RAPID COASTAL ZONE ASSESSMENT SURVEY NATIONAL MAPPING PROGRAMME FOR SOUTH-WEST ENGLAND - SOUTH COAST DEVON:

National Mapping Programme Report

English Heritage Project Number 6046

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Rapid Coastal Zone Assessment Survey for South-West England - South Coast Devon

Component One

National Mapping Programme

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Rapid Coastal Zone Assessment Survey National Mapping Programme for South-West England - South Coast Devon

A National Mapping Programme Report

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Figures

This report is intended for paperless distribution. The figures in this report are therefore optimised for on-screen viewing and detail may be lost if printed.

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Abbreviations

AP	Aerial Photograph
AONB	Area of Outstanding Natural Beauty
BGS	British Geological Survey
CCO	Channel Coastal Observatory
CUCAP	Cambridge University Committee for Aerial Photography
DAP	Devon Aerial Photograph
DBA	Desk Based Assessment
DCC	Devon County Council
DCA	Devon Character Areas
DCCHER	Devon County Council Historic Environment Record
DCCHET	Devon County Council Historic Environment Team
EA	Environment Agency
EH	English Heritage
EHA	English Heritage Archive (formerly the National Monument Record)
GIS	Geographical Information System
HLC	Historic Landscape Characterisation
LIDAR	Light Detection And Ranging
MORPHE	Management of Research Projects in the Historic Environment
NCA	National Character Areas
NE	Natural England
NHPCP	National Heritage Protection Commissions Programme
NHPP	National Heritage Protection Plan
NHRE	National Record for the Historic Environment
NMP	National Mapping Programme
NMR	National Monument Record (now renamed as English Heritage Archive)
NNR	National Nature Reserve
OS	Ordnance Survey
PAO	Project Assurance Officer
PDF	Portable Document Format
PGA	Pan-Government Agreement
RAF	Royal Air Force
RCHME	Royal Commission on the Historical Monuments of England
RCZAS	Rapid Coastal Zone Assessment Survey
SAC	Special Area of Conservation

SPA	Special Protection Areas
SMP	Shoreline Management Plan
SSSI	Sites of Special Scientific Interest
WHS	World Heritage Site

The First Edition Ordnance Survey 25 inch mapping dating to the 1880s-1890s is referred to throughout the document as ‘First Edition OS’, and similarly the 1904-1906 Second Edition Ordnance Survey 25 inch maps are referred to as ‘Second Edition OS’.

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This survey was commissioned by English Heritage. All interpretations, transcriptions and HER records were created by Cain Hegarty, Richard Sims and Stephanie Knight. Helen Winton of EH Aerial Survey and Mapping acted as NMP Quality Assurance Officer. Sarah Maclean acted as Project Assurance Officer.

DCC HER training, support and quality assurance was provided by Graham Tait and Ann Dick. The project was overseen by Bill Horner, County Archaeologist for Devon County Council, who also provided occasional advice on interpretation and invaluable local detail. John Valentin was line manager for the AC archaeology NMP Team and he and Sarnia Blackmore helped produce project documentation.

The project was primarily carried out using aerial photographs loaned by the English Heritage Archive and Cambridge University Collection of Aerial Photographs (CUCAP). The EH Archive aerial photographic loans and digital geographical data for aerial photographic coverage were administered by Luke Griffin. The CUCAP loans were administered by Alun Martin. We are grateful to CUCAP for permitting the reproduction of their images in this report. Environment Agency lidar imagery and recent vertical aerial photograph coverage was supplied to the survey in digital format via the Pan-Government Agreement (PGA) by EH Aerial Survey and Mapping. High quality recent digital vertical aerial photograph coverage was made available to the survey by the Channel Coastal Observatory, with particular thanks to Emerald Siggery, Coastal Process Scientist at the Plymouth Coastal Observatory.

Devon Aerial Photographs (DAPs) were supplied by Devon County Council for use in the survey. They are not to be reproduced in any way without the prior written consent of Devon County Council Historic Environment Service. Most archaeological sites in Devon are on private land. Depiction of a site on an aerial photograph, or its inclusion in the Historic Environment Record, does not imply any right of public access.

A number of individuals and organisations provided images and information which have aided interpretation and been included in this report, and to which we are indebted. In no particular order, these include; Roger JC Thomas, Barbara Bender, Nicky Smith and Andy Watson.

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

1 Summary

This report provides a thematic discussion of an archaeological aerial photographic survey of the South Devon coast. The survey covered 414.5 square kilometres of coast and estuary from Plymouth Unitary Authority in the west to the county boundary with Dorset in the east. The interpretive survey followed English Heritage's National Mapping Programme (NMP) methodology.

The project forms component one of the Phase 1 Rapid Coastal Zone Assessment Survey (RCZAS) for the south coast of Devon, part of a suite of projects that constitutes the South West England RCZAS. The South West RCZAS programme of works covers the coastline from the Devon/Somerset boundary in the north to the Dorset/Hampshire boundary in the south. The survey was funded via the English Heritage National Heritage Protection Commissions Programme (NHPCP) and carried out by staff from AC archaeology hosted by Devon County Council Historic Environment Team (DCCHET). Work began in April 2013 and was completed in June 2014.

The general aim of the survey was "to enhance the understanding of past human settlement, by providing primary information and synthesis for all archaeological sites and landscapes visible on aerial photographs or other airborne remote sensed data". This comprehensive synthesis of the archaeological data available on aerial photographs is intended to assist research, planning, and protection of the historic environment" (Horne 2009). Relevant information identified from aerial photographs was interpreted and mapped to a consistent standard and recorded in a digital geographical information system (GIS) and the Devon County Council Historic Environment Record (DCCHER). The project results are available through the (DCCHER), which is publicly accessible on the web.

Being recorded directly into the DCCHER will ensure that the survey results are available to inform strategic and responsive planning and land management advice through DCC. The results are also available for general research. In particular the results will inform Component Two of the Phase 1 RCZAS, a desk-based assessment (DBA) that will take place on completion of Component One.

1501 archaeological features were transcribed during the project, of which 398 were previously recorded on the DCCHER. Of particular significance are extensions to prehistoric field systems, enhanced knowledge of hillfort earthworks, previously unrecorded deserted medieval settlements, possible post-medieval coastal fortifications and an unusual lowland water meadow.

A key outcome is a better understanding of the extent of the Second World War anti-invasion defences along the South Devon coast, including the Taunton Stop Line, and the changing character of the coast in the build up to D-Day, particularly in relation to training activity.

An additional outcome is an insight into the chronology of field boundary loss around medieval settlements. Significantly, archaeological remains were poorly represented both in the coastal and estuarine intertidal zones. This might partly be explained by the profile of many of the estuaries that originated as rias or drowned valleys, and the often inaccessible or hardened nature of much of the South Devon coastline.

2 Introduction

2.1 Circumstances and Reasons for the Project

AC archaeology was commissioned by EH to carry out a Rapid Coastal Zone Assessment Survey Phase One Desk-based Assessment and National Mapping Programme (NMP) for South-West England (South Coast Devon). These form part of a national programme designed to inform EH's responses to Shoreline Management Planning and the developing Defra 'Adaptation Strategy'. This report is concerned with the NMP component only.

2.2 Background to the Project

England's coastal zone contains a legacy of historic assets including a complex array of fragile and irreplaceable archaeological remains, historic buildings and structures, and entire landscapes. These remains are vulnerable to a wide range of threats, including anthropogenic pressures, such as those associated with commercial development and shoreline management, as well as natural processes of coastal change. It is now generally accepted that coastal physical processes are being forced by changes in annual rainfall distribution and wave direction, relative sea-level rise and an increase in storm incidence, all associated with wider climate change.

Over recent decades it has been recognised by coastal managers and Government that the entire English coastline cannot be maintained in its present form through the 21st century and that, where possible, natural processes should be allowed to operate. Coastal management is now viewed more holistically, taking into account not just the need to protect life and property but also environmental and social factors, as part of the move towards Integrated Coastal Zone Management.

Defra's programme of shoreline and estuary management contributes to this development. A Shoreline Management Plan (SMP), for example, provides "a large-scale assessment of the risks associated with coastal processes and presents a policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner" (Defra 2001; 2005).

The process of Shoreline and Estuary Management Plan development is consultative, drawing on information provided by, and balancing the needs of, sectoral interests. Effective participation by the heritage sector depends, first, on identifying coastal historic assets, evaluating their significance and potential, and assessing which may be at risk from coastal change. Data collection, interpretation and synthesis for the Rapid Coastal Zone Assessment Surveys must be directed primarily towards these aims.

In 1997 English Heritage and the RCHME published a joint policy statement on the management of coastal archaeological remains (EH and RCHME 1996) and a nationally-based assessment of English coastal archaeology (Fulford et al 1997). These documents were followed by more specific guidance (EH 2003 and 2006). The assessment highlighted the poor quality of archaeological records relating to the coast and the policy statement recommended that: "The record of coastal archaeology held nationally and locally should continue to be actively

developed and enhanced in order to permit effective management of the resource and to facilitate understanding of England's development as a maritime nation".

Whilst the advantages of thematic surveys on the coast were acknowledged by the assessment, it was also noted that the quality of the available record of coastal remains was such that in many areas any such detailed studies would need to be preceded by rapid baseline surveys allowing a broad assessment of the range of historic assets available on the coast, their significance and their vulnerability.

It is for this purpose that in the late 1990s EH initiated a national scheme of RCZAS for the English coast. By 2010 much of the coastline had been assessed and the South Devon coast and estuarine zone is one of the last areas to be completed. The survey was funded by the EH National Heritage Protection Commissions Programme (NHPCP).

The NMP component of the RCZAS will inform a desk-based assessment which will in turn further enhance the DCCHER. The subsequent Phase 2 of the RCZAS process, yet to be commissioned, will comprise a rapid walk-over field assessment intended to verify records from Phase 1, locate and characterise site types not visible from the air, and assess site significance and vulnerability.

2.3 Overview of NMP Methodology

The air photograph mapping and recording tasks for the AONB were undertaken by the AC archaeology NMP team embedded within DCC HET at County Hall, Exeter. The project followed current NMP standards and methodology with a few minor variations arising from use of GIS as mapping software (Winton 2012; Hegarty 2013). A summary of the archaeological scope of the project is included in Appendix B.

The NMP methodology involves the systematic examination of all readily available aerial photographs and other remote sensing data, such as lidar, to compile a comprehensive synthesis of the archaeological information available on the aerial photographs. This synthetic data is incorporated into the DCC HER and EH Archive and is intended to assist research, planning, and protection of the historic environment (Horne 2009). NMP surveys typically do not include a field element, but provide valuable baseline historic environment data for further research or follow-on field investigations.

Comprehensive background to the NMP methodology and best-practice is available in the Strategy for the National Mapping Programme (Horne 2009) and the Management of Research in the Historic Environment (MoRPHE) Project Management Planning Note 7 Interpretation and mapping from aerial photographs and other aerial remote sensed data.

The methodology developed for NMP transcription and recording for projects based at DCC HET, as employed during this survey, is summarised in Appendix C.

3 Aims and Objectives of the Survey

3.1 Aims

3.1.1 Introduction

The general aims of an NMP survey can be summarised as:

"to enhance the understanding of past human settlement, by providing primary information and synthesis for all archaeological sites and landscapes visible on aerial photographs or other airborne remote sensed data. This comprehensive synthesis of the archaeological data available on aerial photographs is intended to assist research, planning, and protection of the historic environment." (Horne 2009).

The first aim of the RCZAS is:

"to provide heritage information which can be fed directly into Defra and the Environment Agency's Shoreline and Estuary Management Programme, at the levels of Plans, Strategies, and Schemes, thereby helping to ensure appropriate protection of, or mitigation of damage to, historic assets. For future planning at a national level, the results from the RCZAS will be considered in relation to the proposed Defra 'Coastal Erosion Risk Maps' to determine the numbers, types and significance of historic assets at risk, and over what time-scale. From this, the present intention is to develop a prioritised national programme of mitigation. The enhanced NHRE and HER records will also provide Local Authority archaeologists with information relevant to mitigation consequent upon commercial and infrastructure developments." (EH 2012).

Further aims and objectives specific to this project are set out below:

3.1.2 Aims

The general aim of the South Devon coast RCZAS NMP component is commensurate with the overarching aim for the NMP, which is to enhance the understanding of past human settlement, by providing primary information and synthesis derived primarily from aerial photographs for all archaeological sites and landscapes from the Neolithic period to the twentieth century.

More specific aims were defined as:

- Facilitating the provision of baseline Historic Environment data for input to Shoreline Management Plans by defining, characterising and analysing the historic environment of the South Devon coast and Estuarine Zone.
- Facilitating the implementation of the Management Plans for the historic environment for Devon County Council, the East Devon AONB and the South Devon AONB.

3.1.3 Objectives

These aims were achieved through meeting the following objectives:

- The production of NMP standard geo-referenced digital transcriptions of the form and extent of all archaeological sites and landscape features within the RCZAS project area visible on aerial photographs, directly within the DCC HER GIS.

- The production of NMP standard monument records and their incorporation directly into the DCC HER, thereby making the Component One (NMP) results more readily available to the RCZAS Component Two DBA.
- The dissemination of the project results via a project report containing an overview of methodology, sources, and archaeological highlights to facilitate the assessment of the wider SW RCZAS project area and inform future NMP projects in the region.

4 The Project Area

The project covered a total area of 414.5 square kilometres of coastal and estuarine zone (see Figure 1). This included:

- The South Devon coast RCZAS component one (NMP) minimum area of 381 square kilometres comprising a coastal and estuarine strip along the South Devon coast between Andurn Point at Plymouth Sound to the Devon border with Dorset, south of Lyme Regis.

- Two additional areas totalling 33.5 square kilometres included to complete NMP coverage between the South Devon coast RCZAS component one (NMP) project area and the survey area of the East and Mid Devon River Catchments NMP project, (Project Number 6634).

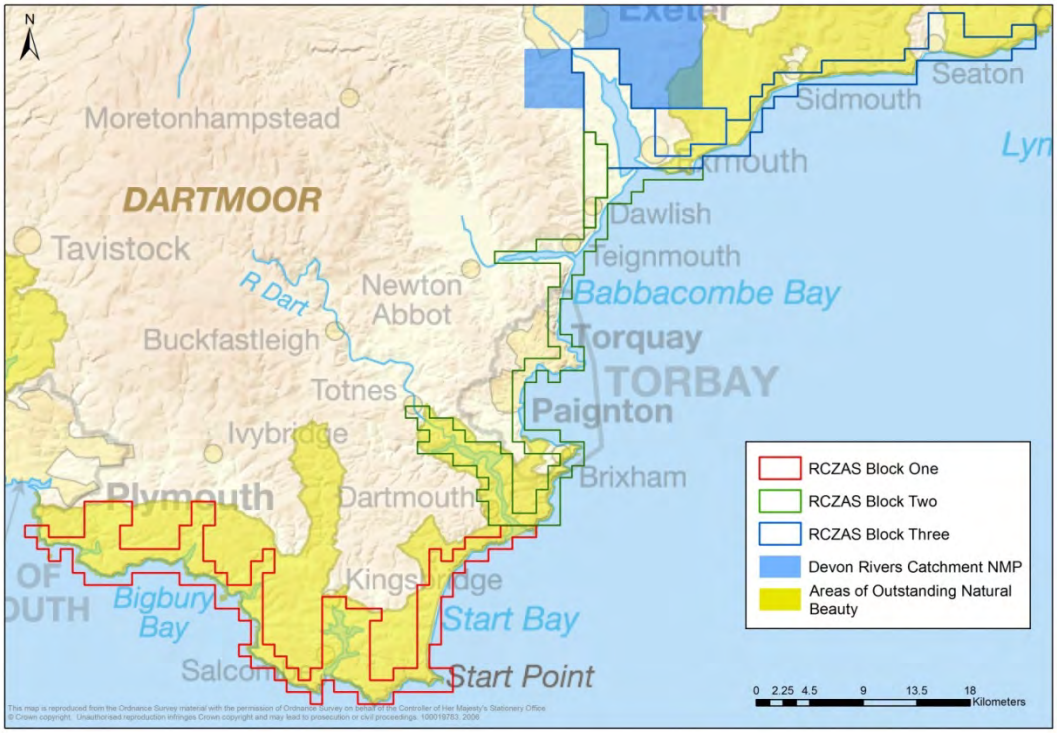

Figure 1: South Coast Devon NMP Project Area. © Crown Copyright and database right 2013. Ordnance Survey 100019783.

The project area was divided into three blocks, which were further sub-divided into Sub-Blocks to facilitate project management.

- Block One – Plymouth to Dartmouth (163 square kilometres, Sub-Blocks A-E)
- Block Two - The Dart Estuary to Exmouth (120.5 square kilometres, Sub-Blocks F-H and additional area M)
- Block Three – The Exe Estuary to Lyme Regis (131 square kilometres, Sub-Blocks J-L and additional area N)

Mapping of complete one kilometre squares is the standard for NMP projects. However, for RCZAS projects, mapping may be reduced in pre-war urban areas. Therefore, in these areas, the RCZAS NMP component may be reduced to the seaward side of a line drawn 100m inland from the mean high water (English Heritage 2012, 4). A detailed timetable and resource assessment (Hegarty 2013)

concluded that the potential of the aerial survey methodology within the urban areas was not high and that completing the full survey area, and thereby providing valuable contextual data for the coastal strip, would not have a detrimental impact on the survey timetable.

4.1 Areas of Outstanding Natural Beauty

The county of Devon contains a high proportion of protected landscapes, including five AONBs. In these designation areas the local authorities have a statutory duty to have regard to the protection and enhancement of the landscape and a responsibility to prepare and adopt management plans.

The RCZAS project area intersects with two AONBs; the South Devon AONB and the East Devon AONB (Figure 1). Approximately 153 square kilometres of the South Devon AONB fall within the survey area. Over 47 square kilometres of the coastal strip of Block Three falls within the East Devon AONB.

4.2 World Heritage Sites

Located on the south coast of England, the Dorset and East Devon Coast World Heritage Site, more commonly known as the Jurassic Coast, comprises eight sections along 155 km of coast from Exmouth in East Devon to Swanage in Dorset. Inscribed onto Unesco's World Heritage list as England's first natural World Heritage Site in 2001, the Jurassic Coast includes a near-continuous sequence of Triassic, Jurassic and Cretaceous rock exposures, representing much of the Mesozoic era (251-66 million years ago) or approximately 185 million years of the Earth's history (http://whc.unesco.org/en/list/1029).

Approximately 35 km of the Jurassic Coast is in East Devon, consisting of mostly Triassic and Cretaceous rocks (Figure 2). The width of the designated area varies from approximately 30 m wide, as at Ladram Bay near Sidmouth, to approaching 700 m wide at Ware Cliffs, west of Lyme Regis. The varying width reflects the changing sequence and characteristics of the coastal geology, from the relatively stable Triassic rocks of the Devon coast to the Jurassic rocks of Dorset more prone to landslides; known as the Spittles, the cliffs above Back Beach east of Lyme Regis, some 2km to the east of the survey area, are part of the biggest landslip in Europe (http://www.lymeregis.org/have_fun/beach/). This WHS equates to an area of nearly 700 hectares (7 square kilometres) within Blocks Two and Three of the survey area.

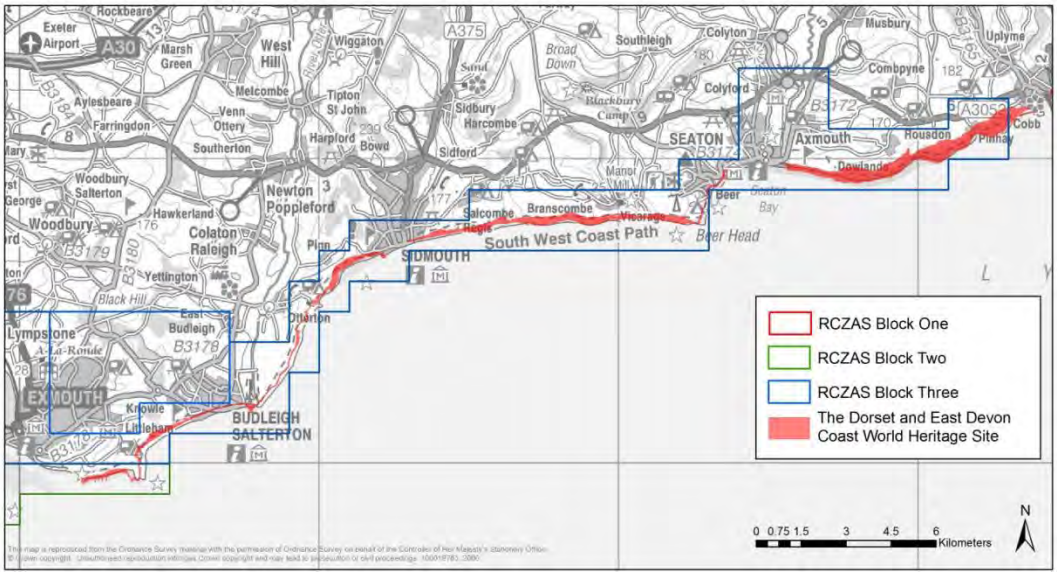

Figure 2: The Jurassic Coast WHS. © Crown Copyright and database right 2013. Ordnance Survey 100019783.

4.3 Geology and Soils

The solid (bedrock) geology and s oils of the coastal and i nter-tidal zone are varied, contributing to its diverse character (Figure 3). To summarise the geological sequence from west to east, from Block One to Block Three, the formations of the south coast of Devon progress from the Devonian (the oldest in Devon formed at c.416-359 million years), to the Permian (c.350-300 million years), the Triassic (250-200 million years ago), the mid-Cretaceous (formed about 100 million years ago), and finally at the very eastern edge of the project area, forming the western extent of the Jurassic Coast World Heritage Site, the Lower Jurassic (formed about 200 million years ago).

The geological description below is taken from BGS data as supplied to DCC (© NERC) and informed by summaries produced by DCC. Basic soil information has been accessed from Cranfield University's Soilscapes website.

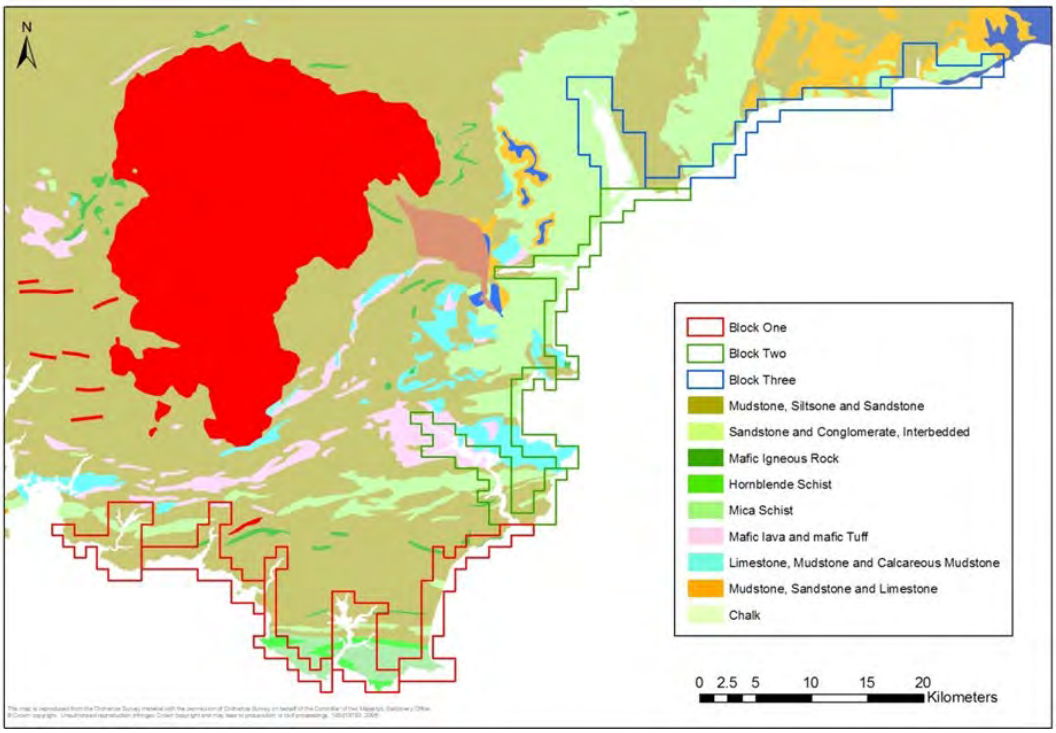

Figure 3: Bedrock geology of the South Devon coast, © NERC.

Block One – Plymouth to Dartmouth (West to East)

Block One is dominated by Devonian Sandstones with significant formations of Slates and volcanic rocks. The oldest rocks in this area are the Dartmouth Slates which form bands from Plymouth to Brixham, intersecting the project block to the east and west.

These bands run to the north of the hard Lower Devonian schist rocks that form the Start–Bolt coastal complex. This comprises two metamorphic rocks, Mica Schist and Hornblende Schist. These schists are found only in the southernmost part of Devon around Salcombe, underlying the coastal landscape from Bolt Tail to the west to Hallsands in the east, bisected by the Kingsbridge Estuary. Small bands of Mafic Igneous rock largely of the Dartmouth Group follow the east to west formations across the county, intersecting the project area at the River Erme, the Kingsbridge Estuary and the coast at Torcross and a round Stoke Fleming.

Risks of coastal erosion are low on t he defended sea fronts of Kingswear, Dartmouth and Salcombe. The Start Bay shingle barrier beaches of Blackpool, Slapton, Beesands and Hallsands are dynamic landforms with an ongoing risk of local instability, although few dramatic changes were noted during the survey (Figure 4). The rates of erosion along much of the remaining undefended cliffs, particularly the hard Schist formations is low, although anthropogenic factors have historically had dramatic effects with ongoing impact, as with the destruction of the village of Hallsands. The Devonian geology has largely degraded to freely draining acid soils.

Photograph: Stephanie Knight, September 2013

Photograph: Stephanie Knight, February 2014

Figure 4: The coast at Slapton Sands. Above: view from the sea. Below: coastal erosion following the storms of early 2014.

Block Two - The Dart Estuary to the Exe Estuary (South to North)

The southernmost areas of Block Two see a continuation of the Devonian formations of Block One. To the north, the geology is more varied, dominated by Permian sedimentary breccias and sandstones with layers of volcanic lava and tuff. The Upper reaches of the Dart Estuary, roughly from Dittisham to Totnes, are dominated by the Ashprington volcanic formations. A concentration of mudstone, siltstone, limestones, sandstones and mudstones of the Meadfoot, Torquay Limestone and Nordon groups can be seen forming the headland at Torquay, with a small area of Mafic Igneous Rock out-cropping. The remainder of the Block Two shoreline from Torbay to the mouth of the Exe comprises breccias and sandstones of the Oddicombe, Heavitree and Alphington, Dawlish and Exeter Groups.

The Permian geologies are susceptible to erosion but the route of the mainline London to Cornwall railway runs along the foot of the coastal cliffs much of the

way between Dawlish and Teignmouth and is protected by well maintained sea defences. However, the conspicuous damage to these defences at Dawlish in early 2014 has reignited the debate about how vulnerable this route and associated defences are (Figure 5).

Freely draining acid but base rich soils and freely draining slightly acid loamy soils dominate Block Two, with the exception of a narrow finger of freely draining slightly acid soils inland of Dawlish to Topsham. This area has confirmed expectations and proved the most cropmark-rich section of the survey area.

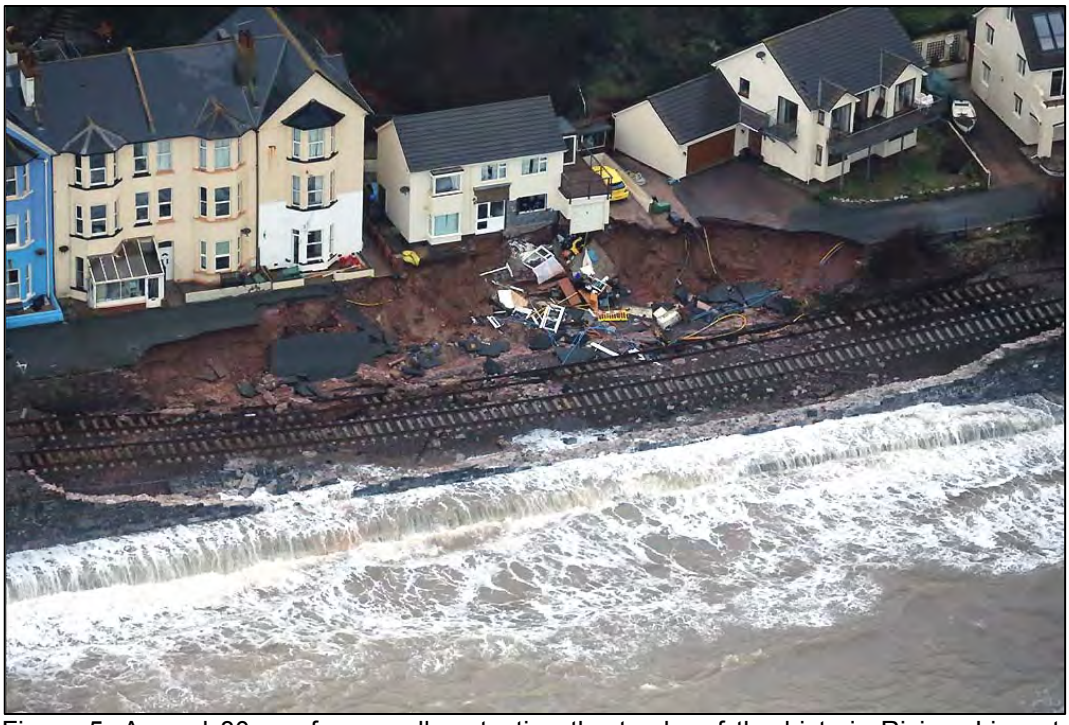

Figure 5: Around 80 m of sea wall protecting the tracks of the historic Riviera Line at Dawlish was destroyed by a storm on the 4th February 2014. Image reproduced courtesy of Network Rail.

Block 3 – The Exe Estuary to Lyme Regis (West to East)

The Permian Breccias continue into the Exe Estuary, from Exmouth to Exeter, but east and north of the Exe the geology comprises interbedded sandstone and conglomerate of the Triassic period and Greensand of the mid-Cretaceous. Significant outcrops of chalk can be found along the coast to the east of Block Three, from Salcombe Regis to Seaton and from Axmouth to the south-west of Lyme Regis. These are the most westerly chalk outcrops in England and are a westward extension of the chalk of the more thoroughly studied coastal chalk landscapes of South East England. Lower Jurassic limestones and mudstones are found only in the extreme east of Devon near Lyme Regis and Axminster. Superficial deposits of Clay-With-Flints occur on the chalk.

Nonetheless, this almost continuous sequence of Triassic, Jurassic and Cretaceous rock formations spanning the Mesozoic Era contributed to the coastline from East Devon into Dorset being designated as England's only natural World Heritage Site, popularly known as the Jurassic Coast (http://whc.unesco.org/en/list/1029).

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Figure 6: The coast at South Down Common, near Beer. The unstable nature of the coastal cliffs is apparent. Note the earthwork banks of the prehistoric field system abutting the cliff edge. NMR 23339/21 24-MAR-2000 © English Heritage

Much of the Block Three coastline suffers from a high rate of erosion and is susceptible to landslides (Figure 6). Unstable sea cliffs occur in the mudstones and sandstones, especially along the coast east and west of Sidmouth and east of Exmouth. Well recorded landslides have occurred in the chalk near Beer and Lyme Regis. The Undercliffs landslide on the Jurassic rocks west of Lyme Regis is one of the best known examples in UK.

The complex geology in this area has contributed to varied soil cover across Block Three. From Exmouth to Sidmouth the soils are made up of roughly north to south banded slightly acid loams and clays with impeded drainage, slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils, freely draining very acid sandy and loamy soils and freely draining slightly acid

loamy soils. Loamy and clayey floodplain soils with naturally high groundwater line the course of the River Otter. From the Otter eastwards into Dorset the soils of the project area largely comprise densely intermixed slightly acid freely draining loamy soils and less well drained clayey soils, with pockets of freely draining lime-rich loamy soils around the chalk geology at Beer.

Interestingly this pocket of freely draining soils and outcropping chalk bedrock has not lived up to the potential for archaeological cropmarks outlined at the Project Design stage (Hegarty 2013, 42), but is an area with potential for further aerial reconnaissance.

4.4 Agricultural Land Classifications

Although primarily a coastal landscape, the influence of agricultural land quality and resultant use on the NMP methodology requires that the agricultural land classification (ALC) within the project area be considered, and this is briefly summarized here. The current descriptions of the ALC grades, as revised by the Ministry of Agriculture, Fisheries and Food (MAFF 1988), are listed in Appendix A; also see Figure 89.

Block One is arguably the most agriculturally active of the three project blocks. Small pockets of grade two soils are located to the interior of the block, but much of the area is made up of grade three with grade four land around the estuarine zones. Grade five and non-agricultural land can be found along the coastline.

With the exception of the contextual areas of the Dart and Teign estuaries which range from grade two to four and a small area of grade five land to the south of Shaldon, much of Block Two is dominated by the non-agricultural urban sprawl of the Torbay conurbation. The exception is the additional area to the north (Sub-Block M) which contains a high proportion of grade one and two land and has demonstrated very high potential for cropmark visibility.

Block Three contains smaller areas of urban development but along with coastal cliffs, dunes and heath a significant proportion of this area is classified as non-agricultural, with small intermixed areas of grade three and four agricultural land. In a continuation of the pattern seen in Block Two, the Exe Estuary contextual area comprises a dense admixture of grade one to four agricultural land and has also demonstrated good cropmark visiblity.

4.5 Historic Landscape Character

A Historic Landscape Characterisation (HLC) project was carried out for Devon and Dartmoor National Park in 2004, in partnership with English Heritage, the Devon County Council Historic Environment Service, the Tamar Valley Service and the Historic Environment Service of the Dartmoor National Park Authority.

HLC is a methodology used to attempt to give archaeological significance to all parts of the historic landscape, not just on the basis of individual sites or monuments. It does this by using modern Ordnance Survey maps to 'characterise' the landscape into a pre-determined range of landscape 'types' according to its physical appearance. These landscape types define broad characteristics demonstrated by areas of land with similar historic uses or shared histories (Turner, 2005).

The Devon landscape types were mapped onto the Ordnance Survey base map and were available to the NMP survey in the DCCHER GIS. Further information on the Devon HLC is available on the DCC website. Further HLC analysis derived from the First Edition OS maps identified landscape components of medieval and post-medieval origin. This proved of value in those coastal areas which saw rapid and intensive development in the twentieth century, often associated with leisure activities and tourism. Figure 7 illustrates the broad HLC types for Blocks One to Three.

Block One HLC

Block One has a rural character, dominated by the modern enclosed field pattern (62%), with enclosure based on medieval strip fields that retain their medieval character making up less than 1% of the block. However, the amalgamation of 'medieval' fields into larger land parcels of modern character might mean evidence of medieval enclosure is underrepresented. The coastal and estuarine nature of the block is very much in evidence with rough ground, cliffs, sand and mud making up 20% of the area. Settlement is dispersed and small-scale, amounting to less than 5% of the block, the largest settlement being Salcombe on the Kingsbridge Estuary. The South Hams coastline has historically been isolated (see 4.33), which might go some way to explain the limited development on this coastline for recreation purposes, such activity being largely limited to Thurlestone golf course. Military complex covers 0.3% and is limited to the former site of HMS Cambridge at Wembury Point.

Block Two HLC (including Sub-Block M)

Block Two is also dominated by enclosure (47%), with enclosure based on medieval strip fields that retain their medieval character again making up less than 1%. However, modern enclosure is a lower proportion than seen in Block One, the accessibility of the English Riviera by rail contributing to a higher degree of urban expansion, most notably in Torbay. The development of land for recreation use here is also significantly higher at over 21%, including golf courses, holiday camps, sports grounds and leisure centres, municipal and tourism infrastructure such as The Den at Teignmouth and the National Nature Reserve at Dawlish Warren. Such developments have undoubtedly limited the application of the NMP methodology, although historic aerial photography can

provide a valuable perspective on the rapidly changing character of a tourist destination (See Section 7.11). Military complexes cover 0.4% of the Block but they are more varied in date and distribution than in Block One, comprising the Napoleonic fortifications at Berry Head, a Second World War rifle range at Straight Point and a multiperiod focus of military activity at Dartmouth, including Dartmouth Castle, the 19th century Royal Naval College and Second World War landing amphibious/landing craft maintenance sites on the bank of the Dart.

Block Three HLC (including Sub-Block N)

The Straight Point Military complex continues from Block Two into Block Three, the only other incidence being the Commando Training Centre Royal Marines at Lympstone. In area, this equates roughly with Block One. The area of enclosed land is more comparable to that of Block Two than Block One, but with settlement dispersed along the coast at Exmouth, Budleigh Salterton, Sidmouth and Beer, comprising 15% of the block area, it has a more rural character. Recreation, in the form of golf courses and holiday camps, makes up 3%.

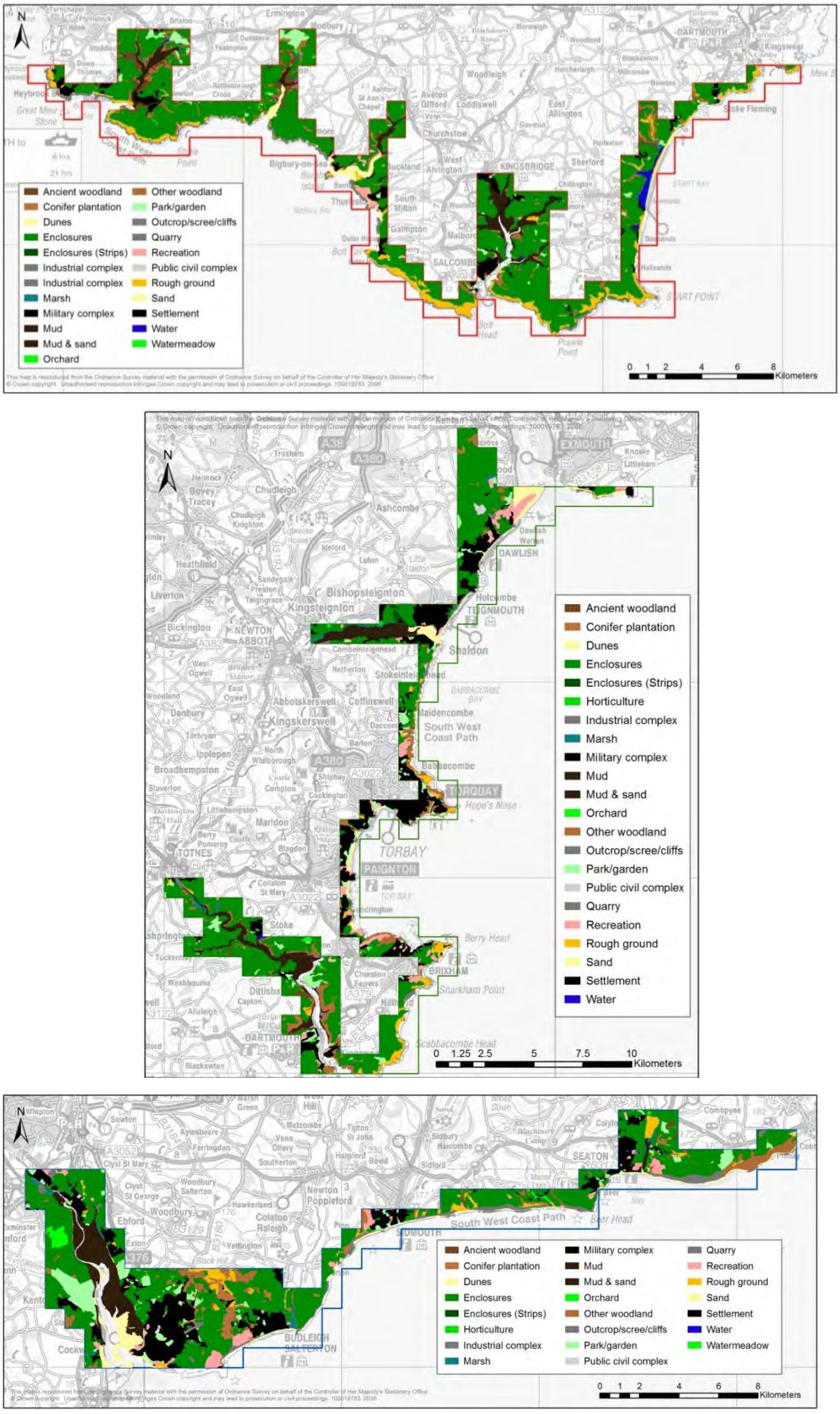


Figure 7: Top to Bottom, HLC for Blocks One to Three. © Crown Copyright and database right 2013. Ordnance Survey 100019783.

4.6 Impact of Geology, Soils and Landuse on the Survey Results

The underlying geological conditions and the soils that derive from them can strongly influence the agricultural use of a landscape and therefore to a large extent determine the condition and visibility of archaeological features. For instance, areas of very heavy, poorly drained soils or areas with very shallow topsoil are likely to have extremely limited agricultural value and be little improved by drainage or ploughing. S uch marginal areas, such as upland moorlands or coastal heaths, often remain as permanent pasture or rough grazing on which archaeological features can survive as earthworks clearly visible from the air, particularly in suitably low lighting conditions (Wilson 200, 38-53).

In contrast, areas of permeable bedrock and well drained soils are more likely to be more flexible agriculturally and therefore put to a wider range of more intensive agricultural and horticultural uses. As a r esult, any earthwork archaeological sites in these areas are likely to have been s ubstantially or completely levelled by centuries of ploughing and improvement, and may be visible only as marks in freshly ploughed soil or differential growth of crops over the location of buried ditches or levelled banks (Wilson 200, 53-87).

In reality a wider range of factors can influence the visibility of archaeological sites, including as elevation and landuse, but geology and soils are fundamental elements to consider. Due to the restricted extent of the RCZAS survey area it is difficult to draw any meaningful conclusions about the impact of geological conditions on the survey results. Nonetheless, a small number of inferences can be drawn from the limited data available.

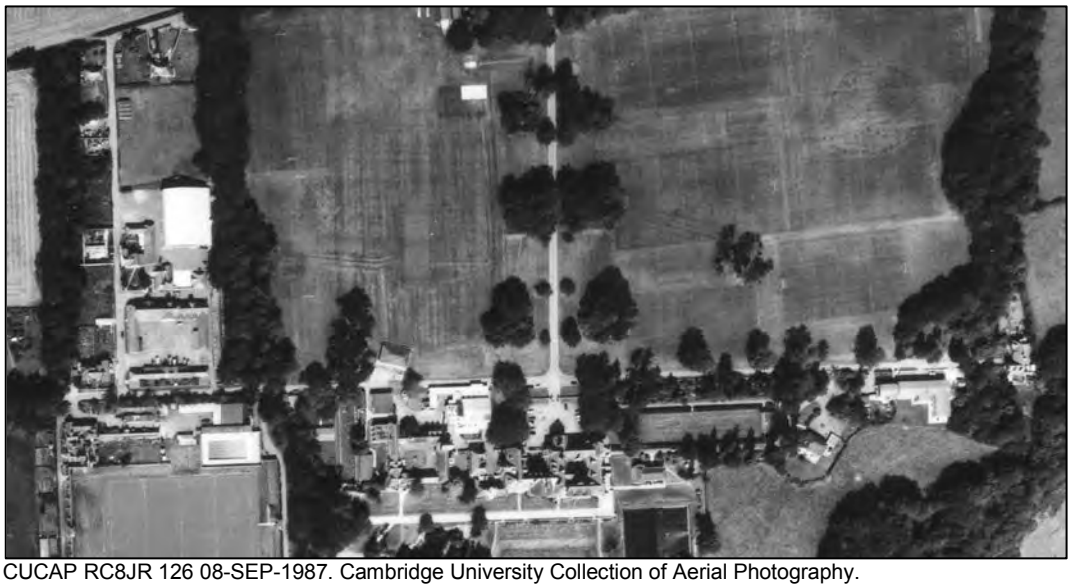
A key conclusion is that, based on the results of the survey, the survival and visibility of earthwork monuments does not appear to correlate with a particular geology. For instance, the HER records for several bank defined field systems of probable later prehistoric date (see section 7.3.1) are distributed throughout the survey area and occur on a range of geologies including Devonian Mica Schist (Sub-Block D and E), Devonian Limestone, Mudstone and Calcareous mudstone (Sub-Block H) and Cenomanian Chalk (Sub-Block K). All are situated on the shallow soils of Grade 3-5 agricultural land in often precipitous marginal locations such as coastal cliffs or combes and, in these instances, it would appear that these factors play a greater role in the survival and visibility of such monuments than the underlying geology.

The interbedded Permian sandstones and conglomerate that dominate large areas of Sub-Blocks H, J M and N correspond with freely draining soils resulting in high quality heavily cultivated agricultural land. Higher numbers of archaeological cropmarks were recorded in this area, providing the only instance where geological conditions have significantly influence the results in this survey.

However, even in this productive location few previously unrecorded buried archaeological remains visible as cropmarks have been recorded. In Sub-Block K and L, where outcrops of chalk bedrock overlain by a mix of both poorly and very well drained soils were anticipated to be productive for identifying previously unrecorded cropmarks, no new archaeological cropmarks were identified from the available aerial photographic coverage, despite including vertical coverage

taken during the spring and summer months of the drought year of 1976. Even some levelled monuments clearly recorded as earthworks on earlier aerial photographs were rather indistinct; for example the probable deserted medieval settlement west of Dowlands had been levelled by this date, and much of its layout is unclear from the resulting soilmarks (Figure 99).

However, some buried features show extremely clearly as cropmarks, as demonstrated in Figure 8. Here at Rousdon, approximately 1km to the east of Dowlands, several former landscape features were plainly visible in 1987, including a tree ring enclosure with tree pits that had been depicted on the late nineteenth century mapping, and a field boundary depicted on the Tithe map but removed prior to the 1890s.



CUCAP RC8JR 126 08-SEP-1987. Cambridge University Collection of Aerial Photography.

Figure 8: Cropmarks at Rousdon (SY 2949 9070) showing the location of former tree enclosures (top right) and field boundaries (centre left).

Other similar post-medieval or modern features were observed as cropmarks in this area. This has been interpreted as indicating that there remains very good potential for identification of new archaeological cropmark sites through aerial survey in this geologically promising location. When flown at an optimal time of year local reconnaissance has recorded significant evidence of prehistoric settlement in areas of lesser geological potential, even if on only a single sortie (for example see Figure 87, MDV50145). Therefore, a sustained targeted programme of aerial reconnaissance on the south coast, particularly the chalk plateaux, may help to ascertain whether the paucity of archaeological sites manifesting as cropmarks is a result of a genuine absence of below-ground archaeological remains, or a reflection of the non-archaeological focus of past aerial reconnaissance programmes.

5 Overview of the Aerial Photographs and Imagery

The APs consulted during this project are held by three main collections; the EH Archives, the DCC HE R and CUCAP. The characteristics, advantages and disadvantages of each resource is summarised below.

5.1 Vertical Coverage

Vertical aerial photographic coverage provides an easily read plan-like view, often surveying very large areas in a systematic manner. However, vertical surveys are unlikely to be taken for archaeological purposes and are therefore rarely flown at those times of day or year most conducive for good visibility of archaeological features. However, as part of the NMP methodology all vertical aerial photographs provided as prints with stereo pairs were examined using a hand-held stereoscope to provide a three dimensional view of the landscape. It is for this reason that the vertical coverage is invaluable to any NMP survey. Coverage available only in digital format was viewed on-screen.

The hard copy vertical APs consulted during this project are held by three main collections; the EH Archives, the DCC HER and CUCAP. Coverage over the survey area was good and, digital sources included, covered a timespan from 1940 to 2012.

Although DCC HER holds a substantial collection of good quality 1940s RAF vertical prints, experience on previous NMP surveys in Devon has shown the collection to be incomplete. Therefore, to minimise the possibility of ommissions and need for further loans from the archive, the project design specified that the EH Archive loan should duplicate the HER 1940s RAF vertical holdings (Hegarty 2013, 47-48). The DCC RAF collection was therefore consulted only in exceptional circumstances, for instance when a modern military site identified from other sources was not clearly visible on the EH Archive aerial photographs.

On this basis, the EH Archives loan contained a total of 7374 vertical APs for the survey area. The distribution over time of the EH Archive vertical coverage is shown in Chart 1. Peaks in numbers correspond with post-war RAF surveys and later large-scale surveys by organisations such as the Ordnance Survey. The earliest coverage was a valuable source of information for short-lived military sites of Second World War and Cold War date, but later coverage taken from the 1960s was also important for recording earthwork evidence of former agricultural activity that was often lost in later years.

DCC also hold hard copy Geonex and Getmapping Millennium coverage, providing comprehensive coverage dating to 1992-1993 and 1999-2000 respectively.

This recent coverage was complemented by a number of digital only datasets. Digital vertical images produced by the Next Perspectives consortium were supplied to the survey as geo-referenced one kilometre square tiles under the Pan-Government Agreement (PGA). The Next Perspectives images had been taken over a number of years from 2001 to 2010. High resolution colour digital vertical coverage for much of the coastline was also available for download direct from the Channel Coastal Observatory (CCO) website. In conjunction with the

historic EH Archive vertical coverage, this recent digital dataset allowed an accurate and up to date assessment of monument survival and condition, which was summarised as far as possible and appropriate in the monument record.

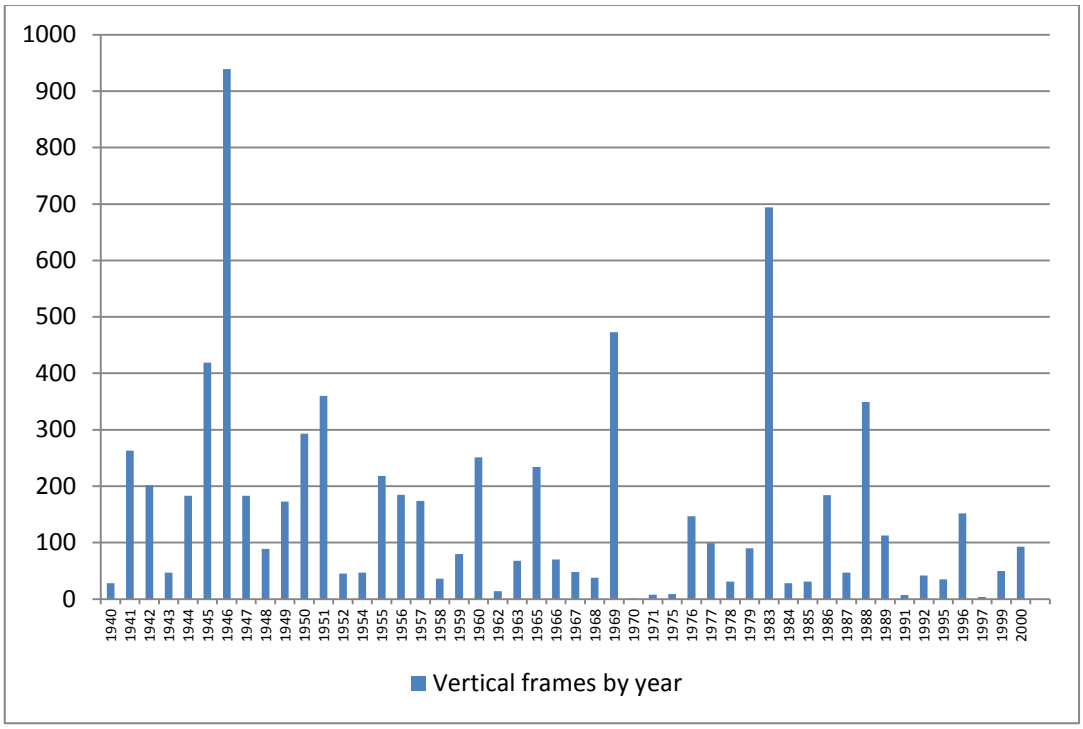


Chart 1: Overall number of EH Archive vertical prints by year. The greatest peak probably coincides with post-war surveys.

5.2 Oblique Coverage

Oblique aerial photography, as the name implies, is taken at an oblique angle to the ground. This provides a more recognisable perspective for the viewer but is often less easy to relate to a mapped landscape. It is most often carried out at a small scale from a light aircraft, making it more cost-effective to apply for specific purposes, such flying at the times of year most suitable for archaeological monitoring or reconnaissance. As such, oblique photographs are often referred to as 'specialist oblique' aerial photographs.

The oblique aerial photographs consulted during this project are held in three main collections; the EH Archives, DCC HER DAPs and CUCAP. Some of these, particularly within the CUCAP collection, were taken for non-archaeological purposes.

5.2.1 The Cambridge University Collection of Aerial Photography

The Cambridge University Collection of Aerial Photography (CUCAP) is founded on aerial surveys of 1947 and now holds around half a million images, oblique and vertical, which can be assessed via an online catalogue. The CUCAP Catalogue search for the survey area returned 795 oblique prints for the project area; 173 for Block One, 169 for Block Two and 453 for Block Three. Few were catalogued with an archaeological subject.

The majority of the remainder targeted non-archaeological subjects, such as townscapes, topographic features, specific land uses or geographical subjects

and were catalogued as such, e.g. Lyme Regis and Seaton, Dawlish Warren and the Exe Estuary, East Devon Pebblebed Commons or Coastal cliffs and Windgate Cliffs, near Sidmouth.

As much of the CUCAP coverage as possible was assessed during the project. Loan requests of 100 prints were therefore submitted for each Sub-Block on rotation, reassessed to take account of any sorties not held as prints and, where necessary, filtered to remove those sorties which appeared to target only topographic or geographical subjects in areas which had shown low potential. Such filtering was kept to a minimum but was felt to be a valid approach in the early stages of the survey to ensure that sufficient CUCAP loans were available for a total coverage of those areas that had highest potential for cropmark visibility and the highest number of CUCAP obliques, most particularly in Blocks Two and Three. Block Three also contained an area of chalk geology that was judged to be of high potential for cropmark visibility. Most CUCAP images, however, targeted coastal panoramic views and were of limited archaeological value.

5.2.2 Devon Aerial Photographs

The Devon Aerial Photograph (DAP) programme generated a county wide collection of specialist oblique aerial photographs. Taken by Frances Griffith and Bill Horner of DCC between 1984 and 2001, the DAPs are held by DCCHER. The majority of DAPs target archaeological sites or elements of the historic landscape, but also record more general townscape, landscape or coastal views. The vast majority of archaeological sites targeted by the DAP programme have been accessioned into the HER. However, the known extent, detail and interpretation of many monuments have been enhanced by the NMP methodology and the survey has recorded a small number of previously unrecorded monuments from the DAP collection (Figure 96). The EH Archive also holds a number of DAP specialist obliques but with a number of ommissions. For the RCZAS survey area DCC hold 556 DAPs and the EH Archive 376. To minimise the impact any missing prints would have on the survey the full EH Archive DAP holdings were loaned and cross referenced with the DCC collection.

In general, with the exception of a concentration on the cropmark producing geology and soils in Block Two, the DAP coverage was of low density evenly distributed over the survey area.

5.2.3 EH Archive Specialist Obliques

Excluding duplicate DAPs, the survey assessed 1057 EH Archive collection specialist oblique aerial photographs. The EH Archive specialist oblique collection was produced by a number of specialist fliers, including English Heritage and previously, the RCHME, and have been taken as part of targeted and systematic survey from the 1960s onwards. The EH Archive coverage for the RCZAS survey dates from the late 1970s onwards. Initially the focus was on ‘traditional’ archaeology, but EH reconnaissance has diversified to include all elements of the man-made landscape. More information can be found on the EH website.

The EH Archive also contains other collections which were also loaned to the survey:

5.2.4 The Aerofilms Collection

For instance, the earliest images available to the survey belonged to the EH Aerofilms Collection, dating to the 1920s. Although in general containing limited archaeological information, the collection included low level vistas that illustrated change and continuity in the towns of the South Devon coast and a small number of potentially significant archaeological sites (Figure 9; Figure 127).

Figure 9: The ruinous Paignton Pier in 1928. The pier-head and associated buildings were destroyed by fire in 1919. AFL 60516 EPW023734 SEP-1928. English Heritage, Aerofilms.

5.2.5 The Harold Wingham Collection

Former Squadron Leader Harold Wingham began photographing archaeology from the air in the 1940s, but carried out surveys of Devon and Cornwall in the late 1950s and early 1960s (Hall 1997). Nearly 100 Wingham collection images were loaned to the survey from the EH Archive and were of high quality. A range of features, including Second World War remains, unusual coastal buildings (Figure 10, MDV104998) and intertidal structures, including possible fish wiers (MDV104121) were recorded from this resource.

Figure 10: Previously unrecorded 'tower' structure at the coast at Watcombe, Torquay. HAW 9394/11 22-JUL-1959. © English Heritage (Harold Wingham Collection).

5.3 Military Oblique Coverage

The EH Archive holds a large collection of military oblique aerial photographs taken by the RAF from 1939 to 1960. They provide an oblique perspective similar to specialist oblique photography but with a more regular coverage, taken in linear sorties in a similar manner to vertical photography. Military obliques provided the survey with almost blanket coverage of the coast and major estuaries, taken between 1941 and 1960.

Military oblique aerial photographs provide a valuable perspective on the coastal landscape of conflict archaeology during and immediately following the Second World War. In particular, military obliques taken from the early 1940s provide an insight on coastal anti-invasion defences often removed on the later vertical coverage, and the early phases of installations such as radar stations and anti-aircraft artillery. Later 1940s and early 1950s military obliques also provide valuable information on the transition of sites from the Second World War, or immediate post-war period, into the Cold War era. This is most apparent at long-lived sites, such as the Naval gunnery training site HMS Cambridge at Wembury Point, near Plymouth.

5.4 Lidar

Airborne lidar uses a laser to measure the distance between the survey aircraft and the ground surface, including buildings and vegetation, thereby creating an accurate model of the ground surface.

The benefits of using lidar for archaeological landscape survey have been widely recognised and summarised by many, including EH (Crutchley and Crow 2009).

Environment Agency lidar data was supplied to the survey via EH as static georectified jpeg images derived from lidar data. It was provided in three different forms dependent on the original date of data capture.

1. Original tiles derived from data captured between 1998 and 2008, at varying spatial resolutions of 2m to 1m.
2. DSM Mosaic: This is a Digital Elevation Model of the terrain plus surface objects such as vegetation, buildings and vehicles. At a spatial resolution of 2m.
3. DTM Mosaic: This is a Digital Elevation Model of the terrain with all surface objects such as vegetation, buildings and vehicles removed, also often known as a “bare-earth model”. At a spatial resolution of 2m.

The composite mosaic tiles are derived from the original tiles by merging data from multiple years. The EA Geomatics Group state that the composites have been produced by merging data from their archive, with over 80% of the data captured since 2002.

It should be noted that these derived imagery tiles do not contain any intrinsic information about height (or intensity or slope etc), each pixel being a colour representation of a height value. The lighting of the tiles (from 315˚ (north-west) and c.60˚ sun-angle) means that they can best be thought of as the equivalent of vertical photographs taken in relatively low sunlight, albeit lit from an angle never

seen in reality in the UK (S. Crutchley 2013, pers.comm.,18th Feb.). An advantage of this data for mapping projects is that as georectified images, the lidar tiles did not need to be separately georeferenced and could be imported directly into the DCCHES GIS and viewed in much the same way as other georectified vertical aerial photographs.

Few previously unrecorded features were identified from lidar data alone and in some instances even well known earthwork sites were difficult to discern. For instance the surviving earthworks of the heavily eroding clifftop site of High Peak Camp (MDV15122- MDV15124), which encompass an Early Neolithic causewayed enclosure and the earthworks and buried remains of part of an early medieval settlement, can barely be discerned. This is probably due to the site being planted as a coniferous plantation at the time of the lidar survey thereby impeding the lidar surveys level of detail and the light direction on the static tiles being unfavourable for showing the subtle earthwork terraces of the surviving ramparts. In this instance the earthworks have since been recorded by an analytical field survey (Rainbird et al 2013).

Nonetheless, the value of the mosaics and static tiles to the survey was high (see Section 5.5). This was seen most clearly in the additional detail added to the record for earthwork landscape features such as the prehistoric field systems at South Down Common, Beer (MDV19842) and Deckler's Cliff, East Portlemouth (MDV15083), and the previously well studied hillforts of Greenway Camp (MDV8541) and Hawkesdown Camp (MDV11391 and MDV58272; see Figures 13, 14 and 17).

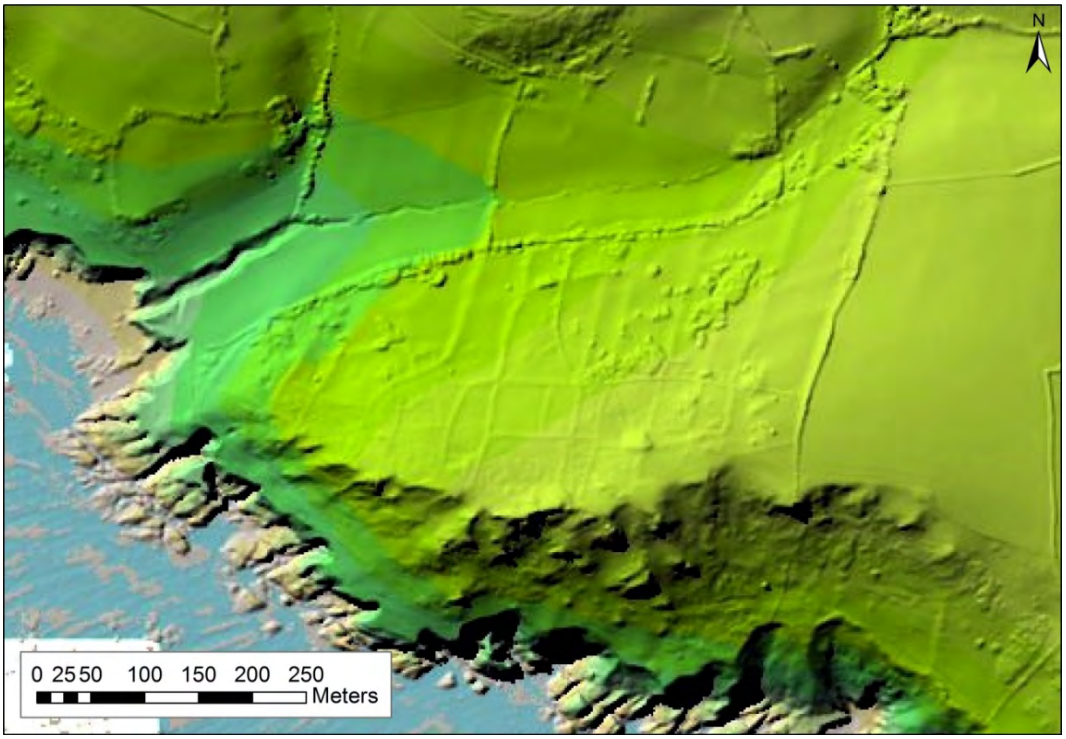


Figure 11: Deckler's Cliff Bronze Age field system. LIDAR SX73NE DSM Enviornment Agency MAY-1998-APR-2008. © Environment Agency copyright 2014. All rights reserved.

5.5 Qualitative Appraisal of the Aerial Photographic resource

Qualitative appraisal of the value of the aerial photographic resource was made as the project progressed. Several runs were of particularly poor quality, either because they were only available as scanned laser copies (MSO 31287 24-AUG-1941; RAF/US/7PH/GP/LOC147 20-JAN-1944; RAF 30184 11-APR-1950), sometimes coupled with cloud cover (RAF/225B/UK854/2 28-JUL-1940), or because of the quality of the original image (DCC Geonex of all dates are relatively low contrast, grainy and at 1:25,000 very little detail can be seen).

Conversely, some runs of aerial photographs were particularly good quality, and in particular a run taken in low light and snowy conditions (RAF/58/5607 22-JAN-1963) was very useful for distinguishing earthworks. In many cases this allowed a good transcription to be made of the site prior to levelling through agricultural intensification in the 1970s. This run was difficult to rectify, perhaps because of the high contrast affecting the ability to accurately position control points.

Specialist oblique aerial photographs were extremely useful for mapping cropmarks, and further sorties taken specifically for archaeological purposes may prove very productive.

Source	Earthwork	Levelled earthwork	Cropmark	Structure	Demolished Structure	Total number of transcriptions
RAF/CPE/UK/1890 10-DEC-1946	100	156	4	59	54	373
RAF/106G/UK/967 01-NOV-1945	126	62	6	126	33	353
RAF/106G/UK/1412 13-APR-1946	61	36	11	35	99	242
Lidar DSM digital layer	160	2	1			163
Lidar DTM digital layer	111			1		112
Channel Coast Observatory	13		3	83	1	100
RAF/58/5607 F21 22-JAN-1963	28	36	2			66
MAL/69014 05-MAR-1969	41	10	10			61
RAF/CPE/UK/1974 11-APR-1947	4	2		52	2	60
Lidar Nov 2006 - Mar 2007	52	2				54
RAF/CPE/UK/2488 11-MAR-1948	7	18		17	12	54
RAF/106G/UK/871 30-SEP-1945	8	11	1	3	25	48
RAF/58/369 27-FEB-1950	15	28	1	1	2	47
RAF/CPE/UK/1824 04-NOV-1946	12	14		14	1	41
US/7PH/GP/LOC145 05-JAN-1944		17		2	19	38
US/7PH/GP/LOC133 30-DEC-1943	4	19		3	7	33
US/30GR/LOC41 27-APR-1944		2			30	32
RAF/S411 17-AUG-1941	1	6			15	22
RAF/106G/UK/508 13-JUL-1945	2	10	2		7	21

Table 1: Most frequently used sources for mapping: aerial photograph runs attributed to more than 20 transcriptions, by evidence type. Shading denotes relative frequency: hard copy photographs are depicted in yellow; digital photographs in red and lidar in green.

An assessment of the meta-data associated with each transcribed feature allowed a qualitative evaluation of the most frequently used aerial photographic sources to be made (Table 2). The value of lidar data for recording earthworks is apparent, but the attribute data in general is dominated by RAF verticals of the immediate post-war period (also see Chart 2). These sorties are particularly useful for earthworks and structures that have since been des troyed. Extant structures were often recorded from Channel Coast Observatory imagery, which covered a large proportion of the project area.

However it is important to note that although these photographs were selected for transcription, interpretation of the sites often hinged on the less easily rectified images.

When the data is analysed in more detail, as anticipated the CUCAPs and DAPs are also important sources for cropmarks (Chart 2), but the small area covered by each run means that relatively few sites were recorded for each individual sortie within this project area.

Chart 3 displays grouped data in a slightly different way. The pre-Second World War sorties from which a small number of transcriptions were made are all obliques, as would be expected. A larger number of transcriptions were made from military oblique and vertical aerial photographs taken during the war, but the largest number were taken from the large number of aerial photographs taken in the 1940s post-war period. A slightly smaller number were transcribed from aerial photographs that were taken from 1950 onwards, and this included a much higher proportion of specialist obliques.

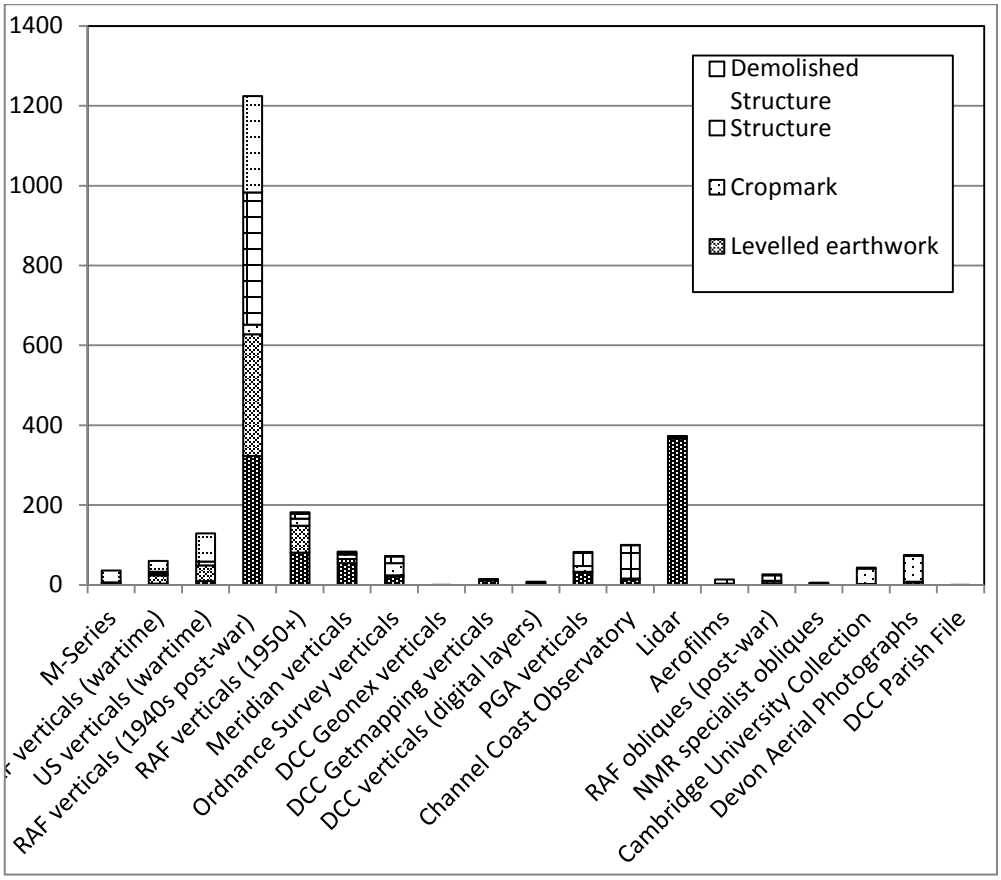


Chart 2: Most frequently used sources for mapping (number of transcriptions): photograph origin by evidence type.

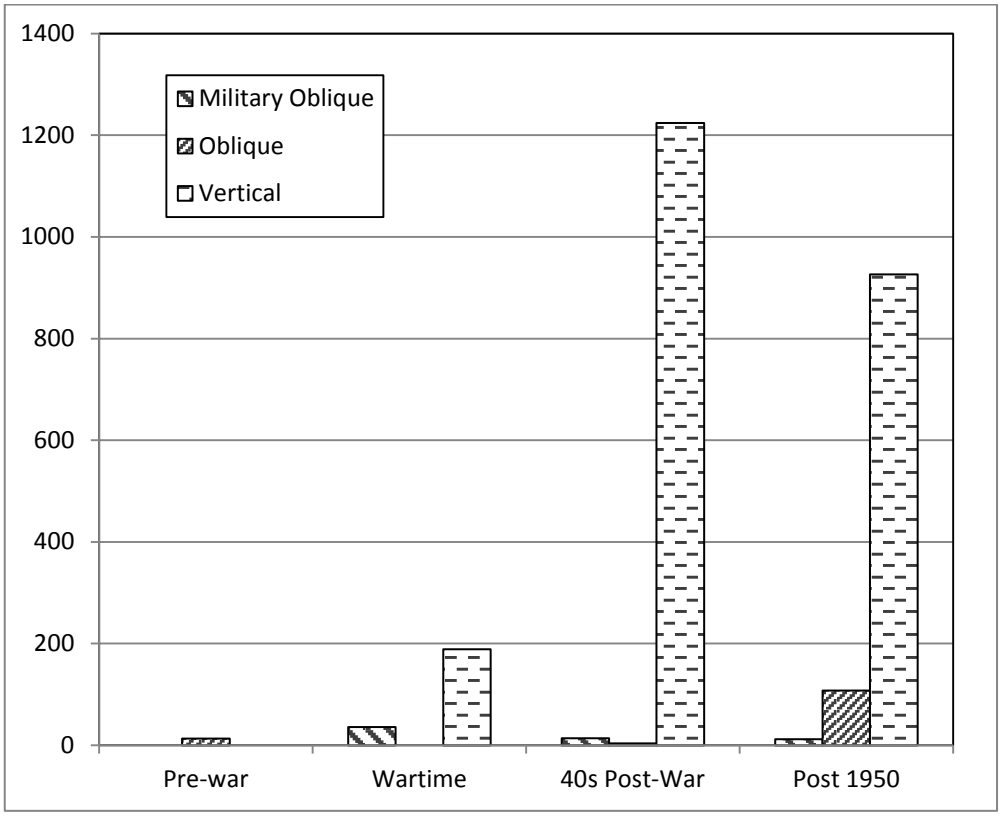


Chart 3: Most frequently used sources for mapping (number of transcriptions): aerial photograph category by broad date range.

6 Overview of the Survey Results

The South Devon Coast RCZAS NMP survey was very successful in enhancing the HER for the South Devon coast. Including findspots and buildings, i.e. monuments outside of the NMP remit, prior to the survey, the HER recorded over 7480 monuments for the survey area. This equated to a monument density of over 18 monuments per square kilometre.

Excluding findspots and buildings, the HER recorded nearly 3990 'NMP-relevant' monuments, for the survey area, such as cropmarks, earthworks and military structures. This equated to a monument density of less than 10 monuments per square kilometre. See Hegarty 2013, Section 13 for a detailed assessment of the composition of the pre-NMP survey HER and assessment of the potential for NMP.

The NMP survey substantially enhanced 398 extant HER records and created 1103 entirely new HER monument records (see chart 4). 'Substantially enhanced' is defined here as incorporating new interpretive text derived solely from the NMP survey. This is distinct from HER monuments that have been associated with the survey event record by associative relationships within the HER database via monument associations, such as parent/child/peer relationships, but which have not generated any interpretive text (an additional 135 records that have not been included in the figures here).

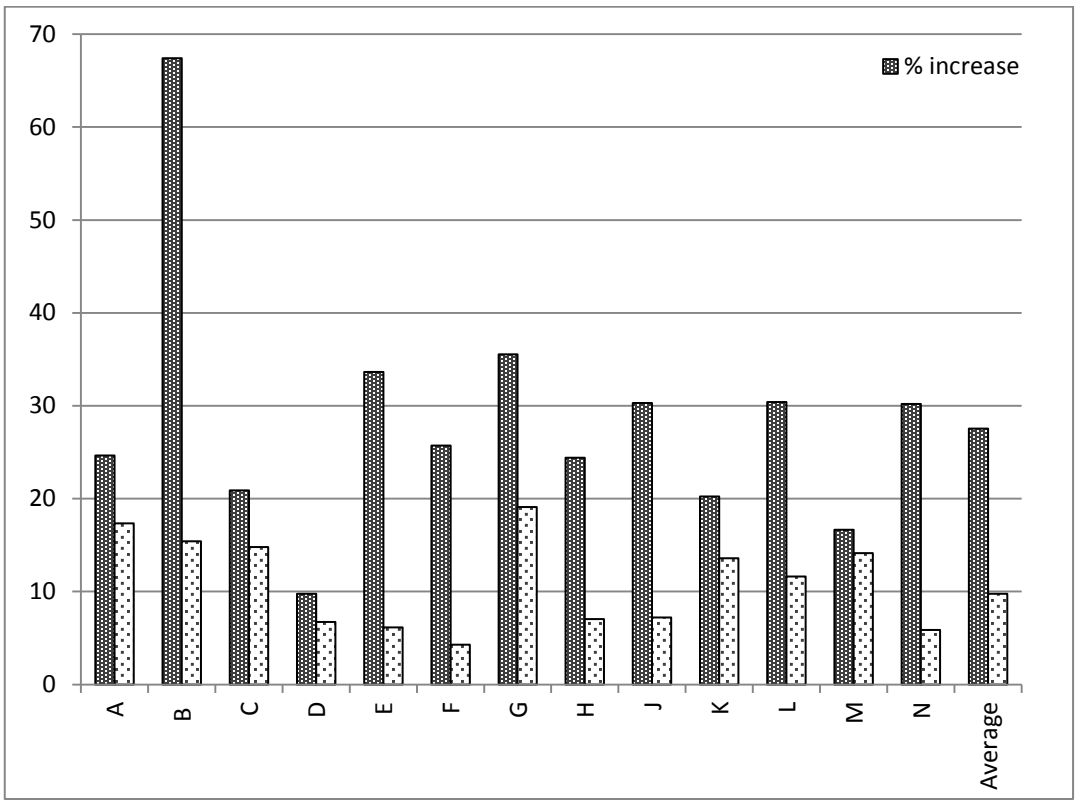


Chart 4: Number of amended and created monument records, broken down by Sub-Block; an average for the whole project area is shown in the final column. The high number of new records in Sub-Block 2 may partly relate to the low density of monuments in this block prior to the NMP survey (at 5.1 per square km this was the lowest of the project). The proportion of Second World War features was just below average, so military activity does not account for the discrepancy, but this block has a higher than average number of post-medieval sites (catch meadows, quarries and field boundaries).

On this basis, approximately three quarters of all survey monument records are 'new' i.e. previously unrecorded, and the remaining quarter are existing records amended by the survey. This equates to amendments being made to approximately 10% of the relevant HER records known prior to the NMP survey and an increase of nearly 28% over the number of pre-NMP relevant HER records. Including all HER monuments (i.e. findspots and buildings) the monument records generated by the NMP survey comprise almost 15% of the total HER record for the survey area.

At the time of writing the HER records 5179 monuments for the survey area (excluding findspots and buildings). In addition to the monument records generated by the NMP survey, the increase can be accounted for by ongoing monument accessioning carried out by DCCHET. On this basis, HER records arising from the NMP survey currently make up nearly 29% of all NMP relevant monument records for the project area.

6.1 Summary of Results/Trends

The majority of the survey results fall within 15 HER monument thesaurus Top Term categories. The broad trends revealed by this classification are illustrated in Chart 5.

6% of records were indexed with monument types that fall within the Unassigned category. These mostly comprised cropmarks, earthworks and structures for which no confident interpretation could be made, structures and earthworks of probable Second World War or modern date, such as bomb craters, or monuments previously recorded as archaeological features now thought to be non-archaeological in origin.

A further 23% monuments were recorded under the Monument <By Form> Top Term (see Appendix H). A high proportion of these were of agricultural character, including over 150 field boundary records, numerous boundary banks and enclosures.

Excluding these categories, over 80% of the monuments recorded by the survey fall within 5 top-terms:

- Military Defence and Fortification
- Defence
- Agriculture and Subsistence
- Industrial
- Maritime

These themes have therefore informed the structure in which the survey results are summarised below, with significant highlights or trends from some of the less populous categories also summarised.

With 153 incidences, field boundaries are the single most numerous monument class recorded by the survey, followed by water meadows (131) and quarries (100). Pillboxes are the most frequently occurring military monument class, with 57 records. A table listing all monuments recorded with 10 or more incidences is

included as Appendix H. A number of monuments have been indexed with more than one monument type.

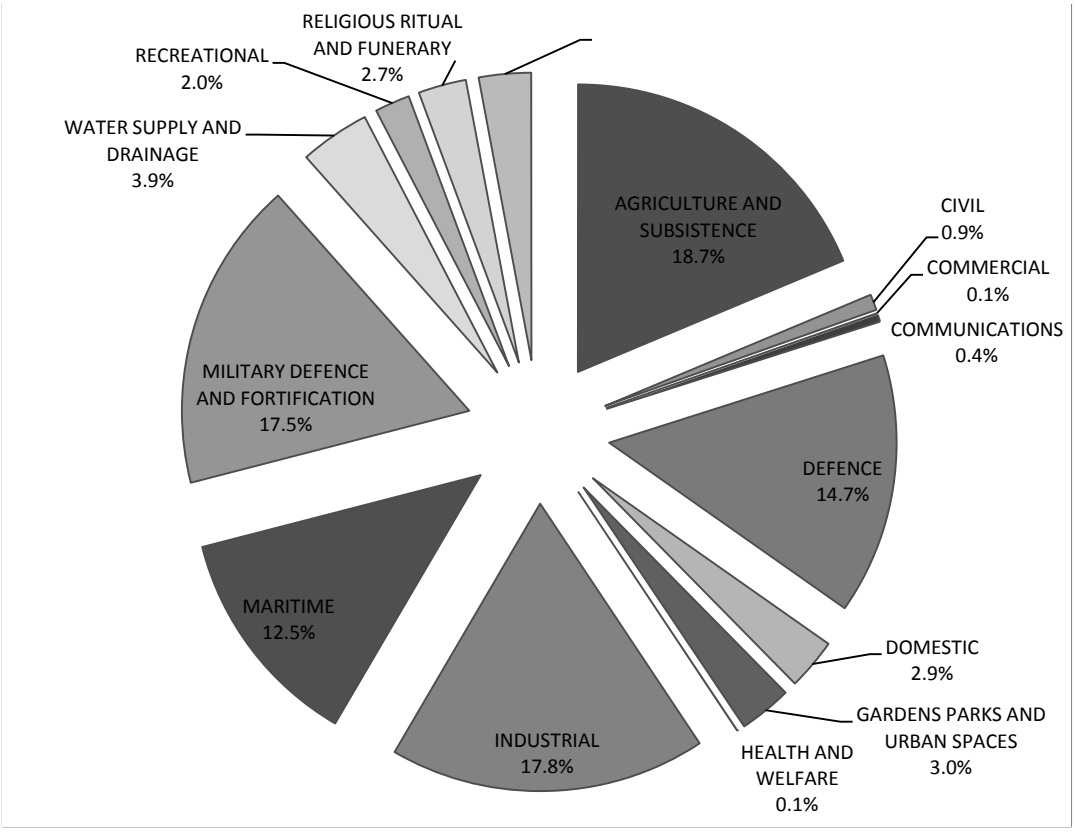


Chart 5: Survey monument records sorted by HER top-terms.

6.2 Date

The DCCHER derives monument period data from a From date and a To date. The monument data is assessed here on the basis of the From date, considered to be the most representative of a monuments interpreted date. On this basis, monuments of modern date, specifically monuments of First or Second World War date, dominate the survey results. Forming 0.1 % of the results, monuments of possible Roman date are in the minority (see Chart 6).

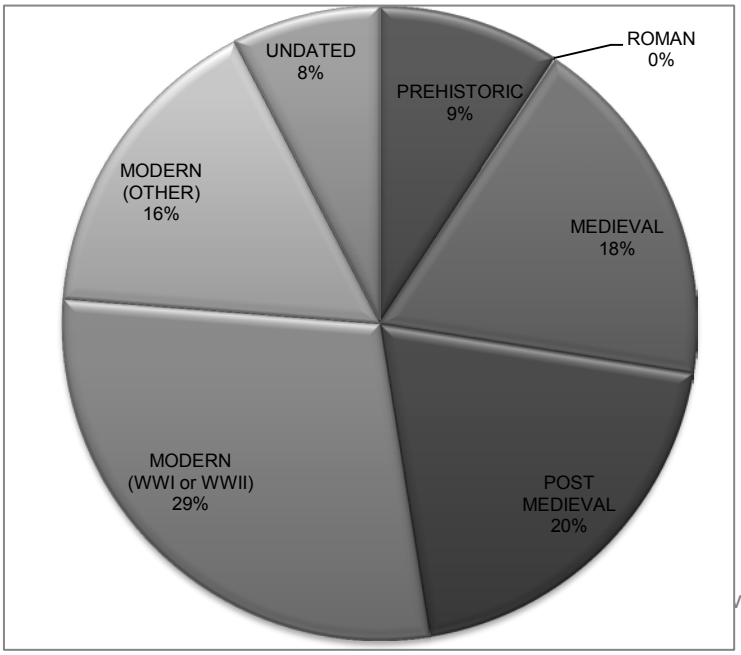


Chart 6: Percentages of monument records by period. For clarity all prehistoric periods are grouped under a single heading and military monuments distinguished from other modern features. Figures for prehistoric monuments are listed in Table 3.

The composition of monuments of later prehistoric date is potentially misrepresented (see Table 2). In particular, monuments of Bronze Age date are potentially over-represented in the dataset as many monuments of probable Iron Age or Roman date are recorded with a possible Bronze Age origin. Conversely, monuments of possible Iron Age or Roman date are therefore potentially under-represented for the same reason.

DATE FROM	TOTAL
Lower Palaeolithic	4
Neolithic	10
Bronze Age	99
Iron Age	32
Prehistoric	37
Total	182

Table 2: Number of prehistoric monuments, indexed by period.

The period composition within the top 5 themes varies considerably. This is illustrated in Chart 7. The Defence and Military Defence and Fortification top terms are dominated by monuments of modern/Second World War date, with a small number of monuments of post-medieval and prehistoric date. The majority of intertidal remains recorded within the Maritime top-term are similarly of largely modern date with less than 10% interpreted as potentially of medieval to post-medieval date.

In contrast, the composition of the monuments recorded within the Agriculture and Subsistence top-term is more varied; although 80% of monuments were interpreted as medieval to post-medieval in date, modern and undated monuments at 7% and 6% respectively are only slightly more numerous than those of later prehistoric origin, with 6%. This reflects the medieval origins of much of the agricultural landscape of Devon.

Monuments attributed to the Industrial top term, mostly quarries, are predominantly recorded as of probable post-medieval date. This relates to their condition as well as association with quarries depicted as 'Old' on the First Edition OS mapping and documentary records. Religious and funerary sites are predominantly Prehistoric in date.

Some of the less numerous top-terms, such as Domestic, have a surprisingly diverse composition, comprising results as varied as roundhouses to barrack houses, accounting for their broad range of periods in such a limited sample.

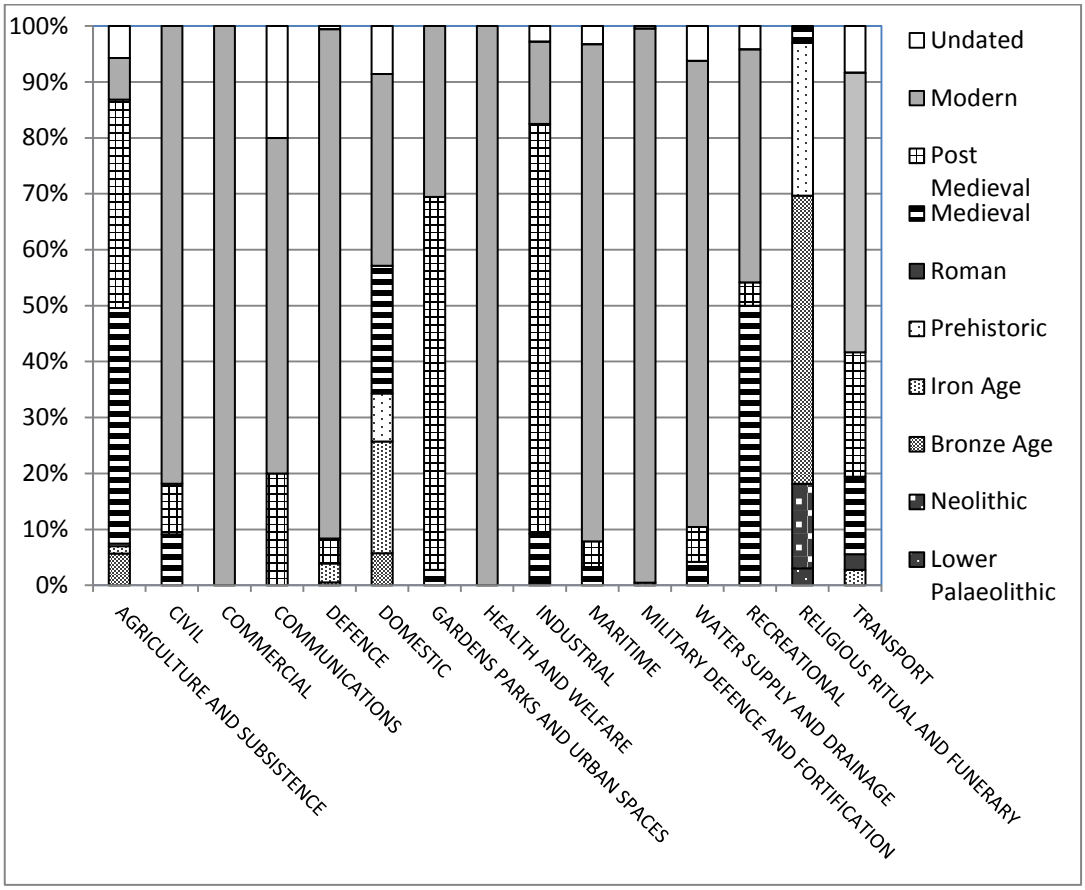


Chart 7: Survey monument records sorted by HER top-terms and proportionately illustrated by broad period groupings.

6.3 Monument Form and Survival

Just over half of the monuments recorded during the project were visible as earthworks (Chart 8) of which approximately a quarter were interpreted as being levelled on the basis of the aerial photographic and lidar data evidence. Structures were the second most common category at approximately a third of monuments, but the figures suggest they survive less well than earthworks; nearly half had been demolished since first visible on the photographs. This is not surprising as many will have been military structures of Second World War date that were intended to be temporary. Cropmarks and soilmarks accounted for only 13% of the monuments recorded during the survey, although it is unclear to what extent this might be altered by specialist photography in suitable conditions (see Section 4.3).

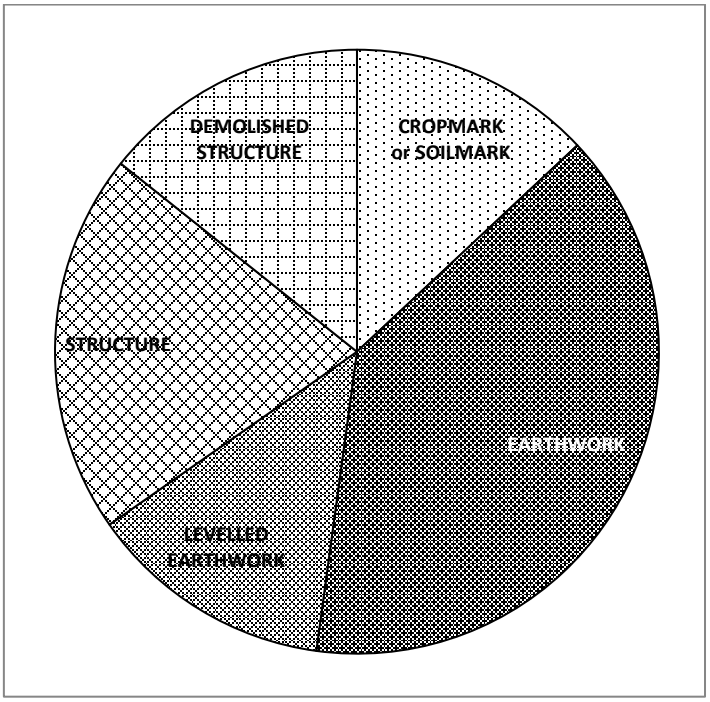


Chart 8: Evidence terms used in NMP methodology, as attributed to monument records recorded during the survey.

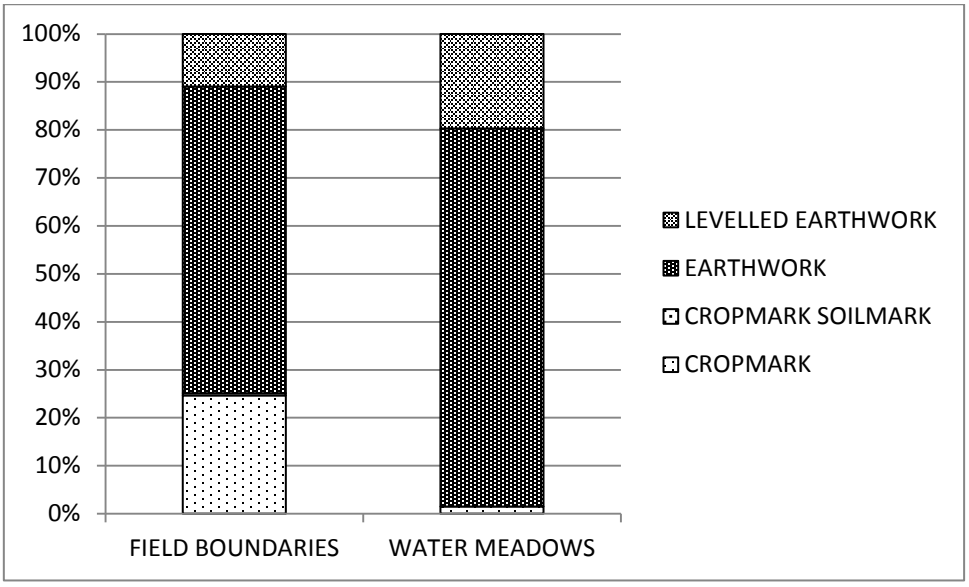


Chart 9: Proportions of evidence types for the two most commonly recorded monument types. 'Water Meadows' includes catch meadow systems, and ' Field Boundaries' incorporates 'Boundary Bank' monument types.

Water meadows and field boundaries (of all types that fall within the NMP remit) were the two most frequently recorded monument types. Considering these in more detail, it appears that a greater proportion of water meadows survive as earthworks than do field boundaries (Chart 9). This is not the case when cropmarks are omitted from the calculations, in which case 20% of water meadows and 15% of field boundaries are recorded as levelled. However it is striking that most former field boundaries and disused water meadows recorded during the survey still potentially survive as earthworks. Although a plausible explanation might be the limited appeal of cultivating relatively low grade land, on

examination a high proportion of the levelled earthworks are located in Grade 3 land, and extant earthworks in Grade 2 land. The exception to this pattern is the southern side of the Exe Estuary, where a higher proportion of field boundaries has been recorded as cropmarks or levelled earthworks (Figure 12).

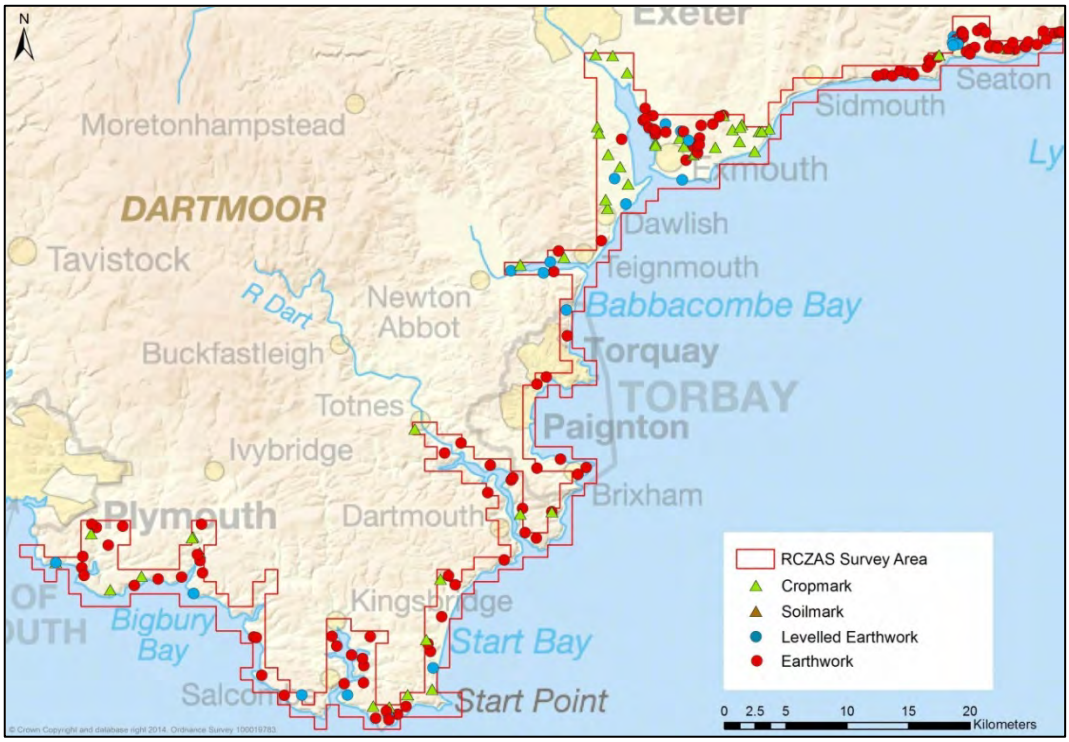


Figure 12: Distribution of field boundaries, symbolised by evidence type.

Many of the levelled earthworks in East Devon had in fact been levelled through development. The pattern is unclear in the remainder of the project area and it is not possible to draw firm conclusions, because the shape of the project area limits landscape interpretation. Due to variables such as lighting conditions it was also frequently not possible to conclude for certain from the most recent aerial photographs available, such as Channel Coastal Observatory digital images, or even the lidar tiles, whether or not monuments identified as earthworks from earlier images survived as upstanding features.

In such cases the last photographs on which evidence of the form of feature was identifiable, often the most recent hard-copy aerial photographs viewable in stereo, was been used to define the evidence term. It is possible that this methodology may have resulted in a slight over-representation of monuments recorded as ‘earthwork’ that are in fact levelled earthworks, but which could not be confidently identified as such.

7 Survey Results

7.1 Introduction

This report provides an illustrated overview of the archaeological themes to emerge from the survey. It is not intended to provide a comprehensive account of the survey's results. All monument records created or amended by the survey are available on the DCCHER via Heritage Gateway.

Highlights of the survey are discussed thematically below, each thematic summary collating monuments from multiple periods. The case studies are focussed on previously unknown sites, sites where NMP has made a major contribution to the understanding of the historic landscape and sites of potential national importance.

For HER interrogation purposes all monument records created or amended by the survey are associated with a Source Record for this interpretation (SDV351146).

7.2 Thematic Results: Military Defence and Fortification

7.2.1 Prehistoric

The prehistoric multivallate hillfort of Greenway Camp (MDV8541) is largely defined by extant field boundaries first depicted on the Brixham parish Tithe map of approximately 1838-48. The earthwork ramparts of the hillfort have been subject to survey since the mid-19th century but are now obscured by dense tree cover. Despite this, previously un-recorded earthwork features were visible on Digital Terrain Model (DTM) images derived from lidar data and specialist oblique aerial photographs (Figures 13 and 14).

These previously unrecorded earthworks comprise two east to west aligned curvilinear banks and ditches that appear to define the southern limit of an early phase in the enclosure of the hillfort. With the surviving northern ramparts the relict ramparts defined a sub-circular enclosure approximately 0.9 hectares in area. It seems probable that a period of re-organisation saw the southern section of this enclosure boundary become largely redundant as the hillfort was enlarged and extended southwards to enclose an area of approximately 1.2 hectares.

LIDAR SX85SE DTM Environment Agency MAR-1998 to MAR-2012. . © Environment Agency copyright 2014. All rights reserved.

NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783.

Figure 13: Greenway Camp hillfort (MDV8541) visible as earthworks on DTM lidar images of between 1998-2012 (left) with transcription (right).

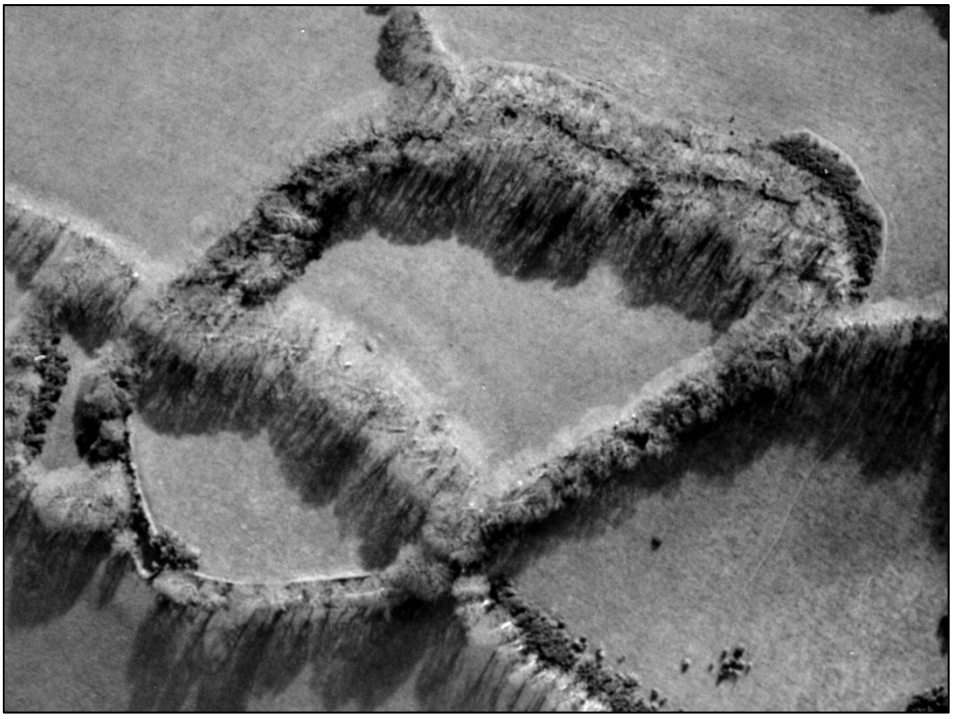


Figure 14: Oblique aerial photographs taken in 1988 showing previously unrecorded earthworks representing part of the early phase of Greenway Camp hillfort. DCC DAP JN/9 11-JAN-1988. © Frances Griffith, Devon County Council.

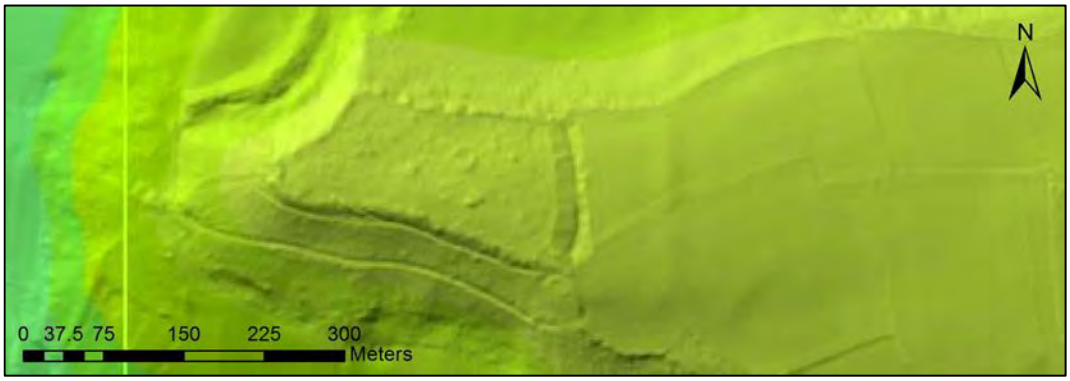
The banks of the scheduled Iron Age hillfort known as Holbury Camp (MDV3155) are clearly visible on images derived from lidar data captured between 2001 and 2010, as more substantial earthworks than the surrounding hedgebanks, although the resolution of the available imagery is insufficient to identify the gaps in the bank where gateways provide access to the interior. The banks are visible as earthworks, with varying amounts of tree cover, on aerial photographs from 1946 onwards. However no convincing archaeological cropmarks or earthworks were observed within the main enclosed area, despite recent geophysical survey having identified probable internal features including a s mall enclosure with ‘antennae ditches’ (Wilkes 2007, 8-9).

Figure 15: Holbury Camp, Holbeton (top left) with possible conjoined curvilinear enclosure ditches to the north (MDV104220; centre left) and curving holloway to the west (MDV104222; centre foreground). CUCAP AFG27 08-JUN-1962. Cambridge University Collection of Aerial Photography.

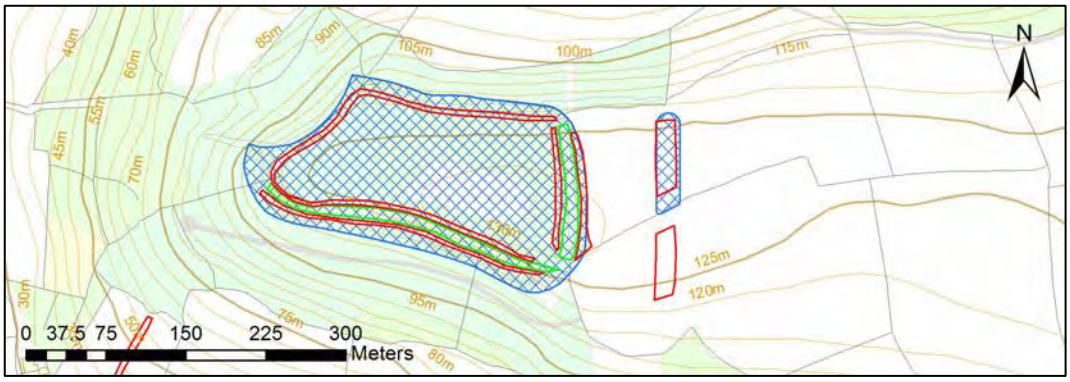
However some possible external enclosure ditches and holloway features were visible as cropmarks on aerial photographs taken in summer 1962 (Figure 15). Further archaeological investigation of these could provide more clarity on their date and function; if they are associated with the hillfort then consideration should be given to including them in the Scheduling (See Appendix I).

Figure 16: Holbury Camp with possible external ditched enclosures to the north and holloway to the west. NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783.

Another well known Iron Age hillfort where the survey has been able to augment existing knowledge is Hawkesdown Camp (MDV11391) situated on a spur of high ground overlooking the upper reaches of the Axe Estuary. Here lidar data has enabled the extent of a surviving outwork across the spur east of the fort to be better recorded (Figure 17).



LIDAR SY29SE DSM Environment Agency 1998-2007. © Environment Agency copyright 2014. All rights reserved.



NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783

Figure 17: Hawkesdown Camp, with eastern outwork (MDV58272) visible as earthwork banks on lidar-derived images (top). The bottom image demonstrates how only the northern part of the surviving outwork has been designated (scheduled area cross-hatched in blue).

The outwork is visible as a large bank circa 20 m in width on aerial photographs from 1999 and on images derived from lidar data captured in 2006. Prior to this date the northern element of the outwork was obscured from view by the hedgerow sited on the bank. The southern element appears to be slighter and is clearly visible only on lidar-derived images. However this section also has good archaeological potential and consideration should be given to extending the Scheduling to include the southern segment of this outwork.

7.2.2 Historic; Pre-twentieth century

An interesting feature at Seaton was recorded in the HER as a Martello tower that once stood on an artificial mound known as 'The Burrow', a "modern ruined pharos of brick, which was apparently 16 feet high and had two guns" (Stukeley 1776, and see Figure 122, label C). The origin of this structure is unclear. Gosling and Marshall (2010, 15) specify a date of June 1627 for the earthwork, which could support the interpretation that the mound was part of a fortification created to defend the coast at the start of the Anglo-French war. However no citation is given so the source of the date cannot be consulted. It is possible that a pre-existing bulwark of Henrician origin, as referenced by Pulman (1965), was refortified in the early seventeenth century.

By 1940 the site had been developed, and no sign of these features was visible on the hard copy aerial photographs. However, a semi-circular earthwork mound is visible on earlier aerial photographs taken in 1928 that were available to the

survey as digital images (Figure 18). At approximately 80 m across it is larger than the earthwork depicted and marked 'The Barrow' on late nineteenth century mapping, but is very likely to be the same feature. A dark mark on the slope may have been from an associated pit, but the site of the tower was probably further to the south, on what is now a level area that map regression suggests was probably landscaped in the latter part of the nineteenth century.

Figure 18: 'The Burrow' at Seaton; lost remains of a multi-period defensive site (MDV14047; MDV106009). AFL 60516 EPW023884 SEP-1928. © English Heritage, Aerofilms.

Sloping earthwork banks or revetments behind the wall defining the northern edge of the Esplanade are depicted on nineteenth century mapping and appear to abut the central mound. Linear structures built into the western embankment create a feature resembling a gun emplacement, but cannot be seen in any detail on the available aerial photographs. It seems likely that the banks were added to the pre-existing mound during re-landscaping of the area in the nineteenth century (Hutchinson, 1872), but it is possible that they could date to the outbreak of the Napoleonic war, when the 'old fort' was 'refurbished' (Gosney 1968).

Two low ring-shaped possible structures flank the mound on aerial photographs taken between 1928 and 1932. The easternmost appears to have overlain a pale double linear feature aligned north to south, possibly the footings of an earlier structure. The circular features resemble First World War gun emplacements, although their location on lower ground behind the embankment would be unusual. The area has been extensively redeveloped in the twentieth century, but the ground level still rises here and it is possible that buried remains survive.

There is considerable historic evidence for military activity on the South Devon coast during the English Civil War (1642-1651). Plymouth held out for four years against Royalist siege, attempts to establish a Royalist stronghold in the South-West instead focusing on Exeter. After the second siege of Exeter (August 1643) the formerly Puritan city fell to the Royalists but Devon as a whole declared for the Parliamentarian cause and much of the archaeological evidence is for Royalist reaction to Parliamentarian threats. For instance, Powderham Castle (MDV63491) was besieged by the Parliamentarians from 1645-1646 and several Parliamentarian fortifications were established at and around the Parliamentarian stronghold at Dartmouth (MDV55599; MDV28402; MDV8568; MDV8518). It is

also possible the fortifications at The Burrow in Seaton (Figure 18) were reused at this time. Similarly, a small probable Henrician battery or bulwark often known as Salcombe Castle (MDV7025) at the mouth of the Kingsbridge Estuary was reconstructed as Fort Charles and reinforced by a local Royalist, Sir Edmund Fortescue, as a defence against possible Parliamentary raiders (Parker, Passmore and Stoyle, 2005).

Parliamentary forces took Dartmouth and Salcombe in January 1646 but the Royalist garrison refused to quit Fort Charles and the Parliamentarians opted to lay siege to the fort rather than risk assault. Stoyle states that "Thereafter, the Parliamentarian forces seem to have been content to besiege the fort at a distance." Stoyle also states that "Little is known about the course of the siege." (Stoyle 1994, 3) but it is recorded that Parliamentary forces established a battery on Rickham Common on the opposite site of the estuary facing Fort Charles as the siege began – which could be interpreted as besieging 'from a distance' (MDV7043: http://www.salcombeinformation.co.uk/salcombe-history.asp).

Although little evidence of the Rickham Common Battery was identified by the survey, a second possible gun emplacement was recorded at East Soar, on the opposite side of the Kingsbridge Estuary, south of Salcombe. A linear bank flanked at either end by two roughly circular mounds is visible as a cropmark and low earthwork on aerial photographs of 1954 and more recent images derived from lidar data (MDV104268). Its prominent location on the east-facing cliffs overlooking The Bar, at the mouth of the Kingsbridge Estuary might support an interpretation as a military or defensive fortification. The earthworks are most readily interpreted as evidence of a rapidly constructed temporary emplacement, such as might be thrown up by local troops during a conflict, but which political affiliation is unknown.

It is of course possible that this earthwork emplacement was created during a later conflict to guard the mouth of the estuary; as is touched upon below, the South Devon coast was heavily guarded during the Napoleonic conflicts. Other interpretations are also possible; the field in which the southern possible gun emplacement is located is recorded in the Tithe apportionment as 'East Beacon Field'. Further investigation is needed to facilitate closer interpretation of this site.

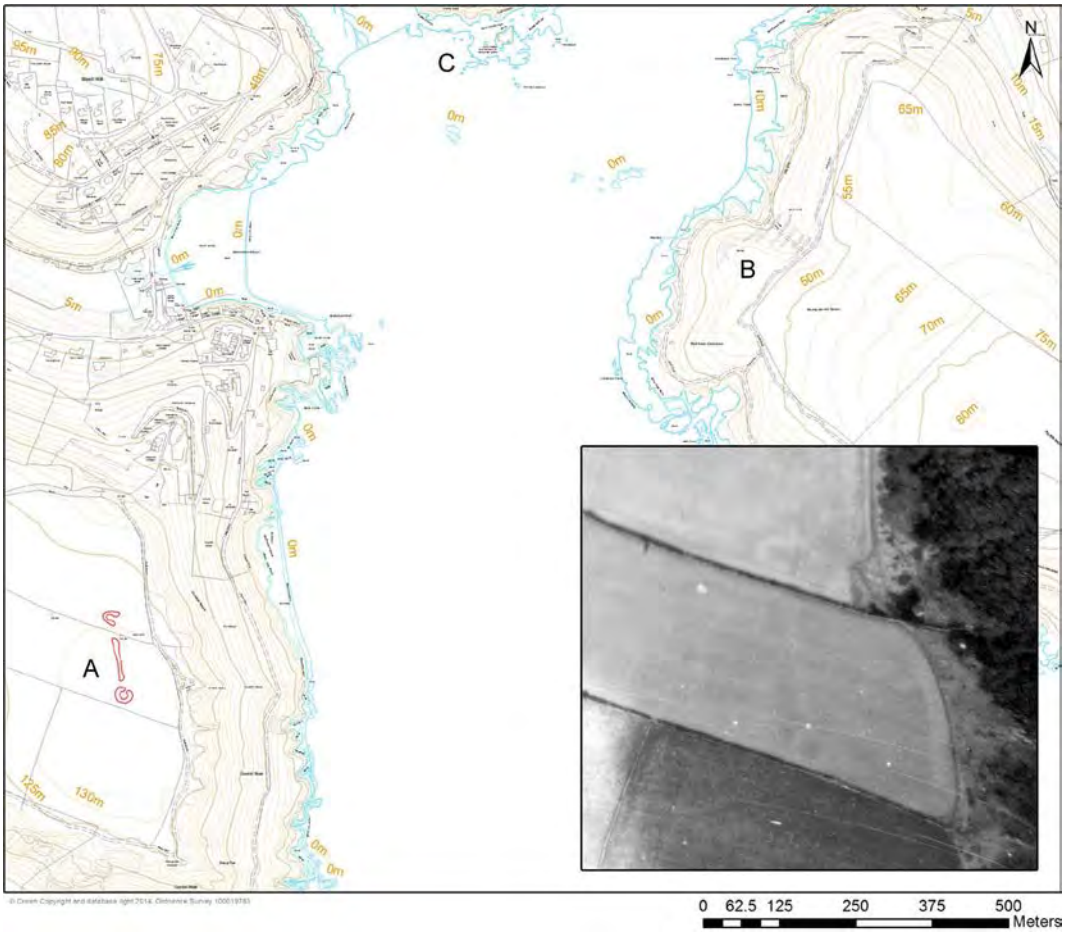


Figure 19: A: A possible gun battery overlooking the mouth of the Kingsbridge Estuary (MDV104268). B: Rickham Common Battery (MDV7043): C: Fort Charles (MDV7025). Inset: RAF/540/1278 V 0025-0026 5-APR-1954. English Heritage RAF Photography.

Several Napoleonic-era coastal defensive sites were recorded during the survey, including the iconic scheduled sites at Berry Head (Figure 20).

Figure 20: Berry Head promontory from the sea, showing the scale of twentieth century quarrying impact on the north side of Fort Number 3. The Napoleonic-era stone redoubt can just be seen on the skyline, on the far right of the image. Photograph: Stephanie Knight, September 2013.

Three dark trapezoidal cropmarks in grass at Berry Head Point, most clearly visible on aerial photographs taken in 2012 (Figure 21), probably formed over the site of gun platforms around the edge of the headland, associated with the earliest battery constructed in 1779-80 (Pye and Slater 1990, Fig 12). Two are on the north side (to the top of the figure) and the third faces south from the headland; the two northernmost platforms are also visible as dark cropmarks in

1969. Their size at 5 m by 3 to 4.5 m is similar to other contemporary gun beds in the area (e.g. at SX 9404 5667 and SX 9368 5666), and the cropmark patterning is unusual, as dark parallel linear features can be distinguished. The clearest comprises five linear features, each circa 0.4 m in width. These darker linear features may have formed over the cuts for the earliest timber structures, or perhaps resulted from hollows created during the later phase of robbing out the granite (as described in the Torbay HER record MTO20085). At least three additional possible cropmark features were too indistinct to map with confidence but are likely to indicate further platforms.

Figure 21: Trapezoidal gun platforms at Berry Head Point, visible as dark green and pale green striped cropmarks (SX 9404 56 67). Channel Coastal Observatory SX9456_20120918ortho.ecw 18-SEP-2012. © Channel Coast Observatory.

This coastal battery was extended and completed in 1809, during refortifications of the coast in the lead up to the Napoleonic wars. One of two forts that were built of a proposed total of four in this area, its substantial defensive structures and earthworks, with numerous internal features, are clearly visible on aerial photographs from 1946 to 2012 (e.g. Figures 22 and 119). Much of the sunken terrace on the northern side has been quarried away since the earliest images were taken and vegetation cover has obscured some remains on the southern side. Although much of the fort is accurately depicted on the base mapping, other parts are visible in greater detail on the aerial photographs and additional features have also been transcribed.

CUCAP K17-AD 129 03-JUL-1973. Cambridge University Collection of Aerial Photography.

Figure 22: Foundations of some of the buildings within Berry Head Fort 3 are visible as low structures or parchmarks in summer 1973; the internal layout of some can be discerned (SX 9445 5654). Detail of the cannon embrasures through the revetment can be seen on the left of the image.

In addition to the massive defensive walls and bank, with gun platforms and embrasures, many of the internal structures depicted on historic plans (see Pye and Slater 1990) were visible as low ruins or earthwork mounds. The internal plans of some of the barracks and the structure south-west of the guardhouse were mapped from aerial photographs taken in the 1970s, during the drought year of 1976 but also in 1973 (Figure 22).

Features additional to those already on the Torbay HER include probable Second World War structures such as two small roughly square buildings, possibly lookouts, on the southern part of the rampart (visible as small white features in the top right of Figure 120a), and two rectangular platforms, perhaps the bases for temporary military structures, located some 100 m to the north (just visible as pale marks in the sunken area on the bottom right of Figure 120a).

Smugglers and Summer Houses

Two coastal structures, similar in form and potentially of similar date and function, have been recorded at Holcombe near Dawlish (MDV105334, SX 9604 7475), and Watcombe in Torbay (SX 9263 6717). Both structures appear to be octagonal in plan, 3 to 3.5 m in diameter and appear to have been flat roofed with a form of crenelated roofline (Figure 23). Neither structure was recorded on the HER data available to the survey.

The Watcombe structure probably corresponds with a structure depicted but not annotated on the First Edition OS map, whilst the Holcombe structure is not shown on any historic mapping.

The date and function of both structures are unknown, but local knowledge suggests that the Holcombe structure was built as a Customs lookout (and the coastal paths "were definitely patrolled by customs men and Smuggler's Lane is genuinely supposed to be a smuggler's exit from the beach" pers. com. Andy Watson and Lin Watson, 6th September 2013). The Ordnance Survey map evidence can be used to support the interpretation that the Watcombe building

predates 1887 and it is possible that, overlooking the evocatively named 'Smuggler's Hole', it was built for a similar purpose.

To date, no close parallel for such structures in coastguard or revenue related function has been identified in the UK. A strikingly similar, although possibly larger structure originally built in the early 19th century to combat smuggling activities has been identified overlooking Botany Bay in New South Wales, Australia (Figure 24).

The structure at Holcombe is on private land and was reportedly recently in use as a summerhouse, although it is somewhat overgrown on aerial photographs of 2012. The Watcombe structure was clearly ruinous in 1959 and its location is now obscured by woodland, its current condition unknown.

HAW 9394/11 22-JUL-1959. © English Heritage. (Harold Wingham Collection).

CUCAP CF/033 16-JUN-1949

Figure 23: Newly recorded octagonal structures at (top-left) Holcombe near Dawlish (MDV105334, SX 9604 7475); (top-right) Watcombe in Torbay (MDV104998, SX 9263 6717).

Figure 24: The Macquarie Watchtower, La Perouse Botany Bay, New South Wales. Randwick City Council Item no.31A. Built to combat rum smuggling around 1810, it was used as a Customs Station between 1831 and 1904.

Information from the Randwick City Council website.

Photograph: © J. Bar reproduced under the Creative Commons Attribution-ShareAlike 3.0 Unported licence.

7.2.3 Second World War: Reuse of Early Twentieth Century Sites

Many of Plymouth's historic coast defences were rearmed for use in the Second World War. Within the survey area, Lentney Coastal Battery (MDV39300) and Renney Coastal Battery (MDV13723), both completed in the early twentieth century, were both rearmed and equipped with new Battery Observation Posts. Renney Battery was the more powerful of the two, paired with Penlee Battery to the west of Plymouth Sound and intended to keep the largest battleships out of range from the dockyard (Pye and Woodward 1996, 225).

During the Second World War Lentney and Renney batteries shared a substantial amount of temporary infrastructure, in particular accommodation and stores, the extent of which has been recorded by the survey. With a Searchlight emplacement at Coombe Park just to the north (MDV72050) and the training establishment of HM Gunnery Range Wembury (later HMS Cambridge: MDV50865) to the south-east much, of the coast between Andurn Point and Wembury Point was turned over to the military complex (Figure 25).

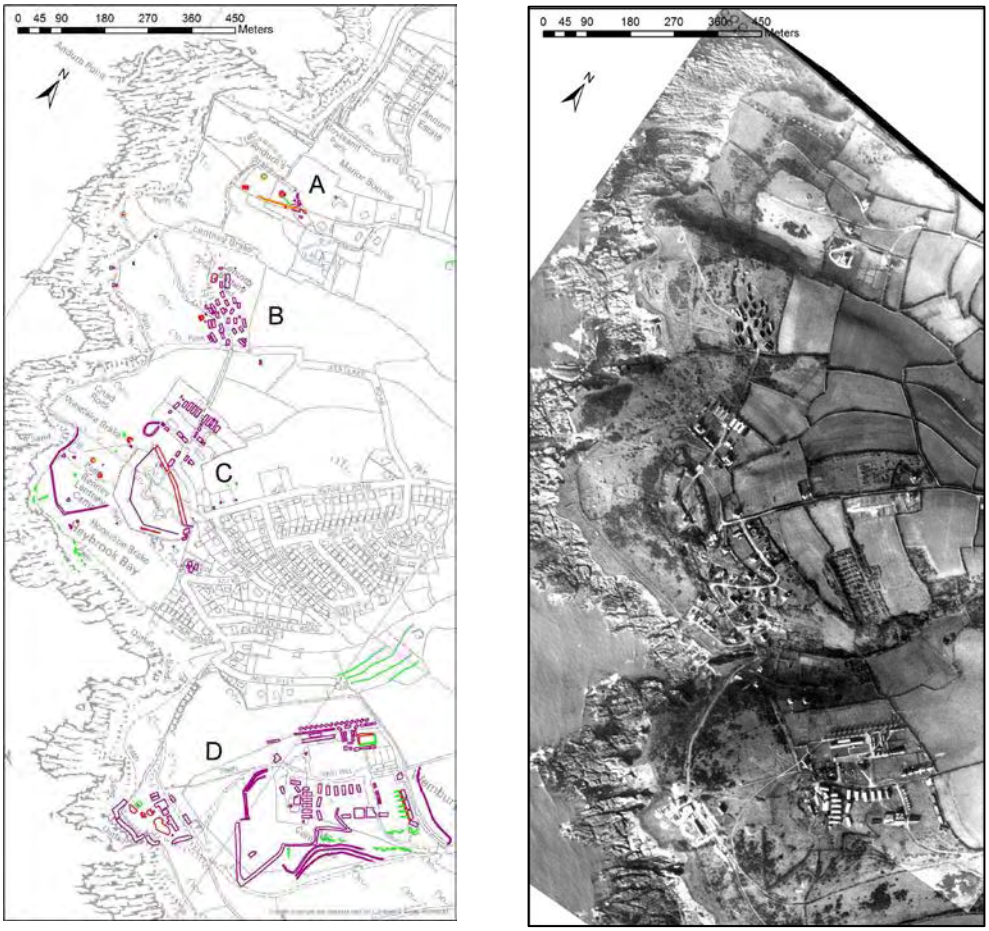


Figure 25: The Andurn-Wembury Point military complex; A) Searchlight Battery (MDV72050); B) Lentney Battery (MDV39300); C) Renney Battery (MDV13723); D) HMS Cambridge (MDV50865). LAA and CASL emplacements are recorded west of Renney Battery. The Second World War Gunnery Training School at Wembury Point is recorded west of HMS Cambridge. RAF/CPE/UK/1890 RP 3110-**3**111 10-DEC-1946. English Heritage RAF Photography.

7.2.4 Second World War: Passive Coast Defence / Coastal Anti-Invasion Defences

Fewer than anticipated early wartime anti-invasion defences were identified by the survey. The available laser scan copies of the early 1940s M-series and US aerial photographs were of variable clarity and often detail of early wartime anti-invasion defences was indistinct. This affected interpretation, hindering both the identification of new features and the ability to check whether features visible on later photographs were present during the early years of the Second World War.

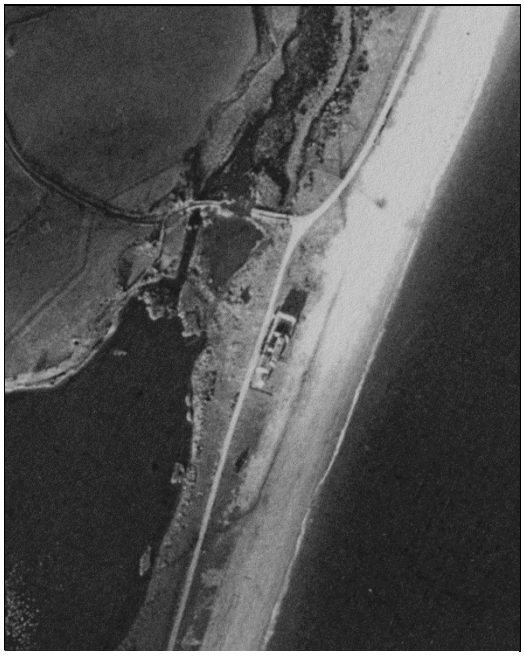
There are few low lying beaches potentially vulnerable to invasion along the South Devon coast and it is probable the density of coastal crust defences was lower here than elsewhere on the south coast. Nonetheless, those that existed were defended and a number of significant concentrations of coastal crust defences were identified.

Coastal Anti-Invasion Defences: Case Study, Slapton Sands

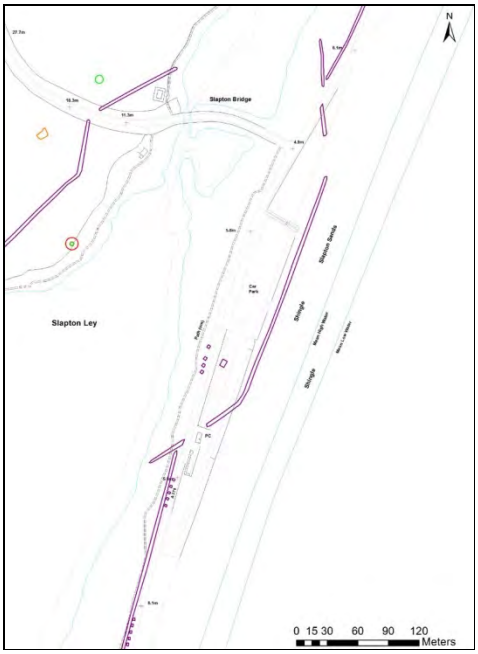
An extensive network of anti-invasion defences was observed along the length of coastline from Hallsands to Strete. This stretch of coastline, which is dominated by Slapton Sands and comprises approximately 8km of gentle sloping beach was a natural weak spot against the threat of invasion when compared to the more rugged and rocky coastline to the north and south. The establishment of a more robust and intricate network of defences along this more vulnerable stretch of coastline was clearly a prime concern during the early stages of the war.

A number of previously unrecorded sites have been identified along this stretch of coastline, although where sites have been previously recorded, the survey has helped to provide a greater understanding of their structure, layout and organisation. The increase in number of sites and the enhancement of previously recorded sites has, therefore, helped to show how these sites form part of an integrated network of defences along this stretch of coastline. The dense concentration of sites recorded along Slapton sands on USAAF aerial photographs of December 1943 onwards has, however, proved problematic when attempting to establish relative phasing of these sites, in particular, from those deemed as *anti-invasion defence sites* to the later *training sites*. Interpretation of these sites was not helped by the general poorer resolution of the RAF 1941 aerial photographs.

Barbed wire entanglements formed an integral part of passive anti-invasion defences along Slapton Sands and were visible on aerial photographs of 1941 onwards as an almost continuous single line from Beesands to Strete (MDV104380 and MDV104575). More elaborate sections of barbed wire entanglements were visible which appear to reinforce strategic weak points located at Torcross, Slapton Bridge and Strete Gate (Figures 26 and 27). After the threat of invasion had passed, however, sections of these barbed wire entanglements appear to have been deliberately breached in order to facilitate training preparations carried out by American troops in advance of the Normandy Landings. The barbed wire entanglements had been completely removed by 1946.



US/7PH/GP/LOC145 8030 05 -JAN-1944. English Heritage USAAF Photography.



NMP mapping © English Heritage. The base map is © Crown Copyright and dat abase right 2014. Ordnance Survey 100019783.

Figure 26: USAAF aerial photograph of 1944, with transcription, showing surviving anti-invasion obstacles at Slapton Bridge (MDV104575), with later training area (MDV104468) to the west.

US/7PH/GP/LOC133 7029 30-DEC-1943. English Heritage USAAF Photography.

NMP mapping © English Heritage. The base map is © Crown Copyright and dat abase right 2014. Ordnance Survey 100019783.

Figure 27: USAAF aerial photograph of 1943, with transcription, showing surviving anti-invasion obstacles along Slapton Sands (MDV104575), with barbed wire entanglements, gun pits and possible anti-tank ditch. A command post (MDV39401) is visible further inland at Strete Gate and possible observation post (MDV104526) to the south.

Other probable passive anti-invasion obstacles were visible along Slapton Sands on military aerial photographs of 1941 onwards, although these were generally poorly defined. Of particular note are a series of upright structures visible along the eastern side of the barbed wire entanglements, which appear to form an integral component of the defences. From Torcross to Slapton Bridge, these obstacles are visible as sets of five closely-set upright posts, with each set spaced approximately 105m apart. These are difficult to see when not viewed stereoscopically but are visible in the transcription parallel to the barbed wire entanglements (Figure 26). From Slapton Bridge to Strete Gate, however, the obstacles appear to be set into groups of two to three, perpendicular to the entanglements. The function of these structures remains unclear since they do not appear to form part of a continuous line, a fundamental feature of other anti-invasion obstacles. It is possible that these posts formed part of an anti-aircraft or anti-tank obstruction, perhaps in association with additional, smaller structures not visible on the available aerial photographs. A common anti-aircraft obstacle, for example, comprised a series of upright posts or scaffold poles inter-connected with steel cable or chain and often flanking a roadside or on wide, firm beaches (Dobinson 1996,133-134). The use of such cable or chain may have conceivably formed part of these structures. The obstacles remain visible on aerial photographs of 1945, although they had been completely removed by 1946.

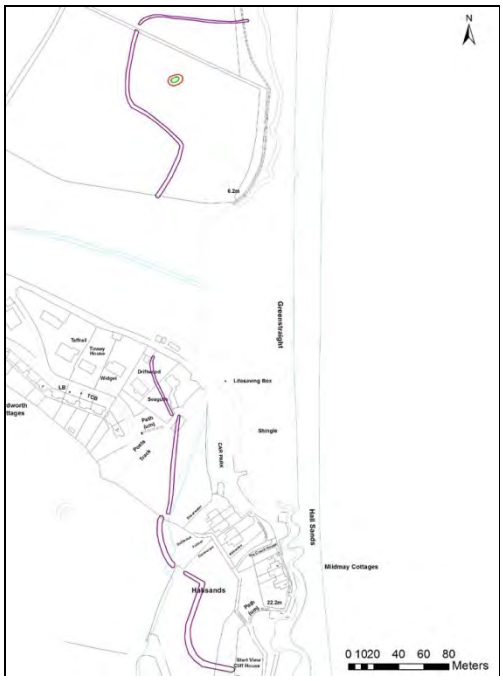
Other common passive anti-invasion obstacles included beach scaffolding and anti-tank ditches. Such obstacles are likely to have been put into place along Slapton Sands, although they were not clearly observed on aerial photographs viewed as part of this survey, possibly suggesting that they were removed shortly after the threat of invasion has passed. A short section of ditch visible parallel to the barbed wire entanglements at the common post at Strete Gate may represent tentative evidence for the remains of an anti-tank ditch (Figure 27).

Along the length of the barbed wire entanglements, a number of probable gun pits are visible as earthwork pit and banked features on aerial photographs of 1941 onwards (Figure 27). These small sub-circular features are typically around 6m in in length/diameter, although more substantial, oval-shaped examples measure up to approximately 10m in length. These features are likely to have been more extensive in number than has been recorded here as part of this survey, which may in part be due to their more temporary nature, as well as their poor definition on aerial photographs against a backdrop of sand. These features have been largely levelled by 1944 during the subsequent training exercises carried out within the area.

Two previously unrecorded structures of uncertain function were also visible on the western side of the barbed wire entanglements on aerial photographs of 1941 onwards at Slapton Bridge (MDV104587) and to the south of Strete Gate (MDV104526, Figure 27). These rectangular structures measure approximately 6.5m and 11m in length, respectively and may represent possible observation posts or pillboxes. MDV104587 has been largely destroyed on aerial photographs of 1944 as possible target practice during the American training exercises, while MDV104526 has been completely levelled on aerial photographs of 1945.

These beach defences appear to have been supported by a wide range of defended stronghold positions located further inland. The site of a previously recorded command post (MDV39401) is visible on aerial photographs of 1941 onwards, to the north of Strete Gate (Figure 27). The command post encompasses an area of approximately 0.66 hectares and is well positioned on the higher ground slightly inland of, and providing commanding views across, Slapton Sands. It is bound by the A379 along its north-west edge which offered good road access and is defined across the remainder of the site by a semi-circular line of barbed wire entanglements. A central structure of the possible command block or gun battery and a possible second structure to the north are visible within the compound. Additional elements of the command post, if present, were probably sited within the protection of trees which front the south-east side of the A379 and, as such, are obscured from aerial photographs. The barbed wire entanglements are visible on aerial photographs until 1943, although they have been completely removed by 1945, whilst the possible command block remains visible as a largely demolished structure on aerial photographs until 1976. Other defended localities include barbed wire entanglements and gun pit at Hallsands (MDV104257, Figure 28), a gun battery at Torcross (MDV30611) and an intricate line of barbed wire entanglements defining a possible gun battery with associated range of gun pits and slit trenches at Strete (MDV104528) (Figure 29). Elements of this latter site may, however, be associated with the later training exercises carried out along this stretch of coast.

US/7PH/GP/LOC133 7017 30-DEC-1943. English Heritage USAAF Photography.



NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783.

Figure 28: Possible barbed wire entanglements and earthwork gun pit at Hallsands, with transcription (MDV104257)

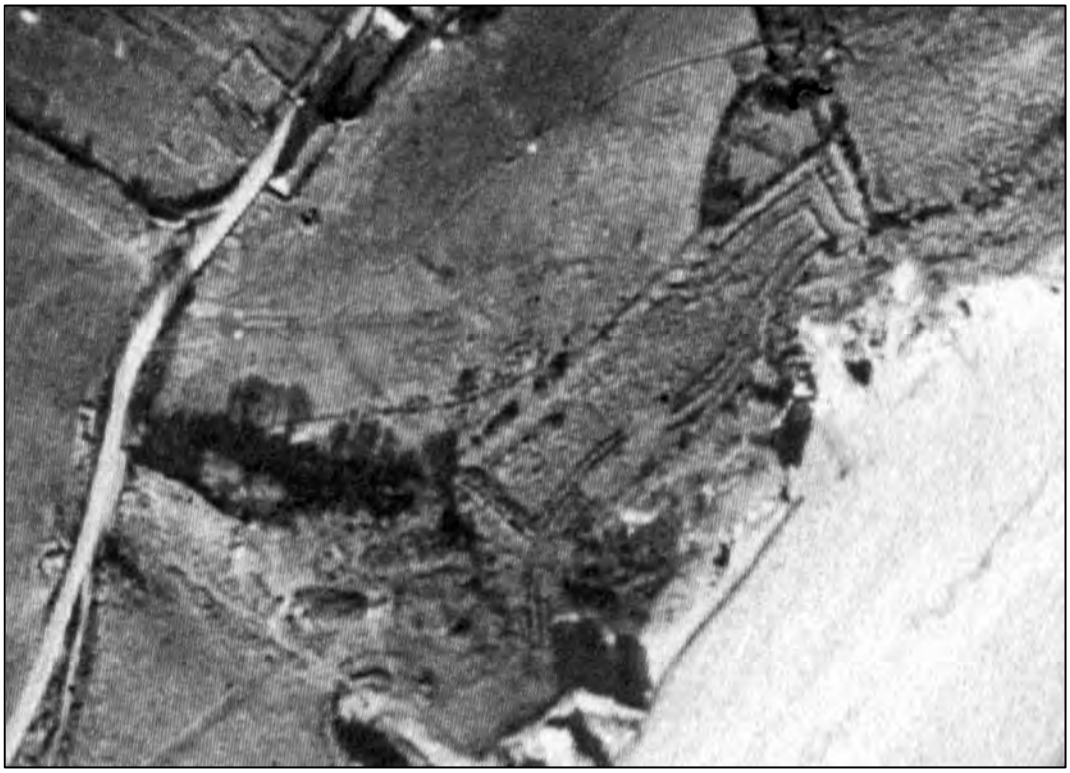


Figure 29: Possible barbed wire entanglements of defended position at Strete (MDV104528) with earthworks. The site may also possibly relate to the later training exercises carried out in this locality. US/7PH/GP/LOC133 7030 30-DEC-1943. English Heritage USAAF Photography.

Whilst minefields were often established in conjunction with anti-invasion obstacles, no such features were observed along Slapton Sands. Tentative evidence for an anti-personnel or anti-tank minefield was, however, recorded further to the north at Blackpool Sands (MDV104552). This possible, previously unrecorded minefield was visible as a s eries of small circular earthwork pits forming two regular parallel rows that span a distance of approximately 190m across the mouth of the inlet, to the south-east of Blackpool Bridge. The pits were likely created following the removal of the mines when the threat of invasion had passed.

A second, smaller focus of anti-invasion defences was recorded around the mouth of the Exe Estuary, at Dawlish Warren and Exmouth. Linear 'coastal crust' defences were recorded along the shoreline from Exmouth Emergency Coastal Battery (MDV39546) south-east of the town, to The Point at the mouth of the estuary. In 1941 Exmouth did not appear to warrant 'defence in depth'; the linear defences appeared to comprise only beach scaffold with possible fragmentary barbed wire entanglemtents to the rear, and anti-personnel minefields are again not discernible (Figure 30 and 31). However, the early 1940s coverage for this area, vertical and military oblique, was again of low copy quality, possibly too poor to reveal the subtle earthworks that might reveal evidence of a recently installed or removed minefield.

Figure 30: Anti-invasion barbed wire apron crossing the estuarine silts around the docks at The Point, Exmouth. MDV105828. NMR SX 9980/17 MSO 31241/46 14-AUG-41. English Heritage RAF Photography.

Figure 31: Anti-invasion beach scaffolding and possible barbed wire defences further east along the foreshore at The Maer, Exmouth (MDV105338). A camouflaged Emergency Coastal Battery is visible to the rear (MDV39546). NMR SY 0179/001 MSO 31241/PO-059 14-AUG-1941. English Heritage RAF Photography.

The anti-invasion defences formed a continuous barrier across the estuary from Exmouth to Dawlish Warren, literally, by means of a submerged obstruction, probably a continuation of the barbed wire entanglement (MDV105848). Although not in close proximity to a vulnerable point, as a reasonably flat extent of land Dawlish Warren presented a potentially vulnerable landing ground for enemy forces from both sea and the air. The only means of exiting the Warren was to the west, also the location of a mainline railway station. As such, the aerial photographs reveal the western end of Dawlish Warren defended almost as a

mini stop-line, with both anti-aircraft and linear anti-invasion defences (Figure 32).

A beach scaffold and possible barbed wire obstruction divides the spit into two, to the west or rear of which were located four or possibly five pillboxes in close proximity. To the south, on areas of former sand flats, intersecting linear fence-like structures are visible. War Office guidelines recommended six main types of aircraft obstruction (Dobinson 1996b, 132-134), of which this is not one. Nonetheless, these structures are interpreted as anti-aircraft obstructions and would have presented an effective obstruction to enemy transport aircraft or gliders attempting to land troops on the Warren. The variety, density and non-standard form of the Warren's defences graphically illustrate the seriousness of the threat perceived by the local arm of Southern Command.

Despite the variable coverge of early wartime AP, a degree of anti-invasion defence was identified on many beaches and estuaries, albeit probably incomplete. In the South Hams possible gunpits were noted around Burgh Island (MDV104287); beach scaffolding from Challaborough (MDV104229) and Bantham Ham (MDV104417) via Broadsands (SX 8961 5745) and Goodrington (SX 8935 5952) to Seaton (MDV105934); barbed wire obstructions at Fishcombe Cove (SX 9166 5669); crenelated ditches at Cockleridge Ham and other parts of the South Hams coast (e.g. MDV104349), and anti-invasion posts in the Avon Estuary (MDV104345). Some of these features appear to survive, the gunpits and some of the ditches as earthworks, scaffold bases at Seaton as truncated structures, and many of the numerous associated pillboxes in a range of conditions.

In addition to sites with a clear modern military function, several less diagnostic small complexes of earthworks and structures were recorded along the coastal margins, and these may also have originated during the Second World War. If so, this means that small remote complexes were scattered along naturally defended areas of coastline, perhaps to monitor activity on the air and sea routes into strategically important areas. However further investigation is required to ascertain the function and date of these sites before any conclusions can be drawn. Seveal are described below (Figure 34-37).

RAF/106G/UK/1412 3045 13-APR-1946. English Heritage RAF Photography.

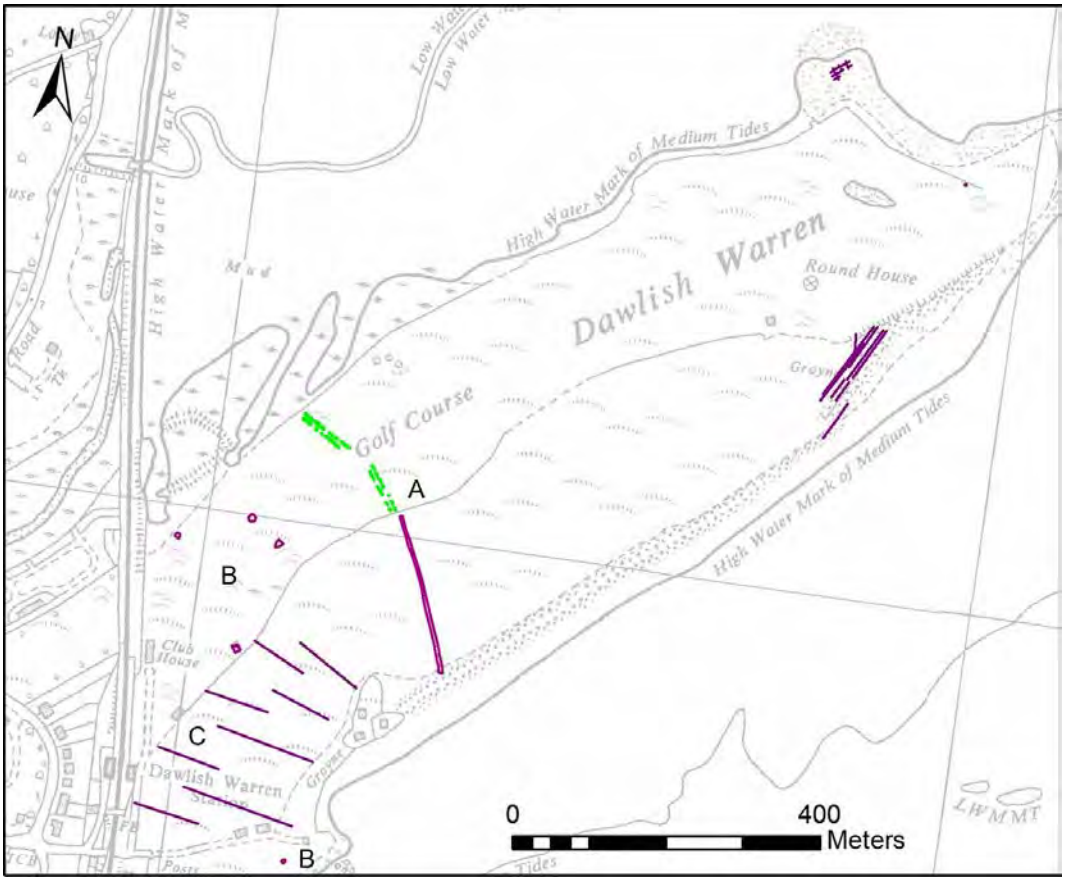
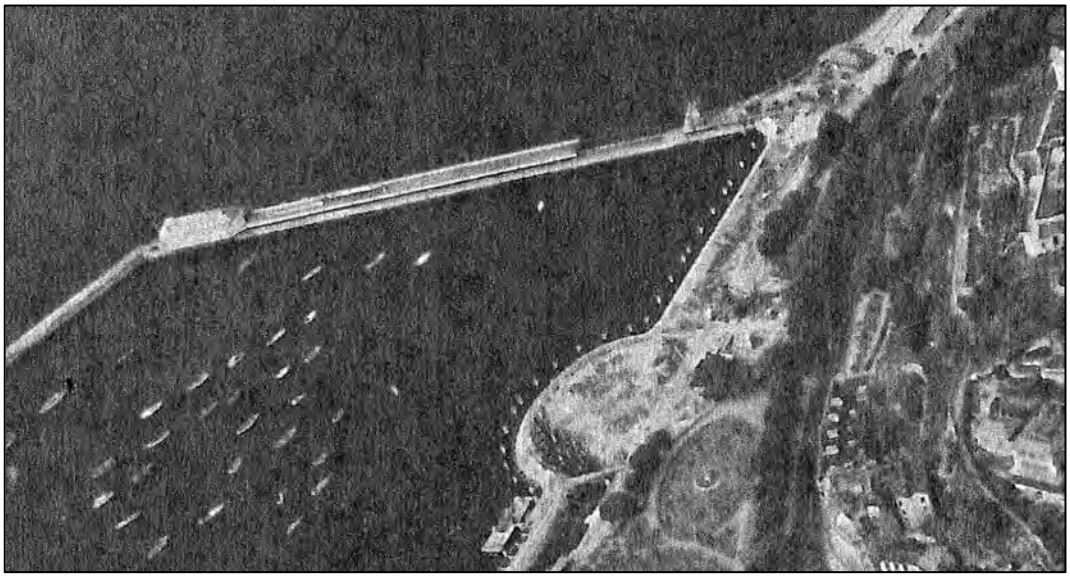


Figure 32: Dawlish Warren Second World War anti-invasion defences. A: Beach scaffolding/barbed wire linear obstruction. B: Pillboxes, largely of local non-standard construction. C: Non-standard anti-aircraft obstructions. The defences are illustrated on a 1953-1969 National Grid OS A edition imperial base map for clarity.

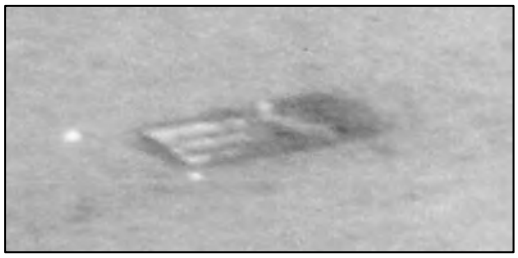


NMR SX9163/10 MSO 31260/PO20 13-SEP-1941. English Heritage RAF Photography.

Figure 33: Torquay seafront in 1941 with a section of Princess Pier removed at the landward end (top of image, SX 9145 6343). Other piers along the south coast were also partially dismantled to hinder any enemy landing attempts (see Royall 2014, 82-83). At Torquay this section was soon reinstated after the war, and appears to have been completely rebuilt by 1946.

a. RAF/106G/UK/1412 RP 4306-4307 13-APR-1946. English Heritage RAF Photography.

b. RAF/106G/UK/1412 RP 4306-4307 13-APR-1946. English Heritage RAF Photography.



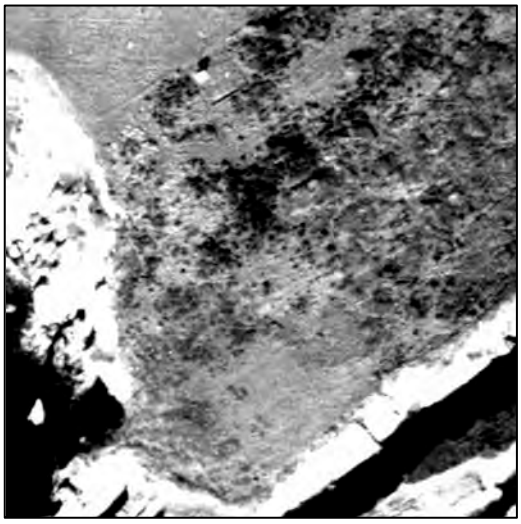
c. NMR SY2889/276 RAF 30149/PSFO 0081 15 - AUG-1960. English Heritage RAF Photography.

Figure 34: Possible military site and buildings near Dowland. a: rectangular pale marks along the road and field boundary (top centre; MDV106570) east of the deserted settlement MDV1140 which is visible as scrubby earthwork banks, and possible military structures on the cliff edge to the south (bottom right; MDV106569). b and c: detail of the structures in 1946 and 1960.

Two rectangular structures, circa 35 m apart, are visible on aerial photographs east of Axmouth taken in 1946 (Figure 34). The southernmost is low, flat and pale, probably a concrete hut base partly obscured or broken up, while the other appears to have a superstructure. Both are circa 6-7 m in width and the extant structure is 17 m long; a size consistent with an interpretation as Nissen-type huts on concrete platforms. The low flat structure is not visible on aerial photographs taken in 1956, and the superstructure of the other appears to have been removed by this date, leaving just the one flat base in a cultivated field. It appears to have been in three parts by 1960, perhaps having been cast in segments that had started to break up by his point. These too appear to have been removed after 1960, and the area has been intensively cultivated since.

These two structures were relatively close to a possible military site approximately 500 m to the north where eleven rectangular pale areas, arrayed along the south and east boundary of a field, are visible on aerial photographs taken in 1946, but not on other available images (Figure 34a). All measure approximately 5 by 10 m in plan, and the features appear to be bare ground probably exposed when overlying temporary structures were removed. Given the date and the possible Second World War military site to the south, a military origin must be considered, and the size of the features is consistent with that of Nissen huts. Equally, temporary hayricks can also cause similar marks, although it would be unusual for these to be found in such a concentration. Further research, such as oral history or documentary searches, may provide some answers.

More enigmatic are the series of parallel rectangular levelled areas visible on aerial photographs taken in 1945 at Bugle Hole near the mouth of the Erme estuary in the west of the project area (Figure 35). They are not clearly defined and may simply be rolled areas of flatter land or shorter vegetation. It is possible that they are associated with the small rectangular structure 120 m upslope that is visible on aerial photographs between 1945 and 1951 within a rectangular enclosure probably defined by a fence. The location suggests this could have been an observation post in the Second World War, but other interpretations are possible. No visible remains of the structure or the earthwork are evident on aerial photographs taken in 2007.



RAF/106G/UK/967 RS 3116-3117 01-NOV-1945. English Heritage RAF Photography.

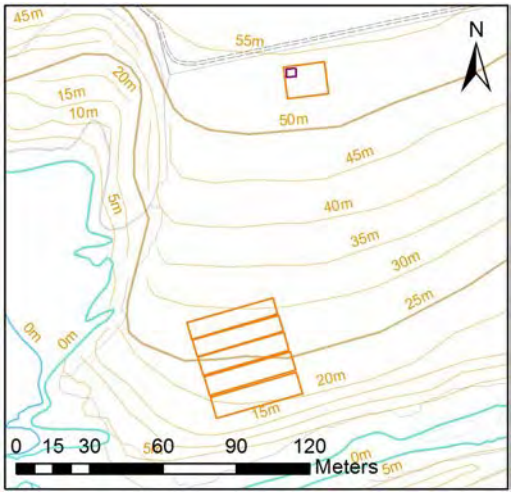


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Figure 35: Possible military terraces (MDV104049) and enclosed structure (MDV104048) near the cliff edge east of Bugle Hole.

RAF/106G/UK/967 RS 3110-3111 01 -NOV-1945. English Heritage RAF Photography.

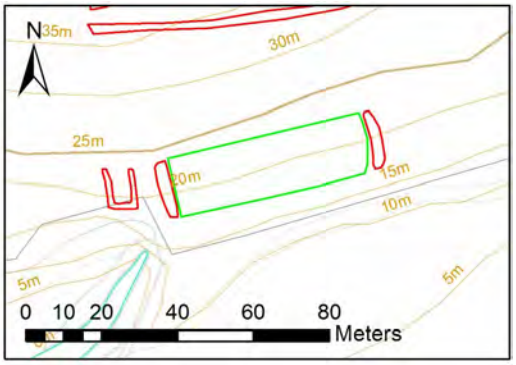

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Figure 36: Possible military earthworks on Beacon Hill (MDV103995).

Another platform was recorded below Beacon Hill, sited in a similar coastal edge location circa 3 km to the west of Bugle Hole. It appears to have been terraced into the slope and i s visible as an earthwork on aer ial photographs from the 1940s (Figure 36). A narrow bank was located at either short end with a further earthwork bank, of similar width but U-shaped in plan, sited just to the west. They are located in a clearly defined area of very short grass sward in comparison to the surrounding rough ground of the coastal slopes. This location suggests these could have had a military origin, perhaps a platform for Second World War structures, although this is open to interpretation. Earthworks are still visible here on recent aerial photographs taken in 2002, although the area of the U-shaped feature is obscured by scrub, and a s ite visit could help to clarify their likely function.

A better surviving structure observed on t he aerial photographs and during the site visit is sited in the more strategically important location of Brixham, close to camouflaged fuel tank stores and the harbour (Figure 37). It appears to be a

lookout, sited on the outside of the seawall, and may be of Second World War origin, although its window openings do not have a military character.

Photograph: Stephanie Knight, September 2013.

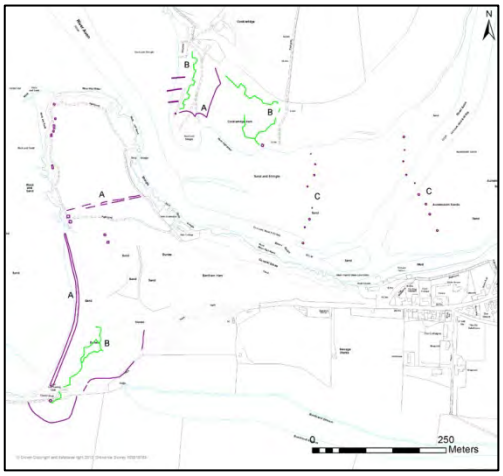
NMR SX9356/3 RAF 30092/SO-01321 15-AUG-1947. English Heritage RAF Photography.

Figure 37: An unusually sited building on the outside of the seawall at Brixham may be a lookout (SX 9334 5667). It is just visible on aerial photographs taken in 1947 (centre of the lower image), and was extant in 2013 (top image).

Estuaries and WWII Monument Survival

The smaller estuaries that cut the South Devon coastline were perceived as potentially vulnerable to the enemy; if not to full invasion then possibly to small raiding parties that could use estuarine inlets to gain access to targets; for example Plymouth docks from the Kingsbridge estuary (Dobinson 1996b, 91)

In light of this it is interesting to note that the provision of anti-invasion defences at estuarine locations across the west of the project area is not uniform. The mouths of some of the smaller western watercourses, such as the River Erme, appear to have been provided with less dense and fewer hardened defences than others of similar size in the same area. Less than 6km to the south-east the Avon was well defended (Figure 38), although predominantly with temporary and ephemeral obstructions.



© Crown Copyright and dat abase right 2013. Ordnance Survey 100019783.

RAF/106G/UK/967 RS 3143 01 -NOV-1945. English Heritage RAF Photography.

Figure 38: Extensive but ephemeral Second World War defences at the mouth of the Avon River, near Thurlestone.

The picture might be slightly different to the east of the survey area. Although not an estuary, Branscombe Mouth near Beer is at the mouth of a broad combe between high coastal cliffs that opens onto a l ow accessible beach, ideal for beach landings. Clearly perceived to be vulnerable, Branscombe Mouth warranted substantial defences comprising three pillboxes (MDV39336, MDV39337, MDV106916), barbed wire entanglements and t hree rows of hardened concrete obstructions across the mouth of the combe itself (MDV55051). Any 'soft' barbed wire beach defences installed as part of the 'coastal crust' had probably been removed by late 1944 and w ere not visible on the earliest images available to the survey, but the hardened obstructions remain visible on CUCAP images of 1950 and roughly contemporary postcards (Figures 39 and 40). Branscombe Mouth's location close to the Taunton Stop Line, a short distance to the east might have contributed to its heavier defences.

Figure 39: Anti-invasion defences at Branscombe Mouth surviving *in situ* in 1950. CUCAP FK0055 13-AUG-1950. © Cambridge University Collection of Aerial Photographs.

Figure 40: Surviving hardened anti-invasion defences illustrated on an undated postcard of Branscombe Mouth. Note two pillboxes behind (west) of the café building. The beach pillbox may be reused or disguised as a fisherman's hut, but loopholes are clearly visible. Reproduced courtesy of the Branscombe Project.

Once the serious threat of invasion had passed in late 1942 anti-invasion defences were only selectively maintained. From mid-1943 into early-1944 removal of defences in the north of Britain was authorised and by the autumn of 1944, after the D-Day landings made any further raids improbable, Southern Command removed any requirement to maintain any 'defence works' and announced that they should be removed (Dobinson 1996b, 197). Any surviving anti-invasion defences are therefore "a small fragment of the original population, which through serendipitous reasons has escaped later and post-war clearance, vandalism, coastal erosion and decay" (Dobinson 1996b, 197).

Excluding pillboxes, few anti-invasion defences appear to survive *in situ* or in the locality of their original deployment. A possible exception might be visible at Branscombe Mouth. Two of the pillboxes overlooking the combe mouth remain *in situ*. Unusually some adaptation and reuse of the defence obstructions might be evident in the form of 'dragons's teeth' bollards, albeit possibly in a modified condition (Figure 41).

Local knowledge suggests that most of the dragon's teeth were buried close to their original position but that some fragments might be eroding from the beach gravels (Barbara Bender, pers. comm. May 2014). This suggestion is supported by evidence observed on a field visit in May 2014 (Figure 41).

Figure 41: Left; Possible ‘dragons’s teeth’ reused as bollards at Branscombe Mouth. Right; cylindrical ‘dragons’s tooth’ buried *in situ* under beach gravels. Photographs: Cain Hegarty, May 2014.

Active Coast Defence

A previously unrecorded Second World War coastal battery was identified on aerial photographs of 1941 onwards on a head land between Castle Cove and Sugary Cove to the south of Dartmouth castle (MDV105219). Of particular interest is the design of the main gun emplacement. Oblique aerial photographs of 1947 (Figure 42a) show the upstanding remains of the gun house as a structure with a flat roof with scalloped edges. This unusual shape may have been designed as a means of camouflage.

A circular feature on the roof might have been intended to emulate a garden feature, house a l ight anti-aircraft machine gun position, or both. A more substantial possible embanked light anti-aircraft emplacement, complete with ammunition lockers, is visible to the immediate north, with a Coastal Artillery Searchlight (CASL) located on a rock outcrop at the eastern extent of the site. This was accessed via a series of descending steps, or ladder and a bridge crossing. Two Nissen huts probably provided accommodation and stores to the immediate north of the gun emplacements, and a pos sible Battery Observation Post (BOP) with an adj acent structure are located to the west, largely obscured by a dense tree cover. An engine room located further to the west of the site was also not visible on aer ial photographs owing to vegetation cover, although it is

depicted on recent mapping and was seen to be extant during a field visit in 2014 (Figure 42b).

The Castle Cove battery might have been constructed as an Emergency Coastal Battery (ECB) during the early stages of the war. Whilst displaying many features typical of an ECB it seems to have been constructed on a somewhat smaller scale and only ever seems to have been equipped with a single gun, as opposed to the standard two (Osborne 2011, 25). Whilst the absence of a second gun house may have been intentional, it may have equally been due to a shortage of guns, which were typically provided by the navy, perhaps with the intention of re-equipping the battery at a later date. It seems, however, that the battery at Castle Cove was largely overshadowed by construction of the much larger Brownstone ECB at Inner Froward Point (MDV21013) in 1942 and positioned on the opposing side of the River Dart.

With the exception of the engine room, all structures of the Castle Cove battery have been completely cleared and levelled on aerial photographs of 1950, although it is possible that below ground elements, for example concrete footings, of this former battery may survive.

Emergency Coastal Batteries survive in extremely varying degrees of completeness. At Sidmouth (MDV39545) and Exmouth (MDV39546) all battery structures and earthworks have now been removed. Similarly all structures and earthworks at Shaldon ECB (MDV39548) have been levelled, but associated structures such as searchlight emplacements survive *in situ*. A gun house might survive at Dawlish ECB (MDV39547) but was largely obscured from view by vegetation. At Seaton only one of the structures survives in anything like its original form (MDV39543); a newly recorded site nearby, with sixteen temporary structures of Nissen hut type on probable concrete bases, is likely to have been associated, but has now been completely redeveloped (MDV106474). At Corbyn's Head none of the structures are extant and their exact location was not recorded on the Torbay HER in 2010. However they were visible on some of the 1940s aerial photographs, allowing their layout and location to be mapped in greater detail (SX 9069 6318).

Conversely, at Battery Gardens, the Brixham Battery Heritage Group is involved with restoration of this well-preserved site (Figure 43). It has been comprehensively recorded (Newman and Salvatore 2003), but even so additional earthwork and structural features could be added from the aerial photographic evidence.

a. NMR SX 8850-22 RAF 30092-SO-0042 15-AUG-1947. English Heritage RAF Photography.

b. Surviving engine room to the north-west of the main battery site. Photograph: Richard Sims, May 2014.

Figure 42: Coastal battery at Castle Cove (MDV105219), Dartmouth, showing remains of the site in 1947 (top) and the surviving engine room in 2014 (bottom).

Photograph: Stephanie Knight, November 2013.

Photograph: Stephanie Knight, November 2013.

NMR SX 9156/1-9256/20 RAF 30092/SO-0128-1029 15-AUG-1947. English Heritage RAF Photography.

Figure 43: Battery Gardens in 2013 and 1947. The gunhouse in the top image is visible as the low long structure (SX 9213 5692) just left of centre in the 1947 photograph, while the searchlight houses in the middle photograph can be seen bottom right of the 1947 image (SX 9211 5696).

Active Air Defence

Along with Portsmouth and Chatham, Plymouth is one of the three principal historic dockyards of the Royal Navy (Pye and Woodward 1996). Established as a royal dockyard in the late 17th century, the defences of the dockyard have been adapted and expanded to meet the needs of various threats, from the wars with France ending in the Napoleonic wars to the rise of increasingly powerful and destructive naval guns which pushed the ring of defensive fortifications further and further from the vulnerable dockyards.

Whilst the First World War required the rearmament of some earlier batteries, the Second World War presented threats previously unimagined, most notably airborne attack (Pye and Woodward 1996, 21). As such, the survey has enhanced the record for a range of both coastal and anti-aircraft defences in the environs of the Plymouth dockyards.

To combat the new threat a range of anti-aircraft gun platforms were developed throughout the war. These can be divided into two broad categories: Heavy Anti-Aircraft Artillery (HAA) and Light Anti-Aircraft Artillery (LAA). Heavy batteries employed a range of large calibre (3 inch to 5.25 inch) guns to combat high-altitude bombers, with the technology improving over the course of the war, most significantly with the advent of radar guided guns. Up to 1940 most HAA were temporary earthwork emplacements. After this date most became permanent, with an arc of four or more guns arrayed around a command post, with accommodation and administrative blocks close by (for example see Figure 45 and Figure 46). Not all HAA battery sites constructed during the early years of the war were armed or manned, and an example of a possibly unused site has been recorded at Berry Head Common, Torbay (SX 9404 5656). In 1944 HAA batteries were redeployed as DIVER batteries to counter the V1 flying bomb (Lowry 1996, Dobinson 1996a).

In contrast, LAA batteries or emplacements could field a range of armaments from light machine guns such as Lewis or Bren guns fixed to poles or tripods, to 40mm Bofors guns. Consequently, LAA batteries or emplacements can vary from small sandbag or earthwork bank protected pits to more permanent blockwork wall and earthwork bank defended platforms. LAA sites were often paired with other defensive installations, such as HAA batteries, radar stations or coastal batteries.

Rocket 'Z' batteries were a third class of AA weapon, located at vulnerable points such as coastal batteries. Straightforward to use, these simple structures required little infrastructure and often left little trace (Lowry 1996, 61). Several rocket batteries are recorded within the survey area on the DCCHER but no evidence was recorded from the available aerial photographs.

The survey enhanced or created 18 HER records for anti-aircraft emplacements. Their type and distribution are illustrated in Figure 44.

Netton Down (MDV103817) and Down Thomas (MDV13884) were the two most south-eastern of the Heavy Anti-Aircraft Artillery emplacements constructed to defend Plymouth from air attack during the Second World War. Only three HAA sites survive in the environs of Plymouth, and of these the Down Thomas battery

has been scheduled as “one of the best preserved examples of those which protected Plymouth during World War II”. Whilst all temporary structures were removed from the battery site in the years after the war, the gun emplacements, command post and access road at Down Thomas survive *in situ*. They are depicted on current OS base maps and remain clearly visible on aerial photographs of 2012.

As such, the survey has transcribed all additional temporary structures and earthwork features. The living accommodation, general administration buildings and operational areas were separate to the battery, housed in a series of linked Nissen hut type structures dispersed around the site. While the main gun emplacements provided Plymouth with defence against high-altitude threats, such as bombing raids, the battery itself would have been at risk from low altitude attack. The NMP survey has fleshed out the detail for the site’s layout, including evidence for two Light Anti-Aircraft emplacements, one of which might have housed a Bofors gun ringed by five machine gun pits (Figure 45).

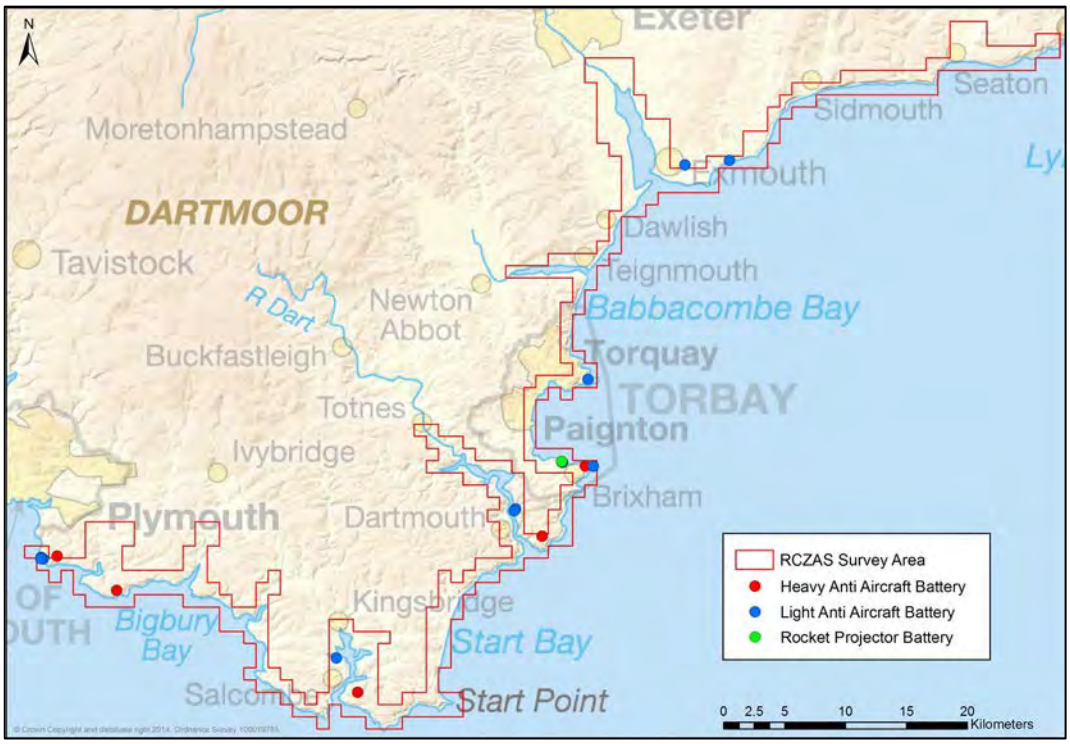


Figure 44: The distribution of HAA and LAA emplacements recorded by the survey along the South Devon coast. Notable concentrations are recorded on the eastern edge of the Plymouth Defended Area, Dartmouth and Brixham. For sites with both HAA and LAA emplacements, such as Down Thomas battery, the primary site has been plotted. © Crown Copyright and database right 2013. Ordnance Survey 100019783.

Figure 45: The four original octagonal gun emplacements and two later additional rectangular emplacements survive arrayed around access road at Down Thomas (MDV13884). The semi-sunken command post and associated structures are visible within the loop of the road. Two rings of probable LAA machine gun pits are visible, the northernmost encircling a possible Bofors emplacement. RAF/CPE/UK/1890 RP 3108-3109 10-DEC-1946. English Heritage RAF Photography.

Figure 46: Netton Down Heavy Anti-Aircraft Artillery Battery (MDV103817): RAF/106G/UK/967 4100-4101 01-NOV-1945. English Heritage RAF Photography.

In contrast, with the exception of slight earthwork depressions marking the location of former gun emplacements, the ruins of one small structure are the only visible surviving remains of Netton Down battery (Figure 46). Nevertheless, the survey has improved our knowledge of this site and enhanced our understanding of its role in our national defence.

The core of the Second World War battery is fairly conventional and parallels Down Thomas; four gun emplacements surround the command post, albeit visible as flattened hexagons or heptagons with access on the inner, seventh side, with two additional square emplacements situated immediately to the north. The ancillary camp structures sit beyond a gun-laying radar platform, visible as a small structure central to an octagonal false datum west of the guns. The false datum, often made of chicken wire, was an artificial horizon that eliminated interference that affected early radar sets (Lowry 1996, 59).

A previously unrecorded aspect of this site is visible approximately 250 m to the south-west. On 1945 RAF vertical photographs a number of small structures are visible loosely arranged alongside four large (circa 20x10 metre) ovoid pits overlooking the coastal slopes, arrayed on the seaward side of a new metalled access road and turning loop. A linear ditch extends from each pit and a structure can be seen within the westernmost pit. These features have previously been noted and interpreted as a possible LAA Battery (Pye and Woodward 1996, 233). However this site is too large in scale for an LAA Battery and Roger J.C. Thomas of EH suggested a new, more convincing interpretation.

Thomas suggests that the site shows evidence of 'up-gunning' to a 5.25 artillery battery and the four pits to the south were probably excavated to house an engine house for each gun emplacement, with adjacent structures housing generators, stores and radar equipment. The linear ditches visible in 1945 were probably simply drainage for the site whilst under construction. Thomas also states that MOD documents of 1951 list Netton as containing four guns, but does not list their type; the transition to a 5.25 coastal artillery battery was therefore a previously unrecorded phase in Plymouth's early Cold War defence.

Passive Air Defence

If HAA batteries can be classified as 'active' air defences, other defences were developed which can be described as 'passive'. Vulnerable points could be defended by a variety of mechanisms, including tethered balloon barrages and decoy sites.

Decoys were developed from 1939 onwards with the intention of deflecting bombing raids, an integral part of the German *blitzkrieg* tactic, from their intended targets (Dobinson 1996c). The earliest decoy sites comprised full reconstructions of airfields, complete with dummy aircraft. As night raids intensified the range of decoys expanded to include night and day dummy airfields (Q and K sites), diversionary fires intended to simulate the fires of already bombed sites (QF and Starfish/SF sites), simulated urban or industrial lights, such as the sparking of trams or 'leaky lighting' from un-blacked out windows or doors (QL sites).

Bombing decoy sites typically mainly comprised temporary structures or ephemeral earthworks that were dismantled or levelled following the end of the war as land returned to cultivation, whereas other elements, such as control blocks, were capable of surviving or proved too difficult to remove. Both elements are present in the decoys recorded during this survey

The HER records five bombing decoys within the RCZAS survey area that functioned as part of the Plymouth defences. Of these, three have been identified from the aerial photographs available to the survey, at Wembury (MDV13885), Worswell (MDV58005) and Cofflete (MDV59237). All were N Series (Naval) decoys using a combination of lights and fire to replicate military, industrial or urban sites (QL/QF/SF (Starfish)) decoys. The position of these decoys around the Yealm Estuary was intended to mimic both the shape of the Plym and the relative positions of the parent sites. For instance, the Wembury decoy (MDV13885), an SF/QL site, was intended to divert enemy bombs from the gasworks, docks and power stations at Cattedown, Plymouth; Worswell (QL/QF)

to deflect raids from Mountbatten RAF station and Turnchapel oil depot and the Cofflete site (QL/QF) from Laira rail marshalling yard.

With the exception of the command posts, usually situated some distance from the operational areas, structures or buildings were not apparent at any of the recorded decoy sites. In fact the layout of the decoys visible from the air only loosely resembled those noted on schematic plans of the sites held by the HER, recorded from original plans (Figure 48: SDV145387). Rather they appeared to largely comprise rectilinear earthwork bank or ditch defined enclosures, presumably firebreaks or firepits. However, it is possible that large mounds, such as were visible at Wembury, camouflaged light or fire generating structures.

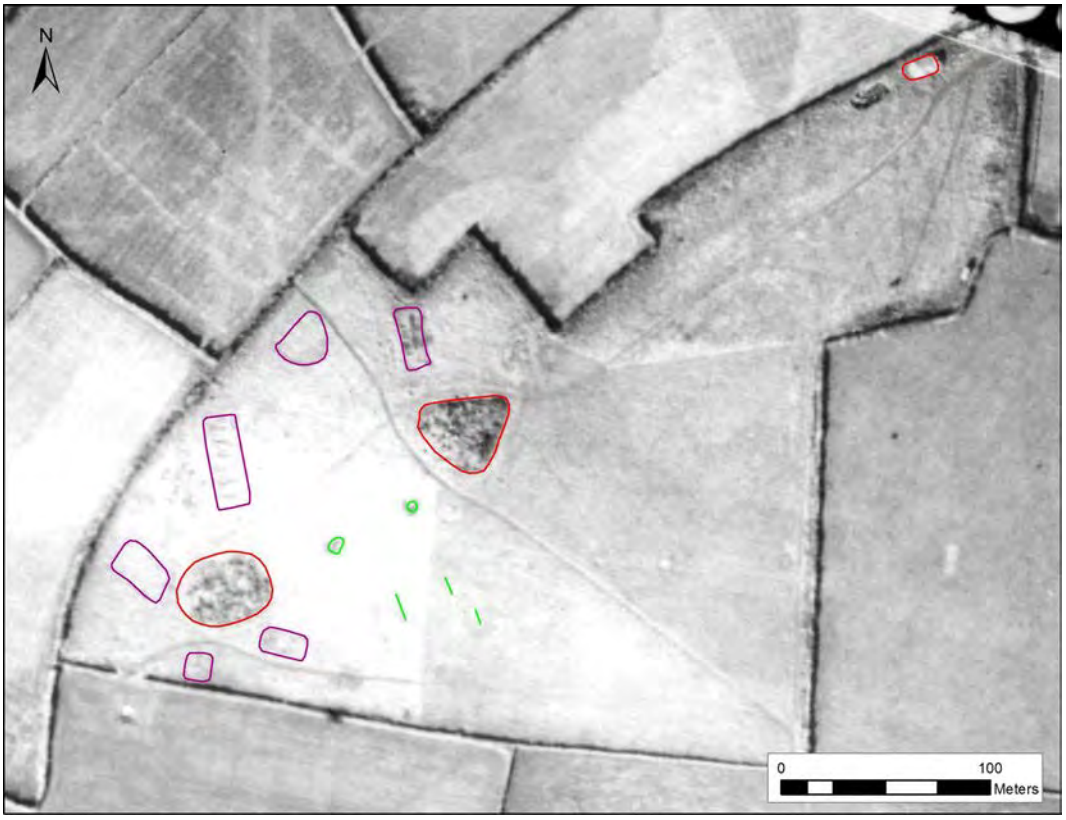


Figure 47: Wembury, the most visible of the three bombing decoys recorded during the survey. Wembury is recorded by Dobinson as a SF/QL type. RAF/106G/UK/967 V 4104-4105 01-NOV-1945. English Heritage RAF Photography.

Wembury decoy is recorded as being bombed on 20th March 1941 and clusters of bomb craters less than a m ile east from both Worsell and C offlete decoys (MDV103853; MDV103879-103881; MDV103865; MDV103876) also support the interpretation that they were at least partially effective. An unexploded German bomb was uncovered in clays north of Steer Point, south of the Cofflete decoy, when the quarry was expanded in the late 1990s (*pers. comm.* Bill Horner) Scattered bomb craters recorded throughout the survey area might be evidence of shedding of excess payload once raids were complete (See Section 7.2.6).

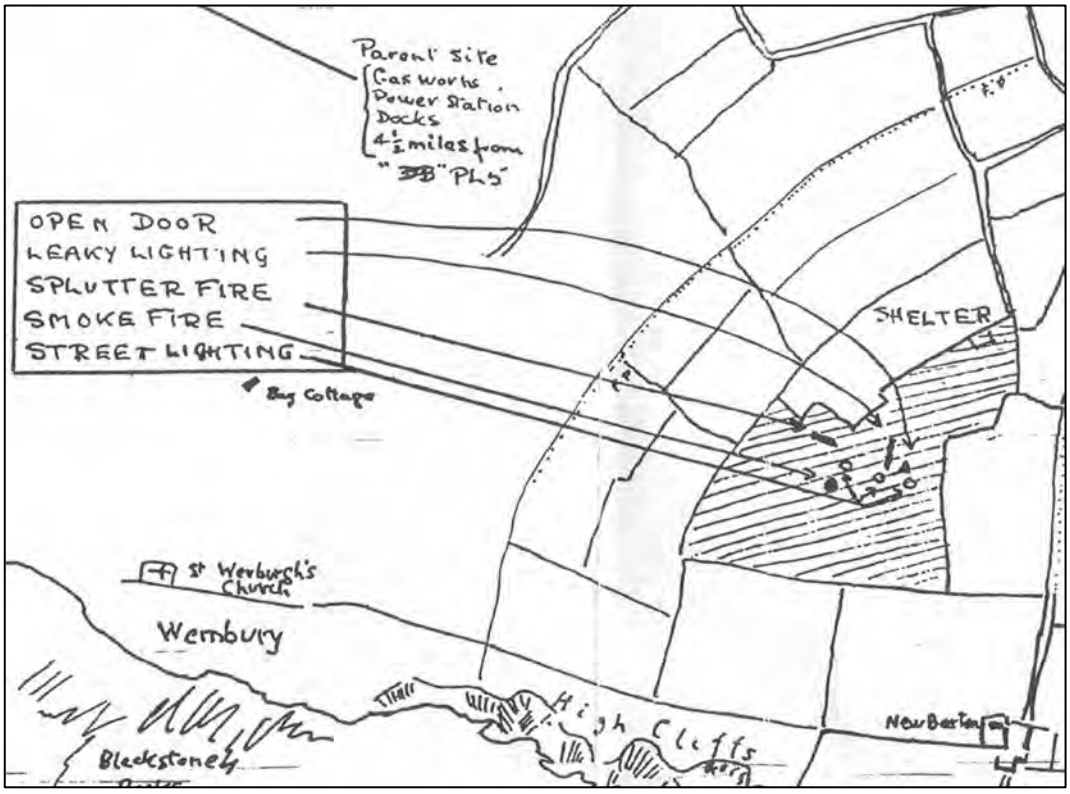


Figure 48: Wembury SF/QL bombing decoy as transcribed from original site plans. (HER source SDV145387, decoy PL5 (B), PRO AQM 199 733).

Radar Stations

The threat of aerial bombardment first experienced during the First World War prompted the development of early warning technology. By the mid-1930s the early acoustic technologies, such as Sound Mirrors, had given way to experimental but ultimately more reliable radar technology (Dobinson 1999, 1).

By the early years of the Second World War radar technology was concentrated on the vulnerable east and south-east coasts, although a Chain Home (CH) station was planned for West Prawle in Devon from 1939 and completed in 1940 (Wasley 1994, 52; Dobinson 2000, 57).

From 1941 into 1942 the gaps in CH coverage in the south and south-west were plugged by the development and extension of the Chain Home Low (CHL) system and the threat of raids under the cover of darkness begun to be countered by the construction of Ground Controlled Intercept stations (Dobinson 1999).

Seven Second World War early warning radar station establishments and their associated domestic or remote sites were located within the survey area and their HER records were enhanced as part of the survey. As can be seen in Figure 49, their distribution was not uniform along the coast, but confined to approximately 100 km between Salcombe and Seaton with a concentration around Prawle Point, the southernmost point in Devon.

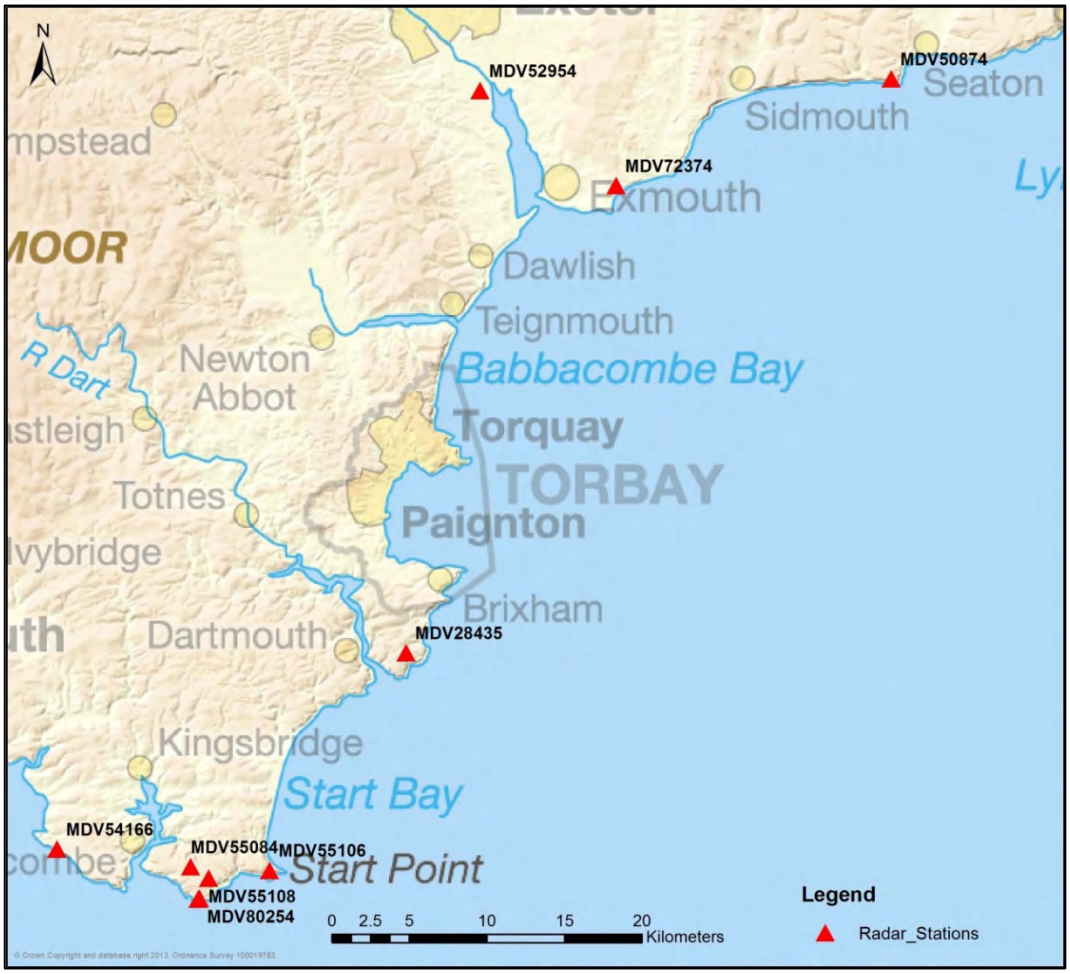


Figure 49: The distribution of Second World War radar establishment HER monument records enhanced by the survey. © Crown Copyright and database right 2013. Ordnance Survey 100019783.

Table 3 lists the monuments amended, the type of radar establishment and summarises the current condition of the site, as visible to the survey. Significant structural remains survive *in situ* at Exminster, West Prawle and West Prawle Remote Reserve, which is accessible from the South West Coast Path. This does not include RAF Hope Cove Ground Control Intercept station (MDV72105) at Bolt Head, a site recorded as part of the East Soar Air Photo Assessment and Survey, and which falls just beyond the RCZAS survey area (Winton and Bowden 2009).

Name	HER No.	Site Type	Established/dates?	Survival
RAF Kingswear, nr.Colaton Barton	MDV28435 (mislocated as MDV64030)	prototype Chain Home Low	16-Oct-1940	Completely Removed
RAF Beer Head	MDV50874	Chain Home Low/Extra Low	3-Mar-1941/ 15-Jul-1942	Structure bases survive *in situ*
RAF Exminster	MDV52954	GCI Intercept	13-Jun-1941	Structures survive *in situ*
RAF Bolt Tail	MDV54166	Coast Defence/ Chain Home Low	Feb-1942	Minimal survival
RAF West Prawle	MDV55084	Chain Home	1939	Structures survive *in situ*
RAF West Prawle Remote Reserve	MDV55108	Chain Home Remote Reserve	28-Aug-1941	Structures survive *in situ*
RAF West Prawle Rotor Domestic Site	MDV72102	Domestic Site		Completely Removed
RAF Start Point	MDV55106	Chain Home Extra Low	15-Jul-1942	Completely Removed
Floors Beacon	MDV72374	Coast Defence/ Chain Home Low	12-Apr-1941	Possible survival under vegetation

Table 3: Second World War radar stations within the survey area. Dates are taken from Dobinson 2000 (VII 2).

Figure 50: RAF Exminster GCI on Exminster Marshes. RAF/CPE/UK/1823 RS 4012 04-NOV-1946.

Figure 51: Extant remains of Exminster GCI on Exminster Marshes, April 2014 Top: tethering blocks; bottom: interrogator hut. Photographs: Stephanie Knight, May 2014.

Figure 52: RAF Kingswear, near Coleton Fishacre. This early CH site occupied a prominent position on the coast at over 150mOD. Wasley (1994, 52-53) states that although the station occupied a prominent position on the coast, its location was criticised as at over 150mOD it was thought too difficult to camouflage. Dobinson (1999, 164) had mislocated this site, locating it near Blackawton, 10km to the west. RAF/CPE/1890 4058 10-DEC-1946. English Heritage RAF Photography.

7.2.5 Second World War Training

Slapton Sands and Exercise Tiger

Towards the latter half of 1943, Slapton Sands was again the focus for military activity, although this time as part of the preparations for Operation Overlord (D-Day). Slapton Sands was chosen as the focus of these operations by American forces (Assault Group U) because it closely resembled the landing beach of 'Utah'. Following evacuation of the surrounding villages and hamlets by the end of 1943, training operations were carried out in earnest during the opening weeks of 1944 (Clamp N/D, 2-7).

Whilst Slapton Sands is a well-documented and recorded example of a D-Day training exercise site, not least due to the tragic loss of life during Exercise Tiger, the survey has nonetheless greatly enhanced the HER record by shedding additional light on the extent, layout, chronology and organisation of the exercise. This is largely due to the comprehensive coverage of USAAF aerial photographs along this area during 1943 and 1944.

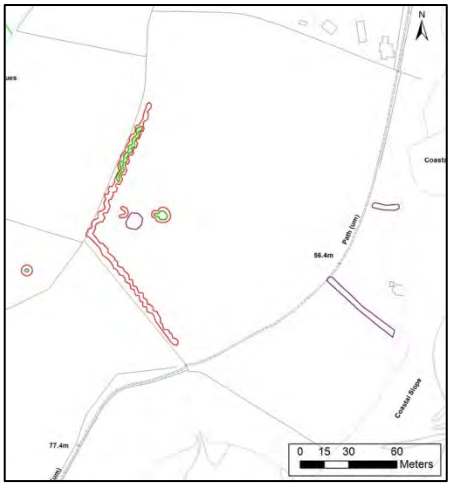
Many of the anti-invasion obstacles established during the early stages of the war became redundant with the onset of these training operations. Many, however, were likely incorporated into the training programme of practice beach assaults, such as barbed wire entanglements (MDV104380 and MDV104575). Others, such as observation post MDV104587, were to succumb to the effects from live naval shelling and aerial bombing.

Two extensive training areas were identified from aerial photographs of January 1944 onwards. The larger of these (MDV104468), occupying an area of approximately 225 hectares (MDV104468), is located on the eastern side of Slapton and extends from Slapton Bridge at the south to Merrifield to the north. A second smaller training area (MDV104519) is also located on the western side of Strete. This stretches from Strete Gate at the south, northwards to Fuge Cross

and occupies an area of approximately 84 hectares. Evidence of barbed wire entanglements located in association with mock gun pits and slit trenches is visible on aerial photographs of January 1944. These features partly demarcate the edge of these two training areas and were likely used as obstacles for mock assaults.

Other smaller-scale training sites are visible across the area. A previously unrecorded site (MDV104392, Figure 53) situated at the southern extent of Slapton Sands at Torcross is characterised by an extensive V-shaped slit trench which measures approximately 177m in length and runs parallel to two converging field boundaries. Embanked earthwork gun pits, structures and barbed wire obstructions formed additional features of this mock fortification site. Most evidence of this ephemeral site had been completely removed and levelled by 1945 when most of this area had been reverted back to agricultural use.

US/7PH/GP/LOC145 8027 05-JAN-1944. English Heritage USAAF Photography.



NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783.

Figure 53: Training site at Torcross (MDV104392) with transcription, showing slit trench, earthwork pit and banked features and structure (casting a long shadow). The site of Beesands battery (MDV30611) is also visible to the east.

Aerial photographs taken on 27th April 1944 (Figures 54, 55 and 56) show the full magnitude of one of these training exercises. Excercise Tiger was a full scale mock assault on Slapton Sands followed by an inland advance towards given objectives, such as gun emplacements and defended buildings (Clamp N/D 10-11). At Slapton Ley, Figure 54 shows two previously unrecorded sites. These include a temporary bridge crossing (MDV106738), which would have helped provide vehicular access to and from Slapton Sands to the training grounds further inland and a pontoon (MDV106737) to north. Both these structures have been removed on aerial photographs of 1945. Further to the north at Slapton Bridge, Figure 55 shows the dense cluster of shell and bomb craters of the naval and aerial bombardment within training area MDV104468 which preceded the beach assault. Firing and bombing markers used to centre and perhaps assess firing accuracy are also visible within training area MDV104519 at Strete Gate, with barbed wire entanglements to the west of these (Figure 56). A range of additional features are visible across the Sands, including shell craters, gun pits, barrage balloons and storage depots, although given their density and temporary

nature these were not transcribed as part of this survey. A number of the earthwork pit and banked features of the training exercises survived as subtle earthwork pits on aerial photographs up until 1951, although had been completely levelled sometime after this date.

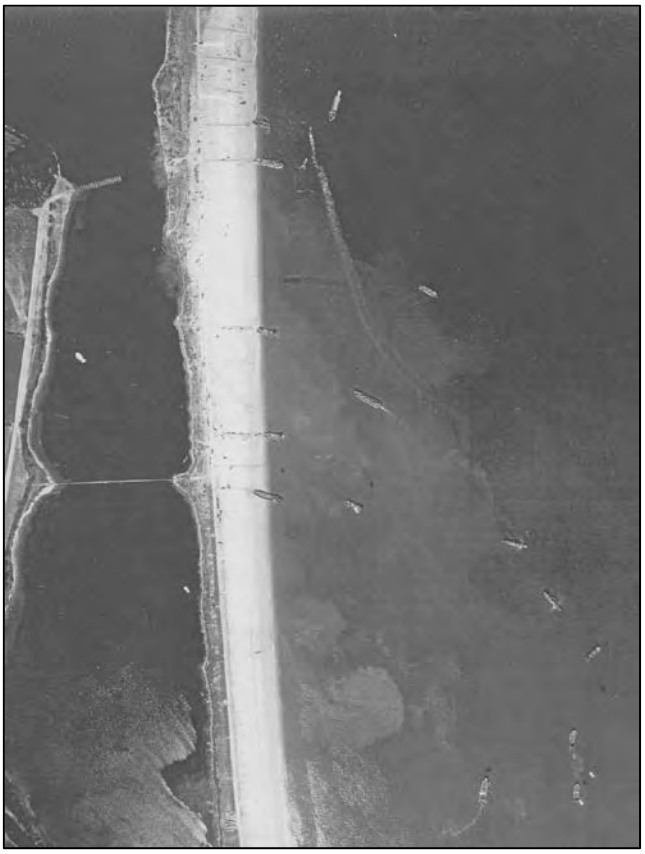
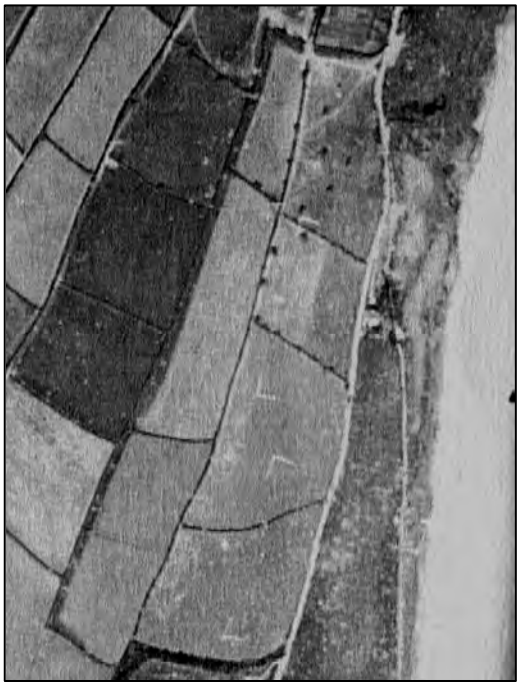


Figure 54: Mock assault on Slapton Sands as part of Exercise Tiger, showing landing craft, barrage balloons, pontoon (MDV106737) and bridge (MDV106738). US/30GR/LOC41 33 27-APR-1944. English Heritage USAAF Photography.

Figure 55: Mock assault on Slapton Sands (MDV104598) as part of Exercise Tiger and training area MDV104468, showing landing craft, barrage balloons and artillery shell and bomb craters. US/30GR/LOC41 38 27-APR-1944. English Heritage USAAF Photography.



US/30GR/LOC41 16 27-APR-1944. English Heritage USAAF Photography.

RAF/106G/UK/967 P 3050 01-NOV-1945. English Heritage RAF Photography.

Figure 56: Artillery firing range within training area MDV104519, showing corner-markers, shell craters and barbed wire entanglements defining its western edge (left). The artillery shell craters and earthwork scars on Slapton Sands remain visible on aerial photographs of 1945 (right).

The aftermath of these training exercises on the landscape was only too visible for the returning inhabitants of Slapton and the surrounding areas. Many buildings had been damaged, for example the stables of the manor house of Slapton shown in Figure 57, or completely destroyed and subsequently levelled, such as at the Royal Sands Hotel at Slapton Bridge (see Figure 128).

Figure 57: The ruined remains of the stables of Slapton Manor (Reproduced from Murch and Fairweather 1984, 38)

The Infantry Training Centre Dalditch Camp

The army training camp of Bicton and East Budleigh Common (MDV15101), known as the Infantry Training Centre Dalditch Camp, represents one of the largest and most extensive military training complexes recorded along the South Devon coastline.

An undated plan of the camp (HER source SDV345782) depicts the camp infrastructure in detail, including principal roads and trackways and an extensive range of buildings and structures such as accommodation and decontamination blocks, Officers' mess, church, gymnasium, cinema, post office as well as the provision of electricity and water and sewage works. The camp covers approximately 140 hectares of common land.

Defence against enemy aircraft was a prime concern of the training camp, particularly during the early stages of the war. A characteristic feature of the site is the dispersed layout of the nissen huts, typically arranged into groups of four, with each group protected by earthwork embankments (Figure 58a), a previously unrecorded aspect of the camp plan.

A number of discrete earthwork pit and banked features representing probable anti-aircraft gun pits and slit trenches are also visible across the camp, primarily concentrated along the perimeter and around key installations such as the sewage works (Figure 58b).

a. b.

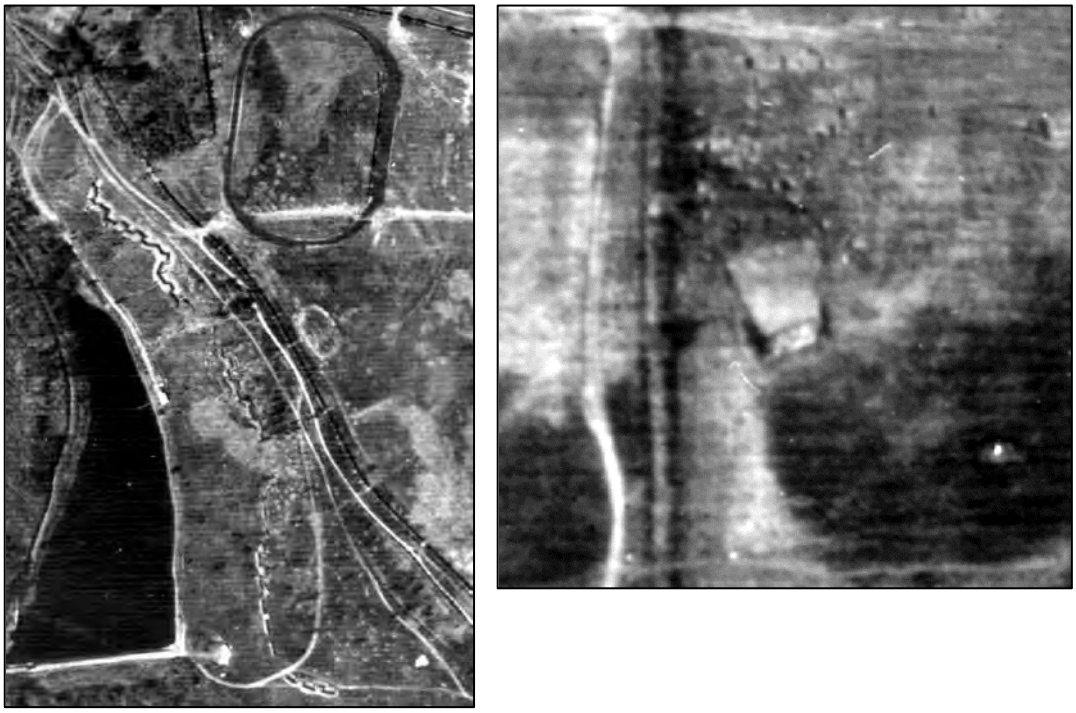
Figure 58: Infantry Training Centre Dalditch Camp: aerial photographs of 1946 showing clusters of Nissen huts with earthwork embankments (left) and the remains of possible former anti-aircraft gun pits and slit trenches (right). RAF/106G/1412 4160 13-APR-1946. English Heritage RAF Photography.

Infantry training was the primary function of the camp and the plan also depicts structural training facilities such as bayonet stances, rifle ranges and parade grounds.

Aerial photographs of 1946 reveal further training facilities concentrated on the northern and southern edges of camp. For instance, an extensive slit trench (MDV70811) is visible adjacent to Squabmoor Reservoir along the southern edge of site (Figure 59a). The survey has recorded more ephemeral evidence of artillery practice or possible live firing across the camp, such as the earthwork pits or craters visible in conjunction with the slit trenches in Figure 59a. Surviving trench earthworks remained visible during a field visit in April 2014 but little evidence of the craters could be seen, and appear to have been largely levelled on aerial photographs of 1954. However, subtle earthwork may survive obscured by vegetation.

Dalditch Camp included a number of known firing ranges, the survey identifying further previously unrecorded examples. An example to the east of Squabmoor Reservoir (Figure 59b) is atypical. The comparatively short and broad plan of this firing range is in contrast to the longer and narrower nature of other examples, which might support the interpretation that it was used for close-range training, such as machine gun or hand-grenade training. A number of small earthwork pits visible to the immediate north of the firing range might represent craters caused by such training.

Whilst much of the former training camp had been dismantled and cleared by 1954, a number of features of the site remain visible on digital images of 2010 and could be discerned during a field visit carried out in 2014. This included footprints of former buildings, upstanding structures such as firing range MDV70805 (Figure 60), decontamination block MDV70792 (Figure 61) and a range of earthwork features, such as slit trench MDV70811.



a. b.

Figure 59: Aerial photographs of 1946 s how practice slit trenches and artillery shell craters (left) and f iring range (right). RAF/106G/1412 4160 13-APR-1946. English Heritage RAF Photography.

Below ground survival of many of the earthwork features and structures is likely to be high, although the north-west extent of the site has been truncated as part of the expansion of Blackhill Quarry. Likewise, former features located on reclaimed agricultural land along the south-east edge of the site are likely to have been subject to the effects of ploughing.

Figure 60: Firing range MDV70805, view to north-east. Photograph: Stephanie Knight, 2014.

Figure 61: Decontamination block MDV70792, view to west. Photograph: Stephanie Knight, 2014.

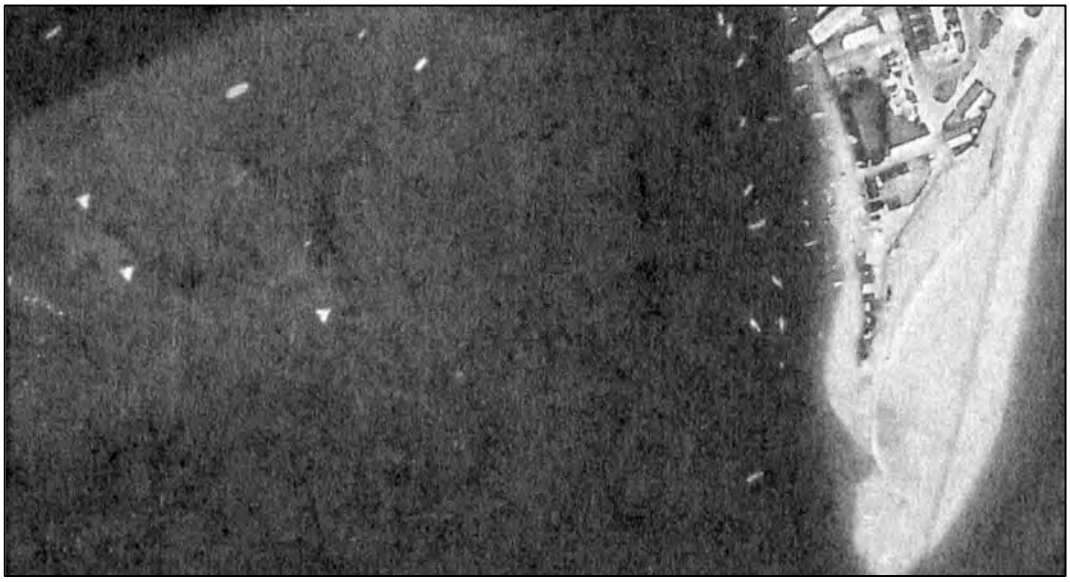
Dawlish/Teignmouth Bombing Range

Four triangular structures are visible beached on The Salty in the mouth of the Teign estuary on aerial photographs of 1941 (MDV105027). Measuring approximately 9.5m across they are similar to triangular rafts recorded in the harbour at Ilfracombe, north Devon, during the later years of the war (MDV103129: Knight and Hegarty 2013).

It is probable that they performed a similar function to the Ilfracombe rafts, namely to be towed out to sea and used as mobile bombing targets for high altitude bombing practise. This interpretation is reinforced by the close proximity of several other contemporary sites.

Located approximately 6.5 km to the north-east, between Dawlish and Dawlish Warren (MDV105274, SX 9726 7769) and approximately 4 km to the south-west at Maidencombe (MDV105010, SX 9277 6864) are two almost identical arrow-shaped structures. Constructed probably from concrete, the arrows have been recorded as Second World War Practice Bombing Range Ground Signal Apparatus. Similar to structures again recorded on the North Devon Coast, the circa 25 metre long concrete arrow directed high altitude bombers on the correct heading for the bombing range targets. Arranged around the arrow are structures comprising reversible reflective signal discs to allow a variety of codes to be communicated to the aircraft, conveying a range of specific instructions on their approach to the bombing range (*pers. comm.* Roger JC Thomas: see Figure 62). Between Teignmouth and Dawlish a previously unrecorded tower has been recorded as a possible bombing range observation post overlooking the coast at Holcombe (MDV105337).

Unlike the north Devon sites, no surviving evidence of the landside structural elements of the bombing range are visible on the recent aerial photographs available to the survey, but it is possible some remains of the observation post survive as sub-surface deposits or obscured by scrub vegetation.



a.

b.

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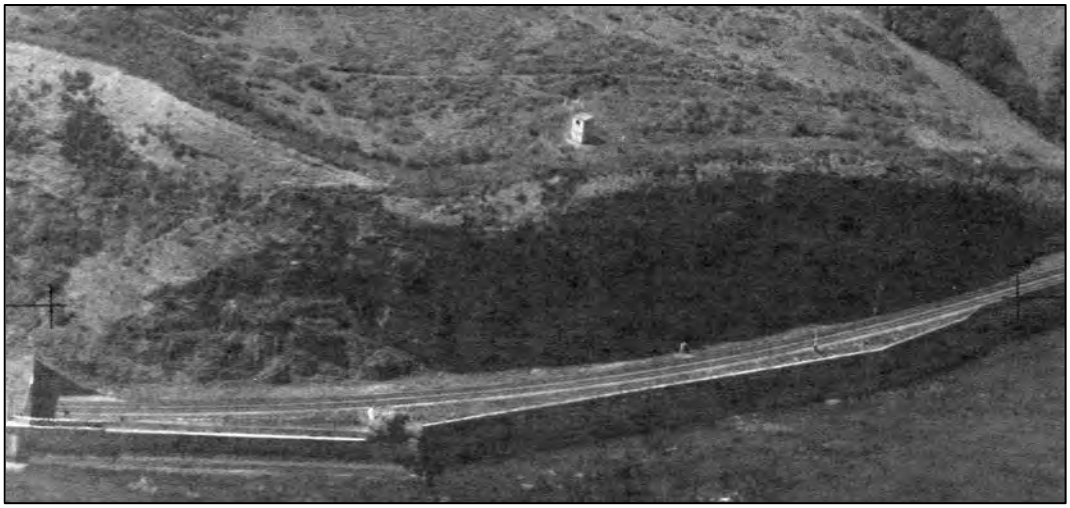
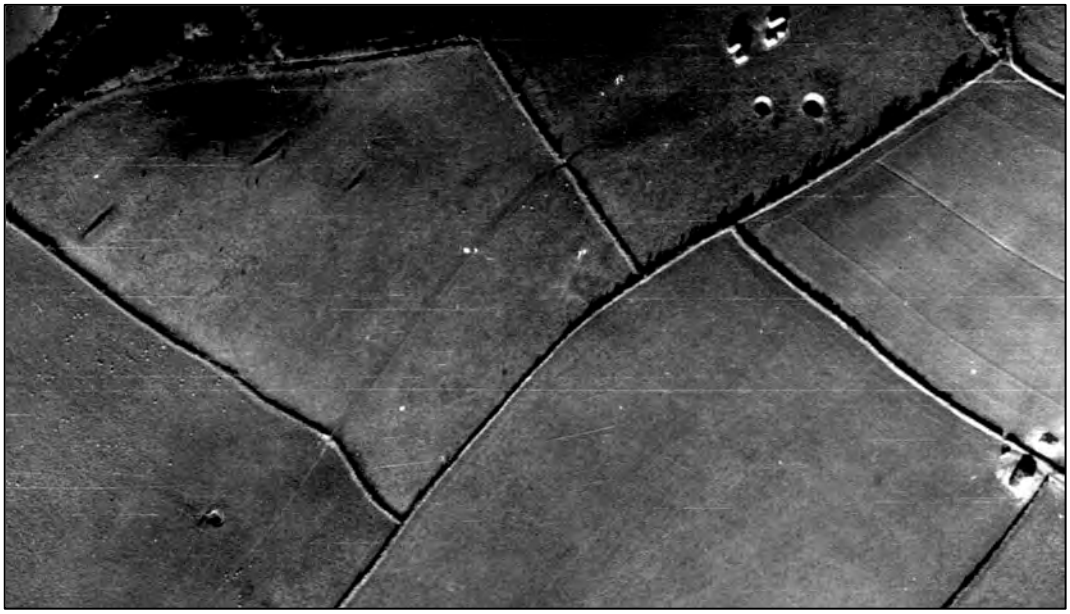


d.

Figure 62: Coastal bombing range infrastructure: a) MDV105337; RAF/S481 V 2-3 13-SEP-1941. English Heritage RAF Photography. b) MDV105274; RAF/S455 V 43-44 29-AUG-1941. English Heritage RAF Photography. c) MDV105010. RAF/1416/S169 PO-03 01-JUN-1941. English Heritage RAF Photography. d) MDV105027. RAF/1416/S169 PO-43 01-JUN-1941. English Heritage RAF Photography.

7.2.6 Second World War: Civil Defence

The impact of the conflict on the civilian population is apparent from the aerial photographic resource. 22 Emergency Water Supply reservoirs, constructed to ensure water availability in the event of air raids disrupting the normal supply, were recorded. They are consistent in size and shape with those seen on aerial photographs along the north Devon coast (Knight and Hegarty 2013) and further afield (see Carpenter 2008, 45-47). Half were located in highly populated Torbay (including near the air raid shelters at Paignton and Brixham), but were also seen throughout the central and eastern parts of the project area in smaller settlements, with five in Teignbridge at Stokeinteignhead or Bishopsteignton and six in four different towns or villages of East Devon (Sidmouth, East Budleigh, Seaton and Colyton), broadly reflecting the location of likely targets of aerial attack. In general they seem to have been removed soon after the war ended, although some remains may survive below ground (e.g. MDV105965).



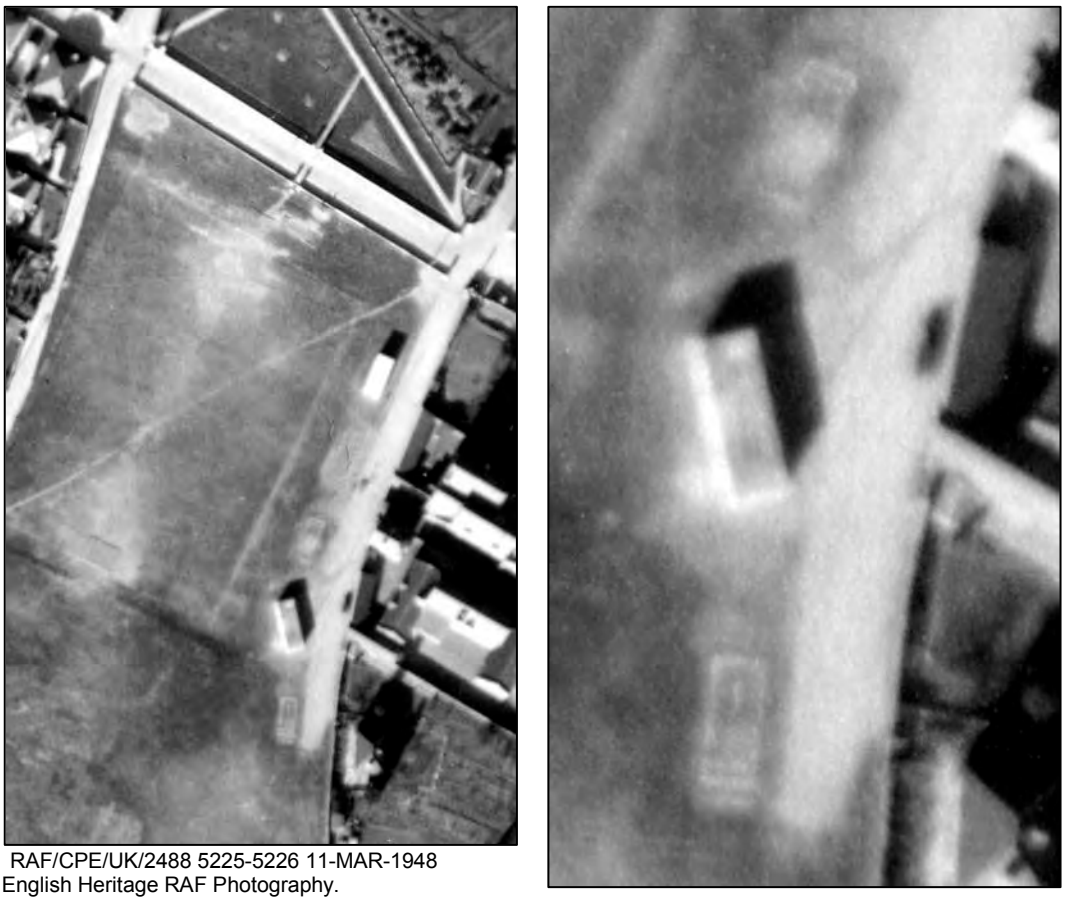
RAF/106G/UK/967 RS 3151-3152 01-NOV-1945. English Heritage RAF Photography.

RAF/540/497 4073-4074 12-MAY-1951. English Heritage RAF Photography.

Figure 63: Bomb craters near Mothecombe (MDV104130), visible as circular pits (top) and then as pale cropmark rings where the surrounding upcast has been ploughed (bottom right). The pit in the bottom left appears to remain an earthwork in 1951, with the dark downslope mark of a water trail clearly visible on the lower image.

Air raids with fatal consequences are well documented in Devon, and scattered bomb craters in rural settings along the south coast are visible on aerial photographs taken during the 1940s and soon after. Some are recorded clustered around strategic targets or bombing decoys (See Section 7.2.4, page 82) whilst others are likely the result of payload dropped by aircraft on the way home from a mission targeting military infrastructure (e.g. MDV104130 south-east of Plymouth) or coastal defences (e.g. MDV105861 on Seaton Marshes). Although the former of these examples appear to have been levelled since 1965 (Figure 63), the latter may well still be visible as a circular earthwork.

In response to the increased threat of aerial bombardment, as war progressed emergency air raid shelters were constructed in public locations, intended for those caught unawares during a raid (Hegarty and Newsome 2007, 43 and 52; Lowry 1996, 66-73). Possible surface air raid shelters appear to have been constructed in the densely populated areas of Torbay, including Paignton Green (SX 8940 6100) and Brixham Recreation Ground (SX 9231 5633). Five structures of typical rectangular flat roofed design were visible at the latter site on aerial photographs taken between 1942 and November 1946. By December 1946 two had been partially removed, and a further structure had been removed by March 1948 (Figure 64).



RAF/CPE/UK/2488 5225-5226 11-MAR-1948
English Heritage RAF Photography.

Figure 64: Air raid shelters (SX 9231 5633) on one side of Brixham Recreation Ground. Left: Three foundations and two extant structures visible in 1948. The pale area of bare ground or parchmark (top left) marks the site of a removed EWS. Right: A close up of the internal layout of two of the removed buildings.

The dimensions and layout of the foundations visible in plan on these and later runs of aerial photographs are very similar to the design of a 50 person Surface Air Raid Shelter as illustrated by Lowry (1996, Fig 31), with blast walls protecting the entrances at the short ends and several internal subdivisions including a central longitudinal partition.

In 1948 the blast walls of the two remaining structures were no longer visible on the vertical photography; at one structure they appear to have been removed completely, whilst at the other they seem to have been incorporated into the main structure. The latter structure remained extant in 1958, when oblique aerial photographs show its western elevation to have had two windows. If this had been an air raid shelter the windows may have been inserted to adapt the building to a different use, possibly as a sports facility. It was removed between 1989 and 1999 and although no upstanding features survive, it is possible that remains are present below ground.

7.2.7 Second World War: Infrastructure

Two unusual sites near Brixham that were not recorded in the Torbay HER data available to the survey are illustrated in Figures 65 and 66. Both are first visible on aerial photographs taken in 1942 and they are likely to have had a military function, perhaps as munitions stores.

Figure 65: One of two complexes of earth-bound structures and associated infrastructure near Brixham; this smaller site south of Brixham Cricket Ground was served by a rail line (SX 9174 5621). A possible Emergency Water Supply reservoir is just visible in the top of the image as a circular structure. RAF/CPE/UK/2488 5225 11-MAR-1948. English Heritage RAF Photography.

At each site five large rectangular earthwork-embanked structures are visible, some with walled entrances and vent structures on the top, and some apparently

linked to each other by covered corridors. Several other buildings are visible at both, as are one or more rectangular pits or water-filled structures. At the Cricket Ground site a circular structure similar in size to an Emergency Water Supply Reservoir appears to have been constructed in one corner after April 1942 and before 1946, indicating that this complex could have been a target for bombing, or perhaps that it was vulnerable to explosion. This site was also linked to the railway that runs to the north by an embanked siding, terminating as four tracks separated by two substantial framework structures; details such as points controls are also visible.

DAP 13294/15 23-DEC-1986. © Frances Griffith, Devon County Council.

NMR SX9456/36-37 RAF 30137/PSFO-P2-0031-0032 27-AUG-1958. English Heritage RAF Photography.

Figure 66: One of two complexes of earth-bound structures and associated infrastructure near Brixham; this larger example is west of Berry Head Common (SX 9373 5628). The two large buildings with high window openings in the lower image are visible on the lower left of the top image. A linear earth-bound structure with its walled entrance is visible on the far left of the lower image.

The site near Brixham cricket ground had been redeveloped as housing by 1977 and no remains are expected to survive here. The site near Berry Head Common remained relatively complete until at least 1986, but by 1989 the area appears to have been levelled. It is possible that remains survive, but this is not clear from the available aerial photograph resource and the area was scrubbed up in 2012. Further archaeological work may help to establish the survival and extent of surrounding remains; documentary and oral history research may also help to identify the function and social history of this complex.

Figure 67: Camouflaged gas towers and works buildings at Hollicombe in 1947 (SX 8974 6238). NMR SX 8962/1 RAF 30092/SO-0115 15-AUG-1947. English Heritage RAF Photography.

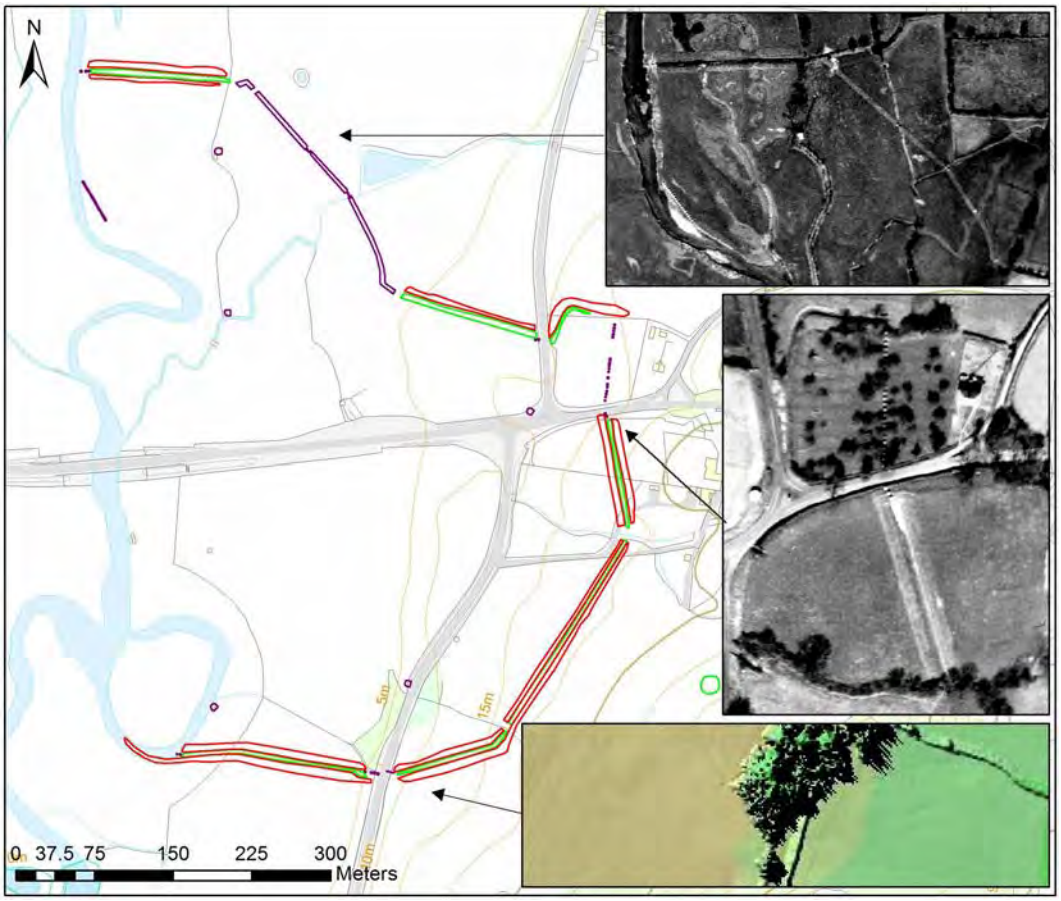
Details of the Victorian gasworks site at Hollicombe are difficult to see on the wartime aerial photographs, partly because the area is indistinct on the available laser copy images, but it is also likely that during the Second World War camouflaging was effective in obscuring this site from the air, when the towers were used to store gas for balloon barrages.

On post-war aerial photographs traditional camouflage patterning can still be seen on the roofs of the gas towers and some of the buildings (Figure 67), and remained in place on some buildings until at least 1958. Similar camouflage patterning was visible on two circular tanks near Brixham during the Second World War, when these structures housed aviation fuel (SX 9324 5653).

The eastern part of the Hollicombe site had been landscaped as a recreation ground by 1986, when the walls of one building survived. This structure was removed between 2006 and 2012, and although the bases of the gas towers are still discernible the site has now largely lost its industrial character.

7.2.8 Second World War Case Study: Taunton Stop Line

As anticipated, many of the components of the Taunton Stop Line were visible on the aerial photograph resource. This is probably the most complete of a number of inland defence lines throughout the country, intended to trap or slow enemy advance in the event of a successful landing that had penetrated the 'coastal crust' (Osborne 2011, 45). It was constructed during the early years of the Second World War when the threat of invasion was greatest, and the southernmost section fortified the natural barrier of the Axe estuary with a range of defensive structures and earthworks.



The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783. Height Data: Licensed to English Heritage for PGA, through Next Perspectives™. NMP mapping © English Heritage.
Aerial Photograph (top and centre right): RAF/CPE/UK/1974 2493-2494 11-APR-1947. English Heritage RAF Photography. lidar (bottom right): LIDAR SY2692SW Environment Agency D0075885 NOV-2006 – MAR-2007. © Environment Agency copyright 2014. All rights reserved.

Figure 68: Obstructions on the east of Axe Bridge forming part of the Taunton Stop Line (MDV106495). Although the anti-tank ditch in the south was infilled relatively soon after the war it is still visible as an earthwork on lidar images.

Many of the HER records for the stop line could be enhanced by the survey, and a number of new records were created. One of the areas where the record of the extent and form of the defences could be significantly enhanced was the area to the east of Axe Bridge. A roughly semi-circular ring of obstacles up to 500m east and 350 m north and south of the bridge was visible as structural and earthwork features on aerial photographs taken in 1946 and 1947 (Figure 68). The major component of the obstacle consisted of a deep ditch up to 5 m in width flanked by low banks up to 7 m in width; in parts the ditch was probably constructed behind existing field boundaries. Two sections of structural obstacles linked the ditches, including a row of anti-tank blocks running north to south through an orchard and a gridlike structure 5 m wide crossing three fields, interpreted as anti-tank scaffolding. Two probable concrete anti-tank blocks had been placed at each of the breaks where the scaffold crossed the field boundary ditches, and concrete blocks also appear to have been placed at the end of other stretches of ditch where they met roads and the river. The structural remains were removed soon after the war ended, although the route of the possible scaffold was clearly visible in 1956. Although difficult to see in the field, lidar data reveals that subtle earthworks survive at almost all sections of the anti-tank ditch.

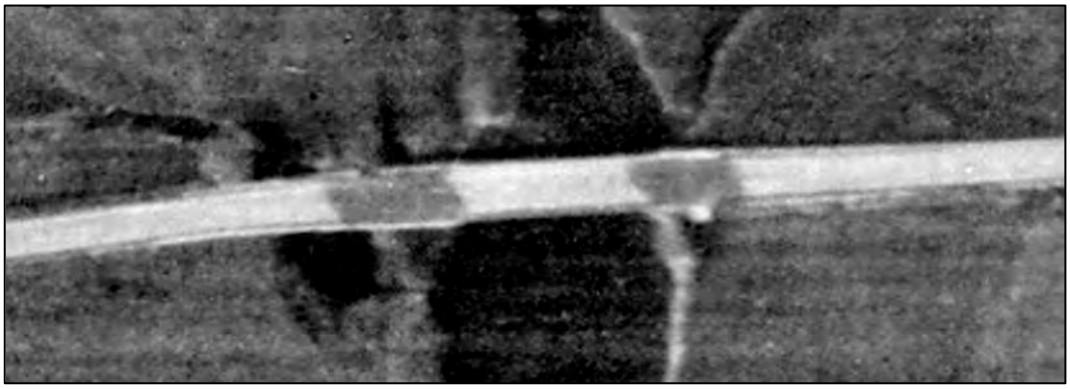


Figure 69: Dark patches on the road over Axe Bridge may be from resurfacing after removal of Second World War roadblocks (MDV72488). RAF/106G/UK/1412 RP 3357-3358 13-APR-1946. English Heritage RAF Photography.

Several dark patches on the road across the Axe are co-located with the position of Second World War roadblocks. The darker parts may reveal areas of resurfacing that took place following the removal of the roadblock obstacles during or after the war. A small pale rectangular structure close to the river in Figure 69 may have been a structural support for a rail across the road. These features are not visible on photographs post-dating the 1940s and it is uncertain whether any remains survive.

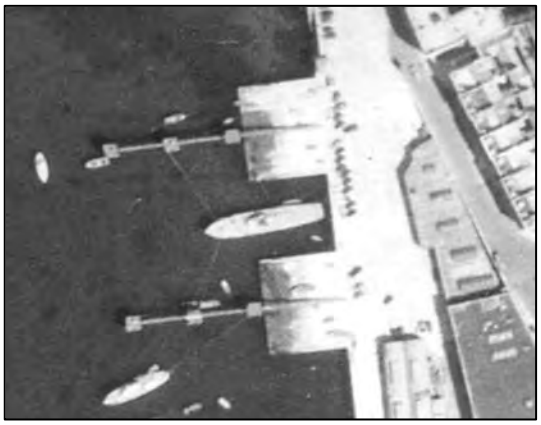
Further to the south, probable coastal crust defences of beach scaffolding and defensive dams are visible at the mouth of the Axe estuary (MDV72490 and MDV105934), but the Second World War resource is dominated by hardened field defences of the Stop Line. Most of the pillboxes lining the east side of the estuary were previously recorded and depicted on the Ordnance Survey base mapping, but in many cases the record could be enhanced by information gathered during the survey. Where appropriate, structures depicted on the base map were transcribed, for example when the extent or shape of the structure could be better defined from the aerial photographs (Figure 70).

Figure 70: Hardened field defences of the Taunton Stop Line. Clockwise from top: Heavy machine gun emplacement MDV39356 was depicted on the base map but additional detail on its shape and size was added from the aerial photographs; Unclassified structure MDV106485 was not depicted on the base map or recorded on the HER, so a new record was created – this deserves further investigation; Pillbox MDV39349 was not visible on the aerial photographs and was not depicted on the base maps, it is still well hidden amongst the trees in the centre of the image; Anti-tank gun MD V80437 was accurately depicted on the base map, so was not transcribed. Photographs: Stephanie Knight, May 2014.

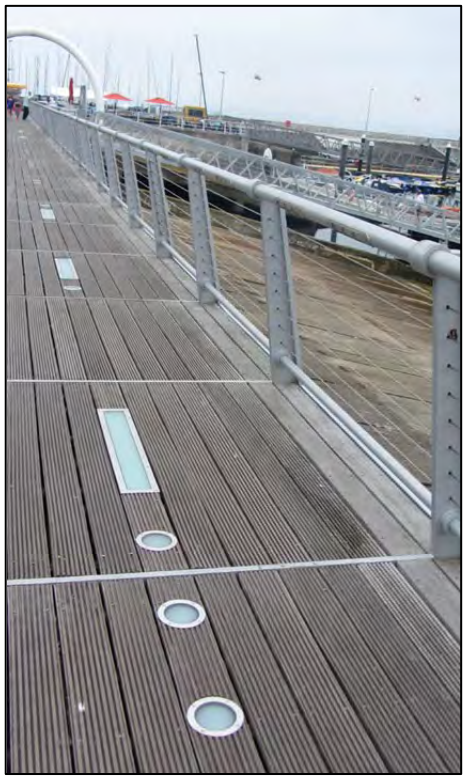
7.2.9 Second World War Case Study: D-Day

A number of well preserved military sites within the project area date to later in the war, including the reinforced concrete embarkation slipways at Beacon Quay in Torquay designated and described by English Heritage as “possibly the best-surviving example of D-Day structures in the country” (NMR 1354564). Completed in May 1943, US troops departed from here in June 1944, bound for ‘Utah’ beach in Normandy. The earliest available aerial photographs on which the embarkation hards and mooring points known as ‘dolphins’ are visible as structures date to 1944; no slipways of any kind are visible here on aerial photographs taken in 1941.

The dolphins do not appear to have been maintained after the war; some mooring points seem to have been removed or collapsed by 1947, and none were visible on aerial photographs taken from 1949 onwards. They are therefore not depicted on any of the available maps, and have been transcribed and separately recorded as part of this project. The embarkation hards however are clearly visible on aerial photographs taken in 2012, by which date the harbour area to the east had been redeveloped to include a related public artwork (Figure 71).



RAF/3G/TUD/UK223 5191 12-JUL-1946
English Heritage RAF Photography.



Photographs (above and left):
Stephanie Knight, September 2013.

Figure 71: D-Day embarkation slipways at Torquay harbour (SX 9181 6317). Top left shows the structures in 1946 with mooring points intact; the slipways in their current setting are illustrated bottom left; floor lights spell ‘vanishing point’ in Morse code in remembrance of the thousands of US troops who departed suddenly in June 1946 (right).

Figure 72: D-Day embarkation slipway (centre left; SX 9312 5660) and mooring points (SX 9305 5662) at Brixham harbour. Two possible Nissen huts are visible just inland of the slipway (SX 9312 5654), and the one of the camouflaged tanks used to store aviation fuel is visible on the left edge of the frame (SX 9324 5653). NMR SX9256/22 RAF 30092/SO-0131 15-AUG-1947. English Heritage RAF Photography.

Corresponding slipways and mooring points were also recorded at Brixham (Figure 72). Although the dolphins seem to have been removed or collapsed onto the seabed soon after 1950, the embarkation hards are extant and the individual concrete slabs can even be distinguished on some of the recent aerial photographs.

7.3 Thematic Results: Agriculture and Subsistence

7.3.1 Agriculture: Prehistoric Field Systems

The survey has enhanced the record for four areas of field system interpreted as being potentially of later prehistoric date.

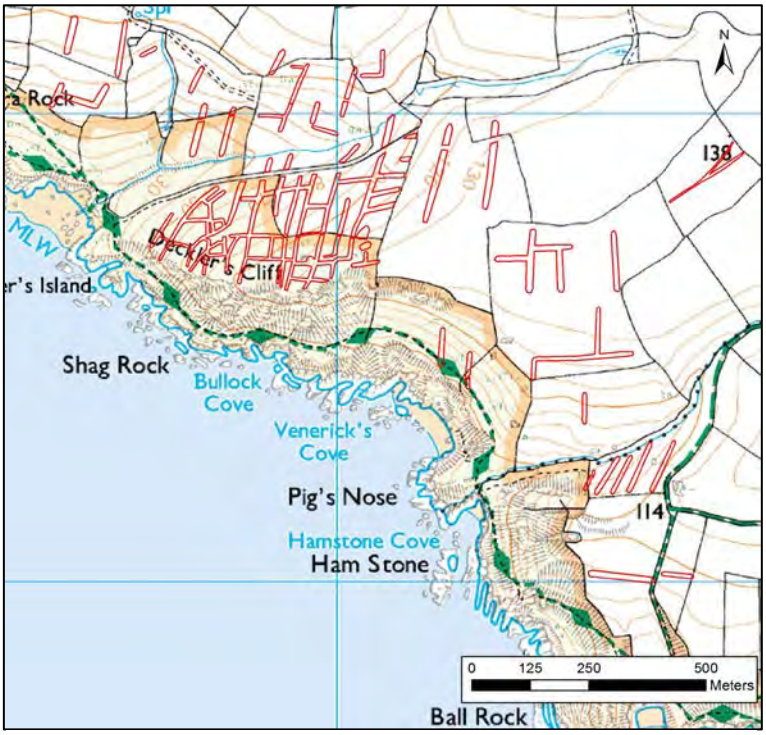
Decklers Cliff

The coaxial field system along Deckler's Cliff (MDV15083, Figure 11XX and Figure 73) is one of the best preserved examples of prehistoric agriculture in Devon. Coaxial field systems are thought to be representative of Bronze Age agriculture in Devon, an interpretation supported by dating evidence gained from Dartmoor and elsewhere, such as Ipplepen (see discussion of Walls Hill below). This field system owes its survival to its location along a rugged stretch of coastline positioned on moderate to steep south and north-west facing slope.

The prehistoric field system survives as a series of linear collapsed stone banks and earthwork lynchets forming a concentrated pattern of small rectangular fields. Evidence of later phases of use within the area is also visible in the form of a series of medieval lynchets.

Elements of this field system have been subject to detailed field survey, for example by Thackray (1990) and Newman (2003). The NMP survey has complemented these survey results by identifying a number of additional and previously unrecorded earthworks located further inland, extending the area of potential prehistoric and medieval remains from approximately 51 hectares to approximately 93 hectares. Visible on lidar data as a series of low earthwork banks, these remains have clearly been subject to a greater degree of erosion by ploughing. Further field survey is strongly recommended with a view to amending and extending the scheduled area.

DCC DAP/FQ 5 21-AUG-1985. Devon County Council Devon Aerial Photograph.



NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783.

Figure 73: Oblique aerial photograph of 1985 showing prehistoric and medieval earthworks at Deckler's Cliff (top) with transcription showing the wider extent of the field system (bottom).

Woodcombe Point to Start Farm

Less extensive possible prehistoric field boundaries were identified further east, from Woodcombe Point towards Start Farm (MDV21377 and MDV104236; Figure 74). These earthwork boundary banks share many similar morphological and topographical characteristics to the co-axial boundaries recorded at Deckler's Cliff, although are less well preserved, possibly due to being levelled to a greater degree through a more intensive ploughing regime.

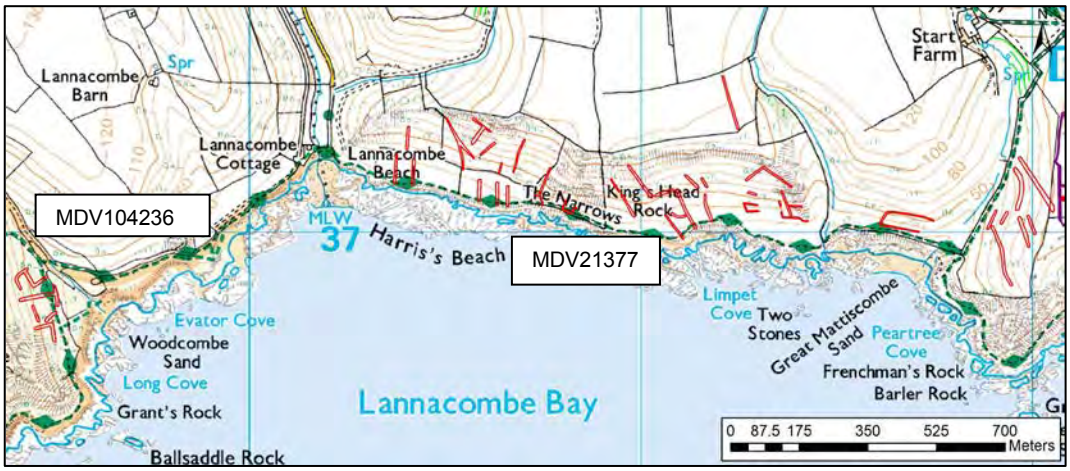
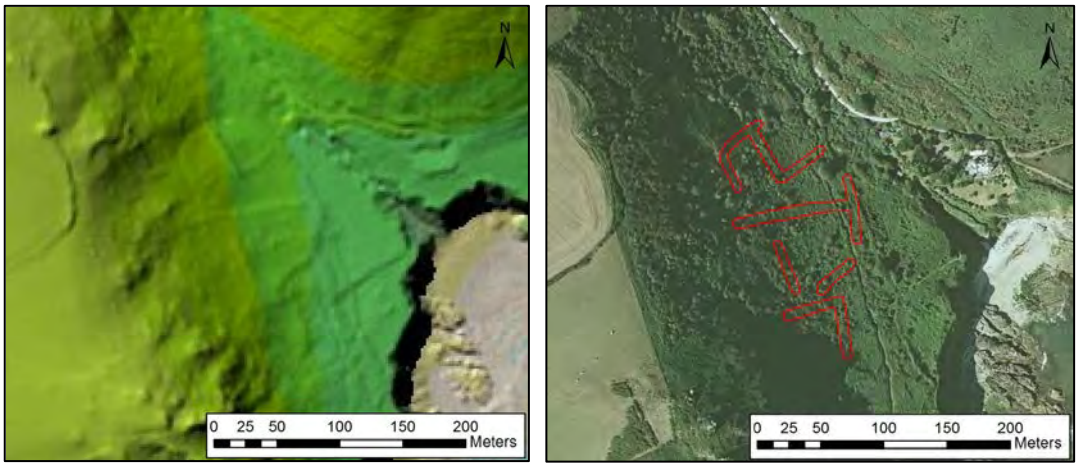


Figure 74: Possible preserved prehistoric field systems (MDV21377 and MDV104236) from Woodcombe Point to Start Farm. NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783.

The previously unrecorded isolated earthworks recorded at Woodcombe Point (MDV104236) are located on a steep east-facing slope to the west of this area (Figure 75). Transcribed largely from lidar data, the nature of the terrain and seasonal vegetation cover mean that the earthworks are not easily visible on aerial photographs and may be more extensive than the transcription indicates.



LIDAR SX73NE DTM Environment Agency 1998-2012. © Environment Agency copyright 2014. All rights reserved.

NMP mapping © English Heritage. Next Perspectives PGA Tile Ref: SX7936 13-Sep-2002. Aerial Photography: Licensed to English Heritage for PGA, through Next Perspectives™.

Figure 75: Earthwork banks of possible relict prehistoric field system recorded at Woodcombe Point (MDV104236), showing lidar image (left) and aer ial photograph of 2002 showing overgrowth, with transcription (right).

Walls Hill, Torbay (SX 9334 6507)

A scheduled field system of probable prehistoric date is visible on aerial photographs of the 1940s onwards and on images derived from lidar data as low fragmentary earthwork banks distributed unevenly across Walls Hill, gentle south-east-facing slopes overlooking the coast at Babbacombe, Torquay.

One of 18 field systems of later prehistoric date recorded on the limestone plateau of South Devon, the relict landscape at Walls Hill has been recorded since the early 19th century, albeit initially interpreted as Roman military site (Gallant, Luxman and Collman 1986). It has been compared to a formerly much more extensive field system at Dainton, Ipplepen, which has been ascribed a later Bronze Age date (Silvester 1980).

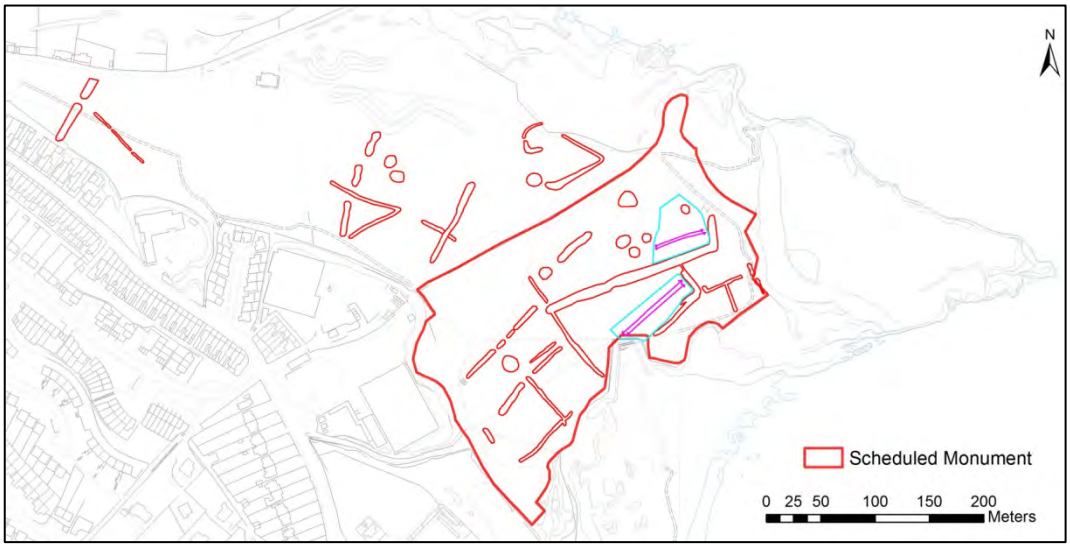
Several small mounds are recorded amongst the field boundaries, most of which probably relate to clearance cairns that are likely to have been subject to 19th century disturbance (Gallant et al 1986).

Discrete areas of ridge and furrow cultivation identified amongst the former field boundaries appear to be aligned upon them. These vary in width and regularity from relatively narrow (circa 2.5 metres between furrows) and curvilinear and straight but broad (up to 4.5 metres between furrows). The are tentatively interpreted as being of medieval date although Gallant *et al's* (1986) suggestion that the earthworks could be associated with late 18th century arable cultivation warrants further investigation.

A good quality field survey of the system was produced by Gallant et al (1986, 31) in their study of field systems on the on the limestone plateau (Figure 76). The NMP survey has largely confirmed the findings of this survey and enhanced the results by adding further detail and extending the possible limit of the field system beyond the scheduled area to the north-west.

The survival of the earthworks at Walls Hill is partly explained by their marginal position and cover of thin and poor quality soil, a feature common to most of the known relict field systems on the Devonian limetone, and other coastal field systems on different geologies but equally shallow marginal soils, including Deckler's Cliff (above).

Walls Hill is not threatened by agricultural activity and is now used as a recreation area, although the earthworks are potentially at risk from erosion caused by leisure activities. Further field investigation is recommended to confirm the extent and condition the newly identified earthworks and their relationship with the scheduled monument, and to characterise and define a chronology for the ridge and furrow earthworks.



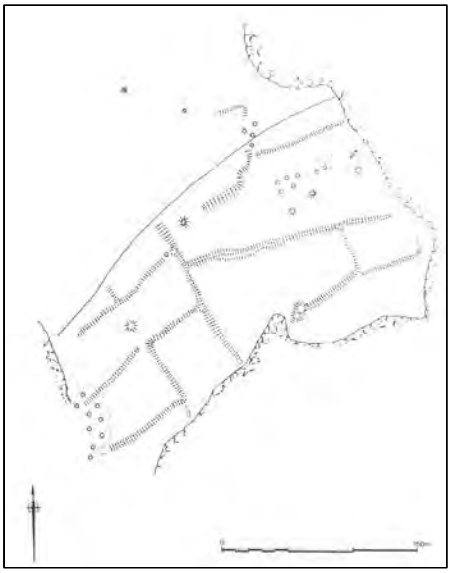
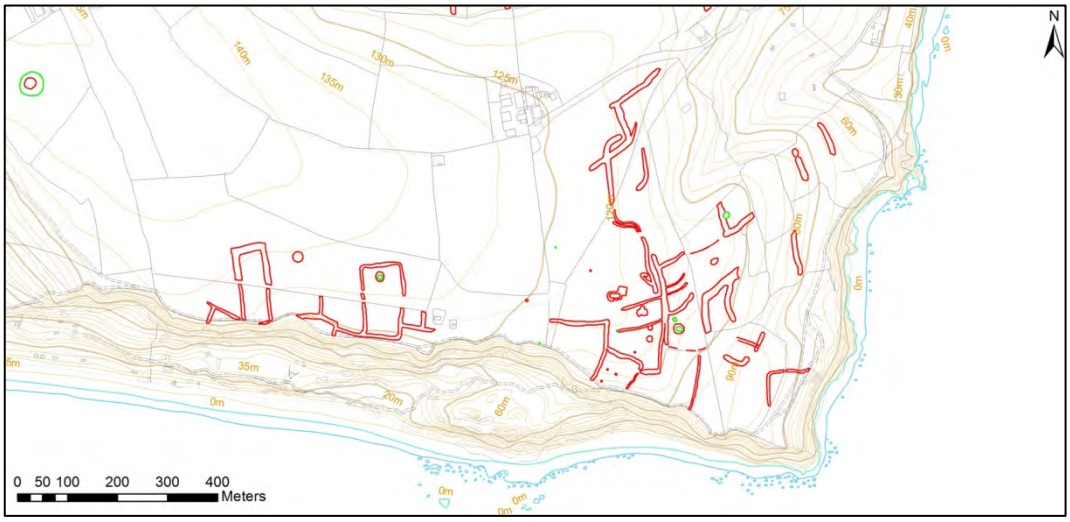


Figure 76: Relict field boundaries of probable Bronze Age date on Walls Hill, Torbay. Top: NMP transcription in relation to the scheduled area. NMP mapping © English Heritage. Bottom: Gallant *et al* survey drawing of 1986.

South Down Common

A field system of probable later prehistoric date has been significantly enhanced by the survey at South Down Common, Beer Head. Prior to the survey the recorded extent of the field system was confined to earthworks recorded on the east-facing slopes between South Down Farm and Beer Head, with some boundaries noted as fossilised within the current field pattern (MDV19842; Figure 77).

Within the current field pattern on the eastern slopes, an area characterised by HLC as being medieval enclosure, relict boundaries potentially of prehistoric date continue to be visible, even in areas where field boundary loss has been recorded as low. This might go some way to support the interpretation that the medieval field pattern on S outh Down Common incorporated prehistoric elements, some of which had passed out of use prior to the mid-19th century.



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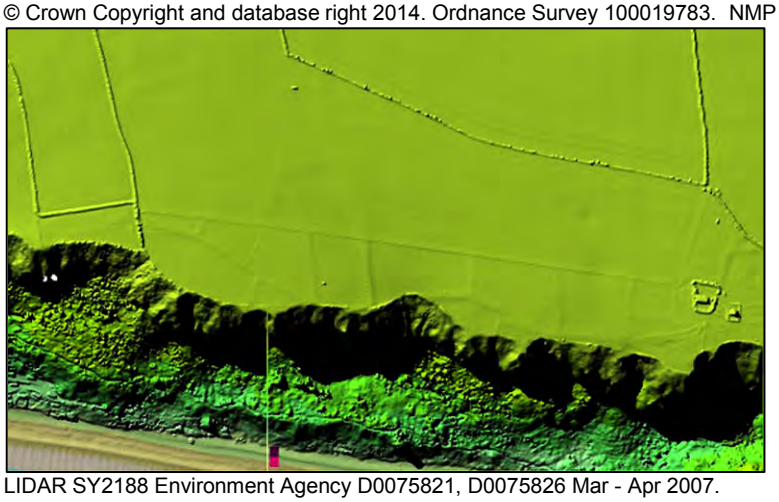

LIDAR SY2188 Environment Agency D0075821, D0075826 Mar - Apr 2007.
© Environment Agency copyright 2014. All rights reserved.


DCC DAP GD/01A-2 26-MAR-1986. © Frances Griffith, Devon County Council.

Figure 77: Relict field boundaries of probable later prehistoric, possibly Bronze Age date on South Down Common, Beer. Top: NMP transcription of wider field system. Middle: Environment Agency lidar tiles of the western extent of the field system. Bottom: Component of the field system previously recorded as a rectilinear enclosure.

Frances Griffith noted by 1983 that the field system probably extended westwards along the coastal cliffs towards Branscombe Mouth (*pers. comm.*).

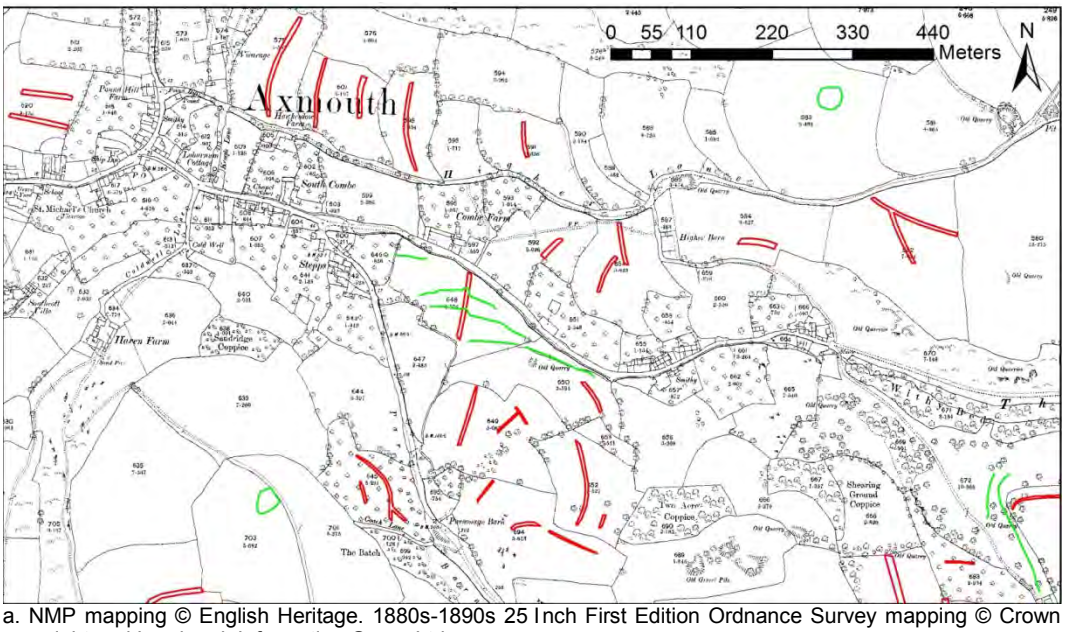
Nonetheless, the relict boundary banks west of South Down Farm had become disassociated form the field system to the east, instead recorded as fragmentary evidence of rectangular enclosures (MDV39952). The earthwork banks recorded from lidar imagery and oblique aerial photography appear to corroborate Griffith's assertion and the NMP transcription confirms that the ostensibly isolated enclosure is part of a westward extension of the broader Celtic field pattern, connected at its southern ends by a curvilinear earthwork bank from which additional perpendicular banks can be seen, evidence for further relict field boundaries. It is probable that this western extension was also incorporated into the post-medieval field pattern.

This western extension of the South Down field system shows evidence of differential preservation. The earthworks north of an east-west aligned modern boundary appear significantly more spread than those to the south of it. Conversely the southernmost boundaries terminate abruptly at Hooken cliffs, illustrating that this significant but unscheduled relict field pattern remains at high risk from erosion of the cliff edge.

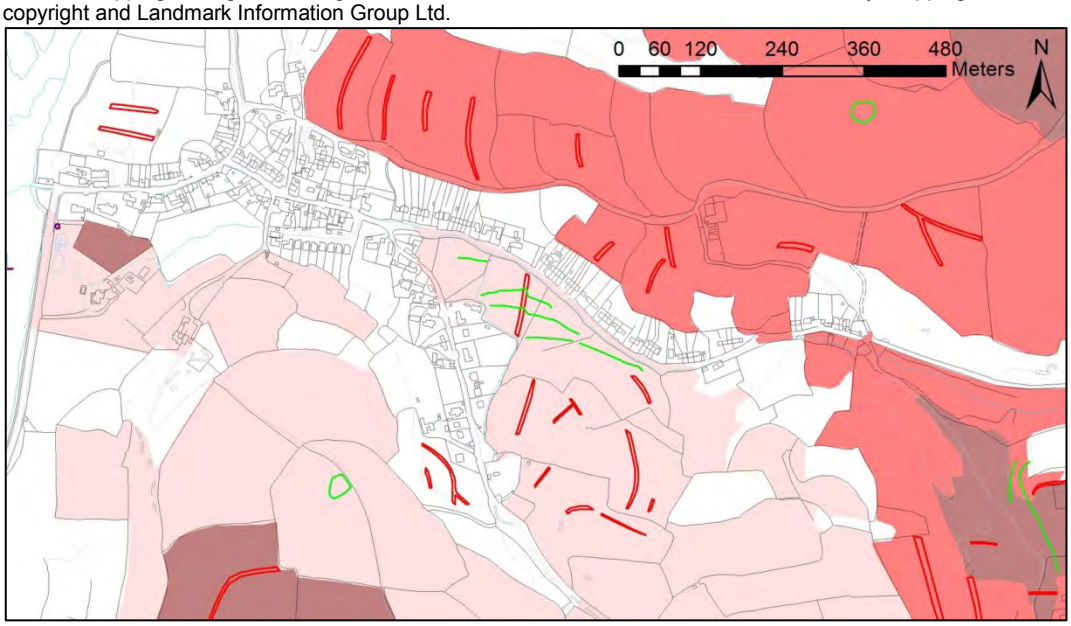
7.3.2 Agriculture: medieval field systems

Earthwork evidence of removed curvilinear field boundaries of probable medieval origin was a commonly recorded feature class throughout the survey area. Some areas have suffered particularly high levels of field boundary loss. Figure 78a for example shows numerous curvilinear boundaries around Axmouth; only the boundaries that were not depicted on the Tithe map were transcribed and it is therefore probable that those illustrated passed out of use prior to the mid nineteenth century.

Although not all curvilinear boundaries in Devon are of medieval origin (Turner 2007, 52), the layout of these around the early medieval settlement of Axmouth supports a medieval date. Somewhat unusually, field boundary loss here seems to have peaked prior to the mid-19th century, rather than during the period of agricultural intensification that followed the Second World War (Figure 78b). This is perhaps a result of land amalgamation during the post-medieval period, or as part of the drive to increase productivity during the early part of the agricultural boom of the mid-19th century.



a. NMP mapping © English Heritage. 1880s-1890s 25 Inch First Edition Ordnance Survey mapping © Crown copyright and Landmark Information Group Ltd.



b. NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783. Data derived from Historic Landscape Characterisation © Devon County Council.

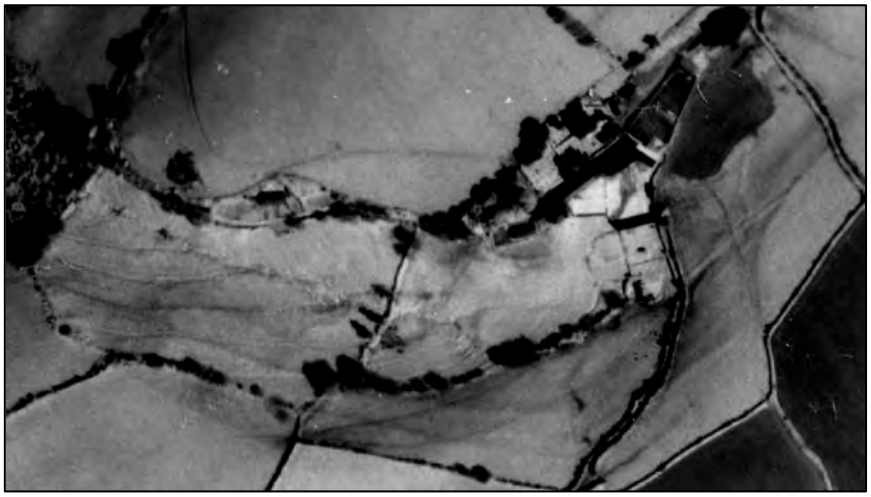
Figure 78: Removed curvilinear boundaries at Axmouth, not depicted on the 1842 Tithe map (MDV106517; MDV106520); a. overlain onto the late nineteenth century mapping, b. compared to the relatively low rate of field boundary loss since the late nineteenth century, derived from Historic Landscape Characterisation data (light pink 8% loss and mid pink 33% loss).

Previously unrecorded earthwork banks (MDV105225) associated with a former farmstead at Brownstone are visible on aerial photographs of 1946 onwards (Figure 79). A farmstead is first recorded at Brownstone in 1244 and it is possible that these earthwork banks relate in part to the medieval settlement.

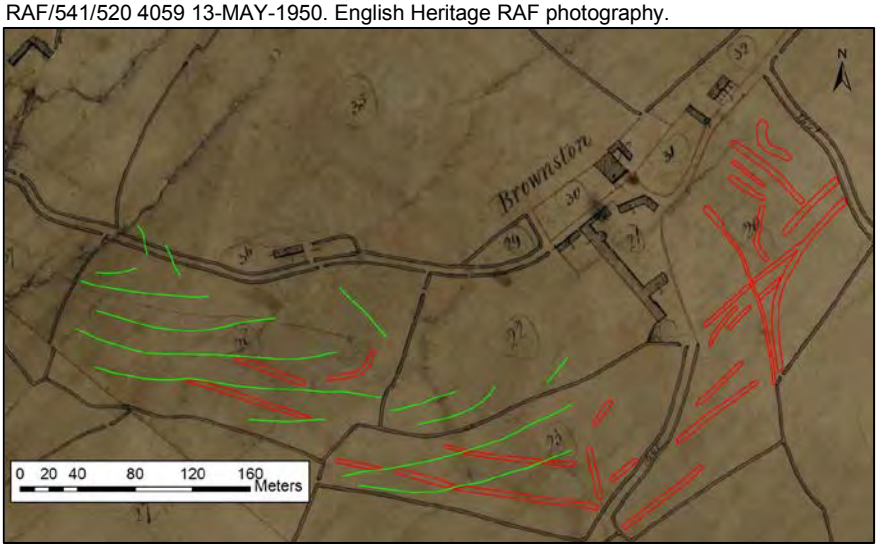
The earthworks occupy an area of approximately 4 hectares of steep north-west facing slope along the southern edge of a combe. To the east of the complex an area of earthworks are confined within a single plot depicted on the Tithe map for Brixham, adjacent to the present farmstead of Higher Brownstone. The nature of these extensive but fragmentary earthworks is unclear, although it is possible that

they may define areas of former farm buildings, the remains of small stock pens and paddocks or evidence of a formerly more extensive hamlet, indicative of settlement contraction.

A former trackway or hollow way flanked by two parallel earthwork banks defines the southern extent of the relict features. This trackway appears to connect two separate trackways at either end, both of which are depicted on the parish Tithe map. Linear earthwork banks representing the remains of possibly contemporary medieval lynchets or strip fields define the southern and south-western extent of the site. By the mid-19th century, the farmstead had under gone fundamental change, the earthwork banks of these former boundaries having fallen out of use. Later changes in farming practice during the 19th century are also evident on aerial photographs at Brownstone as a s eries of catch meadow gutters (MDV105223) which cut through these relict medieval features. Owing to the nature of the terrain at Brownstone, the earthwork banks of this medieval agricultural landscape appear to have been spared the effects of ploughing and remain largely visible on lidar images of 1998-2012. For further discussion of medieval settlement evidence, see Setion 7.4.2.



RAF/541/520 4059 13-MAY-1950. English Heritage RAF photography.



NMP mapping © English Heritage. Tithe map interactive digital layer, Devon County Council.

Figure 79: Possible medieval earthwork bank boundaries and relict trackway (MDV105225) associated with the former farmstead at Brownstone, with later catch meadow gutters (MDV105223).

7.3.3 Agriculture: Pillow Mounds

Before the 19th century rabbit warrens were a common feature of the British countryside. Artificial burrows known as pillow mounds were constructed to provide accommodation and protection for rabbits, which from the medieval period to the 18th century were a valuable commodity. By the early 18th century warrens were in decline and although often occupying marginal land, such as coastal heaths, were often largely superseded by enclosure and agricultural improvement in the 19th century (Williamson 2007).

Two sites displaying potential evidence of pillow mounds were recorded during the survey. The first comprises two low mounds on the north-facing slopes at Bolberry Down in the South Hams (MDV104299 and MDV104301: Figure 80). Each rectangular mound measures circa 20 m long and 10 m wide and is flanked by shallow quarry or drainage ditches, although some spreading of the earthworks by ploughing is evident. Although relatively small the earthworks are typically situated for a pillow mound, perpendicular to the contours of the slope.

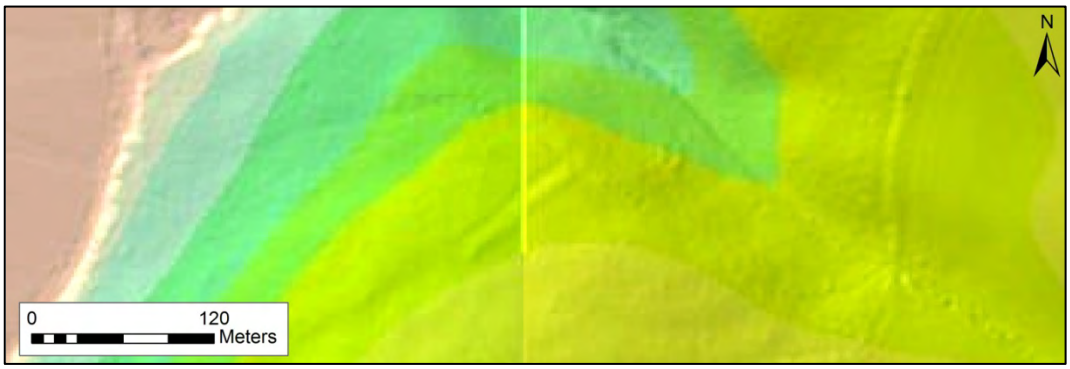
However, the interpretation of the mounds is problematic; it is perhaps improbable that a warren would be situated within an area characterised as medieval enclosure, and by the early 1840s the mounds occupied separate fields, recorded in the Tithe apportionments for Malborough as arable land.

On the other hand, the earthworks are located on a steep slope adjacent to Bolberry Down placing them in a potentially marginal coastal location. It is possible that cultivation expanded in the medieval period to enclose a greater area of the heathland, including the former location of a warren.

Boundary loss recorded between the Tithe map and First Edition OS map might also indicate a degree of arable agricultural intensification in the mid to late-19th century that could have superseded any later warren in this location. The mounds have been almost levelled since the 1940s but recent lidar data indicates that they survive as earthworks, albeit substantially reduced in height.

Lidar data reveals a much more substantial possible pillow mound on the steep north-west facing slopes overlooking the River Yealm (MDV103863, Figure 81). The earthwork bank is over 90 m in length and 15 m broad but is obscured from view on the aerial photographs available to the survey by the canopy of Crawl Wood. Again, the interpretation as a possible pillow mound of post-medieval date is somewhat tentative. Located between areas of Ancient Woodland, defined by Natural England and The Woodland Trust as areas that has been wooded continuously since at least 1600 AD, the section of Crawl Wood in which the bank can be seen is recorded in the Tithe apportionment of 1839 as part of a large area of coppice on the bank of the river. Landuse as coppice might seem to preclude a use as a warren, but warrens and woodland - or at least wood-pasture - are not necessarily exclusive; warrens in wood pasture contexts have been recorded elsewhere in the country (Williamson 2007, 94-95;156).

Figure 80: Possible pillow mounds north of Bolberry Down (MDV104299 and MDV104301). RAF/CPE/UK1890 2028 10-DEC-1946. English Heritage RAF Photography.



SX54NE-SX54NW DTM Environment Agency 2006-2010; Copyright Getmapping Plc.

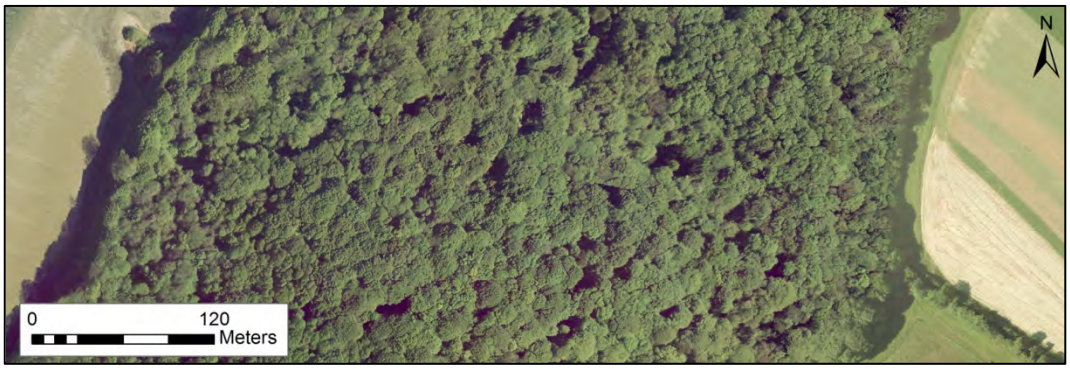


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Figure 81: A possible medieval or post-medieval pillow mound on the EA lidar, under Crawl Wood near Newton Ferrers.

7.3.4 Agriculture: Water Management

Water Meadows

The history and development of water meadows has been assessed and summarised by a number authorities and will not be repeated in detail here (Smith and Stamper 2013, Cook and Williamson 2007, Taylor et al 2006). To summarise their function, a water meadow can be defined as an area of pasture where the quality and quantity of the crop is artificially increased by various irrigation methods, to produce hay for winter fodder, to provide an earlier crop of pasture for grazing young stock or both.

Arguably the simplest form of water meadow is known variously as the catchwork irrigation system, catchwater meadow, catch meadow or field gutter systems. At their most basic catch meadows, as they will be referred to here, comprise a water channel or leat running along the contours of a hill or valley side, connected by a sluice to a pond or stream. When irrigation was required this channel was flooded and dammed, causing the water channel to over-top and water to flow down the valley slope. More often a series of parallel channels, known as field gutters, were constructed below the top water channel, often called the carriage-gutter or headmain, to more evenly distribute the water. They were most used during the 'hungry-gap' between late winter and early spring.

Catchworks were the single most numerous class of feature to be recorded during the Exmoor National Park NMP survey, with over 650 previously unrecorded systems noted, equating to almost a third of the total new record count (Hegarty and Toms 2009, 66), or a density of approximately 0.8 water meadows per square kilometre. This was an elaboration on a known theme, catch meadows previously having been noted as being a feature of the environs of Exmoor (Cook and Williamson 2007; Riley and Wilson-North 2001).

The pattern was not continued along Devon's north coast where catch meadows amounted to less than 4% of the monuments newly recorded by the AONB NMP survey, or a density of approximately 0.15 water meadows per square kilometre. Their distribution was also uneven, with the greatest concentration seen in the Greater Exmoor area (Knight and Hegarty 2013). The pattern for the south coast is different again, with over 130 water meadows identified, comprising over 9% of the survey's previously unrecorded monuments and equating to a density of approximately 0.32 water meadows per square kilometre.

The proportion of coastline will obviously affect the outcome when analysing the incidence of land-based features such as these. However when the calculations are repeated omitting the marine area (a rough estimate), the general pattern holds true. Roughly twice as many water meadows were recorded during the South Devon coast project compared to the North Devon AONB (0.41 per hectare and 0.19 respectively). The difference is amplified when the area covered by the water meadows is investigated, to 0.99 hectares per square kilometre for the South Devon coast in comparison with 0.25 hectares per square kilometre for the north Devon project area, suggesting that the systems in the north were on average smaller.

The conclusions that can be drawn from this data set are constrained by the very narrow project area and dramatically varying landuse along the coast and any generalisations will undoubtedly be unrepresentative of the county as a whole. However, based on the distribution recorded by NMP, it might be possible to confirm Turner's suggestion, based on analysis of HLC data, that:

"In the South Hams, the central part of the Exe valley around Tiverton, and along the southern side of Exmoor, catch meadows were particularly common." Turner (2007, 85).

In fact, in comparison with Turner's distribution map of possible post-medieval catch meadows circa 1890 (Turner 2007, Fig.70), the NMP results appear to extend the distribution, particularly in the east of the county where the density is lowest. Additional survey inland would probably further increase the record.

Within the survey area catch meadows vary in scale and complexity. All dimensions discussed are based on the extent of the systems interpreted from the earliest aerial photography on which they are visible and derived from the resultant monument polygon. They are therefore approximate and open to reinterpretation. The vast majority of catch meadows recorded (*c.* 77%) are less than three hectares in area. Within this subset, most are very simple in form, consisting of only one, two or three gutters, or a higher number of very short gutters (Figure 82). A very small number (10) are over 10 hectares in area, with only two exceeding 20 hectares. Of these, the largest exceeds 30 hectares in area (MDV104838). Whilst large, extending over the confluence of two valleys, this is a relatively simple system, illustrating the general rule that large catch meadows can be simple, but more complex systems are rarely small; this can be illustrated with the 7 hectare catch meadow at Carswell Farm (Figure 83).

Figure 82: Three simple catch meadows visible as narrow gutters, each extending over an area under 3 hectares, to the east of Stoke Fleming (from west to east, MDV104557, MDV104558 and MDV104559). Such small catch meadows are likely to be evidence of farm-scale water management associated with individual farms or smallholdings. RAF/CPE/UK/1890 RP 3050 10-DEC-1946. English Heritage RAF Photography.

Figure 83: A single large and complex catch meadow extends for approximately 7 hectares, to the south of Carswell Farm, Holbeton (MDV104031; North is to the right). It might have operated as an integrated system, taking animal waste from the farmyard and converting into liquid fertiliser, one of the few catch meadows recorded during the survey that could have done so. Larger catch meadows such as this might represent larger estates or collaboration between farms. RAF/106G/UK/967 RS 3114 01-NOV-1945. English Heritage RAF Photography.

A previously unrecorded possible valley floor water meadow is visible as earthwork banks or ditches on aerial photographs of the 1940s and 1950s at Dawlish Warren. At nearly 3.5 hectares, the site covers a substantial area, the earthworks most clearly visible to the south of the stream that flows along the combe to meet the Exe to the west, also supplying the system with water. A ditch that appears to connect with the stream and run centrally across the combe was probably the head main, the means by which the water was distributed across the meadow (Nicky Smith, pers.comm. 28th April 2014). Linear earthwork banks perpendicular to the stream are probably the remains of the ridges containing the water channels or 'carriers' across the meadow, flanked by the remains of the channels or 'tail drains' which ultimately carried water back to the stream.

The earthworks do not correspond with any features depicted on the First Edition OS map of 1887 but the Second Edition OS map symbolises the entire valley floor as marshland. Whilst admittedly tentative, this could be interpreted as circumstantial evidence for the 19th century enthusiasm for, and creation of bedworks, even in inappropriate locations, as seen elsewhere in England (Wade Martins and Williamson 1994). The land potentially reverted to marsh after the bedwork was failed or abandoned as a 'misplaced innovation' (*ibid.*).

Slight earthworks to the north of the stream might support the interpretation that the system extended further across the combe floor, but this area was largely tree covered in the 1940s and 1950s and is completely obscured by vegetation by 2012. The landform is not reliably revealed by lidar. The earthworks south of the stream appear to have been largely levelled by the development of a holiday park but a modern path through the woodland along the northern bank might provide access to enable assessment of the earthwork survival in this area.

Figure 84: A failed bedwork water meadow at Dawlish Warren? MDV105249. RAF/106G/UK/1412 3045-3046 13-APR-1946. English Heritage RAF Photography.

Water Mills

Limited evidence for further agricultural water-management has been recorded. One example is the medieval settlement of Prattshayes or Sprattehayes, part of the manor of Littleham to the south-east of Exmouth. A field named as Spratshayes Meade in the Tithe apportionment for Littleham, to the east of the settlement now called Prattshayes Farm, has been identified as the same field

referred to in a lease of 1685 (DRO1043W1) when it was referred to as ‘Two Mills Meadow’ (Turton 1992, 2). The Tithe map for Littleham shows two watercourses bounding this field to the north-west and south-east, which have also previously been interpreted as mill leats. The north-west channel survives as the course of the canalised Littleham Brook but the course of the southernmost leat has been shifted and now follows the modern field boundary.

The NMP survey has confirmed that the former course of the southernmost leat survives as a subtle earthwork gulley. A possible earthwork platform was previously identified in this field but the NMP survey has confirmed the presence of two substantial earthwork terraces within the field (Figure 85). These have been tentatively interpreted as building platforms, potentially the former locations of both Prattshayes water mills (MDV44887).

RAF/58/369 5023-5024 27-FEB-1950. English Heritage RAF Photography.

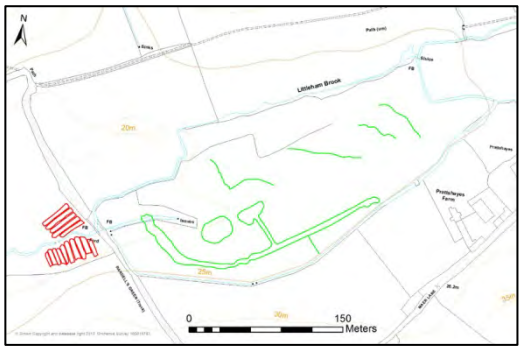

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Figure 85: The possible sites of Sprattehayes water mills. A later catch meadow and possible orchard banks can be seen to the east and west of the possible mill sites.

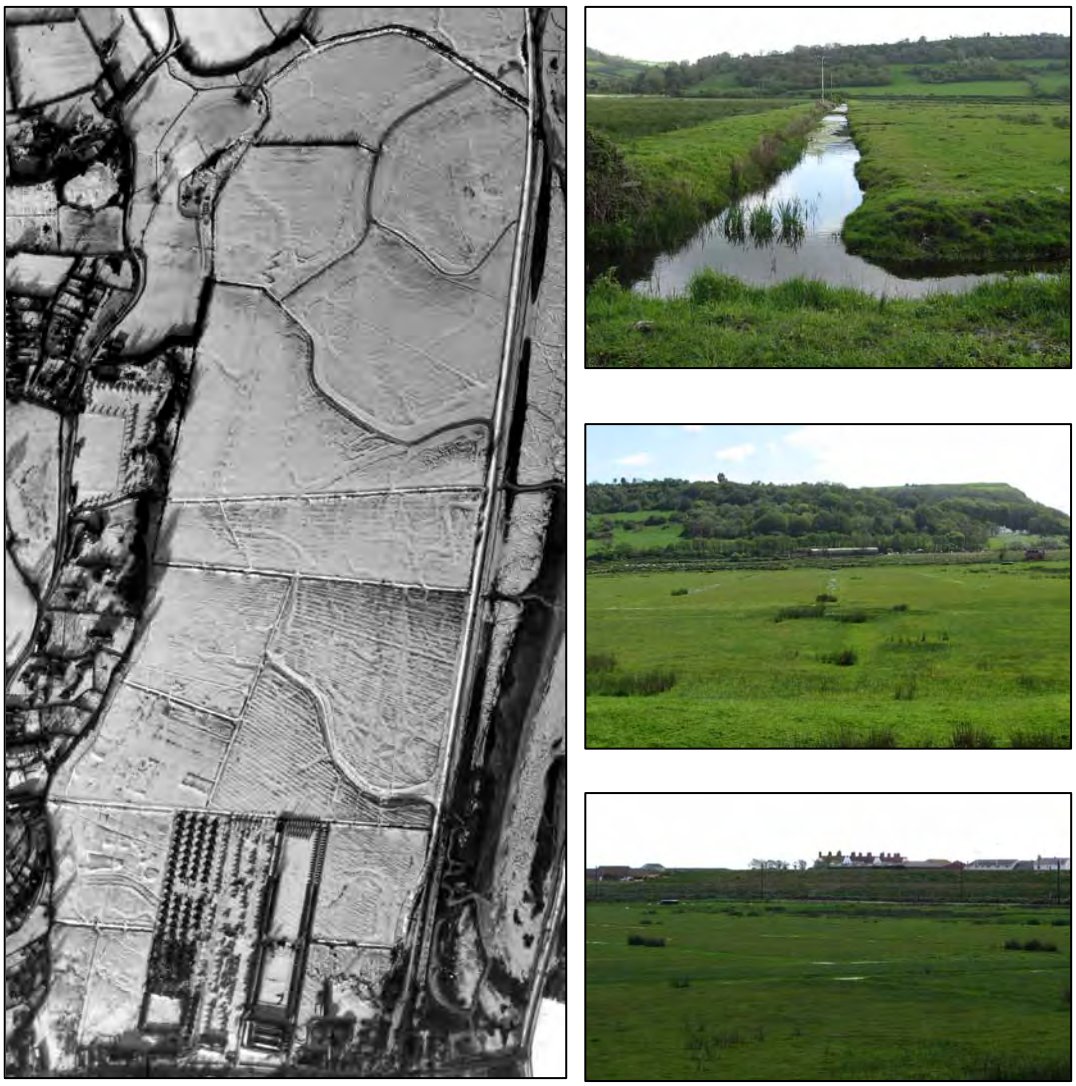
Reclamation and Drainage

Evidence of land reclamation is clearly visible at Seaton Marshes, where an extensive network of drainage ditches and narrow parallel linear furrows from improvement ploughing is visible on aerial photographs taken from the 1940s onwards (Figure 86). Most are likely to be associated with comprehensive nineteenth century drainage, although reclamation here took place over several centuries and phases and some earlier earthworks, such as sea banks, can also be distinguished.

The reclaimed area is divided into segments by deep drainage channels, some straight and clearly anthropogenic in origin, whilst others are curved or sinuous and probably modified palaeochannels. The spacing and alignment of the earthwork furrows varies between the parcels, probably reflecting differences in topography, as well as possibly phasing. Most are aligned cross-contour, between 4 and 8 m apart.

Warners holiday camp was located in the centre of one parcel and the furrows, 5 m apart and aligned north-west to south-east, are visible in the central area between the rows of chalets on aerial photographs taken between the 1940s and 1960s. Created in the 1930s by Harry Warner with Billy Butlin, and seemingly the catalyst for Butlin’s subsequent holiday empire, the camp housed interned foreign nationals and POWs in the Second World War (Warner 2010), although relatively

little in the way of modification for the wartime occupants was visible on the contemporary aerial photographs.



RAF/58/5607 F21 343 22-JAN-1963.
English Heritage RAF Photography.

Photographs: Stephanie Knight, May 2014.

Figure 86: Extensive nineteenth century drainage ditches and furrows on the reclaimed Seaton Marshes (MDV42593). The earlier seawall (MDV42609) is just visible in the top right of the left image as a curving earthwork bank truncated by the railway line. Warners Holiday Camp was sited on the reclaimed land on top of the earthwork furrows and is visible in the bottom centre of the aerial photograph (MDV53277). Probable saltern mounds (MDV51123) are visible to the north and west of the holiday camp; other possible salt working features to the north are less easy to see at this scale.

A large area in the south nearest the sea has now been developed, but the earthworks appear to survive well in the northern part. The main substantial drains dividing the land parcels are depicted on historic and modern maps, and for clarity the dense network of individual drains has not been transcribed as part of this project. However the aerial photographic resource has good potential for further investigating and illustrating the historic sequence of drainage here.

7.4 Thematic Results: Settlement

7.4.1 Settlement: Prehistoric

Excluding a small number of larger or extensive sites such as coastal or promontary hillforts that are most clearly visible as earthworks on images derived from lidar data 51 possible settlement sites of probable later prehistoric or Roman date have been recorded as cropmarks, partly or completely. Of these, 16 (31%) were previously unrecorded (See Figure 88 and Figure 89).

The ascription of dates to cropmark sites is based on morphological comparison to excavated examples. Most excavated enclosures in the South West have proved to be of later prehistoric or Roman date although some have Bronze Age origins and it is probable that some un-investigated sites are significantly earlier in date (Griffith 1988, 58; Green 2009).

35% of all the cropmark settlement monuments recorded are under 1000 square metres (0.1ha) in area, 10 of which (19%) are cropmark ring ditches interpreted as possible round houses of later prehistoric date. These have been recorded in a variety of settings, including small groups defining possible unenclosed settlements and, more often, in association with larger ditched enclosures (see Figure 93 and 92). Such ditch defined enclosures, interpreted as possible evidence for enclosed settlement, are the principle evidence type for later prehistoric or Roman date settlement in the survey area, often associated with possible field systems. The greater proportion of cropmark enclosures fall within the recognised pattern of relatively small and simple enclosures of circular to rectangular shape (Griffith 1988, 59), with approximately 75% of all enclosures (excluding ring ditches) under 1 hectare in area. However it must be stressed that a number of possible enclosures are visible as incomplete cropmarks, which might bias the figures towards smaller sites.

The records of a small number of enclosures of complex form, for instance enclosing ring ditches or smaller ditched enclosures as part of extensive enclosed settlements, have been enhanced by the survey. For example, at over 8 hectares in area, the most extensive enclosed settlement recorded by the survey from cropmark evidence is the previously recorded complex multi-phase site facing south-east on the slopes of Combe Down, near Noss Mayo (Figure 87 MDV50145).

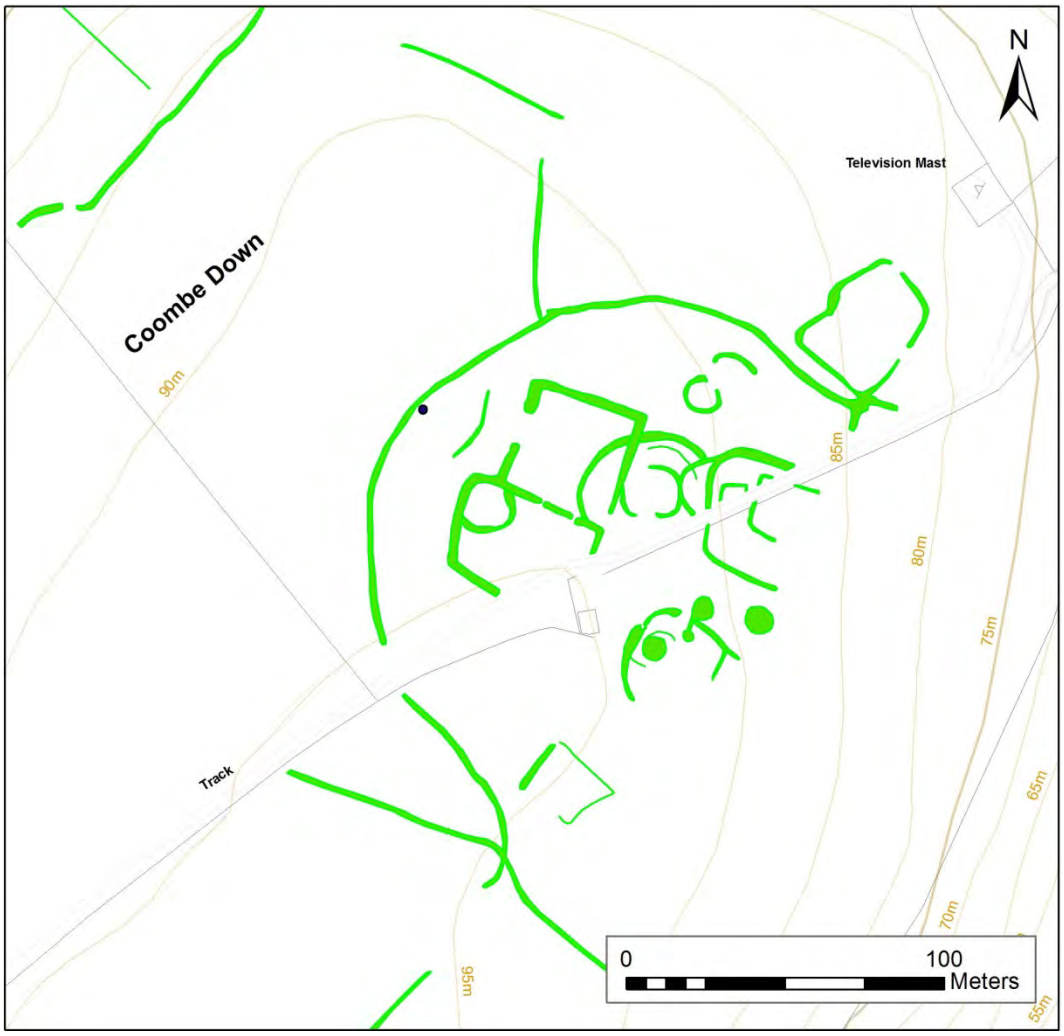


Figure 87: The most extensive enclosed settlement of probable later prehistoric or Roman date recorded by the survey from cropmark evidence (MDV50145). NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783.

The distribution of cropmark sites throughout the survey area is not uniform. The limited extent of the survey area restricts meaningful analysis but topographically there seems to be a bias towards estuarine locations away from the coast. A significant concentration of cropmark enclosures of probable later prehistoric or Romano-British date were observed along the west bank of the River Exe, between Kenton and Exminster, corresponding with the only extensive area of grade 1 and grade 2 agricultural land within the survey area, and the largest continuous area of sandstone bedrock geology (Figures 88 and 89).

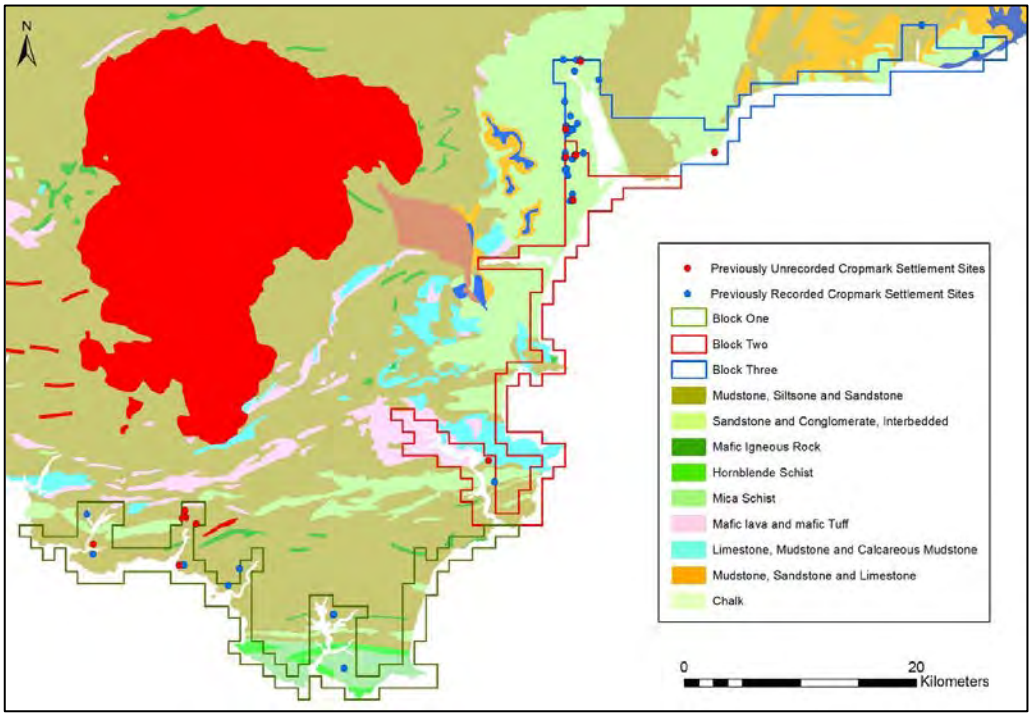


Figure 88: The distribution of all HER monuments for possible settlement sites visible as cropmarks created or amended by the survey, plotted against BGS 1:625k Bedrock mapping. This map is reproduced from the Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. 100019783. 2006.

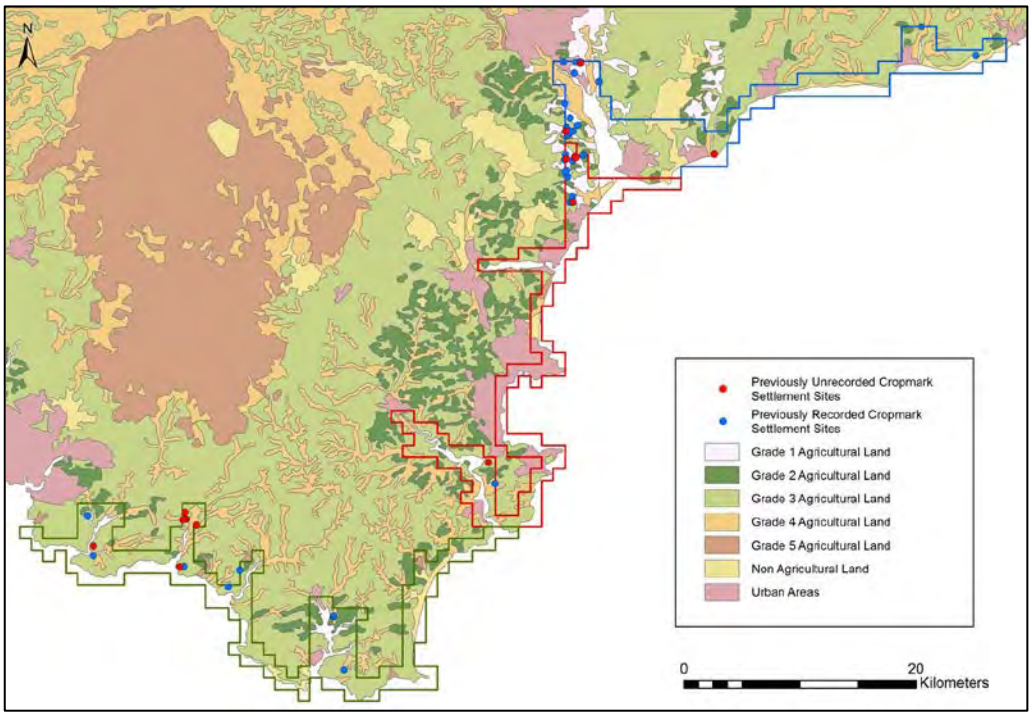


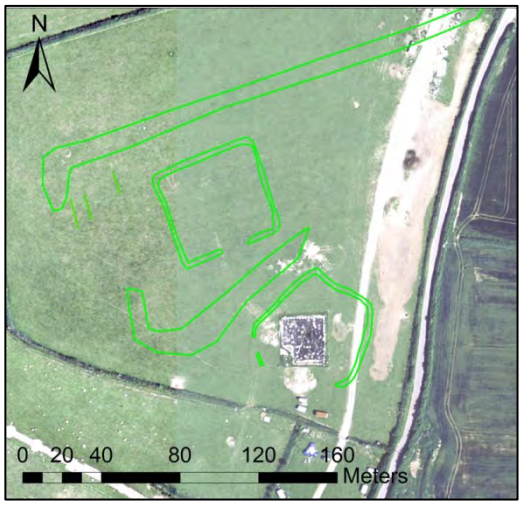
Figure 89: The distribution of all HER monuments for possible settlement sites visible as cropmarks created or amended by the survey, plotted against Defra Agricultural Land Classification mapping. This map is reproduced from the Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. 100019783. 2006.

Overall, fewer cropmark enclosures were identified than anticipated and even well-known sites were not always visible on the non-specialist runs of aerial photographs. For example, the complex of prehistoric to Romano-British enclosures around Mount Folly in the South Hams, which was first identified through aerial reconnaissance in 1989 and has been the subject of a long-running volunteer excavation programme (Figure 90), was visible on only a very few aerial photographs.

Figure 90: A hut circle in one of the Mount Folly enclosures under excavation in 2011. Photograph: Stephanie Knight, July 2011.

The two enclosures are clearly visible as dark rectilinear cropmarks on aerial photographs taken in July 1989 (Figure 91) and 1992, and indistinctly visible as diffuse pale soilmarks in October 1992. They are not visible on earlier available aerial photographs, and this may be a consequence of the low number of summer sorties available. Alternatively, it is possible that deeper cultivation methods, or same-depth cultivation on compacted or eroded soils, had a greater impact on buried deposits from the 1980s onwards.

DCC DAP OA2 12-JUL-1989. Devon County Council Devon Aerial Photograph.



Next Perspectives PGA Imagery SX6544 22-MAY-2007. NMP mapping © English Heritage. Aerial Photography: Licensed to English Heritage for PGA, through Next Perspectives ™.

Figure 91: The Mount Folly enclosures (MDV40102) visible as cropmarks when first identified (left; looking south-east); and before the 2007 excavation season (right) when the site is visible as a covered square area, with spoilheaps to the south and north.

The NMP survey recorded additional detail including narrow linear cropmarks west of the northernmost enclosure from aerial photographs taken during the summer of 1992. The cropmarks probably formed over outer enclosure ditches and correspond to some of the anomalies identified through recent geophysical survey (unpublished geophysics plot kindly shared by Eileen Wilkes). Additional diffuse linear soilmarks, visible on aerial photographs taken in the autumn of the same year, cover a large area and could indicate additional boundaries of prehistoric date further to the south-west.

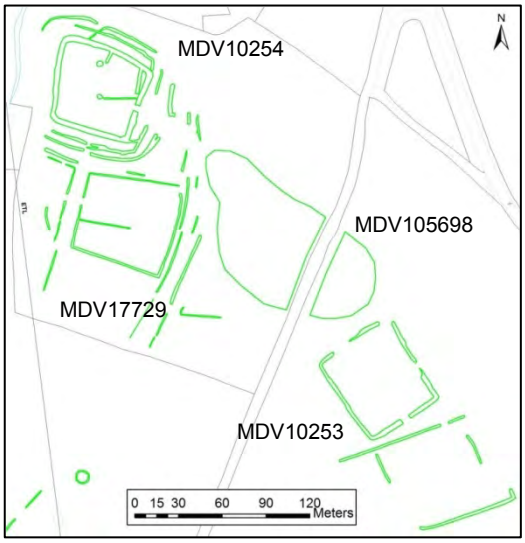
Although the soilmarks suggest active truncation of the buried archaeological remains, and despite the relatively low incidence of cropmarks, the recent excavations of the southernmost enclosure demonstrate good survival of below-ground features. The cut features of the excavated hut circle seem to have been protected from modern plough damage by the deeper soils covering the terrace cut into the slope, in which the round house was sited. In other areas survival of the shallower features may be poorer, but given the potential for buried remains indicated by geophysical survey, targeted aerial survey of the wider area could prove rewarding.

A particularly dense cluster of cropmark enclosures were observed to the north-west of Kenton at Mill Farm (MDV10253, MDV10254 and MDV17729, Figure 92) occupying approximately 5 hectares on the edge of a spur overlooking the River Kenn.

Whilist broadly comparable in area, the variation in form, particularly between the sharply angled enclosures MDV10253 and MDV17729 and the more rounded and triple ditched MDV10254 might support the interpretation that this cropmark complex represents a multiphase settlement that evolved over an extended period.

Cropmark evidence for two additional possible enclosures is also visible to the south-east of MDV10253 and to the west of MDV17729. Fragmentary evidence of a possible contemporary field system was also recorded to the south-east and south of the cropmark complex (MDV17728 and MDV105697).

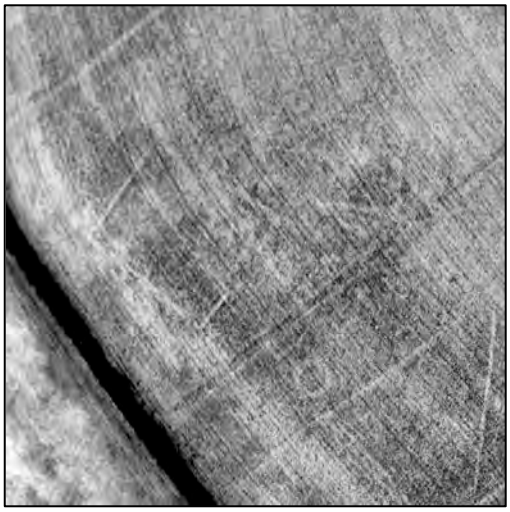
Continued aerial reconnaissance of this area along the western bank of the Exe Estuary is likely to yield further cropmark evidence and may help to provide greater clarity and better understanding of this rich later prehistoric to Romano-British landscape.



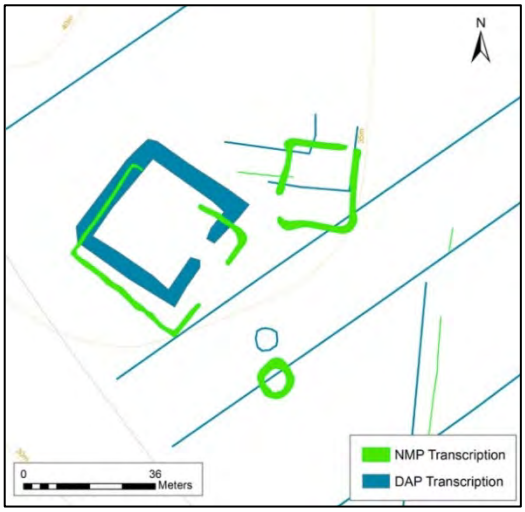
NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783.

DCC DAP 6714 15 23 -JUN-1989. © Frances Griffith, Devon County Council.

Figure 92: Cropmark enclosures visible on oblique aerial photographs of 1970 (MDV10253, top left) and 1989 (MDV10254 and MDV17729, top right), with transcription (bottom). An irregularly shaped quarry of potential medieval date (MDV105698) is visible between the enclosures. Note unenclosed ring ditch MDV37442 south of the main cropmark complex.



CUCAP BUO 036 18-JUL-1975. © Cambridge University Collection of Aerial Photographs.



NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783.

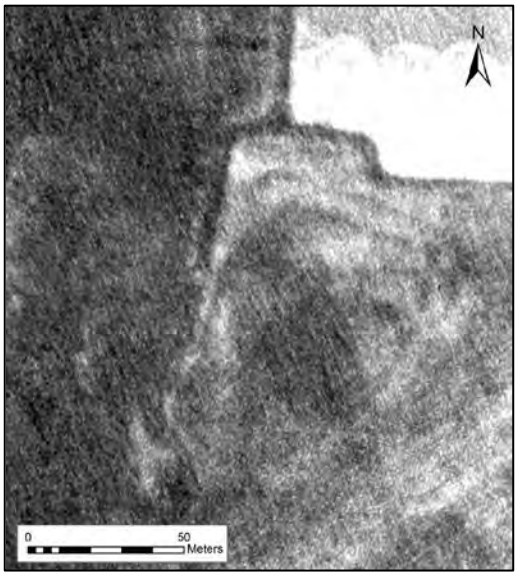
Figure 93: The survey has added value to existing HER data by reinterpreting and recasting existing HER data (MDV17724, MDV105535 and MDV105536 and MDV105545). Note the ring ditch possibly associated with the enclosed settlement evidence.

In addition to improving the spatial data of previously recorded cropmark sites the survey has added value by reinterpretating and recasting extant HER data. Figure 93 illustrates the NMP transcription of two small rectilinear cropmark ditched enclosures, a single ring ditch and linear feature interpreted as a possibly associated field boundary (MDV17724, MDV105535, MDV105536 and MDV105545).

Prior to the survey these monuments were recorded as a single HER monument (MDV17724). The component parts have now been recorded individually and the north-eastern cropmarks, previously interpreted as the south-eastern corner of a larger, double ditched enclosure, have been reinterpreted as a small rectilinear cropmark.

Very few complete or near complete previously unrecorded cropmark enclosures were recorded during the survey. A single example has been recorded from vertical photography, near the crest of Brim Hill east of the River Dart, overlooking Galmpton (MDV105004). Visible on only one run of vertical imagery taken in June 1942 (Figure 94), the possible double ditched enclosure is very poorly defined and could conceivably be partly agricultural in origin.

Two further previously unrecorded near-complete enclosures have been recorded from reassessment of specialist oblique aerial photography. The possible enclosure MDV105552 (Figure 95) is visible on a 1984 DAP to the north of Topsham, west of Cott's Farm. The site is located on gentle north-east-facing slope on the edge of the Clyst Valley. The cropmarks are poorly defined but appear to show the north-east half of a broadly rectilinear enclosure, approximately 30m across. The newly recorded enclosure was located approximately 100m to the south of a much larger previously recorded rectilinear enclosure (MDV60789, Figure 95).

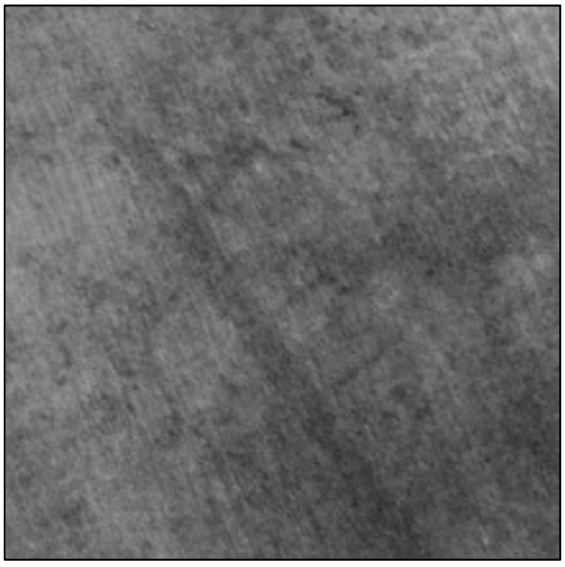


RAF/FNO/29 RV 6081-82 30-JUN-1942. English Heritage RAF Photography.

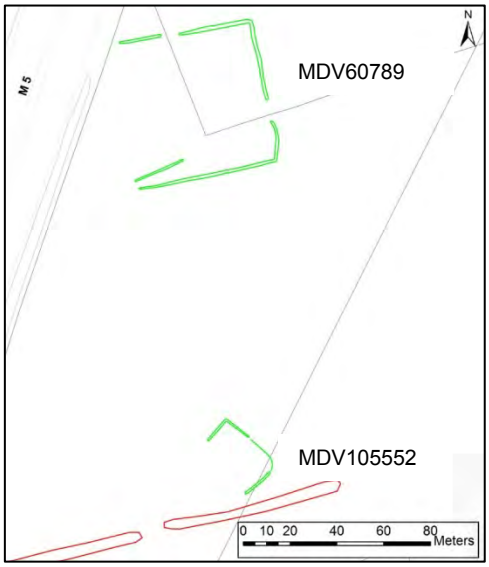
NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783.

Figure 94: A possible double ditched cropmark enclosure near Galmpton, recorded from vertical aerial photography (MDV105004).

Cropmarks defining the western extent of both enclosures are not visible, and as both lie along the 10m contour line it may be that geological or topographical conditions have affected cropmark development on the more sharply sloping ground to the west.



DCC DAP AS/5 03-JUL-1984. Devon County Council Devon Aerial Photograph.



NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783.

Figure 95: Oblique aerial photograph of 1984 showing faint cropmarks of possible enclosure (MDV105552), with transcription, also showing larger enclosure (MDV60789) to the north.

A further previously unrecorded rectilinear ditch defined enclosure (MDV105524) is visible on a single run of DAP aerial photographs of 1989 as a cropmark to the south of Kenton Common (Figure 96). The enclosure is situated on a gentle south-facing slope near the head of a combe at which rises the stream that meets the Exe at Cockwood, to the south-east.

The cropmark is very narrow and regular, and morphologically the enclosure is extremely regular in shape, contrasting with the majority of recorded enclosures that tend towards more curvilinear or sub-rectangular plans with broader enclosure ditches.

Examples of such less regular cropmark enclosures are recorded a short distance to the north and south (MDV17725, MDV60786), and it is possible the very regular nature of enclosure MDV105524 could be an expression of a very long-lived occupation of a prime settlement location. Futher work is of course required to confirm this interpretation.

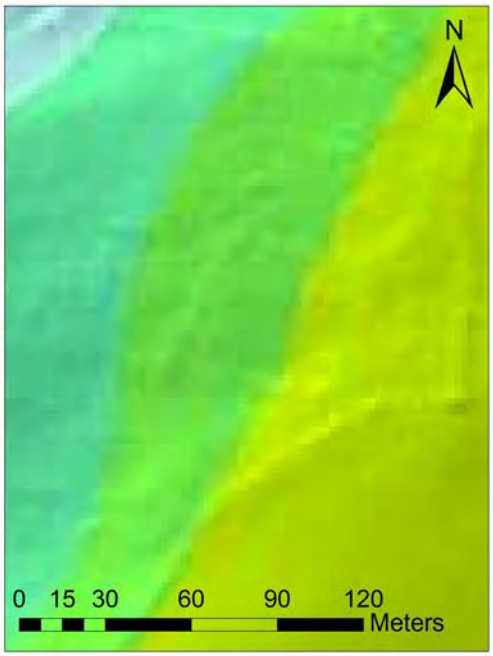
It is interesting to note that although this enclosure was probably the photographer's intended subject, the site was not subsequently recorded on the DCCHER. This might have been due to an accessioning oversight or interpretation of a non-archaeological origin, until noted as part of the NMP survey.

DAP 6715/05 23-JUN-1989 (MF 05). © Frances Griffith, Devon County Council.

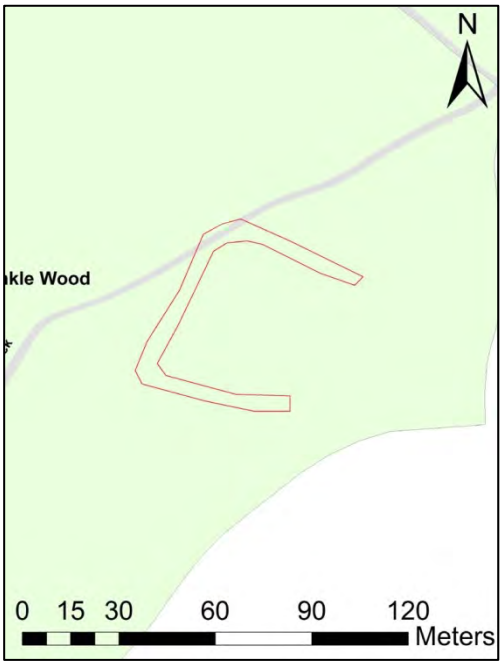
NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783.

Figure 96: A rectilinear ditched enclosure (MDV105524) visible as a cropmark south of Kenton Common. A linear ditched feature projecting from the western side of the enclosure might represent part of a field system associated with the enclosure. A smaller and less regular possible enclosure is visible 100m to the south-west.

A rectilinear earthwork bank-defined enclosure was recorded in Winkle Wood, near Kingston (MDV104442). Not visible on the aerial photographic resource where the ground surface was obscured by tree cover, the possible earthwork bank was identified from lidar imagery. Although interpretation is very tentative this could repay further field investigation (Figure 97).



LIDAR SX64NW DTM Environment Agency 2001-2010. © Environment Agency copyright 2014. All rights reserved.



NMP mapping © English Heritage.
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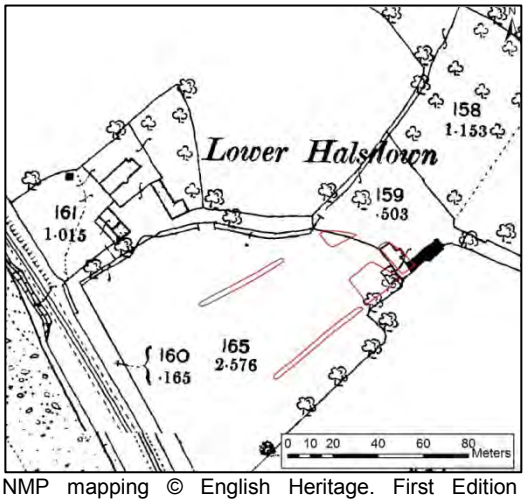
Figure 97: Possible enclosure in Winkle Wood (MDV104442), only visible on the lidar images where data has been manipulated to create a DTM.

NMP mapping © English Heritage. Tithe map interactive digital layer, Devon County Council.



NMP mapping © English Heritage. First Edition Ordnance Survey 25 inch map, 1880's-90's © Crown copyright and Landmark Information Group Ltd.

Figure 98: Possible shrunken medieval farmstead of Middle Halsdon (MDV61241); transcription overlying the parish Tithe map of approximately 1838-48 (left) and First Edition OS map of 1880s-90s date (right).

7.4.2 Settlement: medieval

The survey has added detail to our understanding of the possible shrunken medieval farmstead of Middle Halsdon (MDV61241, Figure 98). This small farmstead is first referred to in an auction notice of 1808 and is depicted as two buildings on the Withycombe parish Tithe map of approximately 1838-48. By this time the farmstead of Middle Halsdon had evidently ceased to exist and is instead recorded as being part of Lower Halsdon, located further to the west.

Earthworks visible on aerial photographs of 1946 onwards, however, have shown that this farmstead is likely to have once been larger than is depicted on historical mapping. Two additional earthwork building platforms on the western side of the former farmstead are visible on the gentle west facing slope. A third earthwork platform is visible adjacent to these, although this clearly corresponds to the western of the two buildings forming part of the farmstead.

The sub-rectangular southern building platform abuts an historic and extant field boundary along its south-east edge while that to the north appears to have been slighted by a later field boundary and trackway by the 1880s-90s.

The survival of these earthwork platforms on aerial photographs taken in 2000 may indicate good below-ground preservation of building remains of this former farmstead.

Considerable detail could also be added to the record of a probable medieval deserted settlement near Dowlands, from the complex of banks and ditches visible as earthworks on aerial photographs taken between 1946 and 1963, and cropmarks on aerial photographs taken from 1969 to 2006 (Figure 99).

The complex is most clearly visible on aerial photographs taken in 1963, when snow cover and low light conditions allow the greatest detail to be seen. Several embanked possible holloways run through the complex, linking roughly rectilinear embanked compartments of varying size, the smallest of which may be the remains of house platforms. A narrow curvilinear bank aligned approximately

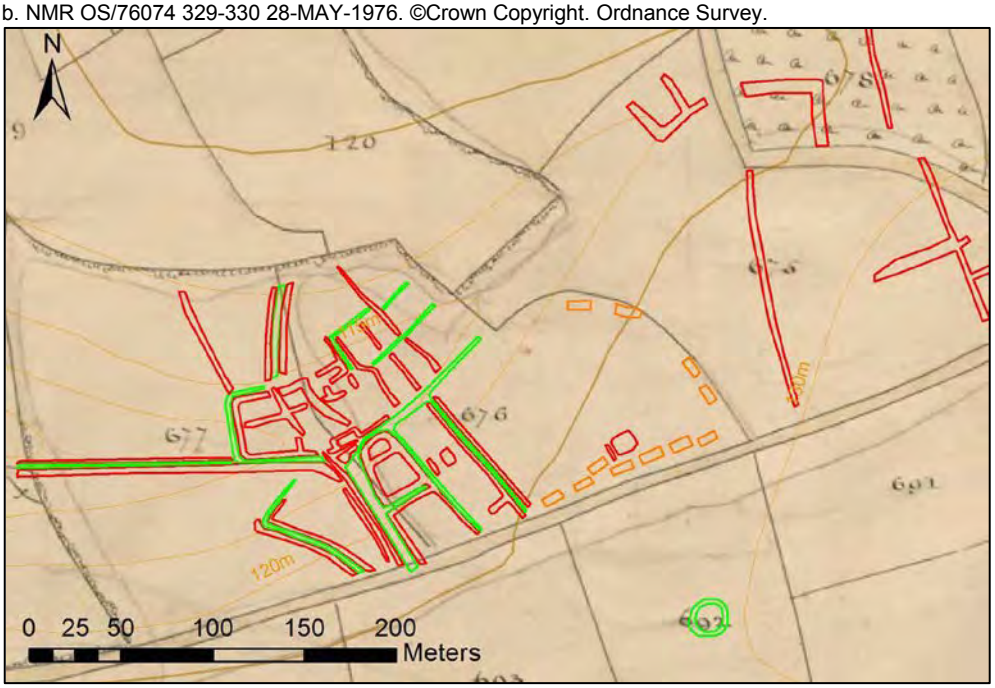
north to south does not seem to fit into the layout, perhaps overlying some of the earthworks in the centre of the complex, and this is likely to be the later field boundary depicted on the Tithe map.

Although the earthworks appear to have been levelled by ploughing during the later 1960s, cropmark evidence from 2006 suggests that below-ground remains are very likely to survive. Further work such as geophysical survey would be useful to better define the extent and detail of the layout.

Newly recorded earthworks around the nearby settlement at Bindon may be of a similar date, and again the snowy 1963 aerial photographs provide by far the best evidence for these (Figure 100). Interpreted as the remains of a shrunken settlement associated with the medieval manor, a curving holloway is visible to the south of several banks defining five possible house platforms, with a boundary bank south of the holloway. Despite probable spreading of the earthworks by ploughing, the boundary bank and holloway are well-defined on the lidar imagery, indicating good survival of these features in 2006-7.

a. NMR RAF/58/5607 F21 347-348 22-JAN-1963. English Heritage RAF Photography.

b. NMR OS/76074 329-330 28-MAY-1976. ©Crown Copyright. Ordnance Survey.



c. NMP mapping © English Heritage. 1842 Axmouth Tithe map: Devon County Council. Height Data: Licensed to English Heritage for PGA, through Next Perspectives™.

Figure 99: The earthworks and cropmarks of a probable medieval deserted settlement at Dowlands are most clearly visible on aerial photographs taken in 1963, but appear to have been substantially levelled by 1976 (MDV11401). Another possible deserted farmstead is visible in image a, far left, as a complex of earthwork enclosures (MDV105566).

Figure 100: Snow cover and low light highlight the earthwork banks of the shrunken settlement at Bindon (MDV106533). RAF/58/5607 F21 346-347 22-JAN-1963. English Heritage RAF Photography.

7.5 Thematic Results: Ceremonial and Funerary

With the exception of some well-known sites such as medieval Torre Abbey and the Neolithic chambered tomb at Broadsands, the small number of scattered coastal barrows or ring ditches of probable Bronze Age date were the main evidence for religious or funerary activity within this project. These included some previously unrecorded cropmark sites in East Devon (MDV106112 and MDV106544), for which interpretation is tentative.

Two previously unrecorded earthwork mounds cautiously interpreted as prehistoric round barrows (MDV104844 and MDV106845) were identified to the west of Ham Barn, Stoke Gabriel on images derived from lidar data (Figure 101). The two adjacent and prominent oval-shaped mounds measure approximately 21m in length by 15m in width and are located towards the crest of a steep south-east sloping spur, with commanding views over the River Dart. A previously recorded barrow (MDV35836) exhibiting similar characteristics and located on comparable terrain, is visible as an earthwork mound approximately 450m to the north-east (Figure 101) and may add some credence to the interpretation given to these features. Should these features prove positive, then there is high potential for the existence of further burial mounds within the vicinity.

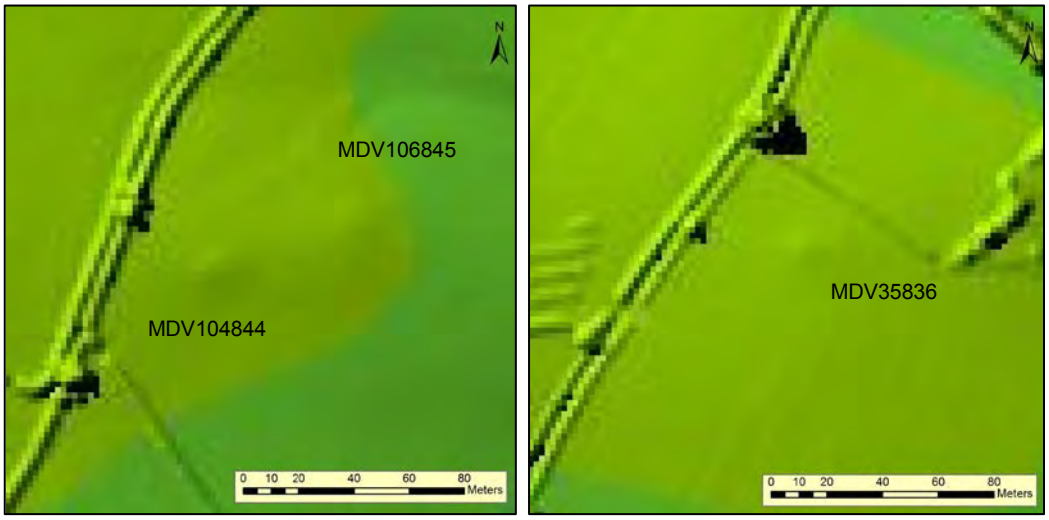


Figure 101: Possible prehistoric barrows to the west of Ham Barn (MDV104844 and MDV106845, left) and barrow recorded further to the north-east (MDV35836, right). LIDAR SX85NW DSM Environment Agency 1998-2012. © Environment Agency copyright 2014. All rights reserved.

7.6 Thematic Results: Intertidal

7.6.1 Maritime and Coastal

Relatively few maritime or coastal intertidal monuments were recorded or amended during the survey (Figure 103). An exception is the wreck of the Louis Sheid that ran aground off Thurlestone Sand in 1939 after being torpedoed by a German Uboat (MDV43504: Figure 102). The wreck was previously recorded but has been more accurately located by the survey. Although much of the wreck has been extensively salvaged, substantial sections remain *in situ* and it is a popular diving destination.

Figure 102: The Wreck of the Louis Sheid three years after it was wrecked off Thurlestone Sand. SX 6742/4 MSO 31279/PO-3092 12-FEB-1942. English Heritage RAF Photography.

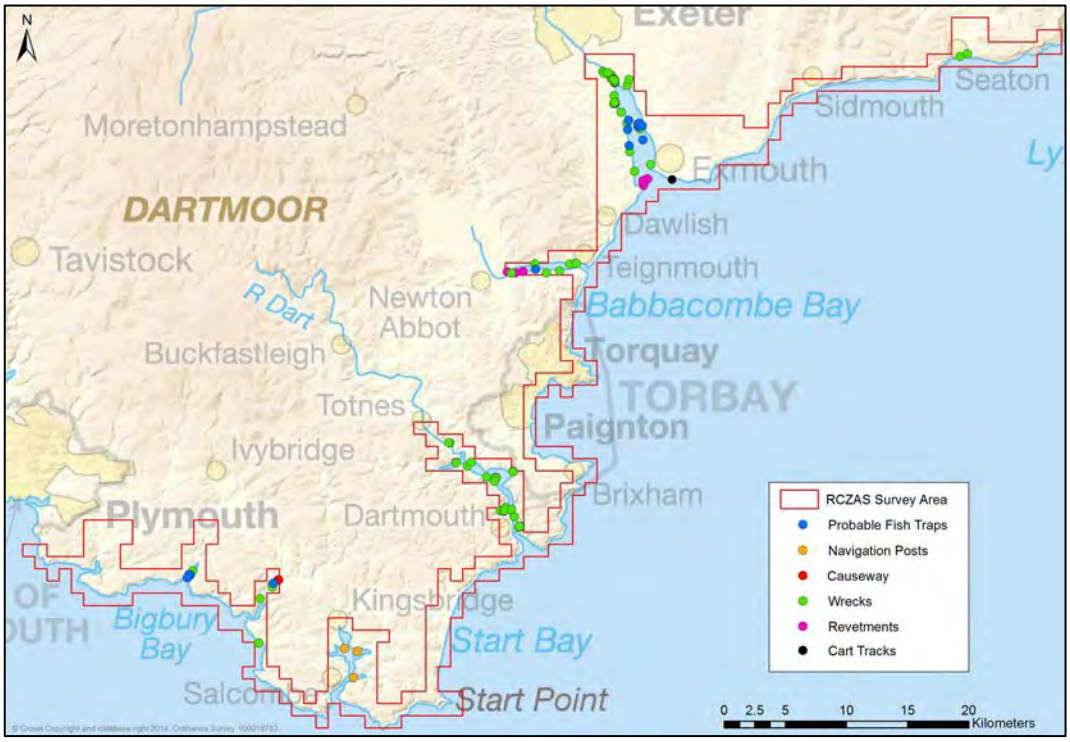


Figure 103: Significant intertidal sites recorded or amended during the survey. This map is reproduced from the Ordnance Survey material with the permission of Ordnance Survey on behalf of the Controller of Her Majesty's Stationery Office © Crown copyright. Unauthorised reproduction infringes Crown copyright and may lead to prosecution or civil proceedings. 100019783. 2006.

Rut Ways

From the mid-18th into the 19th century a limekiln was located on the The Maer to the south of Exmouth (MDV18738). Local histories recall that before Exmouth docks were built in the late 19th century, lighters carrying limestone could unload directly below the kiln at high tide (Abell 1933) or offload stone inshore at high tide and collect it at low tide, often a dangerous procedure (Bush 1978). Other accounts record coal being landed on the beach (Clark 1968). The site of the limekiln was not identified during the survey but a possibly associated site was visible to the south-east.

Two sets of parallel rock cut linear channels are visible at low tide incised into the bedrock at Maer Rocks and Orcombe Rocks. Those at Maer Rocks are aligned upon the site of the limekiln and at least one set of channels is visible projecting into the intertidal zone for nearly 250 m (Figure 104). It is possible that the previously unrecorded channels were contemporary with the limekiln, cut into the exposed rock to facilitate the transportation of limestone or coal at low tide, when the use of carts over beach sand might have been difficult or dangerous. The possible rut ways at Orcombe Rocks might have served a similar function.

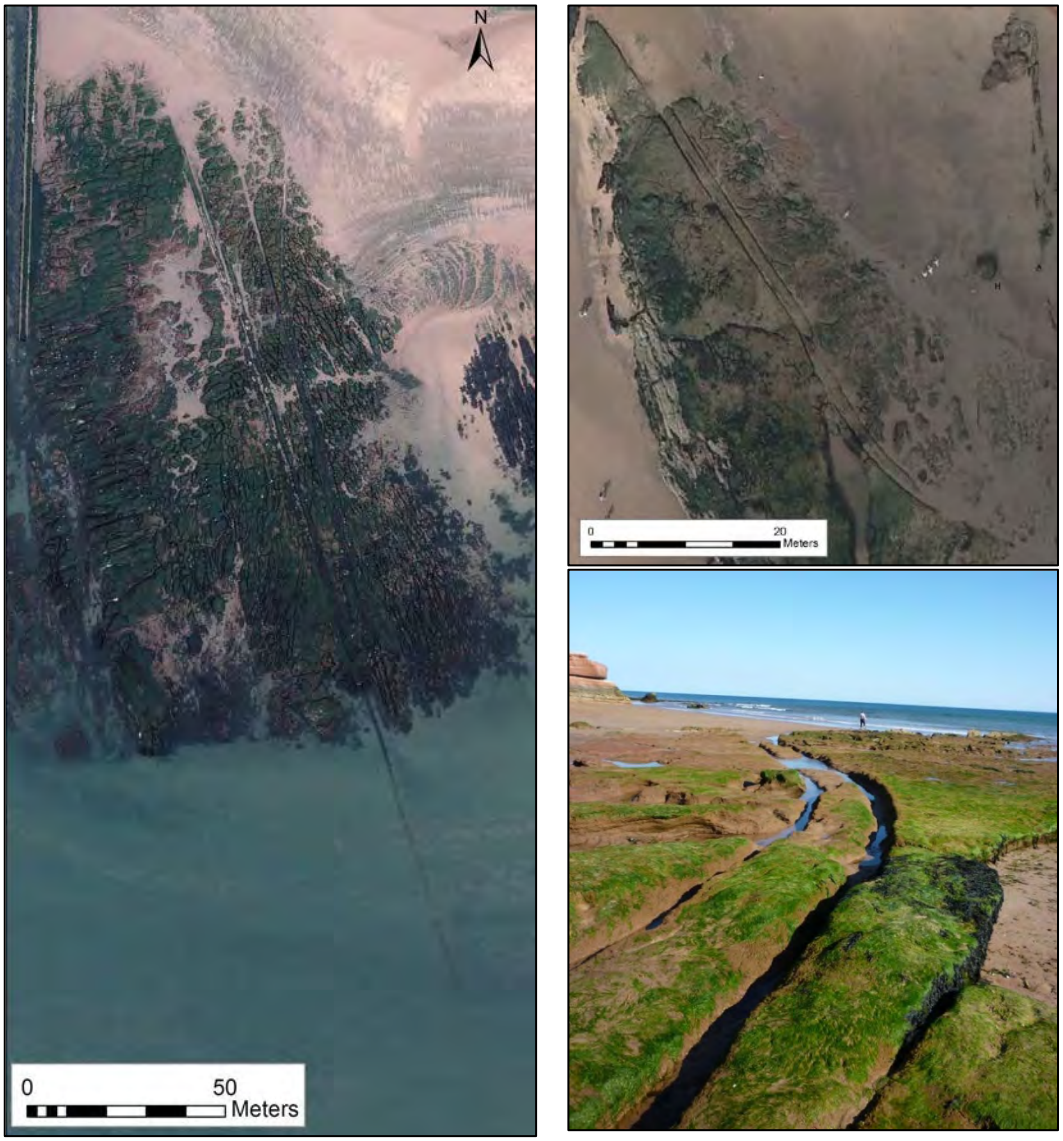


Figure 104: Rock cut cart tracks at Exmouth. Left: previously unrecorded rut ways at Maer Rocks. Right: previously recorded rut ways at Orcombe Rocks. Channel Coastal Observatory SY0179_20120917ortho.ecw 17-SEP-2012. Ground photograph: Stephen Reed.

7.6.2 Estuarine

A variery of estuarine intertidal features have been recorded during the survey and a sample is illustrated below.

Hulks and Wrecks

Intertidal structural remains near Axmouth Bridge, visible on aerial photographs taken by the Channel Coast Observatory in 2012 (Figure 105), could be the medieval carvel-built 'Axe boat' which was first reported to the HER in 2001 and has been archaeologically investigated in the years since its discovery (e.g. Adams and Brandon 2003). The bed of the Axe estuary in this location is only visible at low water, and many of the earlier available aerial photographs appear to have been taken when the tide was in and water levels high. The structure visible in 2012 is therefore only tentatively identified as the Axe boat, as it is possible that more than one hulk is present in this area.

Figure 105: Is this the medieval 'Axe boat'? (MDV105880). CCO SY2590_20120917ortho.ecw 17-SEP-2012. © Channel Coast Observatory.

The survey has identified a large number of hulks within the Exe Estuary, complementing recent survey work carried out by the Universities of Bristol and Plymouth (Read 2006) and work commissioned by English Heritage (Stephenson 2010).

Of particular note was a dense concentration of thirty-three hulks of late 19th to 20th century date recorded within a 400 metre stretch of intertidal mud flats along the western bank of the River Exe, at Topsham (MDV105599-105601; MDV105604-105612; MDV105614-22; MDV105625; MDV105627 and MDV105630-39). Of these, twelve hulks had been previously recorded during the surveys of 2006 and 2010 and although a number of additional hulks were identified on the ground, they could not be recorded at the time owing to their inaccessibility and the sensitive nature of the surrounding natural environment.

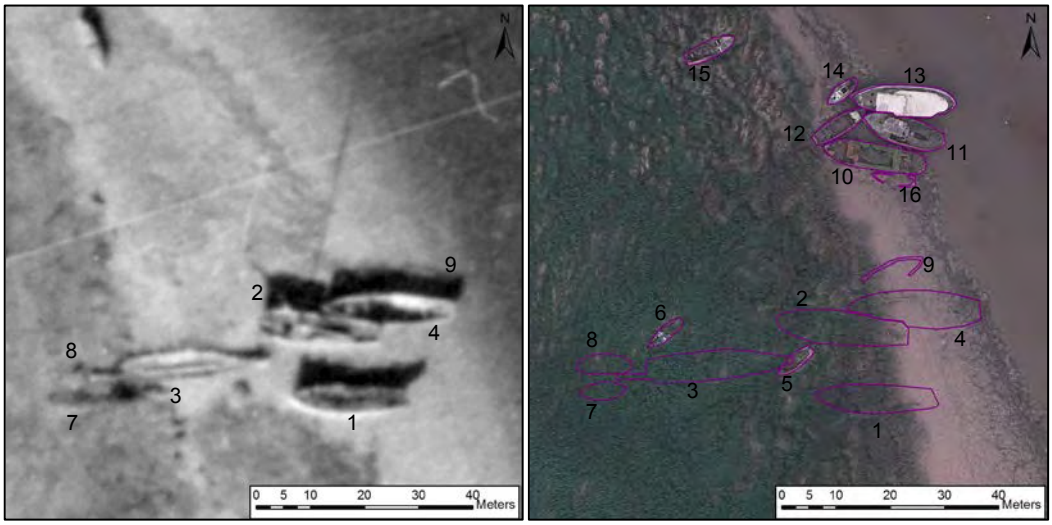
This area has been defined as constituting a 'ships graveyard' comparable to those in Hooe Lake in Plymouth and Tosnos Point close to Salcombe (Read 2006,12). A number of these hulks are first visible as largely complete structures on military aerial photographs of the 1940s (Figure 106) and appear to represent the remains of trawlers and barges of probable late 19th to early 20th century construction. These vessels were more specialised local craft, indicative of changes in the maritime and fisheries trade during this period (*ibid,* 2).

Deterioration of these hulks appears to be a fairly active process, particularly with the smaller craft, which seem to have been levelled through tidal erosion and covered with estuarine muds and marshland vegetation, or perhaps in some cases deliberately removed. The weathering and/or removal of many of these hulks within the latter half of the 20th century appears, however, to be matched by the abandonment of a range of more recent vessels which is testament to the continued commercial and recreational use of the estuary. A number of these more recent hulks remain visible in varying states of condition on digital images of 2012 (Figure 106).

The example of hulks MDV105608-12, MDV105614-22, MDV105625 and MDV105639 illustrates this well. Hulks MDV105608-11 and MDV105615-617 are first visible as abandoned structures on aerial photographs of 1941 and 1942, and all above ground remains appear to have been completely levelled or obscured by the 1950s and 1960s, with the exception of the two larger hulks (MDV105608 and MDV105611) which measure in excess of 20m in length.

The remaining nine hulks were recently abandoned, appearing as structures on aerial photographs of 1978 (MDV105614 and MDV105618) and on digital images of 1992 (MDV105639), 2002 (MDV105619 and MDV105625), 2006 (MDV105612 and MDV105620-21) and 2012 (MDV105622). These nine hulks all remain visible on digital images of 2012, although in varying states of condition.

Given the density of hulks recorded within this area and the dynamic intertidal environment of the Exe Estuary, it is highly likely that below ground remains of additional and as yet unrecorded former vessels lie preserved within the estuarine muds and/or obscured by the marshland vegetation.



RAF/CPE/1823 4011 04-NOV-1946. English Heritage RAF Photography.

NMP mapping © English Heritage. Channel Coastal Observatory SX9687_20120917ortho.ecw 17-SEP-2012.

1: MDV105608 **2: MDV105609** **3: MDV105610** **4: MDV105611** **5: MDV105612** **6: MDV105614** **7: MDV105615** **8: MDV105616** **9: MDV105617** **10: MDV105618** **11. MDV105619** **12. MDV105620** **13: MDV105621** **14: MDV105622** **15: MDV105625** **16: MDV105639**

Figure 106: Comparision of hulks recorded within the Exe Estuary in 1946 (left) and the same area on recent digital images of 2012 (right).

Fish Traps

Thirteen intertidal structures interpreted as possible fish traps or fish weirs have been recorded by the survey.

Previously unrecorded possible fish traps were identified along the Exe Estuary, within The Ridge and Powderham Sand in the central section of the estuary. These are partly visible, possibly eroded or levelled or obscured by estuarine sand and muds. The date of the structures is uncertain, though many probably have a post-medieval if not medieval origin.

Probable fish trap MDV105746 (Figure 107) is located along the western bank of the estuary at Powderham Sand and, at 147m length, represents one of the larger and more complete examples recorded. It is visible as a possible row of posts defining a flattened V-shaped structure broadly parallel to the shoreline with its point, or 'eye' to the south-east, facing into the estuary.

Recorded from aerial photographs of 1999 and 2012, it was not clearly visible on aerial photographs before this date.

This may in part be explained by the generally poorer resolution of earlier aerial photographs compared to more recent images, but also the estuarine dynamics of the Exe Estuary that caused it to be completely covered by mud for prolonged periods.

A survey carried out of fish traps of the Taw and Torridge estuaries has suggested that the Exe Estuary, as with other estuaries along the coast of South Devon, had good potential for fish traps (Preece 2005, 140). The possible examples recorded within the Exe Estuary would clearly benefit from similar such investigation.

Figure 107: Probable fish trap (MDV105746), with mussel beds visible as linear rows to the south. Channel Coastal Observatory SX9783_20120917ortho.ecw 17-SEP-2012.

The small number of intertidal structures visible in the South Hams rivers could be related to the flooding of these drowned valleys resulting from sea level rise and tilting of the British landmass to the south (Shennan *et al* 2009). The course of the channels at the mouth of both the Erme and Avon have altered since the late nineteenth century (and also see Blake *et al* 2007, 7 and Creak 1991, 251), and there is good potential for buried archaeological remains to be present in silted areas.

Several possible medieval or post-medieval intertidal structures were visible in the Erme Estuary on a single run of recent aerial photographs, in contrast to the Avon estuary where the only structures visible on the available aerial photographic resource were of Second World War date. This discrepancy is more likely a result of natural depositional and erosion processes than a genuine paucity of archaeological remains.

Next Perspectives PGA Imagery SX6147 22-MAY-2007. Aerial Photography: Licensed to English Heritage for PGA, through Next Perspectives ™.

NMP mapping © English Heritage. The base map is © Crown Copyright and database right 2014. Ordnance Survey 100019783.

Figure 108: Possible fishtrap structures in the Erme Estuary in 2007; note the looped structure top right (MDV104118).

Several of the possible intertidal structures are illustrated in Figure 108. An unusual looped, roughly U-shaped feature is visible on aerial photographs taken in 2007, with three possible posts along the curve, perhaps anchoring a structure. The feature is not visible on any earlier available aerial photographs including those taken in 2002 during very low river levels. It is therefore likely to be either newly created or, more probably, newly exposed by erosion in 2007. This possible structure is not depicted on historic mapping but its position corresponds with the convergence of two water channels that are depicted on the 1904-1906 Ordnance Survey maps and is consistent with an interpretation as a fish trap of post-medieval or modern date.

The layout has some similarities with fishtraps recorded along the coast of Brittany (Winton pers. comm.) and in the Severn Estuary (Crowther, Dickson and Truscoe 2008), the latter probably dating to the 16th to 19th century. Further archaeological investigation would be needed to help establish the survival, construction materials and likely date of the structures, which are not visible on aerial photographs dating to 2010 and may have been covered, or recovered, by

sand. Monitoring of this site for scouring that may expose further remains is recommended.

Crab Tiling and Aquaculture

Estuaries have also historically provided a rich environment for the exploitation of crustacea and molluscs. For instance, crab tiling is a popular activity that involves laying down artificial materials (traditionally roof tiles but now often plastic guttering) to provide a safe habitat under which shore crabs shelter whilst molting and hardening a new exoskeleton. When collected the crabs are sold or used as bait by anglers. Crab tiling is a traditional activity with some sites remaining in use for generations, but one that has recently increased in popularity. It is a highly visible activity, particularly along the Exe and Teign estuaries, and is managed by local bylaws and codes of conduct (http://www.ukmarinesac.org.uk/activities/bait-collection/bc13.htm; https://www.exe-estuary.org/crab_tile_survey). Although locally significant, crab tiling is monitoring by bodies such as the Exe Extuary Partnership, and evidence of crab tiling activity has not been recorded by the survey.

Other possible evidence of aquaculture has been recorded. Approximately 14m apart, two parallel rows of low upright posts up to approximately 258m long are visible in the intertidal mudflats across the mouth of Batson Creek from Snapes Point to Salcombe (Figure 109). Individual posts are probably masked by an accumulation of sand, mud and or vegetation. This previously unrecorded structure (MDV103925) does not appear to have been constructed to prevent access to Batson Creek and is therefore unlikely to form part of Second World War anti-invasion defences. Instead it appears to terminate at a na vigable channel and has been tentatively interpreted as the possible remains of an oyster rack of probable post-medieval to modern date.

Figure 109: Possible oyster racks (MDV103925) across Batson Creek, Salcombe. NMR 1457/251 01-MAR-1979. © Crown copyright. EH.

Navigation Posts

A complex of previously unrecorded navigation posts within the Kingsbridge Estuary is visible as slight structures on aerial photographs of 1942. The posts are typically arranged into parallel rows positioned either side of Mean Low Water and define navigable channels within three broad areas of the estuary, including Southpool Creek (MDV103937), Frogmore Creek (MDV103944) and between Curlew Point and Tosnos Point within the main estuary channel (MDV103952). In total, these navigation posts define in excess of 3.8km of navigable water along the estuary (Figure 110).

The posts are likely to be of 19th to 20th century date but evidence of phasing, in the form of successive rows of possibly superseded posts, might support the interpretation that some are earlier in date.

Although visible on military aerial photographs of 1942, they were clearly redundant features by this point, and had evidently been so for quite some time. Their marked absence on aerial photographs after this date is noticeable. It seems probable that the buried structures are more extensive than has been recorded as part of this survey and that survival is potentially good. Remains of several possible posts (MDV103952) are visible on digital images of 2002, although this was difficult to establish with any certainty.

Estuarine Causeway

The remains of a possible causeway were identified, providing access to an estuarine island or eyot from the south bank of the River Avon south of Aveton Gifford. The small island is depicted as rough ground on the First Edition OS map and annotated as 'Saltings' on the Second Edition OS map, supporting the interpretation that the island has been a stable intertidal feature for some time. Few early aerial photographs of this location were available to the survey, but a slight earthwork bank is discernible in this location on images of 1946 and it is clearly visible as a partially eroded earthwork on digital images of 2012 (Figure 111).

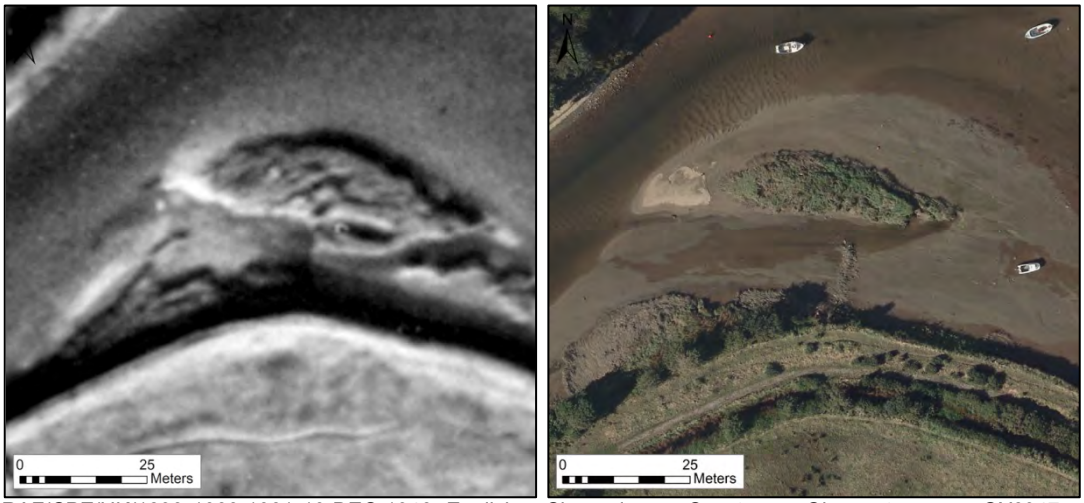
The relict earthwork appears to abut the flood defences enclosing South Efford Marsh, which was reclaimed for pasture in the late 18th century, and it is likely that the causeway post-dates this.

RAF/FNO/29 6052 30-JUN-1942. English Heritage RAF Photography.

RAF/FNO/29 6045 30-JUN-1942. English Heritage RAF Photography.

RAF/FNO/29 6046 30 -JUN-1942. English Heritage RAF Photography.

Figure 110: Navigation posts along Southpool Creek (MDV103937, top left); Frogmore Creek (MDV103944, top right) and between Curlew Point and Tosnos Point within the main estuary channel (MDV103952, bottom).



RAF/CPE/UK/1890 1060-1061 10-DEC-1946. English Heritage RAF Photography.

Channel Coast Observatory SX6947 20120918ortho.ecw 17-SEP-2012

Figure 111: A possible causeway in the River Avon.

Industrial Intertidal Activity

The Hackney Canal (MDV9197) was built for Lord Clifford by his agent Henry Knight between 1841 and 1843 to eliminate the need to transport clay by packhorse from his clay pits near Chudleigh and Kingsteignton to warehouses at Hackney Quay on the River Teign. Commercial use ceased in 1928 although it remained navigable into the 1950s. Much of the canal has been filled and obscured by an extension of Newton Abbot Racecourse, whilst the site of the basin and clay cellars, west of the survey area, has been redeveloped (Pye 1991).

As such, very little evidence of the canal itself was recorded during the survey, but to the east of the canal lock in Hackney Channel, several lengths of intertidal structure have been recorded which are potentially associated with the canal (Figure 112).

A fragmentary linear feature was visible in the intertidal zone of the River Teign following the southern edge of the Hackney Channel (MDV105129). The feature is visible as a probable post-built structure corresponding with a breakwater depicted on maps from the First Edition OS onwards, probably intended to regulate the river as it approached the canal lock connecting the River Teign to the Hackney Canal.

A second feature (MDV105121) visible as a similar probable post-built structure followed the edge of the former deep water channel of the Newton Channel at the point the river diverged from the Hackney Channel to the north, as depicted on the First Edition OS map. The structures are probably the remains of further timber revetments along the main deepwater river channel, contemporary with the canal.

A third linear structure (MDV105116) was visible further to the east as a fragmentary structure over 900 m in length, defining the northern edge of the former deep water channel of the River Teign. A shorter length defined a section of the southern edge of the channel. The structures were probably intended to regulate the approach to the canal lock.

The range of aerial imagery on which these structures remain visible indicate good potential for preservation of the timbers along and within the watercourse, and indicate a rare survival of structural evidence associated with 19th century industry on the River Teign. However, the river has changed course to cross the path of the structures, components of which might be at risk from erosion.

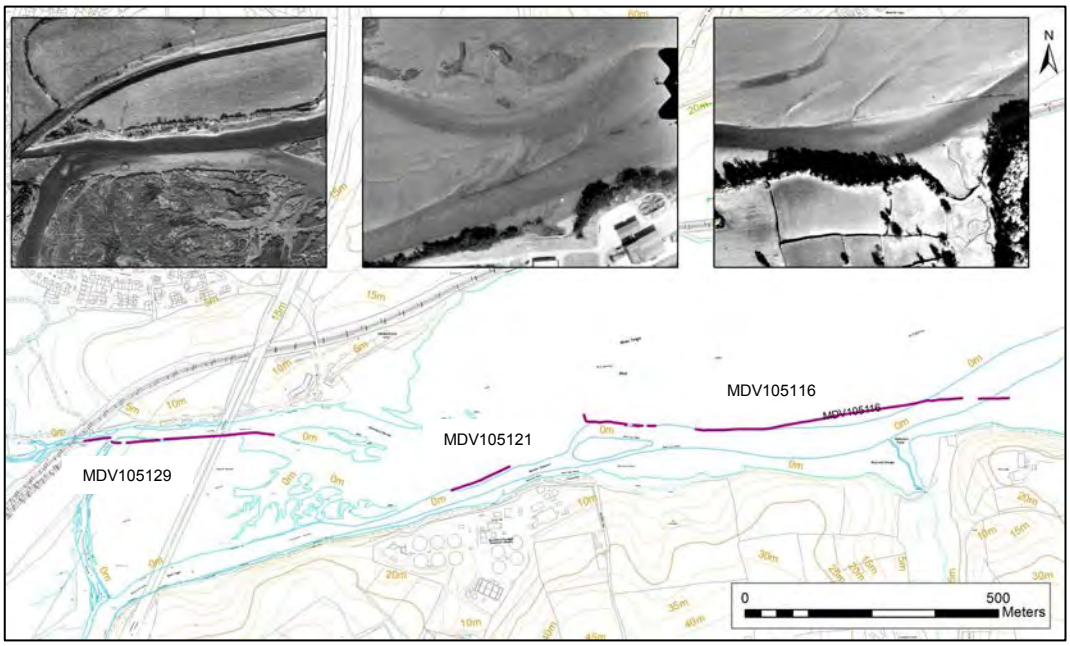


Figure 112: Intertidal structures in the River Teign, probably associated with the Hackney Canal. RAF/CPE/UK1824 4148-4149 04-NOV-1946. English Heritage RAF Photography. OS/77071 006-007 3-JUL-1977. ©Crown Copyright. Ordnance Survey.OS/86246 1053-1054 15-OCT-1986. ©Crown Copyright. Ordnance Survey.

7.7 Thematic Results: Recreational

A small number of features of recreational character were identified as a minor theme. A high proportion was non-archaeological in nature and was often not recorded as part of the survey. However, some could potentially be mistaken for archaeological features. As such an archaeological and non-archaeological example is illustrated below.

Garden Features at Torre Abbey

Dark cropmarks in grass visible on aerial photographs taken in 1947 may have formed over historic garden features at Torre Abbey (Figure 113). The clearer marks include several circles, a crescent and a five pointed star, and indistinct marks to the south-west appear to mirror the pattern. These could have been former planting beds around the oval pond, intended to be viewed from the rooms at the rear of the house. Some marks persisted for several years, and the star is still visible on aerial photographs taken in 1949, confirming that at least some were therefore probably caused by buried features. No such features are visible on later available aerial photographs, and part of the area has since been surfaced, but some remains could survive.

Jousting at Powderham Castle

A number of potentially deceptive non-archaeological features were observed on recent aerial photographs and digital images across Powderham Estate. Whilst caution was naturally exercised given the nature of the historic parkland setting and the high density of prehistoric cropmarks recorded within the area, these features were demonstrably of more recent origin.

Powderham Castle is host to a wide variety of events and corporate functions throughout the year, including outdoor concerts, car shows, charity runs and food festivals, all of which leave their mark on the landscape, typically as areas of flattened grass and parchmarks. Figure 114 shows one such example of a medieval jousting event in June 2004 on grounds to the south of the castle, with a notable and potentially deceptive circular ring of flattened grass, possibly caused by a tethered horse, whilst images of June 2006 show the areas of parching caused by this event. A circular mark of uncertain function but attributed to a similar such event is visible further to the east, with trackways likely caused by use as a car park.

Figure 113: Possible garden features at Torre Abbey (SX 9074 6383). AFL 60005/EAWO11841 07-OCT-1947. English Heritage, Aerofilms.

NMR 23474/29 02-JUN-2004.© English Heritage

Next Perspectives PGA Tile Ref: SX9683 17-JUN-2006. Aerial Photography: Lincensed to English Heritage for PGA, through Next Perspectives™.

Devon County Council Get Mapping 121/99 299 24-JUL-1999.© Getmapping Plc.

Figure 114: Jousting event at Powderham of 2004, showing circular ring mark (top), with areas of flattened grass after the same, but later event of 2006 (bottom left) and circular mark and tracks caused from use as a car park (bottom right).

7.8 Thematic Results: Industrial

Quarries and Extractive Pits

Over 180 records for extractive features were created or amended by the survey, including quarries, extractive pits or spoil heaps interpreted as associated with prospection activity. Of these, fewer than 7% were previously recorded on the DCC HER.

Evidence for quarrying was transcribed and recorded as a matter of course only for those features not depicted on the First Edition OS map. Exceptions were made when extractive features were depicted on historic maps but not annotated, when the features differed notably from those depicted, or when they were recorded as part of an exceptional group.

Based on contextual associations, for instance relationships with adjacent field boundaries or routes, a small number of those quarries recorded (circa 8%) are interpreted as being potentially of medieval date. The majority were recorded as being of probable post-medieval to modern date. The majority of the extractive features recorded were relatively small-scale earthwork pits, with over 92% measuring less than 0.5 hectares in area. A small number of exceptionally large sites were also recorded and are discussed below.

Extractive sites are distributed at a low density across much of the survey area, with notable concentrations to the east of the survey area (Figure 115). For the majority of the smaller extractive sites no direct correlation with underlying geological conditions, current or historic land use or landscape character has been recognised beyond a strong association with agricultural land, and it is probable the pits were dug for a variety of functions (Table 4).

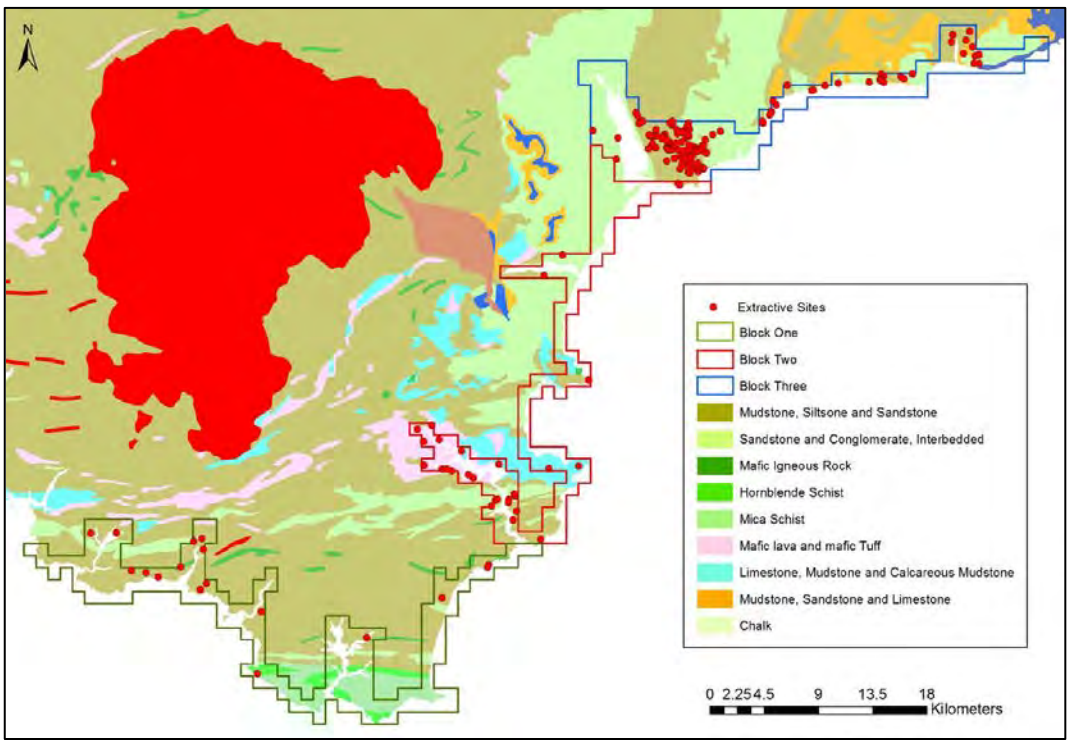


Figure 115: The distribution of all extractive site related HER monuments created or amended by the survey displayed over bedrock geology, © NERC.

Block	Sub-Block	No. Extractive sites	Geological Period	Dominant Geology/Lithology	Dominant Landscape Character
1	A	2	Lower/middle Devonian	Sandstone/ Mudstone, Siltstone and Sanstone	Agricultural
	B	9	Lower Devonian	Mudstone, Siltstone and Sanstone	Agricultural
	C	2	Devonian	Mica Schist, Mudstone, Siltstone and Sanstone	Agricultural / Rough Ground
	D	1	Devonian	Mica Schist, Mudstone, Siltstone and Sanstone	Agricultural / Modern Settlement
	E	3	Lower Devonian	Mudstone, Siltstone and Sanstone	Agricultural / Coastal cliff and beach
2	F	21	Devonian/Lower Devonian	Mudstone, Siltstone and Sanstone / Mafic Lava and Tuff	Agricultural / Coastal cliff and beach / Modern Settlement / Woodland
	G	2	Devonian/Permian	Limestone, mudstone/ Limestone, Sandstone and conglomerate	Historic and Modern Settlement / Recreation / Coastal cliff and beach / parkland
	H	5	Permian	Sandstone and conglomerate	Historic and Modern Settlement / Recreation / Coastal cliff and beach / parkland
	M	0	Permian	Sandstone and conglomerate	Agricultural / Modern Settlement
3	J	19	Permian	Sandstone and conglomerate	Agricultural / Historic and Modern Settlement / Estuarine mud / Parkland
	K	27	Triassic/ Cenomanian	Sandstone and conglomerate/ Chalk	Agricultural / Historic and Modern Settlement / Coastal cliff
	L	10	Triassic/Cretaceous/ Cenomanian	Mudstone, Siltstone and Sanstone / Chalk	Agricultural / Modern Settlement / Leisure / Coastal cliff
	N	80	Triassic	Sandstone and conglomerate	Agricultural / Woodland / historic and Modern Settlement
	Total	181			

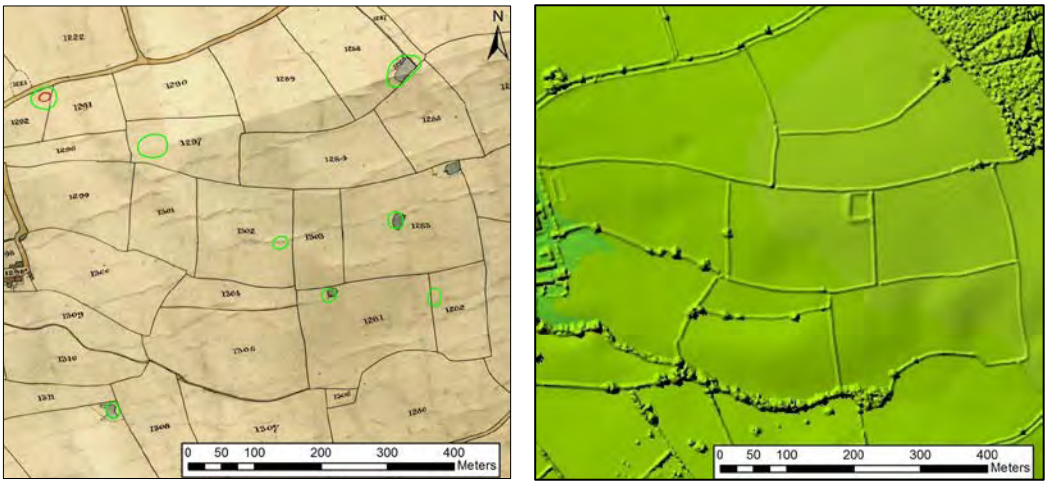
Table 4: Extractive sites and their correspondence with underlying geology and landscape character.

7.8.1 Small-Scale Extraction

Exmouth

An abundance of relatively small extractive pits and quarries were recorded on the easten side of Exmouth, although they were in general only recorded if they were not depicted on the First Edition OS map. These small sub-circular and oval shaped earthwork pits are typically located alongside hedge lines or at the apex of two converging field boundaries and remain a feature in the modern landscape as wooded areas and or ponds.

The dominance of these small-scale industrial features implies a fairly short-lived lifespan, in which pits were sporadically used for extraction of stone or clay for local industries. A significant proportion of these extraction pits had clearly passed out of use by the time of the parish Tithe map and instead are symbolised as ponds (Figure 116), indicating that that they are at least of 19th century date. However a number, for example those which appear to pre-date field boundaries, may have a potential medieval date.



NMP mapping © English Heritage. Tithe map interactive digital layer, Devon County Council.

LIDAR SY08SW DSM Environment Agency 1998-2012. © Environment Agency copyright 2014. All rights reserved.

Figure 116: Extraction pits at Woodlands Farm, symbolised on the parish Tithe map (left) and visible as earthwork pits on lidar DSM images (right).

Chalk and Flint Extraction

Further evidence of piecemeal extraction was recorded in the east of the project area, where numerous pits were visible as earthworks and cropmarks on the chalky coastal plateau above Dowlands Cliffs (Figure 117).

Many had been depicted on the historic mapping and in some cases marked as 'Old Chalk Pits' or 'Old Flint Pits' but a considerable number had not, and the latter are likely to predate the pits recorded on the late nineteenth century mapping. Long term, small-scale extraction of chalk and flint appears to have continued up until the twentieth century, with some quarries being opened after the 1940s.

Eight newly identified earthwork mounds on the slopes of Linscombe, south-east of Salcombe Regis (MDV105953; Figure 118) were recorded as possible spoil heaps, potentially evidence of prospection or extraction. Six of the earthwork mounds roughly follow the 145 and 150 metre contours along the combe with two additional, slightly smaller mounds visible further upslope.

Large-scale quarrying is known in this area; substantial old chalk and greensand quarries (MDV10918, MDV20418) are located to the east of the combe at Dunscombe, some of which are medieval in origin and are one of the sources for building material for Exeter Cathedral. A field visit in May 2014 found the mounds to be upstanding with burrowing damage evident on at least two of the earthworks revealing a flint and chalk rubble composition. Slight scoops visible on the downslope edge of the pits might support the interpretation that the mounds are evidence of a phase of prospection, possibly expansion associated with the previously recorded quarries to the east.

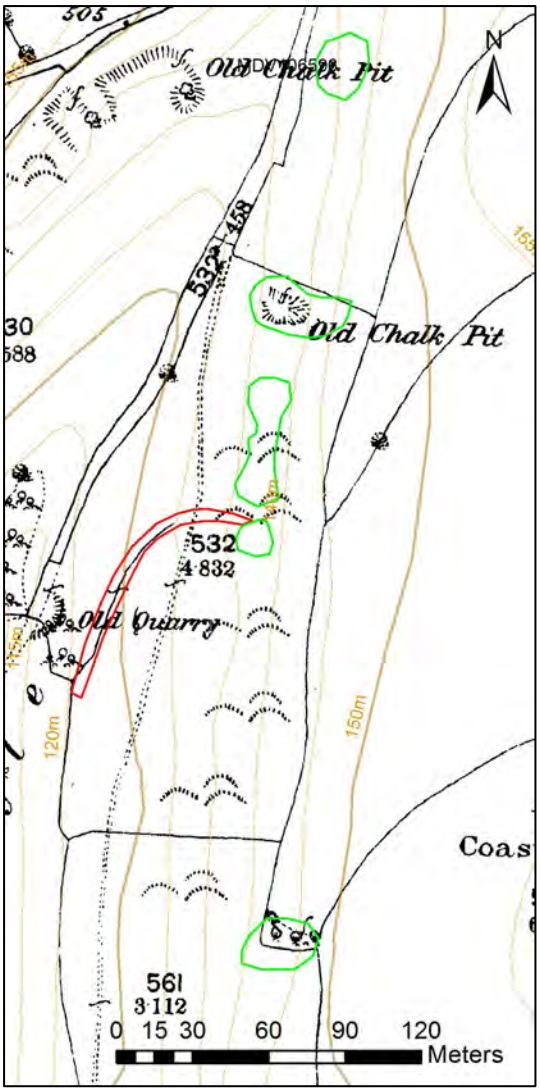


Figure 117: Old Chalk Pits near Charton Goyle depicted on t he late nineteenth century mapping, with additional extraction pits recorded during the survey (MDV106596). NMP mapping © English Heritage. 1880s-1890s 25 I nch First Edition Ordnance Survey mapping © Crown copyright and Landmark Information Group Ltd. Height Data: Licensed to English Heritage for PGA, through Next Perspectives™.

CUCAP TB34 12-JUN-1956. © Cambridge University Collection of Aerial Photography.

LIDAR SY1588 Environment Agency D0075779 Nov 2006 - Mar 2007. © Environment Agency copyright 2014. All rights reserved.

Photograph. Cain Hegarty, May 2014.

Figure 118. Spoil heaps at Lincombe, possible evidence for chalk or flint extraction.

7.8.2 Large-Scale Extraction: Pre-Twentieth Century

In contrast, evidence of very extensive historic quarries has been recorded in the east of Block 3.

Arguably comparable to parts of the historic mines at Beer, beyond the survey area to the north (MDV11100), and to the large cliff quarries recorded by the recent Dorset Coast RCZAS NMP survey to the east (Royall 2014, 61), the quarries were probably excavated for limestone for building materials.

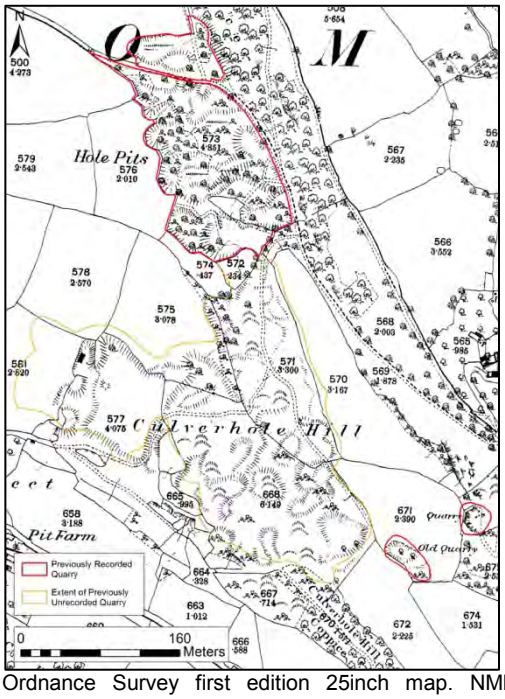
The record for these quarries within the survey area was not consistent. Some were recorded on the DCC HER whilst significant neighbouring quarry earthworks were unrecorded.

The lidar data available to the NMP survey was often used to add detail to, or expand the known extent of the earthworks. However, as many are depicted on the First Edition OS map the earthworks of the quarries have not been transcribed in detail. Therefore any such extensive quarries visible within the

survey area have been recorded by the survey, but with minimal transcription to depict the extent of the works (Figure 119).

Although recorded as potentially medieval in date, it is possible these earthworks have a significantly earlier origin.

LIDAR SY18NE DTM Environment Agency 1998-2012. © Environment Agency copyright 2014. All rights reserved.NMP mapping © English Heritage



Ordnance Survey first edition 25inch map. NMP mapping © English Heritage.

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Figure 119: The extent of a previously unrecorded southern extension of Hole Pits quarry (MDV72658) is visible on lidar at Culverhole Hill (MDV106101).

7.8.3 Large-Scale Extraction: Twentieth Century

Torbay

The progress of quarrying on a large-scale at Berry Head can be documented on the aerial photographs which show a significant part of Fort Number 3, scheduled since 1950, being actively quarried away during the mid-20th century (Figure 120). The quarry does not appear to have increased greatly in extent between 1941 and 1946, suggesting that extraction here was not a high priority during the Second World War. In the post-war period up until the 1960s an area to the west (not illustrated here) and the northern part of the fort itself was excavated, resulting in the removal of a substantial area of the headland including structural remains, as well as possibly evidence of prehistoric activity.

a. RAF CPE/UK1890 3209 10-DEC-1946. English Heritage RAF Photography.

b. NMR SX9456/32 RAF 30092/SO-0135 15-AUG-1947.

c. NMR SX9456/39 RAF 30137/PSFO-P2-0034 27-AUG-1958.

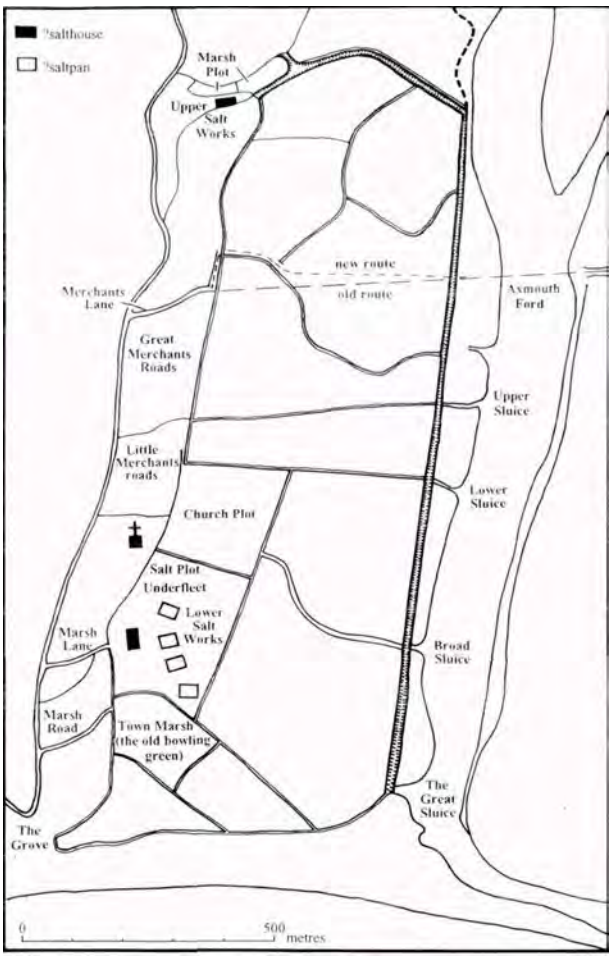
Figure 120: Quarrying at Berry Head Fort Number 3 (SX 9445 5654); south to top.

7.8.4 Salt Working

Salt working is documented at Seaton from the twelfth century and 'indicated in the Domesday book' (Parkinson 1985, 39); therefore a site may already have been established at the edge of the marsh in the early medieval period. However no salt manufacture is then recorded until 1704, and two salthouses and four pans were included in an advertisement dating to 1733 (Parkinson *ibid*.). Upper Salt Works some 800 m to the north was recorded in 1733 and out of use by 1756 (Turton and Weddell 1993, 8). Lower Salt Works were in need of repair in 1734, and their broad location is indicated by the field name 'Salt Plot' on the 1840 Tithe map, near the mouth of the estuary. A sketch made by Stukeley in 1723 appears to show four rectangular pans in the latter area (labelled B on

Figure 122), although their locations may be schematic, and buildings and pans have been roughly plotted by Parkinson (Figure 121).

Although earthworks were recorded in the general area of the Upper Salt Works during the survey, they did not take a particularly diagnostic form. However in the lower area a number of earthwork mounds are clearly visible on aerial photographs taken between 1946 and 2012 (Figure 123). Although they do not all fit into the plan as plotted by Parkinson, the mounds are broadly similar in appearance to salterns visible on aerial photographs in other parts of the country, for example Lincolnshire (Went 2011, 4).



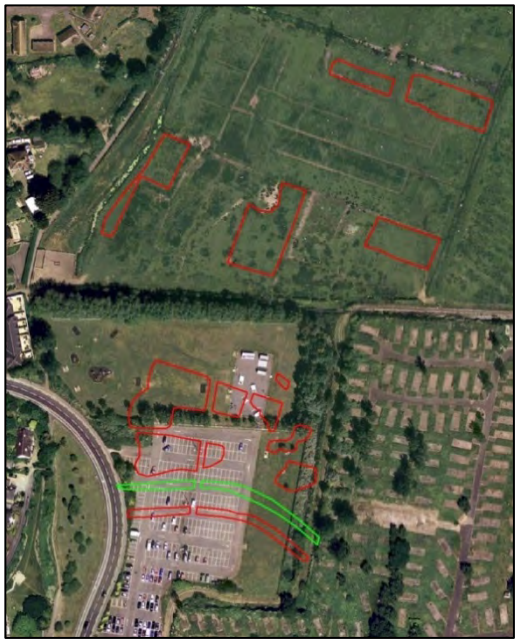
Earthworks have been noted, but not mapped, on Seaton Marshes during archaeological investigations (Turton and Weddell 1993, 8), and an interpretation as post-medieval salterns seems credible. This survey has allowed a more accurate record of the extent and exact location of these features to be made, including a complex of earthworks to the south in an area that has since been developed. Also recorded was a substantial curvilinear ditch with an embankment on its southern side, which may have been related to reclamation and/or saltmaking activity.

Figure 121: Seaton Marshes in the post-medieval period, reproduced from Turton and Weddell 1993, after Parkinson 1985.

Figure 122: Seaton Marshes as sketched by Stukeley in 1723; note the four rectangular features labelled B and the tower on the circular mound labelled C. Reproduced from Turton and Weddell 1993.

Some of the earthworks appear to have been cut by later drainage ditches, although later development means this is cannot be confirmed, and the land is recorded as having been comprehensively drained in the mid-19th century, with 'Salt Plot... completely reshaped' (Parkinson *op. cit.* 52-53). This was one of many phases of land improvement for the benefit of agriculture at Seaton Marshes, following the extension of the shingle bar across the estuary mouth by the mid-15th century and subsequent reclamation in the sixteenth century. The narrow parallel furrows associated with the drainage system are clearly visible on the right of both images in Figure 123, and Figure 86 demonstrates their extent. Establishment of the drain ditches across the marsh could well have resulted in the regularisation and straightening of the sides of many of the mounds.

NMR RAF/58/5607 F21 343 22-JAN-1963. English Heritage RAF Photography.



Next Perspectives PGA Imagery SY2490 17-JUN-2006. NMP mapping © English Heritage. Aerial Photography: Licensed to English Heritage for PGA, through Next Perspectives ™.

Figure 123: Possible saltern mounds at 'Salt Plot' on Seaton Marshes (MDV51123) under snow cover in 1963 (left) and partly developed in 2006 (right). The post-war part of the former Warner's holiday camp is visible on the bottom right of the images (MDV53277).

All of the earthworks in the southernmost area of the Lower Salt Works were probably levelled or covered over between 1971 and 1996 when the land was developed, but the five mounds to the north of the drain are clearly visible on images derived from lidar data captured in 2006. These survived to be visible as clearly defined earthworks when viewed on a site visit in May 2014 (Figure 124), and archaeological investigation may help to clarify their date and confirm their function. There is potential for the subtle or below-ground remains of similar sites to survive in other parts of the marshes; a systematic field survey with targeted evaluation trenching could help to define the extent of salt working activity.

Figure 124: Survival of probable saltern mounds on S eaton Marshes. Top: the southernmost surviving mounds of MDV51123 (right of the frame, partly defined by rushes, looking east). Middle: the low mound visible in the centre left of the frame is one of the northernmost mounds of MDV51223 (SX2489490443, looking north-east). Bottom: an area approximately 1 km to the north has recently been landscaped to create wetland habitat; two possible mounds were recorded here (MDV106955), but these were less well defined and little is now likely to remain. Photographs: Stephanie Knight, May 2014.

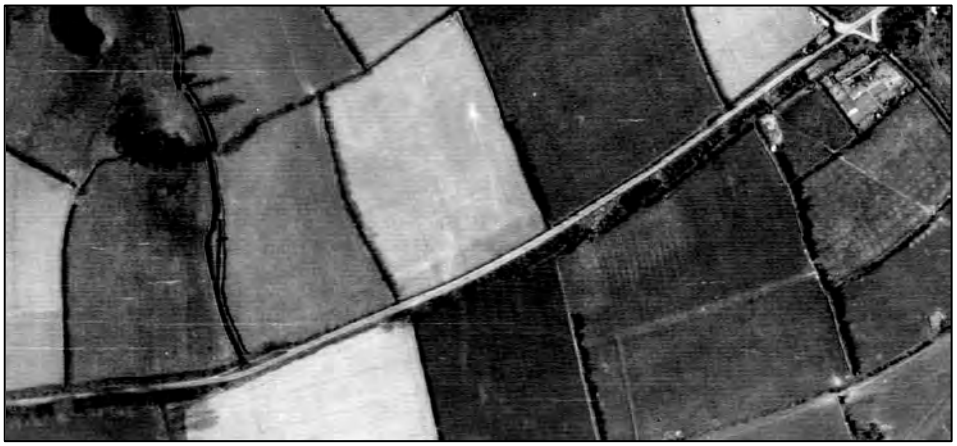
Figure 125: The distinctive landscape of the saltmarsh at Seaton continues to play a prominent role in local heritage and identity. Photograph: Stephanie Knight, May 2014.

7.9 Thematic Results: Transport and Communications

A linear cropmark or soilmark alongside the A3052 south-west of Ware Cross appears to have formed over the remains of an earlier route used before the road shifted slightly to the south and its present alignment (Figure 126). The cropmark partly coincides with a field boundary depicted on the Tithe map and the most straightforward interpretation is that the dark linear is a holloway, flanked by an earthwork bank now showing as a pale linear on the northern side, which became impassable at some point prompting a diversion to the south.

However, images derived from lidar data captured between 1998 and 2007 appear to show a very slight linear earthwork bank along the line of the darker cropmark, indicating that this may in fact have been a raised routeway rather than a holloway. On a site visit in May 2014 the ground was found to be stony and slightly raised; more so than would be expected from using a bank to infill a hollow way.

It is tempting to take this as possible support for an interpretation as a Roman road in this location, as proposed by Margary (1973), but further archaeological investigation is required to help clarify the date and character of this feature.



RAF/106G/UK/1412 RP 3348-3349 13-APR-1946

Photograph: Stephanie Knight, May 2014. Looking east.

Photograph: Stephanie Knight, May 2014. Looking west.

Figure 126: A former routeway along the A3052 at Pinhay Hollow is visible as a linear cropmark bank and ditch on the top two photographs (MDV106640). The ground here is stony and slightly raised (bottom two photographs): could this be the route of a Roman Road?

7.10 Thematic Results: Coastal Trends

During the project severe storms demonstrated the vulnerability of the South Devon coastline, for example at Dawlish where the collapse of the seawall and trainline made national news (Figure 5). This has parallels with earlier extreme weather events, such as a breach in the sea defences at Sidmouth, recorded by aerial photography in June 1925 and discussed in Parliament earlier that year (Hansard 1925).

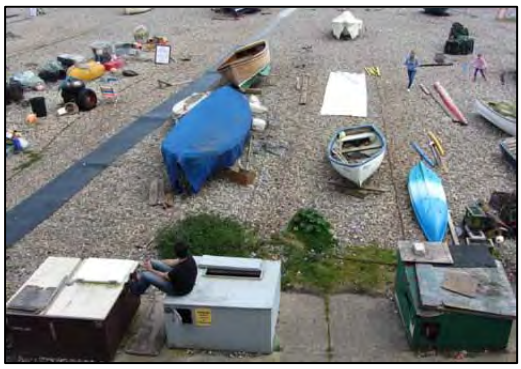
Figure 127: Breached sea wall at Sidmouth. AFL EPW013501 June 1925. © English Heritage (Aerofilms).

Figure 128: A wall eroding out of the shoreline at Slapton after storms early in 2014, with a depth of overburden above is probably part of the remains of the Royal Sands Hotel, accidentally destroyed as a consequence of Secone World War training activity (see Section 7.2.5); the war memorial is also visible. Photograph: Stephanie Knight, February 2014.

However erosion of some parts of the coast also revealed numerous archaeological sites. Within the project area this included submerged forest/peat deposits and an Iron Age-Romano-British site at Challaborough, peat beds at Thurlestone Sands, remains of a Victorian artillery redoubt at Exmouth Beach and part of an industrial complex at Branscombe.

No evidence of these sites had been recorded on the available aerial photographs, due to the depth of overlying sand or sand dune and vegetation cover (Figure 129).

Figure 129: Challaborough Beach in January 2014. Peat deposits are visible in the foreground, and the Iron Age - Romano-British site was exposed after erosion of the beach back, behind the two diggers at the base of the dunes. Photograph: Bill Horner.



Top: Photograph: Stephanie Knight, May 2014.
Left: AFL 60229/EPW013484 JUN-1925. © English Heritage, Aerofilms.

Figure 130: Cross-shaped structures apparently used to secure or winch boats at Beer in 1928 (left, looking landward) and boxed winches in 2014 (right, looking seaward).

The photographic resource also charts developing trends in coastal industries. At Beer, for example, the spectacle of fishing boats lined up on the beach appears relatively unchanged between 1928 and 2014, but the cross shaped structures at the head of the beach, possibly capstans, have been replaced by encased winches (Figure 130). These temporary structures were not mapped during the survey, in line with NMP methodology, but demonstrate the potential of the resource for illustrating change in social history.

7.11 Extended Case Study: Torbay

7.11.1 Methodological Issues

Survey of the Torbay section of the project was hindered by several logistical issues. The need to cross-reference Torbay HER textual and spatial data as well as that held in the Devon HER and the EHA limited progress, as did the need to create new Torbay records for all features recorded, rather than simply amending pre-existing records. Potential for repetition was increased by only having access to old Torbay HER datasets, the most recent dating to 2010, which will also have impeded the accuracy of interpretation of some sites.

The Torbay monument records will be renumbered when accessioned into the Torbay HER at the end of Phase 2. It would therefore potentially be misleading to use the current unique identifiers in this report. Instead, a grid reference is used to identify all Torbay monuments recorded as part of the project.

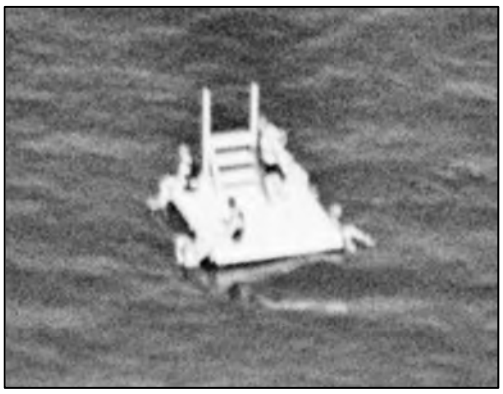
The poor reproduction quality of some of the scanned early aerial photographs affected our ability to check whether features visible on later APs were present during the early 1940s, and it is possible that some Second World War structures may have been missed or incompletely recorded for this reason.

7.11.2 Historical Interest

The aerial photographic resource for Torbay includes numerous images of historical interest, but which do not fall within the remit of this project. Very little of the area has not been landscaped or developed for recreation; flower beds, parks and golf courses dominate large parts of the immediate coastal hinterland. The area is characterised by change and development during the twentieth century; frequent redevelopment of individual sites can be seen and updating and expansion of visitor facilities is commonplace (Figure 131-135). Temporary activity superficially alters the landscape with the seasons (Figure 136).

Figure 131: Beacon Cove and part of Torquay harbour in 1928 (SX 9191 6307). The large building in the foreground is the Marine Spa advertising 'Medical Turkish and Swimming Baths' just below the roofline. Two curved roofed buildings can be seen behind the Spa (centre left); other contemporary aerial photographs show these to be

part of the infrastructure for 'Coast Liner Steamers' which presumably used the quay before the construction of the embarkation hards in the Second World War. Note the floating platform in the sea in the foreground. AFL 60516/EPW023716 SEP-1928. © English Heritage (Aerofilms).



AFL 60516/EPW023716 SEP-1928. © English Heritage (Aerofilms).

NMR 23556/14 02-JUN-2004. © English Heritage.

Figure 132: A diding platform off Beacon Cove, a bay designated for ladies-only bathing according to the early twentieth century OS maps, is visible in 1928 (left). A similar platform was visible on aerial photographs taken in 1958, but by the late twentieth century this type of structure had been superseded by larger, more permanent attractions such as the water park at Goodrington (right).

OS/87109 V 032-033 16-AUG-1987. © Crown copyright. Ordnance Survey.

NMR 21780/13 16-AUG-2002. © English Heritage.

Figure 133: The Marine Spa site in later years: the hexagonal cellular layout of the short-lived Coral Island venue is visible on aerial photographs taken in 1987 (left); subsequent redevelopment for the current 'Living Coasts' attraction and commercial units is captured on photographs from 2002 (right).

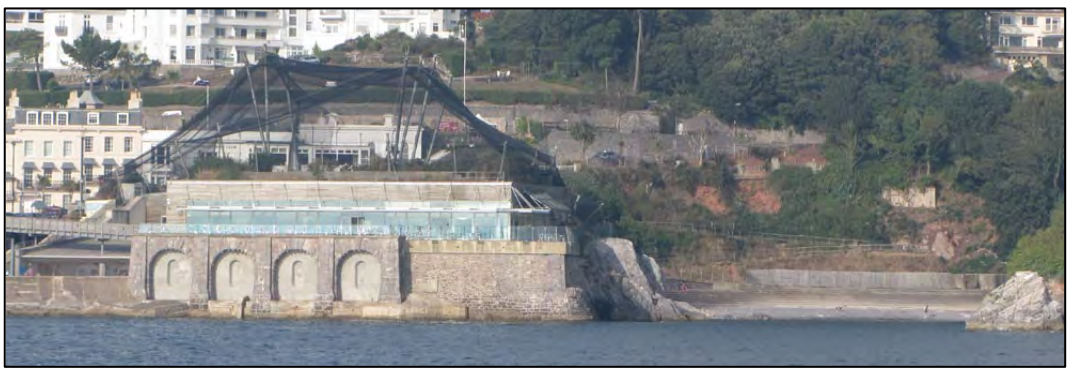


Figure 134: Living Coasts in September 2013, with a good view of the walled-up arches of the former Marine Spa. Photograph: Stephanie Knight.

AFL 60516/EPW023732 SEP-1928. © Crown copyright. EH.

HAW 9394/21 22-JUL-1959. © English Heritage (Harold Wingham Collection).

DCC DAP/P6 23-JUN-1984. Devon County Council Devon Aerial Photograph.

Figure 135: The changing shape of Torquay seafront (SX 9160 6348). In 1928 an arch marked the entrance to Princess Pier and the pitched roof of a bandstand structure is clearly visible on the far right of the top image. The bandstand was removed soon after 1959, and Princess Theatre was constructed nearby. The layout of the seafront was remodelled between 1928 and the 1940s, with the construction of a distinctive semi-circular 'rotunda' and the streamlining of the seawall at the landward end of Princess Pier. The concert hall at the seaward end of the pier (left of the central image) burnt down in 1974.

RAF/58/3190 F21 0078 31-AUG-1959. English Heritage RAF Photography.

NMR 26223/11 21-APR-2009. © English Heritage.

Figure 136: Temporary activity has left its mark on the heavily landscaped seafront areas of Paignton (top) and Torquay (bottom). Parch marks from temporary events such as summer fairgrounds are visible in many of the aerial photographs, including these taken in 1959 and 2009. The flowerbeds, parks and sporting facilities of tennis courts, bowls green, cricket pitch and golf course that have shaped the landscape give the area a municipal character. Torre Abbey in the top right of the lower image is visually dominated by the more recent English Riviera Centre in the foreground. The short-lived 'High Flyer' balloon is visible in the same photograph; although now removed, the fixings are visible on more recent aerial photographs and superficially mimic a Second World War barrage balloon site.

Very little newly recorded rural archaeology was identified in the Torbay area during the survey; remains of individual relict field boundaries, including lynchets of possible medieval date, and a single water meadow provide glimpses of pre-tourist agricultural landuse.

7.11.3 Research Investigations

Several of the well-known archaeological sites in Torbay have been the subject of archaeological excavations, and it is interesting to see evidence of some of these in the aerial photograph resource (Figure 137-139).

Figure 137: Excavations underway at Torre Abbey in 1988 (SX 9074 6383); two people are lifting a cover from one of the many grave cuts, and a planning grid is visible as a pale square in the nave of the medieval abbey church (bottom centre). DCC DAP JN7 11-JAN-1988. Devon County Council Devon Aerial Photograph.

Figure 138: A circular enclosure around Broadsands Chambered Tomb in 1959 (SX 8929 5732), perhaps used to restrict access to excavations undertaken the previous year (Sheridan *et al* 2008: 2). The capstone is visible on some later aerial photographs, but was obscured by scrub on many of the earlier ones. RAF/58/3190 F21 0072-0073 31-AUG-1959. English Heritage RAF Photography.

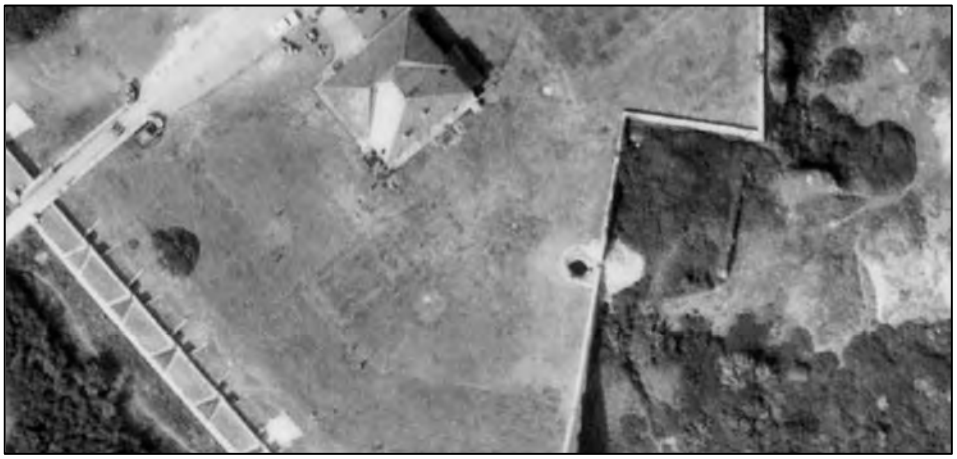


Figure 139: Berry Head in summer 1976. As well as parchmarks of former buildings, an open pit can be seen next to the wall south-east of the guardhouse, with spoil apparently deposited downslope outside the fort. This is thought likely to show the excavations of the tunnels interpreted as the fort's sewage system (Armitage and Masterton 2009). CUCAP RC8 BK 208 02-JUN-1976. Cambridge University Collection of Aerial Photography.

8 Heritage Protection

During the survey a list was compiled of sites of potential national significance or monuments that might warrant further attention.

This list, with a summary of the relevant issues, is reproduced in Appendix I**.** It includes known sites of national significance where designation should be considered, scheduled monuments where the scheduled area could be amended in light of the NMP survey results and previously unrecorded sites that could warrant scheduling.

However this list is not exhaustive and should be taken as a starting point only; it will only include monuments visible on aerial photographs and the suggested sites have not been considered systematically against the criteria for designation.

9 Recommendations

9.1 Recommendations for further work

During the project a number of sites were identified where further archaeological work could be particularly productive, either in enhancing knowledge of well-known sites or in establishing the character of newly recorded sites.

A list of these sites with comments was maintained and is reproduced in Appendix J. It is important to remember that this list is not exhaustive and should be considered a starting point only. Inclusion on the list does not indicate that the features are necessarily under threat or are a particularly high priority for research.

9.2 Recommendations for Aerial Reconnaissance

The survey has confirmed the concentration of visible cropmark sites on the well-draining soils in the environs of the Exe estuary. However, little reconnaissance has taken place in recent years and it is likely ongoing systematic survey would further enhance the record in this area.

It was anticipated that the significant outcrops of chalk bedrock and freely draining soils found along the coast from Salcombe Regis to Seaton and from Axmouth to the south-west of Lyme Regis might reveal previously unrecorded archaeological cropmark monuments of prehistoric date. This pattern was not seen on the available aerial photographs but it is felt that this area has high potential for systematic aerial survey, particularly if targeted in drought conditions.

Estuarine intertidal remains were less well represented than anticipated, particularly sites potentially of medieval and older date. The reasons for this are probably complex, but it is probable that the estuaries, particularly the major watercourses such as the Kingsbridge Estuary, Dart, Teign and Exe estuaries have not received the ongoing systematic survey that might identify structural remains obscured by the shifting silts and mud of the larger estuaries and it is recommended that they are targeted at low tide and after storm events in future aerial reconnaissance.

9.3 Further NMP Projects

The number of newly recorded and significantly enhanced sites within the RCZAS survey area demonstrates the effectiveness of the NMP methodology in Devon. Consideration should be given to extending the NMP methodology further inland, placing the RCZAS NMP survey results in context and thereby facilitating more meaningful analysis of the coastal results. The areas of the South Devon AONB, East Devon AONB and Blackdown Hills present inviting discrete areas for study.

10 Conclusions and Outcomes

10.1 Conclusions

The South Devon coast RCZAS NMP survey has created geo-referenced digital transcriptions of the form and extent of all archaeological sites and landscape features visible on aerial photographs within the RCZAS project area.

It has created 1103 new HER monument records and substantially enhanced 398 extant HER records for all periods from the Bronze Age to the mid-20th century.

In doing so, it has met the aims and objectives outlined in section 3 above. Specifically, the survey has provided baseline Historic Environment data for input to Shoreline Management Plans by defining, characterising and analysing the historic environment of the South Devon coast and Estuarine Zone visible on aerial photographs.

10.2 Outcomes

The results of the survey have been characterised under 9 themes, the main trends and highlights from which are outlined in Section 7. The main outcomes of the survey can be summarised as follows.

Previously unrecorded ceremonial or mortuary prehistoric sites were poorly represented. No evidence for Neolithic ritual monuments was identified and Bronze Age funerary monuments were limited to a small number of scattered coastal barrows or ring ditches, including some previously unrecorded cropmark sites in East Devon for which interpretation is tentative. Earthwork evidence is constrained to two previously unrecorded earthwork mounds cautiously interpreted as round barrows to the west of Ham Barn, Stoke Gabriel.

The survey has improved the spatial data of several previously recorded prehistoric field systems surviving as earthwork banks along the South Devon coast, such as at Deckler's Cliffs, South Down Common and Walls Hill, Torbay. More significantly, the known extent of the surviving earthwork remains has been increased and amendments to scheduled monument areas have been recommended where relevant.

Over fifty possible settlement sites of later prehistoric or Roman date have been recorded as cropmarks, of which approximately a third were previously unrecorded. As anticipated much of the cropmark evidence was concentrated in Blocks Two and Three on the west bank of the Exe estuary

Relict field boundaries and lynchets were the most numerous monument type recorded during the survey and the main evidence for medieval and post-medieval agriculture. Cartographic evidence and HLC data support the interpretation that, in some instances, significant field boundary loss occurred prior to the mid-19th century. Former field systems were often associated with shrunken or abandoned former settlements, as at Higher Brownstone Farm in the South Hams.

Evidence for post-medieval agriculture and subsistence was restricted to small-scale evidence for two rabbit warren sites, both previously unrecorded and located in the South Hams, the remains of land management infrastructure, such

as orchard banks, lynchets and wood banks, and numerous monuments associated with water management. This included a previously indicated water mill site near Exmouth and more extensive evidence for post-medieval improvement, including the reclamation of marshland at Seaton and widespread catch meadow irrigation. Catch meadows were the second most numerous monument type recorded by the survey. A possible former bedwork water meadow was recorded at Dawlish Warren.

Evidence for medieval and post-medieval settlement abandonment or contraction is unusual in Devon, where continuity in settlement is typical. The survey has been successful in adding two possible shrunken medieval settlements to the record and significantly enhancing our understanding of the medieval deserted settlement at Dowland.

Very few intertidal maritime or coastal monuments were recorded or amended during the survey and estuarine intertidal remains were less well represented than anticipated, particularly sites potentially of medieval and earlier date. The reasons for this are likely to be complex and probably related to the prevalence of rias, submerged upland river valleys in the south-west. Rias typically have their deepest waters at the mouth of the estuary, with decreasing depth inland towards often broad but relatively limited and shallow tidal ranges. It might be that this shallow profile and often shifting course resulted in poor visibility of submerged structures. Nonetheless, the survey made a significant contribution to improving the understanding of fish traps, hulks and oyster beds, particularly in the Exe, Teign and Dart estuaries.

Notable exceptions are two discrete sets of rock cut cart tracks in the foreshore at Exmouth and thirteen intertidal structures interpreted as possible fish traps or fish weirs, but all recorded estuarine intertidal remains are probably medieval to modern in date.

The majority of monument records amended or created by the survey relate to the military or defensive role of the coast. HER records for a small number of prehistoric and post-medieval fortifications have been enhanced or created by the survey. However, the high proportion of aerial photographs of 1940s date mean that it was anti-invasion defences and training activity of twentieth century date, particularly the Second World War, that have dominated the survey.

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12 Project Archive

The project's documentary and drawn archive will be deposited at the EH Archive, The Engine House, Fire Fly Avenue, Swindon, SN2 2EH. The contents of the archive are as listed below:

1. A project file containing the project design.
2. This project report in digital format (Word, accessible PDF).
3. The transcription data in ArcGIS geodatabase format and as ESRI Shapefile.
4. HER Monument Polygon data in ArcGIS geodatabase format and as ESRI Shapefile.

All monument records will be supplied to English Heritage when a data exchange mechanism is established for the National Record of the Historic Environment

All project data is available for consultation via the Devon HER at the offices of the Historic Environment Service, Devon County Council, County Hall, Topsham Road, Exeter, EX2 4QD, and online via Heritage Gateway.

Appendix A: Agricultural Land Classification

Description of the Grades and Subgrades

The ALC grades and subgrades are described below in terms of the types of limitation which can occur, typical cropping range and the expected level and consistency of yield. The grades are defined by reference to a range of physical characteristics and limitation factors outlined in MAFF grading guidance (MAFF 1988) that enable land to be ranked in accordance with these general descriptions.

The most productive and flexible land falls into Grades 1 and 2 and Subgrade 3a and collectively comprises about one-third of the agricultural land in England and Wales. About half the land is of moderate quality in Subgrade 3b or poor quality in Grade 4. Although less significant on a national scale such land can be locally valuable to agriculture and the rural economy where poorer farmland predominates. The remainder is very poor quality land in Grade 5, which mostly occurs in the uplands.

Descriptions are also given of other land categories which may be used on ALC maps.

Grade 1 - excellent quality agricultural land

Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly includes top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.

Grade 2 - very good quality agricultural land

Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural and horticultural crops can usually be grown but on some land in the grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable root crops. The level of yield is generally high but may be lower or more variable than Grade 1.

Grade 3 - good to moderate quality agricultural land

Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown yields are generally lower or more variable than on land in Grades 1 and 2.

Subgrade 3a - good quality agricultural land

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

Subgrade 3b - moderate quality agricultural land

Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass or lower yields of a wider range of crops or high yields of grass which can be grazed or harvested over most of the year.

Grade 4 - poor quality agricultural land

Land with severe limitations which significantly restrict the range of crops and/or level of yields. It is mainly suited to grass with occasional arable crops (e.g. cereals and forage crops) the yields of which are variable. In moist climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Grade 5 - very poor quality agricultural land

Land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

Descriptions of other land categories used on ALC maps

Urban

Built-up or 'hard' uses with relatively little potential for a return to agriculture including: housing, industry, commerce, education, transport, religious buildings, cemeteries. Also, hard-surfaced sports facilities, permanent caravan sites and vacant land; all types of derelict land, including mineral workings which are only likely to be reclaimed using derelict land grants.

Non-agricultural

'Soft' uses where most of the land could be returned relatively easily to agriculture, including: golf courses, private parkland, public open spaces, sports fields, allotments and soft-surfaced areas on airports/ airfields. Also active mineral workings and refuse tips where restoration conditions to 'soft' after-uses may apply.

Woodland

Includes commercial and non-commercial woodland. A distinction may be made as necessary between farm and non-farm woodland.

Agricultural buildings

Includes the normal range of agricultural buildings as well as other relatively permanent structures such as glasshouses. Temporary structures (e.g. polythene tunnels erected for lambing) may be ignored.

Open water

Includes lakes, ponds and rivers as map scale permits.

Land not surveyed

Agricultural land which has not been surveyed,

Where the land use includes more than one of the above land cover types, e.g. buildings in large grounds, and where map scale permits, the cover types may be shown separately. Otherwise, the most extensive cover type will usually be shown.

Appendix B: Arch7aeological Scope of the Project

The archaeological scope of the project is in accordance with the Sphere of Interest as outlined in the RCZAS Project Brief (English Heritage 2012). This is reproduced below, with relevant clarifications at the end.

NMP Sphere of Interest

The NMP Sphere of Interest covers the date range and types of sites to be recorded and how to depict them. Typically, this is defined as all archaeological sites visible on aerial photographs as cropmarks, soilmarks, parchmarks or earthworks and, in certain cases, structures or buildings. The earliest sites recognised on aerial photographs usually date from the Neolithic onwards. A strength of NMP is the use of contemporary and immediately post war aerial photographs to map and record military remains from the Second World War.

NMP has great potential as a means of archaeological and historical landscape character assessment, particularly where associations of sites and features confer importance, even where individual sites may not be outstanding. Therefore, the sphere of interest may vary slightly between NMP projects depending on the archaeological context of a site or area. The primary level of survey involved in NMP requires some selectivity in recording, particularly for the more recent periods.

The primary level of survey involved in the NMP requires some selectivity in mapping and recording, particularly for the more recent periods. Guidelines for the most commonly encountered examples of such variations to the Sphere of Interest are detailed below and any variance from this should be defined in the project design. NMP mapping is designed to be viewed against an OS map, and therefore will not usually record non-archaeological features depicted on the base map such as buildings / field walls / hedges / canals / railways. In some contexts some categories of site, such as standing buildings, may be recorded, for example in industrial or military complexes.

The project database will record which elements of any particular archaeological site survive or have been levelled and/or destroyed.

The sphere of interest for the SW RCZAS NMP will be based on the standard NMP Sphere of Interest with the following clarifications:

The aim of the SW RCZAS NMP should be to provide a rapid, basic level survey of the extent and character of the major military remains of the 20th century. The mapping and monument records should highlight the potential of aerial photographs and NMP project results for conservation and further research using more comprehensive sources.

Previous surveys

Where a previous survey (of cropmarks or earthworks) has resulted in the production of a plan it is necessary to assess the sources used and the quality of the resultant plan. To minimise the work necessary for NMP purposes such surveys should, where possible, be accepted and merely updated from any

additional sources available to the NMP surveyor. Where an existing survey has been done to a higher specification and larger scale than NMP, this can be used as the basis for a simplified plan appropriate to the NMP project specification.

If an existing survey does not reach NMP standards, the area should be remapped from aerial photographs. However, if it has relied on sources unavailable to the NMP surveyor then professional judgement will be necessary to decide whether to include specific features, which it is not possible to verify or discount. Normally a textual reference in the monument record to such features is sufficient. Where it is not possible to verify a pre-existing survey, for example, when trees mask the site, it should not normally be mapped, although on occasion it may be necessary to provide a textual record. Plans resulting from excavation and geophysical survey of sites visible on aerial photographs should be treated in the same manner as those from field and aerial survey and used to aid mapping and interpretation.

Cropmarks, parchmarks, soilmarks

All sub-surface archaeological remains are recorded when visible as cropmarks, parchmarks or soilmarks.

Cropmarks and parchmarks.

Different colours and tones, and sometimes height differences, in crops can reveal the presence of buried archaeological features. Where this occurs in grass it is called a parchmark. Marks formed in a similar way may also reveal details of geology and agricultural history.

Soilmarks.

Different colours and tones in bare soil can reveal the presence of an archaeological feature. The main factors affecting visibility are the type of material present and relative moisture levels. The clearest marks are from freshly ploughed fields when the top of the buried archaeological deposit is brought to the surface by the plough, but with substantial features a diffuse effect may survive in the plough soil for many years and it is possible that moisture effects may be transmitted through the plough soil. Marks seen in bare fields formed in a similar way may also reveal details of geology and agricultural history.

Earthworks

Map and record all archaeological earthworks visible on aerial photographs. This includes features visible as earthworks on early photographs, which have been levelled and archaeological features marked on the OS maps that are within the NMP sphere of interest.

Buildings and Structures

Map and record all foundations of buildings visible as cropmarks, soilmarks, parchmarks, earthworks or ruined stonework. Standing roofed or unroofed buildings are usually more appropriately recorded by other methods, so will not normally be mapped. The exceptions are in specific archaeological contexts (e.g. industrial and military complexes and country houses), or when associated with other cropmark and earthwork features. If buildings have been demolished since the photography, then it may be appropriate to map them, in order to make an

association explicit. Alternatively, they may be recorded solely in the text record. Map and record other structures (designed originally without a roof) not depicted on the OS base, particularly 20th century military structures. Structures depicted by the Ordnance Survey (e.g. sheepfolds and shooting butts) can be mapped if considered to be of archaeological significance to the project. Other stone, concrete, metal and timber structures that are within the NMP sphere of interest may also be mapped (e.g. timber circles).

Ridge and Furrow

Record all medieval and post-medieval ridge and furrow, regardless of preservation, according to NMP conventions. The unit of record for ridge and furrow has varied in the past but wherever possible the archaeological context of the remains should remain the basis for recording strategy. The record may relate to a medieval township/parish if known, or a modern Civil Parish, or a discrete archaeologically significant area. The text should include brief comment on preservation and visibility over the area mapped as well as any archaeological assessment. Prehistoric cord rig should also be mapped.

Post-Medieval Field Boundaries

Exclude post-medieval field boundaries, whether seen as cropmarks, earthworks, or still extant, with the exception of circumstances when they may be of particular archaeological significance (e.g. when field systems are not mapped by the Ordnance Survey).

Parkland, Landscape Parks, Gardens and Country Houses

The English Heritage Register of Parks and Gardens includes parks and gardens of special historic interest. Early vertical photographs often show Country Houses in their landscape settings which have often undergone significant change or may even have disappeared entirely. Map all man made garden or landscape features, but not major landscaping. If appropriate map and/or record former Country Houses either completely or partially demolished within the date range of the available aerial photographs. Make or amend a monument record if the house is adequately depicted by the Ordnance Survey. In some cases it may be appropriate to depict and record features normally outside the scope of NMP such as tree avenues. Map and record all vestigial earlier features preserved within parkland and gardens (e.g. prehistoric features or medieval deer parks). Treat significant parks and gardens in an urban context (originally or since engulfed) in the same manner. Modern or 20th century parks and gardens are not normally recorded unless they are relevant to the project specification, for example in military contexts.

Industrial Features and Extraction

The aim of NMP is to provide a rapid, basic level, comprehensive survey of the extent and character of industrial remains in a landscape context. The scope for industrial recording is immense and some data already exists within national databases, local specialist recording groups and literature. Assess this at the project design stage to formulate a strategy for the level of detail to be mapped. For regions with a significant 18th-19th century industrial archaeological component, First Edition OS maps often provide essential aids to interpretation.

Only map or record 20th century industrial remains when of particular archaeological interest, or when associated with earlier features. Urban industrial areas should generally be excluded from NMP recording.

Mapping and recording of industrial features should focus on groups of features (i.e. complexes with extraction, spoil, buildings and transport features) and should distinguish only the main features and industrial processes. Depiction should use appropriate NMP conventions dependent on the size and extent of features, highlighting and mapping the main features within the complex. Map roofed or unroofed buildings, when they are associated with industrial complexes.

The mapping and recording of extractive features (quarries, pits, mines, peat working etc) should follow the same guidelines as those above for industrial features, with the exception of widespread and common small-scale extraction of resources for immediately local use (e.g. chalk pits, marl pits, and minor or modern stone quarries and gravel extraction). Any variation from this should be agreed and specified in the project design. Where possible, at sites where extraction and processing are closely associated (e.g. lime quarries and associated lime kilns, clay pits and associated brick works), a single monument record should be used to explain the relationships between the various elements of the site.

Transport

Major transport features (i.e. disused canals and main railways) were included in the Ordnance Survey Archaeology Division sphere of interest, appear on various editions of OS maps, and were subsequently recorded in AMIE; they should not be mapped unless considered to be archaeologically significant in the context of the project. Smaller features (e.g. local tramways), which were outside the Ordnance Survey sphere of interest, should normally be mapped and recorded, especially in the context of associated features.

20th Century Military Features

NMP military recording includes First and Second World War as well as Cold War features. Data in national and local heritage databases, local specialist recording groups and literature, should be assessed at the project design stage and a strategy must be included for the level of detail to be mapped. The aim of NMP should be to provide a rapid, basic level, comprehensive survey of the extent and character of the major military remains of the 20th century. Military structures (originally designed without a roof) and roofed, or unroofed, military buildings, particularly when associated with other mapped features, are therefore usually mapped, especially when they have been removed or destroyed. Where an extensive site is already mapped by the OS use a minimalist approach for NMP mapping.

Normally NMP mapping of military sites should aim to be a “snapshot” of the main features of the site in 1945 or 1946. Significant changes to the site recorded on aerial photographs during the war should be briefly described in the monument record. Military structures to be mapped include outlines of extensive features such as airfield perimeter and runways, camp perimeters as well as significant buildings and earthwork structures, and all ephemeral features such

as barbed wire, lines of tank cubes, etc. The NMP monument record for military sites should highlight the best source photographs and briefly describe the main elements, or unusual features, and any major changes to the site.

Coastal Archaeology

The coastal zone comprises inshore waters, the intertidal zone, the seashore and river estuaries and is recognised by English Heritage as underrepresented in the archaeological record (English Heritage 1998, 2.1). In coastal areas covered by NMP, recording will continue to identify features within the intertidal zone and to depict them using appropriate conventions.

Wrecks are mapped using a simple plan outline and minimum textual recording.

Record any movement of features in the inter-tidal zone and whether covered over with mud or sand.

Urban areas

Major conurbations (Greater London, Manchester, and Birmingham) are currently a low priority for NMP projects. Smaller urban centres (e.g. Lincoln, Carlisle, and York) are included within NMP project areas. Elements of the urban landscape (e.g. factories, housing, transport termini), and particularly 20th century development, will not normally be mapped. However, they may be mapped in exceptional cases, for example where there is a direct association with features being mapped outside the urban area.

In areas built up in the twentieth century, historic aerial photographs (most are from the 1940s onwards) may record archaeological features, or aspects of the landscape not recorded on historic maps. All archaeological features visible on aerial photographs of the pre-urban landscape are mapped and recorded. Where there are no archaeological features the historic photographs may illustrate landscape change relevant to the historic environment in a project area and can be useful for report writing.

For Rapid Coastal Zone Assessment Survey projects recording may be limited to the seaward side of a line 100m above mean high water rather than the usual full OS 1 km sq required by NMP.

Natural features

Exclude all natural features which are geological or geomorphological in origin. If there is risk of confusion in contexts with other archaeological features, then the natural features should be mentioned in the text record; they should not be mapped. In exceptional landscape areas some natural features may need to be mapped to fully understand the archaeology (e.g. Fenland areas).

Project Specific Clarifications

20th Century Military Features

The Timetable and Quantification Assessment below indicated that the survey was likely to transcribe and identify a very high number of modern military features of Second World War date and potentially also of Cold War date. The aim of NMP should be to provide a rapid, basic level, comprehensive survey of

the extent and character of the major military remains of the 20th century (AerSI 2012, 19-20). As such:

Where an extensive site is already mapped by the OS, a minimalist approach for NMP mapping is employed, and only those features not depicted by the OS are transcribed.

NMP mapping of extensive, complex or long-lived military sites comprises a "snapshot" of the main features of the site as visible in 1945 or 1946. Significant changes to the site noted on aerial photographs during the war are briefly described in the monument record.

An example of minimalist transcription is illustrated in Figure A1 for a complex military site. If recorded in dense concentrations, HER records for military remains can be briefer than for other Historic Environment assets, with a focus on monument survival.

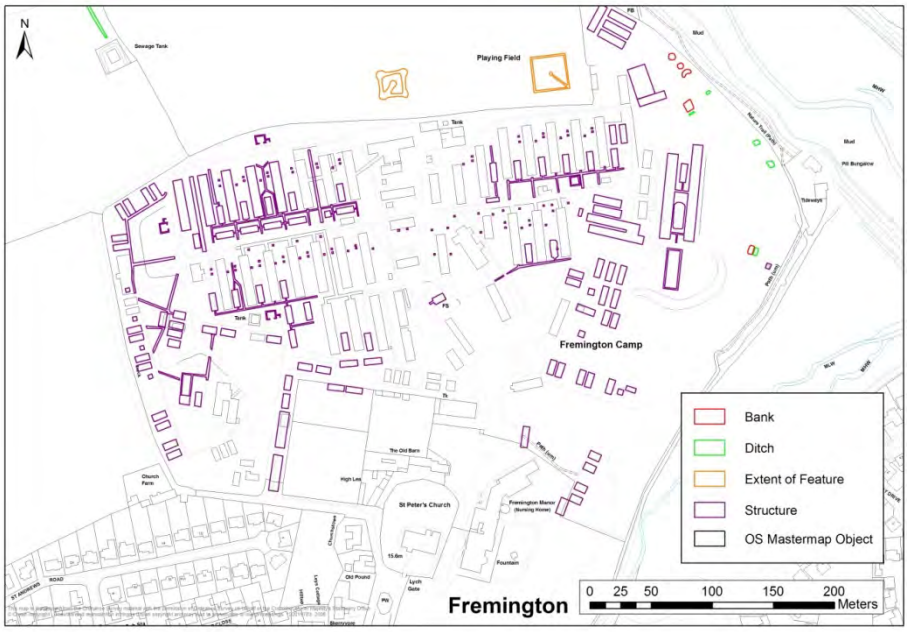

Figure A1. Fremington Camp, North Devon, (HER MDV59361); an examplar for 'minimalist' NMP transcription of a complex modern military site depicted in part on the current OS base mapping (North Devon Coast AONB NMP, project no. 6083).

Coastal Archaeology

The coastal zone comprises inshore waters, estuarine intertidal zones and the coastline. NMP recording identifies features within the intertidal zone and depicts them using the appropriate conventions. Wrecks are mapped using a simple plan outline and minimum textual recording. Intertidal features such as hulks and wrecks are prone to movement. Where a feature can be confidently identified in multiple locations, the last visible position of such features is transcribed, with movement described in the monument record.

Post-medieval field boundaries

In order to enhance project progress, where earthworks or cropmarks are clearly part of a post-medieval field system they are not transcribed, even if they are not shown on historic OS mapping. HER records are however created.

Appendix C: NMP Methodology

The following section summarises the methodology developed by AC archaeology and DCC HET for the North Devon AONB NMP project, which has also been applied to this survey.

The air photograph mapping and recording tasks were undertaken by the AC archaeology NMP team based within DCC HET at County Hall, Exeter. The project followed current NMP standards and methodology with minor variations to reflect the aims of the RCZAS (Winton 2012; Hegarty 2013). A summary of the archaeological scope of the RCZAS project is described in Appendix B.

The aerial photographs assessed include vertical, military oblique and specialist oblique aerial photographs available from the English Heritage Archives, vertical and specialist oblique aerial photographs held by the Cambridge University Collection of Aerial Photography (CUCAP) and vertical and specialist oblique aerial photographs held by the DCC HER. The latter includes a large collection of specialist oblique aerial photographs making up the Devon Air Photograph (DAP) collection. Orthorectified vertical photographs supplied to EH by Next Perspectives™ through the Pan Government Agreement (PGA) as 1sq km tiles in TIFF format were supplied to the survey and routinely examined. High resolution and recent orthorectified vertical photographs available from the Channel Coastal Observatory were also downloaded for use in the survey. A list of the AP archives consulted and relevant contact details can be found in Appendix D.

The survey also routinely assessed a range of historic map sources in digital format, via the DCC HER GIS. This included the Ordnance Survey first to fourth edition 25in maps and Tithe maps for Devon. As the project began the Tithe maps were viewed via an online map-viewer (http://www.devon.gov.uk/tithemaps.htm) and later as a georeferenced GIS layer, albeit containing some gaps. The Tithe apportionments were not checked as a matter of course but were consulted in cases where field name evidence might aid interpretation.

Oblique and vertical photographs were scanned and digital transformations of the archaeological features visible on the photographs were produced using the specialist AERIAL 5.30 software. Digital copies of current OS 1:2500 Mastermap® vector base maps were used for control information and as a base for mapping directly into the DCCHER ArcView GIS. All digital transformations are therefore within a level of accuracy within 5m to true ground position, but typically less than 2.0m to the base map. Rectified images, georeferenced orthophotography and georeferenced raster jpegs drived from lidar data were imported into the DCCHER GIS where all interpreted archaeological features were mapped.

Archaeological features were digitally transcribed according to a nationally agreed layer structure and, where possible, using agreed line and colour conventions as specified by Aerial Survey and Investigation (English Heritage 2011). These are set out in Appendix E. A monument polygon was created for each new monument and existing monument polygons amended. The layer structure used by this project followed EH NMP standards, including non-standard layers for areas with extensive military remains. One exception to this

is in the depiction of Platforms and Slopes. As this project was transcribed entirely within ArcView and not AutoCAD, as per standard NMP practice, it was not appropriate to employ the standard T-hachure convention to depict platforms or scarps; instead these were depicted on the Bank or Ditch layer as seemed appropriate to the interpreter, consistency and ease of understanding being achieved through frequent comparisons.

Object data was attached to each transcribed feature, recording basic interpretative information and consists of four fields; period, type, form, and photo as well as a comment field. Depending on the object data field this was either manually input or derived from the HER record. The format of the object data is summarised in Appendix F. The AC/DCC methodology for NMP in ArcView and the DCCHER is summarised in Appendix G.

HER monument recording took place directly into the DCCHER, where new monument records were created and existing records amended as required. The database automatically generated UID numbers and all recording was input into core fields directly mappable to those described in the NMP Standards and Guidelines (English Heritage 2012), enabling monument indexing to be carried out to NMP and ALGAO standards, including fields for cross referencing to existing NMR records. All HER monument recording is therefore to NMP standards.

Due to restrictions in the availability of up to date HER data for Torbay, monument recording for this Unitary Authority area required a slightly different approach. To eliminate any potential duplication of HER data or loss of recent data not made available to the survey when NMP monument records are accessioned into the Torbay HER, all monument recording, whether for new or amended monument data, required the creation of new monument records. All monument records created for previously recorded monuments have had their Torbay UID recorded in the 'Other Statuses and Codes' tab, thereby allowing them to be associated with their 'parent' monument record when accessioned to the Torbay HER.

Significance

Running lists of sites to consider for designation and recommend for further work were maintained throughout the project.

A list of HER monument records created and substantially amended (defined as records with which the NMP project source had been associated) was established as HBSMR queries cannot easily distinguish between records that had been significantly altered and those changed only superficially (e.g. linked to).

Site Visits

Three site visits were scheduled to take place during the survey. The visits were extremely informative in terms of ground truthing and condition assessment, and the most relevant are discussed and illustrated in the results section above.

Dissemination

This project report will be made available on the English Heritage website.

The NMP transcriptions are available to view at the DCCHER and t he HER monument records arising from the NMP survey are available online via Heritage Gateway.

Appendix D: List of AP Sources Consulted

The following AP collections were consulted for the North Devon AONB NMP survey.

English Heritage
Archive Services
The Engine House
Fire Fly Avenue
Swindon
SN2 2EH
Tel: 01793 414600
Email: archive@english-heritage.org.uk

Cambridge University Collection of Aerial Photography (CUCAP)
CUCAP Library,
Department of Geography,
University of Cambridge,
Downing Place,
Cambridge CB2 3EN
Tel: 01223 764 377
http://www.geog.cam.ac.uk/cucap/

Devon County Council Historic Environment Team
Lucombe House
County Hall
Topsham Road
Exeter
EX2 4QW
Tel: 01392 382246
http://www.devon.gov.uk/environment/

Channel Coastal Observatory
c/o
Plymouth Coastal Observatory
University of Plymouth
Drake Circus
Plymouth
Devon
PL4 8AA
http://www.channelcoast.org/

Appendix E: Map Layer Content and Transcription Conventions

ArcView layers are divided into polygon or line object feature classes. The NMP survey transcription was organised in the following layers.

No non-standard layers were required. Standard Ridge and Furrow layers were not required.

LAYER NAME	LAYER FORMAT (LINE/ POLYGON)	COLOUR	DESCRIPTION	
BANK	Polygon	Red	Use to outline banks, platforms, mounds and spoil heaps.	
DITCH	Polygon Or Line	Green	Use to outline cut features such as ditches, ponds, pits or hollow ways.	
EXTENT_OF_FEATURE	Polygon	Orange	Use to depict the extent of large area features such as airfields, military camps, or major extraction.	
MONUMENT_POLYGON	Polygon	Cyan	Use to indicate the extent of the monument record as defined in the NRHE or HER database.	
STRUCTURE	Polygon	Purple	Use to outline structures including stone, concrete, metal and t imber constructions e.g. buildings, Nissen huts, tents, radio masts, camouflaged airfields, wrecks, fish traps, etc.	

Appendix F: Object Data Tables

Object data was attached to each transcribed feature in ArcGIS. This recorded basic interpretative information and consisted of seven fields, either free text fields to be manually entered, pull-down menus offering pre-set options, or fields to be populated from the HER either on completion of the survey or at regular points to be determined throughout the survey.

Field	Format	Description/Options
Layer	Pulldown list	Cropmark, Earthwork, Levelled Earthwork, Structure, Demolished Structure
HERMonID	Free text field	Manually input
Period	Populated from HER	Interpretive archaeological period
Type	Populated from HER	Monument type
Evidence	Pulldown	Cropmark, Earthwork, Levelled Earthwork, Structure, Demolished Structure
Photo	Free text field	NMP format AP reference
Comment	Free text field	Any comments the interpreter feels necessary

Appendix G: NMP in HBSMR and ArcGIS

By Graham Tait

The NMP methodology used by this project ensured that the NMP data was directly recorded into the Historic Environment Record for the local area (Devon HER). Integrating the NMP data directly with the HER allowed the information to straight-away inform planning and land management, helping to safeguard Devon's historic environment.

It also saved much time, effort and cost associated with accessioning the NMP data into the HER (both technically importing data as well as manually correlating data), and ensured that the NMP could make full use of the data, resources and professional staff knowledge of the HER.

NMP recording for this project was undertaken using the GIS software ArcGIS (from ESRI) and the HER software HBSMR (from exeGesIS). This proved to be an adaptable and practical method of recording, and allowed easy use of data from the Devon HER during the project, as well as providing a straightforward and timely method of ensuring that this NMP data was recording in the Devon HER.

Transcription

Transcriptions were recorded in ArcGIS. This was carried out as set out in the project methodology, and as advised by 'Standards for National Mapping Programme projects' (Winton, 2012).

Transcription database

A transcription database was set up. This was set up as an 'ESRI Personal Geodatabase' (although any geodatabase could be set up to record this information).This geodatabase made use of 'domains' to allow rules about how the data can be edited. These rules allowed for 'coded values' that ensured that only one of a certain category of attributes could be record (i.e. selected from a pick-list).

The geodatabase was created with the following domains and coded values:

Domain: Evidence

Code	Description
CROPMARK	CROPMARK
EARTHWORK	EARTHWORK
LEVELLED EARTHWORK	LEVELLED EARTHWORK
STRUCTURE	STRUCTURE
DEMOLISHED STRUCTURE	DEMOLISHED STRUCTURE

Domain: LayerLine

Code	Description
BANK	BANK
DITCH	DITCH
RIDGE_AND_FURROW_ALIGNMENT	RIDGE_AND_FURROW_ALIGNMENT
STRUCTURE	STRUCTURE
IMPROVEMENT_RIDGE_AND_FURR	IMPROVEMENT_RIDGE_AND_FURR

OW	OW

Domain: LayerPolygon

Code	Description
BANK	BANK
DITCH	DITCH
EXTENT_OF_FEATURE	EXTENT_OF_FEATURE
RIDGE_AND_FURROW_AREA	RIDGE_AND_FURROW_AREA
STRUCTURE	STRUCTURE
IMPROVEMENT_RIDGE_AND_FURROW	IMPROVEMENT_RIDGE_AND_FURROW

(All domains had the following domain properties: Field Type: Text. Domain Type: Coded Values. Split Policy: Duplicate. Merge policy: Default Value.)

Feature classes

Within this database, there were two feature classes (layers). These were:

- Transcription Lines (named NDtrans_line)
- Transcription Polygons (named NDtrans_poly)

These both had the following fields (all of 'text' type):

- Layer (the domain for this layer was LayerLine or LayerPolygon as appropriate)
- HERMonID
- Period
- Type
- Evidence (the domain for this layer was Evidence)
- Photo
- Comment
- NMRMonID

As three people (Cain Hegarty, Stephanie Knight and Richard Sims) were recording transcriptions at the same time, it was decided that they would use three identical databases (and feature classes), and the data could be merged into one database at the end of the project. This allowed a simple method of multi-user editing.

Using the transcription geodatabases

The transcriptions were then created using these feature classes. This meant that for all transcription lines or polygons, attributes were created in three ways:

Coded values / pick-lists

The fields 'Layer' and 'Evidence' were completed using pick-lists. This provided a fast and accurate method of completing these fields.

Manual Input

Other fields such as 'HERMonID', 'Photo' and 'Comment' (where appropriate) were completed manually.

Populated from HER

Fields such as 'Period', Type' and 'NMRMonID' were not completed on this layer, but were populated from the HER database (HBSMR) at the end of the project, and these fields completed within the transcription layer as a batch process.

As this data was only recorded once (within HBSMR) and then exported to the transcription data at the end of the project, time could be saved in recording this information and no double-indexing took place.

The field 'Evidence' was not completed in this way, as different transcriptions for the same monument may have had different evidence types and this needed to be recorded within the transcription layer.

NMP annotations

Annotations were extensively used throughout the NMP process to record features and photographs. These were recorded on a text graphics layer of the map document (.mxd file). To assist with being able to easily switch these text graphics on or off, these were assigned to a new Annotation group, and the relevant project Sub-Block layer was set as its 'Associated Layer'. This meant that the text graphics were displayed when the associated layer was displayed.

In order to ensure that the text graphics did not cause the map document (.mxd) to run slowly, the text graphics were then saved at the end of each map sheet and deleted from the map document. These were saved by converting the graphics to an annotation feature class. However, there is a limit (256 characters) on the size of these annotations, so all text graphics were kept to less than this size.

Monuments

Monuments were created within HBSMR and the monuments polygon layer in the GIS as set out in the project methodology, as advised by 'Standards for National Mapping Programme projects' (Winton, 2012) and the Devon HER recording guidelines. This included the following key fields of data:

- Record Type
- Name
- Summary
- Monument Type(s)
- Location (Parish, District)
- Relevant sources:

These sources always included the project listed as an interpretion (Interpretation - South Devon Coast Rapid Coastal Zone Assessment Survey National Mapping Programme Project) along with who compiled it and the date of compilation. It also included the relevant other sources, as set out in the methodology.

HBSMR conforms to the 'MIDAS Heritage' standard. 'MIDAS Heritage' is a British cultural heritage standard for recording information on buildings, archaeological sites, etc. and states that Monuments (Heritage Assets), Events (Investigative Activities) and Sources (Information Sources) should be recorded separately and related together. The method used by Devon HER uses HBSMR to explicitly record each relevant source (for example a photograph or a personal comment) along with a description of the monument from that source. Devon HER uses a mode within HBSMR that allows each descriptive part of text about the monument to be directly related to a specific source. This ensures that all descriptive text is related to a particular source, so users of the data have more certainty over the provenance of the descriptive text as well as providing an easier way to export the data.

All monuments had a monument polygon created. This linked to the HER monument record, and took the form of a polygon showing the spatial extent of the monument.

Appendix H: Frequently Recorded Monument Types

	AGRICULTURE AND SUBSISTENCE	CIVIL	COMMERCIAL	COMMUNICATIONS	DEFENCE	DOMESTIC	GARDENS PARKS AND URBAN SPACES	HEALTH AND WELFARE	INDUSTRIAL	MARITIME	MILITARY DEFENCE AND FORTIFICATION	MONUMENT <BY FORM>	RECREATIONAL	RELIGIOUS RITUAL AND FUNERARY	TRANSPORT	UNASSIGNED	WATER SUPPLY AND DRAINAGE	Total
FIELD BOUNDARY												153						153
CATCH MEADOW	101																	101
QUARRY									100									100
HULK										80								80
EXTRACTIVE PIT									72									72
PILLBOX					15						42							57
BOMB CRATER											10					31		41
ORCHARD	18						18											36
STRUCTURE																35		35
ENCLOSURE												31						31
WATER MEADOW	30																	30
BOUNDARY BANK												29						29
MOUND												29						29
EMERGENCY WATER SUPPLY																	24	24
EARTHWORK												23						23
FISH TRAP	11												11					22
BARROW														19				19
RING DITCH												19						19
FIELD SYSTEM	18																	18
NON ANTIQUITY																18		18
MILITARY BUILDING					4						12							16
SLIPWAY										8					8			16
JETTY										7					7			14
MILITARY SITE											14							14
NISSEN HUT		7			7													14
CLEARANCE CAIRN (POSSIBLE)	13																	13
GROYNE										13								13
SLIT TRENCH					11						2							13
OBSERVATION POST					4						8							12
WRECK										12								12
FIELD BOUNDARY (POSSIBLE)												11						11
RADAR STATION											11							11
RECTILINEAR ENCLOSURE												11						11
BANK (EARTHWORK)												10						10
COASTAL BATTERY					5					5								10
HILLFORT					5	5												10
LIGHT ANTI AIRCRAFT BATTERY					2						8							10
PILLOW MOUND	5											5						10
QUARRY (POSSIBLE)									10									10
Total (monuments above)	196	7			53	5	18		182	125	107	321	11	19	15	84	24	1167
Total (other monuments)	47	4	1	6	128	34	19	1	35	31	109	90	14	18	24	28	24	613
Total (all monuments)	243	11	1	6	181	39	37	1	217	156	216	411	25	37	39	112	48	1780

Appendix I: Sites Suggested for Heritage Protection Consideration

Name	Priority	MonID	SM no.	Notes
Prehistoric field system at Deckler's Cliff	High	15083	1021253	Additional linear earthwork banks were identified to the north and east of the scheduled area. The subtle nature of the earthworks, much denunded by ploughing, may suggest that the prehistoric and medieval field system is more extensive than has been previously recorded. Additional and c omplementary survey work, such as geophysical survey, may help to provide a clearer understanding of these features in light of extending the area of scheduling for the purpose of future management and protection.
Possible prehistoric field system at Woodcombe Point and The Narrows	High	104236 and 21377		Earthwork banks recorded along this stretch of the coastline bear many close similarities to the field system recorded at Deckler's Cliff, approximately 3km to the west. Subject to further field investigation, designation of these would be recommended and could significantly enhance our understanding of prehistoric agricultural practice of this region as part of a wider landscape setting.
East Soar Field Systems	High	66002; 104154; 36184	1020578	The EH East Soar survey and RCZAS NMP illustrate that the visible earthwork remains extend beyond the scheduled areas. The scheduled areas require revision.
Outwork of Hawkesdown Camp	High	58272	1017775	An outwork believed to be associated with the eastern defences of Hawkesdown Camp. Prior to the survey the northern part was obscured by the hedgebank sited on the bank. The southern part appears to be slighter and is only clearly visible on Lidar-derived images. However the southern part also has good archaeological potential; it may be w orth extending the scheduling to cover the southern segment of this outwork.

Brownstone Emergency Coastal Battery at Inner Froward Point	Medium	21013		Brownstone battery represents one of the most complete and best preserved examples of Second World War coastal defence along the South Devon coast, which includes surviving examples of searchlight positions, gun emplacements, Battery Observation Post, generator room and accommodation block. Scheduling of this site is highly recommended as a rare surviving example of military coastal defence which complements other designated Second World War sites recorded within the vicinity along the River Dart.
Barrows at Ham Barn	Medium	104844; 106845; 35836		Two adjacent and previously unrecorded earthwork mounds representing potential barrows were recorded. The earthworks lie in close proximity to a previously recorded barrow (MDV35836), approximately 450m to the north-east, and may form part of a cemetery. Subject to the outcome of further field investigation, scheduling of the three barrows is highly recommended to help ensure that their group interest is recognised and to assist in their protection.
Barrow recorded at Long Wood	Medium	105107	1020159	A scheduled bowl barrow is recorded at Long Wood, to the west of Greenway Camp hillfort. However, this interpretation now seems highly unlikely. Instead it seems probable that the earthworks represent the remains of a small quarry site or extraction pit. A number of similar features recorded within the immediate area and clearly industrial in origin support this view. De-scheduling of this earthwork is recommended.
Holbury and environs.	Medium	104222	1019782	Features in area around scheduling worthy of further investigation.

Field System on Walls Hill	Medium	104936	1019134	One of 18 field systems of later prehistoric date recorded on the limestone plateau of South Devon, the good survival of the field system is probably due to its marginal position and thin soils. Additional linear earthwork banks were identified to the north and west of the scheduled area. Not at risk from agriculture the newly recorded elements are situated on a playing field and are potentially at risk from erosion caused by leisure activities. Consider extending scheduled area to incorporate NMP mapping.
Field System on South Down Common	Medium	19842, 39952		An extensive but fragmentary relict field system of possible later prehistoric to medieval date, from the coast at South Down Common and Beer Head northwards to Beer. The western elements of the field system had previously been recorded as a possible enclosure. The relict earthworks are at risk from coastal erosion. Assess for scheduling.
Barrow east of Rousdon	Medium	28617		Despite apparently being under arable cultivation, a mound is clearly visible in this location on images derived from Lidar data captured in 2001, which suggests potential for the preservation of significant archaeological information. Assess for scheduling.
Five round barrows 570m south of Hope Cove, forming part of a round barrow cemetery	Low	63615	1019787	Three or four low and irregularly shaped mounds are identifiable on images derived from Lidar data but are not convincingly archaeological in character. It is possible the mounds are geological in origin. Assess for de-scheduling.
Scheduled barrows to west of The Downs, Thurlestone	Low	63611	1019534	The mounds are not clearly identifiable on the aerial photographs available to the survey. Two low and irregularly shaped mounds are identifiable on images derived from Lidar data, but do not appear convincingly archaeological in character. It is possible the mounds are geological in origin. Assess for de-scheduling.

Appendix J: Sites Suggested for Further Work

Name	MonID	Site Visit	Geophysical Survey	Palaeoenvironmental Survey	Analytical Field Survey	Aerial Survey	Oral History	Excavation
Second World War Bombing Decoy at Worswell	58005	✓						
Second World War Bombing Decoy Control Shelter West of Worswell Barton	58006	✓						
Earthwork Bank at Crawl Wood	103863	✓			✓			
Cofflete Park, World War II Military Huts	55125	✓						
Second World War Weapons Pits, South of The Warren	104397	✓			✓			
Prehistoric settlement Coombe Down	50145		✓					
Possible rectilinear enclosure near Fernycombe Beach	104132		✓					
Intertidal structures in the lower Erme estuary	104121 104118 104129 104125 104126 104124	✓						
Rectilinear earthworks at Ivy Head	103995	✓						
Enclosure north-east of Fernycombe Beach	40097		✓					
Holbury Camp and associated features	104222 104221 104220 3155		✓					
Burgh Island gunpits	104281 104287	✓			✓			
Military structures at Thurlestone Golf Course	104424 104439	✓						
Possible enclosure in Winkle Wood	104442	✓						
Possible lime kiln near Boat Hill Copse	104443	✓						
Cropmark complex north of Oldbury Camp	104504		✓					
Earthwork Bank and Mounds at East Soar	104268	✓			✓			
Possible Pillow Mound, North of Bolberry Down	104299	✓						
Possible Pillow Mound, North of Bolberry Down	104301	✓						

Name	MonID	Site Visit	Geophysical Survey	Palaeoenvironmental Survey	Topographic Survey	Aerial Survey	Oral History	Excavation
Possible Pillbox, Middle Soar	104276	✓						
Possible Pit, East of Bantham.	104356	✓						
Possible Mound or Structure, East of Bantham	104357	✓						
Complex of earth bound structures, trackways and tank.	105359, 105436	✓	✓		✓		✓	
Ruins above Hollicombe beach	105246	✓						
Possible Anti-Aircraft battery at Berry Head	105441	✓					✓	
Barrow on Sugarloaf Hill	105273		✓				✓	
Corbyns Head battery	105094		✓				✓	
Possible rectangular military structure at Rodney Point	105345	✓						
Mounds South of Amity Farm	105508	✓			✓			
Cropmark Enclosure West of Starcross	17726		✓					
Watermill at Prattshayes Farm, Littleham, Exmouth	44887	✓			✓			
Rect cropmark enclosure	105806		✓					
Ring Ditch, Otterton	105808		✓			✓		
Mound/barrow E of Berry Camp	10927	✓					✓	
South Down Field System, Beer	19842	✓			✓		✓	
Ring Ditch South of Shell's Lane	106112		✓					
Saltworks on Seaton Marshes	51123							✓
Structure on the Saltmarsh in the Axe Estuary	106476	✓						
Possible Second World War Pillbox South of Boshill Cross	106485	✓						
Shrunken Medieval Settlement at Bindon	106533		✓		✓			
Possible Deserted Farmstead North of Rough Leigh Barn	106556		✓		✓			
Deserted Settlement West of Dowlands	11401		✓		✓			
Military sites near Dowland	106570 106569						✓	
Structure south of Rousdon	106593	✓						
Former routeway - roman road / holloway	106640		✓					✓

Name	MonID	Site Visit	Geophysical Survey	Palaeoenvironmental Survey	Topographic Survey	Aerial Survey	Oral History	Excavation
Possible prehistoric enclosure, Cott's Farm	105552		✓					
Possible remains of a medieval field system, Powderham	105700; 105699	✓			✓			
Possible fishtrap	105746	✓		✓				
Possible shrunken medieval hamlet/farmstead	61241	✓	✓					
Two possible adjacent prehistoric barrows, Ham Barn	104844; 106845	✓	✓		✓			
Coastal battery at Castle Cove	105219	✓						
Medieval earthworks at Higher Brownstone Farm	105225	✓	✓					
Possible prehistoric earthwork boundaries, Woodcombe Point	104236	✓	✓		✓			
Possible prehistoric earthwork boundaries, The Narrows	21377	✓	✓		✓			
Medieval earthworks at Stokenham	104410				✓			
Intertidal feature across Batson Creek, Salcombe	103925	✓						
Earthworks on Rickham Common	29575						✓	
Prehistoric field system, Deckler's Cliff	15083	✓	✓		✓			
Possible prehistoric enclosure, near Galmpton	105004		✓					