complexes while more mixed plant communities and dune-pastures have developed on sheltered lees and lower dune-slopes. This natural habitat has been influenced and modified by human activity through summer grazing of farm animals. In some cases, the marram grass has been introduced to some dunes to encourage stability of these systems.

Abandoned military structures (including anti-tank cubes, batteries, minefields, pillboxes, trenches and weapons pits) can be found within the dune systems in the region. There is also potential of buried prehistoric and historic remains within these dune systems. For example, along much of the north Northumberland coast lies a complex system of sand dunes with archaeological remains (e.g. medieval cemetery at Bowl Hole, Bamburgh) illustrating the time-depth that this Character Type contains in the present landscape.

Figure 85: Druridge Bay dunes and WW II anti-tank cubes, Northumberland (© Dave Hooley, English Heritage)

Since the late 19th century, people have been attracted by the long sandy beaches in the region which edge most dunes. During the second half of the 20th century, caravan and chalet parks (e.g. Warrenby) and golf courses (e.g. Seaton Carew Golf Links) have been established on sand dunes. These parks and golf courses have altered the original character of the area.

VALUES AND PERCEPTIONS

Dunes could be perceived as having a stimulating wilderness which is often tainted by housing and golf course developments. Public perception seems to have forgotten their relationship with local economies and the dune systems' history which is often linked to the marine environment.

RESEARCH, AMENITY AND EDUCATION

There is a potential for research and documentation within this Character Type. Archaeological sites could often be buried under dune systems. Therefore, the archaeological potential and the time-depth that these represent within this Character Type should not be disregarded. Dunes are likely to contain well preserved and stratified prehistoric and historical remains. Dunes are likely to contain well preserved and stratified prehistoric and historical remains. The study of the formation of dunes and

their link to the marine environment and regional climate history could provide an important contribution to the understanding of past human activities (Petts & Gerrard 2006). Further study of the more recent use of dunes by farming communities would also be beneficial (Val Baker et al 2007).

Recreation has used dunes mainly as adjuncts to desirable beaches or as bunker-filled golf courses. However, there is potential for encouraging the appreciation of the dunes, their flora and some of the historic features that they contain from both amenity and educational perspectives. For example, sand dunes are an important element of the Northumberland Heritage Coast. A greater understanding of the dynamic nature of the dune landscape should be highlighted in public interpretation, via on-site boards and displays in museums and visitor centres (Petts & Gerrard 2006).

CONDITION AND FORCES FOR CHANGE

Sea-level change and the shift in the coastline are not the only geomorphological events to occur in a coastal context. Along much of the north Northumberland coast lies a complex system of sand dunes with archaeological remains (e.g. medieval cemetery at Bowl Hole, Bamburgh) illustrating the time-depth that this Character Type contains in the present landscape. Therefore, dune systems are complex and dynamic entities prone to instability and sudden large-scale shifts. This can have significant impacts on the surrounding environment as well as important consequences for recognising, dating, and conserving archaeological remains within these areas (see Petts & Gerrard 2006).

In the region, the main threats to dunes are as follows:

- Recreation pressures on dunes can cause erosion and a loss of plant communities in certain areas
- Overgrazing by stock can reduce the species diversity of dune grasslands and lead to erosion. Alternatively, a lack of grazing may result in the invasion of scrub species and coarse grasses at the expense of the distinctive dune flora.
- Sea level rise may increase the rate of erosion at the base of sand dunes, potentially reducing the amount of material available for dune formation.
- Stabilization at the back of dunes caused by agriculture, golf course management and road construction can prevent the natural landward movement of dunes. If sea levels rise this could result in dune systems being squeezed out and lost.
- Loss of areas of dune to developments, such as roads and golf courses, and because of agricultural improvements.

Military defences within this Character Type seem to be more numerous south of Bridlington. They seem under greater threat since the coast is receding.

Pillboxes and other similar structures are being inundated by dunes at Low Newton (Northumberland).

Sand dune erosion at Low Hauxley (Northumberland) has led to the discovery of burials of probable Bronze Age date eroding out of the cliff face (see Petts & Gerrard 2006).

By understanding the movement of sand dunes, some insight may be gained into the post-depositional factors that may have affected any surviving deposits within the dune zone. It will also provide important conservation information, allowing stabilisation of mobile dunes (see Petts & Gerrard 2006).

RARITY AND VULNERABILITY

Dunes are generally rich in buried prehistoric and historical archaeological remains. These are usually well-preserved since dunes offer a non-acidic environment. Industrial and early recreation sites could also survive well within this environment. Dunes are relatively rare formations, and the prehistoric and historic features found within them and other associated remains could also be rare. For example, at Ross Links (Northumberland), large concentrations of worked flints were found in the 1920s. These were attributed to the Mesolithic period. A Neolithic arrowhead has also been found since then in the same area as well as Bronze Age material.

The coastline from Crimdon Dene to Hartlepool Headland and much of Seaton Common and Teesmouth is classed as a Ramsar site (which are wetlands of international importance designated under the Ramsar Convention). Because of their national importance for their wildlife and geology, the Durham Coast (Hart Warren Dunes) and Seaton Dunes are designated SSSIs as well as being part of a Special Protected Area (SPA). North Gare Sands are also a National Nature Reserve (NNR). Ross Links (Northumberland) is internationally important for its dune health environment.

These sand dune systems in the region are vulnerable to natural forces such as coastal erosion and sea level rise as well as developments such as golf courses and other recreational facilities.

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1.2.9.3 Character Type: Coastal Rough Ground

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Coastal rough ground runs along most stretches of the North East coast. These semi-natural habitats are the product of thousands of years of human activity, particularly summer grazing and extractive industry. Long distance coastal footpaths run through this Character Type, which is therefore rather crowded during the summer months due to tourism.

Salt marsh is found on all the region's estuaries. However, the habitat is particularly concentrated in Northumberland. The regional resource is low by English standards and is particularly poor in the Durham area. This is due to lack of sediment supply and suitable sites for the accumulation of sediments. The amount of salt marsh on the rivers Tyne and Wear has been considerably reduced as a result of land claim (www.durhambiodiversity.org.uk/pdfs/habitats/Saltmarsh.pdf).

Figure 86: Looking west along the Tyne (© Maritime Archaeology Ltd and English Heritage)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Prehistoric components of this Character Type include flint scatters, ritual/ceremonial sites (e.g. barrows) as well as log boats such as those nearby found in the Humber

Estuary (e.g. the North Ferriby and the Brigg log boats. For further details see McGrail 1981, 1994, 1998, 2001). These finds also show the material expressions of the use of this past landscape/seascape and its maritime history.

Military sites are often found on this Character Type, including look-outs, pill-boxes, batteries, radar stations and forts. There are also maritime safety sites such as coastguard look-outs, daymarks and lighthouses.

Figure 87: Pill-box near Blackhall Colliery, Durham (© Maritime Archaeology Ltd and English Heritage)

Figure 88: WW II anti-tank cubes in Beal saltmarshes. Lindisfarne can be seen in the background (© Dave Hooley, English Heritage)

Salt marsh is found on all the region's estuaries. However, the habitat is particularly concentrated in Northumberland. The regional resource is low by English standards and is particularly poor in the Durham area. This is due to lack of sediment supply and suitable sites for the accumulation of sediments. Since the 2nd Industrial Revolution (mid 19th century), the amount of salt marsh on the rivers Tyne and Wear has been considerably reduced as a result of land claim (www.durhambiodiversity.org.uk/pdfs/habitats/Saltmarsh.pdf).

Figure 89: Beal saltmarshes in the foreground, Lindisfarne in the background (© Dave Hooley, English Heritage)

From a natural environment perspective, Coatham Marsh (Redcar and Cleveland) for example is used by over 200 wildfowl species providing a recreational and leisure space for birdwatchers.

VALUES AND PERCEPTIONS

As the boundary between the sea and land, coastal rough ground has considerable psychological and mythical meaning and value for people in the North East. Buildings and structures found on this Character Type relate to the observation of the sea represented by lighthouses, military installations, and beacons, amongst others.

Salt marshes could be regarded as highly valued ecological environments. Unique flora and fauna survive in salt marshes. Several are now nature reserves or have been given national or county nature conservation designations (e.g. Coatham Marsh). Others have been considerably reduced through time as a result of land claim.

RESEARCH, AMENITY AND EDUCATION

Some survey, excavation and analysis of the well-preserved archaeological sites has been undertaken in the region providing valuable information about past human

activities. Examples include the studies undertaken in the nearby Humber Estuary on the Brigg logboat and the Ferriby boats contextualising these finds within the natural environment where they were found (see McGrail 1981, 1994, 1998, 2001; Wright 1990, 1994).

This Character Type has shaped people's landscape and seascape perceptions, especially where there is coastal access and footpaths. This Character Type is also highly valued by both local people and visitors providing a space for recreation and leisure. There is also scope for further development as far as amenity and education initiatives are concerned. The North East coastlines are invaluable from both historical and natural perspectives. Therefore, information boards could be further used to convey these historical and natural interests. The semi-natural vegetation is already of interest to many people and famous archaeological sites (e.g. Scarborough Castle) are regularly visited in the region. Furthermore, it is relevant to mention that there are also provisions to improve open air recreation on foot to the English coast under the Marine and Coastal Access Bill approaching its final stages in Parliament (http://www.defra.gov.uk/environment/marine/legislation/index.htm).

Many interest groups, such as walkers, artists, writers, and historians, already make use of this Character Type, offering potential for outreach initiatives to raise public awareness about the history of this Character Type and its impact on today's landscape/seascape.

CONDITION AND FORCES FOR CHANGE

A few forces for change in the North East region could involve the minimal encroachment by farmers and the expansion of recreation facilities within this Character Type (Petts & Gerrard 2006).

This Character Type has been generally neglected in terms of grazing impacting on the landscape by increasing vegetation within coastal rough ground. This could lead to the gradual submergence of undiscovered archaeological remains which could remain concealed by vegetation. While this offers a form of protection, potential archaeological sites could go understudied.

The Marine and Coastal Access Bill, which is now approaching its final stages in Parliament, makes provision to improve access, create a right to walk around the coast; address uncertainty arising from lack of consistency, and secure and clarify rights of public access to foreshore, beaches and coastal land. This will contribute clarify, simplify and extend access through the creation of a coastal access corridor to which the public has right of access on foot for outdoor recreation. It is also stated that access will be resilient to coastal change (http://www.defra.gov.uk/environment/marine/legislation/index.htm).

RARITY AND VULNERABILITY

This Character Type is subject to Sites of Specific Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar Sites (which are wetlands of international importance designated under the Ramsar Convention), and in some cases they are designated as a Heritage Coast. Some examples are North Northumberland Heritage Coast (from Berwick-upon-Tweed to Druridge Bay in the south

including the Farne Islands), Durham Heritage Coast (from Seaham to Hartlepool) and North Yorkshire and Cleveland Heritage Coast (from Saltburn-by-the-Sea to Scarborough). The Wetlands at Seaton Sands and Greatham Creek are recognised as being of international importance (Ramsar sites) for wintering wildfowl and waders. As a result they are designated as Special Protection Areas (SPAs). Seal Sands are also designated as a National Nature Reserve (NNR).

This Character Type could be considered as relatively rare since well-preserved archaeological features have survived in understandable complexes where time-depth is visible (Petts & Gerrard 2006).

This Character Type is vulnerable to reclaimed land impacting on the historic features surviving within it, the receding salt marsh areas in the rivers Tyne and Wear being some examples.

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1.2.9.4 Character Type: Foreshore

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The region's foreshore comprises sandy, silty or rocky areas which can contain prehistoric and historic remains which are vital to enable a deeper understanding of the region's long-term relationship with the sea and those maritime influences which have

influenced today's character. These prehistoric and historic remains can either be found at the surface of this Character Type (e.g. quays, breakwaters, industrial workings) or buried beneath it (e.g. old land surfaces).

One of the distinguishing attributes of this Character Type is that the often desolate North East foreshores of today were once crowded by seaweed- and bait-gatherers, coal ships, jet and ironstone miners, and fossil collectors, amongst others. There would also have been numerous fishermen drying their nets. The poorer people would have gathered driftwood for fires and sandstone for scrubbing floors, and the children would have picked up coal spilt on the beaches where colliers berthed (see White 2004).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

This Character Type contains remains of varied maritime human activities and their long-term relationship with the sea and those maritime influences which have contributed to forging the character of the North East. Prehistoric remains in the form of peat deposits can also be found within this Character Type. Remains of submerged forests have been found at Hartlepool. Buried prehistoric land surfaces are fragile by nature and can contain unique palaeoenvironmental evidence (as well as artefacts and ecofacts) that can clarify issues regarding past human activities and landscape/seascape uses. Furthermore, palaeoenvironmental evidence can relate to an area's vegetational history or to the processes of submergence and coastal or estuarine change.

Most features within this Character Type in the region relate to the use of the North East coast and estuaries for fishing, shipping and various industries. Some can still be used (e.g. quays, piers) but others have been abandoned, visible only as low footings of walls or lines of rotting timbers. Piers, jetties, sea defences and breakwaters are some examples.

Figure 90: Trawlers at fish market quay, Whitby (© Dave Hooley, English Heritage)

Wrecks or hulks of ships and boats can survive on sandy foreshores and rocky headlands but, in the latter, they will mainly be fragmented. For example, Seaton Carew is a post medieval wreck site (possibly 18th century) located at Hartlepool in the intertidal area (http://www.english-heritage.org.uk/server/show/conWebDoc.6612).

Figure 91: Image of the Seaton Carew taken in 2002 (© Tees Archaeology)

Historic fishing activities have taken place on the North East foreshore such as potting and bait digging. Potting and bait digging impact the landscape/seascape disturbing seabed and/or foreshore deposits as well as the surrounding natural environment (see http://www.ukmarinesac.org.uk/activities/bait-collection/bc11.htm). During the 20th century (and possibly even earlier), bait digging, mainly for lugworms, has been taking place on the Berwickshire and North Northumberland Coast. These areas have been the subject of extensive study and legal regulation in the Lindisfarne National Nature Reserve and Boulmer Haven. Additionally, almost every accessible intertidal reef is exploited by commercial and recreational users who collect winkles, mussels and crabs by hand (http://www.ukmarinesac.org.uk/activities/bait-collection/bc11.htm. These commercial and recreational activities have also impacted the landscape/seascape on this foreshore).

Kelp, a large seaweed plant, was also extensively harvested from the foreshores along the North East coast. From the early 17th century, the word kelp was closely associated with soda and potash (important chemicals in the alum industry) which could be extracted from burning seaweed. The word kelp also refers to these processed ashes. Seaweeds have also been collected as fertilisers since they are nutrient rich and alkaline. The exploitation of kelp was a profitable practice during the 18th and part of the 19th centuries. The alum industry only accounted for a very small percentage of the national

kelp trade which was badly affected by the increasingly available chemical industry by-products. There was a short period of recovery when a process for extracting iodine from kelp ash was discovered. By the mid 20th century, it was confined to a few places in the Outer Hebrides (Scotland) (http://en.wikipedia.org/wiki/Kelp).

Coastal infrastructure such as ports, harbours and sea defences are another component of the foreshore. Archaeological remains on the foreshore can be affected by the construction and maintenance of this infrastructure, as well as by the indirect impact of sea or flood defences.

VALUES AND PERCEPTIONS

In the North East, the foreshore is valued as a place for recreational activities such as fishing, sunbathing and sea-bathing.

Foreshores have been regarded as transitional areas between land and sea. Intertidal studies have often been encouraged from a maritime archaeology point of view due to the richness they represent from a historic environment perspective (see Fulford et al 1997). Perspectives that integrate 'land' and 'maritime' views would be highly beneficial to shed new light about past human activities within this Character Type.

The ruined remains of quays and breakwaters, and the existence of buried land surfaces will generally be unknown. Ship remains, however, could often act as landmarks for many locals and visitors.

RESEARCH, AMENITY AND EDUCATION

Surveys have enabled the integration of a range of archaeological features to offer a broader view and understanding of this Character Type. For example, the surveys undertaken at Hole Wyke show the evolution from the use of open beaches in the early years of the alum industry to complex systems of tramways and tunnels (Buglass 2002).

Excavations of stratified deposits on the beach at Seaton Carew have uncovered what is believed to be a Neolithic or Bronze Age fish trap. At Hartlepool, flints, animal bones, and wooden stakes have also been found on the foreshore area (Fulford et al 1997). These finds provide some examples of the time-depth and historic character of the foreshore area.

Many interest groups, such as walkers, artists, writers, and historians, already make use of this Character Type, offering scope to further develop education and outreach initiatives to raise public awareness about the historic character of the foreshore area and its impact on today's landscape/seascape.

Foreshore hulks provide an excellent focus for cross-curricular studies with local relevance, being a more visible and accessible element of the maritime archaeology resource.

Provisions to improve open air recreation on foot to the English coast under the Marine and Coastal Access Bill approaching its final stages in Parliament have also been made (http://www.defra.gov.uk/environment/marine/legislation/index.htm).

CONDITION AND FORCES FOR CHANGE

This Character Type will continue experiencing gradual erosion by natural forces as well as the long-term threat of sea level rise along the North East coast. Human forces for change include the construction of sewerage schemes and coastal defences, amongst others. The impact of these construction processes, as well as the movement of water and sediments, could damage the potential historical and archaeological remains in this Character Type. Therefore, the potential existence of buried archaeological features within the foreshore should be considered when dealing with coastal developments. Human activities such as salvage, the random recovery of archaeological 'souvenirs' and some fishing activities could be extremely damaging to the non-renewable and fragile nature of prehistoric and historic remains.

In Hartlepool Bay, for example, patterns of sediment movement and accumulation have changed in recent years. This is due to the growing extent of sea defences. Therefore, there are now substantial depths of modern beach sand covering the underlying deposits of peat and clay, which were occasionally exposed (Waughman 2005).

The Marine and Coastal Access Bill, which is now approaching its final stages in Parliament, makes provision to improve access, create a right to walk around the coast; address uncertainty arising from lack of consistency, and secure and clarify rights of public access to foreshore, beaches and coastal land. This will contribute clarify, simplify and extend access through the creation of a coastal access corridor to which the public has right of access on foot for outdoor recreation. It is also stated that access will be resilient to coastal change (http://www.defra.gov.uk/environment/marine/legislation/index.htm).

RARITY AND VULNERABILITY

The foreshore areas of North Northumberland (from Berwick-upon-Tweed to Druridge Bay in the south including the Farne Islands), Durham (from Seaham to Hartlepool) and North Yorkshire and Cleveland (from Saltburn-by-the-Sea to Scarborough) are examples of areas designated as Heritage Coast in the region.

This Character Type could be considered as relatively rare since well-preserved archaeological features have survived in understandable complexes where time-depth is visible (Petts & Gerrard 2006).

Further palaeo-environmental research will help address gaps in the sequences already obtained for the region. For example, there are a number of areas of great potential such as those along watercourses and buried channels inland, and beneath former dune systems where prehistoric and Roman deposits may have been sealed by the accumulating sand dunes (Waughman 2005).

This Character Type is vulnerable to erosion processes, intrusive fishing activities, and developments such as expansion of ports and harbours, and wind farms and their associated cable routes and pipelines, all of them impacting on the historic features surviving within the foreshore.

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1.2.9.5 Character Type: Marine Features

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Most of the North East region is characterised by fine sediment plains, with some patches of mud plains and coarse sediment plains closer to the coast.

The Tweed is a long narrow estuary characterised by muds and sands and therefore an area considered of high to medium archaeological potential. Sandstell Point, at the mouth of the estuary, is a wide spit of clean mobile sand. This sand is subject both to wave action and, in places, the scouring action of the outflowing river. On the more sheltered west-facing shore of this spit, and on Calot Shad on the opposite bank, there is reduced mobility of the sand. Further upstream, at Yarrow Slake, the zone is characterised by more sheltered areas of muddy sand (http://www.jncc.gov.uk/ProtectedSites/SACselection/habitat.asp?FeatureIntCode=h1140).

The south boundary of the North East region just overlaps with the nearby Humber Estuary. The latter could be considered as an area of high potential for archaeological preservation since it is characterised by extensive estuarine muds and silts. This potential has already been demonstrated by prehistoric finds such as the three boat fragments found at North Ferriby, nearby in the intertidal Humber (Wright 1990, 1994), and the Brigg logboat found in the Humber estuary (near the Ferriby boats' find spot) (McGrail 1981, 1994, 1998, 2001). These finds illustrate the prehistoric and historic potential of the estuarine environments along the English east coast.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Variations in seabed topography and composition are influenced by the structure and composition of underlying bedrock, the configurations and composition of features originating at former terrestrial and submarine ice-sheet margins, carbonate biological sedimentary input and by the interactions of all these with the near-bed currents (Holmes et al 2004).

The overall modern topography of the seabed in the North Sea has originated from the influences of deep geological structure on the patterns of basin subsidence, uplift and climate on sediment input. The smaller-scale seabed geometry of the continental shelf is a relict of several glacial periods when large volumes of material were eroded from the adjacent mainlands and from the continental shelf. This material was then re-deposited on the shelf or in the deeper waters on the adjacent continental slope. The modern sedimentary environment of the North Sea continental shelf is now dominated by very low sediment input and the reworking of the seabed by near-bottom currents (BGS 2002).

Extreme changes from arctic to temperate climates have influenced sediment type and the very high rate of sediment input into the North Sea from approximately 800,000 years ago to the present day. The overall effect of repeated glaciations has been to keep the North Sea basin filled with sediments during a time when there was very rapid basin subsidence (BGS 2002). The bulk of the modern seabed sediments comprise substrates that are more than 10,000 years old and have been reworked from strata by currents that have been generated by tides and sea waves. The reworked sediments typically form large areas of seabed sand and gravel (BGS 2002). Such sediments also form the large-scale sandbanks and ridges and smaller sand waves. These characterise much of the seabed topography in the southern North Sea. The largest ridges and banks have formed subparallel to the dominant tidal currents and occur as open-shelf ridges,

estuary-mouth ridges or headland-associated banks (BGS 2002). Some of these nearshore sand banks are mobile, others show little evidence for long-term mobility except at seabed where sandwaves appear to indicate that there is modern clockwise circulation of sand around the bank (BGS 2002).

Soft muds typically cover wide flat areas in the deeper waters of the continental shelf. In the central and northern North Sea the spreads of soft muds are locally characterised by small depressions or 'pockmarks'. These areas of seabed have originated by unusual processes resulting in seabed excavation and soft-sediment mobility (BGS 2002).

Following Gaffney et al (2007), the buried landscapes recorded in the 3D seismic survey as part of the 3D Seismics North Sea Palaeolandscapes project are unlikely to be affected by late Holocene and modern erosion. This implies that the central North Sea may have the potential to contain some the best-preserved Early Holocene palaeoenvironmental records for Northern Europe (Gaffney et al 2007).

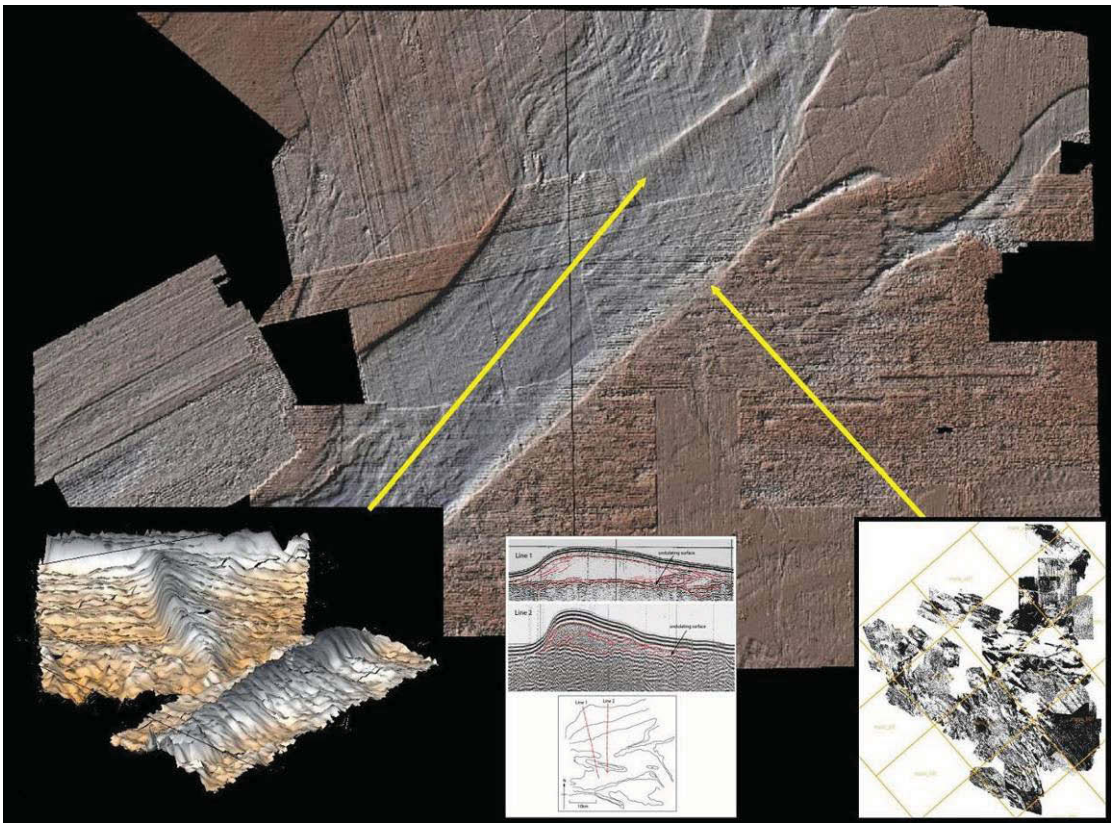

Figure 92: Marine features identified in the Southern North Sea by interpreting 3D seismic data (© Image provided by the North Sea Palaeolandscape Project (VISTA, University of Birmingham). This project was funded by the Marine ALSF and Administered by English Heritage)

VALUES AND PERCEPTIONS

This Character Type is highly valued ecologically due to its biodiversity. Lately, this Character Type has received some attention by archaeologists due to the archaeological

potential that it could represent and therefore contributing to the understanding of past communities' dynamic and varied use of the landscape they inhabited.

RESEARCH, AMENITY AND EDUCATION

Within this Character Type, some survey, excavation and analysis of the well-preserved archaeological remains has been undertaken, providing valuable information about past human activities. Examples include the studies undertaken on nearby Humber Estuary remains of the Brigg log boat and the Ferriby boats are well as the environment in which they were found (see McGrail 1981, 1994, 1998, 2001; Wright 1990, 1994). These examples illustrate the type of historic features that can survive within this Character Type and the historic potential of today's landscape/seascape in the North East coast of England.

The English Heritage-ALSF 3D Seismics North Sea Palaeolandscapes project has shown that the analysis and interpretation of 3D siesmic survey data has identified a range of natural sedimentary traps capable of containing environmental remains, such as palaeochannels and floodplain wetlands (see Gaffney et al 2007). However, these need to be 'ground truthed' so their environmental potential can be confirmed. This approach will allow previous interpretations of landscape evolution and archaeological potential of the region to be assessed (e.g. Coles 1998; Flemming 2004; Shennan et al 2000a, Shennan et al 2000b) as well as aid in the development and testing of new models (see Gaffney et al 2007).

The amenity value of this Character Type could be further explored through, for example, interactive CDs and web resources. HSC provides a flexible and user friendly resource for connecting with and enhancing local communities' current awareness of the character, perceptions and significances of the areas they live and work in. Therefore, potential for educational initiatives through presentations and posters would contribute to raise public awareness about the connection between both the natural and historic environment within a marine context.

CONDITION AND FORCES FOR CHANGE

Human forces for change include offshore wind farms and aggregate extraction areas amongst others. The impact of these activities as well as the movement of water and sediments could have an intrusive impact on this Character Type potentially disturbing any historic features within it.

RARITY AND VULNERABILITY

Some prehistoric and historic features within this Character Type could be considered rare where time-depth is visible (Petts & Gerrard 2006). The nearby Humber Estuary prehistoric remains (e.g. the Brigg log boat and the Ferriby boats) are some examples (see McGrail 1981, 1994, 1998, 2001; Wright 1990, 1994). These examples illustrate the type of features that can survive within this Character Type and the historic potential of today's landscape/seascape in the North East coast of England.

In terms of vulnerability, this Character Type is under threat from environmental processes such as erosion, sea level rise and global warning. This Character Type is potentially under threat from human activities such as intrusive fishing activities (e.g.

trawling) and offshore developments (e.g. wind farms, and aggregate extraction amongst others). The impact of these activities as well as the movement of water and sediments could damage the potential prehistoric and historic features present within this Character Type and therefore should be mitigated accordingly.

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1.2.9.6 Character Type: Sand and Mudflats

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The Berwickshire and North Northumberland coast is an extensive and diverse stretch of coastline in North East England. Stretches of the coast in England show an extensive range of intertidal mudflats and sandflats, ranging from wave-exposed beaches to sheltered muddy flats with rich infaunal communities. These have been selected as biologically diverse and extensive examples of clean sandflats on the east coast. Those in the Lindisfarne and Budle Bay area and on the adjacent open coast flats north of Holy Island are the most extensive in north-east England. Some of the bays along the open coast have mobile sediments (http://www.jncc.gov.uk/ProtectedSites/SACselection/habitat.asp?FeatureIntCode=h1140).

Figure 93: A view of Tynemouth sands (© Maritime Archaeology Ltd and English Heritage)

The Tweed is a long narrow estuary with a wide variety of intertidal mudflat and sandflat communities. Sandstell Point, at the mouth of the estuary, is a wide spit of clean mobile sand. This sand is subject both to wave action and, in places, the scouring action of the outflowing river. It is characterised by a mobile infauna (mainly crustaceans and a few polychaetes) which reflect these conditions. On the more sheltered west-facing shore of this spit, and on Calot Shad on the opposite bank, there is reduced mobility of the sand. Further upstream, at Yarrow Slake, the zone is characterised by more sheltered areas of muddy sand (http://www.jncc.gov.uk/ProtectedSites/SACselection/habitat.asp?FeatureIntCode=h1140).

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Intertidal mudflats and sandflats are generally located in tidal estuaries and can contain important archaeological remains either at the surface (e.g. quays, breakwaters, wrecks) or buried (e.g. prehistoric or historic land surfaces, overwhelmed quays). Most human activities that have left remains in these areas were connected with the marine environment. There is also potential for the presence of prehistoric remains on land that is now intertidal but which used to be dry ground

The area close to the Yorkshire coast was subjected to ice erosion during the Devensian period. Although there are few thick sediment layers which might contain archaeological material, a submerged forest is known south of Hartlepool. Early Mesolithic worked flints have been excavated from the peat beds associated with this forest.

Figure 94: Submerged forest remains, Hartlepool (© Maritime Archaeology Ltd and English Heritage)

The famous Mesolithic site of Star Carr lies in North Yorkshire, five miles south of Scarborough (Clark 2009). Further archaeological potential is likely along this stretch of coast to and within the Tweed and Tees Estuary and further south in the nearby Humber Estuary (for example, see Sheppard 1898). Modern eroding foreshores are also the sites most likely to reveal this Character Type (e.g. Hartlepool submerged forest; submerged peat beds on Tunstall Mere (Sand-le-Mere)).

VALUES AND PERCEPTIONS

This Character Type is highly valued ecologically due to its biodiversity. Many examples are now nature reserves or have been given national or county nature conservation designations (e.g. Coatham Marsh). Scarce attention has been given by historians or archaeologists despite contributing to the understanding of past communities' varied use of the landscape they inhabited.

RESEARCH, AMENITY AND EDUCATION

Some survey, excavation and analysis of the well-preserved archaeological sites has been undertaken in the region providing valuable information about past human activities. Examples include the studies undertaken at the famous Mesolithic site of Star Carr which lies in North Yorkshire, five miles south of Scarborough (Clark 2009); and in the nearby Humber Estuary on the Brigg logboat and the Ferriby boats, contextualising these finds within the natural environment where they were found (see McGrail 1981, 1994, 1998, 2001; Wright 1990, 1994). Archaeological research of the coastal peat bogs has also been carried out, providing invaluable palaeo-environmental information.

The North East coastlines are invaluable from both historical and natural perspectives. Therefore, information boards could be further used to convey these points of historical and natural interest helping to raise public awareness about today's landscape/seascape.

CONDITION AND FORCES FOR CHANGE

The Northumberland coast is under threat due to climate change. The dune systems, extensive beaches and mud flats of Lindisfarne, Goswick Sands, and Holy Island Sands, Fenham Flats, Druridge Bay and Budle Bay are all distinctive landscapes which are likely to be lost due to sea level rise (CPRE 2007).

Figure 95: Lindisfarne sandflats (© Maritime Archaeology Ltd and English Heritage)

The Yorkshire coast is also eroding rapidly and this could create further threats to nearby villages and towns.

RARITY AND VULNERABILITY

This Character Type is subject to Sites of Specific Scientific Interest (SSSIs), Special Protection Areas (SPAs), Special Areas of Conservation (SACs) and Ramsar Sites (which are wetlands of international importance designated under the Ramsar Convention), and

in some occasions they are designated as a Heritage Coast. Because of their national importance for their wildlife and geology, the Durham Coast (Hart Warren Dunes) are designated SSSIs as well as being part of a Special Protected Area (SPA). The Wetlands at Seaton Sands and Greatham Creek are recognised as Ramsar sites for wintering wildfowl and waders. North Gare Sands and Seal Sands are also designated as a National Nature Reserve (NNR).

This Character Type could be considered as relatively rare since well-preserved archaeological features have survived in understandable complexes where time-depth is visible (Petts & Gerrard 2006).

As ecosystems, this Character Type is vulnerable to human activities such as recreational disturbance, commercial exploitation of shellfish and worms, and oil and industrial pollution. This Character Type can also be impacted by events far upstream, and concentrate materials such as pollutants and sediments. Contaminants can be introduced which do not disintegrate rapidly in the marine environment, such as plastics, pesticides, furans, dioxins, and heavy metals.

The Northumberland coast is vulnerable due to climate change. The dune systems, extensive beaches and mud flats of Lindisfarne, Goswick Sands, and Holy Island Sands, Fenham Flats, Druridge Bay and Budle Bay are all distinctive landscapes which are likely to be lost due to sea level rise (CPRE 2007).

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1.2.9.7 Character Type: Water

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Watercourses, running from the high moors inland, frequently dissect the coast along North East shoreline. Main watercourses in the region include the Rivers Tyne and Wear, and Esk. Other rivers include: Calder, Derwent, Ouse, Swale, Ure and Wiske. Numerous springs and ponds are also dotted along the North East coast. This Character Type is popular principally for recreation and fishing as well as shipping. The impact of watercourses in today's landscape is visual although flooding in some areas could be an issue.

In the North East, Kielder Water is a popular area for recreation, tourism and leisure, with water sport facilities on the reservoir for wind surfers, canoeists, water skiers, anglers and yachtsmen in addition to the visitor facilities provided by the Forestry Commission. Kielder Castle, a former hunting lodge for the Earls of Northumberland lies to the north of the reservoir and is the main visitor centre for the Kielder area.

Figure 96: Kielder Water Reservoir (© English Heritage, NMR)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Freshwater has always been a key factor in settlement patterns since it is a key resource critical for survival. This is demonstrated along the North East coastline where settlements have developed along the rivers and streams or close to springs.

Watercourses have often been utilised to facilitate industry (e.g. corn mills, alum works, etc) and settlements. In contrast, settlement and industry can have detrimental effects on freshwater supplies, such as sewage contamination or waste from ironstone mines which has discoloured several streams in the region. Rivers and streams have also been popular for recreational purposes (e.g. boating and angling).

Waterways are dynamic and their courses have changed through time due to natural and sometimes human influence, impacting on today's landscape. There is some evidence that suggests that prior to the last Ice Age, the River Wear once followed the current route of the lower River Team, merging with the Tyne at Dunston. Ice diverted the course of the Wear to its current location, and joined the North Sea at Sunderland. With its proximity to surrounding coalfields, the Tyne was a major route for the export of coal from the 13th century until the second half of the 20th century, when the coal mining industry declined in North East England. The largest coal staithes (a structure for loading coal onto ships) were located at Dunston, Gateshead Hebburn and Tyne Dock, South Shields. The wooden staithes at Dunston, built in 1890, have been preserved, although they were partially destroyed by fire in 2006. Today, in 2009, Tyne Dock, South Shields

is still involved with coal. In the late 19th and early 20th century, the lower reaches of the Tyne were important centres of shipbuilding, and there are still shipyards in South Shields and Hebburn. To support the shipbuilding and export industries of Tyneside, the lower reaches of the river were extensively remodelled during the second half of the 19th century, with islands removed and meanders in the river straightened.

Figure 97: Aerial photography looking through the clouds into the mouth of the River Tyne (© Dave Hooley, English Heritage)

In Yorkshire, streams and brooks are generally named 'becks' (e.g. Staithes Beck), which is a Middle English word from the Old Norse *bekkr*, sharing similar characteristics such as fast flowing, oxygen rich, rain-fed, relatively unpolluted and with diverse flora and fauna.

In some areas of the North East, water is also renowned for being rich in beneficial minerals. In 1626, a stream of acid water was discovered south of the town of Scarborough. The medicinal benefits of this water source were soon discovered and by the 1690s the wells were famous. It was at this time that Scarborough made its first steps as a Spa town as well as a seaside resort.

Figure 98: A view of Scarborough (© Dave Hooley, English Heritage)

The small villages along the river Esk were of great industrial importance to the North East, with coal mined in the valleys, and iron ore dug from quarries on the surrounding moors. Today, the landscape contains remains of the deserted mine shafts, though potash is mined near Boulby. Angling on the Esk is highly regarded, with salmon, sea trout and brown trout being abundant (Bradley 1988).

Today, all major rivers in the North East (e.g. the Tyne, Coquet and Wear) have good runs of salmon and sea trout. The Tyne is an improved river in its water quality and this is reflected in the excellent salmon catches. After recovering from decades of pollution in its lower reaches, even the River Tees now boasts greater numbers of salmon and sea trout. Wild brown trout are found in most streams in the area and many reservoirs provide excellent sport for both brown and rainbow trout (Environment Agency 2009).

Figure 99: Fishing boat on the Tyne (© Maritime Archaeology Ltd and English Heritage)

VALUES AND PERCEPTIONS

Regionally, anglers value those river courses where they had success such as the River Tyne.

This Character Type is also highly valued ecologically due to its biodiversity.

RESEARCH, AMENITY AND EDUCATION

The effect of water quality (pollution) on the historic environment may be a factor affecting the preservation of terrestrial, inter-tidal, and submerged prehistoric and historic features. Pollution alters the chemical composition of water and soil, often making them more acidic and therefore more likely to damage prehistoric and historic features. However, scarce research has been undertaken on water pollution and its effect on archaeological sites (Fulford et al 1997).

This Character Type, highly valued from both an ecological and recreational point of view, has shaped people's landscape and seascape perceptions. The North East coastlines are invaluable from both historical and natural perspectives. Therefore, information boards, for example, could be further used to convey these points of historical and natural interest represented in today's landscape/seascape.

CONDITION AND FORCES FOR CHANGE

Throughout the region, the Environment Agency (EA) has prepared a series of Local Environment Action Plans (LEAPs) for major river catchments such as the Tees, Wear and Tyne. The aim of the LEAPs is to identify, prioritise and cost environmentally beneficial actions. This will be achieved by focusing attention on interested parties in planning for the future environment of a specific area and establishing an integrated plan of action for managing the local environment over five years.

RARITY AND VULNERABILITY

In terms of rarity, all major rivers in the North East (e.g. the Tyne, Coquet, Wear and Esk) have good runs of salmon and sea trout and are therefore regionally valued.

As ecosystems, this Character Type is vulnerable to human activities such as recreational disturbance, and oil and industrial pollution.

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1.2.9.8 Character Type: Woodland

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

This Character Type comprises mainly the remnants of traditionally managed woodlands through coppicing (harvesting wood by cutting trees back to ground level) and pollarding (harvesting wood at about human head height to prevent new shoots being eaten by grazing species such as deer). These woodlands are usually found in the steep-sided valleys extending inland from rivers or, in some cases, via tributaries. It also incorporates ancient woodland and plantations. During the 20th century, many of the ancient woods have been replanted with conifer plantations.

Today, there is no wide area of ancient woodland registered in the North East region. This is probably the result of its widespread removal to clear land for agricultural activities and for later use in industry.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The surviving ancient woodlands would have been managed and formed important elements of the working landscape for many centuries. Medieval farmers and craftsmen would have exploited them as pasture grounds, sources of fuel, coppice wood and timber. Neighbouring mining regions would have also had a close relationship with woods, as sources of timber and charcoal for smelting.

Early medieval distribution of woodland would have been predominately in the steeper valleys, probably established since prehistoric times. These woodlands were gradually lost to agricultural clearing and enclosure on the less steep valley sides from the later medieval period to the 19th century.

Streams and rivers that run through woodlands often have leats (artificial watercourse) which were exploited from at least medieval times to work the water mills used in grinding grain.

Some 18th and 19th century country houses used the opportunities presented by already wooded slopes to establish ornamental parks and gardens in these valleys (e.g. Mulgrave Estate).

In the replanted older woodlands, fragmentary remains of pre-conifer features often survive, such as earlier wood-banks and tracks. Woodlands replacing ancient broadleaf woods generally have more rounded edges and therefore are more sympathetically moulded into the local topography and character.

Today, in Durham, Maiden Castle (an Iron Age promontory fort) is surrounded by old oak woodland. However, there is no wide ancient woodland registered in the area. This is probably the result of its widespread removal to clear land for agriculture activities and for later use in industry.

Figure 100: A panoramic view looking over Durham City from the railway station (©English Heritage, NMR)

VALUES AND PERCEPTIONS

Plantations are sometimes perceived as threatening since they have either obscured or damaged the ecologically varied and historic features of the landscape/seascape.

Some woodlands have public access and are appreciated by those who visit.

Research, amenity and education

Little is known about varying patterns of woodland management and forestry techniques in the North East region. Therefore, basic research should be undertaken to establish historic patterns of woodland (Petts & Gerrard 2006).

From amenity and educational points of view, access to certain woodlands could be increased and the presentation of their historical and educational aspects could be improved through, for example, interpretation boards. However, in general terms, the constraints of topography and property boundaries make the presentation of features in this Character Type challenging.

Condition and forces for change

Woodlands are particularly important habitats for native species such as red squirrel and dormouse. Major issues impacting on those natural habitats are the cessation of traditional management techniques (e.g. coppicing and pollarding), sheep grazing, coniferisation, lack of regeneration, invasion of non-native species, and Dutch elm disease.

The North East woodlands are generally of a small size. However, in some cases, woodlands are significant landscape features, particularly in the upland valleys and coastal areas.

Most of the woodland in the region has patches of recognised ancient woodland.

Rarity and vulnerability

This Character Type contributes to the general character of the landscape/seascape of the region.

Semi-natural ancient woodlands are of great importance for wildlife. This is because they have had a long time in which to acquire a diversity of species and to form stable floral and faunal communities.

Plantations contribute to the present landscape character and they also have amenity value. However, as a whole, the survival of historical features within them in the North East could be considered as relatively low.

There is potential for replanting broadleaf woodland on the steeper slopes of the valleys in the region. The retention of broadleaved woodland will contribute to enhance the historic landscape character of the valleys, improve their biodiversity and help reduce the velocity of water throughput.

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1.2.10 Broad Character: Recreation

1.2.10.1 Character Type: Recreation

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

Tourism is an important source of income and employment for the North East region with many long established seaside resorts. Scarborough, for example, has been described as 'Britain's first seaside resort' (Waters 2005: 51).

The North East coastline attracts many tourists in pursuit of open-air recreational activities. For example, Kielder Water is a popular area for recreation, tourism and leisure, with water sport facilities on the reservoir for wind surfers, canoeists, water skiers, anglers and yachtsmen in addition to the visitor facilities provided by the Forestry Commission. Kielder Castle, a former hunting lodge for the Earls of Northumberland lies to the north of the reservoir and is the main visitor centre for the Kielder area.

Figure 101: A view of Kielder Water reservoir, surrounded by Kielder Forest (© English Heritage, NMR)

Recreational activities in the region typically include walking, bird watching, sunbathing, golfing, climbing, camping and wildfowling. Popular water sport activities involve sea bathing, sailing, surfing, diving (although very patchy throughout the region), leisure fishing, angling, water and jet-skiing. Visiting coastal heritage assets is also becoming increasingly popular, with the seal colony on the Farne Islands, Tynemouth, Dunstanburgh, Bamburgh, Scarborough and Mulgrave castles, and the Abbey at Whitby attracting many tourists (DTI 2002).

Figure 102: Dunstanburgh Castle and view north west along the coast (© Dave Hooley, English Heritage)

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

Various coastal resorts developed throughout the region but perhaps not to the extent of Scarborough. Tynemouth, for example, boasted a seafront skating rink and aquarium in the mid 19th century. By then, railways extended to the coast which made the seaside a more accessible place for recreation. For example, railways reached Redcar and Tynemouth in 1846. The London railway, which reached Newcastle in 1844, made it to Berwick in 1847.

Whitley Bay has been the main seaside resort for Tyneside. Whitley Bay was famous for its permanent seaside fairground The Spanish City, which has now been demolished for a redevelopment in the 1990s. The iconic Dome of the Spanish City has long been a landmark of Whitley Bay and is all that remains from this permanent seaside fairground. Another coastal feature at Whitley Bay is St Mary's Island and its visitor centre and lighthouse. St Mary's Island is linked to the mainland by a short causeway at low tide.

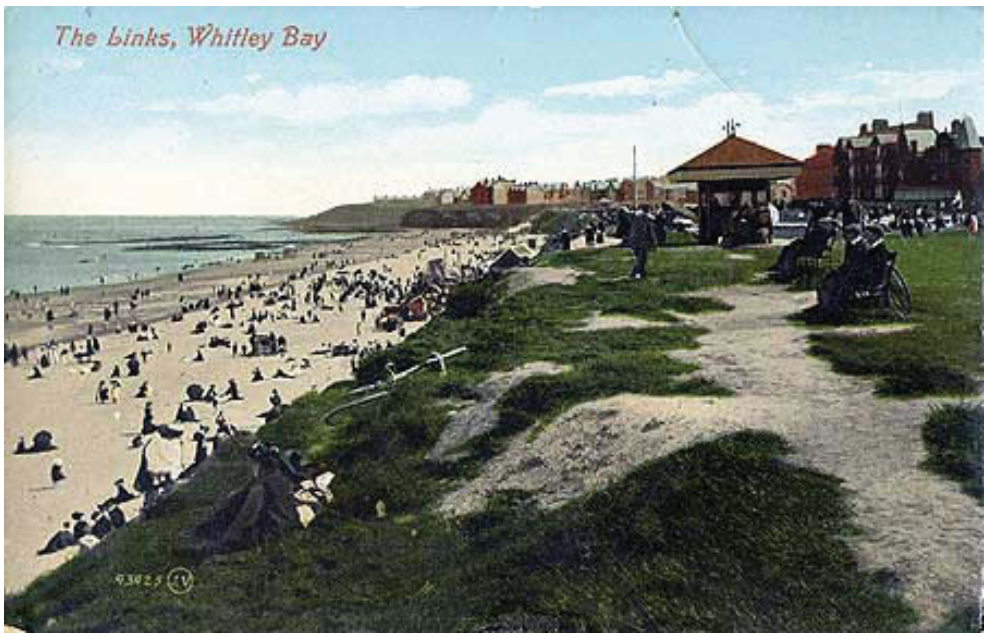

Figure 103: General view from Links Gardens looking down onto the beach and along the coast, Whitley Bay (Tyne and Wear) (© English Heritage, NMR)

Scarborough has been described as 'Britain's first seaside resort' (Waters 2005: 51). An impressive spa building was erected to cater for the mass influx of people who visited the springs, advocating its medicinal 'cistern' waters as a general body cure. In mid 18th century the spa was attracting around a thousand visitors per annum (*ibid*.). Many visitors still use the spa, frequenting the surrounding area with its hillside walks and gardens. Others choose to enjoy other recreational activities such as funfair rides, amusement arcades, public houses and other entertainments of a modern seaside resort (Waters 2005: 56). Scarborough has continued to maintain its position as a major British seaside resort throughout the railway age and into the modern era. There are also various tourist visitor markets in the area attracting a wide range of people (Morfin 1991; Pickles 2002).

In the late 1860s, the Promenade Pier in Scarborough's North Bay was constructed, being a recreational facility intended to attract the lucrative tourist trade in this area. By 1889, this iron-built pier had become rusty, being refurbished with shops and retiring rooms. However, in 1905, severe damage was caused by a destructive storm and the pier was dismantled (Waters 2005: 34).

Figure 104: Scarborough harbour and holidaymakers walking along the pier. Photo taken in 1950s (© English Heritage, NMR)

Figure 105: A view of Scarborough harbour today (© Dave Hooley, English Heritage)

Saltburn is another seaside resort with a pleasure pier built in mid 19th century. Today it includes a recently renovated pier, Victorian buildings, the Valley Gardens, and a smugglers' museum. The coastline is popular with surfers and national surfing events are held in the area, attracting competitors from around the country.

In mid 19th century, Leazes Park (Tyne and Wear) and its lake were created after a petition of working men of having 'ready access to some open ground for the purpose of health and recreation' (http://en.wikipedia.org/wiki/Leazes_Park).

Figure 106: Leazes Park, Newcastle (© English Heritage, NMR)

The wooded gorge of the Ouseburn River in the east of the Newcastle city forms another popular recreation area, linked by Armstrong Park and Heaton Park, where the river finally reaches the River Tyne.

In the 1920s, the valley gardens at Scarborough were described as 'one of the beauty spots' and were a quiet place where families would gather to undertake outdoor activities. Today these parks and woodlands continue to be maintained by the local council authorities (Waters 2005).

Outdoor swimming pools were another recreational feature principally in Tynemouth, Hartlepool and Scarborough during the early 1900s. Today most of these pools have become derelict, either having been grassed over or left to ruin, barely distinguishable from the rocky foreshore. One pool still remains in use at Scarborough, and is one of the few remaining outdoor pools left in the country (Waters 2005: 87). The Tynemouth swimming pool, which was built in 1925, still remains in today's landscape/seascape. Although its associated buildings have disappeared, this swimming pool is one of the best preserved examples in the area and it remained in use until the 1980s. These pools were seen as a modern day replacement for the 'health-giving' dips in the sea which first became popular with the aristocracy, later adopted by the wider population, after doctors advised that sea bathing was a health-giving pastime (Waters 2005).

Figure 107: Tynemouth outdoor swimming pool which remained in use until the 1980s (© Maritime Archaeology Ltd and English Heritage)

The 20th century saw the development of the heritage industry. A 'heritage coast' classification scheme was initiated in 1972 to protect coastlines of special scenic and environmental value from undesirable development. The whole stretch of the North East coastline is designated as a Heritage Coast with coastal heritage sites and facilities which are increasingly used to promote tourism in the region. Some examples include:

- abbeys (e.g. Whitby Abbey),
- castles (e.g. Hylton (Tyne & Ware), Lindisfarne (Holy Island, Northumberland), Durham, Newcastle, Scarborough),
- cathedrals (e.g. Durham, Ripon, York Minster),
- countryside (e.g. Northumberland National Park and North York Moors National Park),
- historic houses (e.g. Alnwick, Beningborough Hall, Burton Agnes Hall, Castle Howard, Wallington Gardens, and Studley Royal, amongst others),
- Roman remains (e.g. Hadrians Wall and Housesteads Fort), and
- museums (e.g. National Railway Museum, and Yorkshire Mining Museum, amongst others).

Numerous hotels were also erected and form a familiar component of the seaside towns in the region.

The chalet and caravan parks in the region mainly comprise late 20th century standard structures. Theme Parks in the region vary in form and extent but most have late 20th century concrete-block buildings.

Some golf courses also were established in the 19th century, but most of them are relatively modern. They are usually landscaped and any possible earlier historical features were removed or damaged (e.g. field boundaries). Clubhouses and ancillary buildings are usually modern concrete-block structures.

Until the late 20th century, recreation in the region had a seaside bias. More recently, there has been a trend shifting towards visiting 'heritage' sites and exploring inland landscapes. However, the increasing popularity of sailing and other water sports has led to marina developments along the North East coast. Several ports and docks now serve as mooring areas for private yachts and pleasure boats.

Other valued recreational activities include angling and diving. Since the early 1990s, the charter angling industry has gone through a period of slow decline, attributed mainly to falling North Sea fish stocks as well as an increase in the number of private vessel owners. Nevertheless, alternative species (e.g. sea bass, tope and pollack) are increasing throughout the region and may provide new opportunities for the charter angling industry (North Eastern Sea Fisheries Committee 2006). Today, all major rivers in the North East (e.g. the Tyne, Coquet, Wear and Esk) have good runs of salmon and sea trout. The Tyne is an improved river in its water quality and this is reflected in the excellent salmon catches. After recovering from decades of pollution in its lower reaches, even the River Tees is now seeing an increase in the numbers of salmon and sea trout. Wild brown trout are found in most streams in the area and many reservoirs provide excellent sport for both brown and rainbow trout. The number of stillwaters offering excellent coarse fishing opportunities for beginners and experienced anglers alike has increased markedly in recent years (Environment Agency 2009).

Although the North Sea is one of the world's best areas for wrecks, diving in the region is patchy. The Farne Islands, for example, are a popular scuba diving location. The islands appeal to divers because of the seals, wrecks and a variety of sites suitable for all levels of diver. There are also several diving clubs along the North East coast.

Seaside towns have experienced change over the years, due to the changing tastes of the region's visitors. For example, the Quayside, an area along the banks of the River Tyne in Newcastle upon Tyne, has been recently modified to provide a modern environment for modern arts, music, housing, culture as well as bars and night clubs. One of the Quayside's main features is the Gateshead Millennium Bridge. The Sage Gateshead performing arts and conference centre is also a prominent landmark.

VALUES AND PERCEPTIONS

The coast along the North East provides a wide variety of choice for different tastes as far as this Character Type is concerned. This is in contrast to the more hectic and mainstream attractions of some other English seaside resorts such as Blackpool and Brighton.

This Character Type causes pronounced contradictory feelings. Some people dislike recreation sites because they are seen as blots on the landscape as well as the physical manifestations of the annual invasion of tourists bringing cars and noise to the region. In contrast, other people perceive recreation sites as representing the region's economy and offering long term security.

Other attractions to this region come from legends that are associated with certain places, such as the famous monkey-hanging legend that is connected with Hartlepool. During the Napoleonic Wars, when the threat of a French invasion of England was very real, a French ship was wrecked off the Hartlepool coast and its mascot monkey tried and hanged as a French spy (see http://www.thisishartlepool.co.uk/history/thehartlepoolmonkey.asp). Whether true or not, local people are attached to this story and even a local rugby team proudly use the nickname of the Monkeyhangers.

RESEARCH, AMENITY AND EDUCATION

Tourism has had a profound impact on the region's recent economy, infrastructure and social structure. However, the potential for further research of this Character Type could be limited to understanding the history of tourism at a regional level, understanding the local and regional historic environment to better inform future developments and developing tools to enable the prediction of tourism impacts with established mitigation measures. Although this Character Type is an amenity for many people, for others it reduces the amenity value of the North East coastline due to the massive impact that tourism has in certain places.

The Dig, Dive and Discover project took place at Hartlepool in 2006, and was funded by the Heritage Lottery Fund's 'Young Roots' initiative. It aimed to make young people more aware of their local heritage and enable them to share it with the community. In this project, Hartlepool Sea Cadets were encouraged to explore Hartlepool's rich maritime heritage bringing different organizations together such as the Hartlepool Diving Club, Hartlepool's Reference Library and The Nautical Archaeology Society (North East). Furthermore, the Nautical Archaeology Society undertakes a wide range of educational activities in nautical archaeology at all levels and encourages the participation of members of the public at all stages (http://www.nasportsmouth.org.uk/index.php). These initiatives provide opportunities for substantial community involvement by combining recreation with raising public awareness about the region's history.

CONDITION AND FORCES FOR CHANGE

Tourism has risen lately in the North East region together with diving and leisure fishing, representing a source of income and employment for this area.

Because of their coastal location, recreation facilities along the North East coast, although with no specific protection, generally fall within designations such as SSSIs, SPAs, SACs, RAMSARs, Heritage Coasts, National Parks and Nature Reserves. However, recreational activities are regulated by local and harbour authorities and by recreational groups.

In general, the construction of chalet/caravan and theme parks removes earlier historical features on the regional landscape/seascape. Golf courses often retain some

fragments of field systems or ancient woodlands in their landscaping, although these features are often fragmented. Golf courses are still being created in the region and chalet/caravan parks expanded. Theme parks are also being established.

World War II defensive structures and post-war industrial remains, which were once ignored, are now being recorded and seen as an important part of the region's heritage, enjoyed by visitors and locals.

RARITY AND VULNERABILITY

Within this Character Type, refurbishment and updating represent a threat to some early features in the North East region. For example, the creation of golf courses and caravan parks involve dismantling of existing landscape features and the creation of new ones. Furthermore, constraints on development initiatives in the region are beginning to exert control on the locations and forms of recreation complexes.

Diving clubs that dive on unknown wrecks could potentially provide local archaeologists and historians with a wealth of new and valuable information on these sites. Collaboration between local divers, archaeologists and historians should be encouraged providing opportunities to continue developing general public awareness.

The rise of foreign travel has had an adverse affect on some of the region's coastal resorts, such as Redcar, Saltburn and Seaton Carew. Further work could usefully define and describe the unique elements of their landscape (Petts & Gerrard 2006: 196) leading to an increase in their tourism potential.

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1.2.11 Broad Character: Settlement

1.2.11.1 Character Type: Settlement

INTRODUCTION: DEFINING/DISTINGUISHING ATTRIBUTES

The coastal area of the North East region is predominantly rural. It contains sparsely populated areas with scattered small towns and villages. Areas of dense population are associated with industrial centres such as the Tyne and Wear, County Durham, and Teesside, as well as the ports of Tyne, Whitby and Scarborough, for example.

HISTORICAL PROCESSES; COMPONENTS, FEATURES AND VARIABILITY

The location of settlements along the North East coast of England is generally associated with offering shelter from storms and a safe haven for boats, Sunderland, Staithes, Runswick, and Scarborough being examples. Fresh water was another crucial consideration since it is a critical resource for survival. Several fishing settlements grew up where becks and rivers entered the sea (Frank 2002: 43).

In fishing villages, houses are generally built as close as possible to the waterside. In this way, the fisherfolk could be constantly near to fishermen's boats, the main means of their livelihood. At Whitby the fishing community lived in the narrow streets by the harbour (Frank 2002: 44).

Figure 108: A general view of Whitby harbour (© Dave Hooley, English Heritage)

Howick is a village in Northumberland. A Mesolithic site was found in this village (known as Howick House Mesolithic Site) due to flint tools eroding out of a sandy cliff. This Mesolithic settlement was occupied for a period of about 100-300 years from *circa* 8000 cal BC (Waddington 2007). It is thought that this site was possibly a permanent residence for hunter-gatherers since Howick is a place where natural resources would have allowed all year round occupation. Its coastal position provided animals, flint for tools, wood for construction and fuel, fish, seals, sea birds and their eggs, shellfish and nearby sources of fresh water (Waddington 2007). This early example illustrates the time-depth of the landscape in this part of the region.

The development of the modern town of Blyth began in the first quarter of the 18th century. The main industries which helped the town prosper were coal mining and shipbuilding, with the salt trade, fishing and the railways also playing an important role. These industries have largely vanished, but the port still thrives. The town was seriously affected when its principal industries went into decline, and it has undergone much regeneration since the early 1990s. The market place has recently been re-developed, with the aim of attracting further investment to the town. The Quayside has also seen much redevelopment and has been transformed into an open space, the centrepiece of which is a sculpture commemorating the industry which once thrived there.

Newcastle upon Tyne is a city and metropolitan borough of Tyne and Wear which developed from a Roman settlement called Pons Aelius (Welch 1963; also see http://www.roman-britain.org/places/pons_aelius.htm). However, its name derives from

a castle built in 1080, by Robert II (eldest son of William the Conqueror). The city grew as an important centre for the wool trade. It later became a major coal mining area. In the 16th century, the port developed along with the shipyards lower down the river, being amongst the world's largest shipbuilding and ship-repairing centres. Since then, these industries experienced severe decline and closure, and the city today is largely a business and cultural centre.

Figure 109: A view of Newcastle upon Tyne (© English Heritage, NMR)

Whilst there is evidence of human activity on the Durham coast from the Mesolithic period onwards, there is scarce evidence of coastal settlement until medieval times. The coal industry transformed the County of Durham since many towns and harbours, such as Seaham, were built specifically for the coal trade.

Redcar originated as a fishing town in the 1300s, trading with the larger market town of Coatham. In the 1840s, work on the Middlesbrough and Redcar Railway was finished. This was created to attract local tourism and trade, but like much of the Middlesbrough region, Redcar's population expansion began with the discovery in 1850 of iron ore in the Eston area of the Cleveland Hills. Redcar means ‘red marsh’ from the Old English rēad "red" and Old Scandinavian kjarr. The name refers to the low lying land by the sea on which Redcar lies.

By the early 19th century, Middlesbrough was still a small farm of around twenty five people. In 1830, Stockton and Darlington Railway line was extended to Middlesbrough. This contributed to a rapid expansion of the surrounding towns and ports. By the 1850s, Middlesbrough's population had grown and it was rapidly replacing Stockton as the main

port on the Tees. Today, Middlesbrough can be considered the heart of the Teesside conurbation and the modern 'Capital' of the area.

The fishing village of Runswick is 'a singular rookery of cottages built with only walking space between them, one above another in the cliff side…' (Frank 2002: 47). This close proximity to the sea and cliffs meant that these settlements were often exposed to sea erosion. At Runswick, some portions of the cliff have fallen off and houses were often damaged or fully demolished (Frank 2002: 48).

In other places such as Whitby and Scarborough, the fishing community were only part of a larger population. Fisherfolks' homes were working places as well as dwellings, where most of the gear was made, mussels and limpets were shelled, and lines cleaned and baited (Frank 2002: 54).

Figure 110: Whitby town and harbour (© English Heritage, NMR)

Figure 111: Scarborough old harbour and town, photo taken in the 1950s (© English Heritage, NMR)

The development of ironstone mining contributed to the formation of many of the small villages we see today in the region. The housing in these small communities was normally provided by the mine owners who also built schools, hospitals, and chapels. The houses were often built in terraces with an allotment to the rear of the house. A number of terraced houses can still be seen in many of the villages today.

Alum works also created a demand for local workers. By the 18th century, some coastal roads in the region were dotted with hamlets for these workers (Chapman 2002: 74). Furthermore, the development of the alum industry, particularly in Whitby, contributed to transform Whitby from a minor fishing station with a modest hinterland into the major Georgian port that it became (Pybus 1991: 54).

From at least the late 19th century, but earlier in the case of Scarborough, some coastal settlements (mostly harbours of fishing settlements) have developed through the tourism industry. However, some cases, such as Ravenscar, represent a failed attempt to turn such settlements into coastal resorts. From the 1960s onwards, the more affordable and attractive climatic conditions offered by the package holiday to the Mediterranean and beyond represented the downfall for many seaside towns. Today, some of these towns are beginning to reinvent and re-launch themselves.

In the 20th century, most settlements in this Character Type also expanded through the provision of housing estates for local families and new residences for a growing population of retired people and people wanting second or holiday homes. There are many settlements that are largely residential now since most of their original industrial, harbour and commercial functions have ceased.

VALUES AND PERCEPTIONS

The majority of settlements along this stretch of coast are hamlets, villages and towns, the cities of Newcastle upon Tyne, Durham and Middlesbrough being exceptions. The hamlets and rural settlements along this coastline are highly valued by both local people and visitors. The numerous 17th century or older buildings add picturesque images and antiquity to the places.

Figure 112: A view of the Middlesbrough and the Transporter Bridge from the shore at low tide (©English Heritage, NMR)

The mining and fishing communities are remembered nostalgically as having been special places, where it was safe to leave the door unlocked. Everybody knew everybody, making the community a safe place to live.

RESEARCH, AMENITY AND EDUCATION

Some coastal towns and villages are important elements of the North East region's tourist industry, often as seaside resorts or refuges on rainy days. Many have historical features (e.g. churches, castles and bridges) which are displayed to visitors and some have interpretative leaflets or booklets to guide people around. There is, however, considerable potential for outreach and public awareness initiatives to further promote the unique and shared past that most towns have. This can be aimed at towns'

inhabitants, particularly children, and visitors, increasing peoples' awareness of the historical value of their homes.

Towns and villages are generally important as features of the landscape, having a wealth and great variety of historical and archaeological components, demonstrating considerable time-depth and contributing to the North East appearance and character. This has potential for further archaeological and historical research as well as the development of education and outreach initiatives.

CONDITION AND FORCES FOR CHANGE

Although settlements, as hubs of human activities, go through continuous change, the layouts and historic fabrics of most of them are relatively well preserved. There was minimal bombing damage in World War II in the region, except at Hartlepool. The main streets of most towns have essentially 19th century or earlier frontages with relatively few disfiguring, modern, standardised shop windows and signs.

It is likely that subsurface remains are well preserved where settlement layouts have suffered little change. In general, rural settlements are also well preserved in the North East region, with modern developments usually seen as lateral expansions (rather than replacements) from an historic core.

The survival of street plans in most towns provides a valuable insight into the organisation and development of those towns. Over the centuries, most towns were established as foci of activities developing through time and generally seen as sequences of relationships of features. For example, at Durham, the 11th century castle still dominates the area but other later features, built or created in relation to it, have formed nuclei for other streets and buildings.

The character of towns is being fundamentally changed by the construction of new housing, often in the form of estates with almost identical houses whose architecture does not always appear to have its roots in the North East traditions.

RARITY AND VULNERABILITY

Towns and villages are generally important as features of the landscape, having a wealth and great variety of historical and archaeological components, demonstrating considerable time-depth and contributing to the North East appearance and character.

Rural settlements are vulnerable to conversions from agricultural or industrial to purely residential accommodation. Their change in character could be attributable in some cases to the creation of mini-suburbs in the countryside and the possible disturbance of their historical meaning and distinctiveness.

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