



Archaeological
Research
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North West Rapid Coastal Zone Assessment (NWRCA) Final SMP2 version



Rock-cut graves at St. Patrick's Chapel, Heysham Head

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North West Rapid Coastal Zone Assessment (NWRCZA)

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Executive Summary

Between August 2007 and September 2009 Archaeological Research Services Ltd carried out, on behalf of English Heritage, a desk based rapid coastal zone assessment of the threat posed to heritage assets on the North West coast by rising sea level and consequential coastal erosion. The North West Rapid Coastal Zone Assessment, or NWRCZA, is one of a series of projects initiated by English Heritage around the coasts of England. The brief specifically required that the assessment be undertaken with reference to Defra's Shoreline Management Plans (SMPs). The area assessed, which extends from the Anglo-Welsh border in the Dee Estuary to the Anglo-Scottish border in the Solway Firth, falls within SMP Cell 11. At the time of writing the Phase 1 report the policy units and policy statements for SMP2 were only at a draft stage. The first phase of the SMPs was completed in the 1990s (SMP1) and the second phase study (SMP2) is currently being prepared for final publication. The policy areas and policy statements for SMP2 were finalised and published in December 2010 and have been used to compile this updated executive summary. The policy statements usually comprise either Hold The Line (HTL) or No Active Intervention (NAI), although Managed Realignment (MR) is also an option. HTL involves various mitigation strategies such as the construction of sea defences while NAI allows nature to take its course. Heritage assets may be considered to be under threat from mitigation strategies associated with HTL or MR and from coastal erosion where NAI is the adopted policy.

The NWRCZA study area consists of almost 900km of coastline between the Lowest Astronomical Tide (LAT) and 1km inland from Mean High Water Springs (MHWS). The review of the heritage assets has been based on a consideration of two data sets. The first consists of the Historic Environment Records (HERs) maintained by or for the Local Authorities with curatorial responsibilities for this section of the coast, namely Cheshire Archaeology Planning Advisory Service, Merseyside Archaeological Service, Lancashire County Council, Cumbria County Council and the Lake District National Park Authority. The second data set consists of the aerial photograph coverage of the study area from which all archaeological features visible have been mapped to the standards of English Heritage's National Mapping Programme. Within the context of the NWRCZA, this has been referred to as the Aerial Photograph Mapping Exercise (APM).

In assessing the threat to heritage assets posed by sea level rise, major sites and groups of sites are discussed individually and the threats they face evaluated. Categories of more numerous types of site are also discussed but the issue of threat is dealt with in a series of tables in which the SMP policy unit is noted along with the importance of individual sites and the degree of threat are rated as high, medium or low. Nearly 75% of the sites recorded in the APM exercise date from the Second World War and consist of numerous categories of site such as pillboxes or anti-tank obstacles or ephemeral features such as minefields. These sites are listed in Appendix I and the relevant SMP policy unit noted. Many are no longer extant.

The NWRCZA study has established that many heritage assets in the coastal zone are under threat from rising sea level and also that a number of categories of asset are as yet poorly understood making an evaluation of the threat difficult. A separate project design has been prepared for a Phase 2 of the NWRCZA which includes priorities for rapid field survey as required by the Phase 2 brief supplied by English Heritage which will address these issues.

“Little attention has been paid in the North-West to coastal, estuarine or marine archaeology...The potential is enormous” (Brennand 2007, 141).

CHAPTER 1

1.1 Introduction

The design of this project is based on the methodology outlined in version 10 of *A Brief for Rapid Coastal Zone Assessment Surveys* (English Heritage 2005). This methodology arose and developed from the earlier English Heritage document entitled *England’s coastal heritage: A statement on the management of coastal archaeology* (English Heritage & RCHME 1996). The area covered by the NWRCZA project (Fig. 1.1) runs from the Anglo-Welsh border in the Dee Estuary to the Anglo-Scottish border in the Solway Firth and from the lowest astronomical tide (LAT) to 1km in-land from mean high water springs (MHWS). The project has been undertaken as a joint venture involving partners from Archaeological Research Services Ltd, Cheshire Archaeology Planning Advisory Service, Merseyside Archaeological Service, Lancashire County Council, Cumbria County Council and the Lake District National Park Authority. Archaeological Research Services Ltd has acted as the lead partner in the project.

The project has comprised a desk-based study with the aim of undertaking detailed desk-based research, including the collation and analysis of all existing archaeological data relating to the study area. This has included the acquisition of HER and NMR data together with data from published and unpublished sources, as well as historic mapping. This has been combined with a programme of aerial photographic transcription and analysis of all the existing aerial photographic coverage to the standards of the English Heritage’s National Mapping Programme (NMP). This mapping programme from the Dee Estuary to Maryport was undertaken by staff from Archaeological Research Services Ltd based at English Heritage’s Aerial Survey unit in York. The area between Maryport and the Anglo-Scottish border was mapped as part of the Hadrian’s Wall NMP. A large amount of additional data, such as geological mapping, soils mapping and bathymetry data has been obtained from various sources. The systematic collation of these data into a single GIS has enabled the production of this report which will form a valuable resource for improved management of the coastal historic environment and for furthering research, education and public enjoyment of the coastal heritage of the North-West.

The project has brought the following benefits:

- 1 SMR/HER enhancement.
- 2 NMR enhancement.
- 3 Assistance in the provision of an improved curatorial response to strategic coastal planning and development issues.
- 4 Facilitation of a more detailed and comprehensive analysis of areas of archaeological importance under threat from natural and human processes.
- 5 Production of data which will be integrated into Defra’s Shoreline and Estuary Management Programme which will assist in the protection and/or mitigation of damage to historic assets.
- 6 Improvement of information available to researchers.
- 7 Provision of information to underpin public understanding and enjoyment of the coastal heritage.

1.2 Reasons for and circumstances of the project

The North-West Coast is subject to ongoing processes of erosion of two principal types:

Natural processes

In common with all areas of coastline of the United Kingdom the North-West coast is at risk from rising sea levels as a result of climate change. The North-West coast is also subject to the combined erosional forces of the sea, wind and rain. The wind also causes protective sand dunes to drift, revealing and exposing archaeological sites to further processes of erosion. Elsewhere, there are areas of accretion where eroded material is re-deposited along the coastline which can also mask archaeological sites.

Human processes

Natural processes of erosion are only part of the threat to archaeology in the North-West coastal region. Human processes such as coastal footpath erosion, industrial, commercial and leisure related development and extractive industries also have an impact. Planning Policy Guidance Notes 15 and 16 provide a certain degree of protection from some destructive human processes but a systematic, detailed survey will both assist in that protection and provide a multitude of additional information to assist with programmes to protect archaeological sites under threat from destructive processes of natural as well as human origin not covered by PPG 15 and 16.

1.3 Aims and objectives

This project is a desk based study that has aimed to collate and synthesise existing data from a variety of sources, and to undertake NMP standard transcription and analysis of aerial photographs of the study area, the Aerial Photograph Mapping Exercise (APME). The data obtained is an invaluable resource for a number of purposes.

- It provides heritage information which can be fed directly into Defra's Shoreline and Estuary Management programme at the levels of plans, strategies and schemes, thereby helping to ensure appropriate protection, or mitigation of damage, to historic assets.
- It provides enhancement to the HERs and NMR records of coastal heritage assets, to a nationally agreed common minimum data standard utilising Monument Inventory Data Standard (MIDAS) and INSCRIPTION wordlists, in order to permit an improved curatorial response to strategic coastal planning or management initiatives at a national and regional level.
- It provides an increased factual base for the initial curatorial response to individual applications for commercial developments or schemes, in advance of more detailed evaluation and mitigation related to Environmental Impact Assessments and/or planning applications.
- It provides an assessment of the likely archaeological potential and vulnerability of all stretches of the coast.

The following objectives have been met in order to fulfil these aims:

1. The production of a detailed GIS of all known archaeological sites within the study area to be fed into Defra's Shoreline and Estuary Management programme, the NMR and the various HERs of the various project partners.
2. The production of air photo mapping and interpretation to English Heritage's (NMP) standards for the whole study area.
3. The enhancement of the various HERs within the study area and the NMR by providing a comprehensive GIS which will include new data acquired through the APM exercise.
4. An analysis, interpretation and overview of the database by examining key themes such as those identified within the North West Regional Research Framework (NWRRF) and other factors such as temporal, geological and spatial variation.
5. The production of an assessment of the degree and nature of threat to the archaeological resource on the North-West coast and the production of data that will allow for the creation of management policies and mitigation.
6. An overview of coastal change from the Late Upper Palaeolithic through to modern times.
7. The production of data that are compatible with the needs of other coastal managers, parallel coastal surveys, industry and researchers.
8. An increase in the understanding of the archaeology of the North-West coast amongst the public and the research community.
9. The production of data and information to underpin the second phase of this project and support any related initiatives.
10. The production a Project Design for Phase 2 of the NWRCZA to undertake rapid coastal survey.

In addition to this report, the principal output is a comprehensive GIS of all archaeological features identified from aerial photographic mapping within the study area. Curators and other interested parties have been provided with the project results in a GIS format together with digital copies of the various reports. It is envisaged that the data obtained will be added to the databases of the various HERs within the project area.

1.4 Report structure

In addition to this introduction, the topics dealt with in the remaining nine chapters of this report are as follows:

- Chapter 2 provides an outline of the main methodological components of the project; that is, the structure of the GIS data base, the APME and the archaeological analysis.

- Chapter 3 is a summary of research carried out by members of the Department of Geography at Durham University into sea level change over the past 10,000 years. This chapter also includes a brief account of the geology and topography of the coastal zone.
- In Chapter 4 the archaeology of the North-West coastal area at a general level is reviewed in order to provide a context for the results of the baseline data sections (Chapters 5 to 9). This chapter also provides general descriptions of the principal types of archaeological site encountered in the coastal zone to prevent repetitious text within the baseline data survey chapters.
- Chapters 5 to 9 examine, in detail, the archaeology of the coastal zone block by block (Fig. 1.2). Chapter 5 dealing with Block 1 (Dee Estuary to the Royal Seaforth Dock), Chapter 6 with Block 2 (Royal Seaforth Dock to the River Wyre Estuary), Chapter 7 with Block 3 (River Wyre Estuary to Road Island), Chapter with 8 with Block 4 (Roa Island to St Bee's Head) and Chapter 9 with Block 5 (St Bee's Head to the River Sark). The divisions have been based upon the initial draft policy units identified for SMP 2 as the RCZA process is designed to dovetail effectively with the SMP process. The division of the report by SMP 2 unit was also made to ensure that the various datasets (outlined in Section 2.2 below) could be effectively analysed within the GIS, without one dataset taking precedence over another and therefore injecting a bias into the baseline assessment. Each chapter begins with an account of the topography, geology, characteristic soils and landuse patterns encountered within the Block. The archaeological data are then reviewed in a chronological framework within which a number of themes have been identified. This is outlined more fully in Chapter 2 when discussing the assessment methodology.
- Chapter 10 sets out suggestions for areas of research where themes outlined in the NWRRF and data present within the coastal zone overlap, as well as identifying key sites deemed to be in need of immediate archaeological survey and intervention.

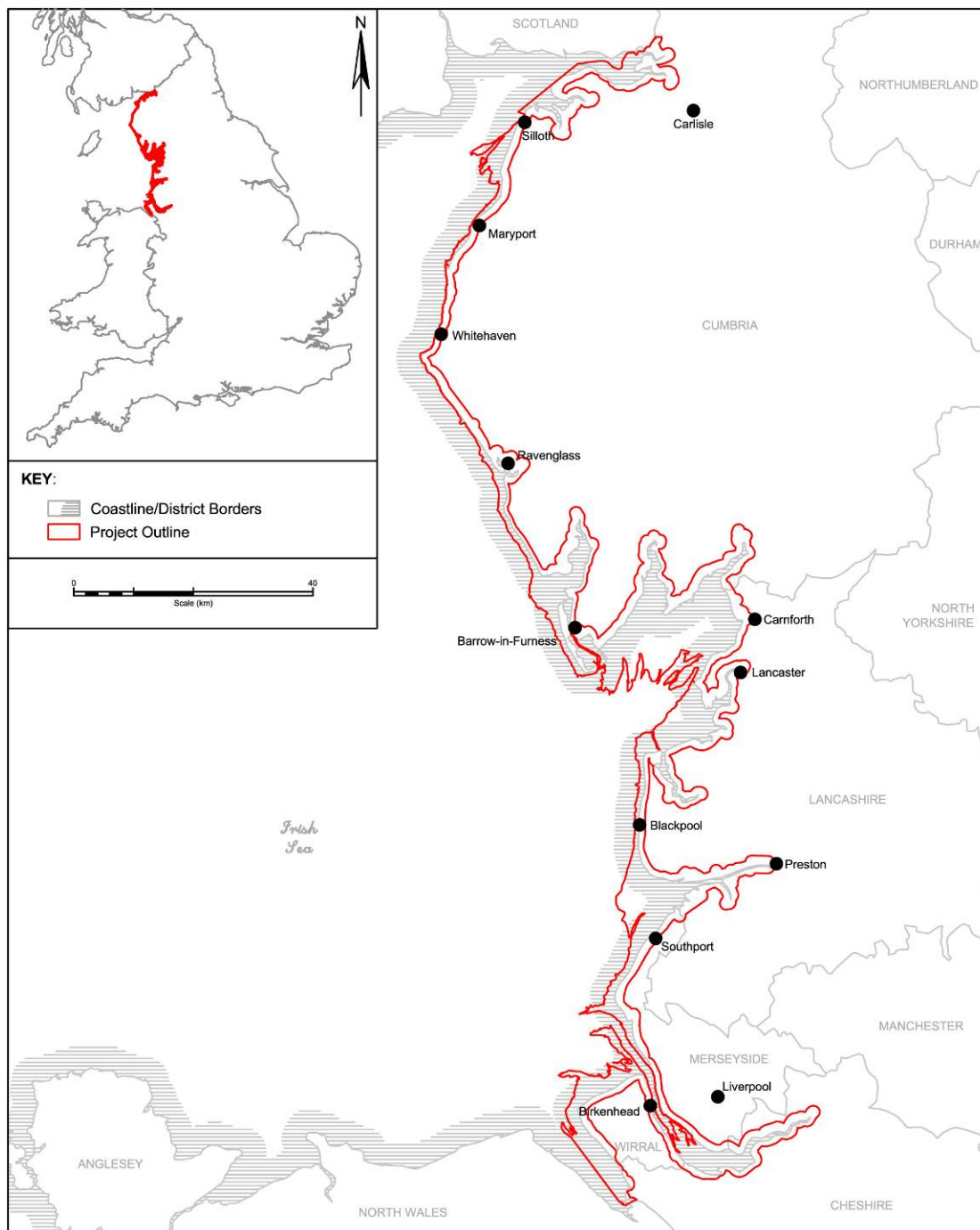


Fig 1.1 Location of the North West Rapid Coastal Zone Assessment study area

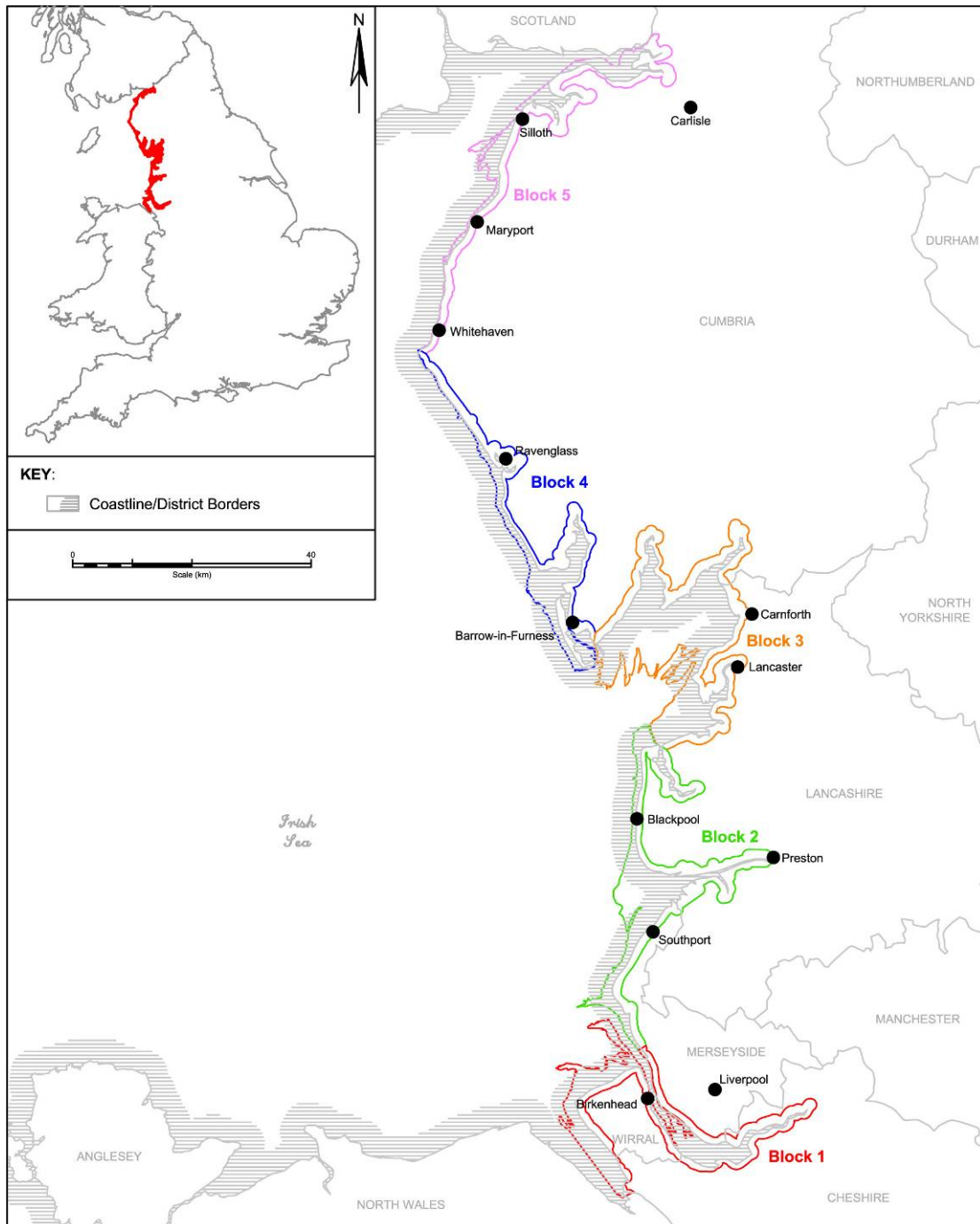


Figure 1.2 Location of five blocks identified for the NWRCZA in accordance with SMP 2 policy units

CHAPTER 2

METHODOLOGIES

2.1 Introduction

The research carried out for the NWRCZA consisted of an evaluation of existing data sets relating to the historic environment, in particular Local Authority based Historic Environment Records (HERs), the National Monuments Record (NMR), and the transcription of aerial photographs carried out as part of the National Mapping Programme (NMP). In addition, a number of other data sets were employed to place the results in context. These consisted of British Geological Survey data on the solid and superficial geology of the study area, the National Soils Research Institute soils and landuse data and bathymetry data. Ian Shennan and Natasha Barlow of the Department of Geography at the University of Durham have provided an overview of their research on sea level change, which is reproduced here in full as Chapter 3. The NWRCZA has been carried out within the area covered by Cell 11 of DEFRA's Shoreline Management Plans (SMPs), the work being carried out on behalf of central government by the Halcrow Group Ltd. The research has been undertaken within a GIS environment employing *ArcGIS 9.2* and assembled by Ben Johnson of Archaeological Research Services Ltd. In this chapter the three main methodological components of the project, the GIS data base, the aerial photograph mapping exercise (APM) and the archaeological analysis, are described.

2.2 The GIS data base

All the data employed in the NWRCZA were either obtained as, or were converted into, GIS files, as points, lines and polygons, from which were generated a series of GIS layers, highlighted in bold in the following bullet points.

- The brief for the project defined the **study area** as extending from the lowest astronomical tide (LAT) to 1km inland from mean high water springs (MHWS) and from the Anglo-Welsh border to the Anglo-Scottish border. The study area was therefore generated from the UKHO Seazone data set (converted from WGS84 to OSGB Petroleum projection) using Chart Datum as LAT. MHWS was obtained from Ordnance Survey mapping and the landward extent by buffering 1km from the MHWS line using the buffer tool in ArcGIS. The Anglo-Welsh and the Anglo-Scottish border were also taken from Ordnance Survey datasets. In urban areas assessment of the study area was limited to those features which fronted onto the coast, such as docks and warehousing.
- Data on the **solid** and **superficial geology** of the study area were obtained from the British Geological Survey while **soils** and **landuse** data were provided by the National Soils Research Institute at Cranfield University.
- For the purposes of the **Shoreline Management Plans** the whole of the NWRCZA study area lies within Cell 11. This has been subdivided into five subcells (11a-e), each of which is further divided into general and specific policy units. These are listed in table 2.1 below along with the preferred scenario for management and are illustrated in figs. 5.1, 6.1, 7.1, 8.1 and 9.1.

- The various **Historic Environment Records** held by the Local Authorities in the study area, namely Cheshire County Council, Merseyside Archaeology Service, Lancashire County Council, Cumbria County Council and the Lake District National Park Authority.
- **Aerial photograph transcriptions** carried out as part of the NMP (full methodology described below).
- Further datasets, such as the **NMR**, grey literature and published sources were also consulted, although such sites were not entered into the GIS, but used for referencing data held within the GIS datasets.

These datasets were used to generate maps which provided the focus of the baseline assessment in Chapters 5 to 9 and the data tables found within those chapters.

Table 2.1 SMP 2 policy units and preferred strategic option for three time frames (see also figs. 2.1-2.5)

General Policy Unit Area	Specific Policy Unit Location	SMP Policy Unit	Preferred Scenario		
			0-20 years	20-50 years	50-100 years
Dee Estuary	Flint Marsh to Chester Weir to Sealand Rifle Range (Inner Dee Estuary, both banks)	11a 5.3	HTL	HTL	HTL
	Sealand Rifle Range to Burton Point	11a 5.4	HTL	MR	MR
	Burton Point to Thurstaston Cliffs	11a 5.5	NAI	NAI	NAI
	Thurstaston Cliffs	11a 5.6	NAI	NAI	NAI
	Thurstaston Slipway to Croft Drive, Caldy	11a 5.7	HTL	NAI	NAI
	Croft Drive Caldy to West Kirby Marine Lake	11a 5.8	HTL	HTL	NAI
	West Kirby Marine Lake to Royal Liverpool Golf Club	11a 5.9	HTL	HTL	HTL
	Royal Liverpool Golf Club to Hilbre Point	11a 5.10	NAI	NAI	NAI
	Hilbre Island	11a 5.11	HTL	HTL	HTL
Wirral	Hilbre Point to Wallasey Embankment	11a 6.1	HTL	HTL	HTL
	Wallasey Embankment	11a 6.2	HTL	HTL	HTL
	Wallasey Embankment to Harrison Groyne	11a 6.3	HTL	HTL	MR
	Harrison Groyne to Perch Rock	11a 6.4	HTL	HTL	HTL
Mersey Estuary	Perch Rock to Riverwood Road/Eastham Park (south/left bank)	11a 7.1	HTL	HTL	HTL
	Riverwood Road/Eastham Park to Eastham Ferry	11a 7.2	NAI	NAI	NAI
	Eastham Ferry to Runcorn Bridge (south bank)	11a 7.3	HTL	HTL	HTL
	Runcorn Bridge to Arpley	11a 7.4	HTL	MR	MR

			Preferred Scenario		
	Landfill Site (Upper Mersey Estuary south bank)				
	Arpley Landfill Site (south bank) to SMP Boundary to west of Sewage Works (north bank)	11a 7.5	HTL	HTL	HTL
	Sewage Works to Runcorn Bridge (Upper Mersey Estuary north bank)	11a 7.6	HTL	MR	MR
	Runcorn Bridge to Pickerings Pasture	11a 7.7	HTL	HTL	HTL
	Pickerings Pasture to Garston Industrial Estate	11a 7.8	NAI	NAI	NAI
	Garston Industrial Estate to Seaforth	11a 7.9	HTL	HTL	HTL
	Seaforth to the River Alt	Seaforth to MEPAS Pumping Station	11a 8.1	HTL	HTL
MEPAS Pumping Station to Hightown		11a 8.2	MR	MR	MR
Hightown to mouth of the River Alt (east bank)		11a 8.3	HTL	HTL	HTL
River Alt mouth (east and west banks) to the Alt Pumping Station		11a 8.4	HTL	HTL	HTL
Formby Dunes	Mouth of the River Alt (west bank) to Weld Road, Southport (Formby Dune System)	11a 9.1	MR	MR	MR
Ribble Estuary	Weld Road to Fairways (Southport)	11b 1.1	HTL	HTL	HTL
	Fairways to Crossens Pumping Station	11b 1.2	HTL	HTL	HTL
	Crossens Pumping Station to Hesketh Out Marsh West (Hundred End Gutter)	11b 1.3	HTL	HTL	MR
	Hesketh Outmarsh West	11b 1.4	HTL	HTL	MR
	Hesketh Outmarsh East	11b 1.5	MR	HTL	HTL
	Hesketh Outmarsh East to White Bridge, Rufford (River Douglas left bank)	11b 1.6	HTL	HTL	MR
	White Bridge, Rufford, to Old Railway Embankment, Much Hoole Marsh House (River Douglas right bank)	11b 1.7	HTL	HTL	MR
	Old Railway Embankment, Much Hoole Marsh House to Hutton Marsh (Pilots Cottage)	11b 1.8	HTL	HTL	MR
	Hutton Marsh	11b 1.9	MR	HTL	MR
	Hutton Marsh to Penwortham Golf Course	11b 1.10	HTL	MR	HTL

			Preferred Scenario		
	Penwortham Golf Course to Penwortham Bridge	11b 1.11	HTL	HTL	HTL
	Penwortham Bridge to Freckleton Marsh (west end of Sewage Works)	11b 1.12	HTL	HTL	HTL
	Freckleton Marsh (west end of Sewage Works) to Naze Point	11b 1.13	HTL	HTL	MR
	Naze Point to Warton Bank	11b 1.14	NAI	NAI	NAI
	Warton Bank to Lytham Dock	11b 1.15	HTL	HTL	HTL
	Lytham Dock to Land Registry	11b 1.16	HTL	HTL	HTL
	Lytham Land Registry to Fairhaven Lake	11b 1.17	HTL	HTL	HTL
	Fairhaven Lake	11b 1.18	HTL	HTL	HTL
	Fairhaven Lake to Miniature Golf Course	11b 1.19	HTL	HTL	HTL
	Miniature Golf Course to St Anne's Pier	11b 1.20	HTL	HTL	HTL
	St Annes's Pier to St Annes' Northern Boundary	11b 1.21	HTL	HTL	HTL
	St Annes to Rossall Point	St Annes (northern boundary) to Squires Gate	11b 2.1	MR	HTL
Squires Gate to Blackpool Tower		11b 2.2	HTL	HTL	HTL
Blackpool Tower to Anchorsholme Park		11b 2.3	HTL	HTL	HTL
Anchorsholme Park		11b 2.4	HTL	HTL	HTL
Anchorsholme Park to Jubilee Gardens		11b 2.5	HTL	HTL	HTL
Jubilee Gardens to Five Bar Gate		11b 2.6	HTL	HTL	HTL
Five Bar Gate to Rossall Hospital (Rossall School)		11b 2.7	HTL	HTL	HTL
Rossall Hospital to Chatsworth Avenue		11b 2.8	HTL	HTL	HTL
Fleetwood and the Wyre Estuary	Chatsworth Avenue to Rossall Point	11b 2.9	HTL	HTL	HTL
	Rossall Point to Marine Lake (east)	11c 1.1	HTL	HTL	HTL
	Marine Lake to Fleetwood Pier	11c 1.2	HTL	HTL	HTL
	Fleetwood Pier to Fleetwood Ferry	11c 1.3	HTL	HTL	HTL
	Fleetwood to Stanah	11c 1.4	HTL	HTL	HTL
	Stanah to Cartford Bridge (south bank) and Cartford Bridge to Shard Bridge (north bank)	11c 1.5	HTL	MR	MR
	Shard Road (A588) to Golf Course	11c 1.6	HTL	HTL	HTL
	Knott End Golf Course	11c 1.7	NAI	NAI	NAI
Knott End to	Knott End on Sea	11c 2.1	HTL	HTL	HTL
	Golf course to Knott End on Sea	11c 1.8	HTL	HTL	HTL

Plover Scar			Preferred Scenario		
	Knott End to Fluke Hall	11c 2.2	HTL	HTL	HTL
Fluke Hall to Cocker Bridge	11c 2.3	HTL	MR	HTL	
Cocker Bridge to Glasson Dock	11c 2.4	HTL	MR	MR	
Lune Estuary	Glasson Dock to Condor Green Farm	11c 3.1	HTL	HTL	HTL
	Conder Green Farm to Aldcliffe	11c 3.2	NAI	NAI	NAI
	Aldcliffe to Freemans Wood (Aldcliffe Marsh)	11c 3.3	NAI	NAI	NAI
	Freemans Wood to Skerton Weir (east bank) and Skerton Weir to Lythe Bridge (west bank)	11c 3.4	HTL	HTL	HTL
	Lythe Bridge to Riverside Farm	11c 3.5	HTL	MR	HTL
	Riverside Farm to Overton Cattle Grid	11c 3.6	NAI	NAI	NAI
	Overton Cattle Grid to Sunderland Village	11c 3.7	HTL	HTL	MR
Sunderland Village to Potts Corner	Sunderland Village	11c 4.1	NAI	NAI	NAI
	Sunderland Point	11c4.2	MR	MR	MR
	Sunderland Point to the secondary embankment	11c4.3	NAI	NAI	NAI
	Secondary Embankment to Potts Corner	11c4.4	HTL	HTL	HTL
Potts Corner to Heysham Dock	Potts Corner to Heysham Power Station	11c 5.1	NAI	NAI	NAI
	Heysham Power Station and Heysham Dock	11c 5.2	HTL	HTL	HTL
Heysham to Hest Bank	South End of Halfmoon Bay to Chapel Hill (Lower Heysham)	11c 6.1	NAI	NAI	NAI
	Chapel Hill to Hest Bank (Morecambe)	11c 6.2	HTL	HTL	HTL
Hest Bank to Heald Brow	Hest Bank to Sewage Works	11c 7.1	HTL	MR	HTL
	Sewage Works to Red Bank Farm	11c 7.2	NAI	NAI	NAI
	Red Bank Farm to Bolton-le-Sands Caravan Park	11c 7.3	HTL	MR	HTL
	Bolton-le-Sands Caravan Park to River Keer	11c 7.4	NAI	NAI	NAI
	River Keer to Heald Brow	11c 7.5	NAI	NAI	NAI
Heald Brow to Humphrey Head	Heald Brow to Frith Wood	11c 8.1	NAI	NAI	NAI
	New Barns	11c 8.2	NAI	NAI	NAI
	Grubbins Wood (New Barns to Ash Meadow)	11c 8.3	NAI	NAI	NAI
	Ash Meadow to the Kent Viaduct (Arnside)	11c 8.4	HTL	HTL	HTL
	Kent Viaduct to Holme Island	11c 8.5	HTL	HTL	HTL
	Holme Island to Humphrey Head	11c 8.6	HTL	HTL	HTL

			Preferred Scenario		
Kent Estuary	Kent Viaduct to Dick Fell Road (Sandside)	11c 9.1	HTL	MR	MR
	Sandside (Dick Fell Road to Hollins Well Road)	11c 9.2	HTL	HTL	HTL
	Hollins Well Road north to Levens Bridge (east bank) and Levens Bridge to Kent Viaduct (west bank)	11c 9.3	HTL	MR	MR
Humphrey Head to Cark	Humphrey Head	11c 10.1	NAI	NAI	NAI
	Humphrey Head to Cowpren Point	11c 10.2	HTL	MR	MR
	Cowpren Point to Cark	11c 10.3	NAI	NAI	NAI
Outer Leven Estuary	Cark to Leven Viaduct	11c 11.1	NAI	NAI	NAI
	Leven Viaduct to Canal Foot Cottages	11c 11.2	NAI	NAI	NAI
	Canal Foot	11c 11.3	HTL	HTL	HTL
	Glaxo Factory Site (south)	11c 11.4	NAI	NAI	NAI
	Sandhall to Conishead Priory	11c 11.5	HTL	MR	MR
	Conishead Priory to Bardsea	11c 11.6	NAI	NAI	NAI
Leven Estuary	Leven Viaduct to Haverthwaite (left bank) and Haverthwaite to Greenodd (right bank)	11c 12.1	HTL	MR	NAI
	Greenodd to Barrow End Rocks (A590)	11c 12.2	HTL	HTL	HTL
	Barrow End Rocks (A590) to Leven Viaduct	11c 12.3	HTL	MR	NAI
Bardsea to Piel Island	Bardsea to Newbiggin	11c 13.1	NAI	NAI	NAI
	Newbiggin to Rampside	11c 13.2	HTL	MR	HTL
	Rampside	11c 13.3	NAI	HTL	HTL
	Roa Island	11c 13.4	HTL	HTL	HTL
	Piel Island	11c 13.5	NAI	NAI	NAI
Walney Island	South End Hawes to Biggar (east side)	11c 14.1	NAI	NAI	NAI
	Biggar to Lenny Hill (east side)	11c 14.2	HTL	HTL	HTL
	South End Hawes to Hare Hill (open coast)	11c 14.3	NAI	NAI	NAI
	Hare Hill to Hillock Whins	11c 14.4	HTL	HTL	HTL
	Hillock Whins to Nanny Point Scar	11c 14.5	NAI	MR	MR
	Nanny Point Scar to Mill Scar	11c 14.6	NAI	NAI	NAI
	Mill Scar to north of West Shore Park	11c 14.7	MR	MR	MR
	North Walney - from north of West Shore Park to Lenny Hill (both coasts)	11c 14.8	NAI	NAI	NAI
Walney Channel (Mainland)	Rampside to Westfield Point	11c 15.1	NAI	NAI	NAI
	Westfield Point to	11c 15.2	HTL	HTL	HTL

			Preferred Scenario		
	Hindpool (Barrow in Furness)				
	Hindpool to Lowsy Point	11c 15.3	NAI	NAI	NAI
Duddon Estuary	Lowsy Point to Askam Pier	11c 16.1	NAI	NAI	NAI
	Askam-in-Furness (including Askam Pier)	11c 16.2	HTL	HTL	HTL
	Askam to Dunnerholme	11c 16.3	NAI	NAI	NAI
	Dunnerholme to Sand Side	11c 16.4	HTL	HTL	HTL
	Kirkby-in-Furness	11c 16.5	HTL	HTL	HTL
	Herdhouse Moss	11c 16.6	NAI	NAI	NAI
	Gallop Pool to Viaduct	11c 16.7	HTL	HTL	HTL
	Duddon Estuary (both banks upstream of Viaduct and right bank south to Green Road Station)	11c 16.8	HTL	MR	MR
	Millom Marshes	11c 16.9	HTL	MR	MR
	Red Hills (industrial area)	11c 16.10	NAI	NAI	NAI
	Hodbarrow Mains	11c 16.11	NAI	MR	NAI
Haverigg to Selker	Hodbarrow Point to Haverigg	11d 1.1	N'TL	MR	H'TL
	Haverigg	11d 1.2	HTL	HTL	H'TL
	Haverigg to Hartrees Hill	11d 1.3	NAI	NAI	NAI
	Silecroft (Hartrees Hill)	11d 1.4	NAI	NAI	NAI
	Hartrees Hill to Selker	11d 1.5	NAI	NAI	NAI
Selker to Eskmeals	Selker to Eskmeals Range	11d 2.1	NAI	NAI	NAI
	Eskmeals Dunes	11d 2.2	MR	MR	MR
Ravenglass Estuary Complex	Eskmeals Dunes to Ravenglass including River Esk to Muncaster Bridge SMP Boundary	11d 3.1	NAI	NAI	NAI
	Ravenglass	11d 3.2	HTL	HTL	HTL
	Ravenglass to Drigg Point including River Mite to Muncaster Mill and River Irt to Drigg Holme	11d 3.3	NAI	NAI	NAI
Drigg Point to Seascale	Drigg Point to Seascale	11d 4.1	NAI	NAI	NAI
Seascale to St Bees	Seascale	11d 5.1	HTL	HTL	H'TL
	Seascale to Sellafield	11d 5.2	NAI	NAI	NAI
	Sellafield	11d 5.3	HTL	HTL	H'TL
	Sellafield to Braystones	11d 5.4	NAI	NAI	NAI
	Braystones, Nethertown and Coulderton	11d 5.5	NAI	NAI	NAI
	Coulderton to Seamill	11d 5.6	NAI	NAI	NAI
	Seamill to Pow Beck	11d 5.7	HTL	HTL	H'TL
St Bees	Pow Beck to St Bees Promenade	11d 6.1	NAI	NAI	NAI
	St Bees Promenade	11d 6.2	HTL	HTL	MR
St Bees Head	St Bees Head	11d 7.1	NAI	NAI	NAI
St Bees to Whitehaven	St Bees Head to Saltom Pit	11e 1.1	NAI	NAI	NAI

			Preferred Scenario		
	Saltom Pit	11e 1.2	HTL	HTL	NAI
	Saltom Pit to Whitehaven	11e 1.3	NAI	NAI	NAI
	Whitehaven South Beach	11e 1.4	NAI	NAI	NAI
Whitehaven to Workington	Whitehaven Harbour and North Beach	11e 2.1	HTL	HTL	HTL
	Bransty to Parton	11e 2.2	HTL	HTL	HTL
	Parton	11e 2.3	HTL	HTL	HTL
	Parton to Harrington Parks	11e 2.4	HTL	HTL	HTL
	Harrington Parks to Harrington Harbour	11e 2.5	HTL	NAI	NAI
	Harrington Harbour	11e 2.6	HTL	HTL	HTL
	Harrington to Steel Works Site	11e 2.7	HTL	HTL	HTL
	Steel Works Site	11e 2.8	HTL	HTL	HTL
	Steel Works to The Howe	11e 2.9	NAI	NAI	NAI
	The Howe to Workington Harbour South Breakwater	11e 2.10	MR	MR	MR
	Workington Harbour	11e 2.11	HTL	HTL	HTL
Workington to Maryport	Workington Harbour to Siddick	11e 3.1	HTL	MR	MR
	Siddick to Risehow	11e 3.2	HTL	HTL	HTL
	Risehow to Maryport Marina	11e 3.3	NAI	NAI	NAI
	Maryport Harbour/Marina	11e 3.4	HTL	HTL	HTL
Maryport to Dubmill Point	Maryport Harbour to Roman Fort	11e 4.1	HTL	HTL	HTL
	Roman Fort to Bank End (Maryport Promenade)	11e 4.2	HTL	NAI	NAI
	Maryport Golf Course to Allonby	11e 4.3	MR	MR	MR
	Allonby	11e 4.4	HTL	HTL	HTL
	Allonby to Seacroft Farm	11e 4.5	NAI	NAI	NAI
	Seacroft Farm to Dubmill Point	11e 4.6	HTL	NAI	NAI
Dubmill Point to Silloth	Dubmill Point to Silloth	11e 5.1	MR	MR	MR
Silloth to The Grune	Silloth Harbour	11e 6.1	HTL	HTL	HTL
	Silloth to Skinburness (open coast)	11e 6.2	HTL	HTL	HTL
	The Grune	11e 6.3	NAI	NAI	NAI
Moricambe Bay	Skinburness (east)	11e 7.1	HTL	HTL	HTL
	Skinburness to Wath Farm	11e 7.2	HTL	MR	HTL
	Wath Farm to Saltcoates including Waver to Brownrigg	11e 7.3	MR	MR	MR
	Newton Marsh	11e 7.4	MR	MR	MR
	Newton Marsh to Anthorn including Wampool to NTL	11e 7.5	MR	MR	MR
	Anthorn	11e 7.6	HTL	HTL	HTL

			Preferred Scenario		
	Anthorn to Cardurnock	11e 7.7	MR	MR	MR
Cardurnock to Scottish Border	Cardurnock to Bowness-on-Solway	11e 8.1	MR	MR	MR
	Bowness-on-Solway	11e 8.2	MR	MR	MR
	Bowness-on-Solway to Drumburgh	11e 8.3	MR	MR	MR
	Drumburgh to Dykesfield	11e 8.4	MR	MR	MR
	Dykesfield to NTL Kingsmoor (Eden)	11e 8.5	MR	MR	MR
	NTL Kingsmoor (Eden) to Rockliffe	11e 8.6	MR	MR	MR
	Rockliffe	11e 8.7	H TL	H TL	H TL
	Rockliffe to Demesne Farm	11e 8.8	MR	MR	MR
	Demesne Farm to Metal Bridge (Esk)	11e 8.9	MR	MR	MR
	Metal Bridge (Esk) to the River Sark	11e 8.10	MR	MR	H TL

NAI: No Active Intervention
 H TL: Hold The Line
 MR: Managed Realignment
 TBC: To Be Confirmed

2.3 The Aerial Photograph Mapping to NMP Standards

by Cinzia Bacilieri, David Knight and Shona Williams

2.3.1 Introduction

The aerial survey mapping was undertaken by Archaeological Research Services Ltd in partnership with English Heritage. The aerial survey mapping component of the project was carried out by ARS Ltd Investigators based with EH's Aerial Survey team in York. The aim of the aerial survey mapping element of the project was to produce accurate mapping and a record of all archaeological features from all periods that could be identified within the study area. Within the context of the NWRCZA this was referred to as the Aerial Photograph Mapping Exercise (APM) and this acronym is used through this report.

The aerial photographic interpretation and mapping focused on the strip of land from the lowest astronomical tide 1km inland from MHWS and extending in length from the Anglo-Scottish border on the Solway southwards to the Anglo-Welsh border on the Dee (Fig. 2.1). The survey included all estuaries, to their tidal limit or first bridging point. To the north of Flimby (area shown shaded green, fig. 2.1), the project area overlapped with that previously mapped in recent years by the Hadrian's Wall World Heritage Site NMP Project (Event No.1360986). These twenty two quarter sheets were already mapped to NMP specifications and were therefore not remapped for this project. The project area covered 125 1:10 000 scale map quarter sheets which included full 1km squares within the maps. This met the requirement of English Heritage's National Mapping Programme (NMP), using the same methodology and scope as the NMP. The project amounted to an area of 1601km² but only c.673km² covered exposed land, and the remainder fell within the inter-tidal zone.

Digital maps at a nominal scale of 1:10,000 and supporting records were produced to NMP standards for an area of 560km² (62 part Ordnance Survey 1:10,000 quarter sheets) of which only 402km² covers exposed land. This project deviates from normal NMP practice, as it has only mapped a narrow corridor along the coast, rather than whole 1:10,000 map quarter sheets. Mapping started on 1st March 2007 and was completed by 22nd July 2008.

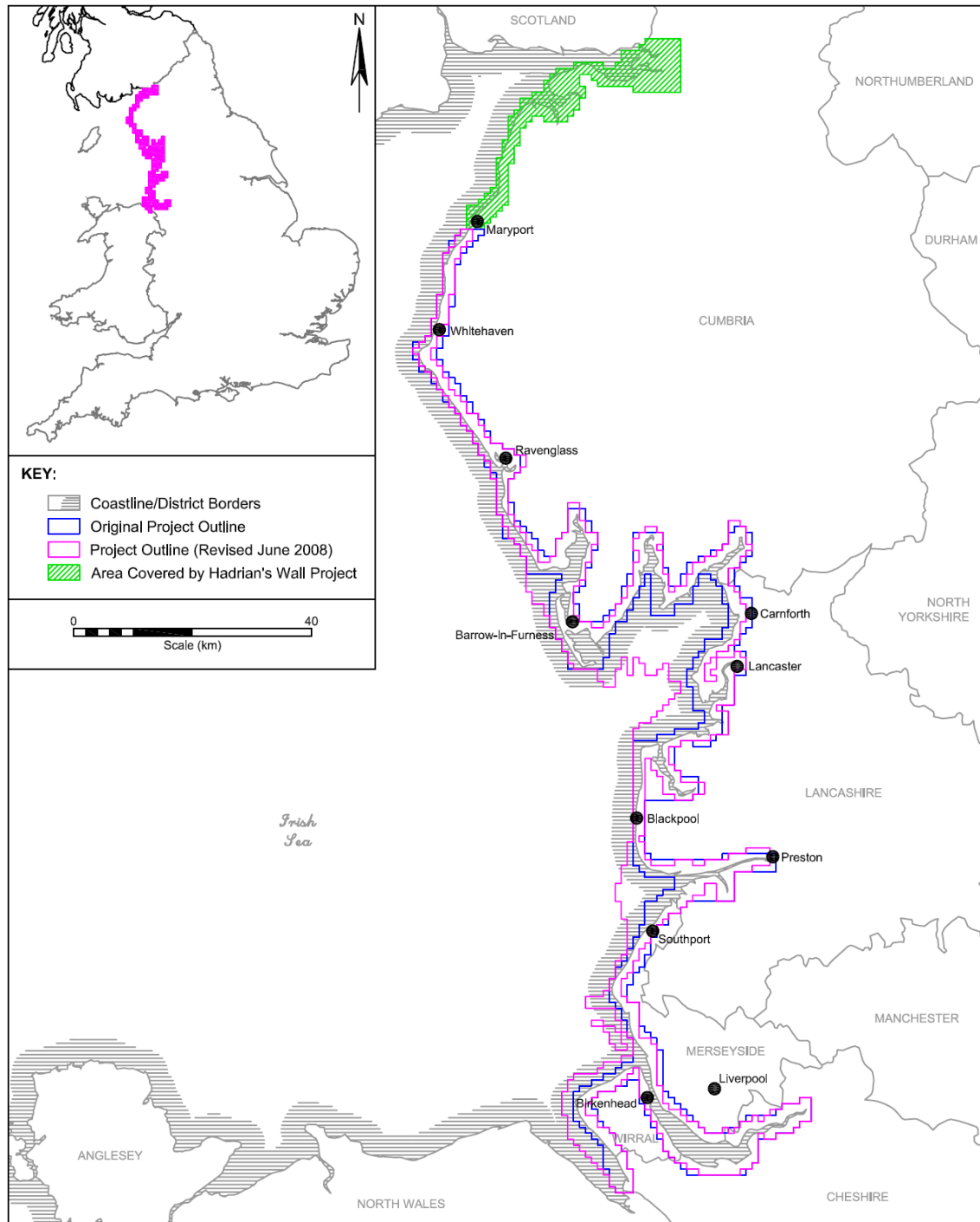


Figure 2.1 NWRCA Aerial Survey Project Area

2.3.2 Archaeological Scope

The mapping adhered to those principles adopted for the NMP, which aims to increase our understanding of the historic environment. All probable and possible archaeological features visible on air photographs as cropmarks, soilmarks, parchmarks, earthworks and structures were identified, interpreted, mapped and recorded. The NMP Sphere of Interest draft report (RCHME 1997, English Heritage 2005) documents the scope of the NMP; the main aspects relevant to this project are summarised below. Minor differences in depiction are observable in those maps part of the Hadrian Wall's World Heritage Site

NMP that fall within the project area. A summary report for the latter project is currently being produced by EH Aerial Survey Team and will be released as part of EH Research Department Report Series (Oakey 2009).

- *Earthwork archaeology*
All extant earthworks identified as archaeological in origin were mapped. When available RCHME /EH ground survey plans were used to assist and enhance the air photograph interpretation and mapping. If the quality of photography was not sufficient to depict individual earthwork features these were mapped as an extent of area.
- *Levelled archaeology*
All cropmarks, soilmarks and parchmarks identified as archaeological in origin were mapped.
- *Post medieval and modern field boundaries*
Field boundaries that have been removed (upstanding or levelled), but are depicted on first edition Ordnance Survey or later edition maps, were generally not mapped. However, where they occurred within newly identified field boundaries, which were not depicted by the Ordnance Survey, then some were mapped to provide a wider context for the field systems.
- *Medieval and post medieval ridge and furrow*
Ridge and furrow was mapped, using a simple graphical depiction, delineating the extent of area and direction of the furrows. The difference between levelled and earthwork ridge and furrow was distinguished. The state of preservation of the latter was evaluated from the latest photography, which in the case of this project was mainly from vertical photographs.
- *Industrial features and extraction*
Widespread and common small-scale (less than 2 hectares) extraction of stone resources was generally not mapped unless it directly impinged on archaeological features. Large-scale quarries (greater than 2 hectares) and coal mining were mapped and recorded, irrespective if they were depicted on any Ordnance Survey maps. Large collieries or open cast mining complexes were mapped generally as an extent of area. Associated features, such as tramways, within the monument perimeter were generally not mapped or were depicted as an extent of area.
- *Post Medieval and 20th Century military features*
Former Post-Medieval, First and Second World War military sites and installations were mapped. Extensive military complexes and sites were outlined as an extent of area as were anti-landing obstacles and tank traps. Installations such as pill boxes and coastal gun/searchlight batteries were also mapped. As many sites of this period and function were by nature short lived and transitory emphasis was placed on the identification and general extent of activity when appropriate, rather than the accurate depiction of single features such as barbed wire fences and local trackways. Significant features within outlined areas were mapped either “as seen” or schematically, according to the quality of the available photography. Where the only source was oblique imagery with poor control, coastal defence sites in the inter-tidal zone such as pillboxes, tank traps, barbed

wire fences and beach scaffolding, were sketch plotted (A sentence was added to the record stating that ‘the monument was sketched because it was not possible to locate the feature due to lack of control points on the source photograph’).

- *Buildings*
The foundations of buildings visible as cropmarks, soilmarks, parchmarks, earthworks, or ruined stonework were mapped, except when they were depicted on first edition Ordnance Survey or later edition maps. Standing roofed or unroofed buildings and other structures were generally not recorded unless they had a particular association in the context of industrial or military remains. Medieval castles and monastic sites previously recorded and extensively surveyed and mapped by the Ordnance Survey were generally mapped as an extent of area.
- *Geomorphological features or natural deposits*
Geomorphological features, natural deposits, organic sediments and paleochannel fills were not mapped. This is in line with normal NMP methodology.
- *Parkland, landscaped parks, gardens and country houses*
Earthwork and levelled landscape and garden features associated with this category were mapped.
- *Maritime Features*
Ship wrecks and fish traps visible in the inter-tidal zones were mapped. If it was not possible to position these features accurately due to a lack of reference points on the source photograph, only a circle on the extent of area layer with a diameter of 100m, 500m or 1km (the radius depending on the control points on the source photograph) was drawn. The centre of this was the grid reference obtained from the source photograph. Following the same methodology adopted for the North East Rapid Coastal Zone Assessment Survey (NE RCZAS), wrecks mapped in the Merseyside and south Lancashire area were recorded as features of uncertain date (Bacilieri, Knight and Radford 2008). This methodology was revised in October 2008, on the basis that few would be likely to pre-date the medieval period, the wrecks were subsequently recorded as post-medieval in date for the remaining part of the project.

2.3.3 *Air Photographs*

All readily available air photographs were consulted which comprised those held in five main collections. The National Monuments Record (NMR) was the prime source. A search for photographs identified 5,910 specialist obliques and 24,055 vertical prints for the project area. The vertical photographs held by the NMR comprised mainly of RAF and Ordnance Survey sorties, with some Meridian Airmaps Ltd photographs, which together ranged in date from 1940 to 1999. The specialist oblique photographs ranged in date from 1940 to 2006; these included specialist military photographs and those from recent reconnaissance.

Additionally, 1202 specialist oblique and 3161 vertical prints were consulted from the Photograph Library of Cambridge University Collection of Air Photographs (CUCAP), administered by the Unit for Landscape Modelling (ULM). AP Collections of Cheshire County Council, Lancashire County Council (M.A.R.I.O online Air Photo catalogue <http://mario.lancashire.gov.uk>) and Cumbria County Council were also consulted.

The CUCAP collection holdings for this project were quantified using the online catalogue (www-arcis.geog.cam.ac.uk). The ULM then kindly loaned the relevant photographs on a quarter sheet by quarter sheet basis. Yvonne Boutwood (EH) and David Knight (ARS Ltd) administered the loan liaison between the project and ULM. Other forms of remote sensing imagery (e.g. Lidar) were not used during the mapping phase of the project. Lidar data tiles were provided for the whole NMP project area in JPEG format, but after an evaluation it was decided not to use them for the mapping side of the project. As for the NERCZA (Bacilieri, Knight, Radford 2008; Tolan-Smith 2008), a review of a sample area suggested that because some of the data was collected at high tide Lidar was of limited use in identifying features in the inter-tidal zone. Where the tide was low the resolution was too low to show small discrete features like wrecks but showed major features. Consequently it was not felt that both NE and NWRCZA were the most appropriate projects in which to test the potential of this data to its fullest. This is not to say that Lidar data does or will not make a contribution to future coastal or inland archaeological surveys.

2.3.4 Monument data

The National Monuments Record database AMIE was consulted as was the relevant HER data for each quarter sheet during the course of transcription and recording. This process was assisted by the output from EH's GIS Data which facilitated graphic representation of the records with attached summary data. Where possible, concordance between HER datasets and AMIE was made.

2.3.5 Mapping methods

Mapping methods were in accordance with practices developed for the National Mapping Programme (NMP). All air photographs were examined under magnification and stereoscopically where possible. Oblique and vertical photographs were scanned at a suitable resolution, normally between 350-400dpi, and rectified using appropriate software (AERIAL 5.29). Ordnance Survey 1:2,500 digital maps were used for control and as a base for mapping in AutoDesk Map 2004 and AutoDesk Map 3D 2007. Within the AutoDesk Map drawing files the interpretation of the features was recorded in an attached data table (Table 2.2). Where appropriate, topographic information was derived from Ordnance Survey Land-Form PROFILE (5m vertical interval, scale 1:10,000) and the height data used to create Digital Terrain Models to improve the accuracy of the photo rectification.

FIELD NAME	FIELD CONTENT	Sample data
MONARCH	AMIE Unique Identifier (UID)	1495736
PERIOD	Date of features (EH Thesaurus)	SECOND WORLD WAR
TYPE	Monument type (EH Thesaurus)	MINEFIELD
EVIDENCE	Form of remains (EH Thesaurus)	EARTHWORK
PHOTO	NMR or other reference for the photograph from which the feature was mapped and the date of photography	RAF 58/B/44 5237 19-MAY-1948

Table 2.2 Monument data table attached to all data mapped as part of the APM exercise

Accuracy for the Ordnance Survey map is in the range of $\pm 2.8\text{m}$ and rectification of photographs is normally within $\pm 2\text{m}$. The latter mismatch may increase up to $\pm 4\text{m}$ or more in the inter-tidal areas where the lack of control points on the available source photograph makes a more accurate rectification impossible. When it was not possible to position maritime features accurately due to a lack of reference points on the source photograph, only a circle on the extent of area layer with a diameter of 100m, 500m or 1km (the radius depending on the control points on the source photograph) was drawn. The centre of this was the grid reference obtained from the source photograph.

The Ordnance Survey First Edition and later mapping was routinely consulted as an aid to the interpretation and mapping. Reports of previous archaeological investigations in the project area were consulted, where they were published and readily available.

2.3.6 Recording Practice

All mapped features were recorded in the English Heritage NMR database, AMIE. The monument types and evidence terms used for this project are listed in the Monument Thesaurus. This was routinely consulted and data from EH's GIS was downloaded for use in the AutoDesk Map environment. New records were created (1163), or existing monument records were amended (203), following NMR Heritage Datasets: Monument Recording Guidelines.

2.4 Baseline Assessment of the cultural heritage resource

2.4.1 Resource assessment, quantification and qualification

For the purposes of the NWRCZA the archaeological analysis of the various data sets adopted the following procedure, undertaken for each block. The first step was to generate the buffered study area for the block in question, either to 1km inland from MHWS in rural areas or to the coastal frontage in urban areas. The geology, soils and landuse data were then reviewed and summarised. The next step involved the identification of the SMP Management Areas or Units. The various policy units and preferred options were noted for reference with the identified heritage assets. The HER data was then assessed within each block with reference to specific period divisions (outlined in Chapter 4) and then against specific thematic elements such as ecclesiastical, military or infrastructure sites. The data structures of the various HERs in the NWRCZA area are not consistent and it proved necessary to adapt the form of the queries within

ArcGIS as the project moved from one area to another.

The plots generated from the HERs were then overlain by equivalent plots generated from the APM exercise data sets in order to identify newly discovered sites and those where aerial photographs have enhanced the record. The final stage was to superimpose on these records those generated from the NMR. Once a list of sites had been identified and isolated, either by date or type, these were then written-up for each area. The data present within the HER, NMR and published and unpublished sources was used to explain and expand upon the sites significance within the NWRCZA.

2.4.2 *Assessment of the threat to the identified resource*

The NWRCZA was specifically designed to assess the threat to historic assets arising from coastal erosion. This threat can take one of two forms. First, assets may be modified, truncated or completely destroyed by erosion or inundation. Second, damage may occur as an unintended consequence of various mitigation strategies adopted by national and local government. The policies established in the final SMP 2 documentation were therefore used to assess the level of threat to a site. Additional factors, including the geological and topographical situation of sites were also analysed to assess the level of risk. This produced a simple scoring system whereby low-lying sites on 'soft' geologies where the SMP 2 policy was NAI would be deemed to be much more at risk than site situated on 'hard' geologies, at higher elevations, or where the policy was HTL. In addition, the special interest of a site was assessed based on the professional judgment of the project team with reference to the criteria set below. The different levels of special interest are defined as *High*, *Medium* and *Low* and no distinction has been made for sites which either no longer exist or for which a field visit is required to assess the level of special interest, such as many of the Second World War features. The following criteria (which are not in any order of ranking), have been taken into account for assessing the special interest of the heritage assets present within the NWRCZA study area and are based on those found in Annex 1 of the DCMS guidelines for Scheduled Monuments (DCMS 2010). The criteria should not, however, be regarded as definitive; rather they are indicators which have contributed to the judgment given which is based on the individual circumstances of each site.

- **(i) *Period***: all types of monuments that characterise a category or period should be considered for preservation.
- **(ii) *Rarity***: there are some monument categories which in certain periods are so scarce that all surviving examples which still retain some archaeological potential are of major importance. In general, however, a selection must be made which portrays the typical and commonplace as well as the rare. This process should take account of all aspects of the distribution of a particular class of monument, both in a national and a regional context.
- **(iii) *Documentation***: the significance of a monument may be enhanced by the existence of records of previous investigation or, in the case of more recent monuments, by the supporting evidence of contemporary written records.
- **(iv) *Group Value***: the value of a single monument (such as a field system) may be greatly enhanced by its association with related contemporary monuments (such as a settlement and cemetery) or with monuments of different periods.
- **(v) *Survival/Condition***: the survival of a monument's archaeological potential both above and below ground is a particularly important consideration and should be

assessed in relation to its present condition and surviving features.

- **(vi) Fragility/Vulnerability:** highly important archaeological evidence from some field monuments can be destroyed by a single ploughing, unsympathetic treatment or coastal erosion; sites may therefore be deemed of importance if they are particularly vulnerable to the effects of erosion.
- **(vii) Diversity:** some monuments may be deemed of high special interest because they possess a combination of high quality features, others because of a single important attribute.
- **(viii) Potential:** on occasion, the nature of the evidence cannot be specified precisely but it may still be possible to document reasons anticipating its existence and importance and so to demonstrate the justification suggesting the site is of high importance. This is usually confined to sites rather than upstanding monuments.

Assessment of sites based upon their level of interest and the perceived threat they were under from erosion then provided a list of sites deemed at risk, presented in section 10.4. Additionally the assessment was used to outline a series of themes identified in the North West Regional Research Framework (Brennand 2007), which the coastal archaeological resource could be used to inform upon. Areas where the threat and/or interest of a site could not be established through the desk-based assessment were also noted and highlighted within Chapter 10.

CHAPTER 3

GEOLOGY, TOPOGRAPHY AND SEA LEVEL CHANGE OF THE NORTH WEST COASTAL ZONE

3.1 Geology

3.1.1 *Solid Geology*

The underlying solid geology varies along the coast (Figure 3.1), though the region divides into two broad units, separated by Morecambe Bay. Rocky headlands such as Heysham Head, Humphrey Head and St Bees Head exist north of the southern shore of Morecambe Bay, whereas to the south, the first solid rock headland encountered is at Hilbre Island, in the mouth of the River Dee (Tooley, 1985). Carboniferous rocks are believed to be present throughout the North Irish Sea, but mostly underlie the Permo-Triassic (Dobson, 1977). Permian Red Manchester Marls and Collyhurst Sandstone dominate the bedrock covering SMP cells 11a and 11b. In the Formby area, the Permian mudstone reaches over 100 m thickness below the superficial geology. Overlaying deep deposits of Triassic rock salt and gypsum extend from the Cheshire plain, to the Fylde and into the Irish Sea. Keuper Marl, the most continuous unit of the Permo-Triassic, includes a wide belt that stretches from Fleetwood to Formby (Edwards and Trotter, 1993).

At the southern edge of Morecambe Bay (SMP cell 11c), upper Carboniferous Millstone Grit separates the Permo-Triassic units to the south from the older Silurian sedimentary rocks and Carboniferous Limestone that outcrop around Morecambe Bay. The deposition of Millstone Grit probably occurred as extensive sheets of sandstone above the delta system that resulted in the Limestone complexes. The Carboniferous Limestone defines the geography of inner Morecambe Bay, with less resistant upper Ordovician and Silurian rock forming a more subdued topography inland (Broadhurst, 1985).

North of Morecambe Bay rock outcropping increases and the geology is once more dominated by the Permo-Triassic (BGS, 2007), including St Bees sandstone (Lower Triassic), exposed at Fleswick Bay. SMP cell 11d runs along the north-east margin of the Manx-Furness or east Irish Sea sedimentary basin of post-Lower Palaeozoic age and its orientation is parallel to a major fault line (Tooley, 1985). Late Permian Dolomite, exposed at Barrowmouth, was probably formed in the eastern margin of the Permian Bakevella Sea. At Saltom Bay, Whitehaven Sandstone lies in a conformable bed over Westphalian Coal Measures that stretch from Maryport to Workington. The upper Carboniferous of the West Cumberland Coalfield extends up to 300 m and includes mudstones and sandy beds (Rayner, 1967). It separates the continuation of the Permo-Triassic rocks in the southern Solway Firth.

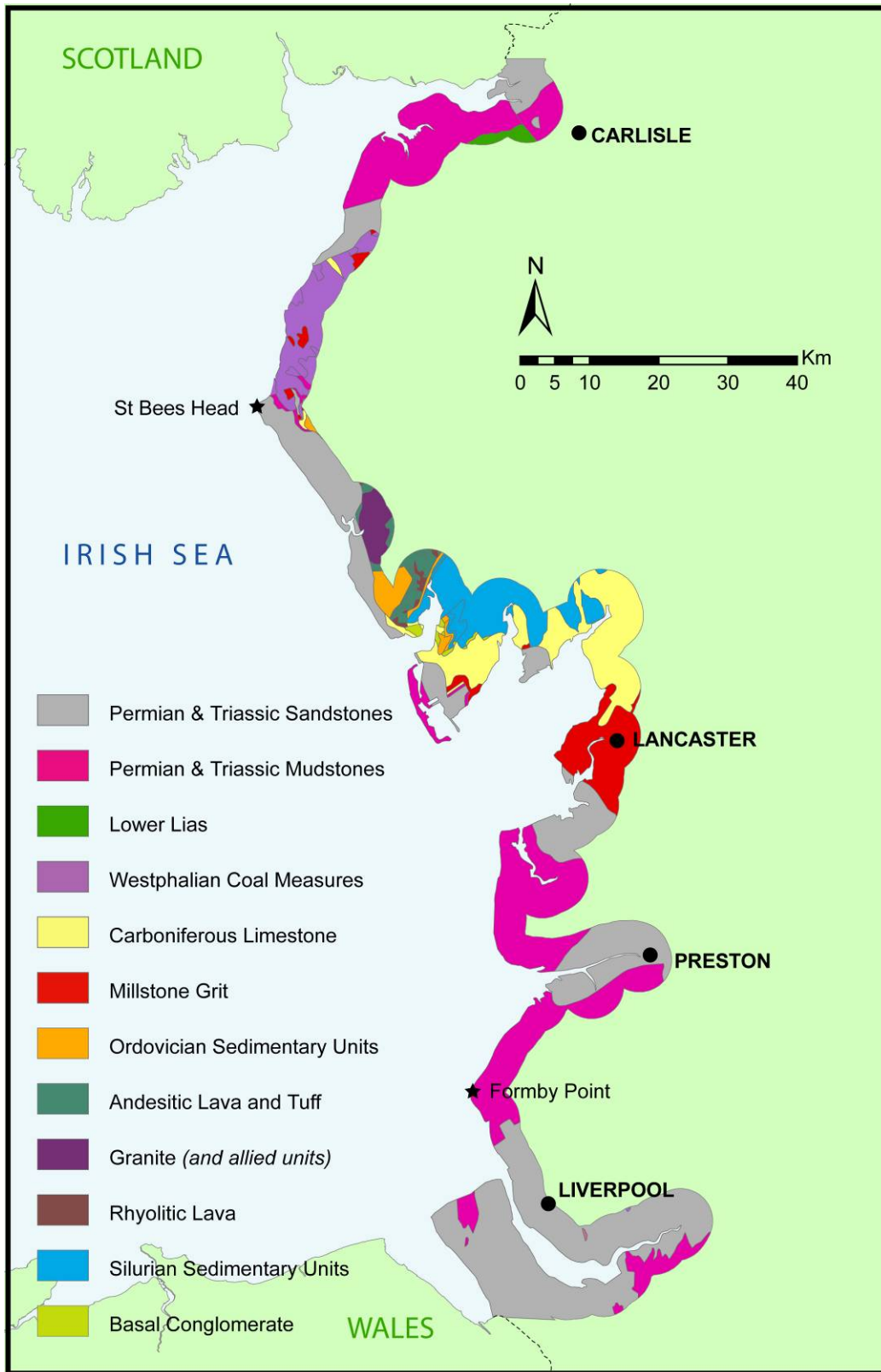


Figure 3.1 Solid geology of 5 km inland zone of the North West coast from the Anglo-Welsh Border to the Anglo-Scottish Border. Solid geology definitions based upon BGS data (BGS, 2007).

3.1.2 *Superficial geology*

Late Glacial Maximum (LGM) glacial till and diamicton dominate the superficial geology of North-West England. Brooks *et al.* (2008) suggest LGM ice to have retreated from the eastern Irish Sea after 14,000 yr BC, though later readvances, such as the Killard Stadial (~12,000 yr BC) (McCabe *et al.*, 2007) continued to deposit glacial material along the North East coast until the end of the Pleistocene. Occupying much of the Cheshire and Lancashire plain is an extensive terrane of sheets of Irish Sea diamict, which rests on and infills tunnel valleys that drain to the south. Overlying the Devensian deposits in the Formby Point region is a discontinuous coversand extending over 200 km², known as the Shirdley Hill Sand. Previously thought to be a Holocene coastal deposit, this is now largely considered to be a windblown deposit of Late Glacial and early Holocene origin (Wilson and Bateman, 2004). To the north of Preston, the Fylde lowland is dominated by the east-west Kirkham moraine composed of a complex sequence of diamict, sand, gravel and lacustrine clay (Chiverrell *et al.*, 2004). North of St Bees the glacial till forms raised beaches due to post LGM isostatic uplift, which at Workington and Whitehaven forms low cliffs. Cliffs also occur to the south of St Bees where the Duddon and Esk Estuaries cut through the glacial deposits. The push moraine at St Bees, was heavily deformed by glaciotectonism during late ice readvances (Williams *et al.*, 2001). In the intertidal zones of the numerous estuaries of the North-West coast, muds and clays overlie the superficial geology, with numerous late Holocene sand dunes and shingle barrier deposits along much of the rest of the region's coastline. Maps outlining the superficial geology of each block are presented in the appropriate chapters.

3.2 **Topography**

The shoreline topography of the North-West coast is, to a large extent, influenced by the shallow waters and wide intertidal areas of the major estuaries which drain into the Irish Sea. The Rivers Dee, Mersey, Ribble, Lune, Kent, Leven, Duddon, Esk and Eden all drain into large estuarine systems with extensive tidal sand and mud flats, backed predominantly by very low-lying reclaimed saltmarsh and low till cliffs. The estuarine intertidal zones, in some cases originally post-glacial river valleys, have been infilled by material transported by the various rivers which flow into them, creating expanses of sand banks which are cut and recut by the changing course of the rivers. The reclaimed marshes, often protected by earthen sea defences rarely exceed more than 5m aOD and the gently undulating till deposits that make up much of the landward portion of the study zone, particularly in its southern extents, are generally lowlying as well, although they do rise to over 50m aOD in places. This low-lying, wide coastal plain reduces in width in southern and western Cumbria, where the Cumbrian massif pushes westward and the low-lying coastal fringe is only a few kilometres wide. Rock outcrops where they do occur are relatively low-lying, and only at St Bee's Head and in the northern reaches of Morecambe Bay do they rise to more than a few tens of metres, with low-lying islands and points, such as Hilbre Island and Heysham Point, being the norm, rising to no more than 10m aOD. More detailed topographic statements are included in Chapters 5 – 9.

3.3. **An Overview of Holocene Coastal Change in North West England**

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3.3.1 *Introduction*

The coast of North West England contains a diverse range of environments, providing suitable resources and locations for human occupation since the retreat of the last British

ice sheet, more than 16000 years ago. It is important to consider relative sea level (RSL) change and coastal evolution of the North West coast to understand how changes in the palaeocoastline affected coastal communities since the Late Upper Palaeolithic. The British Isles ice sheet stored <1 m equivalent sea level at the Last Glacial Maximum but post-glacial isostatic adjustment processes produce vastly contrasting relative sea-level changes at different locations around the coastlines of the UK. The effects of these processes change along the coast of North West England.

The plan of the report is therefore as follows. In Section 3.3.2, we review the mechanisms of Holocene RSL change and the archives of past sea level change to provide a framework to consider the data collected in the North West. Section 3.3.3 reviews the geomorphological processes as important parameters in understanding the temporal and spatial patterns of Holocene coastal change. Section 3.3.4 provides detailed examination of Holocene RSL change and coastal evolution from the Anglo-Welsh to Anglo-Scottish borders, divided into the individual sections of the Shoreline Management Plan (SMP) Cells 11a-11e.

Table 3.1 The Shoreline Management Plan (SMP) cells for the coast of North West England

SMP Cell	Southern Extent	Northern Extent
11a	Great Orme's Head	Formby Point
11b	Formby Point	River Wyre
11c	River Wyre	Walney Island
11d	Walney Island	St Bee's Head
11e	St Bee's Head	The Scottish Border

Due to the nature of the environmental records of Holocene RSL change, there are areas, particularly on stretches of high-energy coast, in which knowledge of past coastal change is limited. In Section 3.3.5 we make recommendations for possible future research and summarise our main conclusions in Section 3.3.6. All ages quoted are in calendar years before 1 BC (yrs BC) unless otherwise indicated (where ages are stated as years before present (yrs BP), present is defined as AD 1950).

3.3.2. Holocene Relative Sea Level Changes

In its simplest form, relative sea-level changes are a function of fluctuations in both ocean and crustal elevations. For each geographical location (φ), the change in relative sea level RSL (τ, φ) at time (τ) can be expressed schematically (Shennan and Horton, 2002) as:

$$\text{RSL}(\tau, \varphi) = \text{Eustatic function}(\tau) + \text{Isostatic function}(\tau, \varphi) + \text{Tectonic function}(\tau, \varphi) + \text{Local factors}(\tau, \varphi)$$

This is a complex relationship as most variables vary in both time and space. The solely time-dependent eustatic function over the last 16,000 years is the change in global volume of water in the oceans due to meltwater discharge from land-based ice sheets and glaciers (Figure 3.1). The isostatic function is the rebound process including both ice (glacio-isostatic) and water (hydro-isostatic) load contributions (Figure 1). Any tectonic effect is usually considered negligible on the millennial timescale in most studies of Great Britain to date (c.f. Kiden, 1995). Local factors include tidal regime, meteorological and hydrological factors, such as changes in air pressure and river discharge, and sediment

compaction. All of these may change through time and may potentially alter how RSL is recorded at each site.

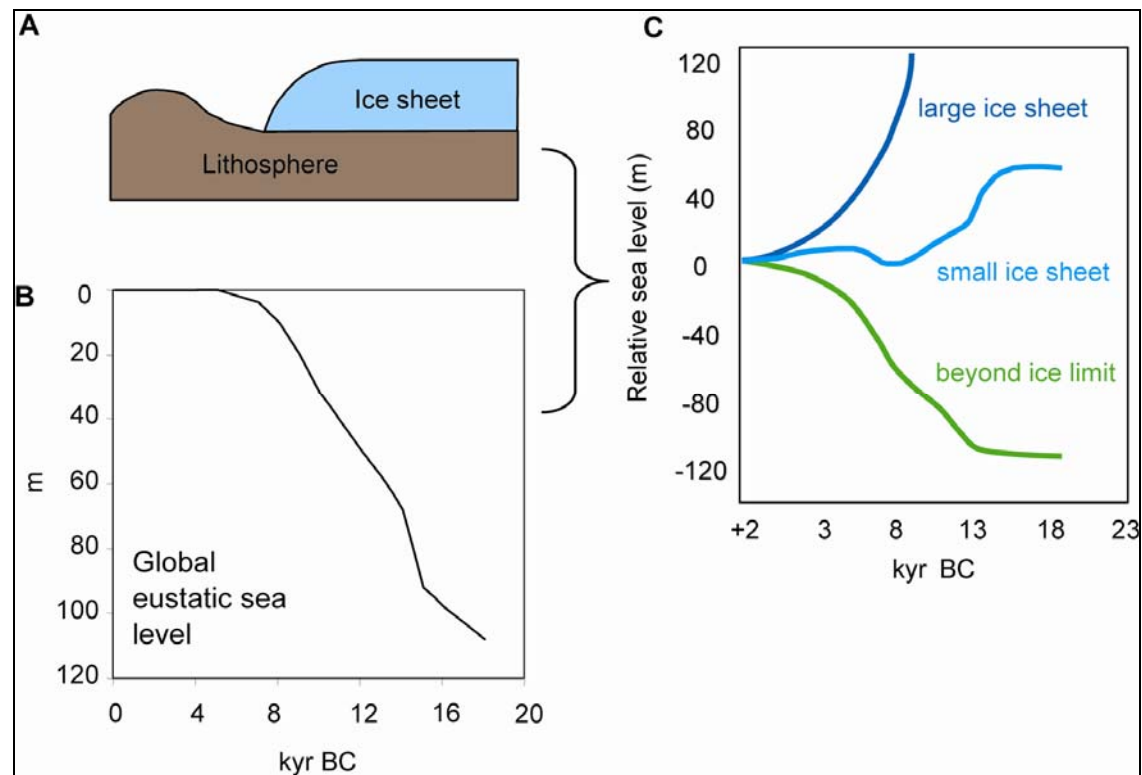


Figure 3.2 - During the last glacial maximum, ~22,000 years ago, ice from Scandinavia and the British Isles extended beyond the present coastline onto the continental shelf. Increased mass of ice caused deformation of the Earth's crust (Figure 3.2A). As global climate warmed, great ice sheets then present across much of North America, Northern Europe, parts of Asia and South America and Antarctica started to melt, causing global, or eustatic, sea-level rise (Figure 3.2B). Patterns of sea-level rise vary from region to region in response to changing distributions of ice and water. Termed relative sea-level change for any particular location on the Earth's surface, the pattern depends on distance from the ice sheet, size of nearby ice sheets and glaciers, their rates of retreat and the structure of the Earth's crust in the region (Figure 3.2C).

Environmental records of Holocene RSL change and coastal evolution have not been destroyed by the series of glacial and interglacial cycles that characterised the Pleistocene and hence can provide a quite detailed record of RSL change. Prior to ~9,050 yr BC there are few records of RSL change as the coastline was offshore from its present position following deglaciation after the Last Glacial Maximum (LGM) ~18-20 kyr BC, with time-transgressive deglaciation following (Evans *et al.*, 2005). The global eustatic sea level curve is largely derived from coral records at locations far from the former ice sheets of the LGM, following model corrections for tectonic and hydro-isostatic effects (Bassett *et al.*, 2005), for example Barbados (Fairbanks, 1989); Huon Peninsula, Papua New Guinea (Chappell and Polach, 1991) and Sunda Shelf (Hanebuth *et al.*, 2000). These records indicate that since the LGM global eustatic sea level has risen 120-125m reaching near present levels ~4050 years BC during the mid Holocene highstand. Since 2050 yr BC there has been minimal polar deglaciation resulting in limited global eustatic sea level change (Peltier, 2002).

Environmental records also capture the effects of the isostatic and local variables of RSL

change. Along the coast of North West England lithology, coastal geomorphology and biological proxies provide elevation and age information allowing reconstruction of local and regional RSL histories. In particular, lithology and micropalaeontological evidence at the contact between intercalated marine and terrestrial sediments at low energy coasts can provide sea level index (SLI) points; indicating the tendency and elevation of sea level change at a given time (Shennan *et al.*, 1983). Over 12,000 SLI points now exist to constrain RSL since the LGM in Great Britain (Shennan and Horton, 2002). Biostratigraphy may also record more subtle changes, for example a transition in the pollen record from a salt marsh assemblage to a freshwater vegetation community (Innes and Frank, 1988). Combined with radiocarbon dating such records can provide limiting dates where the palaeoenvironment indicated by the biostratigraphy is not clearly related to a fossil tide level; at which point sea level must have been at or below that record (Shennan *et al.*, 2000a). Such information helps to constrain SLI points. Combining the environmental evidence of past RSL change with geophysical modelling allows predictions of isostatically-induced sea level changes, improving understanding of the spatial and temporal patterns of RSL change (Shennan and Horton, 2002).

In general, the focus of much RSL research is on the vertical change in sea level, however, models can improve understanding of the horizontal change. Due to the increased influence of anthropogenic activity upon the land and limitations of radiocarbon dating, it becomes difficult to establish detailed RSL history from 1000 yr BC to present when tidal records become available. Along the North West coast, three tide gauges at Gladstone Dock in Liverpool, Heysham and Workington, provide information of changes in sea level from 1991, 1965 and 1992 to present respectively (NTSLF, 2007). A series of combined datasets also provides a near continuous record of sea level at Liverpool from 1768 (Woodworth, 1999).

It is therefore possible to establish a detailed picture of Holocene coastal evolution and RSL change of North West England using a wide range of available field evidence combined with appropriate models. These palaeoenvironmental reconstructions are important to understand the relationship with, and impact of, coastal evolution on the coastal communities of North West England since the late Upper Palaeolithic.

3.3.3 Coastal Geomorphological Processes

The enclosed geography of the Irish Sea dominates the coastal geomorphological processes of the North-West coast. Ireland and the Isle of Man protect the region from waves generated in the Atlantic, resulting in a maximum fetch at Formby of 200 km. The dominant wind direction is south-westerly and wave heights are typically 0.6 to 1.0 m along much of the coast (Draper and Blakey, 1969), though storm waves in excess of 9 m have been recorded off south west Lancashire and over 8 m in Morecambe Bay. The tides in the eastern Irish Sea are semi diurnal with a period of 12.5-13 hours. At Formby mean neap tidal range is 4.5 m and mean spring tidal range 8.5 m (Pye and Neal, 1993). Table 2 summarises the tidal range for tide gauge locations along the North West coast. In Morecambe Bay, tidal range varies with location in the bay, with tidal asymmetry increasing in the inner bay (Mason *et al.*, 1999). Low amplitude and short period waves, combined with macrotidal conditions, result in a typical ridge and runnel beach and wide intertidal zone for many areas of the North West coast. At Formby, for example, a wide multi-barred foreshore exists, its narrowest point at Formby Point, where six or seven ridges are usually visible at low water mark. The ridges are typically breached at 100-200 m intervals by rip channels. The ridges and runnels become less pronounced towards Southport and the River Alt (Pye and Neal, 1993).

Table 3.2 – Mean tidal ranges for the tide gauge locations along the North West Coast (NTLSF, 2008).

	Mean Spring Range (m)	Mean Neap Range (m)
Liverpool	8.22	4.28
Heysham	9.56	4.41
Workington	7.37	3.86

Onshore currents and waves transport fluvio-glacial deposits from the floor of the Irish Sea to form sand and shingle barriers. Walney Island was created from a glacial till bank which has been modified by longshore drift to form a barrier island with shingle beaches and spits on the outside and marshy bays on the inner side. The wide sandy intertidal zone at Lune Bay, whose material is also sourced from the Irish Sea, as well as Morecambe Bay, attenuates waves and provides shoreline protection. The numerous estuaries of the north west coast complicate the pattern of sediment transport. Pye and Neal (1993) note that near-bed residual currents and lower velocity ebb tidal currents than flood tidal currents result in the landward transfer of sediment into Liverpool Bay and the Ribble and Mersey estuaries. In Morecambe Bay, tidal currents are also the dominant agent of sediment transport similarly resulting in a net shoreward movement. A series of complex anticlockwise sediment circulations exist within the outer bay area where there is largely a negative sediment budget (Mason *et al.*, 1999). Sediment transport along the Wirral coastline is controlled by the Dee and Mersey estuaries, with predominant sediment movement west to east via littoral drift from the North Wales coastline, with the Mersey Estuary acting as a sediment sink. Transfer of material between sub cells along the North West coast is limited. At St Bees, for example, eroding cliffs provide the main source of sediment which is transported northwards. Sediment that is not intercepted provides a supply of fine material to the Solway, where the behaviour of the shoreline is highly influenced by the mobile structure of tidal channels within the Solway Firth. The drift divide at St Bees Head, however, means that there is little interaction with the adjacent coastline to the south.

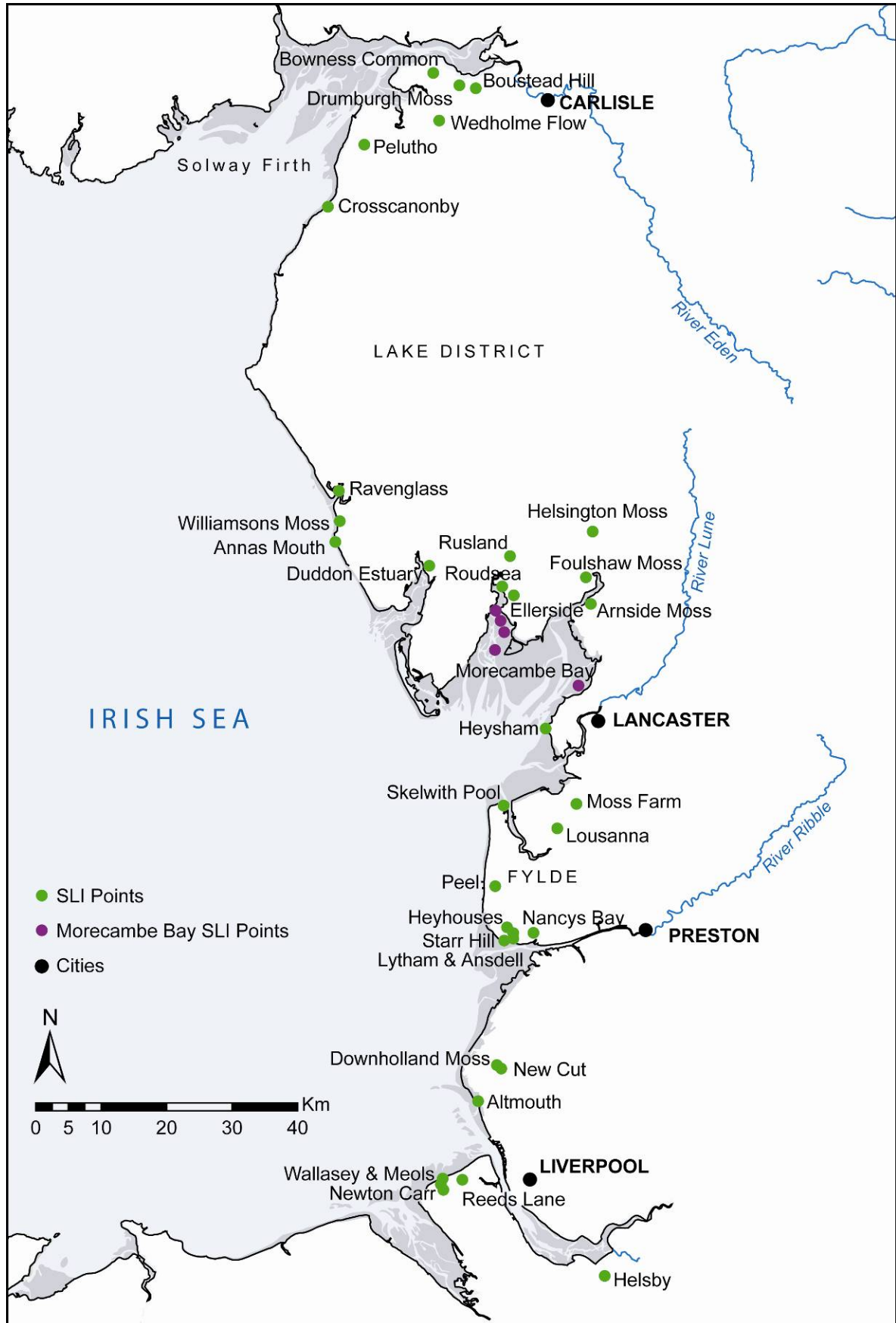


Figure 3.3 - Map of the North West coast from the Anglo-Welsh Border to the Anglo-Scottish Border showing the location of the SLI Points for the region.

3.3.4. North West England Holocene Coastal and RSL Change

The summary of the RSL change and coastal evolution of North West England from the Anglo-Welsh border to Anglo-Scottish Border over the last 12 kyr BC is structured around the Shoreline Management Plan (SMP) cells 11a – 11e. The locations of the SLI points for the North West coast are shown in Figure 3.3 and the main locations discussed within the text are summarised in Figures 3.2 and 3.3. All SLI points for the region are summarised in Tables 3.3 to 3.7.

Anglo-Welsh Border to Formby Point (SMP Cell 11a)

The estuaries of the Mersey and the Dee and the surrounding area provide an archive of Holocene sea level change for the southern North West coast. Shennan and Horton (2002) record 15 SLI points from sites around the Mersey. There is some overlap between SMP cell boundaries and the location of data included in RSL curves, therefore some sites (Altmouth, Formby and Sefton foreshore) from the northern extent of SMP cell 11a are included in the RSL history summarised by the Lancashire sea level curve below.

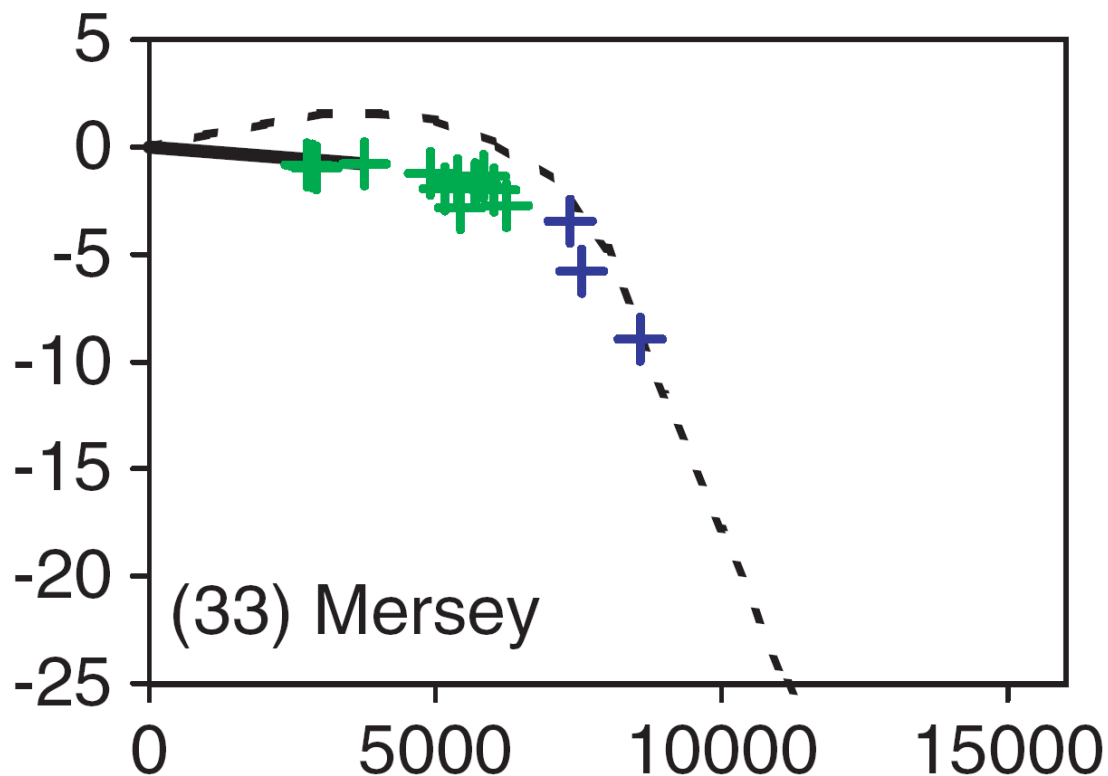


Figure 3.4 - Sea level index points for Mersey sites as calibrated age (yr BP) against change in sea-level relative to present (m) as reported in Shennan and Horton (2002). The best estimate of late Holocene sea level trend plotted as a solid line with the dashed line showing predicted modelled RSL change using a UK-scale model. Note the difference between model predictions and SLI observations. + Basal index points; + Intercalated index points

The oldest record of Holocene sea level change comes from Newton Carr, part of a subsurface depression on the Wirral peninsula, occupying most the area between Hoylake and West Kirkby, where a positive tendency of sea level records incursion of marine conditions at 6814-6460 BC when sea level was -8.97 m below present (Bedlington, 1993). Rapid RSL rise continues in the early Holocene, in line with regional trends, depositing up to 3 m of inorganic marine silt at Newton Carr (Bedlington, 1993;

Innes *et al.*, 1990).

The earliest deposit recorded at Wallasey is a thin band of laminated peats which Kenna (1986) dates to 5490-5245 and 5439-5194 BC marking a time when deciduous woodland lay beyond the present low water mark. Above this layer is 1 m of grey-blue clays and silts (termed the Leasowe Marine Beds) representing tidal flat conditions due to transgression of the coastline. This is then overlain by organics recording a second terrestrial phase where a black peat shows transition from saltmarsh to fen carr woodland during mid to late Flandrian II (before c.5000-4000 BC) (Cowell and Innes, 1994; Kenna, 1986). Further north in the Alt estuary, the maximum extent of mid Holocene intertidal sediments likely occurred to the north of Flea Moss Wood, nr Hightown and Orrell Hill, with north of Orrell Hill occupied by saltmarsh. Marine incursion did not occur to the south of Flea Moss Wood, though changes in the level of the water table resulted in the development in peat growth at Sniggery Wood at 4760-4510 BC (Cowell and Innes, 1994).

Renewed peat formation at Newton Carr occurred ~4500 yr BC where a thick peat (present as both basal and intercalated units) records an extensive terrestrial phase. A thin band of silt interrupts the peat suggesting proximal salt marsh and tidal flat and a period of limited marine incursion at 3904-3654 yr BC (Bedlington, 1993). Similar conditions are recorded in the 'Upper Peat/Forest Bed' at Meols at 4034-3789 BC (Cowell and Innes, 1994). A marine transgression is also recorded at Helsby Marsh c.4000 BC (Huddart *et al.*, 1977). After c.3700 BC widespread regional marine regression occurred resulting in the establishment of oak, pine and birch woodland on the Wirral peninsula. A regressive overlap at Newton Carr records a negative tendency of sea level at 3496-2936 BC with RSL 1.93 m below present (Bedlington, 1993). Above the peat layer at Newton Carr, north of the River Birket, coarse sands dominate the late Holocene sedimentation with the establishment of offshore bars and sand dunes in the coastal zone around Liverpool Bay during a period of static and falling sea level. South of the River Birket a sequence of finer grained intercalated sediments exist, recording a further marine transgression in the late Holocene, followed by organic sedimentation, initially of limus and subsequently peat. At Meols local marine influence is also recorded in the late Holocene at 3100-2704 BC (Cowell and Innes, 1994), similarly at Atlmouth, North Merseyside at 3592-2962 BC (Tooley, 1978b). Burying of peat deposits at Sniggery Wood by wind blown sand occurred at c.3370-3040 BC with the position of the dune belt further east than at present. The dunes protected the lowland areas from later marine incursion, but blocked the drainage of coastal mires (Cowell and Innes, 1994).

During much of the mid Holocene, the coastal margins of Liverpool Bay may have occupied an extensive coastal plain in the lee of a discontinuous back barrier system, resulting in a morphology characteristic of a mesotidal system (Cowell and Innes, 1994). Present day spring tidal range is 8.22 m, requiring a significant increase in tidal range during the late Holocene. This possible tidal increase would account for much of the discrepancy between the model estimates of the mid Holocene highstand and the palaeoenvironmental record (Figure 4), though further research into changes in the tidal prisms is required to resolve this inconsistency (Plater *et al.*, 1999). Late Holocene sea level change in the region is limited with regressive and transgressive overlaps recording changes in local conditions, for example a transgressive overlap at 1120-849 BC is evidence of a period of short lived marine influence at Newton Carr marking RSL at -1.0 m below present (Bedlington, 1993). Dune stability, indicating relative stable periods of sea level, is recorded by fossil dune slacks along the Wirral at AD 1010-1220 to AD

1304-1436 (Kenna, 1986).

The general pattern of RSL change for the southern North West coast is a constant RSL rise dominated by global eustatic sea level change, with local geography determining site-specific RSL change. The possibility of a mid Holocene highstand above present day levels is yet to be resolved, but palaeoenvironmental evidence suggests mid to late Holocene RSL fluctuating around present day levels, resulting in a relatively stable coastline position. Shennan and Horton (2002) propose that the Mersey sits beyond the present day limit of post LGM isostatic uplift, suggesting a rate of subsidence of 0.28 mm yr⁻¹ for the last 4000 years and a best estimate, taking into account sediment compaction, of 0.21 mm yr⁻¹.

Table 3.3 - Summary of SLI points from Mersey. RSL is calculated as altitude minus the reference water level. The RSL error range is calculated as the square root of the sum of square of altitudinal error, sample thickness, tide level error and indicative range.

Site	Lab code	¹⁴ C age ± 1σ	Change in RSL (m)	Calibrated age (yr BC)			Longitude W	Latitude N
				Ma x	Med	Min		
Mersey sea level index points								
Newton Carr	SRR4641	7805 ± 55	-8.97 ± 0.21	681 4	6624	6469	308240	5323410
Newton Carr	SRR4514	6680 ± 75	-5.79 ± 0.21	570 9	5598	5484	308240	5323410
Wallasey	SRR1494	6420 ± 60	-3.46 ± 0.21	547 6	5400	5306	308310	5324380
Newton Carr	SRR4513	5465 ± 90	-2.73 ± 0.21	445 9	4296	4045	308240	5323410
Meols	SRR2694	5250 ± 50	-2.01 ± 0.21	422 3	4074	3967	308450	5324090
Meols	SRR2929	5120 ± 50	-1.37 ± 0.21	403 4	3897	3789	308450	5324090
Newton Carr	SRR4512	4965 ± 40	-1.77 ± 0.21	390 4	3745	3654	308240	5323410
Reeds Lane	SRR1575	4700 ± 70	-2.82 ± 0.21	363 8	3489	3359	305480	5324330
Meols	SRR2693	4620 ± 50	-1.54 ± 0.21	362 2	3439	3104	308450	5324090
Newton Carr	SRR4511	4525 ± 65	-1.93 ± 0.21	349 6	3217	2936	308240	5323410
Meols	GU1312	4315 ± 70	-1.21 ± 1	330 8	2955	2685	308450	5324090
Wallasey	GU1271	3490 ± 60	-0.79 ± 0.21	195 6	1814	1640	308480	5324320
Newton Carr	SRR4510	2825 ± 40	-1 ± 0.21	112 0	978	849	308240	5323410
Wallasey	GU1270	2750 ± 55	-0.89 ± 0.8	100 1	900	807	308500	5324320
Reeds Lane	SRR1574	2620 ± 40	-0.85 ± 0.21	895	808	596	305480	5324330

Formby Point to River Wyre (SMP Cell 11b)

A significant contribution to our knowledge of the sea level changes of North West England during the Holocene come from a series of seminal papers from this section of the coast by Tooley (1974; 1976; 1977b; 1978a; 1978b; 1980; 1982; 1985).

Palaeoenvironmental records of pollen and diatoms, combined with radiocarbon dating, define ten marine transgressions during the Holocene along the Lancashire coast, termed Lytham I to X (Tooley, 1978b). Much of this data comes from sequences at Lytham and around Formby Point, in particular Downholland Moss. Re-evaluation of the data within the concept of transgressive and regressive overlaps (Shennan, 1980; Shennan *et al.*, 1983), results in Lytham I to X redefined as 12 transgressive and 12 regressive overlap periods (Tooley, 1982). Combined with additional work by Huddart (1992), Shennan and Horton (2002) report 42 SLI points and 1 limiting date for Lancashire (Table 3.2, Figure 3.5).

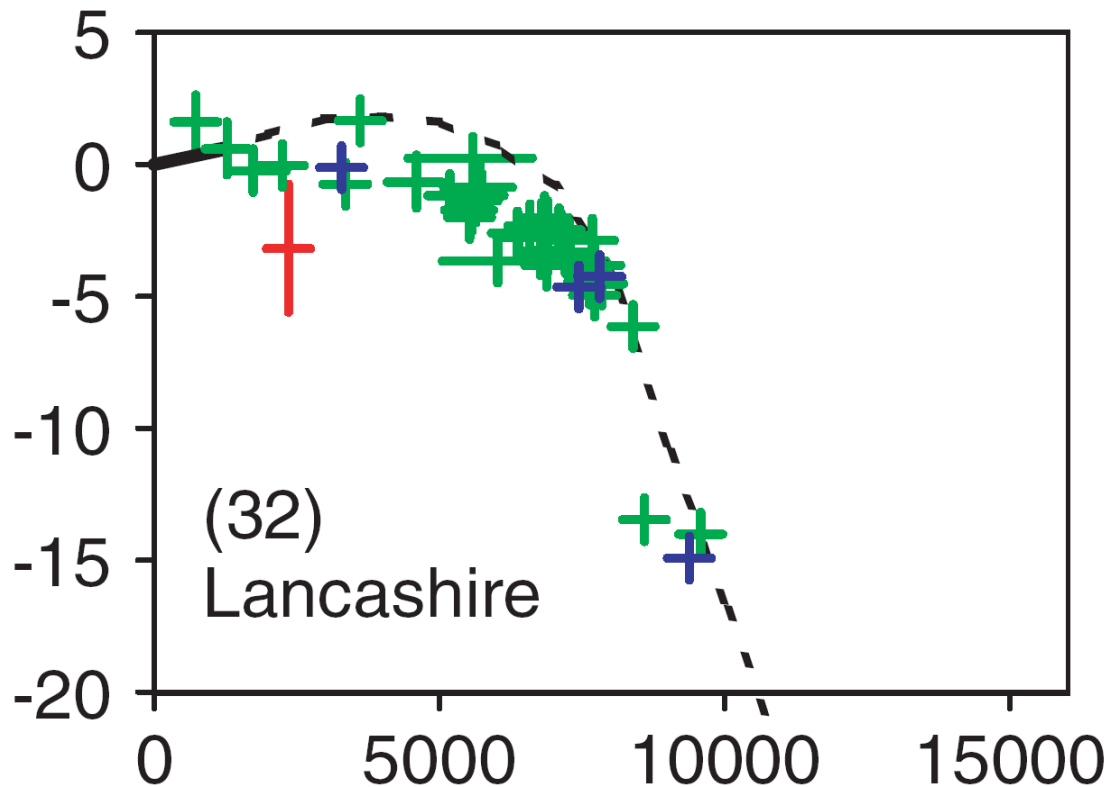


Figure 3.5 - Sea level index points for Lancashire sites as calibrated age (yr BP) against change in sea-level relative to present (m) as reported in Shennan and Horton (2002). The best estimate of late Holocene sea level trend plotted as a solid line with the dashed line showing predicted modelled RSL change. + Basal index points; + Intercalated index points; + Limiting dates

The earliest indication of marine influence on this section of coast is at Heyhouses Lane, St Annes, Lytham (Tooley, 1978b). A regressive overlap records the progressive removal of coastal taxa by freshwater taxa providing a SLI point of 7958-7357 BC with RSL at -14 m below present. At the Starr Hills, Lytham a peat surface dated at 7393-7141 BC overlain by marine silts and clays records marine transgression with RSL -14.94 m relative to present (Tooley, 1978b). Higher concentration of Gramineae, Chenopodiaceae and *Artemisia* pollen grains towards the top of the peat indicates increasing marine influence. The same core at Heyhouses Lane, shows renewed marine sedimentation at 6982-6473 BC with RSL -13.5 m below present (Tooley, 1976; 1978b). Between 6400-5800 BC marine transgression had pushed the coastline inland over 2 km from its present position around south-west Fylde, its landward migration limited by windblown sand approximately 3 km east of the present coast (Middleton *et al.*, 1995;

Tooley, 1978b).

RSL rise during the early Holocene was rapid, which Tooley (1978b) suggests was in the order of 7 m in 200 years, from -13.5 to -6.13 m as recorded at Nancy's Bay at 6633-6244 BC. A sequence of transgressive overlaps where marine silts overlap monocotyledonous peat at Nancy's Bay and Downholland Moss dating from 6633-5634 BC then record RSL rise to -4.17 m below present. From this point onwards, the Lancashire RSL curve is constrained by both regressive and transgressive overlaps (Tooley, 1982). A regressive overlap of salt marsh silt overlain by reedswamp organics followed by a transgressive overlap back to salt marsh silt and clay provides SLI points of -3.81 and -2.88 m below present at 6215-5367 BC and 5891-5561 BC respectively at New Cut (Huddart, 1992). These sit above the SLI points recorded by Tooley (1978b) at -4.47 and -4.18 m below present at ~5650 BC. The presence of *Chenopodiaceae*, *Rumex* and *Galium* at Peal (5660-5301 BC RSL -4.63 m below present) records approaching marine conditions ~5400 BC in the Lytham-Skipplow valley. During this period, the Wyre and Ribble estuaries linked by the marine inundated valley and the western Fylde became an island (Middleton *et al.*, 1995).

Sea level continued to rise into the mid Holocene, though at a decreased rate. Numerous SLI points at Nancy's Bay and Downholland Moss corroborate rising RSL at -3.29 to -1.99 m below present from 5468-4453 BC. At Nancy's Bay both transgressive and regressive overlaps provide SLI points from intercalated silts and peats, and corresponding shifts from marine to/from freshwater taxa (Tooley, 1978b). Maximum incursion of marine influence occurred during the mid-Holocene highstand and palynological analysis shows marine transgression (originally termed Lytham VI) and subsequent regression occurring in association with the elm decline. The mid-Holocene highstand transgression interrupted biogenic deposition at Arnsdale and Silverdale mosses in lowland Lonsdale. In the Lytham-Skipplow valley, deposition of silty-clays occurred and glacio-fluvial gravel islands stood above the level of the sea (Middleton *et al.*, 1995). A core at Lousanna, just north of the River Wyre, records maximum marine inundation in Lancashire at 0.24 m above present levels. South of the river a regressive overlap from the base of a peat at Lytham Hall Park shows RSL at -0.87 m below present at 4317-3125 BC (Tooley, 1978b) as sea level began to fall from the mid-Holocene highstand at the beginning of Flandrian III. Evacuation of the tidal flat zone from Gravel, near Crossens, to the Alt Mouth occurred and similarly Lytham Common and Heyhouses Lane record no marine influence after 3945-3663 BC and 3942-3384 BC respectively (Tooley, 1978b). After 2000 years of isolation of western Fylde, biogenic sedimentation of the Lytham-Skipplow valley prevented further marine transgression, resulting in east and west Fylde reuniting. Initially domination of the area was by salt marsh creeks and saltpans, but as sea level fell, brackish water communities colonised the area, eventually replaced by freshwater reedswamps (Middleton *et al.*, 1995).

Perimarine zone sedimentation corroborates the Holocene RSL changes recorded by intertidal and lagoon deposits. A perimarine area is where sedimentation "took place under the direct influence of the relative sea level movements but where marine or brackish sediments themselves are absent" (Hageman, 1969). Martin Mere, now a much smaller freshwater lake, was such an environment during the mid Holocene. It measured 6 km by 3 km, occupied ~687 ha, with a water surface altitude that varied from +2.7 to +3.4 m OD and a maximum water depth of 6 m (Tooley, 1985). A core from the south-western limit of the basin records a rise in the freshwater table between 6000-4000 BC which initiated organic sedimentation and an increase in the frequency of reedswamp and

aquatic taxa pollen. The rise in the water table was consequent on sea level changes as recorded by regressive overlaps dated at Downholland Moss at 5974-5735 BC and 5806-5458 BC (Tooley, 1985). A core from the eastern extent, at Langley Brook, also records freshwater sedimentation under fluctuating water tables (McAllister *et al.*, 2004). Gresswell (1958) initially attributed the area of Martin Mere to the 'Hillhouse coastline', however evaluation of the litho- and bio-stratigraphic data suggests that marine influence never reached this far inland, and the 'Hillhouse coastline' is the former freshwater lake shoreline (Tooley, 1976; 1977a; 1978b).

From mid to late Holocene further transgressive and regressive overlaps record a fluctuating sea level, mainly dependant on local conditions and events such as the breaching, stabilisation and retreat of sand dunes and gravel bars that established during the relatively stable period of sea level. As the rate of biogenic sedimentation outpaced the rate of sea level rise, marine transgressions were restricted to inlets surrounding Lancashire's estuaries. Lytham Hall Park records three transgressive overlap tendencies during the late Holocene (Tooley, 1982) where an inlet on the north side of the Ribble estuary, to the west of Church Scar, was vulnerable to marine inundation until accumulation of shingle across the mouth of the inlet ~1000 yr BC (Tooley, 1978b). Pollen taxa indicative of open marine conditions, such as Chenopodiaceae and *Armeria*, replace freshwater taxa, including *Iris* and *Hydrocotyle* at 1748-998 BC and 1679-947 BC with RSL at -0.76 and -0.1 m below present. The second late Holocene transgression is 358 BC – AD 665, dated from the base of a peat overlying estuarine clay at Ansdell, Lytham (Tooley, 1978b). Evidence for the final transgression period comes from a well developed layer of peat from AD 1039-1298 that stratigraphically divides the Starr Hills sand dunes (Tooley, 1978b). Tooley (1978b) proposes this stratum closely relates to a period of relatively high sea level, which is associated with dune stability, wet slacks and peat accumulation. Conversely, dune instability and sand drifting would occur during periods of low sea level. Tooley (1978b) suggests that periods of lower sea level during the late Holocene provided the material of dune and barrier building, which then stabilised during higher sea levels. In comparison, on the coast of North East England, Wilson *et al.* (2001) propose most dune building in Northumberland was associated with regressive shorelines and periods of climate deterioration, for example during the Little Ice Age; which is in line with evidence from the Sefton dunes (Pye and Neal, 1993).

The material for the dune complex along the Formby coast probably originated from an offshore sand bank in existence by 4450 BC (Innes and Tooley, 1993; Pye and Neal, 1993). Low dunes began to form along Formby and the Sefton coast from 2800 BC in association with increased wave energy and a renewed higher sea level (Innes and Tooley, 1993). It is likely that the dunes along the southwest Fylde coast formed slightly later. On Formby Foreshore, a date of 787-118 BC from the base of a peat bed overlying a coarse sand records a period of relative dune stability (Tooley, 1978b) which allowed the development of sheltered lagoon and salt marsh environments in the lee of the dunes (Innes and Tooley, 1993). Animal and human footprints occur along the Formby coast preserved in marine silts interbedded with sands and dating to 2389-1696 BC (Huddart *et al.*, 1999). During AD 1200-1400 climate instability initiated coastal erosion and sand blowing, which continued through the Little Ice Age. Sand tongues and sheets extended inland and buried peats at Downholland Moss (Tooley, 1978b). Dune stabilisation reoccurred in the nineteenth century with anthropogenic planting of marram grass, which results in the majority of the Formby dune complex being very young (Pye and Neal, 1993). Recent changes along this area of coast are associated with human activity. Van de Wal *et al.* (2002) show increased sedimentation in the Ribble Estuary over the last 150

years as a consequence of embankment construction and reclamation, reducing the intertidal area, tidal prism and current velocities of the estuary. Here, human activities have outstripped natural forcings in the development of the recent coast.

The dominant control on Holocene sea level changes of the Lancashire coast is the global eustatic sea level rise following the LGM, which has been modified by regional and local processes, particularly from the mid Holocene to present. However, the proximity of the area to the former Lake District ice dome and the Irish Sea ice lobe means that isostatic adjustment is ongoing. The rate of isostatic uplift for Lancashire given by Shennan and Horton (2002) is 0.1 mm yr⁻¹ with a best fit estimate, taking into account sediment compaction, of 0.47 mm yr⁻¹, meaning south Lancashire marks the southern extent of contemporaneous GIA uplift in western England.

Table 3.4 - Summary of SLI points and limiting data from Lancashire. RSL is calculated as altitude minus the reference water level. The RSL error range is calculated as the square root of the sum of square of altitudinal error, sample thickness, tide level error and indicative range.

Site	Lab code	¹⁴ C age ± 1σ	Change in RSL (m)	Calibrated age (yr BC)			Longitude W	Latitude N
				Max	Med	Min		
Lancashire sea level index points								
Heyhouses Lane	HV4346	8575 ± 105	-14.01 ± 0.21	7958	7637	7357	300070	5345250
Starr Hills	HV4343	8390 ± 105	-14.94 ± 0.21	7593	7431	7141	300290	5344210
Heyhouses Lane	HV4345	7820 ± 60	-13.45 ± 0.21	6982	6651	6473	300070	5345250
Nancys Bay	HV4125	7605 ± 85	-6.13 ± 0.21	6633	6448	6244	256270	5345000
New Cut	HV12537	7015 ± 90	-4.53 ± 0.21	6050	5886	5719	300400	5333460
Downholland Moss	HV3936	6980 ± 55	-4.25 ± 0.21	5979	5854	5735	300070	5333570
Nancys Bay	HV4126	6885 ± 80	-4.97 ± 0.21	5967	5773	5634	256270	5345000
New Cut	HV12540	6870 ± 235	-3.81 ± 0.21	6216	5775	5367	301040	5333380
New Cut	HV12539	6840 ± 85	-2.88 ± 0.06	5891	5731	5561	301040	5333380
Downholland Moss	HV3935	6760 ± 95	-4.47 ± 0.21	5806	5667	5484	300070	5333570
Downholland Moss	HV2680A	6750 ± 175	-4.18 ± 0.21	5986	5665	5367	301360	5334030
Peel	HV3934	6535 ± 110	-4.63 ± 0.21	5660	5491	5301	301520	5348490
New Cut	HV12538	6435 ± 300	-3.66 ± 0.22	5962	5341	4712	300400	5333460
Nancys Bay	HV4131	6290 ± 85	-3.29 ± 0.21	5468	5253	5041	256050	5344400
Nancys Bay	HV5294	6250 ± 55	-2.87 ± 0.22	5318	5217	5054	256050	5344400
Nancys Bay	HV4130	6245 ± 115	-2.67 ± 0.21	5467	5183	4858	256050	5344400
Downholland Moss	HV8650	6210 ± 100	-2.49 ± 0.21	5368	5151	4852	310200	5333580
Downholland Moss	HV3358	6050 ± 65	-3.27 ± 0.21	5205	4946	4777	301360	5334030
Downholland Moss	HV8649	6050 ± 80	-2.21 ± 0.21	5209	4952	4731	310200	5333580
Nancys Bay	HV4127	6025 ± 85	-3.8 ± 0.21	5208	4923	4715	256270	5345000
Downholland Moss	HV8651	5985 ± 195	-1.99 ± 0.21	5319	4889	4453	310200	5333580

Nancys Bay	HV4129	5950 ± 85	-2.28 ± 0.21	5046	4832	4609	256050	5344400
Nancys Bay	HV4124	5945 ± 50	-3.38 ± 0.21	4930	4821	4715	256270	5345000
Nancys Bay	HV4128	5775 ± 85	-2.33 ± 0.21	4826	4627	4405	256050	5344400
Downholland Moss	HV3847	5615 ± 45	-2.74 ± 0.21	4527	4438	4353	301160	5334030
Downholland Moss	HV2683	5565 ± 205	-2.6 ± 0.21	4844	4410	3965	301360	5334030
Helsby Marsh	HV2685	5250 ± 385	-3.68 ± 0.21	4915	4062	3098	246030	5316460
Lytham	HV3845	5005 ± 65	-1.17 ± 0.21	3945	3801	3663	300540	5345250
Lytham	HV2919	4960 ± 210	-0.87 ± 0.21	4317	3758	3125	259250	5345040
Lousanna	HV3052	4900 ± 450	0.24 ± 0.21	4670	3637	2496	253200	5353470
Heyhouses Lane	HV4344	4895 ± 95	-1.39 ± 0.21	3942	3695	3384	300070	5345250
Moss Farm	HV4347	4830 ± 140	-1.72 ± 0.24	3960	3607	3141	250410	5355420
Peel	HV3933	4800 ± 75	-2.02 ± 0.22	3709	3574	3371	301520	5348490
Altmouth	HV2679	4545 ± 90	-1.19 ± 0.22	3514	3236	2927	303480	5331040
Downholland Moss	HV4705	4090 ± 170	-0.65 ± 1	3090	2643	2139	302160	5333550
Lousanna	GAK2500	3370 ± 120	1.67 ± 0.21	1955	1671	1406	253200	5353390
Lytham	HV2918	3150 ± 150	-0.76 ± 0.21	1746	1406	998	259140	5344570
Lytham	HV2917	3090 ± 135	-0.1 ± 0.21	1679	1329	947	259140	5344570
Lytham	HV2916	2270 ± 65	-0.04 ± 0.22	495	301	118	259140	5344570
Ansdell	HV5215	1795 ± 240	-0.22 ± 0.21	358	AD 215	AD 665	259180	5344240
Ansdell	HV4708	1370 ± 85	0.6 ± 1	AD 470	AD 666	AD 885	259140	5344310
Lytham	HV4417	805 ± 70	1.63 ± 1	AD 1039	AD 1213	AD 1298	300540	5345250
Lancashire limiting data								
Nancys Bay	HV9260	2330 ± 65	-3.17 ± 2.44	759	404	200	255450	5344400

River Wyre to Walney Island (SMP Cell 11c)

Some of the late Holocene SLI points presented in the sea level curve for Lancashire (Table 3.3, Figure 3.6) (Shennan and Horton, 2002) come from Lousanna, just north of the River Wyre (Tooley, 1978b). The southern extent of SMP cell 11c is therefore considered to have a very similar Holocene sea level history to SMP cell 11b. A separate sea level history exists for Morecambe Bay consisting of 28 SLI points and 3 limiting dates (Shennan and Horton, 2002).

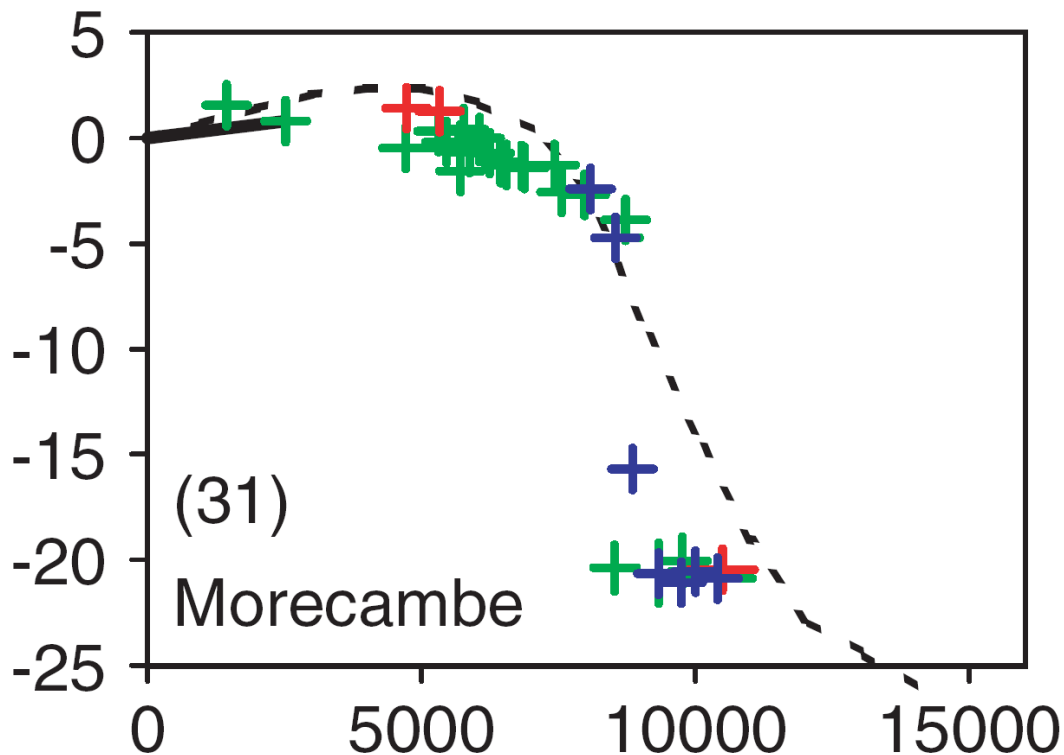


Figure 3.6 - Sea level index points for Morecambe sites as calibrated age (yr BP) against change in sea-level relative to present (m) as reported in Shennan and Horton (2002). The best estimate of late Holocene sea level trend plotted as a solid line with the dashed line showing predicted modelled RSL change. + Basal index points; + Intercalated index points; + Limiting dates

Morecambe Bay provides the oldest record of marine inundation of North West England. A SLI point from a peat at Heysham fixes RSL at -20.87 m below present at 9096-7962 BC (Tooley, 1978b). Within the first millennium of the Holocene, a protected bay was already in existence, suggesting the developing Irish Sea had submerged any possible land bridge linking England and Ireland. The rate of RSL rise in Morecambe Bay at the start of the Holocene is estimated at $+10 \text{ mm yr}^{-1}$ slowing to $+4 \text{ mm yr}^{-1}$ around 8300 BC (Tooley, 1974; Tooley, 1978b). The rate of rise then slowed, with a minimum rate of $+1.6 \text{ mm yr}^{-1}$ from 8300 to 6870 BC (Zong and Tooley, 1996), during which time the present coast of Morecambe Bay had been transgressed (Tooley, 1978b). A period of rapid rise ($+36.7 \text{ mm yr}^{-1}$) occurred at 6870-6510 BC (Zong and Tooley, 1996). Rapid RSL rise of the early Holocene ended peat growth at 7124-6648 BC in the Leven Estuary, with RSL -15.71 m below present. Open habitat and coastal taxa, including *Chenopodiaceae* and *Armeria* are present in the top of the peat with is overlain by a marine facies of silty-clay, fine sand and occasional pebble beds (Huddart *et al.*, 1977).

Zong and Tooley (1996) suggest the rate of RSL fluctuated between -8 mm yr^{-1} and $+12 \text{ mm yr}^{-1}$ since 6510 BC. Some of this variance is explained by the consolidation of Holocene sediments over time and palaeotidal changes which alter the elevation of SLI points. Hinton (1996) suggests that tidal amplitudes in Morecambe Bay reduce as mean water levels lower. Zong and Tooley's (1996) evidence from Skelwith Pool suggests that a rise of sea level at a rate over $+4 \text{ mm yr}^{-1}$ would have resulted in extensive marine inundation of the lowlands. At Roudsea Wood rising sea level deposited intertidal sediments at 6243-5991 BC (Zong, 1998). After 4250 BC, either a fall in sea level or increased sedimentation reduced marine influence in this area of Morecambe Bay. Zong

and Tooley (1999) show the occurrence of nine flood events associated with storm surge conditions between 5201-4728 BC and 4766-4456 BC as marine sediments were washed into a back barrier lagoonal setting at Roudsea Wood. After ~3000 BC RSL began to stabilise and then fall as recorded by a series of regressive overlaps around Morecambe Bay, including at Skelwith Pool (Zong and Tooley, 1996) and Roudsea Marsh, where pollen analysis also shows seaward expansion of salt marsh (Zong, 1998). At Helsington Moss, in the Gilpin valley, marine conditions ended at ~4000 BC, similarly at Arnside Moss at 4030-3638 BC with RSL 0.42 m above present. This retreat, which is comparable to the removal of marine conditions from south Lancashire at the start of Flandrian III (~3000 BC), occurred slightly earlier at Morecambe Bay, likely due to isostatic uplift of the area (Tooley, 1978b).

A transgression occurred ~2250 BC with a RSL rise of ~1m recorded by diatoms at Roudsea Wood (Zong, 1998) and a regressive overlap from 3326-2343 BC at Heysham Moss where RSL was -0.49 m below present (Huddart *et al.*, 1977). Skelworth Pool stratigraphy records the largest sea level fluctuation of the mid to late Holocene at this time, shifting from +10 mm yr⁻¹ to -8 mm yr⁻¹ and back to +8 mm yr⁻¹ in 500 years (Zong and Tooley, 1996). Zong (1998) suggests that shoreline retreat was minimal, but rather salt marsh zones at Roudsea Wood migrated inland. Marine influence then reduced and a sandbank began to develop in the upper Leven estuary. After 779-388 BC RSL rose again at Roudsea Wood, overtopping the sandbank and shifting salt marshes inland again (Zong, 1998). A final regression occurs at AD 433-596 in the sequence at Arnside Moss with RSL 1.55 m above present recorded by a 10 cm layer of silty fine sand overlying a woody peat (Huddart *et al.*, 1977). Since then RSL has subtly fallen and estuarine tidal flats have dominated the Bay.

North of the southern margin of Morecambe Bay, there is an increase in the angle of transgressive surfaces compared to southern Lancashire, reflecting the greater ice load in the north than the south during the LGM (Tooley, 1978b). Shennan and Horton (2002) suggest 0.5 mm yr⁻¹ of isostatic uplift since 4000 yrs BP, with a best fit estimate, taking into account sediment compaction, of 0.69 mm yr⁻¹.

Table 3.5 - Summary of SLI points and limiting data from Morecambe. RSL is calculated as altitude minus the reference water level. The RSL error range is calculated as the square root of the sum of square of altitudinal error, sample thickness, tide level error and indicative range.

Site	Lab code	¹⁴ C age ± 1σ	Change in RSL (m)	Calibrated age (yr BC)			Longitude W	Latitude N
				Max	Med	Min		
Morecambe sea level index points								
Heysham	BIRM139	9195 ± 155	-20.87 ± 0.85	9096	8440	7962	255330	5401520
Heysham	BIRM140	8925 ± 200	-20.54 ± 0.52	8536	8051	7587	255350	5401520
Morecambe Bay	HV3361	8740 ± 65	-21.09 ± 1	8161	7796	7595	301400	5410420
Morecambe Bay	HV3356	8685 ± 175	-20.03 ± 1.13	8259	7805	7458	301070	5409470
Morecambe Bay	HV3462	8330 ± 125	-20.63 ± 1.44	7577	7366	7081	250350	5405270
Morecambe Bay	HV3362	7995 ± 80	-15.71 ± 0.82	7124	6904	6648	302230	5408180
Skelwith Pool	Q2782	7875 ± 85	-3.88 ± 0.23	7044	6771	6509	300520	5355290
Rusland	HAR3709	7750 ± 100	-4.74 ± 0.22	7024	6592	6413	300260	5416040

Morecambe Bay	HV3360	7725 ± 95	-20.39 ± 1.1	6980	6566	6392	302210	5411320
Roudsea Wood 33	Be79290	7270 ± 70	-2.4 ± 0.21	6243	6132	5991	301296	5413330
Skelwith Pool	Q2783	7150 ± 80	-2.69 ± 0.21	6205	6014	5840	300520	5355290
Roudsea Wood	Q2098	6680 ± 65	-2.54 ± 0.22	5707	5596	5484	301240	5413520
Roudsea Wood	Be79291	6520 ± 70	-1.27 ± 0.21	5615	5481	5327	301296	5413330
Roudsea Wood	Be79292	6030 ± 70	-1.42 ± 0.21	5201	4923	4728	301296	5413330
Roudsea Wood	Be79293	5990 ± 70	-1.33 ± 0.21	5043	4879	4717	301296	5413330
Roudsea Wood	Be79294	5740 ± 60	-1.29 ± 0.21	4766	4592	4456	301296	5413330
Skelwith Pool	Q2784	5660 ± 55	-1.14 ± 0.21	4668	4495	4357	300520	5355290
Skelwith Pool	Q2785	5430 ± 50	-0.72 ± 0.4	4356	4281	4051	300520	5355290
Skelwith Pool	Q2786	5130 ± 50	-0.66 ± 0.06	4036	3918	3795	300520	5355290
Arnside Moss	HV3460	5015 ± 100	0.42 ± 0.21	4030	3817	3638	249010	5412120
Skelwith Pool	Q2787	4980 ± 55	-0.35 ± 0.21	3939	3767	3652	300520	5355290
Roudsea Wood	Be79295	4970 ± 60	-1.58 ± 0.21	3939	3759	3646	301296	5413330
Skelwith Pool	Q2788	4710 ± 75	-0.2 ± 0.21	3640	3500	3360	300520	5355290
Foulshaw Moss	Q88	4616 ± 112	0.3 ± 0.36	3638	3366	3027	249430	5414230
Heysham	HV2920	4190 ± 150	-0.49 ± 0.21	3326	2762	2343	252470	5402240
Roudsea Wood	Be88434	2420 ± 80	0.78 ± 0.21	779	559	388	301352	5413330
Arnside Moss	HV3461	1545 ± 35	1.55 ± 0.21	AD 433	AD 503	AD 596	249010	5412120
Morecambe limiting data								
Heysham	BIRM141	9270 ± 200	-20.46 ± 2.60	9205	8543	7969	255350	5401530
Roudsea Wood	Be79296	4620 ± 90	1.25 ± 2.62	3633	3386	3091	301269	5413330
Roudsea Wood	Be79297	4190 ± 50	1.4 ± 2.62	2891	2768	2621	301296	5413330

Walney Island to St Bee's Head (SMP Cell 11d)

Much fewer low energy sedimentary environments suitable for the preservation of an archive of Holocene sea level change exist between the till outcrops of the Cumbrian coast, where marine erosion ensures a supply of larger sized material. Consequently, Shennan and Horton (2002) report only 6 SLI points for Cumbria (Table 3.6, Figure 3.7).

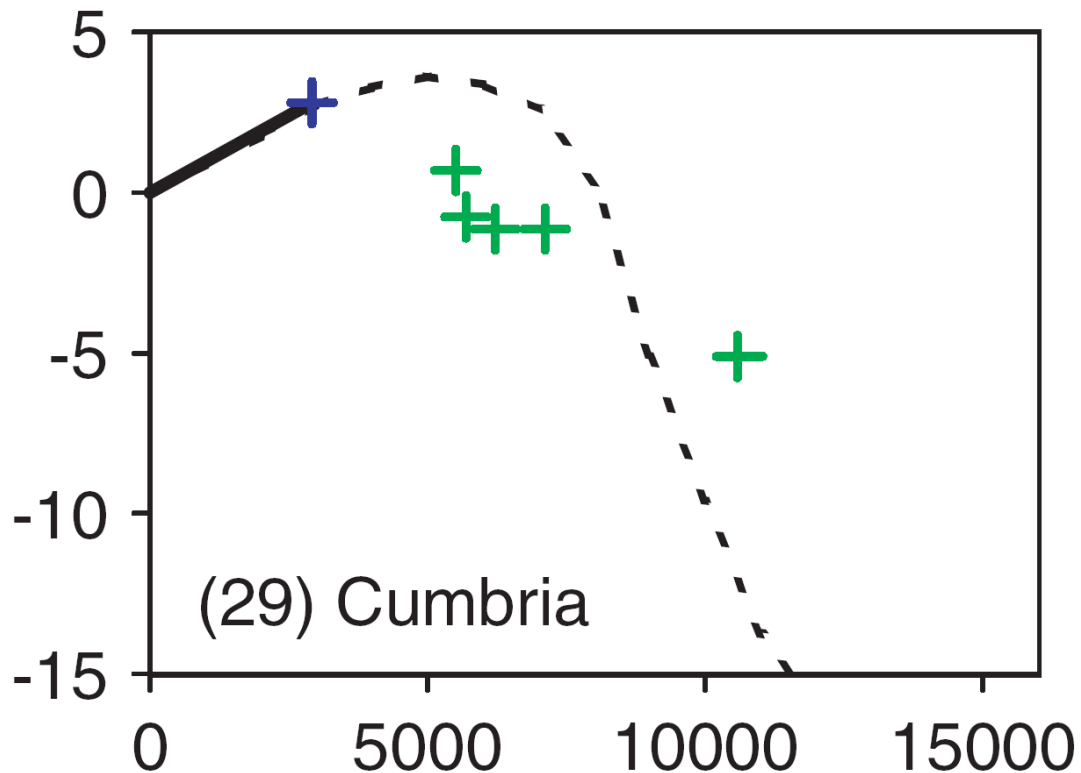


Figure 3.7 - Sea level index points for Cumbria sites as calibrated age (yr BP) against change in sea-level relative to present (m) as reported in Shennan and Horton (2002). The best estimate of late Holocene sea level trend plotted as a solid line with the dashed line showing predicted modelled RSL change. + Basal index points; + Intercalated index points

The oldest SLI point is an unpublished date from Ravensglass (Sea Level Research Unit, Durham University), recording RSL at 5.1 m below present at 9085-8337 BC. At Williamson Moss, a basin in the raised beach has been isolated from the sea by a series of raised shingle ridges resulting in a transition from brackish marine clay to freshwater gyttja (Huddart *et al.*, 1977). The base of the gyttja records isolation at 5364-4944 BC when RSL was -1.15 m below present. A similar elevation is recorded by a regressive overlap at Ellerside Moss, Cartmell (SMP 11c, but included in Shennan and Horton's (2002) Cumbria RSL curve) but occurred later at 4457-3997 BC.

At Duddon Estuary, two SLI points record mid Holocene transgression. The transgression facies is a grey silt or clay or brown coarse sand that transfers into biogenic peats and turfas. The pollen record shows succession from salt marsh communities with *Chenopodiaceae*, *Artemisia*, and *Plantago maritime* to a reed swamp, including *Phragmites*, *Filipendula* and *Potamogeton* eventually replaced by a fen of *Alnus* and *Quercus* with *Salix* (Huddart *et al.*, 1977). Dates from the base of peat record RSL at -0.76 m and 0.67 m relative to present at 3930-3647 BC and 3643-3377 BC respectively (Tooley, 1978b). The model results for this part of the coast suggest a possible mid-Holocene highstand of greater than that documented from the environmental archive, at ~4 m above present (Shennan and Horton, 2002) (Figure 7).

At Annas Mouth, Selker Point, a raised shingle beach overlies freshwater clays, which is underlain by turfa and gyttja. A date on the material immediately subjacent to the freshwater clays at 1123-978 BC provides a maximum for the onset of marine conditions during the late Holocene (Huddart *et al.*, 1977; Tooley, 1978b).

Shennan and Horton (2002) are unable to provide an estimate of RSL change over the past 4000 yrs for this part of the coast due to the limited amount of data. Their best estimate for the rate of relative uplift, allowing for sediment compaction, is 0.95 mm yr⁻¹.

Table 2.6 - Summary of SLI points from Cumbria. RSL is calculated as altitude minus the reference water level. The RSL error range is calculated as the square root of the sum of square of altitudinal error, sample thickness, tide level error and indicative range.

Site	Lab code	¹⁴ C age ± 1σ	Change in RSL (m)	Calibrated age (yr BC)			Longitude W	Latitude N
				Max	Med	Min		
Cumbria sea level index points								
Ravenglass	HV5221	9360 ± 65	-5.095 ± 0.34	9085	8625	8337	324430	5421110
Williamsom Moss	HV5227	6230 ± 85	-1.145 ± 0.35	5364	5173	4944	324300	5418420
Ellerside Moss	HV3844	5435 ± 105	-1.13 ± 0.21	4457	4263	3997	259510	5412490
Duddon Estuary	HV3841	4960 ± 50	-0.76 ± 0.21	3930	3744	3647	311370	5415230
Duddon Estuary	HV3840	4760 ± 45	0.67 ± 0.21	3643	3564	3377	311480	5415090
Annas Mouth	HV3842	2820 ± 55	2.785 ± 0.34	1123	978	833	325060	5416580

St Bee's Head to the Scottish Border (SMP Cell 11e)

The South Solway sea level curve summarises the environmental record of sea level change during the Holocene in SMP cell 11e. Shennan and Horton (2002) report 14 SLI points and 1 limiting date for this stretch of coast (Table 3.7, Figure 3.8).

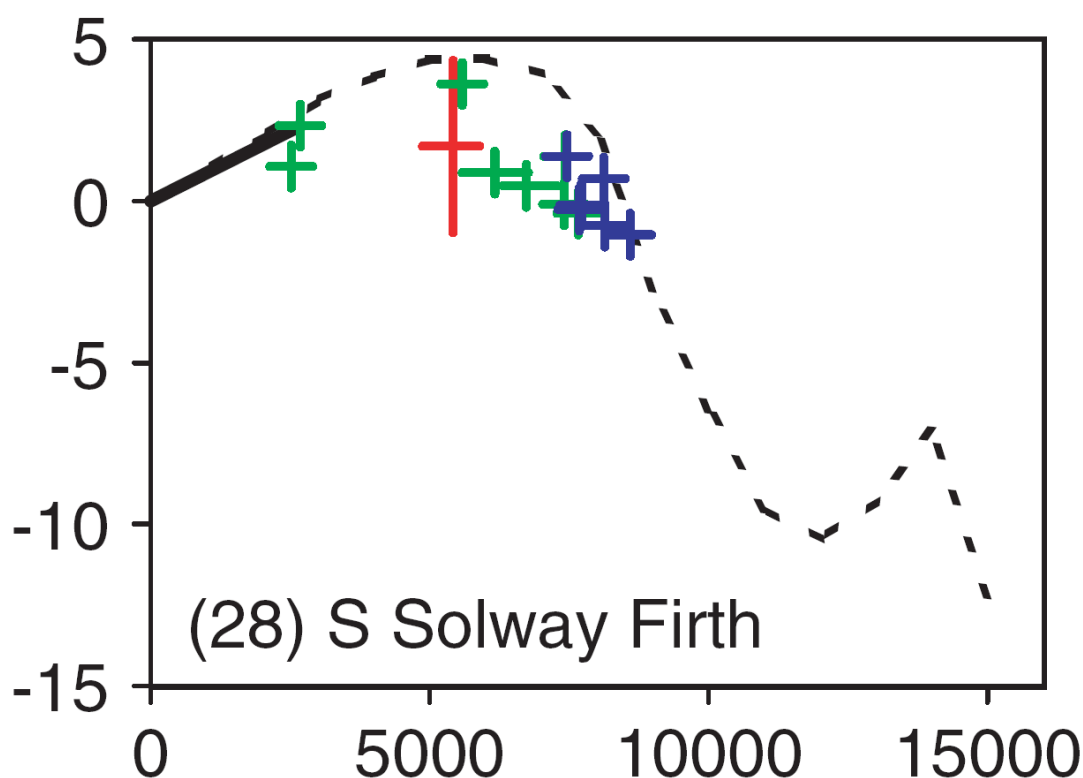


Figure 3.8 - Sea level index points for South Solway Firth sites as calibrated age (yr BP) against change in sea-level relative to present (m) as reported in Shennan and Horton (2002). The best estimate of late Holocene sea level trend plotted as a solid line with the dashed line showing predicted modelled RSL change. + Basal index points; + Intercalated index points; + Limiting dates

The oldest marine deposit in SMP cell 11e is at Black Dubb, north of Allonby. Huddart *et al* (1977) suggest that the bands of clays, peat and sand, beneath the 7.5 m high raised beach, is evidence of an early Holocene sand-dune system, with fossil dune slacks, resulting from high sea-level and elevated water table in the coastal zone. A radiocarbon date of 8203-7053 BC corroborates with a pollen assemblage in the peat which includes *Chenopodiaceae*, *Artemisia* and *Plantago*, placing the facies in Flandrian I. This sequence provides no direct evidence of RSL, but suggests the palaeocoast at or near the present day coastline.

Lloyd *et al.* (1999) also record RSL being near to present day levels in the early to mid Holocene with a series of SLI points from the southern shore of the Solway Firth. Positive sea level tendencies at 7028-6460 BC and 6374-6073 BC from a saltmarsh peat at Drumburgh Moss, overlain by intertidal clay, record RSL at -1.1 and -0.8 m below present respectively. A similar sequence at Boustead Hill records the initiation of peat growth, suggesting RSL at or below 0.69 m above present at 6376-6015 BC (Lloyd *et al.*, 1999). At Bowness Common and Wedholme Flow, marine transgression, represented by a clay facies, started after 5838-5634 BC and 5977-5619 BC respectively (Huddart *et al.*, 1977). During this period of relatively high sea level, Wedholme Flow was inundated via the River Waver and River Wampool. At Crosscanonby, a clay bed containing brackish and marine diatoms also records the transgression (Huddart *et al.*, 1977). It is likely that the seaward side of the drumlin, Swarthy Hill, was eroded and breached, allowing marine inundation of the inter-drumlin depression. The transgression ended at 5618-5303 BC, earlier than at Wedholme Flow, likely due to the formation of sand and shingle on the raised beach. The presence of *Chenopodiaceae* in the gyttja and peat above and below

the marine unit records, that despite a reduction in marine influence, the open coast was relatively close.

A short-lived marine phase occurred at Boustead Hill from 5696-5315 BC to 5611-5339 BC, where foraminifera and pollen in a transgressive and regressive overlap sequence record succession from freshwater marsh, to salt flat and finally intertidal conditions, and back again. The SLI points from this sequence record the highest level of mid Holocene RSL along the north Cumbria coast at 1.38 m above present (Lloyd *et al.*, 1999), suggesting the mid Holocene coast was inland of its present position. Bowness Common and Wedholme Flow also record the negative tendency of sea level change into the mid Holocene with RSL at 0.45 m and 0.87 m above present at 5327-4362 BC and 4825-3640 BC (Jardine, 1975).

Late Holocene dates from Pelutho and Drumburgh Moss show a falling RSL trend from above present. Estuarine species begin to reappear in the sequence at Drumburgh Moss at 891-517 BC. A negative tendency then follows with a regressive overlap dated at 761-399 BC (Lloyd *et al.*, 1999). The lack of data from the mid to late Holocene suggests a period of static or minor RSL between ~4000-500 BC. Since the regressive contact at Drumburgh Moss, RSL has fallen to present.

Along the north Cumbria coast, the proximity of LGM glacier loading has a greater influence on Holocene RSL change and coastal evolution compared to further south, resulting in a RSL history dominated by both isostatic and eustatic processes. Consequently, Shennan and Horton (2002) report the greatest rate of uplift over the past 4000 years for the North West coast at 0.66 mm yr⁻¹ in northern Cumbria, with a best estimate, taking into account sediment compaction of 0.87 mm yr⁻¹.

Table 3.7 - Summary of SLI points and limiting data from South Solway. RSL is calculated as altitude minus the reference water level. The RSL error range is calculated as the square root of the sum of square of altitudinal error, sample thickness, tide level error and indicative range.

Site	Lab code	¹⁴ C age ± 1σ	Change in RSL (m)	Calibrated age (yr BC)			Longitude W	Latitude N
				Max	Med	Min		
South Solway sea level index points								
Drumburgh Moss	UB3894	7806 ± 81	-1.06 ± 0.21	7028	6645	6460	308400	5454500
Drumburgh Moss	UB3892	7353 ± 53	-0.75 ± 0.21	6374	6195	6073	308400	5454500
Boustead Hill	UB3891	7315 ± 79	0.69 ± 0.21	6376	6169	6015	306180	5454360
Wedholme Flow	HV5228	6870 ± 95	-0.14 ± 0.21	5977	5762	5619	311270	5451540
Bowness Common	HV6208	6850 ± 60	-0.27 ± 0.21	5838	5735	5634	312260	5455480
Crosscanonby	HV6209	6810 ± 130	-0.39 ± 0.21	5974	5712	5484	327070	5444370
Boustead Hill	UB4054	6563 ± 110	1.38 ± 0.21	5696	5516	5315	306180	5454360
Boustead Hill	B103262	6510 ± 60	1.37 ± 0.21	5611	5468	5339	306180	5454360
Crosscanonby	HV6210	6495 ± 95	-0.1 ± 0.21	5618	5449	5303	327070	5444370
Bowness Common	HV6207	5875 ± 220	0.45 ± 0.21	5327	4790	4362	312260	5455480
Wedholme Flow	HV4713	5385 ± 280	0.87 ± 0.21	4825	4208	3640	311260	5451560
Pelutho	HV4418	4845 ± 100	3.6 ± 0.21	3914	3633	3369	322060	5449480
Drumburgh Moss	UB-3893	2587 ± 56	2.33 ± 0.21	891	733	517	309030	5454470
Drumburgh Moss	B103261	2430 ± 60	1.06 ± 0.21	761	559	399	309030	5454470
South Solway limiting data								
Wedholme Flow	HV4714	4725 ± 190	1.68 ± 2.67	3935	3470	2927	311260	5451560

Regional summary

The impact of differential isostatic loading on RSL along the north-west coast of England is summarised in Figure 3.9. The weight of ice loading from the Irish Sea ice stream and the north west Scotland ice dome, results in a north-south trend where RSL change in the north is largely dominated by isostatic processes, compared to the eustatic dominance in the south. This results in the southern sector of the north-west coast experiencing much greater RSL rise during the Holocene, compared to the north where RSL rose and fell closer to present levels due to the interplay of isostasy and eustasy. A slight interruption in the north-south trend occurs along the Cumbrian coast. The models predict a slightly higher rate of isostatic uplift in the central area due to the ice mass that existed in the Lake District both during the LGM and Younger Dryas, resulting in greater isostatic loading within its proximity.

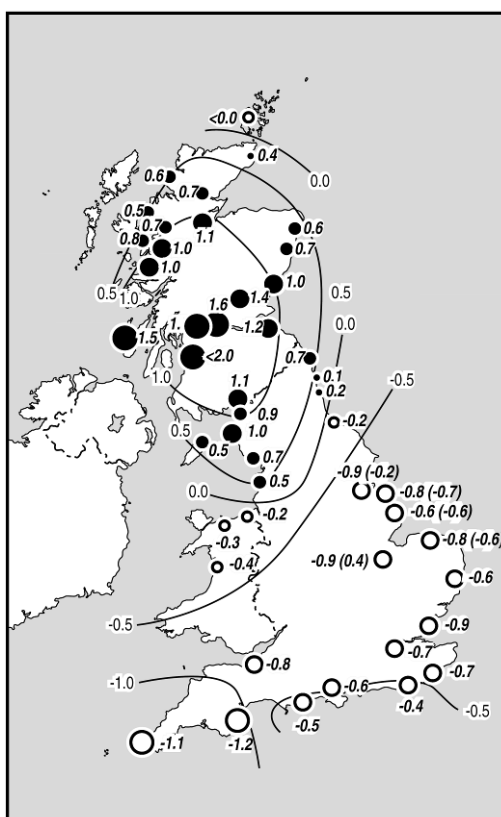


Figure 3.9: Late Holocene relative land-/ sea-level changes (mm yr⁻¹) in Great Britain from Shennan and Horton (2002). Positive values indicate relative land uplift or sea-level fall, negative values are relative land subsidence or sea-level rise. Figures in parentheses are the trends that take into account modelled changes in tidal range during the Holocene. Contours are drawn by eye as a summary sketch of the spatial pattern of change

3.3.5. *Potential for further work*

The wide range of data presented above has allowed the reconstruction of Holocene coastal evolution and RSL change along the North West coast. There are areas however, where further work would improve understanding of local and regional horizontal changes in the palaeocoastline. The contemporary geology of the North West coast is well documented by the British Geological Survey (2007). At present, the resolution of palaeogeographical maps and models, such as that produced by Shennan *et al.* (2000b) for the North Sea, is very limited for the North West coast. There is a wealth of RSL data for the North West, which combined with bathymetric and geological information, provides great potential for modelling the palaeogeography of the Irish Sea. This would provide better estimates of timing of events, such as the isolation of the Isle of Man from the North West coast of England. In addition, improving understanding of the relationship between climate changes and coastal evolution, for example the role of climate deterioration during the Little Ice Age and dune development, requires further research to be able to determine Holocene coastal evolution.

A limitation of palaeoenvironmental data is its restricted use in the late Holocene when intensive anthropogenic activity on the landscape disturbs the environmental record. Further work is required to combine historical records of coastline configuration and environmental change with evidence derived from the landscape to provide additional RSL data for the late Holocene period before instrumental monitoring comes into use. Combining both these geological and historical records will improve estimates of palaeogeography of the North West coast.

Increasing the spatial and temporal resolution of vertical and horizontal changes of the coast will also have implications for the modelling of coastal change. Shennan *et al.* (2000b) acknowledge that there is little justification in increasing the sophistication of models if there are no data to test their output. Additionally, detailed palaeogeography will aid future modelling work where the next steps are to investigate sediment movement, particularly with regard to palaeotidal changes through estuarine environments such as those at Merseyside, Ribble and Solway. Shennan *et al.* (2003) have already demonstrated such possible improvements by using an integrated approach to higher resolution coastal modelling in the Humber Estuary. There is some disagreement between the SLI points from the North West coast and model suggestions of RSL change during the Holocene (Shennan and Horton, 2002), likely due to shifts in tidal amplitude during the Holocene and the role of sediment compaction upon SLI point elevation. With improved estimates of palaeotidal change and calculation of sediment compaction, some of this disparity is likely to be resolved.

3.3.6. *Conclusions*

During the Holocene, the North West coast of England, from the Anglo-Welsh to Anglo-Scottish Border, has experienced varied RSL change. From the late Upper Palaeolithic to the mid Holocene all areas of the coast experienced marine transgression by global eustatic sea level rise due to melting LGM ice sheets. Maximum sea level rise occurred along the Lancashire coast where the degree of post LGM isostatic uplift is less than further north. Model results suggest a rise of up to 25 m resulting in horizontal transgression of the present coastline by up to 7 km during the mid Holocene highstand. The Cumbrian coast experienced up to 7 m of RSL rise in the early Holocene with a highstand of up to 4 m above present. A series of transgressive and regressive overlaps then record fluctuating RSL from the mid Holocene to present, with a net negative tendency. The development of shingle and sand barriers and beaches during the late

Holocene defines local sea level changes and coastal evolution. The geography of the Irish Sea provides a relatively sheltered and macrotidal coastal environment, though evidence of high-energy storm events punctuate the Holocene sea level record. The varied solid and drift geology of the North West coast results in a differential response to these Holocene sea level changes with the contemporary coast consequently dominated by salt marshes, estuarine tidal flats, sand dunes, shingle barriers, cliffs and raised beaches. Knowledge of the horizontal extent of Holocene sea level changes is still relatively limited, with the timing of the submergence of an Irish Sea land bridge undefined. Developing palaeogeographical maps of coastal evolution will provide better constraint on the timing of such events. Overall, the Holocene coastal history of the North West coast is characterised by a terrestrial regression forcing coastal communities inland.

CHAPTER 4

AN OVERVIEW OF THE ARCHAEOLOGY OF THE NORTH WEST COASTAL ZONE

4.1 Introduction

This chapter will provide a brief review of the archaeology of North-West England, with emphasis on providing contextual information for the archaeology present within the NWRCZA study area. It will also outline the archaeological assets of the coastal zone within broad chronological periods to prevent repetitious discussion of specific types of archaeological feature within the base line assessment chapters. A full gazetteer of the archaeological sites of the coastal zone can be found in Appendix I, although not all the sites presented in the Appendix are discussed in the baseline assessment chapters. Given the variety of datasets reviewed for this assessment the site type definitions have followed English Heritage's Monument Class Description, although an element of flexibility has been retained to incorporate the nature of the HER and NMR records, as well as the nature of description and discussion in the published and unpublished archives.

For clarity the division by chronological period is set out below. Again, due to the varied nature of the resources assessed and the period distinctions therein, the division has been based upon generally accepted period divisions and it is acknowledged that there is disagreement within the wider archaeological community about where such period divisions may lie. However, it should be made clear that it is not within the scope of this assessment to stipulate where period divisions should be drawn, but to adopt a series of conventions that are standard throughout this document, to allow for ease of use and consistency of reference.

- **Late Upper Palaeolithic** - pre 8000BC
- **Mesolithic** - 8000 BC to 4000BC
- **Neolithic** - 4000BC to 2100BC
- **Bronze Age** - 2100BC to 750BC
- **Iron Age** - 750BC to AD 44
- **Roman and Romano-British** - AD 44 to AD 410
- **Early Medieval** - AD 410 to AD1066
- **Medieval** - AD 1066 to AD 1485
- **Post-medieval** - AD 1485 to AD 1800
- **Industrial and modern** - AD 1800 to present

4.2 The archaeological context of the NWRCZA

4.2.1 *Early Prehistory*

In the Late Upper Palaeolithic period, following the last period of glaciation (11,000 to 8000BC) the study area would have been a low-lying plain with the coastline some 15 kilometres to the west (Tooley 1985). The coastal plain would have had an open appearance with birch, juniper and willow scrub with open meres occupying depressions across the landscape (Leah *et al.* 1997). Evidence of hunter-gatherer activity dating from this period has been discovered in the wider region. For example, the remains of an aurochs with associated barbed antler points has been found preserved by peat at

Poulton-le-Fylde in Lancashire on the Alt estuary (Hallam *et al.* 1973). This has been dated to 13500-11500 cal BC (Jacobi *et al.* 1986). Further evidence of activity in the region during this period have been identified in the form of diagnostic flintwork from caves in Cumbria such as Kirkhead Cave and Lindale Low Cave (Salisbury 1988; 1992), although the dating of this material has been questioned (Gale and Hunt 1990). More recently evidence of Late Upper Palaeolithic activity was found in a rock shelter site at Carden Park in Cheshire (Fitzpatrick Matthews 2006).

During the Mesolithic period the main location for human activity within this section of the landscape is thought to have been the coastal fringes (Cowell and Innes 1994; Cowell 1999), which in some cases was located inland from its present position, for examples at Eskmeals on the west Cumbrian coast (Higham 1986), although in some locations it was as much as 8m below the present MHWS, such as at Newton Carr on the Wirral (Bedlington 1993). This obviously has an affect on the potential distribution of coastal Mesolithic sites and sites which are presently coastal may not have been during the Mesolithic period, as well as other sites having been lost to rising sea level. The evidence for the Mesolithic settlement of the coastal zone of the study area consists mainly of lithic scatters, although excavated sites such as Monk Moors have revealed an arrangement of hearths and stakeholes and can therefore be thought of as settlement sites (Bonsall 1989). There are also records of midden deposits, possibly of Mesolithic origin, on the islands of Hilbre and Walney (Cowell and Innes 1994; D. Coward, pers. comm.). Programmes of fieldwalking in the region since the 1980s have produced evidence of Mesolithic activity along the North-West coast. In the Merseyside region the National Museums and Galleries on Merseyside undertook a systematic fieldwork programme which discovered numerous sites dating from the period (Cowell 1992). This includes evidence of Early Mesolithic activity, which was the subject of excavation, on the Wirral at Greasby, where a series of stone-lined pits were discovered (Philpott and Cowell 1992). Early Mesolithic flintwork has also been recovered from Heysham Head (Salisbury and Sheppard 1994). Further north the work of flint collectors has discovered evidence of Mesolithic activity on the Cumbrian coast (Cherry and Cherry 1995) and at Eskmeals (Bonsall 1981). The work of the North West Wetlands Project also identified numerous sites of Mesolithic date (Cowell and Innes 1994) concentrated in coastal and estuarine areas. Early prehistoric evidence may also be found in the submerged forests and inter-tidal peats that are known from the North-West, where the shifting coastline has reclaimed former land surfaces into the intertidal zone (Cowell and Innes 1994; Hodgkinson *et al.* 2000). The vast majority of Mesolithic sites within the study area by typology date from the Late Mesolithic period. However, the similarity in flintworking during the later Mesolithic period with that produced in the early Neolithic may mean that some of these scatters date from the later period. Exciting evidence of the Mesolithic period has been revealed by the erosion of fossilised footprints from the coast at Formby which have been dated to the Mesolithic and later periods (Gonzalez *et al.* 1996).

4.2.2 *Later Prehistory*

Aerial photographic research in the region began with the work of Professor J.K. St Joseph in 1949 in the Solway Plain area of Cumbria, work which was continued by G.D.B. Jones and N.J. Higham in the 1970s and continued as part of English Heritage's National Mapping Programme Hadrian's Wall Project. R. Bewley undertook a large-scale analysis of aerial photographs of the Solway plain as part of his doctoral research in the early 1980s. This identified many ditched enclosures to which Bewley attributed a Romano-British date. The benefits of combining fieldwork with aerial photographic

analysis was revealed when one of these sites, at Plasketlands, was excavated revealing a circle of large post holes in addition to the ditch (Bewley 1993). Radiocarbon dating, obtained from one of these postholes, revealed that the timber post-circle actually dated from the Early Neolithic period.

The North West Wetlands Survey deduced from palaeoenvironmental analysis that the lowlands of North-West England were characterised in the Neolithic, Bronze Age and Iron Age periods as a predominantly forested landscape associated with small scale clearances and settlement and small scale cereal cultivation (Cowell and Innes 1994). However, the Neolithic period saw a sequence of marine transgressions and regressions, more fully discussed in Chapter 3, and this obviously had an affect on the location of Neolithic sites and potential loss to changing sea levels. Overall, few systematic fieldwalking projects have taken place in Cheshire and Merseyside but when programmes have been undertaken as around Ashton in Cheshire (Leach 1942), Neolithic material has been discovered. Neolithic settlement evidence has also been discovered at Norton, Cheshire (Greene and Hough 1977) and at Beeston Castle, Cheshire (Ellis 1993) which confirms the presence of Neolithic communities in the region in the early Neolithic period. The site at Norton is only a handful of kilometres from the coast and here numerous Neolithic pits were excavated which were found to contain Grimston Ware pottery and flint flakes. Grimston Ware has also been discovered incidental to other excavations within Chester itself (McPeake and Bulmer 1980; Mullin 2002).

In contrast to the southern part of the region parts of Cumbria have seen extensive fieldwalking programmes (e.g. Cherry and Cherry 1983, 1984, 1985, 1986 and 1987). However, there is little excavated evidence and few securely dated assemblages that can be ascribed to the period. There have been discoveries of Neolithic stone axes in the region although relatively few from the coastal area. One of the most significant Neolithic “axe factories” is located in the Cumbrian uplands, where Group VI axes were manufactured in the Langdale valley, which have been found throughout Britain and even into continental Europe (Bradley 1993). The presence of at least one Neolithic tomb in the Liverpool region is confirmed by the Calderstones, which have been moved from their original location, but display typical passage grave art (Forde Johnston 1957; Cowell and Warhurst 1984). There are no definite Neolithic monuments within the coastal zone itself. The only possible example being at Haverbrack in Cumbria which is thought to be a long mound. Funerary monuments dating from the Neolithic, such as long mounds and chambered tombs are almost exclusively known from the Cumbrian uplands, where there are twenty-five recorded, although none have seen recent archaeological investigation. The two located closest to the NWRCZA study area are Skelmore Heads, on the Furness Peninsula, and Sampson’s Bratful, in the Egremont area.

It has been suggested that some areas of the North-West lowlands were abandoned during the Bronze Age and Iron Age periods and little is known about settlement sites in the region from these periods (Hodgson and Brennand 2007). However, evidence of later prehistoric activity has been identified in the region. For example, Bronze Age pit circles, ring ditches and a burnt mound were excavated in and around Carlisle (McCarthy 2002). Bronze Age inhumations and a cremation cemetery was excavated at Ewanrigg, Maryport on the Cumbrian coast (Bewley *et al.* 1992) and Bronze Age features have been found during excavations at Pilling (Edwards 1992). Additionally there are numerous clearance cairns in the Cumbrian uplands, generally thought to be associated with Bronze Age land improvement and the extensive Bronze Age settlement site of Barnscar is

located just outside the NWRCZA study area in the hills above Ravenglass on the west Cumbrian coast. As with the Neolithic funerary monuments, Bronze Age burial cairns have rarely been subject to modern excavation and analysis and there are very few known to be located within the coastal zone, although the site of Ewanrigg is an obvious exception. At Ewanrigg the cemetery was found to straddle the Neolithic/Bronze Age period division (*ibid.*). Stone circles and other 'ritual' monuments are perhaps the best known and most evocative of archaeological sites dating to the Bronze Age although again there are very few in the NWRCZA study area and most of those that are present have been subject to reconstruction.

There is an apparent scarcity of sites and material culture associated with the Iron Age of the North-West region of England. Hillforts are present on some of the sandstone ridges of Cheshire such as those at Helsby overlooking the coast and one, Swarthy Hill, is located north of St Bee's on the Cumbrian coast. These sites are very poorly understood and even recent studies have struggled to come to any positive conclusions on the nature of the Iron Age in the North-West (Bewley 1994; Hazelgrove *et al.* 2001). Where excavated, many sites, thought to be of Iron Age date, have not produced any datable material and those that have (such as Maiden Castle on the mid-Cheshire sandstone ridge, and Mellor, Greater Manchester) appear to indicate that sites were no longer in use by the Late Pre-Roman Iron Age (Matthews 2002). Iron Age farmsteads have been excavated at Brook House Farm, Merseyside which was identified from aerial photographs, at Latham, West Lancashire, identified as a result of works in advance of development, and at Irby on the Wirral (Brennand *et al.* 2004). McCarthy has also suggested that some of the ditched enclosures identified by Bewley (1993) date from the Iron Age period (2002). These small lowland enclosures, of which there are a number located within the NWRCZA area, are often univallate, sub-rectangular sites and there is little information regarding such sites with regard to settlement hierarchy and the nature, scale and duration of occupation. Funerary monuments dating to the Iron age period are even rarer than domestic and military sites. However, an Iron Age burial was also discovered by chance during his excavations of the Roman milecastle at Maryport (Bellhouse 1981).

4.2.3 Roman and Romano-British

The military aspects of the Roman occupation of the North-West of England have been well researched from the antiquarian period through to the present day. This has especially been the case in Cumbria where Hadrian's Wall comes to an end at Bowness-on-Solway. However a series of forts, milefortlets, coastal defences and earthworks were constructed along the Cumbrian coast as far south as Maryport. These form part of the Hadrian's Wall World Heritage Site. A series of scholars have surveyed and excavated sites along this particular stretch of coastline (e.g. Collingwood 1923; 1933; Birley 1949; 1969; Bellhouse 1969; 1981; Potter 1979; Higham and Jones 1975; Jones and Wooliscroft 2001) however in many instances these excavations have been limited to small-scale evaluation trenching and few sites have been subject to larger-scale excavation, although Maryport (Wilson 1997) and Ravenglass (Potter 1979), are two examples within the NWRCZA study area that have seen more extensive investigation. Most recently the Hadrian's Wall NMP has mapped aerial photographs for the area to NMP standard. Excavations such as the Lanes Project in Carlisle between 1978 and 1982 also revealed substantial areas of the Roman townscape (McCarthy 2000). An industrial site at Wilderspool on the Mersey in Lancashire has also been excavated (Hinchcliffe and Williams 1992). The Roman city of Ribchester has been investigated from the early 19th century to the present day amounting to over 100 excavations and evaluations (Brennand

et al. 2004). Many of these urban centres are developments of the *vici* that grew up around the forts and, whilst there has been little targeted excavation, investigative techniques such as geophysics, employed across the *vici* at Maryport, have indicated just how substantial such sites can be (Biggins unpub.)

In contrast there is a lack of evidence from sites beyond the major military sites or urban centres and the relationship between the Roman occupiers and the native population is not well understood. As outlined above, it appears from the available evidence that hillforts were abandoned by the middle Iron Age. However, in contrast sites, such as the enclosed settlement at Wolsty Hall, Cumbria have produced 2nd century AD pottery (Blake 1959) and so the status of native British sites during the Roman period is unclear at best. The coastline north of Maryport is particularly rich in enclosure sites, as are the areas south and east of Penrith and west of Carlisle (e.g. Bewley 1993).

Within the North-West region there is also a lack of detailed knowledge about Roman and particularly Romano-British burial practices. Few conclusively Romano-British burials have been recorded and some of the best known material comes from cave sites such as the Dog Hole, Haverbrack where human and animal bone, along with iron and bronze work, all dating from the first to the ninth centuries AD were found (Benson and Bland 1963). Roman burial practices in the area are almost exclusively known from military sites or their immediate vicinity, such as the Beckfoot cremation cemetery, although few have been excavated using modern techniques (Brennand *et al.* 2004). Later inhumation practices also appear under-represented and cremation seems to have remained prevalent throughout the North-West, although this may be due to a lack of excavated burial sites.

The North-West has one of the few references to a Roman harbour in Britain, the *Portus Setantiorum* mentioned by Ptolemy. However the location of the site is not known and various suggestions for its location have been put forward (e.g. Watkin 1883; Shotter 1997) and it may not necessarily have had any significant structural facilities. It is apparent that a west coast trade route was in operation from the Iron Age onwards, possibly centred around Meols on the Wirral (Griffiths 2007). Finally it has been suggested that Ravenglass, with its natural harbour, may have been the base for a naval squadron (Shotter 1979).

4.2.4 Early Medieval

The post-Roman and early Medieval period has been investigated in the coastal area of North-West England at Carlisle (McCarthy 1993) and at Lancaster. Continuing activity on the sites of Roman forts has been noted at Lancaster, Carlisle, Ravenglass and Muncaster (Cramp 1984). However, settlement sites in the early Medieval period are extremely rare (Brennand 2007) due, at least in part, to the settlements being of wooden posthole construction and that the prevalence of pastureland masks such sites. The pattern of settlement has previously been predicted from place name evidence (e.g. Fellows-Jensen 1985), something which has been increasingly shown to be increasingly unreliable (Roberts 1989-90). However, the lack of research into the early Medieval period in the North-West has, undoubtedly, accentuated this lack of evidence. In contrast early Christian activity is relatively well-known across the region and knowledge and understanding of the ecclesiastical world is perhaps most well understood. Excavation of the headland site of St Patrick's Chapel, at Heysham in Lancashire, has revealed evidence of an 8th century chapel and church (Potter and Andrews 1994). The importance of headland sites and isolated locations is also suggested from other, similar

sites, such as the Chapel of St Hildeburgh, on Hilbre Island, the Church of St Michael at Workington and numerous cross fragments from the coastal fringes of the North-West. Griffiths has recently published a volume on the material collected from Meols, a probable early Medieval trading port on the north coast of the Wirral. Meols was uncovered by coastal erosion of sand dunes in the second half of the 19th Century. This area has revealed evidence for an important port which traded with the classical world and Africa from the at least 7th Century through to the end of the Medieval period. Over 5000 artefacts were collected from the coast by antiquarian collectors which are now housed in the various museums. Meols appears to have been a Scandinavian trading port in contrast to the Mercian port of Chester. This suggestion is supported by the large number of Scandinavian place names on the Wirral (Griffiths 2007).

4.2.5 Medieval

The Medieval period in the coastal zone of North-West of England again suffers from a general lack of research activity. As was the case with the early Medieval period, much of the archaeology of the study area is ecclesiastical or has strong ecclesiastical links. Given that monasteries were an extremely important part of medieval life, often with large land holdings, and formed the *foci* of wide networks of parish churches, almshouses, hospitals, farming estates and tenant villages, this is not surprising. However, given that religious houses and their estates are some of the most substantial surviving archaeology remains dating from the period there has been relatively little work been undertaken in the last 50 years, with the exception of the excavations at Norton Priory (Greene 1972; 1974). Early examples of important monastic orders, such as the Savigniacs, were founded at Tulketh, Combermere and Calder abbeys, all later amalgamated into the Cistercian order. Further abbeys, such as Cockersand and Norton were established by reformed orders, such as the Premonstratensian and the Cistercians respectively. Smaller ecclesiastical sites, such as churches and chapels, are amongst the most numerous of known medieval sites still extant, although little analysis of their development, fabric or archaeological remains has been made (Brennand *et al.* 2004). The same can also be said of the granges attached to the larger monastic sites.

Archaeological investigation of defensive structures of the North-West region dating from the medieval period has been generally limited, with some notable exceptions, such as Aldingham motte-and-bailey (Davison 1969) and Halton Castle near Runcorn (McNeil and Jamieson 1987). Later castles have seen little investigation although Piel Castle is one of the few in the region that have been subject to a fabric survey and limited excavation (Newman 1987, 1996). A substantial number of moated sites are known from the North-West region, although many more have probably been lost through processes of urbanisation and the intensification of agricultural practices. Few have been the focus of any form of archaeological recording or excavation (Brennand *et al.* 2004). These moated sites are less common in the more upland areas in the north of the region, where fortified towers, such as the Hazelslack pele tower, are more common.

Settlement patterns across the North-West have often been considered to be of little interest by researchers and as a result little research into the topic has been undertaken. Across the North-West region traces of surviving settlement are often dispersed rather than in nucleated villages (Brennand *et al.* 2004). Traces of medieval agriculture, in the form of parcels of ridge-and-furrow are widespread in the coastal zone and throughout the region. It is usually possible to identify two types of ridge-and-furrow. One type exhibits a reversed 'S' shape in plan which is assumed to reflect the use of teams of oxen to pull a plough, the curve arising because of the difficulty in turning a large team of

oxen at the end of each ridge. This is the classic type of ridge-and-furrow and is considered to be mostly of Medieval or early post-medieval date. A second type is similar in width but straighter in plan and reflects the use of horses to pull the plough, which could be used in smaller teams and were more manoeuvrable than oxen. This change was contingent on developments in the form of harness used for draught animals and was occurring in England from the 16th century onwards. Accordingly, straight ridge-and-furrow is usually regarded as being post-medieval in date.

Urban settlement during the medieval period is also poorly understood, as there were few towns and the region was considered to be sparsely populated. White records that 'we have not yet defined archaeologically a single burgage plot or a single medieval house site in any Lancashire Town' (1996, 125). The Lancashire Historic Towns Survey has upgraded the HER in relation to coastal towns such as Lancaster but much still remains to be done.

Ports operated along the length of the North-West coastline in the medieval period but little archaeological work has been undertaken on them. This is often due to the fact that urban expansion has destroyed evidence of medieval activity. For example this occurred at the fishing hamlet of North Houses, which expanded to become Blackpool, urban expansion has destroyed evidence of Medieval activity. The coastal towns of Lytham, Blackpool, Fleetwood and Morecambe all developed in the Victorian period having been fishing hamlets in the Medieval period (Bagley 1967). However, 'a survey of the Medieval and Post-Medieval fishing industry in England did not mention a single site from the North-West' (Brennand 2007, 119).

Medieval industrial sites are known from the study area such as workings by the monastery at St Bees in Cumbria who were extracting coal and the monks at Furness were working iron in the 13th Century (Bowden 2000), although very little archaeological attention has been paid to the material record and few sites have been shown to contain demonstrably Medieval features (Brennand *et al.* 2004). Iron smelting at bloomery sites has also seen little fieldwork in the North-West and site distribution is probably skewed by research bias and the destruction of sites in areas which saw heavy industrialisation and urbanisation in later periods (*ibid.*). The medieval salt industry, centred on Cheshire, has been the focus of recent research although comparatively little work has been undertaken on the coastal fringes beyond the potential identification of sites around the estuaries (Cranstone 1999) such as at Eskmeals and Crosscannonby.

4.2.6 Post-Medieval

The post-medieval rural environment has been under-researched although the agrarian landscape, as ridge-and-furrow, dominates much of the archaeological record, particularly as part of aerial photographic mapping projects. One exception has been the assessment of post-medieval reclamation of the lowland mosses as part of the North-West Wetlands Survey (e.g. Cowell and Innes 1994; Middleton *et al.* 2000). Further developments are apparent in the exploitation of the rural landscape in the medieval period. These include the apparent increase in the coppicing of woodland on the Furness peninsula for example, to fuel the smelting of iron (Marshall and Davies-Shiel 1969). Settlement within this landscape appears to have been dispersed and sparse set within large areas of undeveloped, unreclaimed and unenclosed land (Whyte 2003).

The development of the urban landscape in the post-medieval period was not extensive until the end of the period and most expansion came during the Industrial Revolution.

Most towns, such as Barrow-in-Furness, were almost non-existent in the post-medieval period and expansion of Liverpool only began in the latter half of the period, although it expanded quickly and, by 1702, was the third largest trading port in England (Liverpool City Council 2003), becoming the second largest by the turn of the 19th century. The Atlantic trade and its development saw further ports developing, such as Runcorn and Whitehaven, often developed by industrialists such as Sir John Lowther (Brennand *et al.* 2004) to develop their commercial interests. The development of the salt industry was one of the most important for the region in the post-medieval period and numerous coastal workings are known about or postulated (Cranstone 1999). Movement of the products of early industrial processes was local in nature or by coastal transport from quays such as those around Morecambe Bay, prior to the development of the canal system. The early iron industry, located between Lancaster and Kendal, was supplied with ore from the Furness peninsula by coastal shipment around Morecambe Bay (Newman 2003).

4.2.7 Industrial and Modern

The North-West was at the vanguard of the process of industrialisation, and the coastal regions were crucial in this development as they were used to export the products of industry as well as providing some of the raw materials such as coal and iron which powered its development. The period saw the growth of Liverpool as an international trading centre, based principally on the slave trade. The importance of Liverpool was recognised in 2004 when it was inscribed as a World Heritage Site. The industrialisation of the North-West led to the development of settlement and population centres from dispersed agricultural settlement to burgeoning industrialised cities and towns (Barker and Cranstone 2004). The process also an alteration in the rural landscape as some settlements became depopulated by migration to the new industrial centres whilst in other areas new settlements grew up around specific industries, such as mines (Harris 1974). The development of urban centres was also often around specific industries, so Birkenhead was built around the shipbuilding industry, Barrow-in-Furness was created by the iron industry and shipbuilding and Blackpool, Morecambe and Southport became centres of leisure to serve the industrial communities of the Industrial Revolution (Brennand *et al.* 2004).

Many of the coastal towns, planned and built in the 19th century, were established because of their coastal location as transport by water was often the only available means of moving large cargoes. The development of the port facilities also saw the creation of the network of canals which cover most of the North-West region, and these were a crucial part of the fabric of the industrial towns and cities. The transport of goods by inland waterway began in the North-West in the Runcorn area with the Bridgewater Canal in the late 18th century and culminated in the same place with the Manchester Ship Canal in the late 19th century. Sadly little archaeological work has been undertaken on the development of the network and the construction of canals (Brennand *et al.* 2004).

The industries which developed during this period were varied, from chemical workings around Runcorn and Widnes, coal and iron mining on the west Cumbrian coast, gunpowder manufacture in Cumbria, salt working which lead to the expansion of Whitehaven and factories producing every kind of manufactured goods from textiles to clay pipes, many of which were exported globally through the docks of Liverpool.

The coastal resorts of the North-West developed a distinctive urban form. The building of the railways saw the tourism industry grow rapidly and the seaside centres expand to

serve the populations of the mill towns of Lancashire. Some towns grew in an unplanned manner, with Blackpool being the prime example, but others, such as Fleetwood and Morecambe, are amongst the finest examples of planned seaside towns in the country (Brennand *et al.* 2004). These towns also saw the creation of a whole new variety of monuments, including promenades, piers and pleasure grounds.

Coastal military installation developed during this period to protect the growing Atlantic trade from seaborne attack. This saw the development of coastal gun batteries in the 18th century at places such as Liverpool and Whitehaven, although few have been archaeologically investigated. Defensive features were built or redeveloped in the First World War with anti-aircraft and coastal batteries built at Barrow and Liverpool, although little is known about them (Dobinson 1996). The Second World War saw the expansion of the network to defend against an imagined possible invasion from Ireland and to protect the port facilities of Liverpool and Barrow-in-Furness. Liverpool, the headquarters of Western Approaches Command, was the second most heavily bombed city in England during the Second World War, after London. Barrow-in-Furness was also a target of the *Luftwaffe*, who were trying to destroy the important ship-building facilities there.

4.3 A discussion of common site types found in the NWRCZA

4.3.1 *The Palaeolithic*

Site types – Cave

There are no known Lower and Middle Palaeolithic sites from the North-West region, although there is good, if sparse, evidence of human activity in the region during the Late Upper Palaeolithic as well as palaeoenvironmental deposits from the Late Devensian period. Evidence for human activity comes from **cave** sites in the limestone region around southern Cumbria and north Lancashire. Two sites lie within the study area, at Kirkhead Cave and Kent's Bank Cavern, south of Grange-Over-Sands in Cumbria, however other significant sites such as Lindale Low Cave and Bart's Shelter, both in Cumbria, as well as Badger Hole, Lancashire are located within one kilometre of the study area.

4.3.2 *The Mesolithic*

Site types – Cave, Lithic scatter, Midden

Evidence for Mesolithic activity in the area is influenced by the location of previous fieldwork, although there is good palaeoenvironmental evidence throughout the study zone. The location of Mesolithic settlements is obviously influenced by the shifting coastline during this period. Evidence of Early Mesolithic, as well as Later Mesolithic, activity is proposed from **cave** sites such as Bart's Shelter, mentioned above, although close analysis and interpretation of most of these finds remain unpublished.

The discovery of **lithic scatters** is a common occurrence throughout lowland and upland England and the coastal fringes of the North-West are no exception, due to the occupation and use of the landscape by mobile populations for at least 6000 years. There is no widely accepted definition of what represents a lithic scatter. However within this project it has been assumed that where a record has been made of a flint scatter, lithic working site or similar, the density of flints is significant and therefore could be associated with buried archaeological features. The coastal zone would have been a resource rich area for hunter-gatherers. A type of site commonly encountered in such situations is the **midden**, an accumulation of food debris from an adjacent settlement,

and often consisting mostly of shellfish remains but also including fish and animal bones. Middens can also be Neolithic in date, although their use may be multi-period. Middens have been recorded at Hilbre Island and on Walney Island.

4.3.2 *The Neolithic*

Site types - Flint scatter, Long Mound

As with the Mesolithic period much of the Neolithic evidence for the study area is influenced by the location of specific fieldwork projects. Much of the material is known from **flint scatters**, a small number of which have been excavated, and many of the scatters are located around the 6m OD contour line, the height of the maximum marine transgression *c.* 3800 BC as discussed in Chapter 3. Much of the fieldwork has been undertaken in Cumbria and excavated sites in the county, including Eskmeals, Williamsons Moss and Ehenside Tarn, give an indication of a form of Neolithic occupation sites characterized by repetitive use over long periods of time. Further excavations, such as those at Roose Quarry, which produced Early Neolithic pottery and leaf-shaped arrowheads, and at Sandscale, which produced a small structure of postholes and pits associated with a Later Neolithic/Early Bronze Age lithic assemblage indicate more short term or transitory occupation sites. There is also tentative evidence of a **long mound** at Haverbrack in Cumbria. These are usually a trapezoidal mound of earth and/or stone containing one or more chambers that acted as burial places and ritual centres for their builders.

4.3.3 *The Bronze Age*

Site types - Stone circle, Round Barrow, Cremation cemetery, Clearance cairn, Cairnfield, Burnt mound

There is evidence dating from the Bronze Age period within the study area, particularly in Cumbria. A number of **stone circles** are known from the area on the coastal fringes of Cumbria, generally of small diameter (less than 20m), where they still survive to their full extent, such as the concentric circle on Birkrigg Common on the Furness Peninsula. These monuments are regarded as ceremonial in function, although their purpose is open to interpretation and at some sites, of which Birkrigg is one, they were used for burial practices. Burial monuments comprise **round barrows** and **cremation cemeteries**. Round barrows are circular mounds of earth and stone covering one or more burials which may be either inhumations or cremations or both. **Clearance cairns** are very similar in form to the round barrow, comprising generally circular mounds of stone, which are thought to represent small cleared areas used for stock grazing. However there is large variety and longevity amongst these types of monument, and whilst some do contain burials, some are associated with more obvious field demarcation systems and some may well have been made through into the Post-Medieval period. A **burnt mound** is known from Drigg, Cumbria. These are mounds of burnt stone with an accumulation of ash and charcoal and some form of water holding trough nearby, usually interpreted as sweat lodges although they may also have been used as cooking sites.

4.3.4 *Iron Age*

Site types – Hillfort, Enclosed settlement

There is an apparent lack of evidence of Iron Age archaeology in the study area and settlement is subsequently poorly understood with a poor survival of material culture. There is one definite **hillfort** within the northern part of the study area. Hillforts are fortified enclosures, defined by earthworks surrounding hilltops and enclosing an area that is often heavily occupied with evidence of hut circles. Whilst there are a number of

sites within the study area, generally known from aerial photographs that are described as enclosures of various forms, the lack of excavation and associated datable deposits or small finds makes the dating of such features tentative at best and they could easily belong to earlier or later periods. Whilst such features are generally regarded as Iron Age, it is known from elsewhere in the country that many were occupied into the Romano-British period and some may well date from this period. Such sites represent mixed farming economies undertaking arable agriculture and livestock rearing. There are **enclosed settlements**, with associated field systems, located across much of the northern part of the study area.

4.3.5 Roman and Romano-British

Site types – Hadrian's Wall, Fort, Milecastle, Turret, Vallum, Signal Tower, Marching Camp, Vicus, Enclosed settlement, Bloomery, Cemetery

The Roman period is well documented within the study area, however there is an overwhelming emphasis on military sites, due to the nature of past research. As with the preceding Iron Age there is apparently little material culture and poor site visibility of archaeological remains apart from the military sites and, where excavated, remains are often heavily truncated and ephemeral in nature. The World Heritage Site of **Hadrian's Wall** contains a wide range of military sites, from the large **forts**, through the milecastles, **turrets**, and **signal towers**. Most forts were built to a standard pattern to house units of between 500-1000 troops. Each consisted of an oblong enclosure about two hectares in extent with gates on each side and rounded corners, giving rise to a standard 'playing-card' shape. The interiors were occupied by barrack blocks and stores, with stables in the case of cavalry units. Two important buildings lay in prominent places in the centre of each fort, a commanders house built on the lines of a civilian town house and a headquarters building from which the administration of the garrison was undertaken. Latrines were provided at suitable locations where the slope of the ground facilitated flushing. Bath blocks were usually built outside the main area of the fort as the fires used to heat them represented a hazard. Initially, these garrison forts were built of earth, turf and timber and the quantities required must have been considerable, while there was a continual demand for fuel for heating. By the 2nd century most of the forts which continued in use had been rebuilt in stone. In a short space of time most forts acquired civilian settlements outside their gates, the *vici* (sing. *vicus*).

In Cumbria Hadrian's Wall itself was initially built in turf, though it was later rebuilt in stone. Every Roman mile there were small **fortlets**, usually known as milecastles (although sometimes recorded in the HERs as milefortlets) and between each milecastle were two turrets. Although not part of the initial plan, from an early stage in the development of the system forts were added to the line of the wall at about 10 km intervals. To the south, the frontier zone was marked by the construction of the **vallum**, a deep flat bottomed ditch between parallel banks of upcast. The *vallum* is regarded more as a formal line of demarcation than a component in the defensive system. Nevertheless, it could only be crossed easily at a series of purpose built causeways protected by gates and giving access to each of the forts (Breeze and Dobson 2000). The signal towers were substantial stone structures and it is believed that their purpose was to provide warning of attack by raiders from the sea. To function effectively they would have needed to communicate both with inland defence forces and naval flotillas strategically positioned along the coast. One such naval base may have lain at Ravenglass.

As the initial Roman advance was made temporary **marching camps** were constructed by the excavation of ditches and the throwing up of earthwork banks. These latter may

have been surmounted by palisades which could have led to tree felling in the immediate vicinity though the legionaries may have carried timber stakes with them for this purpose.

It is thought the native population still lived in the same forms of **enclosed settlement** that they had occupied in the Iron Age, although as discussed above, the nature of native settlement in the Romano-British period is by no means clear.

A **bloomery** was a type of furnace once widely used for smelting iron from its oxides. They are so named because a bloom of Iron and Steel was produced as the ironstone never reached the melting point of Iron. A standard furnace would be constructed of a one metre high circular clay wall into which ironstone and charcoal were added through the top. A fire would be started at the base which would have air blown into it and a liquid slag could be 'tapped' from the base of the furnace to run, like lava, before solidifying.

Roman **cemeteries** took the form of cremation burials in urns in the early part of the period. Elsewhere in the country there was a shift towards inhumation towards the latter part of the occupation, however it is unclear if this happened in the North-West region.

4.3.6 Early Medieval

Site types – Places of worship, Monastic sites, Sculpture

The early Medieval period is principally represented by the ecclesiastical establishments of the early church. Places of worship and monastic sites took a variety of forms including **churches, chapels, nunneries, and priories** and the archaeological record of such sites is varied. St Patrick's Chapel, at Heysham, is the best known example within the study area of an early Christian site where a small chapel on the headland was surrounded by a large graveyard and rock-cut graves. Elsewhere, early sites are known to have existed from the survival of **sculptural fragments**, usually **cross fragments**, although there are early burial monuments known as **hogback tombs** located within the study area.

4.3.7 Medieval

Common site types – Castle, Motte-and-Bailey, Pele Tower, Fortified House, Deserted Medieval Village, Places of worship, Monastic sites, Ports, Bloomery, Ridge and Furrow, Fish traps, Salt Works

Several of the early Medieval monastic sites were refounded in the medieval periods as **abbeys** and **priories**, and examples are known throughout the study area. Other places of worship, predominantly **churches**, were also founded during the medieval period, either as new sites or as redevelopments of earlier Christian centres, as appears to have happened, for example, at St Michael's, Workington.

The principal military structures and monuments of the Medieval period are **castles, motte-and baileys, pele towers** and other **fortified houses**. The Norman invasion and subsequent settlement as well as the centuries of warfare with Scotland saw the development of numerous defensive monuments. The Norman style motte-and-bailey, with its distinctive mound (motte) and palisaded enclosure (bailey) surrounding it, were superseded in later centuries as larger stone castles were built. The stone castles were usually built with a keep and perimeter walls, often surmounted by towers and were sited

to protect the interests of surrounding landowners, such as Piel Castle, which was built for the monks of Furness Abbey. The other principal manifestations of the years of unrest are the pele towers and other fortified houses, dating from the 15th and 16th centuries. These can be considered as small castles, usually consisting of a strongly defended tower several storeys in height surmounted by a crenellated parapet. Today they often stand alone but were more usually part of a complex of manorial buildings. Moated sites were another type of defended manorial dwelling, where the house and other buildings were defended by a wide moat, which may have been filled with water.

Many villages in the North-West had their origins in the medieval period, either as planned developments by major lay or ecclesiastical landlords or as a result of organic growth around early centres. Those that did not survive or thrive into more recent times can be identified today as **deserted medieval villages (DMVs)**. Traces of medieval agriculture, in the form of parcels of **ridge-and-furrow** are widespread in the coastal zone and throughout the region.

Medieval **ports** would have formed important early transport facilities for visiting shipping in the form of quays, jetties and staiths but the continued use of these facilities in later times has meant that few traces of their early form survive. **Fish traps**, often built by monastic houses, survive in the inter-tidal zone and were formed of large earthen banks, usually revetted with timber, designed to funnel fish into nets for capture.

A major medieval industrial activity on the coast was the production of salt at various **saltworks**. As well as documentary references to this activity, physical traces survive in the form of the various salt mounds and in place-name evidence. The evidence for salt making mostly consists of mounds of debris in the case of 'sleeching' which involved the extraction of salt from salt marsh deposits, and documentary references to the existence of salt pans in which the brine was evaporated. **Bloomeries** also continued to manufacture iron.

4.3.8 Post-Medieval

Common site types – Fort, Castle, Fortified House, Places of worship, Ports, Docks, lighthouses, Ridge and Furrow, Fish traps

The post-medieval sites and monuments fall into similar categories as those from the medieval period and there are similarities in the need for defensive sites, such as the fortified houses and castles, as warfare with Scotland continued until the Act of Union at the start of the 18th century. The major impact on the ecclesiastical landscape came with the Dissolution of the monasteries in the 16th century when the major religious houses of the region were stripped of their assets, allowed to fall into decay and were subsequently used as quarries for building stone.

The term **port** covers a wide range of structures from simple **quay** walls, through formally built **piers** to **docks**. It was with the great expansion of industrial activity from the mid-18th century that the development of the shipping facilities of the North-West gathered pace. The need to export the products of the region, led to an exponential growth in the provision of harbour facilities and a comparable growth in shipbuilding. Ships were originally built at the head of the beach and launched over rollers down to the shoreline, but the increasing size of vessels and the industrialisation of the process led to the provision of purpose built **shipyards**. A vast range of ancillary structures were also to be found in shipyards including sheds for timber storage, iron forges, ropewalks and

chain lockers.

The construction of purpose built **lighthouses** began around the latter part of the 17th century and was undertaken by enterprising individuals to protect their developing shipping empires trading, for example, from the developing ports at Liverpool and Whitehaven.

4.3.9 Industrial and Modern

Common site types – **Docks, Quays, Lighthouses, Wrecks, mines.**

Military site types - **Coastal batteries, Bombing Decoy, Pillbox, Anti-tank obstacles, Searchlight batteries, Airfield, Radar station, Anti-aircraft battery**

The Industrial Revolution saw the development of numerous ports of the North-West to serve a global market and the dock complex at Liverpool expanded to become one of the largest in the world. Details of the various docks and their associated features within the North-West study area are discussed in greater detail within chapters 5 – 9.

There are numerous **shipwrecks** lying off the coast of the study area, most of which date from the industrial period, although it is possible that some are post-medieval in date. In most cases the locations of the wrecks are not precisely defined and are recorded with a general NGR. Located within the inter-tidal zone often all that survives are the keel with a few spars and planks, held together by corroding metalwork.

Coal mining has had a decisive impact on parts of the landscape of the North-West region and, in the coastal zone, on the west Cumbrian coast in particular, where important examples of early **coal mines** are located. Although the mine itself is often deep underground the pithead complexes often contain examples of early industrial practices and the shafts themselves can be exposed by coastal erosion, opening some of the workings to the air for the first time. **Iron mines** and **copper mines** also became an important industry for the North-West region although there are few examples from within the study zone. The development of **gunpowder works** in Cumbria also formed an important manufactured product for the area.

With the exception of the system of Roman defences, there was no systematic attempt to defend the coast until the 18th century with establishment of a series of **coastal batteries** at the emerging ports of Liverpool and Whitehaven. These batteries mounted muzzle loading cannons until breach loading ordinance was introduced in the late 19th century. In the late 18th century the threat of war with the French and attacks by American privateers such as John Paul Jones led to a renewed interest in coastal defence and in the provision of gun batteries to defend the major ports of the North-West coast. Throughout the 19th century, as threats waxed and waned, coastal defences were updated or mothballed. Major developments were stimulated either by improvements in weaponry, such as the move from muzzle loading cannons to breach loading guns or by the extension of the various port facilities the batteries were designed to protect.

The advent of the First World War saw the development of this defensive system and new batteries, such as the Hilpsford battery on Walney Island were constructed. Other surviving First World War features include **practice trenches** such as those at Blackpool and Walney Island. **Sound mirrors** were large reflective dishes which amplified sound and in which Royal Observer Corps personnel sat, listening for the drone of approaching zeppelins.

During the Second World War a range of offensive and defensive structures were created to prevent invasion and protect the shipping and infrastructure of the North-West region. The following accounts are mainly based on the details to be found in Brown *et al* (1996).

Coastal batteries were designed to fire on ships and landing craft. In many cases they were facilities re-commissioned from the First World War (again Hilsford battery is an example) and deployed the same calibre ordinance. Structures consisted of the gun emplacements themselves, now usually roofed over to provide protection from aerial attack, a Battery Observation Post (BOP), magazines, generator buildings, searchlight emplacements and accommodation for the gun crews. The whole might lie within a barbed wire perimeter defended by pillboxes and weapons pits.

By the end of 1941 aerial bombardment posed the greatest threat. To combat this threat major installations and ports were provided with **anti-aircraft batteries**. The standard weapons deployed at these sites were 4.5 inch or the more later, more effective 3.7 inch guns. As initially built, batteries usually consisted of four emplacements arranged in a 'clover-leaf' arc around a battery command post with, occasionally, two additional emplacements set to one side or at either end of the arc. Other facilities included magazines, accommodation for the gun crews and a platform for a gun laying radar unit. The emplacements themselves were of a variety of shapes and where more than one type is found on a site this might imply developments during the course of the war, the original 4.5 inch guns being replaced from 1943 onwards by improved 3.7 inch weapons.

Typically, **searchlight batteries** consisted of a circular earthwork 9m in diameter for a 90cm light, a predictor emplacement, a generator, accommodation for the detachment and at least one light anti-aircraft machine gun pit. Searchlight emplacements generally only survive as crop marks.

As well as anti-aircraft artillery major centres of population, industry and ports were protected by **barrage balloons**. These balloons were intended to make enemy aircraft fly higher, thus diminishing the accuracy of their bombing and divert them towards the air-aircraft batteries. From the APM exercise transcriptions these sites can be seen to consist of a series of concentric rings for the tethering of the balloon itself and for anchoring the lines that extended below it to deter under flying.

As an alternative to engaging enemy aircraft or forcing them to fly higher, attempts were made to divert their attention through the use of **bombing decoys**. These were ground installations configured in such a way as to confuse enemy pilots and encourage them to waste their bomb load on meaningless targets. Two types were regularly deployed. 'QF' sites were established to provide mock fires to give the impression that the area had already been attacked while 'QL' sites attempted to simulate street lighting, marshalling yards and dock facilities. A detailed study of decoys has been made by Dobinson (2000).

As a last resort the civilian population and military personnel could retreat to purpose built **air-raid shelters** of which several types were built including trench shelters for multiple occupancy and the famous *Anderson* shelters erected semi-sunken in thousands of back gardens.

If an enemy had ever reached the beach the heavy calibre weapons of the coastal defence

batteries would have been of little use. The responsibility would then fall to **beach defence batteries** to hold the beach and prevent an incursion inland. The weapons deployed often consisted of a single 3 pdr or 6 pdr anti-tank guns in a concrete pillbox or earthwork emplacement.

Concrete **pillboxes** are the most familiar defensive structure encountered on the coast. They are the classic example of a protected position from which troops could engage the enemy, and a number of different types can be identified. They were either sited tactically to command a particular point of vulnerability or in groups as part of a wider system. Most notable of the latter are the pillboxes on strategically sited Stop-Lines. Hundreds of pillboxes are recorded in the NWRCZA study area and many survive to the present day. A comprehensive study of these features lies beyond the scope of the present project and the existence of most pillboxes is simply noted in tabular form.

Lines of concrete blocks are the most commonly encountered **anti-tank obstacles**, though ditches and solid walls pierced with embrasures were also deployed. During the war these were supplemented by **beach scaffolding** and **minefields**. These latter defences were cleared once the threat of invasion had passed, though they can often be identified on wartime aerial photographs.

Added to the threat of a sea borne invasion the possibility of an enemy arriving by air, either by parachute or the landing of troop carrying gliders, had to be considered. The latter concern was addressed by the construction of **anti-glider obstacles** at possible landing sites. These consisted of lines of concrete blocks similar to anti-tank obstacles but incorporated within a system of earthwork ditches and banks. The simplest variety consisted of single or parallel lines of obstacles up to 150m long and 10m wide. When set in groups, they were about 100m apart.

4.4 Conclusion

This completes the review of the common site types encountered on the North-West coast. Chapters 5 to 9 review these remains in detail and note the extent to which individual assets and groups of assets should be considered to be under threat from coastal erosion.

CHAPTER 5

A REVIEW OF THE ARCHAEOLOGY FROM THE DEE ESTUARY (CHESHIRE) TO SEAFORTH (MERSEYSIDE)

5.1 Introduction

The area discussed in this chapter extends from the Anglo-Welsh border in the Dee Estuary on the south-western side of the Wirral Peninsula to the northern limit of the Royal Seaforth Dock in Bootle at the mouth of the River Mersey (Fig. 5.1) and is defined as Block 1 of the project. This section of the study area encompasses the estuaries of the Dee and the Mersey, the Wirral Peninsula and the urban conurbations of Neston, Heswall, Hoylake, Wallasey, Birkenhead, Ellesmere Port, Runcorn and Liverpool. The Historic Environment Records analysed for this section comprised the datasets maintained by Cheshire Archaeology Planning Advisory Service and the Merseyside Archaeological Service. The draft Shoreline Management Plan 2 policy units are presented in table 5.1 and Figure 5.1.

Table 5.1 Shoreline Management Plan 2 Policy Units and preferred scenario

General Policy Unit Area	Specific Policy Unit Location	SMP Policy Unit	Preferred Scenario		
			0-20 years	20-50 years	50-100 years
Dee Estuary	Flint Marsh to Chester Weir to Sealand Rifle Range (Inner Dee Estuary, both banks)	11a 5.3	HTL	HTL	HTL
	Sealand Rifle Range to Burton Point	11a 5.4	HTL	MR	MR
	Burton Point to Thurstaston Cliffs	11a 5.5	NAI	NAI	NAI
	Thurstaston Cliffs	11a 5.6	NAI	NAI	NAI
	Thurstaston Slipway to Croft Drive, Caldy	11a 5.7	HTL	NAI	NAI
	Croft Drive Caldy to West Kirby Marine Lake	11a 5.8	HTL	HTL	NAI
	West Kirby Marine Lake to Royal Liverpool Golf Club	11a 5.9	HTL	HTL	HTL
	Royal Liverpool Golf Club to Hilbre Point	11a 5.10	NAI	NAI	NAI
	Hilbre Island	11a 5.11	HTL	HTL	HTL
Wirral	Hilbre Point to Wallasey Embankment	11a 6.1	HTL	HTL	HTL
	Wallasey Embankment	11a 6.2	HTL	HTL	HTL
	Wallasey Embankment to Harrison Groyne	11a 6.3	HTL	HTL	MR
	Harrison Groyne to Perch Rock	11a 6.4	HTL	HTL	HTL
Mersey Estuary	Perch Rock to Riverwood Road/Eastham Park (south/left bank)	11a 7.1	HTL	HTL	HTL
	Riverwood Road/Eastham Park to Eastham Ferry	11a 7.2	NAI	NAI	NAI

			Preferred Scenario		
	Eastham Ferry to Runcorn Bridge (south bank)	11a 7.3	HTL	HTL	HTL
	Runcorn Bridge to Arpley Landfill Site (Upper Mersey Estuary south bank)	11a 7.4	HTL	MR	MR
	Arpley Landfill Site (south bank) to SMP Boundary to west of Sewage Works (north bank)	11a 7.5	HTL	HTL	HTL
	Sewage Works to Runcorn Bridge (Upper Mersey Estuary north bank)	11a 7.6	HTL	MR	MR
	Runcorn Bridge to Pickerings Pasture	11a 7.7	HTL	HTL	HTL
	Pickerings Pasture to Garston Industrial Estate	11a 7.8	NAI	NAI	NAI
	Garston Industrial Estate to Seaforth	11a 7.9	HTL	HTL	HTL

5.2 Geology, Topography, Soils and Landuse

This stretch of coastline is an estuary-dominated system with both the River Mersey and the River Dee channels being formed along geological faults which have been modified by sub-glacial meltwaters infilling after the last glacial re-advance (Halcrow 2002). The bedrock geology of the Wirral Peninsula and the Liverpool area predominantly consists of Triassic sandstones, with Triassic mudstones present on the northern section of the Wirral Peninsula and Pebble Sandstones in the upper reaches of the Mersey estuary around Runcorn and Widnes. The superficial geology of the area is dominated by Devensian Till deposits with a complex sequence of coastal deposits. These deposits comprise Holocene salt marsh deposits on the south-west side of the Wirral, blown sand deposits backed by a tidal river deposit along the north shore of the Wirral, extensive Holocene tidal flat deposits within the channel of the River Mersey, the Shirdley Hill Sand Formation between Hale and Garston on the north bank of the Mersey and pockets of undifferentiated intertidal deposits, particularly around the mouth of the Mersey estuary (BGS 2008).

The shoreline topography in this area is influenced by shallow waters and a wide intertidal zone characterised by a series of sand banks, such as East Hoyle and West Hoyle Banks, and shoals, with the only rock formations at Hilbre Point, Hilbre Island and Red Rocks, where outcropping sandstone forms small islands. Lowlying reclaimed saltmarshes form much of the shoreline of the Dee estuary, although in places such as Thurstaston the banks of the estuary are defined by a low cliff or steep break in slope cut into the glacial till. Most of the remainder of the shoreline is protected by man-made seawalls which have halted the historic regression of the shoreline and now maintains an artificial shoreline position (Halcrow 2002). The inland areas are dominated by the gently undulating boulder clays and dunes which overly the sandstones and mudstones situated along the north and south sides of the Wirral peninsula (Cowell and Innes 1994) forming low-lying landscape. Higher ground (>50m aOD) is only present around Heswall and Caldy on the southern shore of the Wirral Peninsula and at Runcorn.

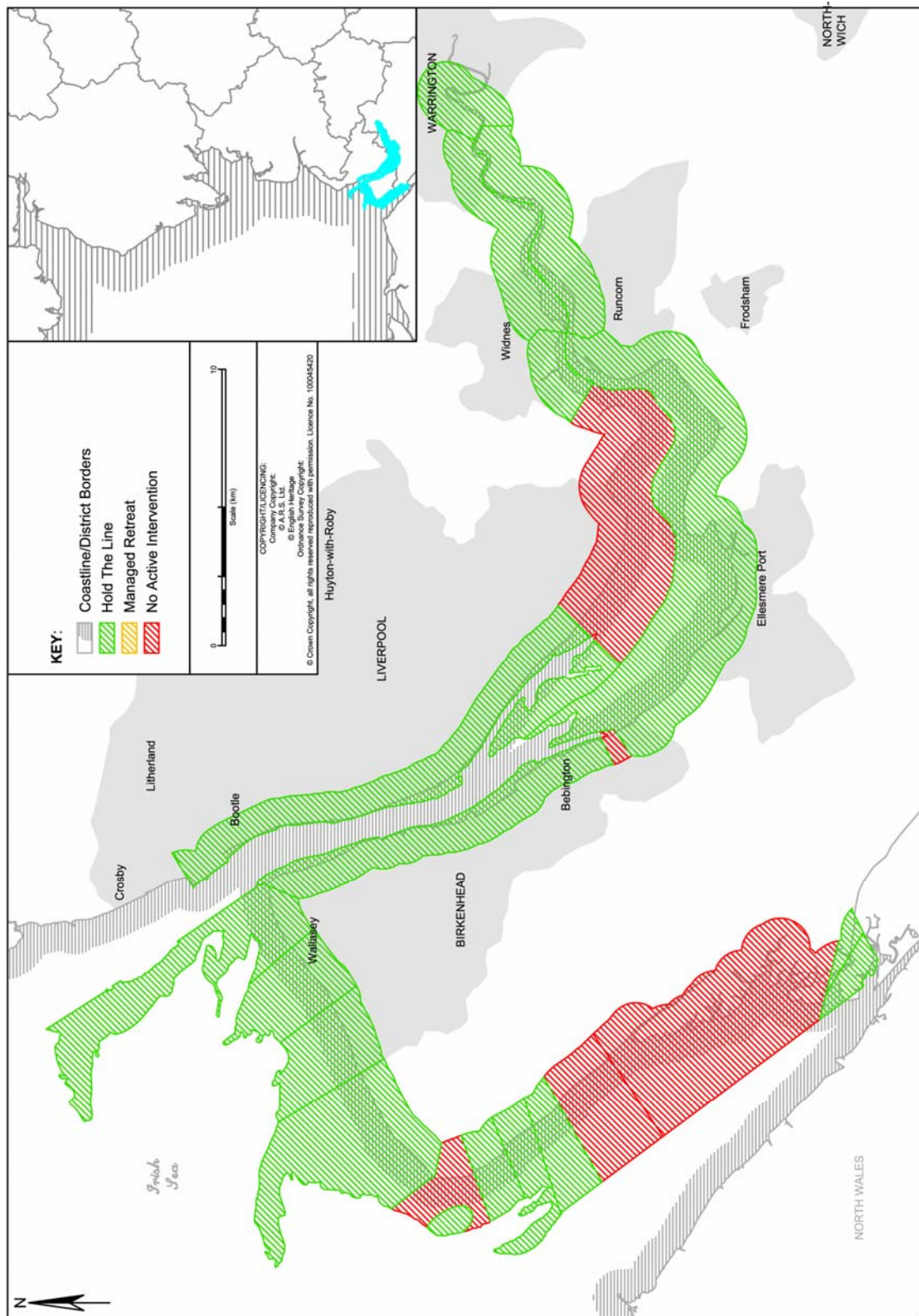


Figure 5.1 Location of Block 1 and SMP 2 policy units indicating preferred option for the next 20 years

The superficial geology has a direct bearing on the principal soils (Table 5.2 and Figure 5.2) and, to a limited extent, on the land use of the area. Most of this section of coast is urban in character with extensive industrial complexes dominating large stretches of the coastline. The major urban conurbations have been mentioned above and the industrial landscape contains diverse industries such as large motor vehicle works, the Stanlow Oil Refinery at Ellesmere Port, Liverpool John Lennon Airport and the famous dock complexes of Liverpool and Birkenhead. Areas which are not industrial in character are situated on the west side of the Wirral peninsula with isolated pockets along the northern shore; the south side of the River Mersey between Stanlow Oil Refinery and Runcorn; the upper reaches of the Mersey estuary between Runcorn and Warrington; and the area around Hale, on the north side of the Mersey to the east of Liverpool John Lennon Airport. These non-urban areas contain a mixture of agricultural land, as well as country parks and golf courses serving the urban conurbations. The implications for the survival of below ground archaeology within the urban and industrial landscape could therefore be considered poor, although good survival may occur in certain areas, such as waterlogged deposits around docks.

Table 5.2: Soils, land use and preservation potential from the Dee estuary to Seaforth. Data derived from Farewell 2007 and NSRI database (see Chapter 10 for further discussion of preservation potential of soil types)

Simple Description	Land Use (when not urban)
Deep loam	Cereals and some horticultural crops in drier lowlands
Deep red loam	Cereals, sugar beet and potatoes; some short term grassland.
Deep sandy	Cereals, potatoes, field vegetables and horticultural crops; some short term grassland.
Dune sand	Sand dune and some wetland habitats: recreation; very limited agriculture and coniferous woodland
Saltmarsh	Saltmarsh habitats some summer grazing; recreation
Sandy over red sandstone	Cereals and potatoes. horticultural and fruit crops; some permanent grassland and woodland on steep slopes
Seasonally wet deep clay	Cereals, sugar beet, potatoes
Seasonally wet deep loam	Permanent grassland with stock rearing where flood risk low
Seasonally wet deep red loam	Cereals and grassland; grassland in the Northern Region
Seasonally wet deep red loam to clay	Dairying on short term and permanent grassland. some cereals in drier districts
Seasonally wet deep sandy	Cereals; potatoes and sugar beet; some grassland and coniferous woodland
Seasonally wet deep silty	Dairying and stock rearing on permanent grassland
Seasonally wet deep clay	Stock rearing on permanent grassland with occasional winter cereals; more cereals in drier districts.

5.3 Early Prehistory: Palaeolithic and Mesolithic (Fig. 5.3)

As outlined in Chapter 3, prior to the late Mesolithic period the coastline in this area lay much further to the north and west, extending from Anglesey to Cumbria and the coastal deposits of peats, marine sediments and sands, particularly situated around the northern edge of the Wirral peninsula, only began to be formed in the 7th millennium BC (Tooley 1985). Prior to this the valleys of the Dee and the Mersey would have been riverine rather than estuarine and would not have formed the barrier, caused by high tidal ranges, which they do today. They could therefore have formed a focus for Palaeolithic and earlier Mesolithic settlement (Cowell and Innes 1994).

No artefacts from the Palaeolithic are recorded within this part of the study area.

5.3.1 Mesolithic sites and findspots

The data presented here relating to Mesolithic activity within this section of coastline is problematic due to the fact that there are discrepancies between the HERs and other sources (e.g. Cowell and Innes 1994; Griffiths 2007). Resolving these discrepancies is difficult and beyond the scope of a rapid assessment. What is presented here is a complete list and location information for all sites within the area listed as Mesolithic, with limited commentary on the provenance of the data. The vast majority of the sites are located along the north shore of the Wirral peninsula. Further investigation of the various datasets to produce a more accurate and comprehensive representation of Mesolithic activity in this area is presented as a priority for further research.

At Red Rocks off Hilbre Point (SJ 203 884; HER 2008-001 M) on the north-west tip of the Wirral, labelled A10 by Cowell and Innes (1994), excavation in 1914 produced ‘some pieces that have Mesolithic blade and blade-core affinities’. This site, based on raw material affinities with lithics recovered from Greasby, is possibly of early Mesolithic date (*ibid.* 34). Another site was located at Red Noses, New Brighton (SJ 2996 9407; HER 2994-001 M) on the north-east tip of the Wirral, labelled A6 by Cowell and Innes (1994), where two obliquely-blunted microliths, are reported to have been discovered. These were found with other lithic material, not necessarily of Mesolithic date. The obliquely-blunted microliths are also thought to be early Mesolithic in date. A further site is also detailed from the same location on the rocks of Little Eye to the south of Hilbre Island off the north-west tip of the Wirral peninsula (SJ 1989 8673; HER 1986-001 and 1986-007 M). The first site is equivalent to Cowell and Innes’ (1994) site A7 and is also mentioned by Griffiths as having produced finds from a ‘narrow band of dark soil’ (Griffiths 2007, 374). The artefacts consist predominantly of small flakes and spalls, one rod microlith and a small blade core, all of late Mesolithic date. Another possible Mesolithic find comes from Hilbre Island (SJ 184879; HER 1887-003), where a probable later Mesolithic microlith (Cowell and Innes 1994; site A8) was recovered in the mid-19th century, along with other, later material. Limited survey work was undertaken on Hilbre Island in 1995, with some photographic recording and section drawings made of eroding material. However the work was limited in scope and further examination of Hilbre Island is deemed a priority for further survey. Mesolithic material has also been recovered from the vicinity of the now eroded Dove Point (SJ 231906; HER 2390-001 M; Cowell and Innes 1994, site A5) during the 19th century. Finds include an obliquely-blunted point, a notched blade, a ‘rough scraper’ and flakes (Cowell and Innes 1994, 219). Additionally, Griffiths (2007) mentions that evidence has been found for a number of prehistoric middens in the eroding cliff sections on Hilbre Island. A further three

Mesolithic findspots (SJ 224 855; HER 2285-020 M; SJ 4435 8178; 4481-004 M; and SJ 4395 8155; 4381-003 M) are recorded along the Wirral coast. The first, at Caldly Hill, produced two flint blades now held by Liverpool Museum (Acc. Nos. 1977.89.21 & 22). Late Mesolithic flint scatters have also been identified at Ditton Brook (300 artefacts), Croxteth Park, Merseyside (550 artefacts). These sites were discovered as a consequence of fieldwalking programmes and in advance of development. The SMP 2 policy for Hilbre Island is Hold the Line.

The later Mesolithic finds or sites of the north Wirral coast are closely associated with palaeoenvironmental deposits, known as the Lower Peat/Forest Bed (SJ 236908 to 266922; HER 2692-001 M) and the Upper Peat/Forest Bed (UPFB), separated by a layer of clays and silts known as the Leasowe Marine Beds. The Lower Peat/Forest Bed (recorded by Cowell and Innes 1994 as site A1) is dated to 5490-5245 cal BC (6420 ± 60 BP; SRR-1494) and 5439-5194 cal BC (6460 ± 40 BP; SRR-1496), whilst part of the Upper Peat/Forest Bed has been dated to the middle of the 5th millennium BC (Cowell and Innes 1994), with further stratified layers dating from the Neolithic onwards (Griffiths 2007). Most of the deposits have been eroded (see Chapters 3 and 4 for details), with records of a visit in 1985 to the Lower Peat/Forest Bed at Leasowe showing that 'only small pieces of wood and tree stumps survive and the peat is also very poorly preserved' (Cowell and Innes 1994, 219), although sections of the deposits do survive under the dune deposits along the coast. At Gatewarth Farm, Cheshire (SJ 586869; HER 2590 CH) excavations in 1995 revealed floodplain sediments which contained deposits of peat, timbers, scour pool detritus, animal bones and deer antlers. The deposits were radiocarbon dated from the Mesolithic (7270 yrs BP in HER record) to the Roman period (1660 yrs BP in HER record). Additional sites with palaeoenvironmental potential are the marshes of Gowy, Ince and Frodsham, all close to the boundary of the study area and none of which have been subject to survey work (R. Edwards, pers. comm.).

The probable presence of early and later Mesolithic sites and associated palaeoenvironmental material within this part of the study area, particularly on the north Wirral shore, presents an opportunity for research into Mesolithic settlement on the coast. Whilst the SMP 2 policy for the entire North Wirral frontage is HTL there is some potential for survival in the intertidal zone which could be assessed in conjunction with deposits on the landward side of the present defences. Research initiatives in the NWRRF that could be addressed by targeted fieldwork on the north Wirral shore and Hilbre Island are Research Initiatives 2.21, 2.25, 2.26 and 2.27 which state:

'There is a need to identify well-preserved Mesolithic contexts for production of secure radiocarbon dates. This would assist with a more precise chronology for the whole Mesolithic period' (Brennand, 2007, 37)

and

'Targeted excavation of a range of Mesolithic sites to secure lithic assemblages from secure contexts. Typological analysis of lithic types coupled with radiocarbon dating' (*ibid.* 38)

Targeting the known archaeological and palaeoenvironmental remains from the Mesolithic period, some of which are actively eroding is seen as a priority for further

work in this area. There is also significant potential for integrating the information from the Wirral area with other Mesolithic sites further north, such as Heysham, Lancashire and Eskmeals, Cumbria, as well as the fieldwalking data retrieved on the Cumbrian coast by the Cherry's (see Chapters 8 and 9), to increase knowledge of the development of Mesolithic settlement on the coastal fringes in the north-west as well as addressing Research Initiative 2.23 which stresses the need for:

‘Inter- and intra-regional comparisons of the sources of Mesolithic flint and chert assemblages’ (*ibid.* 38).

5.4 Later Prehistory: Neolithic, Bronze Age and Iron Age (Fig. 5.4)

5.4.1 Neolithic sites and findspots

There is a general lack of evidence dating from the Neolithic period in this part of the study zone. As mentioned in Chapter 4 this is due, at least in part, to the fact that at least some of the coastal zone was underwater in the Neolithic period due to the maximum sea transgression occurring at the beginning of the period when the sea level was at 8m aOD (Tipping 1994, Clare *et al.* 2001). Evidence from Meols shows that the coastal landscape was at least partially forested with the Upper Peat Forest Bed dated from *c.* 4500 BC which was succeeded by a fen carr reedswamp *c.* 4000BC, in turn superseded by saltmarsh conditions *c.* 3800BC, with a subsequent drying from *c.* 3500BC which saw the development of reed swamp (Griffiths 2007). Palaeoenvironmental evidence suggests that numerous small scale and temporary clearances of the forest cover occurred throughout the Neolithic period and the presence of charcoal layers dating to this period suggests the clearances were created by the deliberate use of fire (Turner and Scaife 1995). This clearance coincides with the presence of cereal pollen within samples dating from this period (Cowell and Innes 1994).

The extent to which there was a continuance of hunting and gathering in the early Neolithic has been subject to much recent debate and the position does not appear to be consistent across different regions. On the north Wirral coast the excavation of a bone midden produced an auroch's skull, red deer antlers, dog and horse skulls together with vertebrae at Leaslowe Bay (SJ 296 921; HER 2692-012 M) dated to the third millennium BC (Griffiths 2007; Kenna 1986) which confirms that hunting was still being practised in the Neolithic period, at least on the north Wirral coast.

The lowland coastline of Cheshire and Merseyside appears to have been bereft of monumentality. Cowell (2000) has suggested that this may be due to the perseverance of hunting and gathering communities in the region with the additional small-scale exploitation of cereal crops, however there is the possibility that the extensive industrial and urban development of the region may have destroyed such evidence. The Calderstones, Merseyside, and a mortuary enclosure at Farndon, Cheshire, whilst lying outside the study area, do provide some evidence for monumentality along this section of coastline. However, they have been moved from their original location and are thought to have come from a passage grave, which was destroyed in the 19th century as Liverpool developed. Research Initiative 2.34 in the NWRRF^F states:

‘The distribution of megalithic monuments is currently concentrated in the north of the region. If this distribution really were genuine, then there is a need to identify what alternative funerary and ceremonial

practices were undertaken elsewhere [i.e within the lowlands of Merseyside and Cheshire]' (Brennand 2007, 43).

5.4.2 Bronze Age sites and findspots

There is evidence of Early Bronze Age activity within the coastal area in the form of lithic scatters at Hale on the north bank of the Mersey Estuary, at Irby on the Wirral and at Hilbre Island off the Wirral coast, as well as seventeen other findspots of metalwork around the northern parts of the Wirral and in the upper reaches of the Mersey. However, there are no known settlement structures or field systems of Bronze Age date within this part of the study zone. One burial site has been identified at Grove Hill (SJ 2195 8690; HER 2186-023 M) on the north-west Wirral coast. A Bucket Urn was found on Hilbre Island, although this was not apparently associated with any burial and so could represent evidence of a settlement location (Griffiths 2007).

5.4.3 Iron Age sites and findspots

Evidence for Iron Age activity in the study area is sparse and limited to findspots of Iron Age artefacts such as coins and swan-neck pins from the foreshore at Meols. The discovery of three swan-neck pins coincided with the emergence of three circular, stone-built structures seen eroding from sand dunes in the 19th Century and it is thought that the swan-neck pins probably came from these roundhouses, although this is not made explicitly clear by the antiquarian records (Griffiths 2007). The discovery of exotic artefacts, such as three Carthaginian coins dating from the late 3rd Century BC, suggests the location of a market engaged in long-distance trade, and the excellent access to the lowlands of Cheshire and Lancashire as well as the mineral-rich north Wales hills, would have made Meols a prime location for a market (*ibid.*), a story that is repeated throughout later periods. The large number of finds from Meols stand instark contrast to the low number of sites identified from aerial photographs in Cheshire and Merseyside as a whole, in comparison to other regions. This could be due, at least in part, to the fact that the soils of the area are generally stagnogleys, which are moisture retentive and crop marks form best in areas of moisture stress. Additionally, the area is predominantly pastoral, where not urban in character which will again reduce the number of sites visible from aerial photographs. The few known sites in the wider area are predominantly isolated single enclosures. The only exception is at Greasby, just inland of the study area on the Wirral peninsula where two small enclosures share one common side. There are no examples of unenclosed sites and few examples of linears forming field systems (Collens 1999), although there is a field system at Kelsall, just outside the study area. The site at Greasby, approximately 2km inland from the border of the study area, was associated with Cheshire Stony Very Coarse Pottery of Iron Age date and it is possible that the site was unenclosed at this early phase (Philpott and Adams 1999).

5.5 Roman and Romano-British (Fig. 5.5)

5.5.1 Roman and Romano-British sites

There are few known Roman or Romano-British sites within the area, although considerable numbers of finds dating from the Romano-British periods have been recovered from the foreshore at Meols suggesting it was the location of a significant, now destroyed, market location and possible settlement in this period, which is thought to have taken advantage of the sheltered anchorage provided by Hoyle Lake, a tidal pool off Hilbre Island, which silted up in the 18th century (Griffiths 2007). As was the case with the discoveries of artefacts of all periods at Meols there was a lack of stratified archaeological deposits. Numerous early (pre-Flavian) coins were found in the

assemblage and the fact that the majority of the material is late 1st and 2nd century AD suggests the area was an active market where coins and other items were circulated and lost in some quantity. This again contrasts with the hinterland, where few finds of coins and other artefacts have been made and suggests that the site was ‘integrated into the monetary economy of Roman Britain in a way that the rural settlements of its hinterland were not, and from an early date’ (Griffiths 2007, 391).

5.5.2 Roman military sites

A Roman Fortlet is known from Ince (SJ 4487 7708; SAM 27589; NMRUID 1355575; SMR 1958 CH), situated on a low ridge, overlooking the Ince Marshes with excellent views along the River Mersey. The site is well-preserved and has two rock-cut ditches nine metres apart, forming a sub-rectangular enclosure covering 0.48ha. Excavations in 1994 found a piece of Samian Ware dating to c. 80 – 110 AD in the fill of a modern feature, suggesting the site was founded after the legionary fortress at Chester. Postholes were also revealed during the excavation, showing the fortlet had internal timber structures (Philpott 1995). Roman fortlets are rare in Britain and this is one of only 50 known examples, half of which are in Scotland, and the scheduling information for the site states that ‘as one of a small group of Roman military monuments which are important in representing army strategy and therefore government policy, fortlets are of particular significance to our understanding of the period and all surviving examples are considered nationally important’ (English Heritage Scheduled Monument Description 27589). It is thought that the site was used to monitor river traffic on the Mersey, passing between the fort and *canabae legionis* at Chester and the proposed trading post at Meols. The site is protected from the River Mersey by the Manchester Ship Canal.

5.5.3 Roman and Romano-British settlements

An example of a probable Romano-British Enclosed Settlement is located at Halton Brow (SJ 5342 8250; NMR; HER 110 CH). The site has been partially excavated and a V-shaped ditch, 1.2m deep, forming an apparently rectangular enclosure of around 1.4 ha has been revealed. No evidence was discovered of internal features but pottery sherds, dating to the 2nd or 3rd Century AD, suggest the site was agricultural in nature, presumably a farmstead (Brown *et al.* 1975). Two other probable Romano-British Enclosed Settlements are known from aerial photographs at Moss Side (SJ 5653 8566; NMR ; HER 2436 CH), which is rectangular in shape and at Marsh Farm (SJ 5540 8663; NMR ; HER 2437 CH), which is a convex square with rounded corners (Collens 1994).

5.5.4 Roman infrastructure

The suggested route of the Roman Road between Chester and Wilderspool (SJ 5975 8527 centred; HER 2417/1/0 CH) just clips the eastern edge of the study area. However, the exact location of the road has not been discovered in this area and analysis of the aerial photographs for this part of the study zone showed no evidence of its existence.

There is also mention of a possible Roman wreck (Brennand 2006), located in the now infilled Pool that gave Liverpool its name. It was discovered in 1898 during excavation in Tryon St. The boat is of unknown date, but was found together with Roman coins and other artefacts, suggesting it may have been of Roman date (Gladstone 1932).

5.5.5 Roman and Romano-British findspots

There are also 43 other Roman findspots predominantly of coins but with other finds such as brooches along this stretch of coastline.

5.6 Early Medieval (Fig. 5.6)

Evidence of Early Medieval activity in the study area comes from antiquarian finds, largely unstratified and recorded to varying standards, and it is only since the 1970's that any sites other than ecclesiastical sites have begun to be discovered (Brennand 2007).

5.6.1 Early Medieval ecclesiastical sites

The known Early Medieval sites from the study area are predominantly ecclesiastical in origin such as St Bridget's Church, West Kirby (SJ 2179 8642; NMR ; HER 2186-001 M) and associated Churchyard (NMR ; HER 2186-002 M). The churchyard is curvilinear in shape and therefore thought to be from an early date. Sculptured stones including the fragments of four separate crosses were found when an earlier church was demolished in 1869. There is also a distinctive Viking period Hogback tombstone, within the churchyard carved in grey sandstone, which probably dates to the 11th Century AD (Thacker 1987, 289). A pre-Conquest Chapel, annexed to West Kirby, is located on Hilbre Island (SJ 1844 8796; HER 1887-001 M) where 'Anglo-Saxons were present from an early period' (Thacker 1987, 269). This is associated with a Cemetery (HER 1887-027 M), a graveslab (HER 1887-017 M) of 10th or 11th Century AD date and an early cross head (HER 1887-019) which possibly indicates the development of a pilgrimage site (Ecroyd Smith 1865; Thacker 1987). There is also documentary evidence for a monastic cell dedicated to St Hildeburgh (from whom the Island gets its name) known to have existed by 1081 AD. Further examination of the ecclesiastical remains at St Bridget's and on Hilbre Island is warranted as Research Initiative 4.32 states a need to:

'target churches on headlands for study as possible early sites, particularly when they are associated with...early medieval stone sculpture' (Brennand 2007, 88).

The SMP 2 policy for Hilbre Island it to be confirmed at the time of writing.

5.6.2 Early Medieval military sites

From the 6th Century AD the Mersey formed the border between the Kingdoms of Mercia and Northumbria. During the reign of Athaelflaeda, Lady of the Mercians, a *burh* or fortified settlement was constructed at Runcorn in 915 AD (SJ 5082 8333; HER 109 CH) as part of new frontier defences along the River Mersey. The precise location is unknown, but it was likely to have been situated on Castle Rock in Runcorn, which projected into the River Mersey until it was destroyed in 1862 to improve navigation of the river and for the construction of a viaduct. In 1845 it was described as 'a triangular piece of ground cut off from the land by a ditch six yards wide' (Dodgson 1981). There is one possible Battlefield dating from this period in the study area, at Bromborough (SJ 3563 8315; HER 3583-001 M). This is the reputed site of the battle of Brunanburgh in 937 AD between Athelstan of Wessex and a mixed force of Irish, Britons and Norse. The armies on both sides were large, possibly as many as 18,000 men each, and the Anglo-Saxon victory effectively ended 'British' resistance to the Saxon invaders, combining most of England for the first time under one rule.

5.6.3 Early Medieval infrastructure

The use of waterways as a method of transport is reinforced by the discovery of various Early Medieval log boats in the Mersey, of which two are known from the study area at Warrington (SJ 5985 8657; HER 504 CH; and SJ 5830 8710; HER 506 CH). The former was found in 1931, made of oak and has been radiocarbon dated to 1090 cal AD, whilst the latter was discovered in 1971, was constructed of elm and has been radiocarbon dated to 1000 cal AD (McGrail 1978). No evidence of any cargo was recovered with either vessel, but they are thought to represent small trading vessels used to transport goods along the Mersey, possibly from Meols.

5.6.4 Early Medieval findspots

At Meols comparatively little evidence of Early Medieval activity has been discovered, although there is a hint of an ecclesiastical presence, in the form of early Christian artefacts including three Byzantine coins of the 6th Century AD. However, a more significant number of Viking objects have been found on the foreshore at Meols and, as with earlier periods the site was possibly used as a transshipment port and market, something attested to by the find of part of a merchant's balance scales (Griffiths 2007). There is also a documented early 10th Century Viking presence on the Wirral, under Ingimund, who was given lands in the area following the large-scale expulsion of the Vikings from Ireland and Anglesey. The lands were donated by Aethelflaeda, although Ingimund apparently repaid the favour by besieging her in the city of Chester, from where he was repulsed by the legendary use of boiling beer and swarms of bees (*ibid.*).

5.7 Medieval (Fig. 5.7)

5.7.1 Medieval ecclesiastical sites

The majority of the monuments known from this part of the study zone are ecclesiastical in origin. A Benedictine Priory was founded in Birkenhead (SJ 3280 8855; NMR ; SMR 3288-001 M) , an Augustinian Priory was founded at Norton (SJ 5484 8304; SAM 27608; NMRUID 71788; SMR 66/1 CH) and a Cistercian Abbey was founded at Stanlow (SJ 4277 7735; SAM 22590; NMRUID 69550; SMR 17/1 CH). The Benedictine Priory at Birkenhead was founded around 1170 and, in 1330, a royal grant from Edward II gave them the rights to operate a ferry between Birkenhead and Liverpool (Knowles and Hadcock 1953). Norton Priory (Fig. 5.*) was founded in 1133 by the Baron of Halton, William Fitz Nigel and achieved the status of Abbey in 1391. The scheduled area includes the remains of the abbey as well as ruins of the abbey church, cloister, chapterhouse, dormitory, refectory, kitchens, Abbot's lodgings, a guest house, early church building, a bell pit and tile kiln, the monastic cemetery and a moat, which enclosed the entire complex but was infilled in the 18th or 19th century (Harris 1980). The Abbey at Norton is unique in that it is the only Augustinian monastery to have undergone recent excavation between 1970 and 1985. The excavations investigated a large part of the abbey complex and revealed two timber-built aisled halls which were occupied during the first phase of construction. These halls burnt down in the 13th century and were replaced by a kitchen (Greene 1972; 1974). The remainder of the abbey is constructed in stone. A casting pit for a 12th Century bell, as well as a medieval tile kiln indicate industrial activity at the site. Norton Priory is a site of national importance which has been the subject of recent archaeological investigation and also through survey and documentary research, a site which has been firmly placed in its local and regional contemporary landscape context. Parts of the site still remain unexcavated. The surrounding moat will preserve important waterlogged remains and the graveyard inhabitants could yield information on the diets, diseases and origins of the monks and lay brethren (English Heritage Scheduled Monument Description 27608). Stanlow Abbey was founded on a low rocky promontory

in the Mersey in the latter half of the 12th century by John de Lace, Baron of Halton and was dedicated to St Mary. In 1279 during a storm the site was swamped by the sea and badly damaged. Further damage to the site by a serious fire in 1289 led to many of the monks transferring to Whalley Abbey and the site became a grange of that house, being listed as such in 1535. The site is a rare example of a failed monastery being converted into a grange and few granges, although numerous in the Medieval period, can now be accurately located (*cf.* references for granges below). *In-situ* and re-used medieval fabric survives and further evidence of the abbey and grange will exist at the site (English Heritage Scheduled Monument Description 22590).

Moated sites and monastic granges are recorded in the HER's at Bromborough (SJ 3564 8212; HER 3582-012 M), Garston Old Hall (SJ 4040 8451; HER 4084-030), Speke Hall (SJ 4188 8257; HER 4182-001), Ince Manor (SJ 4492 7652; SAM 13516; HER 19/4/0 CH), Poole Hall (SJ 3909 7847; HER 11/1/1) and a possible site at Great Sankey (SJ ; HER 565 CH). Additional possible moated sites have been recorded from aerial photographic transcription as part of APM exercise at Doe Green, to the west of Great Sankey (SJ 5789 8492; NMRUID 1462635) and at Moore, to the east of Runcorn (SJ 5504 8768; NMRUID 1462453). Ince Manor was one of twenty-one held by St Werburgh's Abbey, Chester. Two sandstone buildings dating to the 13th or 14th century still stand on the site, that to the north-east being the former Hall and that to the north-west a range of lodgings and these, along with a wall to the south-west enclose a small courtyard. A moat, cut into the bedrock, now partly infilled and overlain by modern features, still survives to the east of the site. The manor was one of the earliest recorded properties of the canons of St Werburgh, being mentioned in the Domesday Book. Ince Manor is one of only five standing monastic manorial buildings in the north of England, is still in a good state of preservation and is one of the more complex structures of this type in the country. The lodgings are the best preserved example in the country and the hall has a rare example of a defended entranceway. According to the scheduling information the manor is known to have belonged to St Werburgh's prior to the Norman Conquest and therefore evidence of early medieval archaeology could well be present at the site (English Heritage Scheduled Monument Description 13516).

A number of churches founded in the medieval period are recorded in the HERs. These include Liverpool Church (HER 3390-002), St Wilfred's Chapel (HER 4084-003 M), Heswall-cum-Oldfield (HER 2681-001 M), the Church of All Saints (SJ 5106 8323; LB 56027; HER 108/1 CH) and its associated Churchyard (HER 108/1/1 CH) in Runcorn and the Church of St James (SJ 4498 7635; HER 19/2) at Ince. The Church of All Saints, Runcorn, is now a Grade II* listed Church built in 1849 on a rock overlooking the River Mersey, but was built on the site of an earlier church, which may even have been late Saxon and associated with the Runcorn *burh* (Thacker 1987). St James is also Grade II* listed and was remodelled in the mid-19th Century, up to which point it was said to have retained Norman features. There are also three medieval crosses known from documentary sources at Whiston (SJ 4600 8200; HER 69 CH), White Cross (SJ 5975 8818; HER 567 CH) and Garston (SJ 4041 8442; HER 4084-004 M).

5.7.2 Medieval military sites

The only large, non-ecclesiastical site within the study area is Halton Castle (SJ 5377 8205; SAM 27611; LB 55981; NMRUID 71576; HER 104/1 CH), now a ruined shell-keep, but with a motte-and-bailey predecessor, which stands on a prominent hill of red sandstone overlooking the estuary of the River Mersey to the north. The motte-and-bailey was built by Hugh Lupus, Earl of Chester, in *c.* 1070 by isolating the highest part

of the promontory on the north-western side through the excavation of a ditch 8 metres wide and utilising the natural platform on the rest of the hilltop as a bailey. Excavations at the site in 1987 indicated that the ditch was infilled in the 13th century. Subsequent phases removed all traces of previous castles by removing all earth down to the bedrock before rebuilding commenced. By 1250 the curtain wall of the keep had been built, together with a square tower on the west side, a round tower at the north end, and stone buildings in a range along the north-western side. In the 15th century a gatehouse was constructed. The excavations in the 1980's also revealed evidence for a settlement outside the Castle walls (English Heritage Scheduled Monument Description 27611; McNeil and Jamieson 1987). The site is a Scheduled Monument and Grade I Listed Building. Shell keeps are rare nationally (only 71 examples are known) and no two examples are exactly alike. They are a significant medieval monument type, acting as administrative centres and the *foci* for settlement patterns and this site, in conjunction with the ecclesiastical buildings at Norton and the nearby medieval village form the 'vestiges of an extensive surviving medieval landscape' (English Heritage Scheduled Monument Description 27611).

5.7.3 Medieval rural sites

Evidence of rural settlement is very limited. Antiquarian evidence from Meols suggests there were three different types of building associated with the medieval finds, comprising those with rough stone foundations into which timbers were set, those of simple wattle construction, and those of a type known as 'clay dabbins' comprised of clay walls in a rectangular construction (Griffiths 2007). Away from Meols there are possible shrunken medieval villages at Weston (SJ 5090 8040; HER 107/1 CH) on the south-west coast of the Wirral, which was mentioned in the Domesday Book, but has now been obscured by modern development, and Leighton (SJ 2860 7940; HER 31/0 CH), east of Runcorn, which was also mentioned in the Domesday Book, but may never have been more than a group of farmhouses. Ince Village (SJ 4500 7650; HER 19/0 CH), with associated manor house, was also mentioned in the Domesday Book with three hides and five ploughs and survives as a village to the present day.

5.7.4 Medieval industrial sites

Industry dating from the medieval period, in the form of mills are known at Netherpool (SJ 3900 7770; HER 22 CH), Norton Priory (SJ 5430 8370; HER 123 CH) and Garston (SJ 4029 8424; HER 4084-001 M). These mills are known from documentary records, although their exact location and type of mill is unknown.

5.8 Post-Medieval (Fig. 5.8)

The volume of records available from archives, as well as new records produced for this project, increases dramatically for the Post-Medieval periods (and later Industrial and Modern periods) for this part of the study area. The level of detail presented within this review is therefore, of necessity, selective and whilst sites of perceived importance (e.g. docks, early industrial sites and their infrastructure) are included, information on other sites (e.g. farms, inns and cottages) is not included in detail.

5.8.1 Post-medieval rural sites

As was the case with the preceding medieval period the post-medieval period in this part of the study area comprised an essentially rural landscape, with a number of known farms, farmhouses and associated barns scattered throughout the study area, of which seven are Grade II Listed Buildings. These are Brookfield Farmhouse, Runcorn built in

1691 (SJ 50854 82129; LB 56042; HER 128/1 CH); Manor Farmhouse, Runcorn built in the early 17th century (SJ 50868 80393; LB 56031); a barn, south of the Old Hall in Runcorn built around 1607 (SJ 50908 80317; LB 56024); Hall Farmhouse built in 1743 (SJ 36003 79999; LB 215592), on the south-east of the Wirral; Manor Farmhouse built in 1683 (SJ2270585314; LB 441582); Oldfield Farmhouse built in 1604 on the west side of the Wirral (SJ2551182828; LB 215637) and Redstone Farm built in the 18th century on the north side of the Wirral (SJ2255889843; LB 441461). There are also a number of Grade II Listed farmhouses immediately outside the study area in the village of Ince, on the south side of the Mersey. The results of the transcription of the aerial photographs is dominated by ridge and furrow and field boundaries with 67 of 86 mapped post-medieval features being associated with agricultural fields. However, the masking of previous landscapes by the large-scale urban development can be seen by the fact that of over thirty known agricultural buildings from this part of the study area only five are located in the vicinity of surviving ridge and furrow, mainly on the southern edge of the Wirral peninsula.

Other rural sites dating from the post-medieval period include a rectilinear enclosure (SJ 2554 8232; NMR 1468067), transcribed by the APM exercise on the west side of the Wirral and a duck decoy pond (SJ 4780 8268; SAM 27851; NMR 69741; HER 68/1/2 CH), a Scheduled Ancient Monument built in the 17th century to trap wildfowl.

5.8.2 *Post-medieval maritime sites*

Shipping and the maritime industry were a hugely significant factor in the development of this part of the study area, particularly with reference to the dock complex of Liverpool. By the late 1500's Liverpool and its surrounding areas began to take advantage of the increased silting of the River Dee to win trade that crossed the Irish Sea that formerly used the port of Chester, a process recognised in 1626 when King Charles I granted the town a new and improved charter (Belchem 2006). Additionally, the development of trade with America in the later 17th century increased the importance, and wealth, of the port of Liverpool dramatically. The first recorded cargo from America was landed in 1648 and consisted of 30 tons of tobacco. Trade then increased rapidly throughout the late 17th century. Prior to the 17th century, in contrast, most trade had been with Europe and was dominated by the ports of south and east England (LLC? 2003). As trade with America increased the ports of the west coast, including Liverpool, began to expand with coal, cloth and salt in particular being exported and sugar and tobacco imported. The development of the dock complex owed much to the merchants who, in seeking personal profit, pooled their resources to fund the development of the port facilities (*ibid.* 2003). The development of the port of Liverpool, and the city of Liverpool, was also inextricably linked with the slave trade. The vast profits from this trade transformed Liverpool into one of the most important cities in Britain (Belchem 2006).

Liverpool's initial development as a port occurred despite its unsuitability as a location for mooring, loading and unloading ships. Until the 18th century the shoreline was situated approximately 250m inland from the present High Water Mark, along the line of Strand Street (the A5036). The estuary had a large tidal range, fast flowing current, rock outcrops and exposure to westerly storms making the only safe anchorage in the Pool that gave Liverpool its name. In 1709 work began to develop the Pool, along with its inlet, into a commercial dock (the Old Dock) by building a brick and wooden pile structure, finished with sandstone (SJ 34178897; HER 3489-024? M). Officially opened in 1715 it was the first commercial, enclosed wet dock in the world and could harbour up

to a hundred ships of the time. The dock also included one graving (dry) dock (SJ 3417 8997; HER 3489-032 M). The dock was further developed in 1737 when its entranceway was converted into what would become Canning Dock, by the creation of three more graving docks, two of which are still extant (SJ 3402 8997; HER 3489-024), making them the oldest structure of the Liverpool docks visible today. From 1767 a tidal basin that was to become Herculaneum Dock, approximately 2 miles further upstream from the Old Dock was used to service a nearby copper works. Further docks were built to the south of Canning dock, at Salthouse, George's, Duke's, King's and Queen's docks between 1757 and 1785. Captain William Hutchinson, a former privateer, was appointed the first Liverpool Dock Master in 1759 who, as well as inventing the reflecting mirrors used in lighthouses, insitigated the building of new lighthouses at Perch Rock (SJ 3089 9469; HER 3094-23 M) on the north-east tip of the Wirral at the mouth of the Mersey, at Mockbeggar, Hoylake (SJ 2145 8900; HER 2189-015 M) and Bidston. The latter was also used to relay semaphore messages to Liverpool on the safe arrival of shipping (Liverpool City Council 2003).

5.8.3 Post-medieval industrial sites

Other early industries, apart from water- and wind-powered mills used in the rural environment, comprised both productive and extractive industries, as well as infrastructure to support the shipment of goods and material. An early glassworks (probably in use before 1772) is known from the Warrington area (SJ 5981 8809; HER 626/2 CH). A further example was located amongst the Liverpool dock complex (SJ 3442 8961; HER 3489-007 M) and another in Birkenhead (SJ 3204 9025; HER 3290-001 M). An ironworks (SJ 3421 8973; HER 3489-013 M), a copperworks (SJ 3454 8929; HER 3489-003 M) and a brickworks (SJ 3385 9076; HER 3390-009 M) were also located around the early Liverpool dock complex, all taking advantage of the newly expanded harbour facilities to reach new markets.

Coal mining occurred at Denna Colliery (SJ 2902 7615; NMR 1125632; HER 30/1 CH) on the south-west corner of the Wirral on a small-scale from the 1600's although larger scale extraction did not start until the latter part of the 18th century, when two underground canals were cut to haul the coal and the mineral was shipped from the nearby Denhall Quay (SJ 2894 7593; HER 3 CH) to Wales, Ireland and the Isle of Man. Expansion in the late 19th century saw deeper seams excavated and a railway link (HER 30/3 CH) established to the mainline. A stone quarry was established at Runcorn, possibly during this period, although it later expanded dramatically and is discussed in more detail in the following section. Small quarries were also transcribed from aerial photographs for this project, situated along the western edge of the Wirral peninsula, probably for sandstone extraction, and are thought to be post-medieval in origin given their size and location.

Dungeon Lane saltworks (SJ 45058204; HER 4582-001 M) and an associated nearby wharf were built at the end of the 17th century where four pans, of sandstone, were constructed to refine salt from rock salt and salt water. The site is an extremely well-preserved example of an post-medieval saltwork and is one of the sites that supplied salt to the developing port of Liverpool. It is therefore of considerable significance at least regionally and, given its rarity value, nationally. The site lies on MHWs and is at risk of erosion from coastal processes (as well as from 4WD vehicles running over the site), as the SMP 2 policy for this location is NAI. The associated wharf lies in the intertidal zone. In the site archive in the Liverpool HER an accompanying letter mentions a saltwork on

Hilbre Island, although no further evidence of this site was found. Survey work on Hilbre Island may therefore identify its location.

5.8.4 *Post-medieval infrastructure*

The early infrastructure supporting the increasing shipment of goods through the Liverpool docks was provided firstly by improved navigation on the region's rivers and then by the canals. The Mersey and Irwell Navigation and the Douglas Navigation were two early 18th century examples of artificially improved river systems to aid transport of goods, although evidence for works for both these projects lies outside the study area. The Bridgewater Canal is one of the first true canals in Britain and was opened in 1761 to transport coal between Worsley in Salford and Manchester. The success of the canal led to its expansion to Runcorn, which was successfully completed by 1773. A series of ten locks connected the canal basin (SJ 5025 8295; HER 125/1/1 CH) with the River Mersey. A complex was built at the basin that allowed boat building, and also included a dry dock and warehouses, the foundations of one of which can still be seen (Ashmore 1982; Cheshire County Council and English Heritage 2003).

5.9 Industrial and Modern

The 19th century saw the post-medieval beginnings of the Industrial Revolution explode into a myriad of industries and their associated infrastructure, as well as the huge urban development that housed the workers for the factories and foundries. Dwellings were also constructed that housed those that worked in the dock complexes, canals and railways that shipped materials and products to a global empire. The 20th century then witnessed the harnessing of this industry for the prosecution of two World Wars and the development of the associated military complexes that defended them. However even during the massive expansion of industry in the area there was still a rural presence, particularly on the Wirral peninsula and on the south side of Liverpool around Garston, with over 40 records of farms or farmhouses constructed in this period present in the HERs, in addition to those known from the post-medieval period.

5.9.1 *Industrial and modern maritime sites*

The docks of Liverpool expanded on their 18th century origin in dramatic style in the 19th and 20th centuries. International trade, including slaves and particularly cotton, saw the city become the largest market in the world for the latter commodity, supplying the booming mills of Lancashire and Manchester. The capacity of the Liverpool docks to import raw material and export manufactured goods was integral to the industrial development of England. As a result of the ending of the East India Company's monopoly on trade in 1813 further trading links were established with India and the Far East and the dock complex grew accordingly with over ten miles of quay being built between 1824 and 1858 alone (Belchem 2006). Seven docks had been built in Liverpool by the end of the 18th century. A further 27 docks were built by the end of the 19th century, expanding to the south of Queen's and to the north of Canning Dock. The development of the dock complex is presented in table 5.3 and fig. 5.9.

Table 5.3: The docks of Liverpool

Dock Name	HER No.	Date opened	Grid reference
Old Dock	3489-024?	1709	SJ 3439 8997
Canning Dock	3489-056	1737	SJ 3416 8999
Salthouse Dock	3489-033	1757	SJ 3426 8979

George's Dock	3390-006	1771	SJ 3392 9027
Duke's Dock	3489-062	1773	SJ 3430 8958
King's Dock	3489-060	1785	SJ 3430 8931
Queen's Dock	3489-061	1785	SJ 3445 8901
Princes Dock	3390-029	1810	SJ 3377 9057
Manchester Dock	3390-030	1815	SJ 3394 9004
Clarence Dock	3391-014	1830	SJ 3352 9179
Brunswick Dock	3488-017	1832	SJ 3471 8839
Waterloo Dock	3391-011	1834	SJ 3353 9121
Victoria Dock	-	1836	SJ 3350 9145
Trafalgar Dock	-	1836	SJ 3352 9160
Coburg Dock	3488-010	1840	SJ 3456 8873
Toxteth Dock	3487-001	1841	SJ 3491 8792
Albert Dock	3489-063	1846	SJ 3410 8973
Nelson Dock	-	1848	SJ 3345 9280
Bramley-Moore Dock	3392-003	1848	SJ 3346 9249
Salisbury Dock	3392-004	1848	SJ 3339 9209
Collingwood Dock	3392-006	1848	SJ 3353 9210
Stanley Dock	3392-007	1848	SJ 3373 9211
Wellington Dock	-	1850	SJ 3352 9268
Sandon Dock	-	1851	SJ 3352 9302
Huskinson Dock	3393-010	1852	SJ 3349 9324
Wapping Dock	3489-058	1855	SJ 3443 8936
Canada Dock	-	1859	SJ 3344 9379
Brocklebank Dock	-	1862	SJ 3324 9428
South Ferry Basin	3488-015	1865	SJ 3443 8860
Herculaneum Dock	3587-029	1866	SJ 3547 8733
Langton Dock	-	1881	SJ 3307 9457
Alexandra Dock	-	1881	SJ 3300 9496
Harrington Dock	3587-027	1882	SJ 3521 8753
Hornby Dock	-	1884	SJ 3283 9539
Gladstone Graving Dock	-	1913	SJ 3254 9587
Gladstone Dock	-	1927	SJ 3254 9587
Royal Seaforth Dock	-	1972	SJ 3205 9638

The docks are now part of a World Heritage Site which stretches from Wapping Dock in the south to Stanley dock in the north and includes numerous Listed Buildings, including some of the dock complexes, warehouses and commercial buildings. The three early 20th Century buildings at the Pier Head, comprising the Royal Liver Building, the Cunard Building and the Port of Liverpool building, form the focal point of a waterfront that is instantly recognisable. The Royal Liver Building, Grade I Listed (SJ 333880 390329; LB 214151) is one of the first multi-storey reinforced concrete framed buildings in Britain, whilst the Cunard Building, a Grade II* Listed Building (SJ 333923 390273; LB 214150) was built to house the offices of the famous Cunard Shipping company, a competitor to the White Star shipping line that operated the *Titanic*. The Port of Liverpool Building, also Grade II* Listed (SJ 333922 390208; LB 214149), formed the head office of the Mersey Docks and Harbour Board that oversaw the Liverpool Dock complex. To the south of the Pier Head buildings lies Albert Dock, with its five impressive warehouses, which are Grade I Listed (SJ 334105 389735 centred; LB 213631, 213632, 213633, 213634; HER 3489-064, 3489-065, 3489-066, 3489-067, 3489-068 M). Constructed in the middle of the 19th century, the warehouses were the first commercial public warehouses on the dockside, and could contain 250,000 tons of imported goods. Also incorporated

into the Albert Dock area are the older Canning Docks, of mid-18th century date. The Canning Docks comprises the Canning Dock, of 1737, built as a dry, tidal dock and the Canning Graving Docks Nos. 1 and 2, built in 1757, all of which are Grade II listed. The rest of the dock area of the World Heritage Site lies to the south of Albert Dock.

Fort Perch Rock (SJ 30969948; HER 3094-21 M; NMR 1429176) situated on the north-east of the Wirral peninsula, was completed in 1829 to defend the port of Liverpool. Built to a trapezoidal plan in red sandstone and initially mounted with 15 34-pounder guns. The fort saw continuing development, particularly during the First and Second World War, and it was during the latter it fired onto a German U-boat in Liverpool Bay.

There are numerous wreck sites in Liverpool Bay, often the result of vessels being driven onto the numerous sand bars and 12 have been mapped as part of the APM exercise for this project. However, many of the recorded sites have been dispersed by storms, destroyed by explosion as they cause a hazard to shipping, or refloated and rescued, so ascertaining how many and where such features are located is impossible (*c.f.* Adams and Ahmad 2005), particularly within the remit of a rapid coastal zone assessment. This issues is further discussed in Chapter 10.

5.9.2 Industrial and modern infrastructure

The development of the canal system complemented and facilitated the increasing transport of materials through the port of Liverpool and elsewhere in the study area. The first canal to enter Liverpool was the Leeds and Liverpool Canal, built during the late 18th century, which terminated at Clarke's Basin (SJ 333835 390945; HER 3390-014 M) serving a coal yard on the quayside. The Leeds and Liverpool Canal developed into the longest and most successful canal in Britain transporting coal, wool, cotton, limestone, grain and other cargo to the industrial centres of northern England. In 1846 the canal was connected to the Liverpool Dock complex at Stanley Dock. Old Quay in Runcorn, which formed the link between the River Mersey and the Runcorn to Latchford Canal, opened in 1804 and provided a complex that it was hoped would rival the earlier Bridgewater Canal (Starkey 1990). The Bridgewater Canal also developed during this period as well, with Francis Dock being built in 1843. 55,000 tons of raw cotton was imported through Runcorn during the period 1840-1842. In 1847 Runcorn's maritime importance was recognised when it became a Customs Port independent of Liverpool. Although the foreign trade did not materialise quite as hoped, the port continued to expand and Alfred Dock, complete with hydraulic cranes, was completed in 1862 (Starkey 1990; Cheshire County Council and English Heritage 2003). The continuing expansion of the port of Runcorn ended in 1887 when work began on the construction of the Manchester Ship Canal. The Bridgewater Navigation Company was bought by the Ship Canal Company, who gained control over the port facilities at Runcorn. Until the Ship Canal was completed ships used a temporary dock at Weston Point, an area which had been in use since 1810 where the Weaver Navigation connected to the River Mersey (SJ 4940 8130; HER 78 CH). On completion of the Ship Canal in 1894 trade resumed at the Runcorn Docks but the development of the Ship Canal did remove the Old Quay at Runcorn, where the canal, ferry slipway, tidal basin, docks and locks were almost completely destroyed (*ibid.* 1990). The development of Ellesmere Port (SJ 4060 7730; HER 61/1/1) with its complex of Grade II listed buildings began when the Shropshire Union Canal, transported Welsh coal, iron and limestone from Derbyshire. The development of Ellesmere Port in the early 19th century was initially on a small scale, although it did include a canal lighthouse (SJ 050577413; LB 56298), which is now Grade II Listed, as well as warehousing, basins, and a covered transshipment centre (Aspinall and

Hudson 1982). However during the latter part of the 19th century freight from the potteries of Staffordshire was transported through the port, which led to the creation of specialist warehousing including the Grade II Listed china clay warehouse (SJ 4044 7730; LB 56328; HER 61/1/2 CH).

5.9.3 Industrial and modern industry

The industries that the various dock complexes and their infrastructure served were varied. The Cammel Laird facility (SJ 33295 38825; HER 3288-027 M) in Birkenhead was founded in 1824 and became pre-eminent in the design and construction of steel ships and their propulsion systems. Between the early 19th century and the end of the Second World War, over 1,100 vessels were launched from the slipways. These included the first steel ship ever built, the *Ma Roberts*, in 1858, the second *Mauretania* for Cunard Lines in 1939, and the first all-welded ship, the *Fullagar*. Shipbuilding in Runcorn was at its height in the 19th century, with the Bridgewater complex having the earliest shipbuilding facilities, with six vessels being launched in the last ten years of the 18th century (Cheshire County Council and English Heritage 2003). By the mid-19th century Runcorn was well-known as a builder of high-quality vessels, from small inshore boats to large transatlantic ships, with shipyards located at Castle Rock, Belvedere Street and Mersey Street. However, as ship design changed from wooden sailing vessels to steel-built steamers shipbuilding at Runcorn declined (Starkey 1990).

Other industries located within the study area included various types of chemical works including acid, alkali, alum, glue, grease and soap works, as well as glass works, timber yards, quarries, tanneries and metal works for iron, copper, lead and zinc. The chemical industry of the Widnes area began to develop in the middle of the 19th century when increasing transportation costs imposed by the canal and rail companies meant that St Helens, the previous centre of the alkali industry, fell into decline and Widnes, better sited to import the raw materials of coal, salt and limestone, as well as being sparsely populated (the highly-polluting process produced two tons of waste for every one ton of soda), made it an attractive location for development. In 1865 the Phoenix Chemical Works (SJ 5078 8417; HER 4241/26/0 CH) opened in the West Bank Dock area, and was soon followed by further chemical works. One of the factories, United Alkali (SJ 5070 8431; HER 4241/0/1), operated in the First World War to produce Ammonium Nitrate and Acetone, used in the production of explosives. Soap manufacture was also important to the Widnes area with Gossage's Soap Works (SJ 5133 8426; HER 4241/28/0 CH) opening in 1854, producing over 50% of Britain's export market in soap by the end of the century. Tanning also provided a major source of industry, particularly in the Runcorn area along the line of the Bridgewater Canal, where there was easy access to the large dairy herds of Cheshire and a ready supply of oak bark, used in the tanning process. Halton Road Tannery (SJ 5250 8281; HER 4245/18/0 CH), Royal Oak Tannery (SJ 5269 8290; HER 4245/20/0 CH), and Highfield Tannery (SJ 5270 8300; HER 4245/25/0 CH) were all situated in Runcorn, whilst there was also a tannery in Widnes (SJ 5252 8548; HER 4241/5/0 CH) and one in Garston (SJ 4017 8378; HER 4083-016 M). Alum is also important to the tanning industry and the Australian Alum Works (SJ 5275 8309; HER 4245/26/0 CH) was located in Runcorn.

New industrial and modern features mapped for this project include extractive pits and associated spoil heaps, as well as a number of trackways.

5.9.4 The World Wars (Figs. 5.10 and 5.11)

Due to the large number of known sites in the study area not every Second World War feature will be discussed in full. Major sites, such as airfields, gun batteries and camps, whether they survive or not, will be described in detail whereas minor sites, such as air-raid shelters, pillboxes and bomb craters, are recorded in tabular form in the appendices.

Liverpool was the second most heavily bombed city in England during the Second World War, as it formed a vital route through which supplies were imported into the country. Over 90% of the cargo imported into Britain during the war, some 75 million tonnes, passed through the docks at Liverpool. The docks were badly damaged during the bombing raids, along with adjacent areas, and over 4,000 Liverpudlians were killed during the 80 or so air-raids by the *Luftwaffe*. During one raid, on May 3rd 1941 the *SS Makaland*, berthed in Huskisson Dock (HER 3393-010 M), was hit and its cargo of bombs exploded, destroying the dock and causing heavy damage to surrounding quays. One piece of the ship's hull plating was blown into a park over a mile away. Liverpool also acted as the headquarters for the Western Approaches Command and as a staging post for the Battle of the Atlantic, the longest running campaign of the war, that started with the sinking of the *SS Athenia*, bound for Canada from Liverpool within 24 hours of the declaration of war, through six years and eight months, and finished with the loss of the freighter *Avondale Park* and a Norwegian minesweeper in 1945. During this time almost 13 million tons of Allied and neutral shipping was destroyed and over 100,000 Allied personnel lost their lives (Liverpool City Council 2003). The importance of Liverpool to the war effort is shown in the number of newly mapped features from the transcription of aerial photographs as a result of this project, which are dominated by sites associated with the Second World War. Of the 348 new Industrial and modern features mapped, 342 are either military emplacements, such as airfields, military camps, gun batteries and pillboxes or are associated with the war, such as air raid shelters and munition factories.

An important WWI feature on the north side of the Wirral peninsula is a sound mirror (SJ 32165 38915; HER 2189-025 M). This was used as a Royal Observer Corps post, designed to give advance warning of approaching enemy Zeppelins.

There are two important airfields located in this part of the study area. These were at RAF Hooton Park (SJ 375 792; NMR 1397920; HER 2855/0/0 CH) and Speke Airfield (SJ 414 833; NMR 1410957; HER 4183-007 M). The latter is now much expanded and is better known as Liverpool John Lennon Airport. RAF Hooton Park was built on park land which belonged to a previously demolished country house and racecourse, on the south-east corner of the Wirral peninsula. In 1917 it was developed as a training centre for Canadian and American pilots and a number of important First World War buildings survive including a group of Belfast Truss hangars. After the First World War the airfield was converted to civilian use and until 1933 it functioned as Liverpool's municipal airport. During the Second World War the airfield was militarised and had three roles: as a fighter base for 610 City of Chester Squadron in the Battle of Britain; as Number 7 Aircraft Assembly Unit and in anti-submarine warfare in keeping shipping lanes open during the Battle of the Atlantic. By the end of 1944 the airfield had two intersecting tarmac runways and a number of hangars including B1, Bellman, Robin and Blister types (NMR record). The airfield closed in 1957 and the site was subsequently used by the car industry. Parts of the original airfield site are still visible as upstanding structures, cropmarks and earthworks on air photographs with a number of air-raid and blast shelters visible surrounding hangars and military buildings. Speke Airfield was first used a civilian airport in 1930 and was officially opened in 1933, with the late 1930's buildings that served the airfield still extant, although now serving other functions (SJ 4130 8388;

HER 4183-008 M). The Second World War saw the conversion of the airfield to military use and aircraft were built in the Rootes and Lockheed factories at the site. This also involved the construction of larger, tarmac runways to deal with the heavier aircraft. In 1966 newer, larger runways were built to the south and in 1986 the old facilities were closed, new ones built and in 2001 the airport was renamed Liverpool John Lennon Airport.

Eight anti-aircraft batteries have been mapped as part of the aerial photographic transcription for this project, of which seven are previously unrecorded in the HERs. In 1942 heavy anti-aircraft battery Mersey Z/H30 (Fig. 5.12) at Leasowe (SJ 276 924; NMR 1414605), and heavy anti-aircraft battery GG/H28 at Thurstaston (SJ 2383 8341; NMR 1414618), were armed with four 4.5-inch guns with a GL Mark II radar and manned by the Home Guard. The latter appears to have been associated with a military camp to the immediate north-west (NMR 1414632), as well as anti-aircraft obstacles and barbed wire entanglements. At Red Noses (SJ 299 941; NMR 1414608) the heavy anti-aircraft battery K/H33 was initially armed with two 3.7-inch guns in 1942, but was upgunned to four 5.25-inch guns in 1945, when it was manned by 443 Battery of the 130th Royal Artillery Regiment. Heavy anti-aircraft battery G/H36 at New Ferry (SJ 3420 8559; NMR 1414622), with associated military buildings, was listed as unarmed in 1942. At Campbelltown Road in Birkenhead an anti-aircraft battery (SJ 3290 8726; NMR 1414627) is visible as a series of structures on air photographs. However the 1941 vertical photography was not of sufficient quality to allow an accurate transcription. There was also a heavy anti-aircraft battery to the east of Speke Airfield (SJ 433 827; NMR 1464497) with associated military camp and features. The battery previously recorded in the Cheshire HER and mapped for this project is at Moore, to the east of Runcorn (SJ 578 850; NMR 1462459; HER 4118 CH) and comprises a heavy anti-aircraft battery and associated camp and two searchlight batteries to the south and west (NMR 1462546 and 1462552). Six searchlight batteries have been mapped for this project in this part of the study area.

A total of 66 barrage balloon sites were located in this part of the study area, predominantly around the major urban centres at Liverpool, Birkenhead and Runcorn, with further sites at Speke airfield and around the industrial factories of Widnes. Additionally there were three bombing decoy sites, two of which are not recorded in the HERs, situated on the Wirral peninsula at Burton Marsh (SJ 288 751; NMR 1467648; HER 4226 CH), Heswall (SJ 2440 8260; NMR 1414633), and Moreton (SJ 2438 9083; NMR 1414636). All three sites were 'Permanent Starfish' bombing decoys, built to prevent enemy bombing of Liverpool and its infrastructure. The 'Starfish' decoy, of which fourteen protected the Liverpool area, operated by lighting a series of controlled fires during an air-raid to replicate an urban area that had previously been targeted by bombs. Also incorporated into the three sites from 1942 was a 'QL' decoy which displayed lighting to simulate railway marshalling yards and factories associated with the dockyards. The sites were probably used to prevent bombing of the Garston docks area, Bootle, and the docks at Birkenhead. A number of bomb craters are visible on aerial photographs at each site, suggesting that they had some success.

Anti-invasion defences can be divided into the gun and search light batteries and pillboxes that provided offensive fire and the anti-aircraft obstacles, minefields, beach defences and barbed wire entanglements that provided a passive defensive system. One coastal battery is recorded in this part of the study area, the Perch Rock Coastal Defence Battery (SJ 30962 94489; NMR 1429176) which was recommissioned in the Second

World War. A total of 81 pillboxes have been recorded in the study area. Two areas of anti-aircraft obstacles have been identified in this part of the study area. At Leasowe (SJ 276 924; NMR 1414605) they defend the Heavy Anti-Aircraft Battery Mersey Z, and are small in area, whereas at Runcorn they form of a series of parallel ditches located to the north and west of the ICI Randle poison gas and explosives Filling Factory (discussed below). Three minefields have been recorded with two located on the north Wirral (SJ 288 933; NMR 1479718; and SJ 278 927; NMR 1479732) around the heavy anti-aircraft batteries and one (SJ 322 971; NMR 1476595) associated with the beach defences of scaffold and barbed wire in the area that is now the Royal Seaforth Dock.

Eleven military camps are present within this part of the study area, serving the various military installations Over 1500 air raid shelters serving the civilian population have been mapped.

In addition to military sites three wartime production factories have been mapped, at Speke Airfield (SJ 426 831; NMR 1416049), Birkenhead (SJ 344 849; NMR 1475245) and north-east of Runcorn (SJ 543 842; NMR 1086051; SMR 2820/1 CH). The latter is the ICI Randle poison gas and explosives Filling Factory which was developed in 1938 to manufacture arsenicals and cyanides for bombs. It also contained a small explosives Filling Factory for the final assembly of munitions. The site has now been levelled and is in use as landfill, with plans to bury the former works to a depth of 30 metres.

5.10 Conclusion

This stretch of coastline, incised by the major estuaries of the Rivers Mersey and Dee has produced significant evidence of both prehistoric and historic heritage assets. Good evidence of Mesolithic occupation have been discovered, particularly on the Wirral peninsula, a situation in marked contrast to the Neolithic period, from which few artefacts have been recovered and no sites are known from within this part of the study area. This is probably due, at least in part, to marine transgression, but also perhaps due to recent urban expansion destroying earlier sites, such as has happened at the Calderstones on Merseyside. There is also comparatively limited evidence for Bronze Age, Iron Age, Roman and Romano-British sites, with the earlier periods being limited to isolated findspots and the Roman and Romano-British periods only being evidenced by the small fortlet at Ince and three farmsteads. This small corpus of information has been added to by the mapping of new Iron Age or Romano-British field systems in the upper reaches of the River Mersey as part of this project.

Early Medieval and Medieval sites are dominated by ecclesiastical remains, with early sites present on the Wirral peninsula and monastic sites at Birkenhead, Stanlow and Norton. The abbey at Norton has provided significant evidence of Augustinian abbey life, having been extensively excavated in the latter part of the 20th century. By comparison there are only two military sites, the destroyed *burh* at Runcorn and the castle at Halton, although the latter is a rare form of fortification and consequently a significant site. It is not until the post-medieval and later periods, that the increase in trade associated with the development of the dock complexes at Liverpool, Birkenhead and Runcorn, that the most impressive heritage features of this part of the study zone were built. From unprepossessing origins the development of Liverpool into one of the premier ports in Europe is astounding, culminating in the creation of numerous listed buildings and its inscription as a World Heritage Site. The development of Liverpool was founded on post-medieval trade with America, especially the slave trade. The port was also the

landing site for most of the *matériel* imported into Britain during the Second World War and, as the headquarters for the Western Approaches Command, it was heavily defended and bore the brunt of numerous *Luftwaffe* raids.

Notwithstanding the development of the port of Liverpool, perhaps the most significant archaeological location within this part of the study zone was at Meols on the north Wirral shore, a name which is derived from the Old Norse *melr* signifying a sandbank. There have been 5008 catalogued artefacts recovered from this section of beach and beach frontage, dating from early prehistory through to the post-medieval period. Sadly much of the material came from the now almost completely eroded Dove Point, which has gradually been destroyed by the sea over at least the last 200 years, and probably up to half a kilometre of coastline has been lost since the early 18th Century. The finds from Meols indicate long-term use of this part of the north Wirral as a significant trading post, from at least the Roman period. However, many of the items were eroded out of the foreshore deposits during the Victorian era and collected by antiquarians, with little or no structured archaeological investigation being associated with their recovery. The finds came from the broad inter-tidal area where the remains of a submerged forest could be seen as it eroded and ‘amongst the blackened tree stumps, in the hollows and pools left by the tide, objects of flint, metal and, less often, pottery were frequently found... The sand-dunes along the high water mark, which were regularly undermined and eaten away by the sea, revealed buried archaeological layers as they shifted and collapsed’ (Griffiths 2007, 5). What is clear is that the large number of finds, in conjunction with more modern fieldwork, has shown there is ‘much potential for further archaeological field investigation along the north Wirral coast’ (Griffiths 2007, xvii). Overall, this section of coastline contains significant archaeological remains, some of which are of international importance. However, processes such as the erosion of the coastline and urbanisation have masked and/or destroyed many sites, particularly from earlier periods.

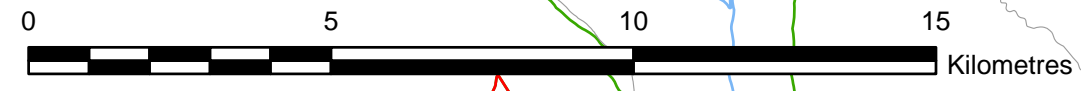
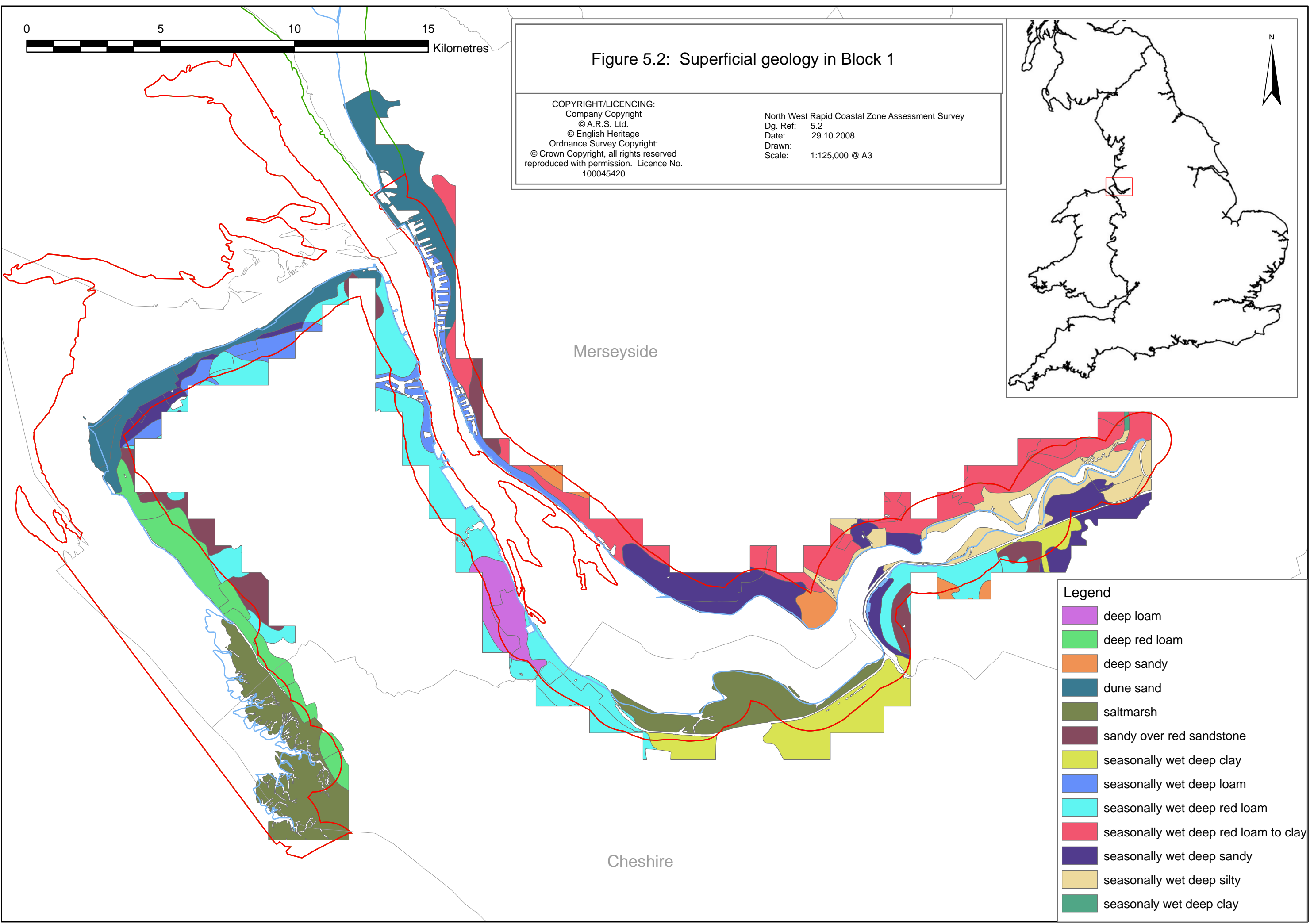
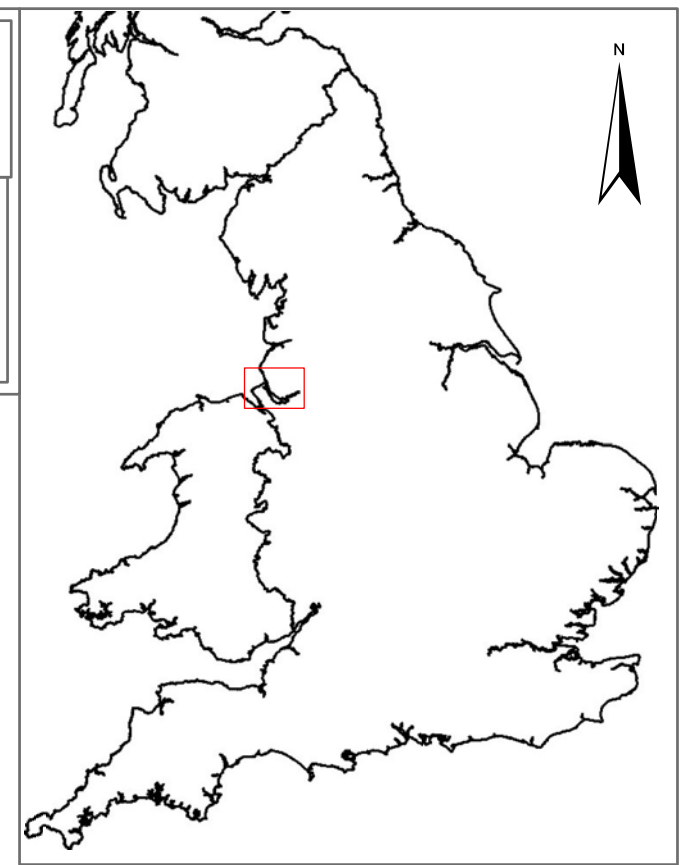


Figure 5.2: Superficial geology in Block 1

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Merseyside

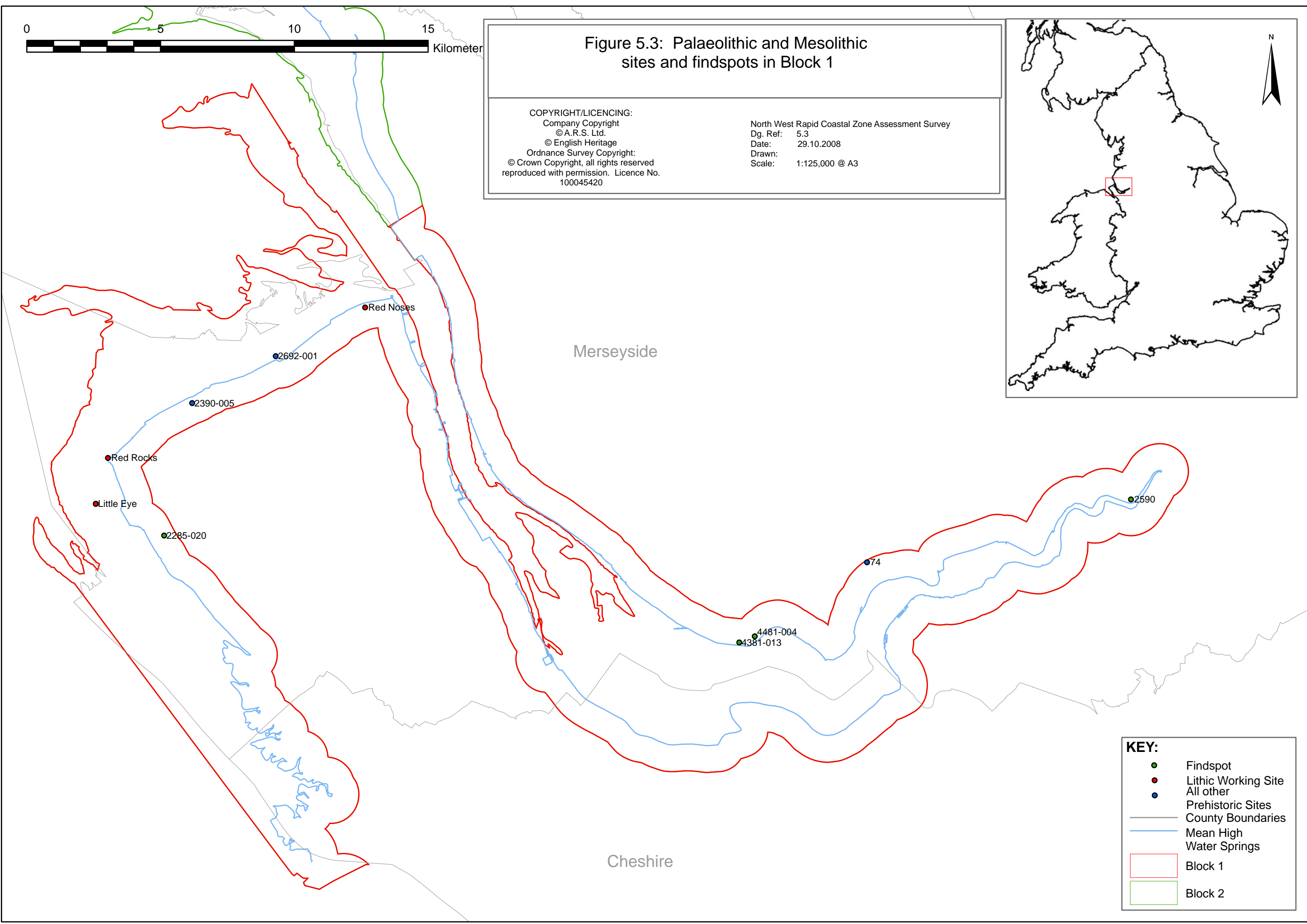
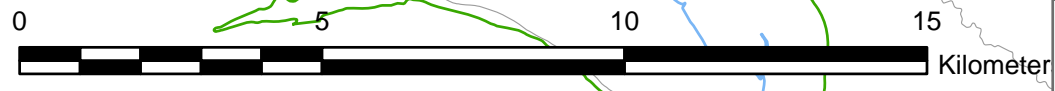
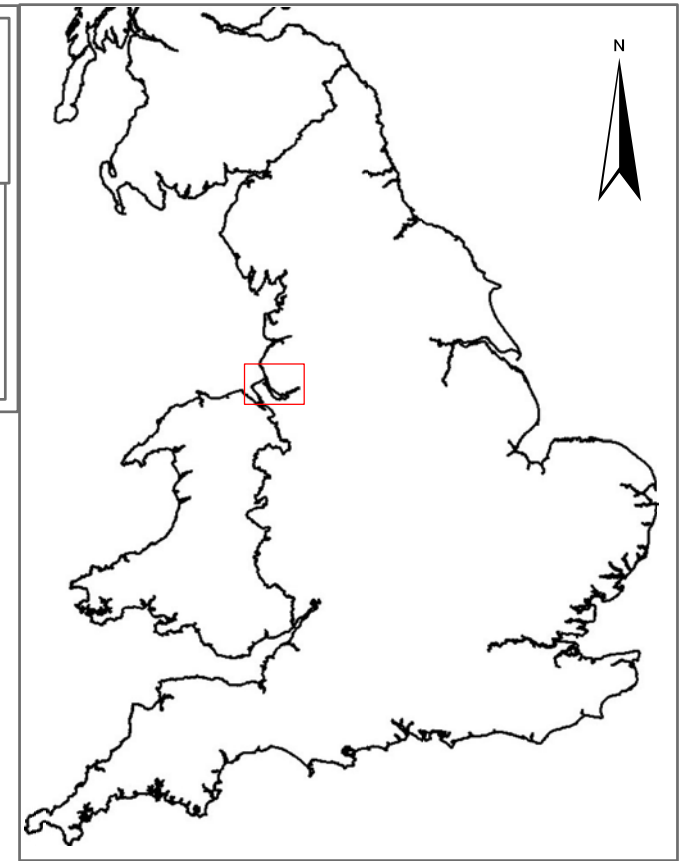
Cheshire

- Legend
- deep loam
 - deep red loam
 - deep sandy
 - dune sand
 - saltmarsh
 - sandy over red sandstone
 - seasonally wet deep clay
 - seasonally wet deep loam
 - seasonally wet deep red loam
 - seasonally wet deep red loam to clay
 - seasonally wet deep sandy
 - seasonally wet deep silty
 - seasonally wet deep clay

Figure 5.3: Palaeolithic and Mesolithic sites and findspots in Block 1

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KEY:

- Findspot
- Lithic Working Site
- All other
- Prehistoric Sites
- County Boundaries
- Mean High
- Water Springs
- Block 1
- Block 2

Red Noses

2692-001

2390-005

Red Rocks

Little Eye

2285-020

Merseyside

Cheshire

74

4481-004

4381-013

2590

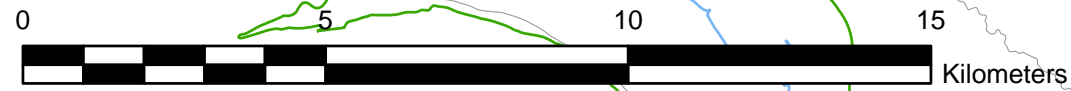
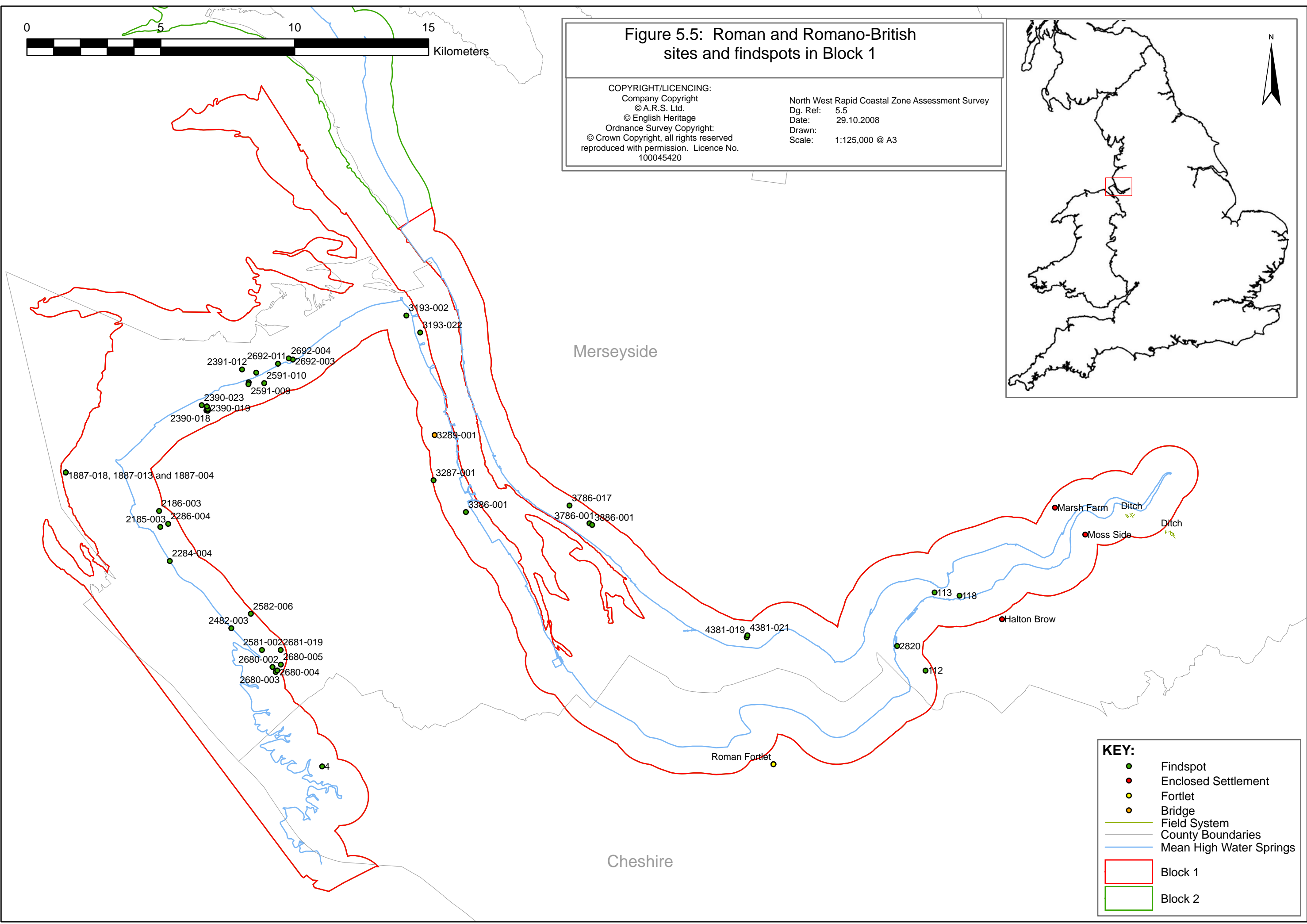
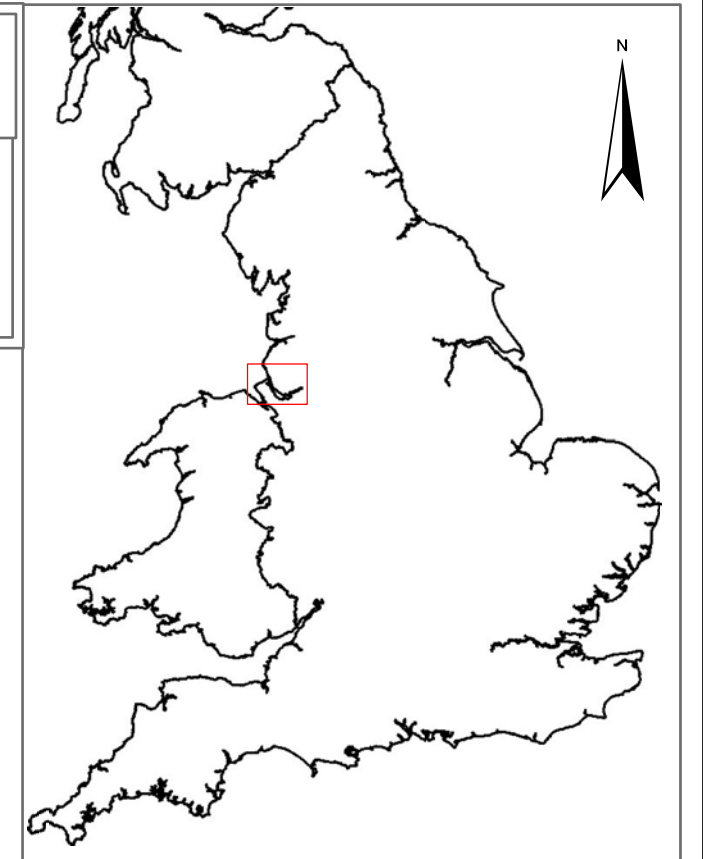


Figure 5.5: Roman and Romano-British sites and findspots in Block 1

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KEY:

- Findspot
- Enclosed Settlement
- Fortlet
- Bridge
- Field System
- County Boundaries
- Mean High Water Springs
- Block 1
- Block 2

Merseyside

Cheshire

Roman Fortlet

Marsh Farm

Moss Side

Halton Brow

4381-019 4381-021

2820

112

113 118

3786-001 3786-017

3386-001

3287-001

3289-001

3193-002

3193-022

2692-011 2692-004 2692-003

2391-012 2591-010

2591-009

2390-023 2390-019

2390-018

1887-018, 1887-013 and 1887-004

2186-003 2185-003 2286-004

2284-004

2582-006

2482-003

2581-002 2681-019

2680-002 2680-005

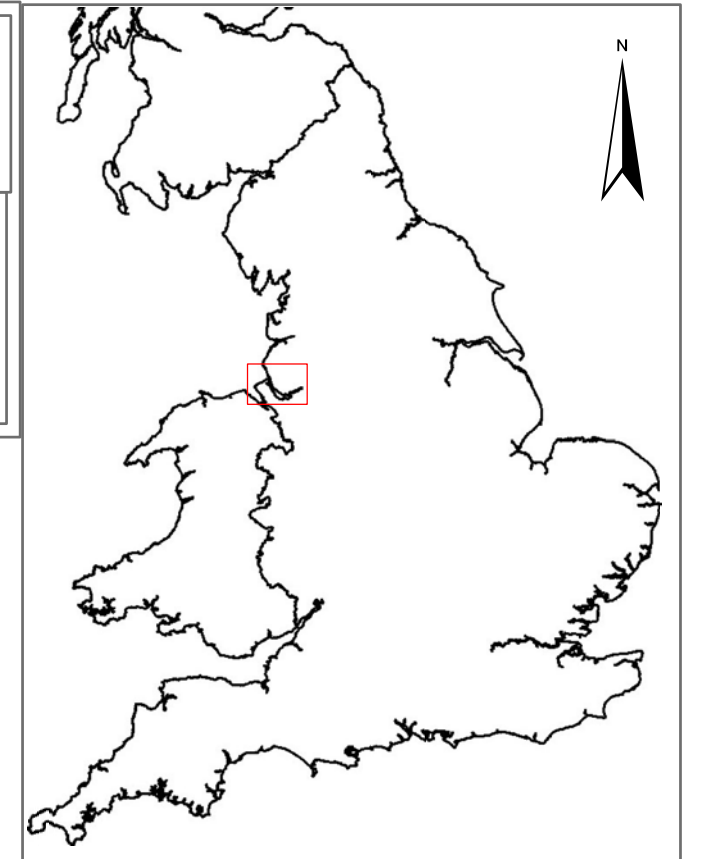
2680-003 2680-004

4

Figure 5.6: Early Medieval sites and findspots in Block 1

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Merseyside

Cheshire



2591-007
 2390-025 ● 2591-008

● Chapel of Hilbre and associated features

● West Kirby Church and associated features

● Bromborough

● Runcorn burh

● Warrington Logboat 11

● Warrington Logboat 7

KEY:

- Findspot
- Burh
- Church/Chapel
- Logboat
- Battlefield
- County Boundaries
- Mean High Water Springs
- Block 1
- Block 2

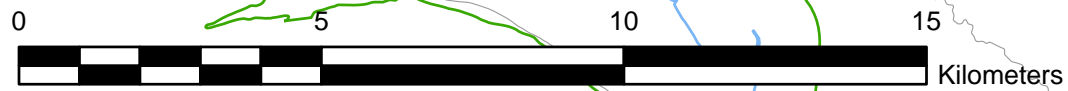
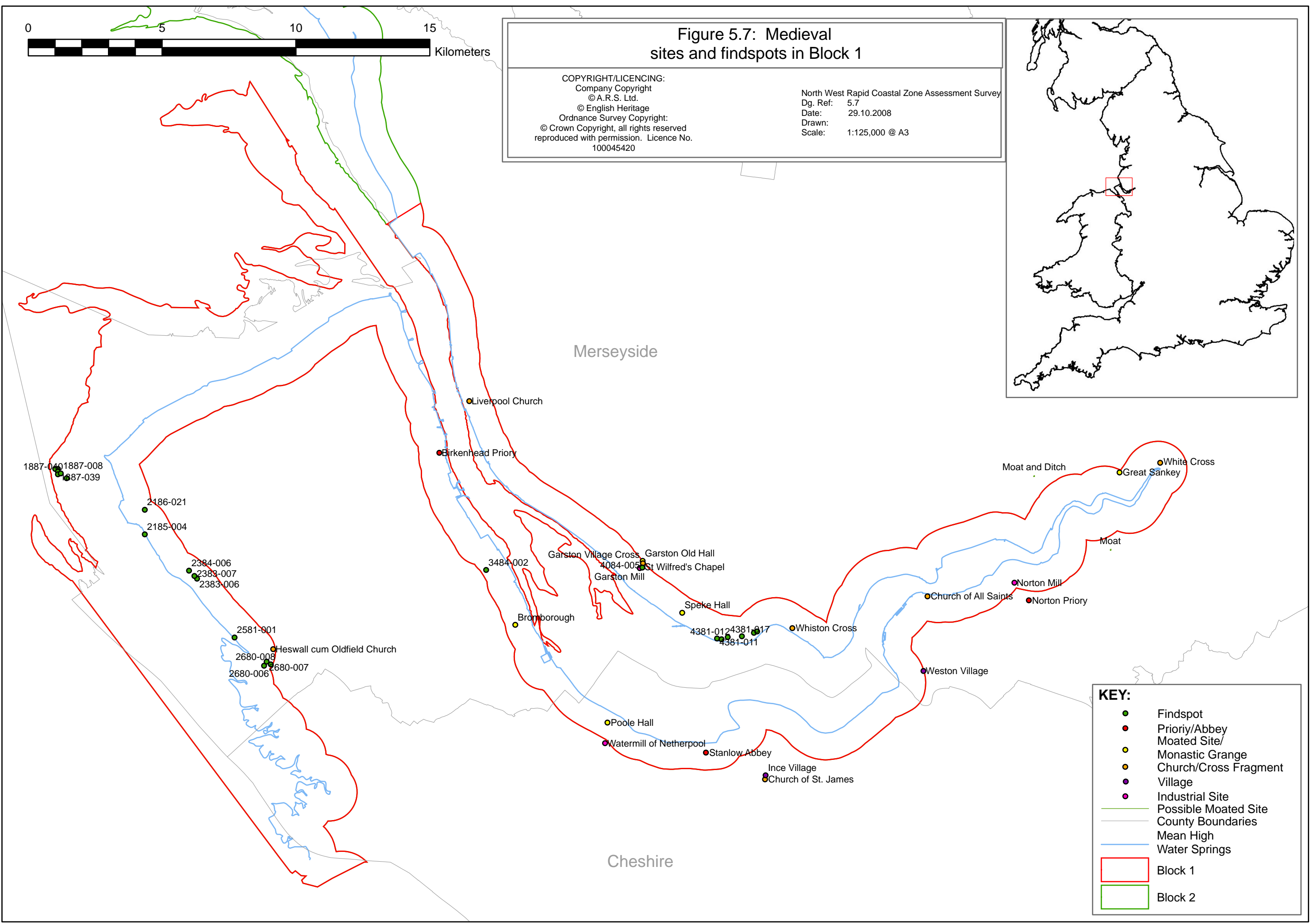
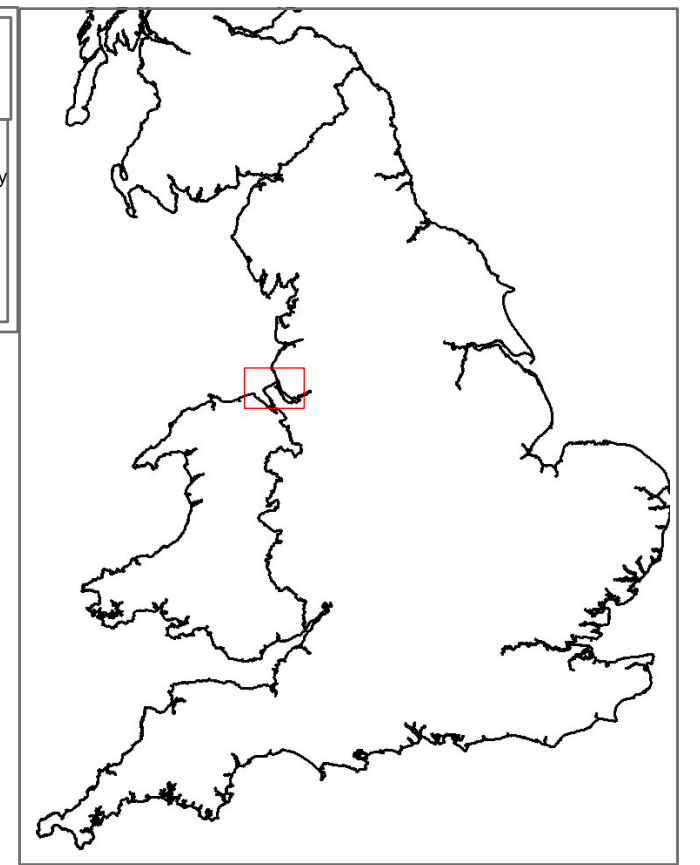


Figure 5.7: Medieval sites and findspots in Block 1

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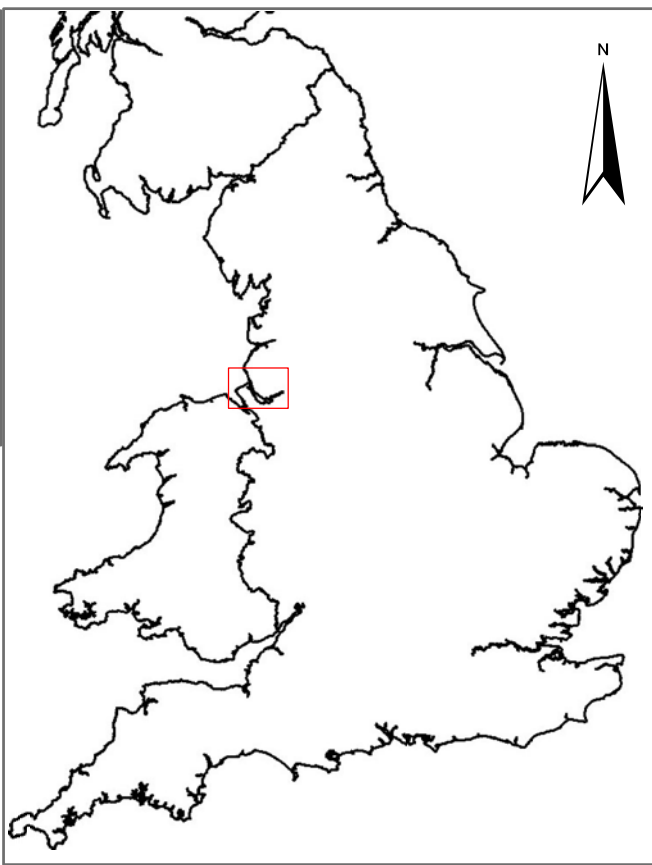
KEY:

- Findspot
- Priority/Abbey
- Moated Site/
- Monastic Grange
- Church/Cross Fragment
- Village
- Industrial Site
- Possible Moated Site
- County Boundaries
- Mean High
- Water Springs
- Block 1
- Block 2

Figure 5.8: Selected Post-Medieval sites and findspots in Block 1

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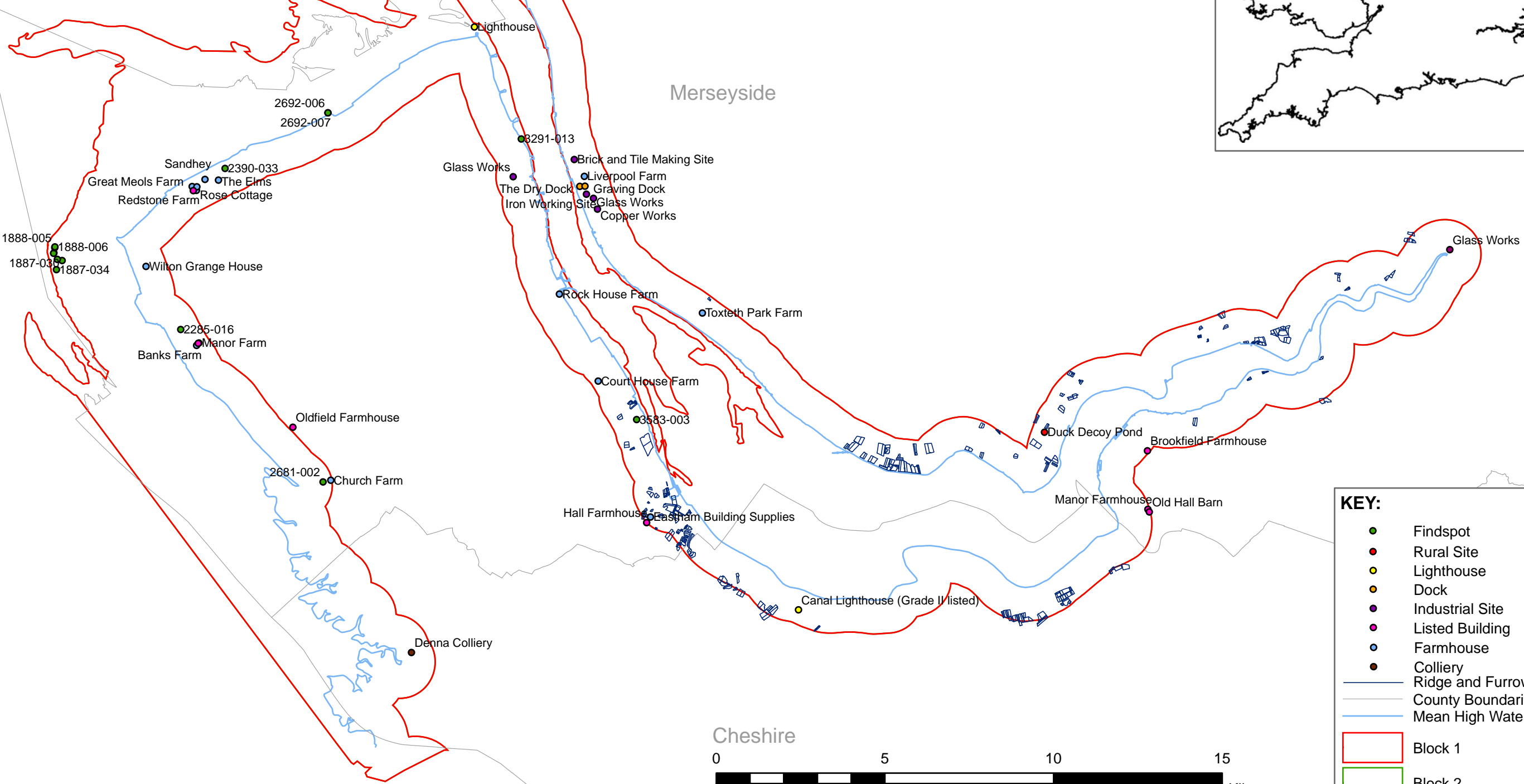
Merseyside

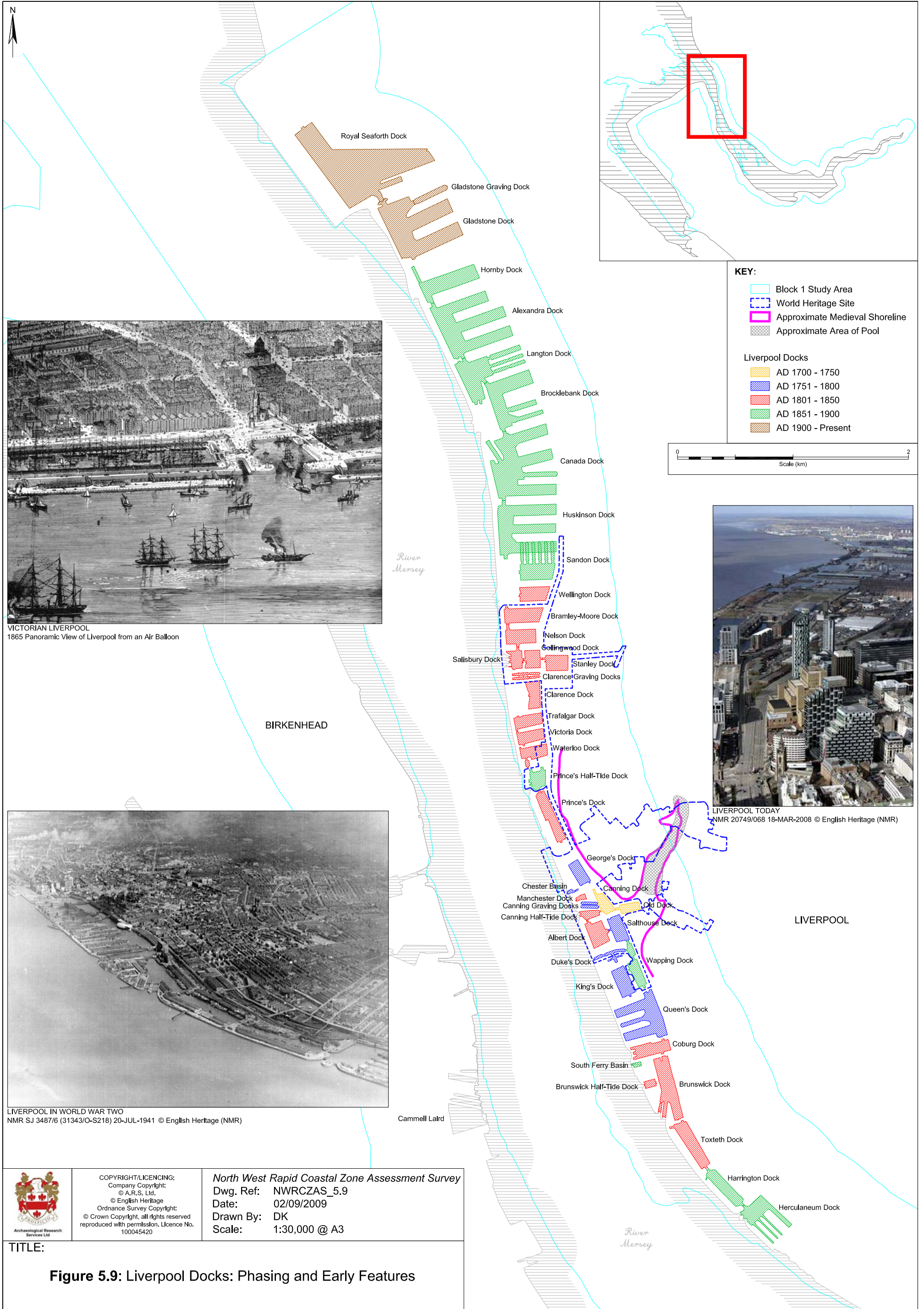
Cheshire



KEY:

- Findspot
- Rural Site
- Lighthouse
- Dock
- Industrial Site
- Listed Building
- Farmhouse
- Colliery
- Ridge and Furrow
- County Boundaries
- Mean High Water Springs
- Block 1
- Block 2

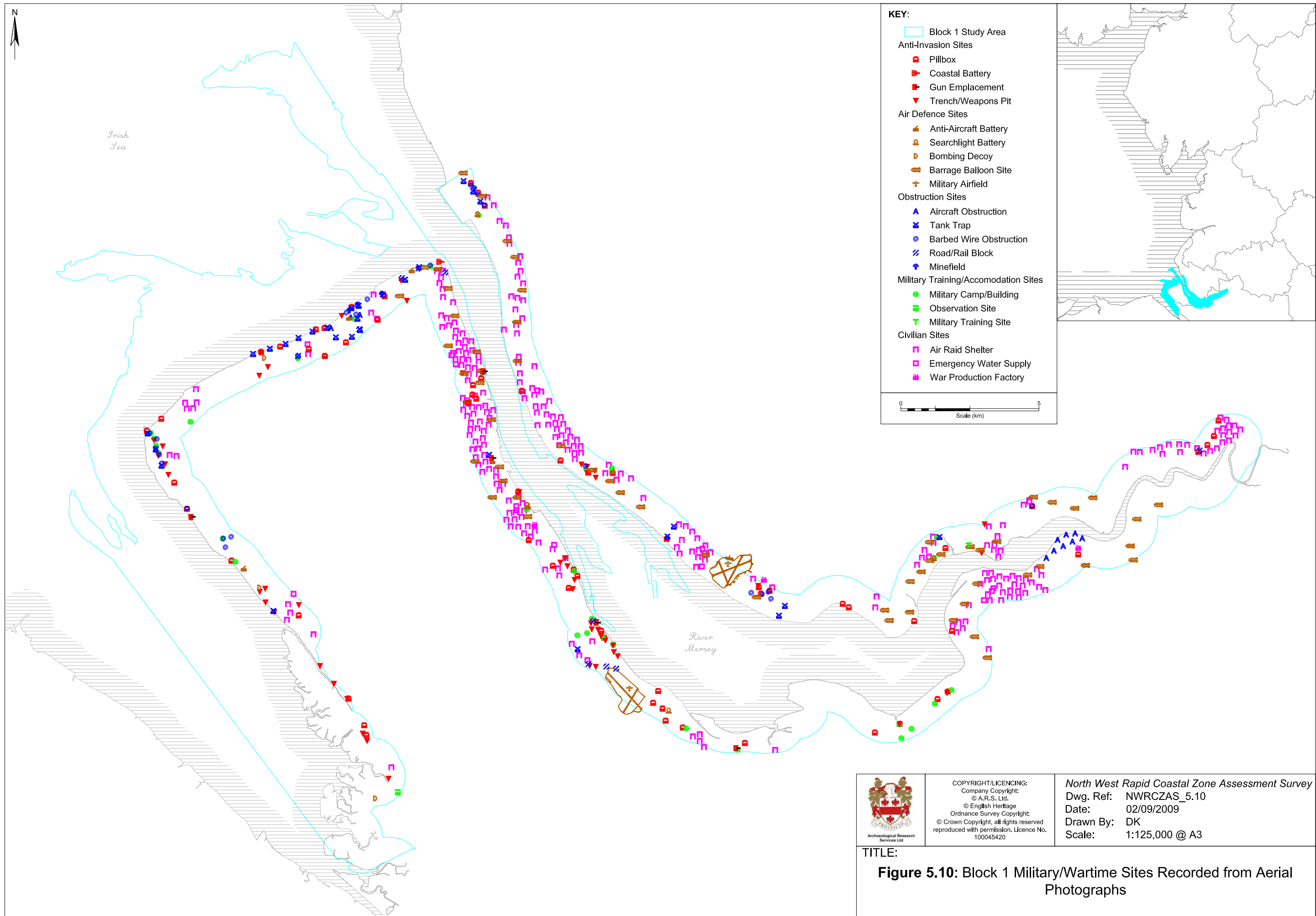




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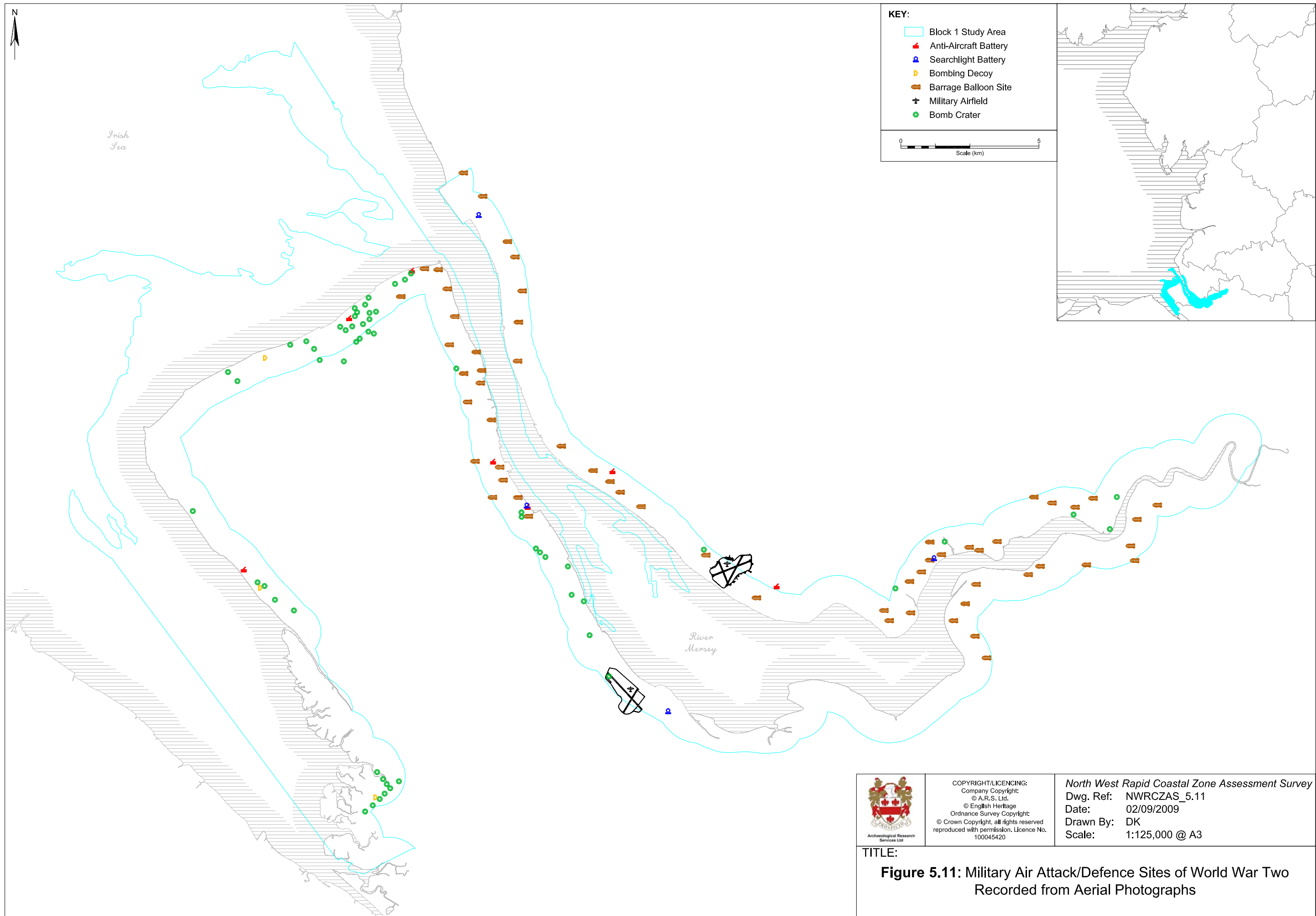
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Figure 5.9: Liverpool Docks: Phasing and Early Features



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Figure 5.10: Block 1 Military/Wartime Sites Recorded from Aerial Photographs



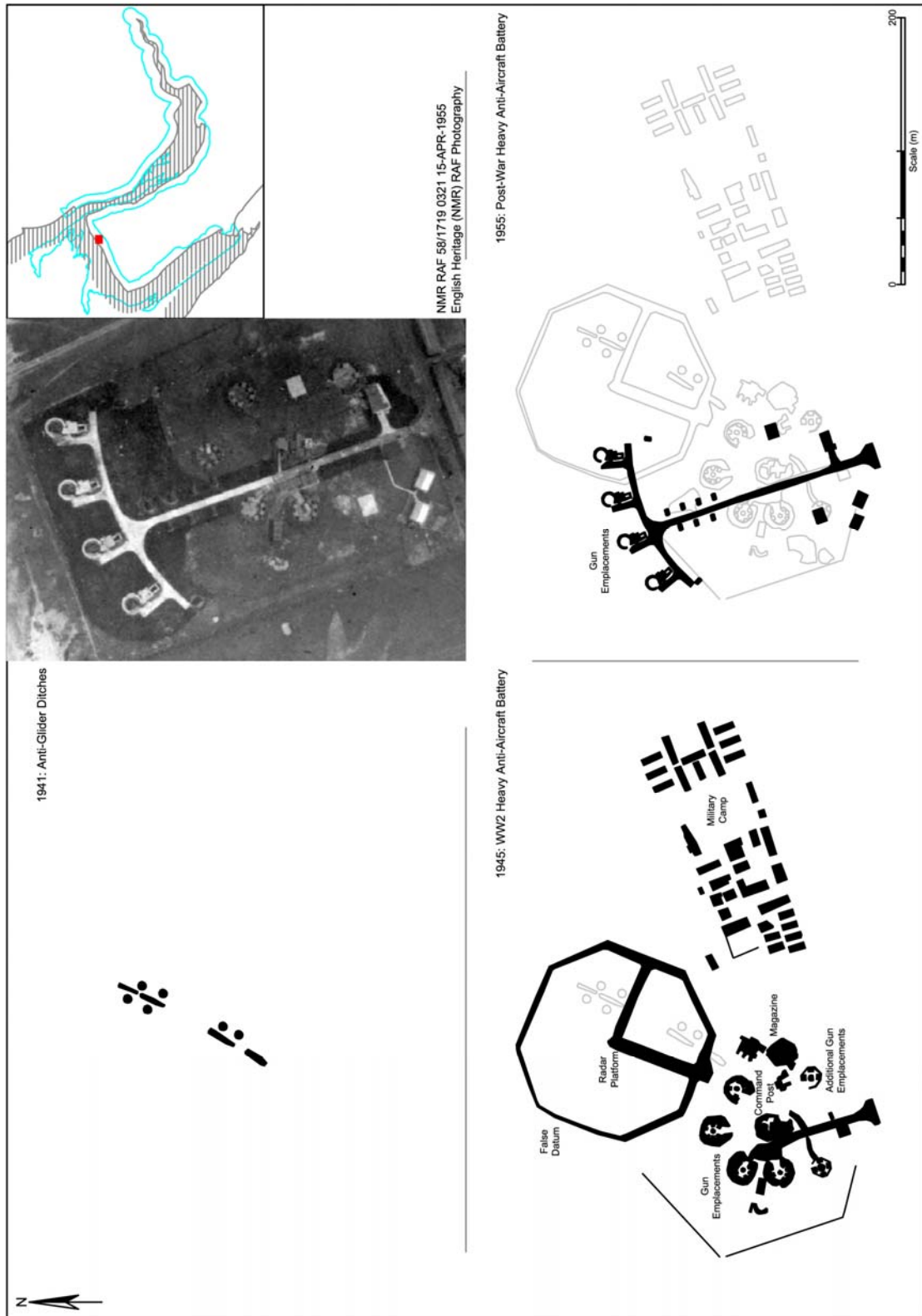


Fig. 5.12 Heavy Anti-aircraft battery Z/H30 at Leasowe showing three phases of development as well as the aerial photograph used to map the post-War battery

CHAPTER 6

A REVIEW OF THE ARCHAEOLOGY FROM THE ROYAL SEAFORTH DOCK (MERSEYSIDE) TO THE RIVER WYRE (LANCASHIRE)

6.1 Introduction

The area discussed in this chapter extends from the northern limit of the Royal Seaforth Dock in Bootle into the River Wyre (Fig. 6.1) and is defined as Block 2 of the project. This section of the study area encompasses the extensive dune systems of Formby Point and the estuaries of the Rivers Ribble and Wyre as well as parts of the urban conurbations of Chorley, Southport, Preston, Lytham St Annes, Blackpool and Fleetwood. The Historic Environment Records analysed for this section comprised the datasets maintained by the Merseyside Archaeological Service and Lancashire County Council. The Shoreline Management Plan 2 policy units are presented in table 6.1 and fig. 6.1.

Table 6.1 Shoreline Management Plan Policy Units and preferred scenario.

General Policy Unit Area	Specific Policy Unit Location	SMP Policy Unit	Preferred Scenario		
			0-20 years	20-50 years	50-100 years
Seaforth to the River Alt	Seaforth to MEPAS Pumping Station	11a 8.1	H TL	H TL	H TL
	MEPAS Pumping Station to Hightown	11a 8.2	MR	MR	MR
	Hightown to mouth of the River Alt (east bank)	11a 8.3	H TL	H TL	H TL
	River Alt mouth (east and west banks) to the Alt Pumping Station	11a 8.4	H TL	H TL	H TL
Formby Dunes	Mouth of the River Alt (west bank) to Weld Road, Southport (Formby Dune System)	11a 9.1	MR	MR	MR
Ribble Estuary	Weld Road to Fairways (Southport)	11b 1.1	H TL	H TL	H TL
	Fairways to Crossens Pumping Station	11b 1.2	H TL	H TL	H TL
	Crossens Pumping Station to Hesketh Out Marsh West (Hundred End Gutter)	11b 1.3	H TL	H TL	MR
	Hesketh Outmarsh West	11b 1.4	H TL	H TL	MR
	Hesketh Outmarsh East	11b 1.5	MR	H TL	H TL
	Hesketh Outmarsh East to White Bridge, Rufford (River Douglas left bank)	11b 1.6	H TL	H TL	MR
	White Bridge, Rufford, to Old Railway Embankment, Much Hoole Marsh House (River Douglas right bank)	11b 1.7	H TL	H TL	MR

			Preferred Scenario		
	Old Railway Embankment, Much Hoole Marsh House to Hutton Marsh (Pilots Cottage)	11b 1.8	HTL	HTL	MR
	Hutton Marsh	11b 1.9	MR	HTL	MR
	Hutton Marsh to Penwortham Golf Course	11b 1.10	HTL	MR	HTL
	Penwortham Golf Course to Penwortham Bridge	11b 1.11	HTL	HTL	HTL
	Penwortham Bridge to Freckleton Marsh (west end of Sewage Works)	11b 1.12	HTL	HTL	HTL
	Freckleton Marsh (west end of Sewage Works) to Naze Point	11b 1.13	HTL	HTL	MR
	Naze Point to Warton Bank	11b 1.14	NAI	NAI	NAI
	Warton Bank to Lytham Dock	11b 1.15	HTL	HTL	HTL
	Lytham Dock to Land Registry	11b 1.16	HTL	HTL	HTL
	Lytham Land Registry to Fairhaven Lake	11b 1.17	HTL	HTL	HTL
	Fairhaven Lake	11b 1.18	HTL	HTL	HTL
	Fairhaven Lake to Miniature Golf Course	11b 1.19	HTL	HTL	HTL
	Miniature Golf Course to St Anne's Pier	11b 1.20	HTL	HTL	HTL
	St Annes's Pier to St Annes' Northern Boundary	11b 1.21	HTL	HTL	HTL
St Annes to Rossall Point	St Annes (northern boundary) to Squires Gate	11b 2.1	MR	HTL	HTL
	Squires Gate to Blackpool Tower	11b 2.2	HTL	HTL	HTL
	Blackpool Tower to Anchorsholme Park	11b 2.3	HTL	HTL	HTL
	Anchorsholme Park	11b 2.4	HTL	HTL	HTL
	Anchorsholme Park to Jubilee Gardens	11b 2.5	HTL	HTL	HTL
	Jubilee Gardens to Five Bar Gate	11b 2.6	HTL	HTL	HTL
	Five Bar Gate to Rossall Hospital (Rossall School)	11b 2.7	HTL	HTL	HTL
	Rossall Hospital to Chatsworth Avenue	11b 2.8	HTL	HTL	HTL
	Chatsworth Avenue to Rossall Point	11b 2.9	HTL	HTL	HTL
Fleetwood and the Wyre Estuary	Rossall Point to Marine Lake (east)	11c 1.1	HTL	HTL	HTL
	Marine Lake to Fleetwood Pier	11c 1.2	HTL	HTL	HTL
	Fleetwood Pier to Fleetwood Ferry	11c 1.3	HTL	HTL	HTL
	Fleetwood to Stanah	11c 1.4	HTL	HTL	HTL
	Stanah to Cartford Bridge (south bank) and Cartford	11c 1.5	HTL	MR	MR

			Preferred Scenario		
	Bridge to Shard Bridge (north bank)				
	Shard Road (A588) to Golf Course	11c 1.6	HTL	HTL	HTL
	Knott End Golf Course	11c 1.7	NAI	NAI	NAI
	Golf course to Knott End on Sea	11c 1.8	HTL	HTL	HTL

- NAI: No Active Intervention
- HTL: Hold The Line
- MR: Managed Realignment

6.2 Topography, Geology, Soils and Landuse

This stretch of coastline is part of the same estuary-dominated system of Liverpool Bay described in Chapter 5. The Ribble Estuary bisects the block in two with dune systems of the Sefton Coast to the south and around Lytham St Anne’s to the north, with low-lying boulder clay cliffs on the Fylde Peninsula. The bedrock geology predominantly consists of Triassic Sidmouth Mudstones, with Triassic sandstone around Chorley and the upper reaches of the Ribble estuary. The superficial geology of the area is dominated by very extensive blown sand deposits around Formby Point, between Chorley and Southport, as well as around Lytham St Anne’s and at Fleetwood. Devensian Till deposits are located in the upper reaches of the Ribble estuary, around Blackpool and in the upper reaches of the Wyre estuary. Clay and silt tidal deposits are located in the area between Blackpool and Fleetwood on the west side of the River Wyre. Small areas of peat are located to the north of Chorley, to the north of Southport and in Blackpool (BGS 2008).

As with the section of study area to the south the shoreline topography is influenced by shallow waters and a wide intertidal zone characterised by a series of sand banks. Inland from the coastline is very low-lying comprising undulating glacial till deposits, with no topographic features higher than 20m aOD and no hard outcroppings of rock. There are relatively high dunes on the Sefton Coast, stabilised by pine trees and marram grass, and on two of the more significant ridges, standing to around 15m aOD, lie the villages of Little Crosby and Ince Blundell. Low-lying reclaimed saltmarshes protected by flood embankments form much of the shoreline of the Ribble estuary, particularly on its southern shore. Much of the Fylde peninsula is defended by seawalls, particularly around Lytham St Anne’s, Blackpool and Fleetwood.

The principal soils located within this block are presented in table 6.2 and figure 6.2 and define much of the character of land-use in the area. The dune systems of Formby point are used for recreational purposes and the saltmarsh north of Southport forms the Ribble Estuary National Nature Reserve, although further inland the marshes have been improved and converted to agricultural land. There is no heavy industry along this stretch of coastline and what little industry there is being clustered around the two small airfields at Warton and Blackpool. The sea frontage between Lytham St Anne’s and Fleetwood is heavily built upon with the resort town of Blackpool and its associated tourist features

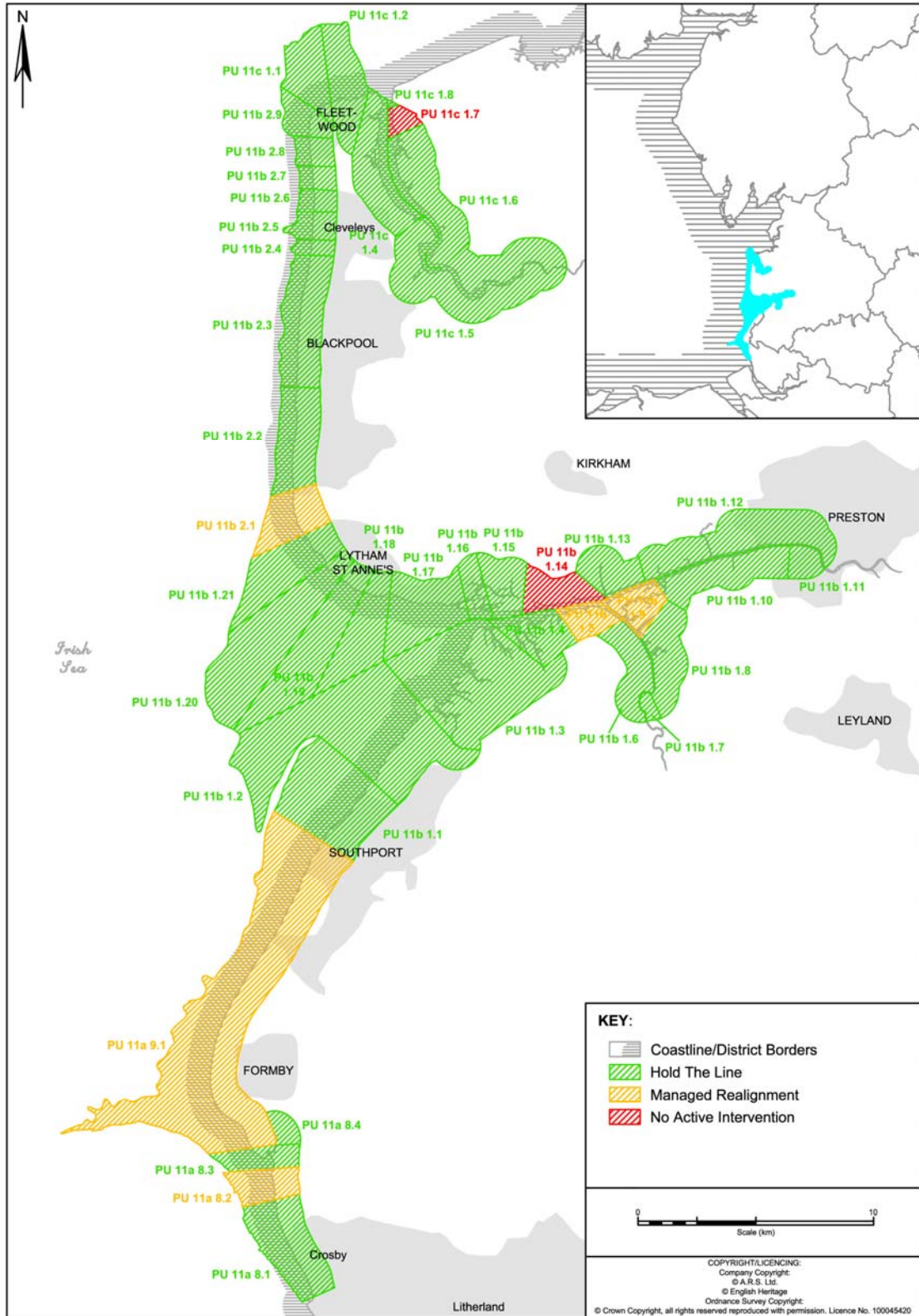


Figure 6.1 Location of Block 2 and SMP 2 policy units indicating preferred option for the next 20 years

providing much of the character for this coastline between the River Ribble and the River Wyre.

Table 6.2: Soils, landuse and preservation potential from the Royal Seaforth Dock to the River Wyre. Data derived from Farewell 2007 and NSRI database

Simple Description	Land Use (when not urban)
deep loam	Dairying and stock rearing on permanent and short term grassland; some arable crops where flood risk low.
deep red loam	Cereals, potatoes and sugar beet and some horticultural crops in drier lowlands. grassland in moist districts.
deep sandy	Cereals, potatoes, field vegetables and horticultural crops; some short term grassland
dune sand	Sand dune and some wetland habitats: recreation; very limited agriculture and coniferous woodland: some gravel extraction in the South East Region.
loam over red sandstone	Stock rearing on permanent and some short term grassland.
loam over sandstone	Stock rearing and dairying: some arable land and coniferous and deciduous woodland
loam over shale	Stock rearing in uplands, dairying and some cereals in moist lowlands; coniferous and deciduous woodland and rough grazing on steep slopes.
peat	Lowland bog and wet moorland habitats of low grazing value, some coniferous woodland; peat extraction
Restored following opencast coal working	Permanent grassland and some cereals
saltmarsh	Saltmarsh habitats some summer grazing; recreation
sandy over red sandstone	Cereals and potatoes. horticultural and fruit crops; some permanent grassland and woodland on steep slopes.
seasonally wet deep clay	Cereals, sugar beet, potatoes, field vegetables and horticultural crops in the Fens and Lancashire; some grassland in Lancashire and Cumbria
seasonally wet deep loam	Permanent grassland with stock rearing where flood risk low
seasonally wet deep red loam to clay	Dairying on short term and permanent grassland. some cereals in drier districts
seasonally wet deep sand	Cereals, sugar beet, potatoes and horticultural crops; rough grazing where undrained.
seasonally wet deep silty	Cereals and permanent and short term grassland in Cumbria. arable and horticultural crops in the Fens.
seasonally wet deep clay	Stock rearing on permanent grassland with occasional winter cereals; more cereals in drier districts.
shallow loam over limestone	Stock rearing on Herb-rich grassland habitats of good grazing value; recreation; some arable In lowlands.
shallow loam over shale	Permanent and short term grassland; stock rearing in uplands. dairying in moist lowlands: some cereals in Devon and Cornwall
silty over limestone	Stock rearing on permanent grassland: some winter cereals and some herb rich habitats of moderate grazing value: coniferous forest: recreation.
stony loam over gravel	Stock rearing on permanent grassland in moist lowlands: some cereals, sugar beet and potatoes in drier lowlands
stony loam over hard rock	Stock rearing in moist uplands on permanent grassland and good value rough grazing; widespread deciduous woodland habitats.

6.3 Early Prehistory: Palaeolithic and Mesolithic (Fig. 6.3)

As has been mentioned above the coastline during the Palaeolithic and earlier parts of the Mesolithic would have been far to the west of the present coastline. It is therefore not unsurprising that the coastline itself has revealed hardly any evidence for the presence of human activity until the Late Mesolithic period. The coastal zone would have acted as a focus for activity during this period as would areas of open water such as lakes with their wide variety of resources for hunter gatherers. Furthermore, sites from this early period may have been covered by the shifting of unstable aeolian coversands (Cowell and Innes 1994, 82). Only one possible artefact from this area dates from this earlier period and this is a chert point with possible Late Upper Palaeolithic affinities from Little Crosby just inland from the study area. This artefact was discovered during a programme of fieldwalking undertaken for the North-West Wetlands Project (*ibid.*). This project also revealed a series of later Mesolithic flint scatters just inland from the coast principally around Little Crosby. These sites were located around wetlands that in the late Mesolithic period were waterlogged areas created behind the coastline that developed into freshwater swamp and fen habitats that again would have created a resource rich location for hunters and gatherers. Confirmation of the presence of hunter gatherers on this stretch of coastline in the latest part of the Mesolithic period is evidenced by the series of human footprints (NTSMR 52115 – 52120) which have been identified in the inter-tidal zone along a four kilometre stretch of coastline between Formby and Ainsdale (Gonzalez *et al* 1996). These footprints have been dated to have been created from the Late Mesolithic period to the Bronze Age period and have been found alongside wild animals such as red deer, aurochs, roe deer and wolf. A total of 219 trails of human footprints have been identified usually approximately 60m west of the edge of the dunes (Adams and Harthen 2007), although it is not possible to undertake extensive survey due to the buried nature of the landscape and the built-up areas of Formby (Adams and Harthen 2006), and further features including a Neolithic trackway and Bronze Age period animal bones from aurochs, red deer and dog. The footprints provide tantalising insights into the prehistoric period with children and females dominating and adult males rarer. The SMP 2 policy for this stretch of coastline is MR, a process which will see the gradual erosion of these important deposits and any possibly associated features.

There is only one Mesolithic findspot in the HER records for this area, an antler mattock, found in the bank of the River Ribble in 1992 (SD 488 288; HER MLA13244 L). No further information regarding the find was recovered from data held in the HER or the results of the North West Wetlands Survey.

6.4 Later Prehistory: Neolithic, Bronze Age and Iron Age (Fig. 6.3)

6.4.1 Neolithic sites and findspots

As with much of the southern section of coastline forming part of North-West Rapid Coastal Zone Assessment there are no Neolithic monumental features within this section of coastline. The Neolithic evidence for this stretch of coastline is limited to thirteen findspots, presented in table 6.x, which are located around Formby, the upper reaches of the Ribble and Wyre estuaries and between Lytham St Anne's and Blackpool. The finds are predominantly stone axes.

6.4.2 Bronze Age sites

A Bronze Age round cairn (SD 31133210; HER PRN36 L) was located at Stonyhill Lodge to the south of Blackpool, although the site was destroyed in antiquity by the

farmer, who removed over twenty cartloads of burnt soil and stone from a large circular cairn. Located nearby were two springs, one of which emerged from a 'large oblong mound', and into one spring, the Fairy Spring, offerings of nails and pins were still made in the 19th century (Thornber 1852). There is a possible settlement site on the Wyre peninsula, just south of Fleetwood. The site (SD 33208 44331; HER PRN26074 L) is located on a glacial drumlin called Burnhill and very small-scale investigations report a circular floor pierced with stakeholes. Roman pottery, possibly of military origin, has also been found at the site, which could be of some significance. To the south, a site within the former ICI factory, called 'Castle Hill' is currently being investigated for early settlement (P. Iles, pers. comm.). A Bronze Age trackway (SD 29470246 ;HER 2902-018 M) is located at Altmouth, south of Formby.

6.4.3 *Bronze Age findspots*

Two dug out canoes (SD 51200 29600; HER PRN 1410 L) were being made for Preston Docks on the River Ribble. One of the boats was associated with bronze implements and both are confidently dated to the Bronze Age based on their typology (Fox 1926; McGrail 1978). They possibly represent trading vessels moving between the river systems and inshore waters of the coastline, similar to those found further south in the Mersey estuary and mentioned in Chapter 5. Two other logboats are also known from the same area, although their dating is unknown and they are recorded as prehistoric in origin (McGrail 1978). A further eleven Bronze Age findspots, including further finds from Preston Dock, predominantly of metal objects are also recorded within this section of coastline.

6.4.5 *Iron Age findspots*

There is very little evidence for Iron Age activity in this part of the study area with only two findspots of material from this date being recorded.

6.5 Roman and Romano-British (Fig. 6.5)

6.5.1 *Roman sites*

Evidence for Roman and Romano-British sites and findspots within this part of the study area is limited. A short section of Roman Road 703 (SD 354400; HER PRN26142 L), from Ribchester to Poulton-le-Fylde is thought to be located to the north-east of Poulton-le-Fylde (Margary 1957), although this is conjectural. No evidence of this stretch of the road was revealed during the APM exercise. Two other sites of possible Roman date are located in the Fleetwood area. At Rossall Point a large paved platform (SD 31094722; HER PRN347 L), possibly a landing stage, was reported (Thornber 1832). In 1840 a large quantity of Roman coins were found very close by and were possibly associated with the platform. There was also a local story of a thick-walled, circular building, associated with the platform (Watkin 1883). Additionally a road (SD 33224816; HER PRN349 L), thought to be Roman, was visible in 1836 on the shore at Fleetwood and could be traced along the Naze, towards Poulton (Watkin 1883). The areas are now built over and no evidence of these features survives today.

6.5.2 *Roman findspots*

A total of 20 findspots of Roman coins (including four hoards) are distributed throughout this section of the coastline. The coinhoard at SD 31094722 (HER PRN346 L), is that which has been associated with the platform mentioned above. It contained nearly 400 silver coins, initially described as 3rd Century *denarii* (Watkin 1886) which has led to some confusion in the literature, although it now appears clear that the hoard of

388 4th century silver *siliquae* in Preston Museum and that described in earlier texts are one and the same (Robertson 1948; Shotter 1978).

6.6 Early Medieval (Fig. 6.6)

6.6.1 Early Medieval findspots

There is almost no evidence for Early Medieval activity along this stretch of coastline, in contrast to the areas to the north and south. No sites are recorded, either within the HERs or as part of the APM exercise and only one coin, an Anglo-Saxon *stycca* from AD 844 (SD 271062; HER 2706-004 M), has been found, at Formby Point.

6.7 Medieval (Fig 6.7)

6.7.1 Medieval ecclesiastical sites

There are a total of fourteen ecclesiastical sites (including four crosses) within this section of the study area. The largest ecclesiastical site was Tulketh Abbey, Preston (SD 52243015; HER PRN1701 L), a Cistercian monastery founded on the 4th of July 1124. The monastery only existed for three years before the monks moved to Furness Abbey in southern Cumbria (Farrer and Brownbill 1912; Knowles and Hadcock 1953). The site was an early example of monastery founded by the Norman Savignac order. No evidence of the site was recorded as part of the APM exercise and the area is now urban and built over. Further sites, including St Mary's Priory, Penwortham and Lytham Priory are located just outside the study area.

The sites of three early churches, all of which have been replaced by more recent buildings, were located at St Cuthbert's, Lytham St Anne's (SD 35702722; HER PRN1279 L), All Hallow's Church, Blackpool (SD 31902 40576; LB 37897; HER PRN1311 L) and the Church of St Mary the Virgin at Penwortham (SD 52382901; LB 27851; HER PRN1447 L). St Cuthbert's, a Grade II* Listed was founded from the Priory of Lytham in the 12th Century AD (Farrer and Brownbill 1912). At All Hallow's, a Grade II Listed Building, the 12th Century doorway was demolished in 1883, along with the rest of the church, but the stones were numbered and re-erected in the south doorway of the church, although the decoration of the signs of the zodiac are Victorian interpretations of carvings seen when whitewash was removed from the original (Farrer and Brownbill 1912). A substantial part of the Grade II* Listed Building of the Church of St Mary the Virgin is 14th Century in date, comprising the walls, windows and some of the window glass, with a 15th century nave, aisles, west tower and south porch. The first record of the church dates to 1140 however when it was granted to Evesham Abbey (Farrer and Brownbill 1912). Two monastic granges are known within the study area, one north of Hightown (SD 2937 0490; HER 2904-010 M) and one at Rossall (SD 31544478; HER PRN 1308 L). The latter was, from 1216, bestowed on the Abbey of Dieulacres, Staffordshire (Farrer and Brownbill 1912), but has been lost to the sea and was replaced in the 17th Century with a new hall further inland (Clarke 1923).

Further medieval ecclesiastical sites in this area comprise three (or possibly four) chapels and four cross and cross fragments. According to the Lancashire HER the chapels are located on the east and west banks of the Wyre (SD 334447; HER PRN1304 L; and SD 336446; HER PRN2227 L) and in the upper reaches of the Ribble estuary at Hackensall (SD 34894277; HER PRN1332 L; and SD 3529342990; HER PRN1412 L). The chapel at Hackensall was the place where the Abbot of Cockersand sent a monk to pray for the souls of King John and others in the early 13th century (Farrer and Brownbill 1912). The

chapel at Hutton is thought to have been founded around AD 1200, although there is little information regarding the site (Farrer and Brownbill 1907). Nothing is visible at the site today and no evidence of the site was revealed as part of the APM exercise for this project. The Chapel of St Mary Magdalen (SD 52932990; HER PRN 1417 L) was attached to the leper hospital of the same name (see entry below), from the time of its foundation in the late 12th century AD. By the mid-15th century, when the hospital was no longer in use, it was known as a free chapel (Farrer and Brownbill 1908; Hardwick 1857). Crosses, fragments, or locations of crosses are known from Hightown (SD 30070364; HER 3003-002 M), North Meols (SD 32861687; HER 3216-002 M) and Hangman's Bank (SD 51072936; HER PRN1409 L) and Penwortham (SD 52362883; HER PRN1450 L), both in Preston. The cross at Hangman's Bank was removed when the River Ribble was diverted to create the docks at Preston. It is possible that it was a monument to an executed criminal (Taylor 1906). Only the base of the cross at Penwortham survives and is now surmounted by a modern cross (*ibid.* 1906).

6.7.2 *Medieval military sites*

There are two known motte-and-bailey sites and one possible location, all at Preston. Within the grounds of Tulketh Hall a motte-and-bailey was located (SD 52303009; HER PRN108 L), although this was destroyed sometime in the latter part of the 19th century by sand extraction. The site was formed by a semicircular defensive ditch which separated a low cliff from the land beyond. No evidence of the castle has been recorded and the site was no longer in military use by 1127, when a group of Cistercian monks lived there (Hardwick 1857; Farrer and Brownbill 1908). Part of Penwortham Castle (SD 52442907; NMR 42566; SM 13446; HER PRN284 L) survives in St Mary's Churchyard, Preston, to the northeast of the church, where a conical earthen mound, which measures approximately 36.5m at the base and 7.5m at the summit is located. A shallow ditch, now filled with graves, still survives although the bailey has been disturbed by the construction of the church and graveyard. The castle is named in the Domesday survey of 1086, but was in ruins by the middle of the 13th century (Farrer and Brownbill 1908). The extent of the site was mapped as part of the APM exercise for this project. At Ashton Hall a possible motte has been identified (SD 51153025; HER 15204 L) by a ground survey undertaken by Dr T C Welsh. The survey indicated an incomplete motte with a building situated on top. No evidence of these features were transcribed by the APM exercise.

6.7.3 *Medieval rural sites*

Rural medieval sites, comprising field systems, boundary ditches, ridge and furrow, deserted medieval settlements and a farmhouse are known from within this section of the survey area and are shown in figure 6.7. New evidence of medieval field systems, comprising field boundaries and ridge and furrow, have been mapped as part of the APM exercise and the example at Upper Rawcliffe is shown in figure 6.10. These features are concentrated in the areas around Hightown and in the upper reaches of the Ribble estuary, particularly on the south bank near to Hesketh. The location of these field systems does not correlate with the putative locations of most of the deserted medieval settlements mentioned above however, which are located within the present urban conurbations of Preston and Blackpool. Only at Hightown is there a correlation between a deserted settlement and associated field systems and the monastic grange north of Hightown also has medieval field systems nearby. A farmhouse at Hutton (SD 46762702; HER PRN 1329 L) stands on, or near, the site of a 15th century manor house that belonged to the monks of Cockersand Abbey, and is surrounded by ridge-and-furrow. The lack of medieval rural archaeology within this section of the coastline can possibly be attributed to the presence of the extensive shifting dune systems around Formby Point,

which are not conducive to agriculture, and the development of the urban centres of Lytham St Annes, Blackpool and Fleetwood, which may have destroyed any earlier medieval sites.

6.7.4 Medieval Industrial sites

Three early mill sites are known, two from the north side of the River Ribble and one from the east side of the River Wyre. The two on the Ribble are watermills, at Freckleton (SD 3436442898; HER PRN 1321 L) built in the early 15th century and in Preston (SD 3543; HER PRN1703 L) which is referred to obliquely in the 13th century (Walford 1880). The mill at Hackensall, on the River Wyre (SD 35118 46593; HER PRN15022 L) is described as a tide mill, shown by the presence of a boomerang-shaped pool on the 1st edition OS map, which may relate to references to grants of land made to the monks of Cockersand Abbey in the mid-13th century (Higham 1994).

6.7.5 Other medieval sites

Two other medieval sites of interest are the leper hospital of St Mary Magdalen (SD 52982989; HER PRN1411 L) and a prison (SD 5020; HER PRN792 L), both in Preston. The hospital was first mentioned in letters of 1177, granted by Henry II, and comprised a warden with male and female leper inmates. It is not known how many inmates there were or the religious rule that they lived under and by the end of the medieval period the hospital was no longer in use, having been converted to a house and later a 'house of correction' which survived until the 18th century (P. Iles, pers. comm). Very little is known of the prison, with some documentary sources suggesting its location in Preston in 1201 (Pugh 1955) although this seems a very early date.

6.8 Post-Medieval (Fig. 6.8)

6.8.1 Post-medieval ecclesiastical sites

One church and two chapels are recorded as having been built in the post-medieval period on this stretch of coastline. At Much Hoole, to the east of the River Douglas, south of the Ribble estuary, the Church of St Michael (SD 46302232; HER PRN1341 L) was built in 1628, with 18th and 19th century additions and alterations. Two chapels are also present in the study area, one Presbyterian, at Bispham (SD 3139; HER PRN1314 L), built in the latter part of the 17th century (Farrer and Brownbill 1912) and one attached to Rawcliffe Hall (SD 41594183; HER PRN1398 L), built in the 17th century.

6.8.2 Post-medieval rural sites

As with the medieval archaeology for this part of the study area the rural archaeology of the period is dominated by ridge and furrow field systems, with limited evidence of farms or manors. Newly recorded ridge and furrow fields have been transcribed along the entire length of coastline as part of the APM exercise. One post-medieval manor house is known in the study area, located at Hightown (SD 29290490; HER2904-002 M) with ridge and furrow located immediately to the south. Fifteen farms are also recorded along this stretch of coastline along with two post-medieval barns located outside Preston. Church House Farm near Hesketh Bank (SD 46292238; LB 26481; HER PRN1343 L), Hesketh Farm, Penwortham (SD 49912801; LB 30011; HER PRN1331 L), and Church Farm, Lytham St Anne's (SD 34852788; LB 385265; HER PRN18283), are all Grade II listed and were built in the 17th century. Quaker's Farm and Village Farm on the River Wyre are now demolished. Other rural sites include a fishpond (SD 30150182; HER 3001-001 M) and a rabbit warren (SD 30070355; HER 3003-020 M), both at Hightown

and an enclosure, of probable post-medieval date on the east bank of the River Wyre (SD 3574445311; NMR 1483997) mapped by the APM exercise for this project.

6.8.3 Post-medieval industrial sites

In comparison with the coastline around Liverpool and the River Mersey, this section of coast has little early industry and infrastructure located within it. Three quarries or sand pits have been transcribed as part of the APM exercise for this project, all at Sefton (SD 2793508740; NMR 1479035: SD 27740670; NMR 1479045: SD 2784505785; NMR 1479075) and are part of process of sand-winning from the dunes along the foreshore. Sand extraction has been occurring at Formby since at least the early 18th century. However, little information is available regarding the early areas of extraction as this was not subject to any planning control until after the Second World War and early companies involved in the extraction have now gone out of business, taking their records with them (Crosby 2007). It appears from the available records that much of the extraction took place to the south of Formby Point, around Raven Meols (*ibid* 2007), which means that the quarries mapped from aerial photographs may represent some of the earliest sites of sand extraction on this part of the coastline. The earliest transport infrastructure within this part of the study area is the line of the Preston to Lancaster Canal (SD 5266530244: HER PRN10338 L), the longest canal in the country without any locks, which was designed in the late 18th century by John Rennie and built by 1797.

6.8.4 Post-medieval maritime features

There is one landmark tower dating to the post-medieval period, located at Formby Point (SD 27460536; HER 2705-001 M) and built in 1719. A total of ten wreck sites, mostly located within the Wyre estuary, have been recorded as part of the APM exercise, with an additional site recorded in the Lancashire HER off Blackpool.

6.9 Industrial and Modern

Sites dating from the industrial and modern period dominate the heritage of this section of coastline. At the same time as the dock complex of Liverpool was expanding the coastline to the north saw the development of two equally significant forms of industry – fishing and tourism. Fleetwood was at one time the third largest fishing port in the British Isles and Blackpool, synonymous with the development of coastal resorts, developed to serve the population of the expanding industrial towns of North-West England. There are a number of other important maritime sites as well however, including the oldest lifeboat station in the country at Formby and docks and shipyards at Preston, Lytham St Anne's and Fleetwood. Other industry also developed, particularly the extraction of china clay in the northern part of this section of the study area.

6.9.1 Shipping and infrastructure

In the early part of the 19th century Fleetwood developed under the direction of Sir Peter Hesketh-Fleetwood, MP for Preston, who saw his family estates here as suitable for a port terminal linking London and Scotland. At the time there was no rail link between the two and so port and leisure facilities were created, including the oldest surviving building in Fleetwood, the former Customs House (SD 3405148069; LB184767; HER PRN5449 L), now the Fleetwood Museum, a Grade II Listed Building, built in 1836 by architect Decimus Brown. Sadly for Hesketh-Fleetwood, the completion of the rail route between London and Scotland in the 1850's and the rise of Blackpool as a resort town meant his dreams were short lived. The development of the port facilities continued however with pleasure steamers leaving for the Isle of Man, Scotland and Ireland and

commercial cargo increasing with the arrival of the railways (Marshall 1969). In 1877 Wyre Dock (SD 3363947215; HER PRN20833 L) was constructed by the Lancashire and Yorkshire Railway Company. Most significant however was the rise of the fishing industry in the later part of the 19th century as the vessels of Fleetwood expanded their range into the North Atlantic which, coupled with Fleetwood's decline as a cargo port as the facilities at Liverpool expanded, saw the town exploit its position as the only fishing port on the west coast of England to eventually become the third largest in the country (Porter 2008). The development of the port saw the building of lighthouses and landmarks around the channel of the River Wyre. The Lower (Beach) Lighthouse and the Pharos Lighthouse were designed by Decimus Burton and opened in 1840 and both are Grade II Listed Buildings, whilst the Wyre Lighthouse was built offshore by Alexander Mitchell in the late 1840's.

Table 6.3 Lighthouses in Block 2

HER No.	Easting	Northing	Name
PRN15027	332600	427800	Lytham Lighthouse
PRN21539	332656	428000	Lytham Lighthouse, 57-63 Lightburne Avenue, St Annes
PRN4770	344461	456296	Lighthouse, east side of entrance to Glasson Dock
PRN5444	333838	448518	Lower (Beach) Lighthouse, The Esplanade, Fleetwood
PRN5446	332510	451200	Wyre Lighthouse, Fleetwood
PRN5447	333937	448287	Upper Lighthouse/Pharos, Pharos Place, Fleetwood
PRN10711	342216	454296	Plover Scar Lighthouse

The Albert Edward Dock at Preston (SD 515296; HER PRN6624 L) was also a significant maritime structure and, in the late 19th century, was the largest dock in the British Isles, measuring 914m long and 183m wide (Ashmore 1969). Two further docks are located at Lytham St Anne's, Lytham Dock (SD 38402788: HER PRN6143 L), built between 1840 and 1842, and used by vessels travelling to and from Preston Dock, and a graving dock (SD 3786327823: HER PRN26643 L), built in the early part of the 19th century. Shipyards are known from Lytham St Anne's (SD 28103755; HER PRN19057 L), Freckleton (SD 434284; HER PRN6657 L) and Preston (SD 5282428957; HER PRN20381 L). The shipyard at Lytham built paddle steamers during the Inter War era for export to Africa (Ashmore 1969). Only the slipway of the yard at Freckleton still survives and coastal vessels were built and repaired here (Ashmore 1982). The Caledonian Shipbuilding and Engineering Works were built in Preston around the middle of the 19th century, but no longer survive.

The development of the marine economy saw the establishment of lifeboat stations at Formby (SD27050629; HER 2706-002 M), Lytham St Anne's (SD 37072700; LB 20880; HER PRN15026 L: SD 3213728464; HER PRN21544 L), Blackpool (SD 3066434952; HER PRN15492 L) and Fleetwood (SD 3399548402; HER PRN20867 L). The site at Formby was first mentioned in 1776, on a map of the area of Liverpool. Lytham Lifeboat House is Grade II Listed and was built in 1851. It is most famous for its lifeboat's actions in the *Mexico* disaster of 1886, when the Lytham lifeboat was the only lifeboat to return home. The second lifeboat station in Lytham no longer exists, and the same is true of the station at Fleetwood.

There are numerous wrecks present along this stretch of coastline, although correlating those mapped as part of the APM exercise with those present in the HER records means a definitive figure cannot be reached. It is clear from the records however that most of

the wrecks sites come from the channel of the River Wyre and its estuary and are a combination of inshore and offshore fishing vessels and cargo vessels.

6.9.2 Industry

A wide variety of industries are located along this stretch of coastline, although all are within the northern section, between Preston and Fleetwood. Clay pits and cotton mills are the most numerous of industrial sites with 24 clay pits, particularly around Blackpool, and 23 cotton mills, all in Preston. Other industries are varied with extractive sand pits and gravel pits at Preston and Fleetwood, saw mills and brickworks at Preston, Blackpool and Fleetwood, an Ironworks in Preston, one saltworks, on the west bank of the River Wyre, exploiting the Preesall saltbeds. This salt resource led to the construction of a chemical works at Thornton, which in turn was developed during the First World War and after, to form the large ICI Hillhouse complex (P. Iles, pers. comm.). The fish processing works at Lytham St Anne's (SD 367269: HER PRN15035 L) was built in the early 20th century as contamination affected the mussel beds harvested by the inshore fishing vessels. The facility, essentially a large concrete tank with a seawater inlet pipe allowed the mussels to clean themselves prior to sale. The site is now owned by the Ribble Sailing Club who use the tanks to house their dinghies.

6.9.3 Leisure

Whilst industry, and particularly the fishing industry, forms a significant part of the character of this section of coastline it is the resort and leisure facilities that it is most renowned for. The dunes around Formby Point and Sefton which are visited for their wildlife and their golf courses and Blackpool is famous for its tower, piers, fairgrounds and promenade, whilst there are piers and more genteel facilities at Southport and Lytham St Anne's. From a number of small fishing hamlets, the modern conurbation of Blackpool developed in the middle of the 19th century, after the arrival of the railway in 1846. Initially a spa town it soon transformed itself into the foremost seaside resort for northern working-class factories travelling from the mill towns of Lancashire (Walton 1998). The pre-19th century origins of Blackpool are small, comprising a dispersed settlement along the foreshore, with a handful of hotels, where the entertainment comprised walks (or rides if one could afford it) along the grass promenade and a small theatre. The principal reason for visiting Blackpool before the mid-19th century was for sea bathing and drinking the water (*ibid.*). It was the later part of the 19th century however that saw the rise of Blackpool, with the development of rail links to the industrial mill towns. By 1860 the entertainment was still limited, with Uncle Tom's Cabin (SD 3066938548: HER PRN15465 L) at the north of the town providing refreshments and dancing. In 1863 the North pier (SD 30403638; LB 41671; HER PRN3644 L) was built, stretching for over 1400 feet into the Irish Sea and providing an exclusive area to promenade with refreshment kiosks at its seaward end. The north pier was followed by the Central Pier (SD 3039635472; HER PRN3645 L) in 1868, which measured over 1500 feet long, and the South Pier (SD 3029233760; HER PRN3646 L) in 1893, which was initially called the Victoria Pier. Other piers were built at Southport (SD 33011788; LB 479151; HER 3317-019 M), Lytham St Anne's (SD 31802859; HER PRN3643 L: and SD 3659826773; HER PRN21595 L), of which only the pier on the South Promenade is still extant, and Fleetwood (SD 3359148578; HER PRN2862 L: SD 3394548633; HER PRN5451 L). The pier at Southport, built in 1860, is the second longest in the country, at 3600 feet long, although in 1868 it was extended to 4380 feet long, before being damaged by fire and reduced in length and is a Grade II Listed Building. The development of the facilities at Fleetwood, Lytham St Anne's and Southport were designed to provide a more genteel experience for those wanting to avoid the increasing gaudiness of Blackpool. The

popularity of Blackpool is evidenced by the number of hotels present within this section of study area. Of the 58 present recorded within the HERs, 40 are in Blackpool, with the rest scattered between Preston, Fleetwood and Lytham St Anne's. By the end of the 19th century Blackpool could accommodate over quarter of a million people (Walton 1998). The variety and quality of entertainment at Blackpool continued to develop, culminating in the opening of Blackpool Tower (SD 30623604; LB 183675; HER PRN10630 L) in 1894, a Grade I Listed complex of facilities including a ballroom, a circus, an aquarium and a roof garden. In the early 20th century the promenade area continued to be developed and expanded, and the Pleasure Beach (SD 306331; HER PRN12847 L) made its first appearance on the dunes to the south of the town where, on a site which had long been used by fairground artists and gypsies, Sir Hiram Maxim built his Captive Flying Machine (SD 3058133383; HER PRN24295 L) in 1905.

6.9.4 The World Wars

A handful of First World War sites are known from this section of coastline. These include four Royal Observer Corps Sound Mirrors, at Crosby, Formby Point, and Southport, with the site at Formby Point transcribed by the APM exercise.

In Blackpool a network of First World War practice trenches (SD 3132333511; NMRUID 1480790; HER PRN22272 L) were dug, on the landward side of the Pleasure Beach (Lowry 2001) and later became a public education facility (P. Iles, pers. comm.). A single trench was also transcribed by the APM exercise to the north of Blackpool (SD 31613935; NMR 1482880).

The APM exercise for this project has identified and transcribed a multitude of military sites dating from the Second World War, not of all of which can be outlined here. Major sites, such as airfields, gun batteries and camps, whether they survive or not, will be described in detail whereas minor sites, such as air-raid shelters, pillboxes and bomb craters, will be recorded in tabular form.

Two airfields are located at Warton (SD 418277; NMRUID 143202) and Blackpool (SD 322313; NMRUID 1411199). Warton Airfield opened in 1942 and consisted of three concrete runways with storage and repair hangars. By 1944 it was used as Number 2 Base Air Depot by the USAAF. The APM exercise has identified anti-aircraft (NMRUID 1480772) and searchlight batteries (NMRUID 1480780) associated with this airfield. Blackpool Airfield was brought into military use in 1939, previously having been used as the site of flying displays in the early 20th century, and served as a reconnaissance training site and a Spitfire station to intercept bombing raids on Liverpool. During the Second World War a shadow factory was also built on the site by Vickers, which built and tested the Wellington bomber there. The airfield passed back into civilian use after the end of the war.

Of the six anti-aircraft batteries in the area five, which includes the one at Warton Airfield) have been transcribed by the APM, two being sites new to the Lancashire HER and an additional site, not transcribed by the APM is mentioned in the Merseyside HER at Formby Point. To the north of Hightown (SD 292 045; NMRUID 1476694) a heavy anti-aircraft battery with associated pillboxes, military camp, military buildings and barbed wire obstructions, known as Fort Crosby (Fig. 6.11), were visible as structures on air photographs transcribed as part of this project. The battery appears to have been replaced with a post-war construction on the same site (NMRUID 1476699). The site

also appears to be associated with a firing range (NMRUID1476718), practice trenches (NMRUID 1476708), a minefield (NMRUID 1476711) and Altcar Training Camp (NMRUID 1476714). The modern site of Altcar Firing Range lies immediately to the south. To the south of Hightown an anti-aircraft battery (NMRUID 1476276) was included within the larger coastal gun battery, detailed below. This is possibly the same anti-aircraft battery as that recorded in the Merseyside HER (SD 299012; HER 2901-003 M). A further battery is mentioned in the Merseyside HER at Formby Point (SD 275066; HER 2706-003 M), but no record of this site was found during the APM exercise. Two further batteries are located to the north of this section of coastline, at Warton Airfield (SD 442279; NMRUID 1480751) mentioned above and at Blackpool (SD 313388; NMRUID 1480751), which was listed as unarmed in 1942 and equipped with a radar unit. Five searchlight batteries have been recorded in the area, to the east of Preston, to the south of Southport and three north of Crosby, supporting the coastal battery and defending the approaches to the River Mersey. Only two barrage balloon sites are located on this stretch of coastline, both at Crosby.

Two bombing decoy sites, at Crosby (SD 305019; NMRUID 1476671) and east of Warton Airfield (SD 470288; NMRUID 1469011) in Clifton Marsh, have been transcribed as part of this project. The latter site included a 'Permanent Starfish' type, recreating a bombed urban environment and was built in 1941 to deflect bombing from Preston. A 'P-series' Oil QF decoy was also created at the site to divert raids from the oil installations of Preston. This recreated oil pools targeted by bombs. A third decoy, the 'QL' type from the 'C-series' replicated the lighting of an area of docks and factories, which were also located in nearby Preston. No bomb craters were mapped around these sites, but craters have been transcribed within the study area.

As with the area around Merseyside, anti-invasion defences can be divided into gun and search light batteries and pillboxes that provided offensive fire and anti-aircraft obstacles, minefields, beach defences and barbed wire entanglements that provided a passive defensive system. The search light batteries have already been detailed above. Crosby Point coastal gun battery (SD 29680233; NMRUID 1425941) was located to the south of Hightown, defending the area around Crosby. The AA battery it incorporated has already been mentioned above. The gun battery was initially built for the First World War when it was armed with three 6-inch breech loading guns. By 1941 these had been replaced with 4.7-inch naval guns, which, in turn, were removed in 1944. Anti-aircraft obstructions, anti-tank obstacles and minefields were located off the Sefton Coast and around the Ribble estuary, whilst beach defences protected Blackpool Airfield from seaward attack. A total of 117 pillboxes were located within the study area. A total of 88 air raid shelters were recorded as part of the APM exercise.

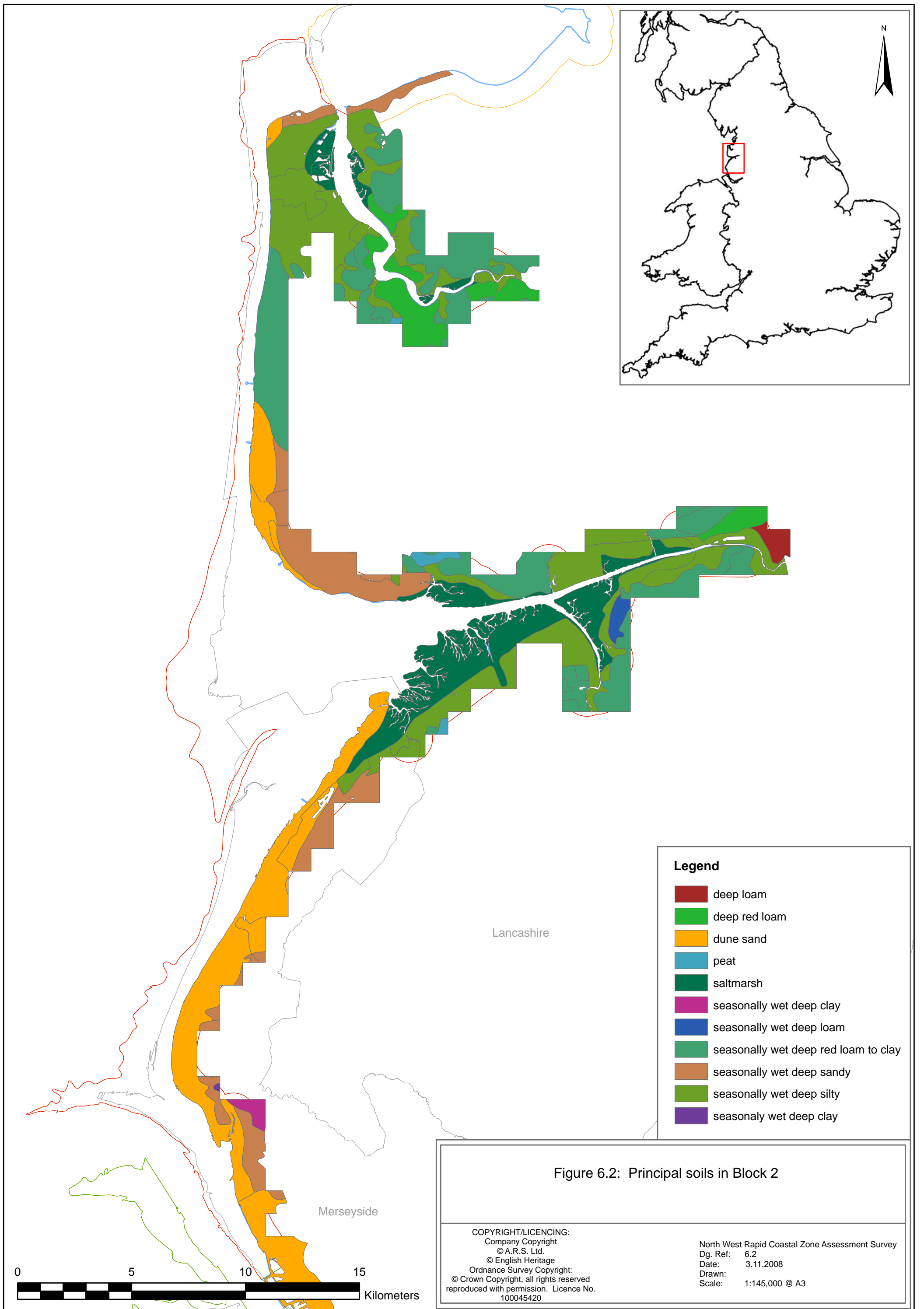
6.10 Conclusion

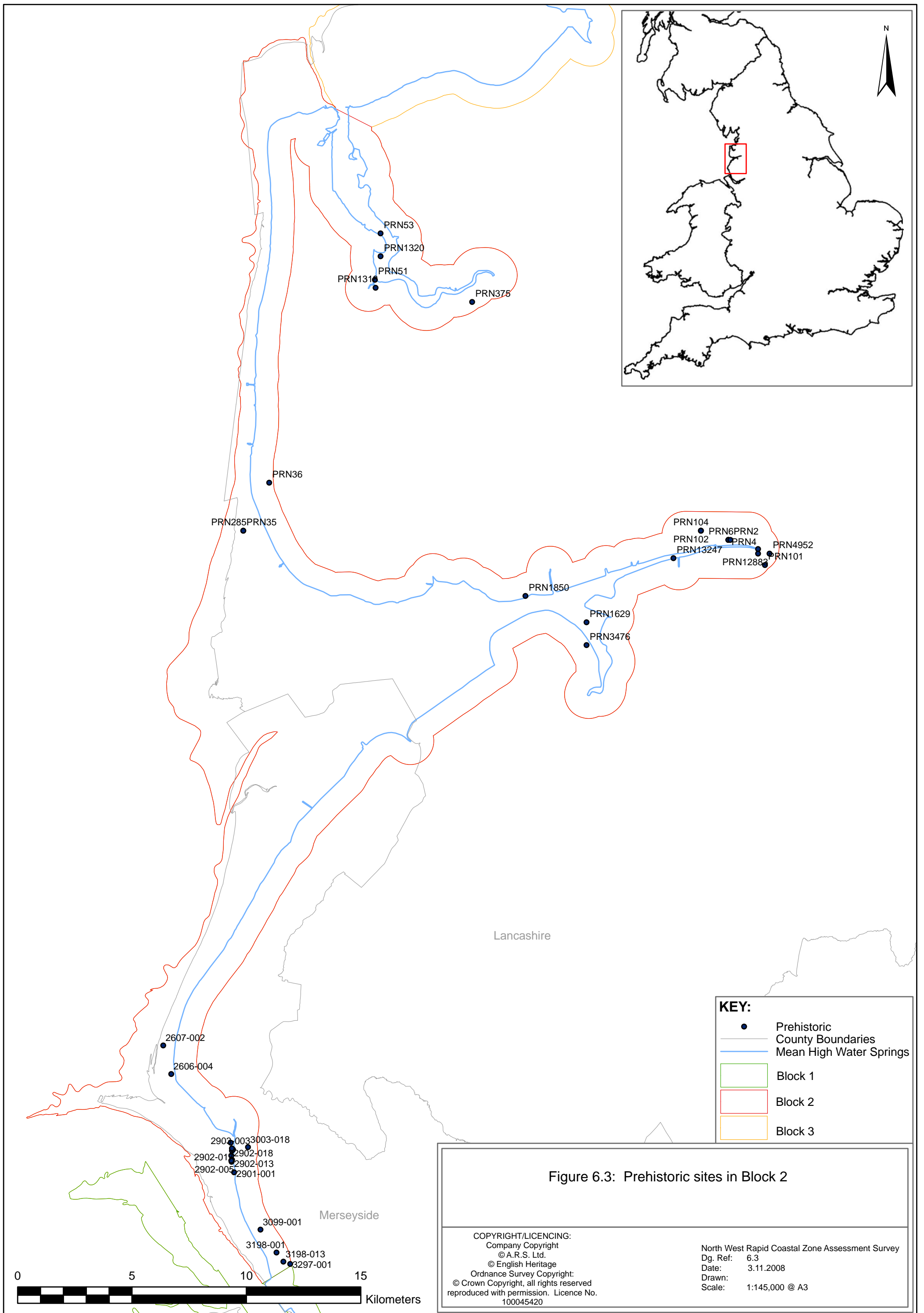
This area of coastline presents a marked contrast to the industrial and urban landscape to the south. The extensive dunes of the Sefton coastline, the estuary and saltmarsh of the Ribble and the resort towns of Southport, Lytham St Anne's and Blackpool contain different forms of archaeology to those further south, comprising less industrial sites and more rural and leisure related facilities. There are limited, but highly significant, prehistoric archaeological features, particularly around the Sefton shoreline, where the eroding footprints of Mesolithic, Neolithic and Bronze Age people and animals can be found. As with the coastline further south, marine transgression and urban expansion may have destroyed or obscured earlier sites. Extensive fieldwalking programmes at Little

Crosby and Ince Blundell, just inland from the boundary of the study area suggest a Mesolithic presence that was exploiting the nearshore area and it is possible that further evidence of prehistoric activity exists between the known areas of activity and the present shoreline, within the boundaries of the North West Rapid Coastal Zone Assessment.

Ecclesiastical remains are the main heritage asset dating from the early Medieval and Medieval periods, although there is only one abbey site, the short-lived Tulketh Abbey, at Preston. Medieval military sites survive at three motte-and-bailey castles and there are few other heritage assets from this period located within this stretch of coastline. The presence of the leper hospital at Preston perhaps indicates how peripheral the Ribble estuary area was during this period as such sites are usually located in the most remote of areas. The archaeological record for the post-medieval period is also relatively sparse and limited to ridge-and-furrow field systems with a few farmsteads and mill sites.

The most visible heritage assets along this stretch of coastline are those associated with the creation of the leisure facilities of Blackpool, Lytham-St-Anne's and Southport, built to serve the factory workers of the Industrial Revolution. Whilst Fleetwood developed into one of the largest fishing ports in Britain there are surprisingly few archaeological features associated with the industry present within the study area. This may explain why the town has so often been overlooked within literary reviews of the development of the fishing industry and it 'still lacks a detailed analysis of its development and only limited work has been undertaken to record and document its early buildings' (Brennand 2004, 10). The resort towns, with their listed buildings, hotels, piers and funfairs, have been gradually degrading since their early 19th century heyday and, whilst there is an emphasis in the North West Regional Research Framework on the industrial heritage that transformed north-west England, there is little mention of the corresponding development of the leisure facilities used by the factory workers. These resort towns contain unique monument types, such as the piers and promenades, and some of the earliest surviving examples of funfair rides, including Hiram Maxim's Flying Machine, which have only ever been recorded photographically.





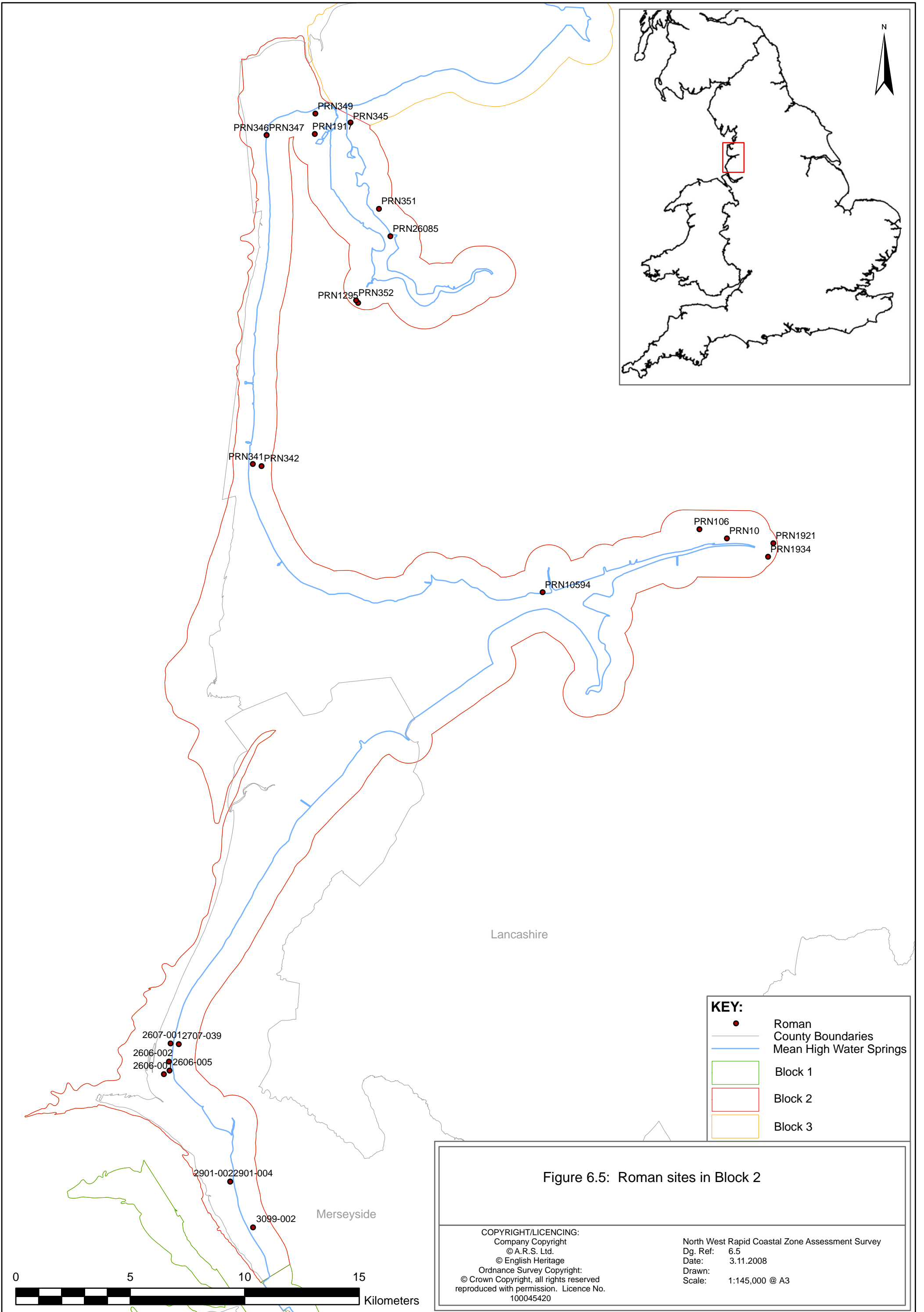
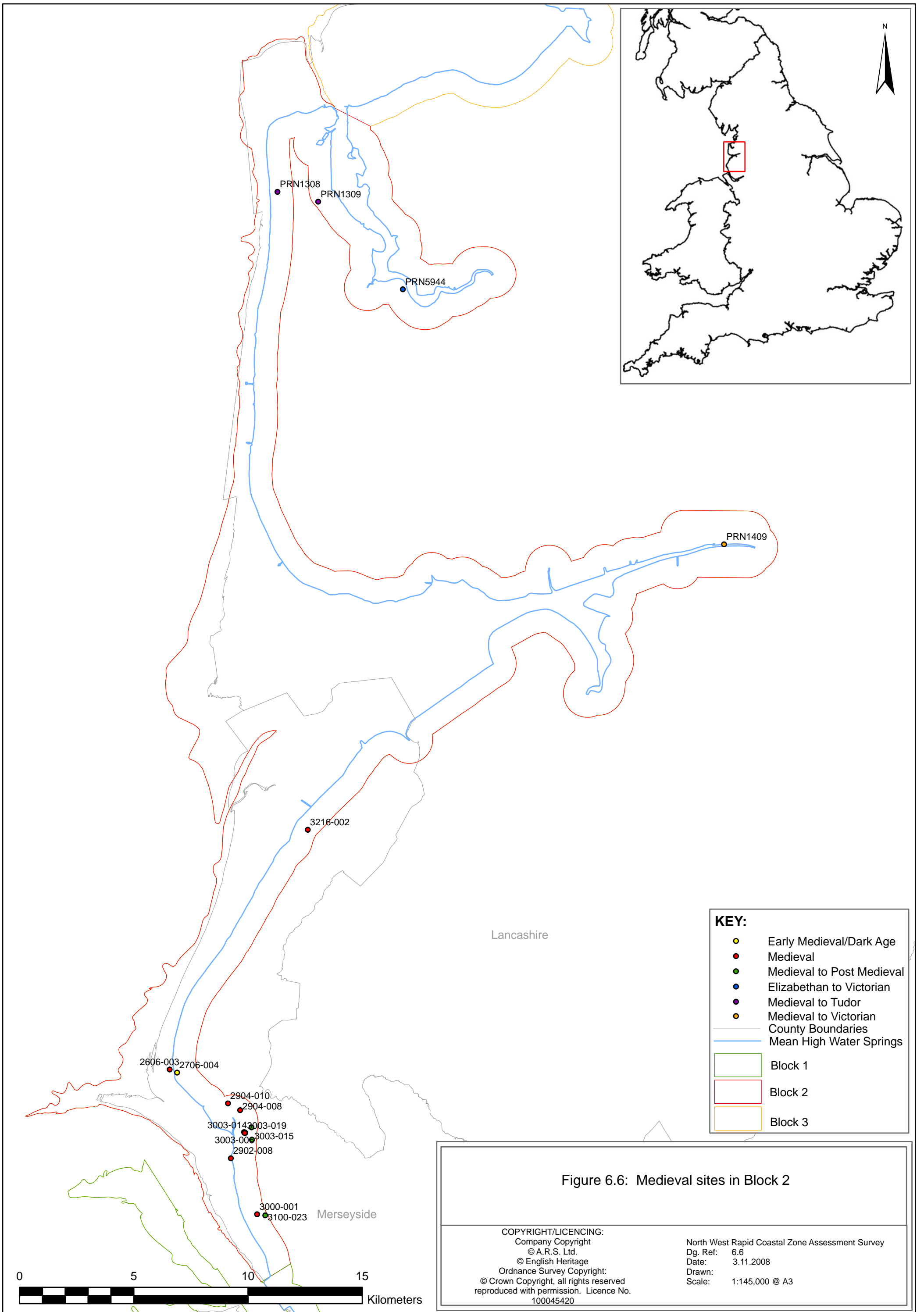


Figure 6.5: Roman sites in Block 2

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North West Rapid Coastal Zone Assessment Survey
 Dg. Ref: 6.5
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 Drawn:
 Scale: 1:145,000 @ A3



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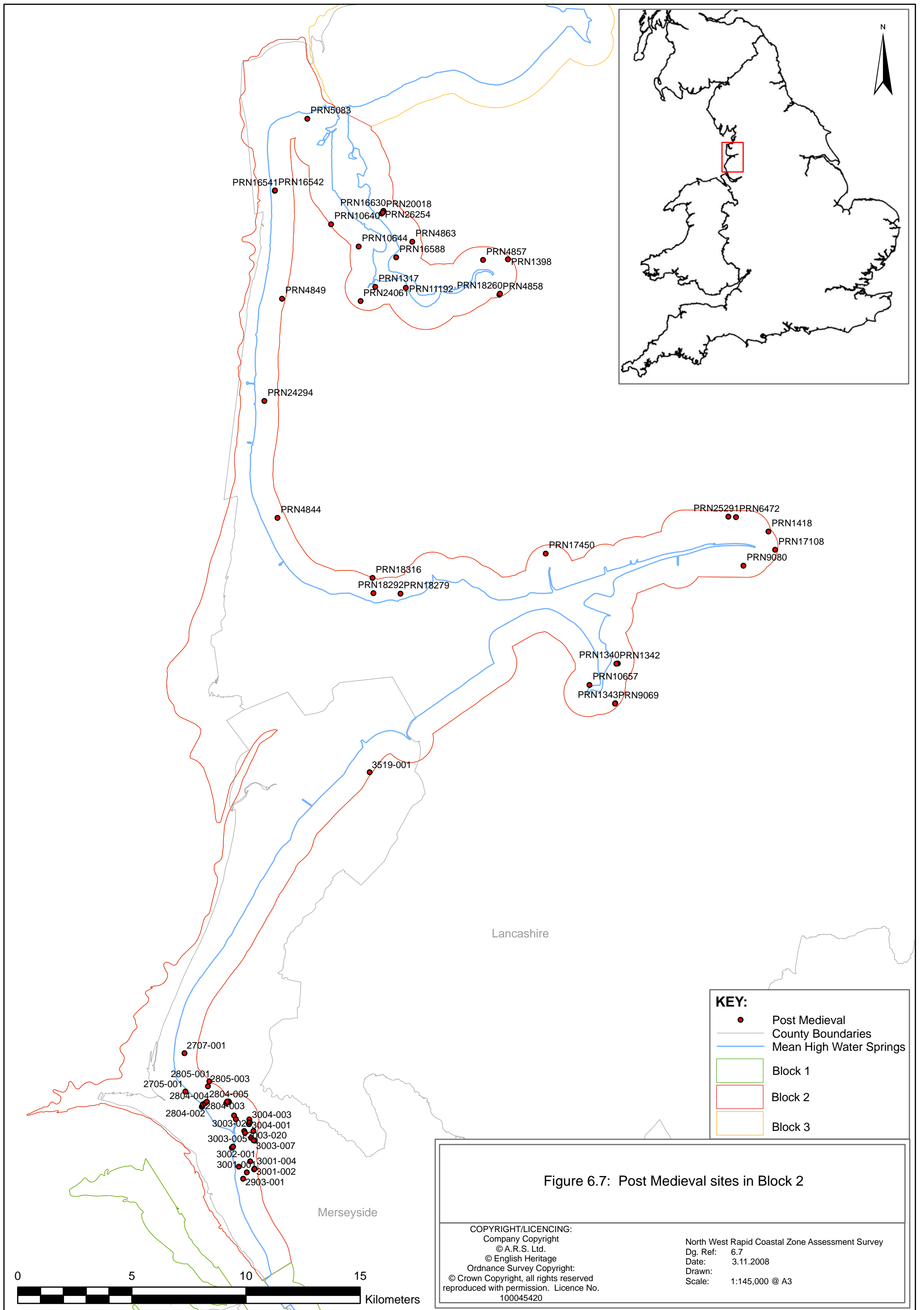
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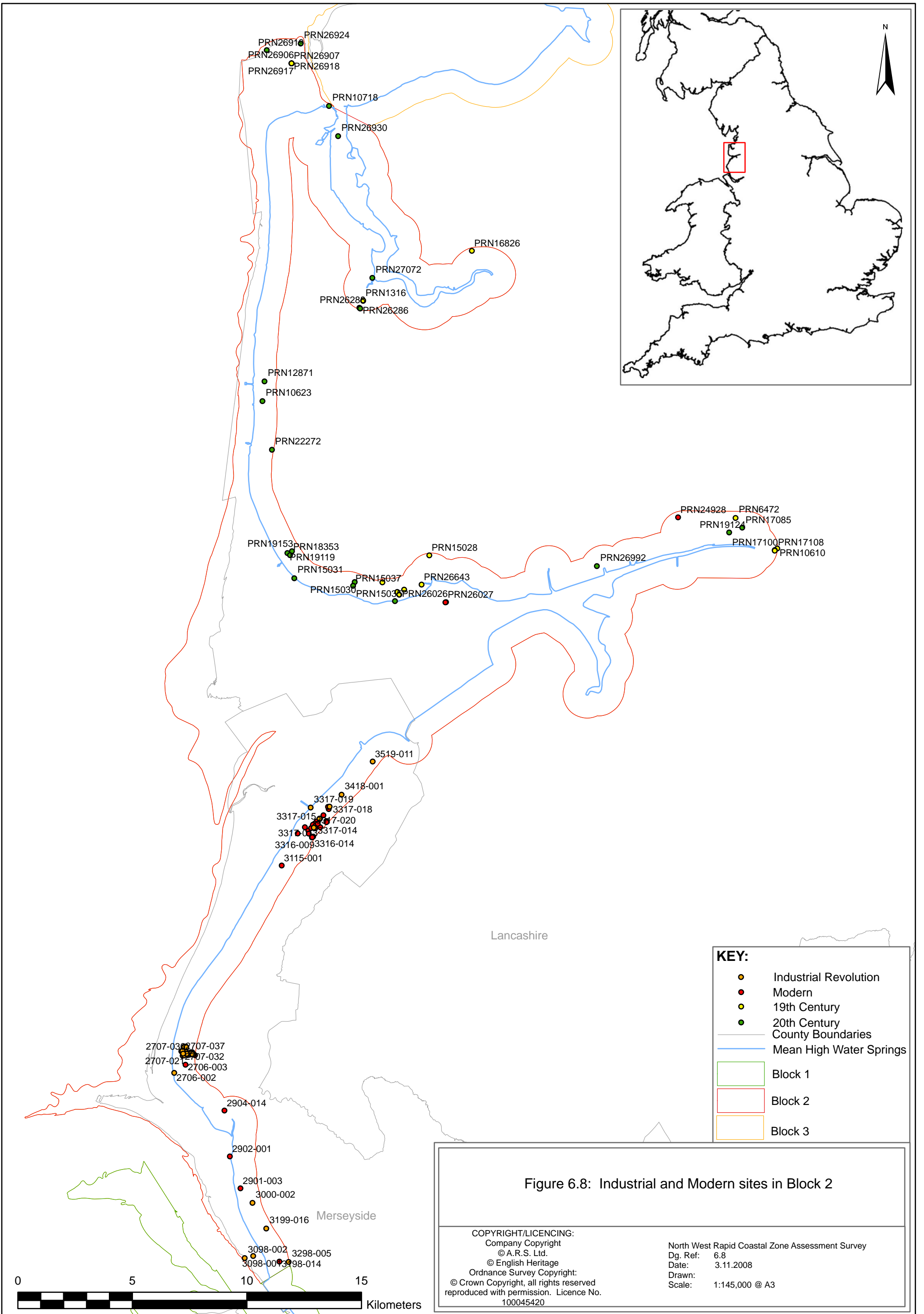
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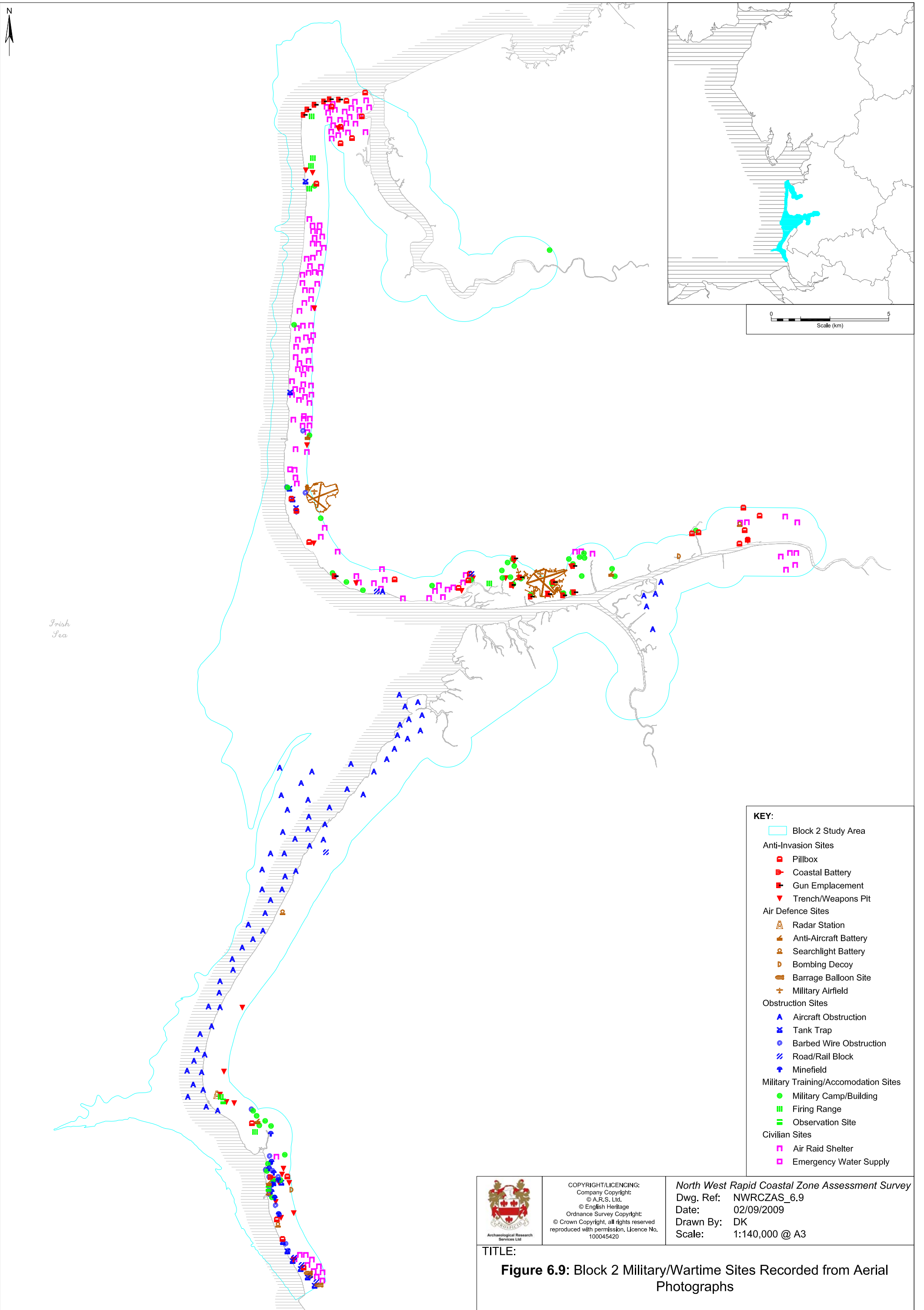
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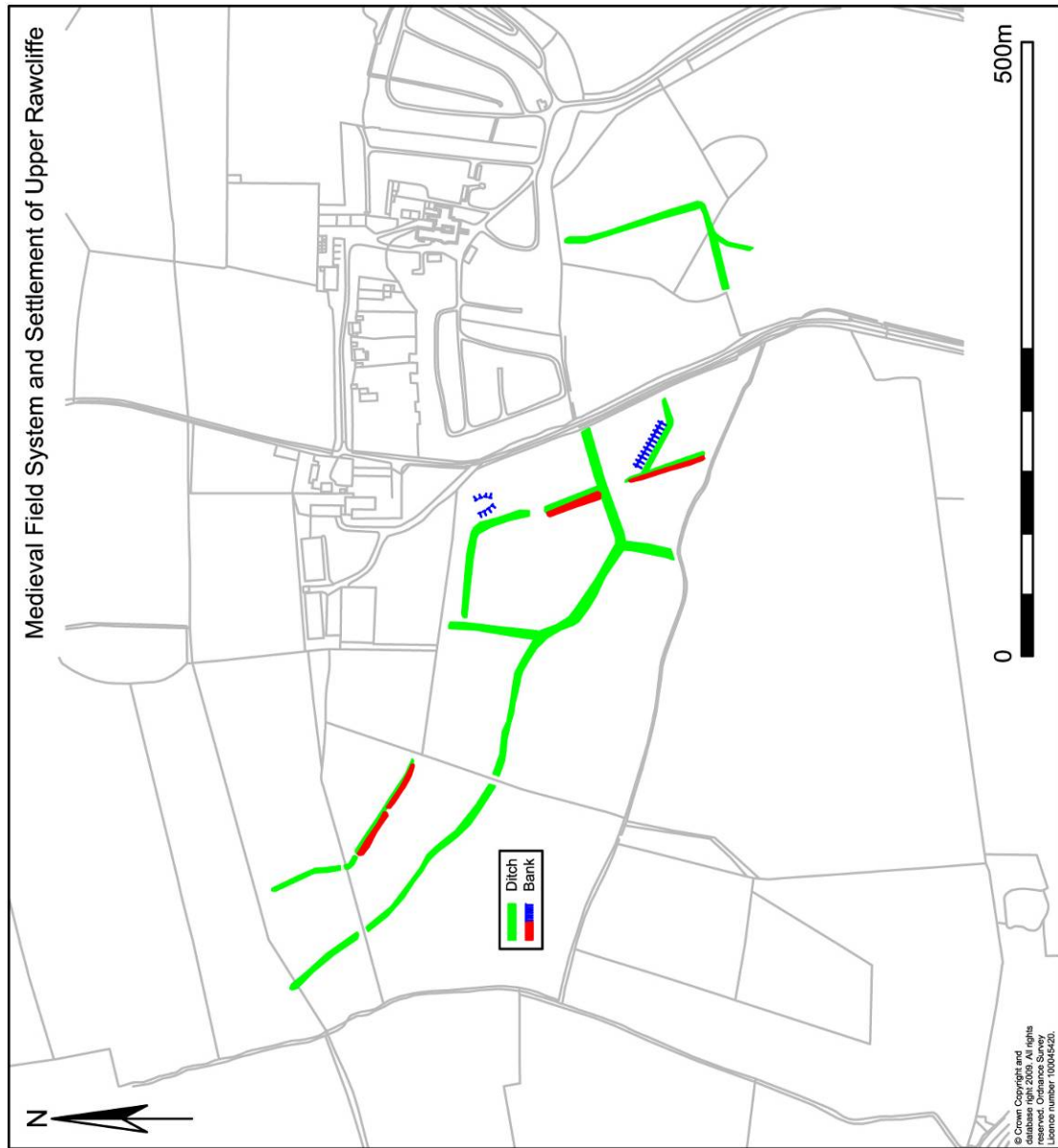


Fig. 6.10 The Medieval settlement and field system at Upper Rawcliffe mapped from aerial photography

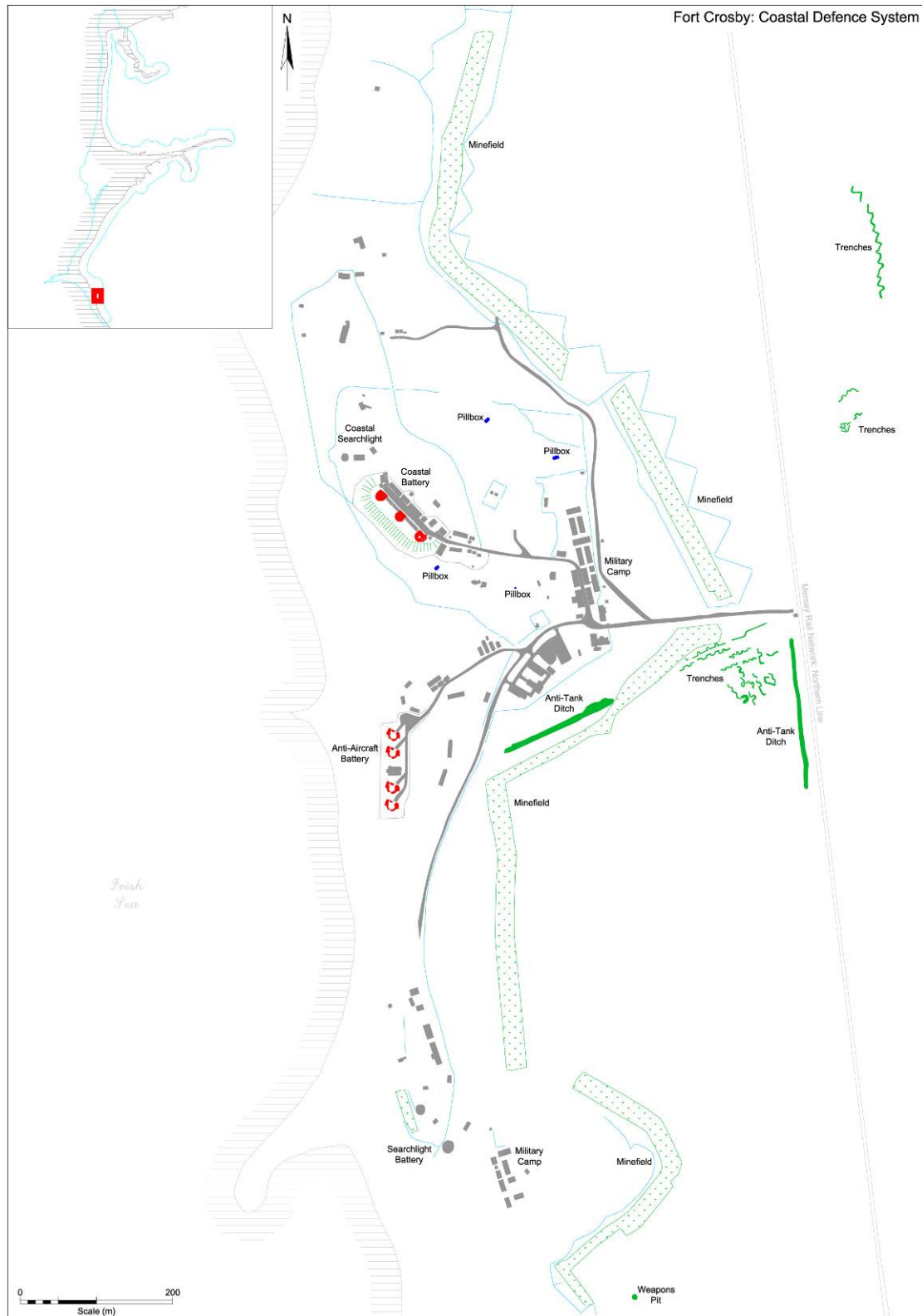


Fig. 6.11 Fort Crosby, at the mouth of the Mersey estuary, mapped from aerial photography

CHAPTER 7

A REVIEW OF THE ARCHAEOLOGY FROM THE RIVER WYRE (LANCASHIRE) TO ROA ISLAND (CUMBRIA)

7.1 Introduction

The area discussed in this chapter extends from the eastern bank of the mouth of the River Wyre to Roa Island on the south Cumbrian coast (Fig. 7.1). This section of the study area is dominated by the extensive sand and mud-flats of Morecambe Bay into which drain the Rivers Leven and Kent, as well as the estuary of the River Lune to the south of this stretch of coastline. Only two major conurbations lie within this part of the study area, at Lancaster, on the River Lune, and at Morecambe, but the shoreline is scattered with small towns and villages such as Heysham, Arnside, Grange-over-Sands and Ulverston. The Historic Environment Records analysed for this section comprised the datasets maintained by Lancashire County Council, the Lake District National Park Authority and Cumbria County Council. The Shoreline Management Plan 2 units within this section are presented in table 7.1 and figure 7.1. This section of coastline includes part of the Arnside and Silverdale Area of Outstanding Natural Beauty.

Table 7.1 Shoreline Management Plan Policy Units and preferred scenario

General Policy Unit Area	Specific Policy Unit Location	SMP Policy Unit	Preferred Scenario		
			0-20 years	20-50 years	50-100 years
Knott End to Plover Scar	Knott End on Sea	11c 2.1	HTL	HTL	HTL
	Knott End to Fluke Hall	11c 2.2	HTL	HTL	HTL
	Fluke Hall to Cocker Bridge	11c 2.3	HTL	MR	HTL
	Cocker Bridge to Glasson Dock	11c 2.4	HTL	MR	MR
Lune Estuary	Glasson Dock to Condor Green Farm	11c 3.1	HTL	HTL	HTL
	Conder Green Farm to Aldcliffe	11c 3.2	NAI	NAI	NAI
	Aldcliffe to Freemans Wood (Aldcliffe Marsh)	11c 3.3	NAI	NAI	NAI
	Freemans Wood to Skerton Weir (east bank) and Skerton Weir to Lythe Bridge (west bank)	11c 3.4	HTL	HTL	HTL
	Lythe Bridge to Riverside Farm	11c 3.5	HTL	MR	HTL
	Riverside Farm to Overton Cattle Grid	11c 3.6	NAI	NAI	NAI
	Overton Cattle Grid to Sunderland Village	11c 3.7	HTL	HTL	MR
Sunderland Village to Potts Corner	Sunderland Village	11c 4.1	NAI	NAI	NAI
	Sunderland Point	11c 4.2	MR	MR	MR
	Sunderland Point to the secondary embankment	11c 4.3	NAI	NAI	NAI
	Secondary Embankment to Potts Corner	11c 4.4	HTL	HTL	HTL
Potts Corner	Potts Corner to Heysham	11c 5.1	NAI	NAI	NAI

			Preferred Scenario		
to Heysham Dock	Power Station				
	Heysham Power Station and Heysham Dock	11c 5.2	HTL	HTL	HTL
Heysham to Hest Bank	South End of Halfmoon Bay to Chapel Hill (Lower Heysham)	11c 6.1	NAI	NAI	NAI
	Chapel Hill to Hest Bank (Morecambe)	11c 6.2	HTL	HTL	HTL
Hest Bank to Heald Brow	Hest Bank to Sewage Works	11c 7.1	HTL	MR	HTL
	Sewage Works to Red Bank Farm	11c 7.2	NAI	NAI	NAI
	Red Bank Farm to Bolton-le-Sands Caravan Park	11c 7.3	HTL	MR	HTL
	Bolton-le-Sands Caravan Park to River Keer	11c 7.4	NAI	NAI	NAI
	River Keer to Heald Brow	11c 7.5	NAI	NAI	NAI
Heald Brow to Humphrey Head	Heald Brow to Frith Wood	11c 8.1	NAI	NAI	NAI
	New Barns	11c 8.2	NAI	NAI	NAI
	Grubbins Wood (New Barns to Ash Meadow)	11c 8.3	NAI	NAI	NAI
	Ash Meadow to the Kent Viaduct (Arnside)	11c 8.4	HTL	HTL	HTL
	Kent Viaduct to Holme Island	11c 8.5	HTL	HTL	HTL
	Holme Island to Humphrey Head	11c 8.6	HTL	HTL	HTL
Kent Estuary	Kent Viaduct to Dick Fell Road (Sandside)	11c 9.1	HTL	MR	MR
	Sandside (Dick Fell Road to Hollins Well Road)	11c 9.2	HTL	HTL	HTL
	Hollins Well Road north to Levens Bridge (east bank) and Levens Bridge to Kent Viaduct (west bank)	11c 9.3	HTL	MR	MR
Humphrey Head to Cark	Humphrey Head	11c 10.1	NAI	NAI	NAI
	Humphrey Head to Cowpren Point	11c 10.2	HTL	MR	MR
	Cowpren Point to Cark	11c 10.3	NAI	NAI	NAI
Outer Leven Estuary	Cark to Leven Viaduct	11c 11.1	NAI	NAI	NAI
	Leven Viaduct to Canal Foot Cottages	11c 11.2	NAI	NAI	NAI
	Canal Foot	11c 11.3	HTL	HTL	HTL
	Glaxo Factory Site (south)	11c 11.4	NAI	NAI	NAI
	Sandhall to Conishead Priory	11c 11.5	HTL	MR	MR
	Conishead Priory to Bardsea	11c 11.6	NAI	NAI	NAI
Leven Estuary	Leven Viaduct to Haverthwaite (left bank) and Haverthwaite to Greenodd (right bank)	11c 12.1	HTL	MR	NAI
	Greenodd to Barrow End	11c 12.2	HTL	HTL	HTL

			Preferred Scenario		
	Rocks (A590)				
	Barrow End Rocks (A590) to Leven Viaduct	11c 12.3	HTL	MR	NAI
Bardsea to Piel Island	Bardsea to Newbiggin	11c 13.1	NAI	NAI	NAI
	Newbiggin to Rampside	11c 13.2	HTL	MR	HTL
	Rampside	11c 13.3	NAI	HTL	HTL
	Roa Island	11c 13.4	HTL	HTL	HTL
	Piel Island	11c 13.5	NAI	NAI	NAI

NAI: No Active Intervention

HTL: Hold The Line

MR: Managed Realignment

7.2 Topography, Geology, Soils and Landuse

The bedrock geology is complex, particularly around southern Cumbria. In the Lune estuary the bedrock is formed by Triassic sandstone, with Namurian mudstones and siltstones in its upper reaches which continue northwards to the River Kent. However, in the upper reaches of the Kent Visean Limestone predominates. The shoreline around the northern and western fringes of Morecambe Bay is then formed by a complex sequence of Visean Limestone and Mudstones. The superficial geology is dominated by tidal flat deposits within Morecambe Bay, as well as around the southern edge of the Lune estuary with raised tidal flat deposits between Morecambe and Lancaster. Alluvial till deposits are located within the Kent estuary and diamicton deposits are situated around the perimeter of Morecambe Bay. Raised sand and gravel marine deposits are situated around Flookburgh and Ulverston with peat deposits on the east side of the River Kent.

The dominant topographic feature of this part of the study area is the shallow, open embayment of Morecambe Bay, which stretches from the River Wyre to Roa Island, which originally consisted of deep, post-glacial river valleys. These valleys were then infilled by glacial deposits transported by the Rivers Kent, Leven and Lune, and has led to a coastline of predominantly low-lying, gently undulating unconsolidated sediments. Large expanses of sand and mud-banks form the inter-tidal deposits, which have been cut and recut by the shifting courses of the Kent and the Leven, and moved constantly by a complex wave pattern. This fluctuating process has made charting the sands almost impossible. Whilst the Bay is a single entity it can be thought of in two parts, with the River Wyre to Heysham Head (the Lune estuary) comprising the first part, and the second, larger component being the main bay between Heysham and Roa Island (Halcrow 2005). The Lune estuary is bounded by very low-lying saltmarsh and tidal flat deposits, rising to no more than 5m aOD, although further inland glacial till deposits rise to around 35m aOD. At Heysham Head these till despositis rise to a similar height. There are also outcroppings of sandstone such as Red Nab and Heysham Head which rise to around 10m aOD. There are concrete sea defences along parts of this coastline at Knott End-on-Sea and Heysham, with man-made earthen embankments protecting further stretches of the coastline. To the north of Heysham Head there are low-lying saltmarshes around the more sheltered parts of north Morecambe Bay, for example to the south of Arnside and around Flookburgh, but steep-sided limestone outcrops become increasingly dominant, such as Arnside Knott, Humphrey Head, Kirkhead and Birkrigg Common, which can rise to a height of 150m aOD.

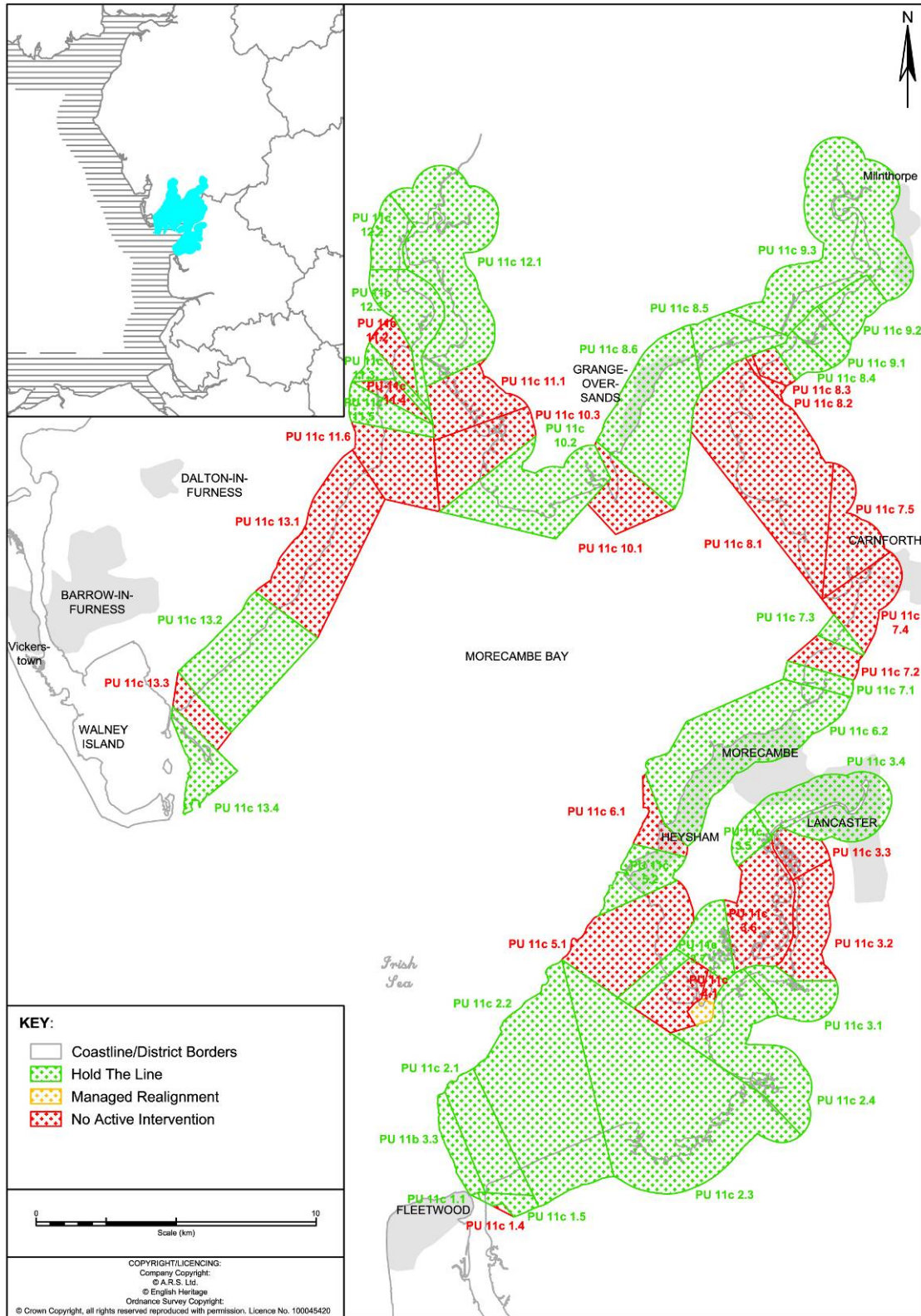


Figure 7.1 Location of Block 3 and SMP 2 policy units indicating preferred option for the next 20 years

The principal soils located within this block are presented in table 7.1 and figure 7.2 and are complex. The dominant uses of this stretch of coastline are agriculture, predominantly pastoral, and tourism, with caravan parks and campsites and innumerable footpaths and trails along most of the coastline. Tourism is also important for Morecambe and the villages of Arnside, Grange-over-Sands and Ulverston. The only heavy industry is in Ulverston, where the Glaxo-Smithkline factory is located adjacent to the old canal.

Table 7.2: Soils, landuse and preservation potential from the River Wyre to Roa Island. Data derived from Farewell 2007 and NSRI database

Simple Description	Land Use (when not urban)
deep loam	Cereals and some horticultural crops in drier lowlands: stock rearing and dairying in Cumbria.
deep sandy	Cereals. sugar beet and potatoes
dune sand	Sand dune and some wetland habitats: recreation; very limited agriculture and coniferous woodland
loam over red sandstone	Dairying on short term and permanent grassland; stock rearing on high ground
loam over shale	Stock rearing in uplands, dairying and some cereals in moist lowlands; coniferous and deciduous woodland and rough grazing on steep slopes.
peat	Lowland bog and wet moorland habitats of low grazing value, some coniferous woodland; peat extraction
saltmarsh	Saltmarsh habitats some summer grazing; recreation
seasonally wet deep clay	Cereals, sugar beet, potatoes, field vegetables and horticultural crops in Lancashire; some grassland in Lancashire and Cumbria
seasonally wet deep sandy	Cereals; potatoes and sugar beet; some grassland and coniferous woodland
seasonally wet deep silty	Sugar beet; grassland and some cereals in moist districts.
shallow loam over limestone	Stock rearing on Herb-rich grassland habitats of good grazing value; recreation; some arable In lowlands.
shallow loam over shale	Permanent and short term grassland; stock rearing in uplands. dairying in moist lowlands

7.3 Early Prehistory: Palaeolithic and Mesolithic (Fig. 7.3)

7.3.1 Palaeolithic sites and findspots

There is limited, and highly controversial, evidence for Late Upper Palaeolithic activity within this part of the study area, particularly around the northern fringes of Morecambe Bay in a number of cave sites within the limestone outcrops. Only two such cave sites lie within the one kilometre coastal strip, at Kent's Bank cave (SD 334483; HER 2560 C) and Kirkhead cave (SD 39107566; HER 2415 C) and only Kirkhead Cave is listed as Palaeolithic in the HER, with Kents Bank listed as Prehistoric. As stated by C. Salisbury 'academic acrimony... surrounds Kirkhead Cave (Salisbury 1997, 1) and the same is true of many of the other cave sites in southern Cumbria. A complete review of the evidence relating to this topic is beyond the remit of this study, particularly as most of the sites lie outwith the boundaries of the study area, even if in some cases on the Furness peninsula they are only situated a few hundred metres from the boundary, such as Lindale Low Cave and Bart's Shelter. Kirkhead Cave was the focus of excavations from the mid-19th century and the late 1960's (Bolton 1864; Ashmead *et al.* 1969; Ashmead and Wood 1974). The antiquarian excavations recovered human and animal bones, bronze and iron work, pottery, a Roman coin and other material, showing a long-term, though

discontinuous occupation of the site. Ashmead's excavations discovered 21 flint artefacts which were considered by the excavators to be Late Upper Palaeolithic and were apparently closely associated with an antler 'boss', which was radiocarbon dated to 10700 ± 200 bp (HAR 1059). The provenance and identification of the antler have since been both questioned and defended by various authors (Gale and Hunt 1985; 1990; Salisbury 1988; Tipping 1988). In the early 1990's excavations were undertaken by C. Salisbury at three caves in the immediate vicinity of Kirkhead. Of these, one had collapsed and fallen into the valley below and a second, Whitton's Cave, produced evidence that was no earlier than Bronze Age in date. At Kent's Bank Cavern two flint blades which were 'identical in every respect to the Kirkhead assemblage and which the author is happy to state are Late Upper Palaeolithic' (Salisbury 1997, 9) were found. Further excavation work has been undertaken at the site but the full results are unpublished and the details listed above are open to other interpretation. The North West Regional Research Framework has highlighted that the 'sites are potentially of national importance, but remain poorly understood' and require a 'chronological framework and publication as a matter of urgency' (Brennand 2007, 36). NWRRF Research Initiative 2.18 states:

'There is an urgent need to retrieve, process and publish the archives for the Morecambe Bay cave and rock shelter excavations. This is especially relevant to the material accumulated by the late Chris Salisbury.'

And Research Initiative 2.19 states:

'In the event of unexcavated material being unavailable or incomprehensible, targeted excavation of cave and rock shelter sites around Morecambe Bay may verify or extend the data from earlier excavations' (*ibid.*, 36-37).

Other Palaeolithic material from this stretch of coastline is from Lancashire, where a Palaeolithic scraper (SD 47226197; HER PRN480 L) was found.

7.3.2 *Mesolithic sites and findspots*

There is good evidence for Mesolithic activity from Lancashire, particularly on Heysham Head where a late Mesolithic site (SD 40926168; HER PRN26083 L) was excavated in 1992, recovering over 1100 flint pieces including scrapers, blades and microliths. No structural evidence was found and there were few diagnostic pieces however, making interpretation of the site slightly controversial (Salisbury 1994; Middleton 1995). At Dalton Square in Lancaster (SD 4796261620; HER PRN26200 L) a well-preserved soil horizon, excavated as part of a development scheme, was found which contained Mesolithic and Neolithic flints. Other flint finds come from Heysham Sands (SD 417616; HER PRN2674 L), Kents Bank (SD391756; HER 3334 C: SD 395753; HER 3335 C) and Aldingham (SD 2867971500; HER 41892 C). A pebble macehead (SD 4675; HER PRN505 L), was found at Silverdale in 1853 and a net sinker (SD36474812; HER PRN52 L), thought to be of Mesolithic date, was recovered from Preesal, near Knott End-on-Sea.

7.4 Later Prehistory: Neolithic, Bronze Age and Iron Age (Fig. 7.3)

7.4.1 Neolithic sites and findspots

A possible long barrow is located at Haverbrack (SD482802; HER 2488 C), which is recorded as being 25m long by 12m wide, orientated north-south and surviving to almost 1.5m high at its wider southern end (Fell 1971). There are a further seventeen Neolithic findspots from this stretch of coastline.

7.4.2 Bronze Age sites

Birkrigg Common, on the Furness Peninsula, Cumbria, contains a number of Bronze Age monuments, although most lie outside the boundary of the study area. A concentric stone circle (SD 29237396; SAM 27658; HER 2379 C) is sited on one of the relatively level areas of hillside, commanding extensive views across Morecambe Bay. It is formed of two approximately concentric limestone-built circles, the inner measuring 8.5m in diameter and the outer 24m in diameter. Most of the outer stones are now fallen and covered by turf and bracken and none exist on the north-east side where a hollow way runs adjacent to the inner ring. The circle was excavated in 1912 and again in 1922. Excavation in the inner ring revealed a cobbled 'pavement' of blue rag stone, which is not a local stone, and a second, more discontinuous pavement beneath. This second pavement overlay five cremated burials, one lying on a third cobbled layer beneath, three in shallow pits and one covered by an inverted Collared Urn (Gelder and Dobson 1912). Excavations in the outer ring uncovered stones, thought to have been used as tools, with two being interpreted as a small pestle and mortar which, found in close proximity to a piece of red ochre, were thought to have been used for making pigments (Gelder 1922). Also on the Common, approximately 1.5km south of the circle is a cairn (SD 288726; HER 2368) of possible Bronze Age date. No finds or features were found associated with the cairn and it is possible this represents a field clearance cairn, rather than a burial cairn, of which there are a number on Birkrigg Common. A probable ring cairn (SD 49368082; SAM 35029; HER 2492 C) is located in Dallam Park on the east side of the River Kent. Originally thought to be a medieval ringwork, it is now considered to be a ring cairn measuring over 30m in diameter and surviving to a height of around 2m. Also of probable Bronze Age date is a round barrow (SD 46937854; NMR 1002554) which was mapped as part of the APM exercise for this project at Arnside. Although the barrow is not recorded in the Cumbria HER it was recorded by the Arnside/Silverdale AONB Rapid Identification Survey (RCHME 1993). Kirkhead Cave was also used during the Bronze Age and excavations in the mid-19th century produced Bronze Age pottery, as well as bronze implements and bone fragments, suggesting it was used as a burial site (Gilks 1987). Additionally the site of Whitton's Cave, mentioned above, produced a non-diagnostic flint blade and a 'coarse, unbaked fragment of incised pottery' (Salisbury 1997, 5) which were found along with human and animal remains. Salisbury states that the probable first use of the site, which was purely for burial, was in the Bronze Age, although there is no evidence for why this should be so.

7.4.3 Bronze Age findspots

A total of 20 Bronze Age findspots are located along this stretch of coastline and consist of bronze and stone weapons, three 'cinerary urns' found in the 19th century and other pottery fragments and flint tools.

7.4.4 Iron Age sites and findspots

There are no recorded Iron Age sites or findspots in this part of the study area.

7.5 Roman and Romano-British (Fig. 7.5)

7.5.1 Roman sites

The most substantial Roman military site in this part of the study area are the remains of the fort (SD 47316191; SAM 34987; HER PRN449 L and PRN3894 L) and *vicus* (SD 47666180; HER PRN3500 and PRN18879) at Lancaster. The fort was excavated in the late 1920's and again in the early 1970's. Earlier sources describe the survival of parts of the superstructure of the fort and the defensive ditch and suggest it was pentagonal, rather than rectangular, enclosing the plateau on which Lancaster Castle now stands (Watkin 1883; Harrison 1896). Excavations in the 1920's concentrated on the northern and western ramparts. Here, late first century AD finds were associated with substantial walls, a tower, and roadway exiting the defences and aligned towards the River Lune. These excavations suggested that the fort was in fact hexagonal, rather than pentagonal. The Wery Wall (SD 47486203; HER PRN446 L) was excavated in 1927 and again in 1970 and the bath house (SD 47516189; HER PRN472 L) in 1973. (Jones and Shotter 1973; Shotter 1990).

Two Roman roads listed within the study area at Lancaster, although the course of only one is certain. The course of Roman Road 705 (SD 4861; HER PRN 26149 L) from Lancaster to Overborrow is conjectural but that of Roman Road 70d (SD 478616; HER PRN26146 L) is certain having been revealed during excavations in 1954 (Margary 1957).

The remains of a Roman building (SD 47616183; HER PRN471 L), possibly a temple, were discovered in the 18th century in Lancaster, where stones, bricks, tile, pottery, coins, bronze objects and other items were found (Watkin 1883). Two Roman cemeteries are located in Lancaster (SD 47556191: HER PRN18983 L: SD 4767661385; HER PRN25283 L). No other record than its location exists for the former, but the latter was revealed during excavation in 2001, where several cremations were found, five of which were dug into a sub-rectangular mortuary enclosure. Research Initiative 3.34 states:

‘There is scarcely and knowledge of religious sites in this period...and the opportunity to excavate any such sites...should be a priority’
(Brennand 2007, 68).

7.5.2 Roman findspots

A total of 95 Roman findspots are located within the study area, most of them in Lancaster. These finds include coins and pottery, as well as eight altars, three statues and an anchor.

7.6 Early Medieval (Fig. 7.6)

7.6.1 Ecclesiastical sites

There are two very significant early Christian sites adjacent to each other at Heysham, Lancashire. St Patrick's Chapel (SD 40996165; SAM 34983; LB 391833; HER PRN402 L) is located on an exposed rock outcrop overlooking Morecambe Bay and comprises an undivided rectangular building, dating to around the 10th century AD, with an associated cemetery featuring rock-cut graves. The site has been known of since at least the 18th century and was the focus of detailed investigation in 1977 and 1978, when a full record of the structure was made and extensive excavations were undertaken within and around the chapel. The excavations revealed an earlier structure than the one presently standing, measuring about 4m in width internally, which had been decorated with painted plaster

and may have had an entrance at its western end. This structure survived in the base of the walls on the north, south and east sides, to a maximum height of 0.7m. The plaster was lime-based and formed a surface for a painting in yellow, red and a dark 'green-brown', which included lettering, analysis of which suggests that the chapel may have initially been built in the 8th century AD (Higgins 1990). The find of a bird-headed statue, of late 7th or early 8th century style, in a secondary context with a burial of probable late 9th or early 10th century date, reinforces the early date for the first phase of the chapel. The second phase of development, which saw the expansion of the chapel to the east, is difficult to date, but it is suggested that it either slightly pre-dated, or was contemporary with, the burials dating to the 11th century AD. This is based on stratigraphic grounds, as well as a radiocarbon date (940 ± 80 BP HAR-2757; AD1010-1185 cal AD), recovered from one of the burials within the chapel (Potter and Andrews 1994). Associated with the chapel are a sequence of graves, which probably both pre-date and post-date it. The cemetery has been divided into six main components by the excavators: the six rock-cut graves to the west of the chapel (SD 4097761654; LB 391835); a west cemetery, set in a natural hollow; a central cemetery extending southwards from the chapel; an eastern cemetery; two rock-cut graves to the south-east (SD 4098861649; LB 391834; HER PRN12418 L) and burials within the chapel.

The burials from St Patrick's need further examination in line with the NWRRF initiatives 4.36 and 4.38,

‘to undertake full scientific analysis, including absolute dating, stable isotopes and DNA investigation’

and

‘to establish whether a phase in the development of burial practice in the region has...largely escaped notice’

The nearby church of St Peter's (SD 4104561650; LB 391836; HER PRN419 L), was also built sometime in the late 8th or early 9th century AD (Taylor 1965), although much of the presently visible church is Norman or later. The west door, adjacent wall, both ends of the south wall, the upper part of the east wall and the north door, now re-erected in the churchyard, all date from the Saxon period and would have been contemporary with the chapel of St Patrick's. A pre-Norman cross fragment (SD 4105961614; SAM23743; HER PRN2407 L) called the Lazarus stone (Potter and Andrews 1994) is located in the churchyard and a hogback tombstone (SD 4104061650; HER PRN4208 L) of probable 11th century date was found in the churchyard and has now been moved inside the church.

7.6.2 Other Early Medieval sites

There is some evidence of Lancaster having a mint prior to the Norman Conquest (SD 4560; HER PRN489 L) as, although the location is not known and remains doubtful, coins from the reign of Harold I have been found (Farrer and Brownbill 1914). Two cave sites from Cumbria also have evidence of Early Medieval activity although one, the Dog Hole at Haverbrack (SD 4826880203; HER 2489 C), appears to have been a dog's den and contained bones dating from between the 5th and 9th centuries AD (Benson and Bland 1963). The cave at Merlewood, Grange-over-Sands (SD 41157892; HER 2449 C) was excavated in 1892 and contains material from other periods, including the Roman

material mentioned above, as well as seven *styccas*, from Eanred, Ethelred and Archbishop Vigmund.

7.6.3 Early medieval findspots

Two early medieval coins and one spearhead, found in St Peter's Churchyard, are the only other items of interest dating from this period.

7.7 Medieval (Fig. 7.7)

7.7.1 Medieval Ecclesiastical sites

The most significant Medieval ecclesiastical site on this section of coastline is Cockersand Abbey (SD 42705376; SAM27855; LB182270; NMR 41089; HER PRN406 L), situated on low-lying land to the south of the Lune estuary. Founded as a hermitage around 1180, when Hugh Garthe settled at Cockersand, it was soon transformed into a hospital, dedicated to St Mary. By the late 12th century AD it had become a Premonstratensian Abbey and remained so until the Dissolution (Knowles and Hadcock 1953). The site of the church was excavated in the early 1920's revealing the church, which formed the north range of the cloister, and a map of 1536 illustrates domestic buildings forming the south range and the *dorter* the west range (Swarbrick 1922). The most visible remaining building of the abbey is the 13th century chapter house, a Grade I Listed Building, which was renovated and used as a family mausoleum from the mid-18th to the mid-19th century. Fragments of the church also survive as upstanding columns of masonry, and there are numerous earthworks, which were mapped as part of the APM exercise for this project. The site is on the Buildings at Risk Register and flooding and erosion present a serious threat, with the HER record mentioning 'bones' seen eroding from the sea cliff in front of the chapter house in 1997 and the need for limited rescue excavation in 2000. This erosion is continuing. The NWRRF initiatives 5.21 states.

'Monastic outer courts, ancillary buildings and precinct boundaries should be investigated through [a variety of techniques]'

Although not explicitly stated as an initiative, the NWRRF highlights a lack of focus of activity on the 'lesser' monastic orders. In contrast it highlights a prior focus on 'the principal orders, hence to an extent the Augustinian, Benedictine and Cistercian sites are well understood' (Brennand 2007, 105). A recent survey of the Abbey by English Heritage (Burn 2009) suggested that little of the precinct was under threat. However at least 3m of land at the top of the sea defences have been lost within the past 50 years or so and the western boundary of the precinct appears to have been along the same line as the present sea defences. Given Cockersand Abbey's position as a site of a 'lesser' order, where the archaeology of the outer precinct is being destroyed by coastal erosion (as evidenced by survey and rescue excavation) and the SMP 2 strategic option at this location is to change to MR it is essential that mitigation is undertaken as a matter of urgency.

Two friaries are located in Lancaster, a Dominican Friary (SD 4789561652; HER PRN454 L) in Dalton Square and a possible Franciscan Friary (SD 4762; HER PRN 483 L). The latter is not well documented but the former was founded c. 1260 by Sir Hugh Harrington and survived until the Dissolution in 1539 (Farrer and Brownbill 1908).

Three priories, St Mary's (SD 47376199; HER PRN451 L) in Lancaster, Cockerham Priory (SD4652; HER PRN401 L) and Conishead Priory (SD 30467579; LB 460003; HER 2392 C) are recorded. St Mary's was founded as a cell of the Benedictine Abbey of St Martin at Sees in Normandy in the late 11th century AD and only the church, now the parish church, still survives (Knowles and Hadcock 1953). The site at Cockerham was Augustinian and founded at the start of the 13th century, being dissolved by the middle of the 14th century (Farrer and Brownbill 1908), although no remains of the site have ever been located. At Conishead the priory was originally founded as a leper hospital in 1154 but converted to an Augustinian priory in 1181 and dissolved in 1536. The building now visible on site, which is Grade II* Listed was built in the early 19th century but partial excavation in the early 20th century revealed a cruciform church and buildings to the north of the church (Kelly 1930; Knowles and Hadcock 1953). Three further churches are known at St John the Baptist, Pilling (SD 40314862; LB 185037; HER PRN2231 L), now a Grade II* Listed building built in the 19th century, the Church of St Helen at Overton (SD 4404657576; LB 182195; HER PRN601 L) which dates from the 12th century with a surviving Norman doorway (Farrer and Brownbill 1914) and St Cuthbert's at Aldingham (SD 28347103; LB 23366; HER 2335 C). St Cuthbert's was founded in the late 12th century, although the dedication may indicate an early Medieval church on the site and there is a possible fragment of a pre-Norman cross built into the east wall. The south wall is the oldest surviving section of the church, with much of the fabric being 14th century (Pevsner 1979). Six chapels are recorded within this stretch of coastline. The locations of none of these chapels are now known and their presence is recorded only from documentary sources.

Three monastic granges are recorded in documentary sources from this section of the study area. These are known to have been at Overton (SD 343457; HER PRN389 L), Morecambe (SD 3642; HER PRN425 L) and Grange-over-sands (SD 4078; HER4707 C) but the exact locations of these sites are unknown (Farrer and Brownbill 1914). A fourth grange was located at Frith Hall (SD 33817976; HER 2384 C) founded from Cartmel Priory before the early 16th century. This grange was positioned on a low headland in the Leven estuary about 5 miles north of the Cowp Scar fish traps (detailed below and radiocarbon dated to the 14th century), and it is known that the Priory had fishing rights in the area in the mid-16th century. There is a record of a possible moated site (SD 4358; HER PRN388 L), which is mentioned in the Victoria County History as comprising a series of earthworks (Farrer and Brownbill 1908). However, no evidence of the site remains and it cannot be traced on early Ordnance Survey mapping which simply labels the area a disused quarry.

7.7.2 Medieval Military sites

Lancaster Castle (SD 47356183; LB 383090; NMR 41218; HER PRN448 L) was created at the end of the 11th century AD by Roger de Poitou, and replaced an earlier earthwork castle, which may have had Saxon origins, although there is no direct evidence for this (*cf.* Cox 1897; Milner 1885). The castle was successfully besieged in 1199 by Hubert de Brugh, who fortified the earthworks using labour supplied by the Earl of Chester. It was then partially destroyed by the Scots in 1314 (Cox 1897). In 1649, during the Civil War, the castle was ordered to be slighted, having successfully withstood an earlier siege, but the scope of the works was probably limited and the castle continues in use today, the majority of the site acting as a prison and court (P. Iles, pers. comm.) The castle covers an area of around 115m in diameter as mapped by the APM exercise for this project but much of the current circuit of walls is of 18th and 19th century date. In 1649, during the Civil War, the castle was substantially demolished, having successfully withstood an

earlier siege. The only buildings retained were those for the courts and gaol, which had been previously administered from the castle. Repairs were made in 1663 and these seem to have remained until the construction of the present structures in the late 18th and early 19th centuries (Allen Brown *et al.* 1963; Colvin *et al.* 1975).

The remains of a Norman motte-and-bailey are located at Aldingham (SD 27786986; SAM 27682; NMR 37622; HER 2613 C). The motte is a reused earlier 12th century ringwork and survives to around five metres in height with a diameter of around 30m across its top. The motte is surrounded by a substantial ditch 7.5m wide and 2m deep and traces of the bailey ditch can still be seen around 40m north of the motte. Rescue excavation in 1968 demonstrated three phases of activity with the earliest ringwork, surrounded by a palisade and with internal timber buildings, being infilled in the mid-12th century and extra height and palisading added to the mound in the 13th century. This latter stage appears to not have been completed as the owners, the le Fleming family, moved to Gleaston Castle, just outside the study zone (Farrer and Brownbill 1908; Davison 1969). The scheduling information for the site suggests that this is a rare example of a motte being converted from an earlier ringwork and that significant archaeological features will still survive. Coastal erosion is currently threatening this site and parts of the south and east of the motte and encircling ditch have already been destroyed. The SMP 2 policy for this location is NAI and the site will continue to be damaged by every high tide. Less than 200m to the north of the motte lies Moat Farm (SD 27817004; SM 27683; NMR 38085; HER 2337 C), a rectangular platform surrounded by a waterfilled moat. The platform has been raised slightly using upcast from the moat ditch and measures approximately 30m in width, whilst the moat has a width of around 13m. Although it is not clear when the site was built it is thought to have been the site of the manor house of Michael le Fleming, prior to the move to Gleaston Castle, and probably dates to the same period as Aldingham motte-and-bailey (Farrer and Brownbill 1908). The site is relatively undeveloped and will contain significant archaeological deposits.

Hazelslack pele tower (SD 47627881; LB 76596; NMR 41496; HER 2520 C) near Arnside was built in the late 14th century and was probably ruined by the end of the 17th century. Originally attached to a larger building to the east this probably formed the solar for a larger hall, originally standing four storeys high, but now partly demolished, built of rubble with ashlar facing, with small loop lights to the lower storeys and small square windows in the upper storeys. Internally, the remains of a partition wall and fireplaces still survive (Perriman and Robinson 1988).

7.7.3 Medieval Rural sites

Four deserted medieval villages are listed in the study area, at Hillam (SD 4553; HER PRN2526 L), Ashton (SD 461572; HER PRN18786 L), Oxcliffe (SD 448616; HER PRN18788 L) and Heaton (SD 444604; HER PRN18794 L), of which the latter three are listed in the index of Deserted Medieval Villages of North West England (Medieval Villages Research Group 1973) along with a shrunken medieval village at Milnthorpe (SD 4981; HER 3371 C). The exact location of these sites is unknown. At Arnside there are the remains of a longhouse, enclosure and associated lynchets (SD 45387609; NMR 1002528; HER 4991 C) which were mapped as part of the APM exercise for this project (Fig. 7.10). Aerial photographs showed the building surviving as earthwork banks measuring 17m in length and the enclosure, also surviving as an earthwork, measuring 28m internally from bank to bank. The lynchets, which are aligned north-east to south-west, lie to the east of the enclosure and longhouse and have a length of over 100m.

Early Ordnance Survey mapping locates a number of houses in the vicinity, labelled as Far Arnside, and survey work in the early 1990's showed evidence for further features in the vicinity (Quartermaine 1993). In light of this evidence it is therefore possible that this area contains the remains of a deserted medieval village. Medieval ridge and furrow fields and fields defined by lynchets have been transcribed as part of the APM exercise for this project along the whole stretch of coastline and an example of a field system at Dallam Park, Beetham, is presented in figure 7.11. However, there are substantially fewer ridge and furrow field systems in this stretch of coastline in comparison with that further south, with lynchets becoming increasingly common around the northern fringes of Morecambe Bay, where there are few examples of ridge and furrow. This change in field system evidence is probably due to the increasingly undulating nature of the terrain in the more northerly parts of this section of coastline, with lynchets being formed by ploughing on hillslopes.

Further evidence of medieval activity in the area is demonstrated by the fish traps located around the fringes of Morecambe Bay. These are presented in table 7.3, although each site may encompass a grouping of traps under one entry.

Table 7.3 Medieval fishing sites in Block 3

HER No.	Easting	Northing	Name	Summary
Lancashire				
PRN391	342920	455360	Crook Farm, Cockerham	Medieval fishing baulk
PRN408	342200	454200	Near Plover Scar Lighthouse	Medieval fishing baulk
Cumbria				
41201	331050	474700	Wadhead Scar, Bardsea	Fish traps
41865	334200	473300	Cowp Scar Fish Traps, Cartmel Peninsula	Fish Traps

The fish trap near Plover Scar lighthouse was transcribed by the APM exercise for this project, and could have been built by the Canons of the nearby Cockersand Abbey. The fish traps near Crook farm were also possibly built for Cockersand Abbey. The Plover Scar fish traps were visible on aerial photography from 1955 although the present condition of them are not known as the area was underwater when the last available photographic evidence was made in 1987. The fish traps at Cowp Scar were exposed in 2000 when the River Leven eroded sand and saltmarsh deposits to a depth of almost seven metres. Constructed of stone banks and wooden posts, many of which survive to a metre or more in height, a radiocarbon date of 575 ±28 BP or 1303-1368 cal AD was obtained from them (Cowp Scar Research Group 2005)

7.7.4 Medieval Industrial sites

There is limited evidence for medieval industry in the area with only the sites of four mills and possible mills known and these are presented in table 7.4. Of greater significance within this part of the study area are the 19 bloomeries, presented in table 7.4, which are predominantly clustered around the upper reaches of the River Kent and are an important example of early industrial iron working in the North-West region.

Table 7.4 Mills and bloomeries

HER No.	Easting	Northing	Name	Type
Lancashire				
PRN11338	343000	458000	Overton	Mill
PRN12902	349600	430700	New House Farm Mill	Mill
PRN2505	345500	460000	Skerton, Lancaster	Mill
PRN26642	335695	427607	Windmills, Lytham Park	Mill
LDNPA				
2559	333400	481180	-	Bloomery
12185	333041	481656	-	Bloomery
15975	330900	483740	-	Bloomery
15976	330900	482470	-	Bloomery
15977	330670	481100	-	Bloomery
15978	333130	481540	-	Bloomery
15979	331180	482860	-	Bloomery
16045	341500	478750	-	Bloomery
Cumbria				
15977	330675	481106	Arrad Foot Bloomery Site, Egton with Newland	Bloomery
15976	330930	482580	Sod House Bloomery Site, Greenodd, Egton with	Bloomery
15979	331182	482864	Penny Bridge House Bloomery Site, Egton with N	Bloomery
16045	341501	478749	Raven's Nest Bloomery Site, Grange over Sands	Bloomery

7.7.5 Other Medieval sites

A leper hospital (SD 48136208; HER PRN2375 L) was built in Lancaster in the later 12th century on the command of King John. Whilst the inmates were ejected in 1322 they were soon restored, prior to the hospital being granted to the nuns of Seton. By 1532 the hospital had received no alms for over 60 years and was demolished (Knowles and Hadcock 1953). The exact location of the site is not known as it falls within the built-up area of the city. The site was not identified on aerial photographs consulted for this project.

7.8 Post-Medieval (Fig. 7.8)

7.8.1 Post-Medieval ecclesiastical sites

There is a Friend's Meeting House in Lancaster (SD 47306168; HER PRN4651 L), built in 1708 and altered on three occasions in the 18th century. This is the only Religious Society of Friends (or Quaker) religious house within the whole of the NWRCZA area, although the important Quaker site of Swarthmoor Hall is located just outside this section of the study area on the Furness Peninsula in south Cumbria. Charles Fox, seen by many as the principal founder of the Quaker faith, stayed at Swarthmoor Hall on his early travels in the middle of the 17th century and, in 1669, married Margaret Fell, the widowed owner of Swarthmoor Hall. The founding of the site at Lancaster therefore represents a visible sign of the early establishment of the Quaker movement in the North-West.

7.8.2 Post-Medieval military sites

Archery butts (SD 47156158; HER PRN4650 L) were recorded in Lancaster on the 1st edition OS map of 1848, although the site no longer exists. The original date of the site is unknown and it probably represents a later recreational facility rather than a medieval military site.

7.8.3 Post-Medieval rural sites

There are three halls listed in the Lancashire HER, at Heysham (SD 4147861158; LB 391823; HER PRN422 L), Parrox Hall (SD 3601747843; LB 185039; HER PRN1306 L) and Bare Hall (SD 4529164911; LB 391808; HER PRN428 L). Heysham Hall was built at the end of the Elizabethan period, in 1598, and was restored in the 19th century, although much of the original Tudor character survives in a characteristic H-plan (Pevsner 1969). The hall is now a public house and is Grade II* Listed. Parrox Hall, at Knott End-on-Sea, and also Grade II* listed was built sometime in the 16th century in an L-shape and retains some original features, although it was subjected to renovations in the 17th and 18th centuries. Bare Hall, on the eastern edge of Morecambe, is a small rectangular building, built in 1566 which was in use as a public house until the middle of the 20th century, has been converted to residential flats and is Grade II Listed. There is also a manor house called Scale Hall on the western edge of Lancaster (SD 4637962621; LB 383223; HER PRN15922 L) built on an L-shaped plan around 1700. This building is now used as a country club it is Grade II Listed.

There are numerous post-medieval farmhouses, farmsteads and barns along this stretch of coastline which are listed in table 7.5, although many such sites are not included in the HER records unless they are listed buildings. The farmhouses are predominantly located around the Lune estuary, in proximity to the largest concentration of ridge and furrow field systems. Post-medieval ridge and furrow is far less common around Arnside and the northern extent of Morecambe Bay and there are correspondingly fewer farm buildings. The few buildings that are recorded in these area and the ridge and furrow do correlate however, particularly in the upper reaches of the River Kent.

Table 7.5 Post-Medieval farms and barns

HER No	Easting	Northing	Name	Site Type
Lancaster				
PRN12519	345397	451502	Shepherd's Farm, Cockerham	Barn
PRN20022	346060	457166	Ashton Hall Barn, Ashton with Stodday.	Barn
PRN16337	341080	458130	The Tudor Bar, Tower Holiday Camp, Middleton	Barn
PRN26891	342680	463310	Moss House Garage, 42/44 Regent Park Avenue, Morecambe	Barn
PRN12518	345200	453450	Norbrick Farm	Barn
PRN18805	339170	449950	Fluke Hall, Pilling	Barn
PRN20004	343094	455092	North of Crook Farmhouse	Barn
PRN16365	342618	455775	1, 2 and 3, Cotton Tree Barn, Sunderland	Farm building
PRN4607	344990	461936	Oxcliffe Hall Farmhouse, Lancaster Road, Oxcliffe	Farmhouse
PRN16336	341108	458096	Ye Olde Farm House, Tower Holiday Camp, Middleton	Farmhouse
PRN10954	345977	475182	Bank House Farm, Bank House Lane, Silverdale	Farmhouse
PRN16339	341507	457704	Carr Lane, Middleton	Farmhouse
PRN16340	341472	457573	New Brows Farmhouse, Carr Lane, Middleton	Farmhouse
PRN2863	345374	451497	Shepherd's Farm, Cockerham	Farmhouse
PRN12443	343934	464502	Park Farmhouse, Raby Street, Morecambe	Farmhouse
PRN12517	345697	451435	Marsh House Farmhouse and barn, Cockerham	Farmhouse
PRN16344	344329	459072	Colloway Farmhouse, Overton	Farmhouse
PRN16345	343698	457949	Dennison Farmhouse, Back Street, Overton	Farmhouse

HER No	Easting	Northing	Name	Site Type
PRN16349	343683	458048	5, Main Street, Overton	Farmhouse
PRN16350	343667	458016	7, Main Street, Overton	Farmhouse
PRN16515	346195	455801	Websters Farmhouse, Conder Green	Farmhouse
PRN20002	343800	454550	Clarkson's Farm	Farmhouse
PRN20003	343100	455090	Crook Farmhouse	Farmhouse
PRN20005	343063	453071	Bank House Farmhouse	Farmhouse
LDNPA				
12611	346500	481165	-	Barn
30291	333080	481570	-	Barn

7.8.4 Post-Medieval industrial sites

Post-medieval industrial sites are few in number within this part of the study area, but there is known to have been a gunpowder works at Lowwood, Backbarrow, Cumbria (SD 34808385; SM27805; HER 3344 NPA). This was originally a bloomery, which was converted to a gunpowder factory at the end of the 18th century. The site is significant in the development of early industry, both in terms of the iron industry and the gunpowder industry, occupying a large area with many buildings still surviving, although in poor condition. Several buildings have distinctive features, unparalleled elsewhere, and their function has not been adequately established (EH Schedule of Ancient Monuments).

Other industrial sites include lime kilns and bloomeries, as well as quarry sites and metalworking sites such as blacksmiths, forges and a copper works. None of the sites are at risk of erosion.

7.8.5 Post-Medieval maritime sites

At Sunderland Point, at the mouth of the River Lune is a quay (SD 4266956078; HER PRN4812 L), with associated settlement, built in the early 18th century to provide a more convenient port for Lancaster than the quays further up the River Lune. A stone jetty and warehouses were built around 1700, but the quayside was exposed to the erosional effects of the Irish Sea and this, coupled with the lack of deep water, led to its rapid demise, especially as the facilities at Glasson Dock, slightly further upstream and in a more sheltered location, developed (Price 1983).

There are three small ports located in Cumbria, at Greenodd (SD 315826; HER 5547 C), south of Ulverston (SD 3093775768; HER 2391 C) and at Baycliff (SD 2880271599; HER 3148 C). The site at Greenodd was used to export copper, slate and lead from mines in the southern Lake District prior to the arrival of the railway in the middle of the 19th century and also incorporated a boatyard which built coastal vessels (Marshall and Davies-Shiel 1969). South of Ulverston, in the grounds of Conishead Priory, there are series of upright posts for a landing stage at the end of the line of an old iron ore shipment track. It is possible these were associated with the medieval priory but it is more likely that they were associated with the shipment of iron ore from the Furness Peninsula. The port at Baycliff was used to transport iron ore (Marshall and Davies-Shiel 1969).

7.9 Industrial and Modern

7.9.1 Shipping and infrastructure

Shipping facilities such as harbours, docks and wharves are located all along this stretch of coastline. Heysham Harbour (SD 4000060148; HER PRN4786 L) is by far the largest

of these sites, built by the Midland Railway at the turn of the 20th century. Covering an area of 36 acres it was constructed mainly in concrete with wooden jetties and originally housed a railway station, cattle dock and goods shed (Price 1983). The site is now the location of Heysham Nuclear Power Stations 1 and 2, built in the 1970's. Glasson Dock (SD 4444356204; SAM 11869; HER PRN2600 L) was established in the late 18th century originally with a pier built in 1780 and later a dock of around 2 acres. A graving dock was constructed at the site in 1837, built to the design of Jesse Hartley who designed Liverpool's Albert Dock (Price 1983). At Morecambe there is a small harbour recorded (SD 426646; HER PRN4806, 16436,20456,24295 L). The jetty was built to carry a railway when it was hoped to turn Morecambe into a major port, a plan which never materialised (*ibid.*) A lighthouse was located on the end of the jetty. At Jenny Brown's Point, Silverdale there is a small jetty (SD 46627352; HER PRN4821 L) associated with the copper works (detailed below) and a large breakwater feature. The present structure evident on site was built by the end of the 19th century, but there is evidence of an earlier wooden jetty of early 19th century date (Ashmore 1969). A large stone jetty was built at Hest Bank around 1810, to allow transfer between the Lancaster Canal and coasting vessels. This was redundant by 1840 with the development of Glasson Dock (below) and the site was buried by sands for many years, before channel changes in the early 21st century revealed its location again (P. Iles, pers. comm.).

Two lighthouses are known within the study area, at Plover Scar (SD 4221654296; HER PRN10711 L), built in the later 19th century at the entrance to the River Lune, and at Glasson Dock (SD 4446156296; HER PRN4770 L), built at the end of the 18th century.

There are four canals listed in the available records for the study area, although three of them form part of the Lancaster Canal. Their details are presented in table 7.6. Both the Lancaster Canal and the Ulverston Canal were built at end of the 18th century. The Lancaster canal was built as part of a network that connected Kendal in the Lake District with Lancaster, Preston and, originally Manchester, although the latter section was never constructed as a connection with the Leeds and Liverpool Canal was made south of Preston instead (P. Iles, pers. comm.). A set of six locks and a large basin for transhipment at Glasson Dock provided access to the sea at the mouth of the River Lune (Price 1983). The Ulverston Canal was a much shorter length, running 2km from the River Leven into the town of Ulverston and is claimed to be the deepest, widest and straightest canal in England. Built to provide an outlet for the town of Ulverston and the raw materials of the southern Lake District it was used to transport people and materials to Liverpool and to link into the Lancaster Canal. The arrival of the railway in the mid-19th century saw its rapid decline however and it is now used as a water supply for the nearby chemical works operated by Glaxo-Smithkline.

Table 7.6 Canals in Block 3

HER No	Easting	Northing	Name
Lancashire			
PRN10358	347310	466520	Lancaster Canal, Bolton-le-Sands
PRN4766	345500	455500	Lancaster Canal, Glasson branch
PRN4792	348300	462100	Lancaster Canal
Cumbria			
2382	330275	478130	Ulverston Canal

There are a number of fish weirs within this part of the study area, with three listed as industrial or modern in date located in the River Lune, and the rest to the north of Morecambe. As with the sites mentioned earlier these site types can be difficult to date as their method of construction and design has changed little over the centuries (P. Iles, pers. comm.). They are presented in table 7.7.

Table 7.7 Fish Weirs from the Industrial and Modern Period in Block 3

HER No	Easting	Northing	Name	Site Type
Lancashire				
PRN26013	343049	464707	Ring skear, Morecambe Bay	Fish weir
PRN20557	344140	465380	Foreshore N of jct. btwn Marine Rd E & Victoria Parade, Morecambe	Fish weir
PRN20558	344159	465333	Foreshore N of 2a Victoria Parade, off Marine Road East, Morecambe	Fish weir
PRN20559	344468	465303	Foreshore north of St Winifreds, Marine Road East, Morecambe	Fish weir
PRN20694	341599	464067	Fishing Baulk, east of Ring Sands, West End, Morecambe	Fish weir
PRN20695	341602	463880	Fishing Baulk, east of Ring Sands, West End, Morecambe	Fish weir
PRN26014	344701	465405	Foreshore, off Bare, Morecambe Bay	Fish weir
PRN26015	345816	466161	North of Scalestones Point, Morecambe Bay	Fish weir
PRN23613	342930	454934	Fishing Baulk, South of Crook Skear, near Glasson	Fish weir
PRN26019	346531	466812	Foreshore, Hest Bank	Fish weir

A total of 28 wreck sites are listed within Morecambe Bay as a whole although only two were mapped as part of the APM exercise for this project, which may suggest that the constantly shifting sands of the Bay are either masking or eroding the sites.

7.9.2 Other industry

Mining and quarrying formed an important part of this part of the North-West's economy during the Industrial Revolution, although it had begun as early as the 16th century, and there are two mines located within the study area. Copper mining was undertaken at Heald Brow (SD 46857410; HER PRN12304 L), and near Bardsea (SD 2944273706; HER 5580 C) which was worked unsuccessfully in the 19th century. An iron mine at Jack Scout Cove (SD 45987375; HER PRN19253 L) was used for the small-scale extraction of iron ore for use as paint pigment and marking sheep (P. Iles, pers. comm.). Two further mines are located in Cumbria (SD 29377371; HER 18079 and 18080 C) although the type of extraction is unrecorded in the HER.

At Jenny Brown's Point, Silverdale there is the chimney for a copper works (SD 46627352; HER PRN4821 L), associated with copper mine mentioned above and adjacent to the jetty there. This is the only surviving part of the former copper works. Other industrial sites include the development of the gunpowder factory mentioned above which was associated with coppiced woodland (SD3483; HER 13735 NPA) and two powder houses, one close to the Lowwood powder works (SD 3290481735; HER 304 NPA), which was used to store barrels from the works prior to shipment and one possibly located to the north of Lancaster (SD 664344; HER PRN4603 L). Lime kilns are the most common type of industrial feature located around the northern fringe of Morecambe Bay (and the most common in this part of the study area). Most of the kilns are small and probably for private or local use but the sites at Arnside Tower, Castle Head, Nutwood and Blackstone Point are large examples of the monument type and

more likely associated with industrial processing and shipment of quick lime (Williams 2004). None of the sites are at risk of erosion by coastal processes.

7.9.3 Leisure

Although tourism is now the dominant economic force for much of this part of the study area there are actually few sites recorded along this stretch of coastline relating to historic leisure activities. Morecambe was formed in the latter part of the 19th century when the three villages of Bare, Poulton-le-Sands and Torrisholme collectively became known as Morecambe. Unlike Blackpool, which predominantly served the industrial towns of Lancashire, Morecambe was frequented by visitors from Scotland and Yorkshire through the early and mid-20th century. There are fewer hotels and entertainment facilities at Morecambe, when compared to Blackpool although it does have a promenade. The two piers at Morecambe, the Central Pier (SD 43456463; HER PRN2502 L) built in 1870 and the West End Pier (SD 2438; HER PRN2501 L) built in 1893, were destroyed by fire and storm and many of the amusement facilities are now closed. The International Style Midland Hotel (SD 42826438; LB 391854; HER PRN12436 L), was built in 1932 to replace an earlier building of the same name, is one of Morecambe's more recent success stories however, the Grade II* Listed building having undergone extensive recent refurbishment by Urban Splash.

Middleton Towers Holiday Camp (SD 41145823; HER PRN26060 L) was built in 1939 and almost immediately requisitioned by the Government for use in the war. It opened as a holiday camp after World War II and contained a large entertainment building known as the *SS Berengaria* built in the style of an ocean liner which housed artefacts from the Cunard Line vessel of the same name which was broken up and auctioned in 1939. The site was taken over by Pontins in 1964 but closed in 1993 and has now been completely demolished.

7.9.4 The World Wars

This block, with its lack of urban conurbations, contains very little archaeological evidence from the World Wars, although there were extensive anti-glider obstacles placed within Morecambe Bay (see. Fig. 7.9) and mapped as part of the APM exercise for this project. These appear to have been long since swallowed by the shifting sands.

A First World War filling factory (SD 449629; NMR 1485081) was recorded as part of the APM exercise to the west of Lancashire, although no further information regarding the site was found.

A Second World War airfield was located at Cark, Cumbria (SD 373 714; NMR 1381510) and known as RAF Cark, with three airstrips and associated military buildings, pillboxes, obstructions, shelters and so on. The site included six fighter pens, marked as Hurricane pens on the original plan, on the south east side of the airfield. The airfield was constructed in 1941 and became a training school in 1942. From November 1944 it was used for test flying and development RAF Cark closed at the end 1945. Anti-aircraft batteries were located at RAF Cark, three locations on around the Heysham area (SD 412574; NMR 1484466: SD 40677 59994; NMR 1484455: SD 410 613; NMR 1472296) and east of Barrow-in-Furness (SD 2414 6716; NMR 1489978). Little is known about the former two at Heysham or the site near Barrow, but the third site at Heysham is recorded as Heavy Anti-Aircraft Battery Heysham H1 and was armed with four 3.7-inch guns

Further Second World War sites are limited to two searchlight batteries, associated with Heysham H1 battery and the battery at Barrow-in-Furness, anti-aircraft obstacles within Morecambe Bay and a small number of air raid shelters and pillboxes.

7.10 Conclusion

This stretch of coastline has produced evidence of both prehistoric and historic heritage assets. Whilst the evidence of Late Upper Palaeolithic cave occupation is recognised as controversial it is considered to be an important part of the archaeology of this part of the study area although further work to more clearly elucidate the available evidence and, if necessary, acquire further quality data is obviously required. There is some evidence of Mesolithic activity in this part of the study zone although comparatively little when assessed alongside the areas to the north and south. Neolithic evidence is apparently almost non-existent, although this section of coastline does contain the only potential Neolithic monument in the NWRCZA area, the possible long mound at Haverbrack. Evidence of activity dating to the Bronze Age is limited to monumental sites in the area around Birkrigg Common, although again these are some of the few monumental sites dating to the period in the NWRCZA study area. On Birkrigg Common a number of cairns and the concentric stone circle of the Druid's Temple overlook the estuary of Morecambe Bay. No evidence of Iron Age activity was found within the study area and Roman activity is also limited, with only the site of the pentagonal fort at Lancaster comprising a major site.

In contrast this part of the study area contains one of the most important early Medieval sites at Heysham where the St Patrick's Chapel and the nearby Church of St Peter sit on a rocky headland. The site of St Patrick's, with its evocative rock-cut graves, was subject to extensive excavation and found to be surrounded by a series of burial grounds with a number of phases of activity. Medieval activity is also well attested, with Cockersand Abbey, priories at Lancaster and Conishead, a motte-and-bailey castle at Aldingham and an important later castle at Lancaster, all being located within this part of the NWRCZA study area.

There is little evidence of post-medieval activity, although the development of coastal shipping of the early products of the iron industry is attested by the various small jetties, built around the shores of Morecambe Bay. During the Industrial period this changed however and the development of more substantial harbour facilities can be seen, often associated with particular industries, such as the copper works at Jenny Brown's Point. Other developments saw the linking of the coastal shipping facilities more closely with the developing canal system. The development of the resort town of Morecambe also occurred during the Industrial period, receiving tourists from Scotland and Yorkshire.

Overall, this section of coastline contains some very significant archaeological remains, such as Cockersand Abbey and Aldingham motte-and-bailey which are located in areas where coastal erosion is having a detrimental impact.

Figure 7.2: Principal soils in Block 3

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Legend

- | | | |
|---|--|---|
|  deep loam |  loam over shale |  seasonally wet deep sandy |
|  deep red loam |  peat |  seasonally wet deep silty |
|  deep sandy |  restored following opencast coal working |  seasonally wet deep clay |
|  dune sand |  saltmarsh |  shallow loam over limestone |
|  loam over granite |  sandy over red sandstone |  shallow loam over shale |
|  loam over red sandstone |  seasonally wet deep clay |  silty over limestone |
|  loam over sandstone |  seasonally wet deep loam |  stony loam over gravel |
| |  seasonally wet deep red loam |  stony loam over hard rock |
| |  seasonally wet deep red loam to clay | |
| |  seasonally wet deep sand | |

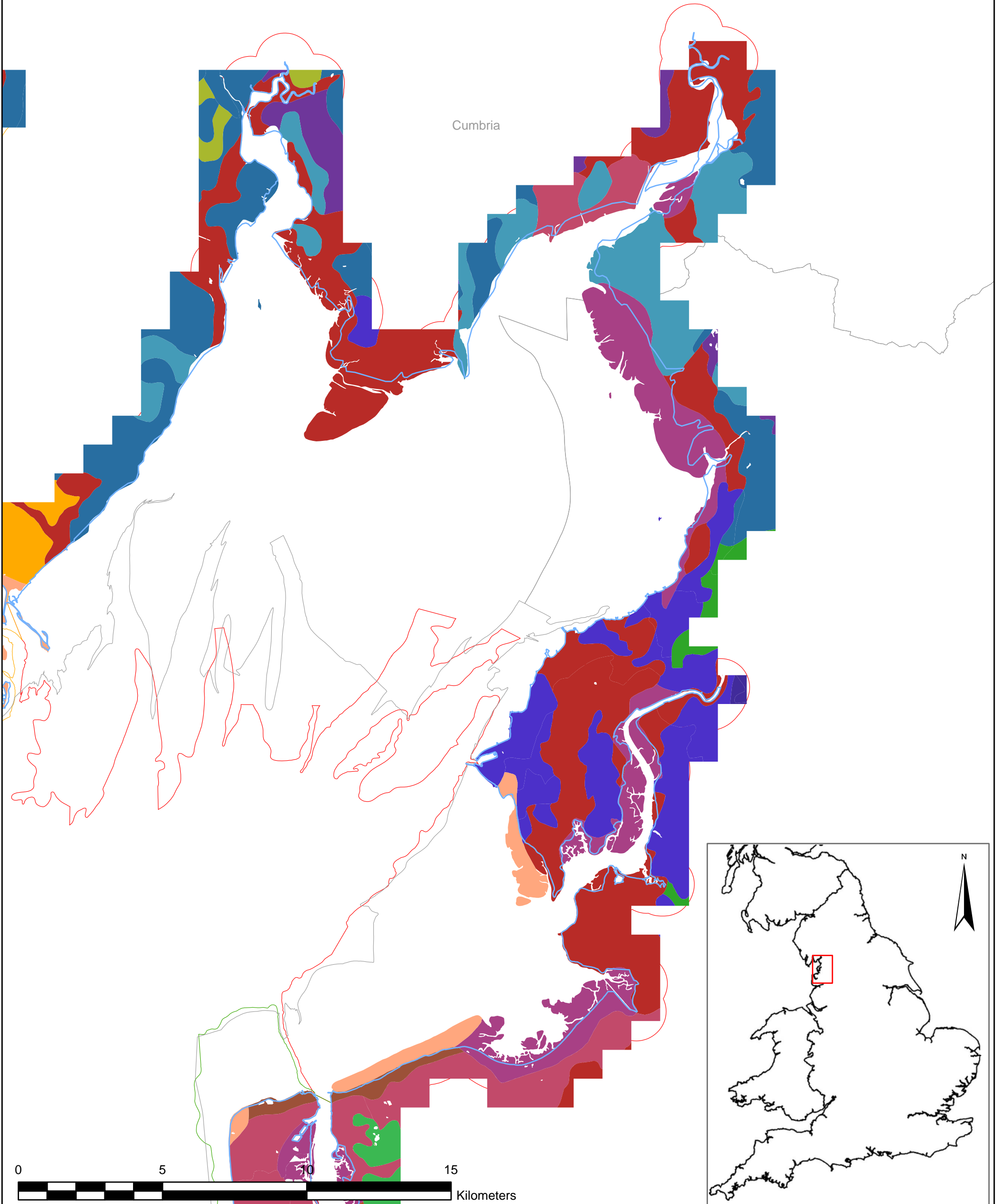


Figure 7.3: Prehistoric sites in Block 3

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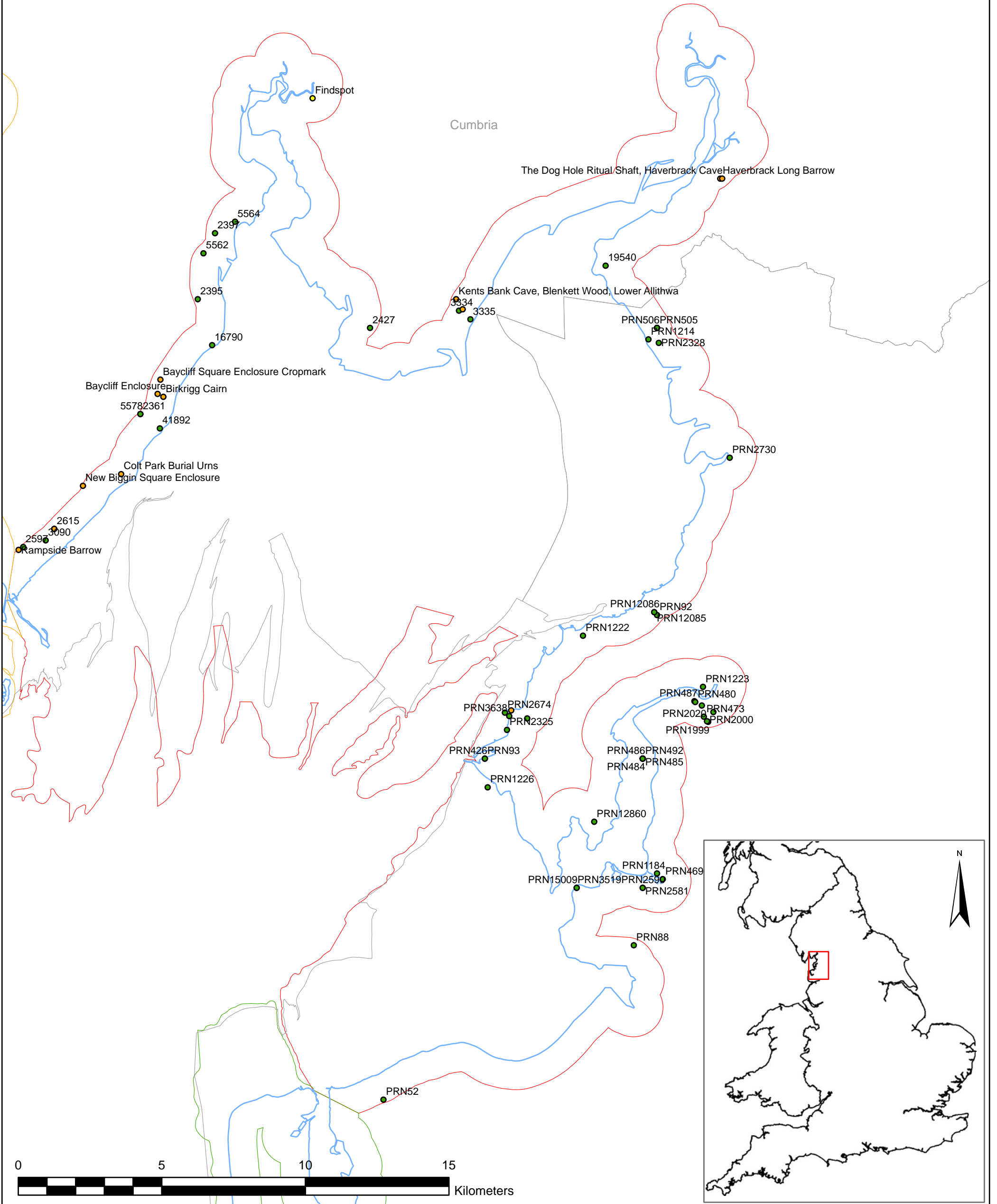


Figure 7.5: Roman sites in Block 3

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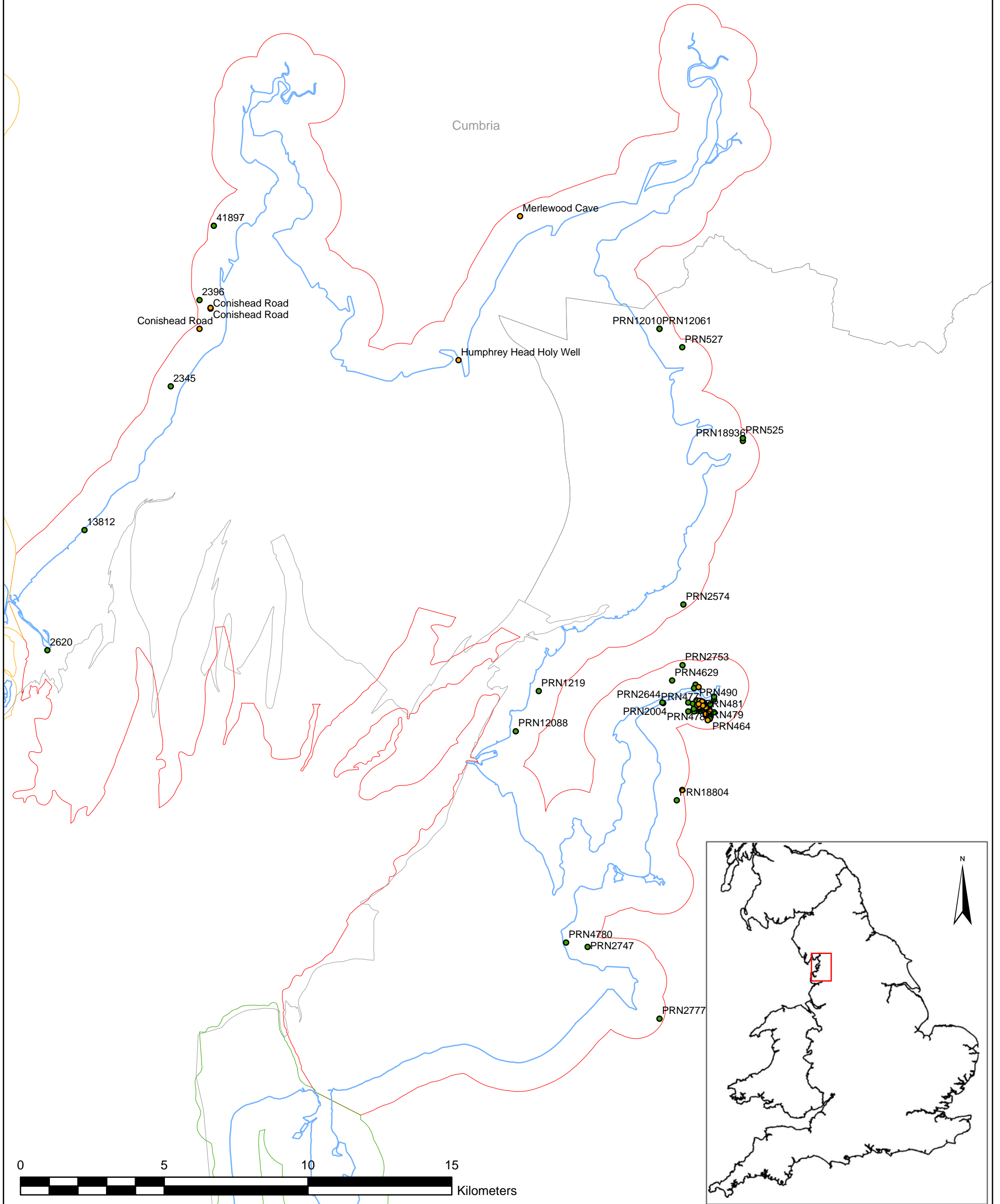


Figure 7.6: Medieval sites in Block 3

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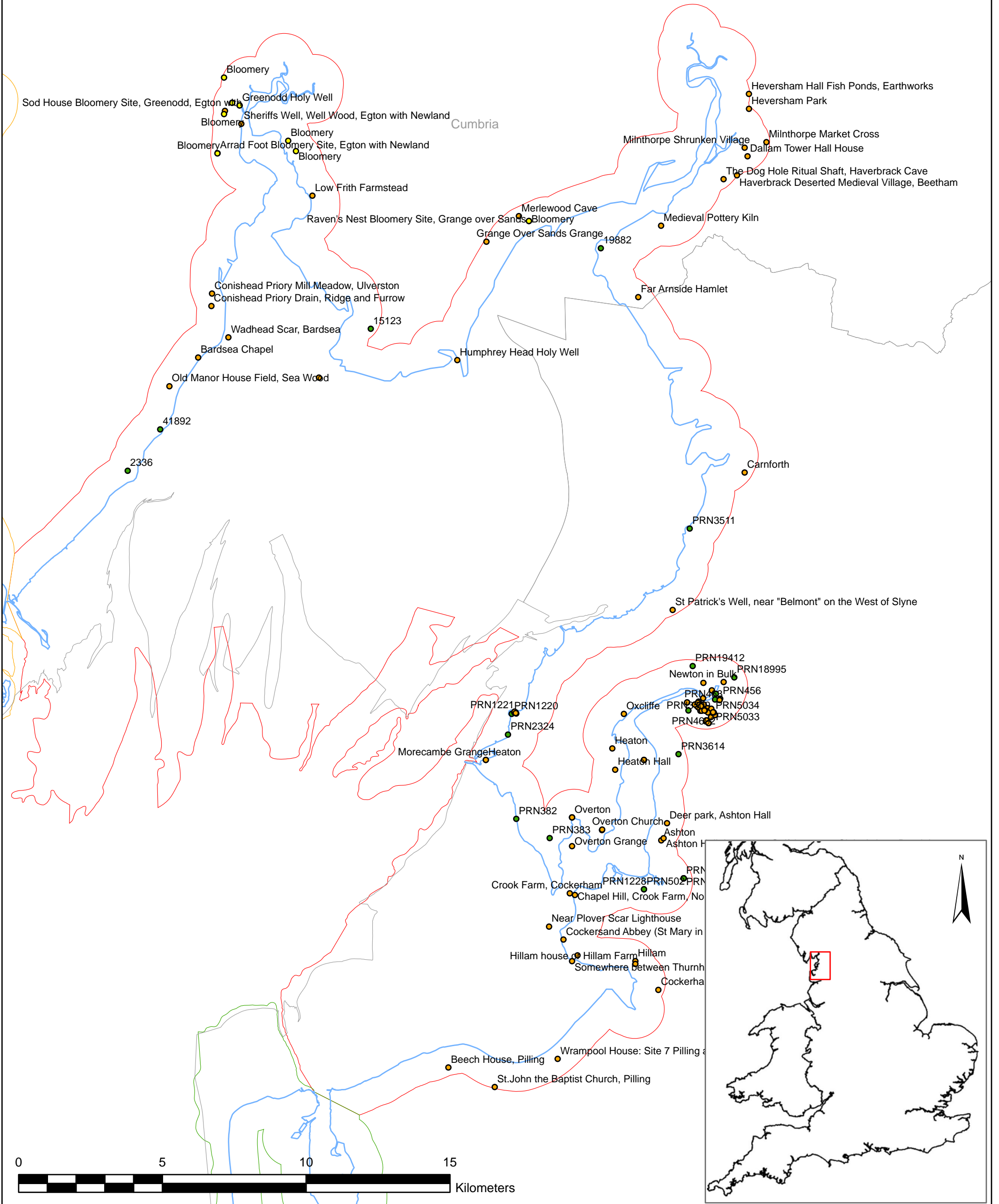


Figure 7.7: Post Medieval sites in Block 3

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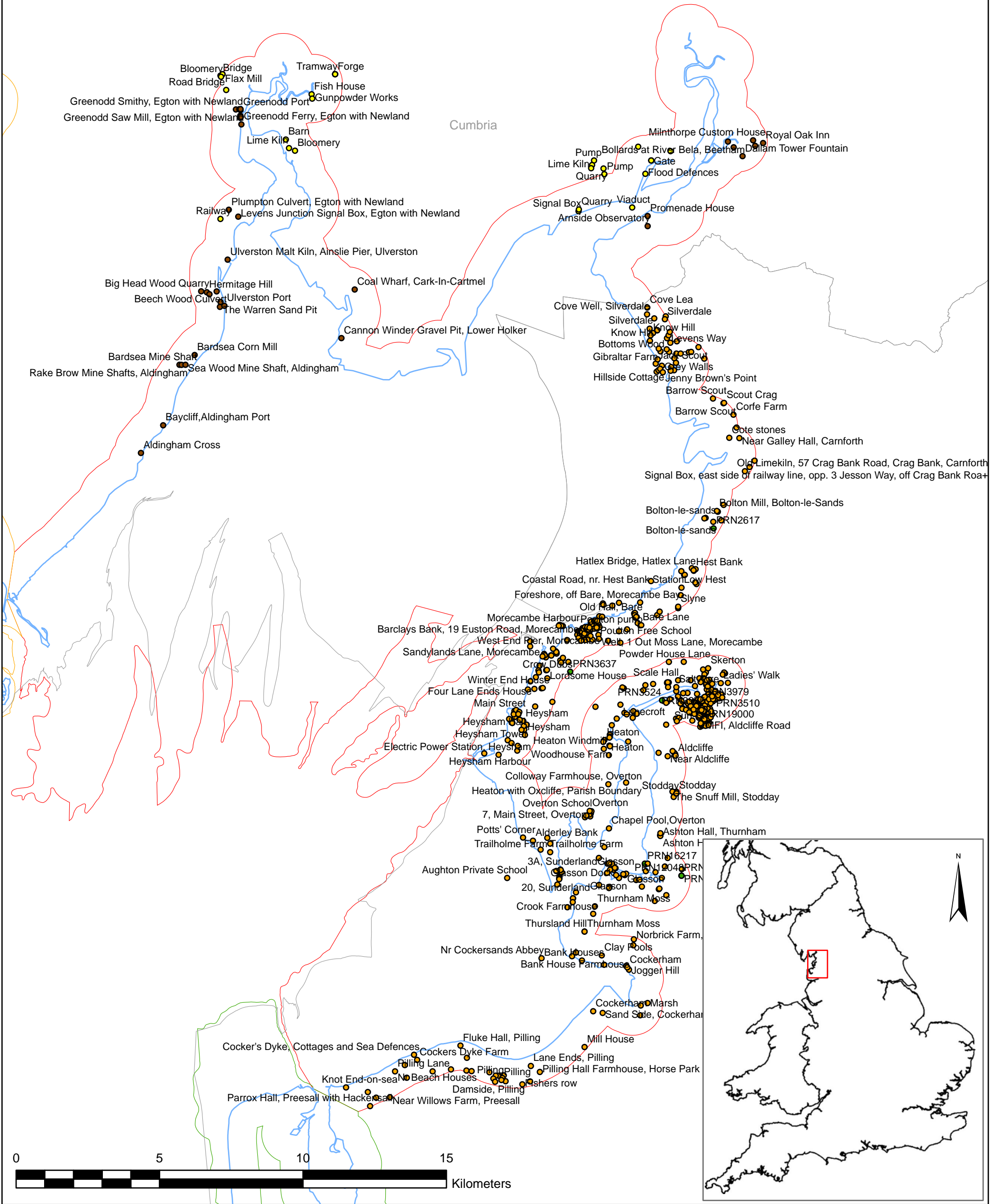
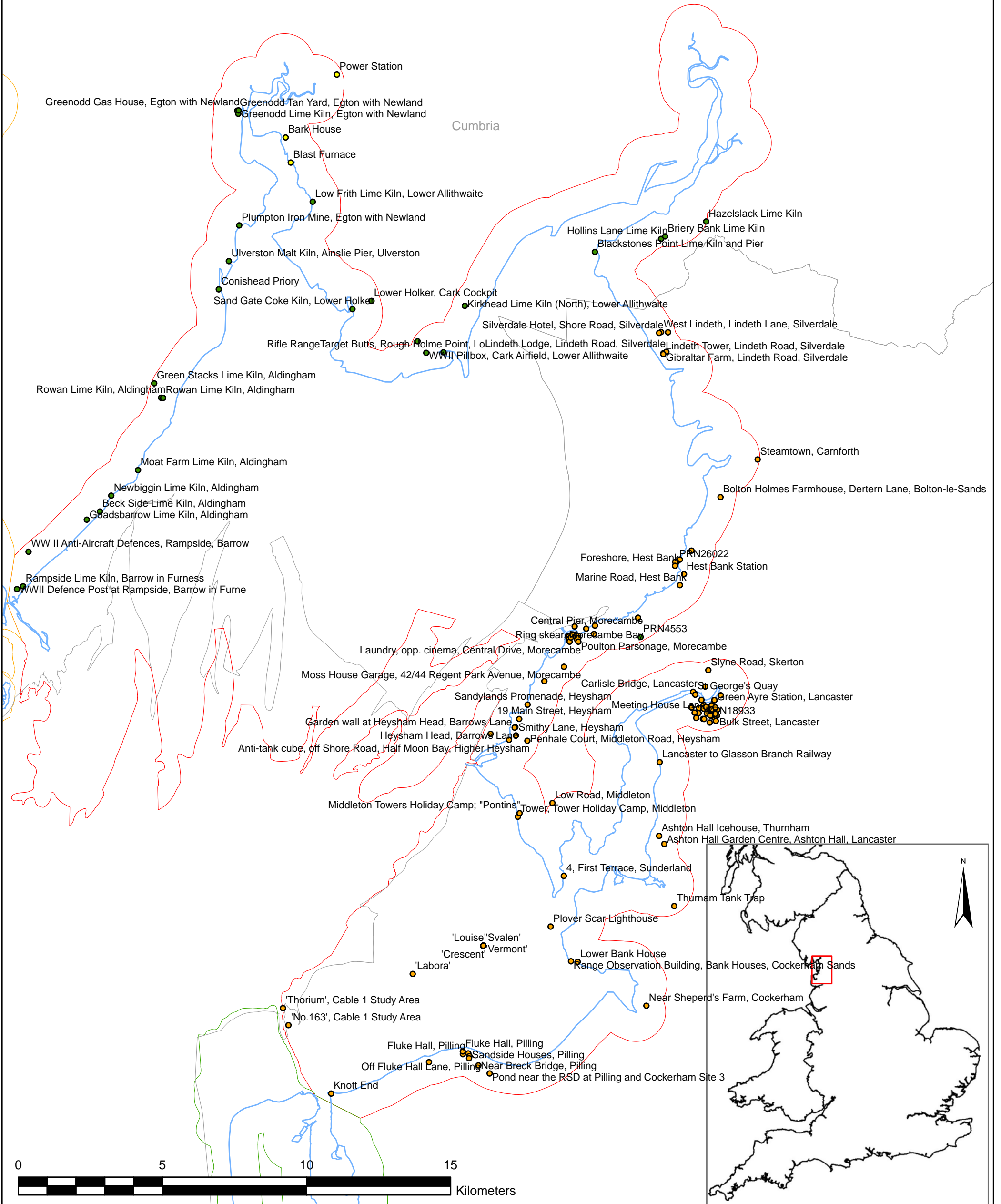
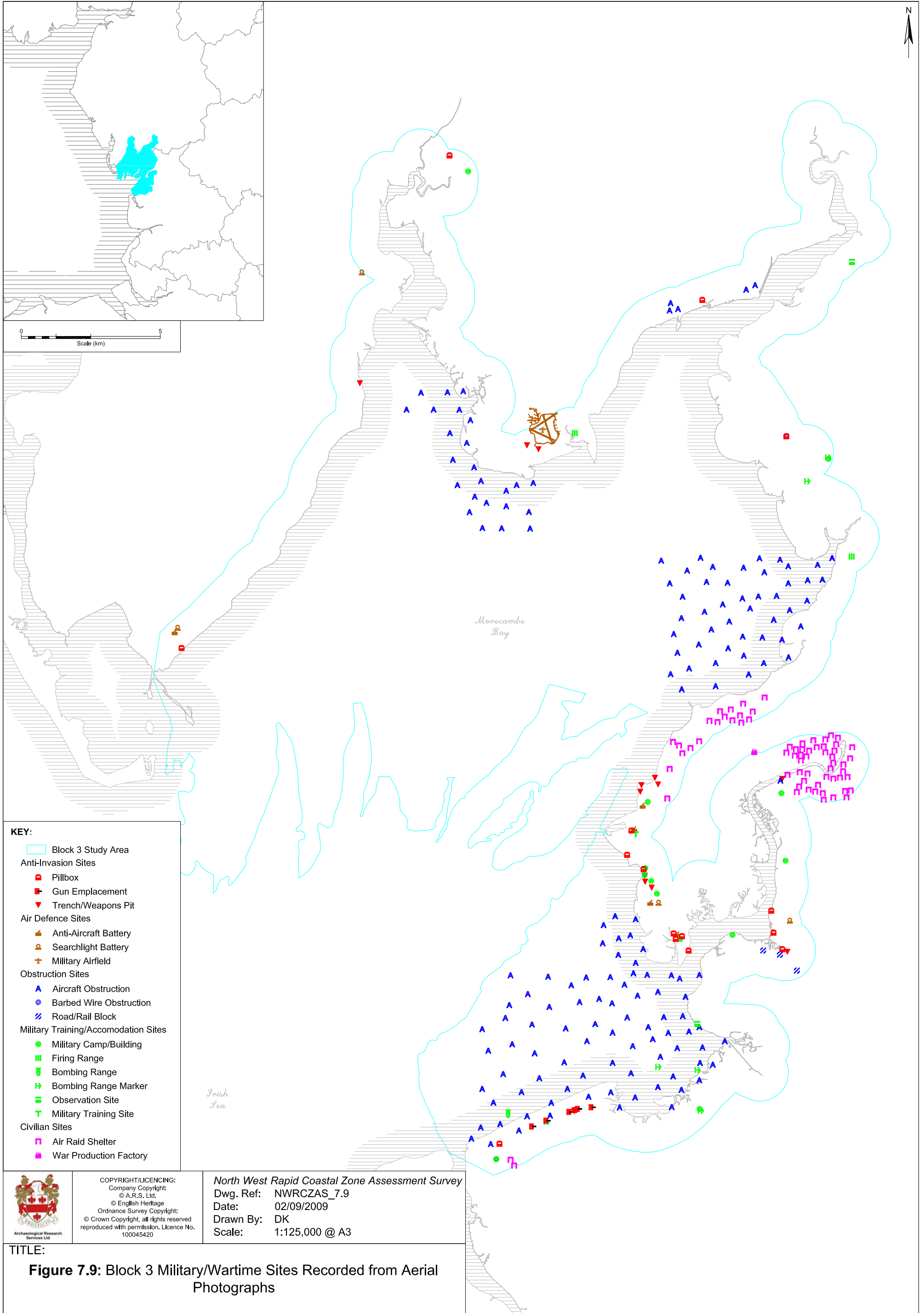


Figure 7.8: Industrial and Modern sites in Block 3

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Figure 7.9: Block 3 Military/Wartime Sites Recorded from Aerial Photographs

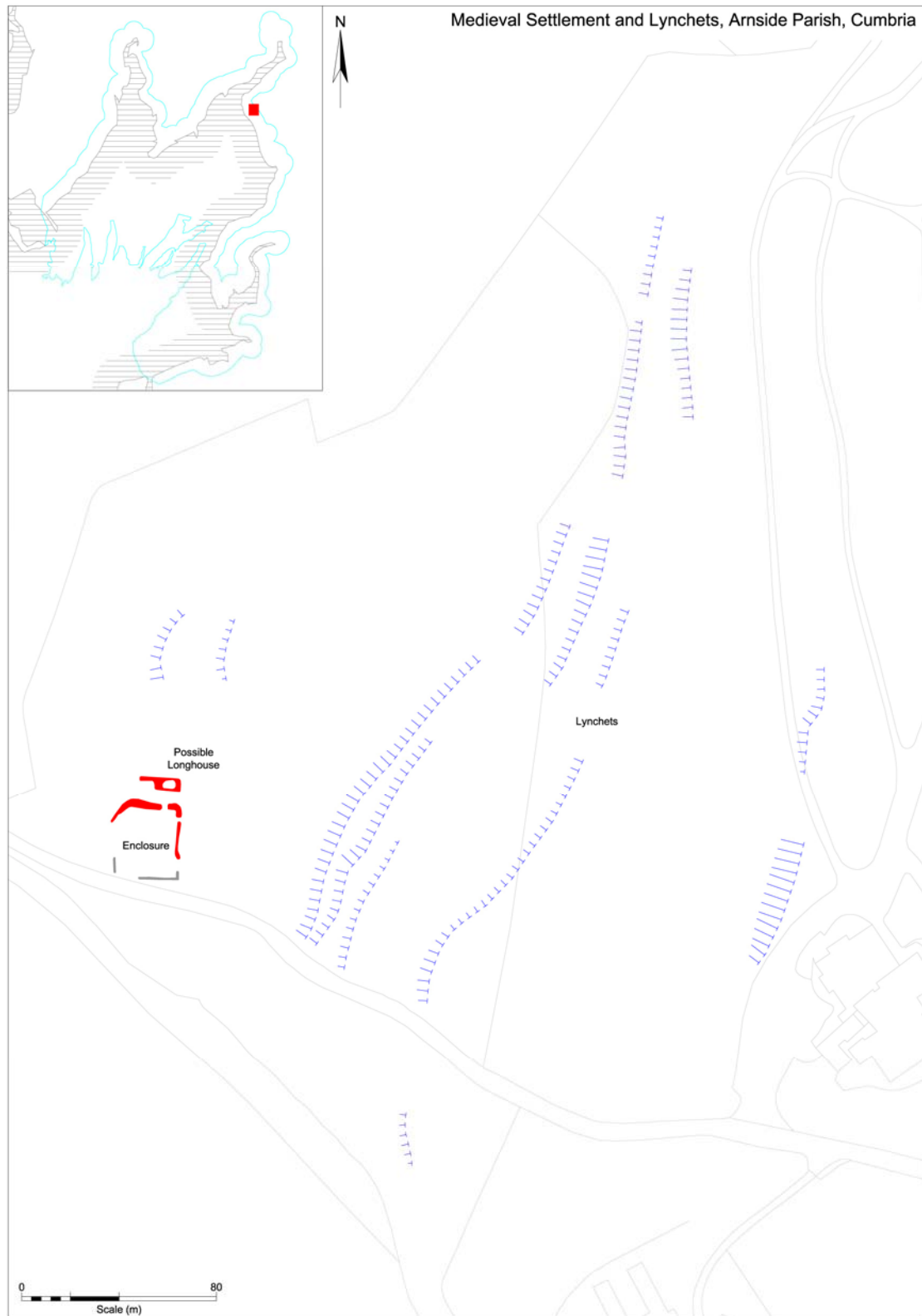


Figure 7.10 Medieval settlement and lynchet field system at Arnside mapped from aerial photography

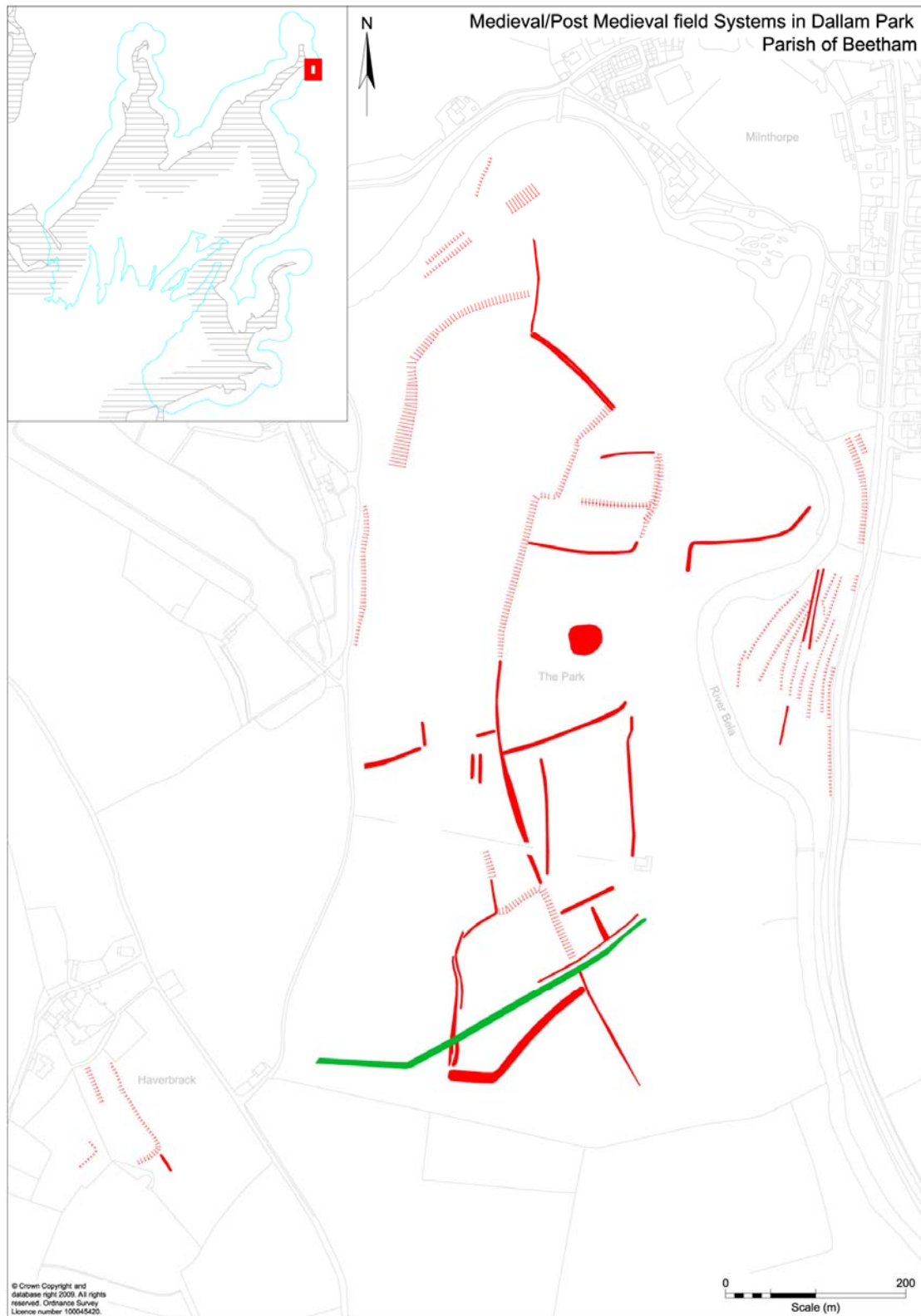


Figure 7.11 Medieval and post-medieval field systems at Dallam Park, Beetham, mapped from aerial photography

CHAPTER 8

A REVIEW OF THE ARCHAEOLOGY FROM ROA ISLAND (CUMBRIA) TO ST BEE'S HEAD (CUMBRIA)

8.1 Introduction

The area discussed in this chapter extends from Roa Island, which lies just off Barrow-in-Furness, to St Bee's Head in Cumbria (Fig. 5.1) and is defined as Block 4 of the project. This section of the study area encompasses the estuaries of the Rivers Duddon and Esk, Walney Island and the urban conurbations of Barrow-in-Furness and Millom. The Historic Environment Records analysed for this section comprised the datasets maintained by Cumbria County Council and the Lake District National Park Authority. The Shoreline Management Plan 2 policy units are presented in table 8.1 and Figure 8.1.

Table 8.1 Shoreline Management Plan Policy Units and preferred scenario

General Policy Unit Area	Specific Policy Unit Location	SMP Policy Unit	Preferred Scenario		
			0-20 years	20-50 years	50-100 years
Walney Island	South End Hawes to Biggar (east side)	11c 14.1	NAI	NAI	NAI
	Biggar to Lenny Hill (east side)	11c 14.2	HTL	HTL	HTL
	South End Hawes to Hare Hill (open coast)	11c 14.3	NAI	NAI	NAI
	Hare Hill to Hillock Whins	11c 14.4	HTL	HTL	HTL
	Hillock Whins to Nanny Point Scar	11c 14.5	NAI	MR	MR
	Nanny Point Scar to Mill Scar	11c 14.6	NAI	NAI	NAI
	Mill Scar to north of West Shore Park	11c 14.7	MR	MR	MR
	North Walney - from north of West Shore Park to Lenny Hill (both coasts)	11c 14.8	NAI	NAI	NAI
Walney Channel (Mainland)	Rampside to Westfield Point	11c 15.1	NAI	NAI	NAI
	Westfield Point to Hindpool (Barrow in Furness)	11c 15.2	HTL	HTL	HTL
	Hindpool to Lowsy Point	11c 15.3	NAI	NAI	NAI
Duddon Estuary	Lowsy Point to Askam Pier	11c 16.1	NAI	NAI	NAI
	Askam-in-Furness (including Askam Pier)	11c 16.2	HTL	HTL	HTL
	Askam to Dunnerholme	11c 16.3	NAI	NAI	NAI
	Dunnerholme to Sand Side	11c 16.4	HTL	HTL	HTL
	Kirkby-in-Furness	11c 16.5	HTL	HTL	HTL
	Herdhouse Moss	11c 16.6	NAI	NAI	NAI
	Gallop Pool to Viaduct	11c 16.7	HTL	HTL	HTL
	Duddon Estuary (both	11c 16.8	HTL	MR	MR

			Preferred Scenario		
	banks upstream of Viaduct and right bank south to Green Road Station)				
	Millom Marshes	11c 16.9	HTL	MR	MR
	Red Hills (industrial area)	11c 16.10	NAI	NAI	NAI
	Hodbarrow Mains	11c 16.11	NAI	MR	NAI
Haverigg to Selker	Hodbarrow Point to Haverigg	11d1.1	N'TL	MR	HTL
	Haverigg	11d 1.2	HTL	HTL	HTL
	Haverigg to Hartrees Hill	11d 1.3	NAI	NAI	NAI
	Silecroft (Hartrees Hill)	11d 1.4	NAI	NAI	NAI
	Hartrees Hill to Selker	11d 1.5	NAI	NAI	NAI
Selker to Eskmeals	Selker to Eskmeals Range	11d 2.1	NAI	NAI	NAI
	Eskmeals Dunes	11d 2.2	MR	MR	MR
Ravenglass Estuary Complex	Eskmeals Dunes to Ravenglass including River Esk to Muncaster Bridge SMP Boundary	11d 3.1	NAI	NAI	NAI
	Ravenglass	11d 3.2	HTL	HTL	HTL
	Ravenglass to Drigg Point including River Mite to Muncaster Mill and River Irt to Drigg Holme	11d 3.3	NAI	NAI	NAI
Drigg Point to Seascale	Drigg Point to Seascale	11d 4.1	NAI	NAI	NAI
Seascale to St Bees	Seascale	11d 5.1	HTL	HTL	HTL
	Seascale to Sellafield	11d 5.2	NAI	NAI	NAI
	Sellafield	11d 5.3	HTL	HTL	HTL
	Sellafield to Braystones	11d 5.4	NAI	NAI	NAI
	Braystones, Nethertown and Couderton	11d 5.5	NAI	NAI	NAI
	Couderton to Seamill	11d 5.6	NAI	NAI	NAI
	Seamill to Pow Beck	11d5.7	HTL	HTL	HTL
St Bees	Pow Beck to St Bees Promenade	11d 6.1	NAI	NAI	NAI
	St Bees Promenade	11d 6.2	HTL	HTL	MR
St Bees Head	St Bees Head	11d 7.1	NAI	NAI	NAI

NAI: No Active Intervention

HTL: Hold The Line

MR: Managed Realignment

8.2 Topography, Geology, Soils and Landuse

This section of the coastline is divided by the Duddon Estuary, formed by faulting in the underlying Carboniferous rocks, with the Furness Peninsula to the south and the narrow coastal plain between Millom and St Bee's Head to the North. Walney Island, the largest island in the NWRCZA area, is located to the south-west of the Furness peninsula. The

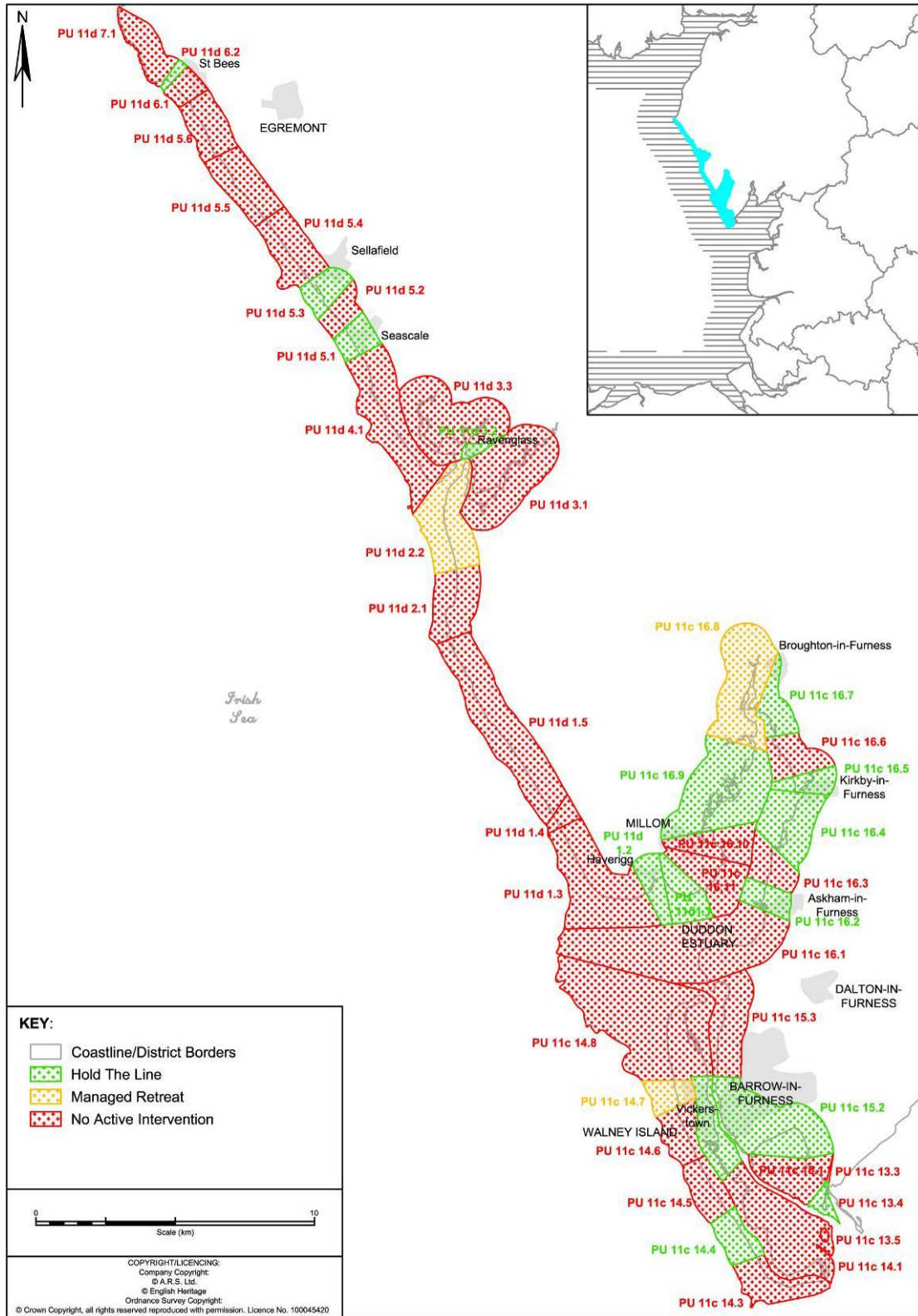


Figure 8.1 Location of Block 4 and SMP 2 policy units indicating preferred option for the next 20 years

shoreline in this part of the study area is different from those to the south as the coastline here predominantly consists of either sand dune systems, such as Roanhead and on Walney Island, or low till cliffs with a narrow intertidal zone, which becomes increasingly narrower to the north of Millom. Only the Duddon estuary consists of the wide intertidal sand and mud flats, similar to those found in Morecambe Bay and the other major estuaries. Walney Island, at the southern end of this area, is a low-lying feature created by deposited layers of glacially derived material, and rises to no more than 20m aOD, with many of the dune systems and marshes at the north and south tips of the island lying at less than 5m aOD. The Duddon estuary is partially bounded by a series of low-lying sand dunes, such as Sandscale Haws and reclaimed saltmarsh at Arnaby, north of Millom. North of Millom the low-lying coastal plain narrows to three kilometres or so, as the massif of the Cumbrian fells pushes westward, and widens again only at Eskmeals and around Ravenglass, where the Rivers Esk, Irt and Mite join into the Esk estuary. North of Sellafield the ground gradually rises towards the height of St Bee's Head, forming an increasingly high cliff shoreline. The shoreline in this area is increasingly dominated by skears and low wave cut platforms.

The bedrock geology predominantly consists of Permian and Triassic sandstones, which form the southern tip of the Furness peninsula and the coastline between Millom and St Bee's Head, with carboniferous limestone and other sedimentary units present around the edges of the Duddon estuary. The superficial geology of the area is dominated by Devensian Till deposits, fronted by raised marine deposits of sand and gravel. Blown sand deposits cover the southern and northern ends of Walney Island, Sandscale Haws in the Duddon estuary, around Haverigg and the Esk estuary (BGS 2008).

The principal soils located within this block are presented in table 8.1 and figure 8.2.

Table 8.1: Soils, landuse and preservation potential from Roa Island to St Bee's Head. Data derived from Farewell 2007 and NSRI database

Simple description	Land-use (when not urban)
deep loam	Cereals and some horticultural crops in drier lowlands: stock rearing and dairying in Cumbria.
deep sandy	cereals. sugar beet and potatoes; dairying on short term grassland in Cheshire and Wales
dune sand	Sand dune and some wetland habitats: recreation; very limited agriculture and coniferous woodland: some gravel extraction in the South East Region.
loam over granite	Stock rearing in uplands on permanent grassland and some moorland of good grazing value; coniferous woodland- dairying some early potatoes and broccoli in west Cornwall,
loam over shale	Stock rearing in uplands, dairying and some cereals in moist lowlands; coniferous and deciduous woodland and rough grazing on steep slopes.
peat	Lowland bog and wet moorland habitats of low grazing value, some coniferous woodland; peat extraction
saltmarsh	Saltmarsh habitats some summer grazing; recreation
seasonally wet deep clay	Cereals, sugar beet, potatoes, field vegetables and horticultural crops in the Fens and Lancashire; some grassland in Lancashire and Cumbria
seasonally wet deep red loam	Cereals and grassland. some potatoes in Staffordshire; grassland In the Northern Region
seasonally wet deep sandy	Cereals; potatoes and sugar beet; some grassland and coniferous woodland
seasonally wet deep silty	Cereals and permanent and short term grassland in Cumbria. arable and horticultural crops in the Fens.
seasonally wet deep clay	Stock rearing on permanent grassland with occasional winter cereals; more cereals in drier districts.

Simple description	Land-use (when not urban)
stony loam over gravel	Stock rearing on permanent grassland in moist lowlands: some cereals, sugar beet and potatoes in drier lowlands
stony loam over hard rock	Stock rearing in moist uplands on permanent grassland and good value rough grazing; widespread deciduous woodland habitats.

The dominant landuse in this area is agriculture, predominantly pastoral, with remnants of the shipbuilding and mining industries present at Barrow and Millom. Major industry is located in the Barrow dockyards, where a long tradition of shipbuilding has culminated in the building of the Trident nuclear submarines, and at Sellafield, where the first British nuclear reactor was built.

8.3 Early Prehistory: Palaeolithic and Mesolithic (Fig. 8.3)

8.3.1 Palaeolithic sites and findspots

The only evidence of Palaeolithic activity in this area was the discovery of a rough-out Palaeolithic axe (SD 174795; HER 6586 C) which was found near to Millom in 1988. The find is now in Whitehaven Museum.

8.3.2 Mesolithic sites and findspots

There are 44 Mesolithic lithic scatters and solated findspots recorded within this part of the study area and the are presented in figure 8.3. The sites are generally of isolated finds, mainly discovered in antiquity, as a result of erosion, or as part of fieldwalking programmes such as those undertaken by the Cherry brother (1984, 1985, 1986, 1987.) Many more finds are recorded in the HERs as being from mixed assemblages, also containing Neolithic and Bronze Age material and so their interpretive potential is relatively poor. However, in the Eskmeals area, south of Ravenglass, excavations in the 1980s revealed evidence for Mesolithic occupation at Monk Moors dating from the early and mid- 6th millennium BC (Bonsall *et al* 1994), and comprising an arrangement of hearths and stakeholes with a large quantity of lithic material. Nearby, at Williamson's Moss (SD085917; HER 13940 LDNPA), located within the study area, Mesolithic activity was located around the shore of an inland lake, from where over 32000 lithic artefacts have been recovered. Unfortunately, the site has not yet seen full publication (Tipping 1994; Hodgkinson *et al.* 2000) Locations which have produced Mesolithic material which may be under threat from coastal erosion are located at Cow Leys Lane and Trough Head (see Bronze Age section below for further discussion on Trough Head), both on Walney Island, and at Drigg. The SMP 2 policy for the Trough Head area is HTL, but the site is situated on the very edge of the policy unit to the north, into which the Cow Leys Lane site falls, where the policy is NAI followed by MR. A recent site found on Walney Island comprises a shell midden (SD17087185; HER 41881 C), where shells associated with heat-shattered stones were found as a result of footpath erosion and disturbance caused by gravel extraction (D Coward, pers. comm.). The site whilst lying some distance from MHWS, is situated on low-lying ground at less than 10m aOD. The SMP 2 policy for this area is NAI and the midden could therefore be at risk from future sea-level rise and corresponding coastal erosion.

Whilst detailed evidence for occupation is limited, as the period is represented principally by lithic scatters in the main, there is good palaeoenvironmental evidence for the Mesolithic period and much of the later Mesolithic activity appears to have been concentrated around raised beach contexts, such as are seen around the Esk estuary, nearby freshwater tarns, such as Eskmeals Pool, and carr swamps (Bonsall *et al.* 1994, Hodgkinson *et al.* 2000). NWRRF Initiatives 2.21 and 2.22 state:

‘There is a need to identify well-preserved Mesolithic contexts for production of secure radiocarbon dates. This would assist with a more precise chronology for the whole Mesolithic period’

and

‘More information than has been published may be available in the archives of past excavations, in particular from sites on the west Cumbrian coast, which needs to be brought into the public domain’ (Brennand 2007, 37-38).

8.4 Later Prehistory: Neolithic, Bronze Age and Iron Age (Fig. 8.3)

8.4.1 Neolithic sites and findspots

A total of 63 Neolithic lithic scatters and findspots are located within this section of the study area and are presented in figure 8.3. The former stone circles at Annaside and Kirkstones and the reconstructed circle at Seascale Howe, as well as the standing stone at Seascale Howe and former standing stone at Ehenside are discussed in the Bronze Age section below, although they are mostly recorded in the HER as being either Neolithic or Bronze Age. No other monumental archaeology dating to the Neolithic is located within this part of the study area.

A burnt mound (SD 045986; HER 4300 C) at Drigg was discovered as a result of coastal cliff erosion in 1967 (Cherry 1982). Increasing erosion led to investigations into the site in 1999 and 2000 which found the remains of a burnt mound, predominantly located in material at the cliff base, but with some elements surviving *in-situ*, which were evaluated by trenching and recorded. However, geophysical survey of the landward side of the cliff edge did not reveal any further evidence of archaeological anomalies. Further erosion in 2002 saw increased destruction of the site. The SMP 2 policy for this area is NAI and a review of the present site situation is urgently recommended.

The Ehenside Tarn Neolithic occupation site (NY 00270705; HER 1248 C) was discovered in the late 19th century when the lake was drained. Finds of Group VI stone axes, grinding stones and a dugout canoe together with a possible paddle were recovered from amongst an area of wooden stakes and brushwood, interpreted as a platform at the lake edge (Darbishire 1873). Fieldwalking in the vicinity has produced further flint artefacts dating from the Neolithic period (Cherry and Cherry 1984).

The North End Haws site (HER 1496 C) has produced extensive evidence for Neolithic and Bronze Age flint working and settlement, including numerous flint artefacts, ceramics and midden debris, from at least eight separate sites in the vicinity, which were subject to partial excavation between 1936 and 1957 according to the HER records. The SMP 2 policy for this area is NAI and the land is very low-lying which places the sites at severe risk of erosion from sea-level rise. The three lithic working sites at Eskmeals (HER 1396; 1397; 1398 LDNPA) were discovered in the late 1960’s and finds were recovered over a large area from within the dune system and close the riverbank. They were predominantly of Neolithic date, although some Mesolithic and Bronze Age material was included in the assemblage (Cherry 1965). Given the buried archaeological features associated with lithic scatters found at Monk Moors and Williamsons’ Moss

(above), it is probable that these lithic scatters will also have surviving below ground archaeology. The NWRRF suggests that very few Neolithic sites are known from the North-West (which is true of the other sections of coastline that form part of the NWRCZA) and those that are known have been predominantly excavated in antiquity (such as Ehenside Tarn) with the result that “the nature and economy of Neolithic settlement is [therefore] poorly understood” (Brennand 2007, 39). The SMP 2 policy for the area at Eskmeals is MR and the sites are all located on very low-lying ground so are at risk of erosion. Their archaeological investigation must therefore be seen to be a priority.

8.4.2 Bronze Age sites

A stone circle was located near Annaside, south-west of Bootle (SD099853; HER 1460 LDNPA; and SD089863; 5351 LDNPA). In the mid-18th century the circle was recorded as being formed from 20 stones and measured around 18m in diameter. By the mid-19th century 12 survived and only one was left standing by 1923 (Clare 1973). A second circle was located at Kirkstones to the south-east (SD10618432, HER 1478 LDNPA) which has been completely destroyed. It was described as being made of 30 stones in two concentric rings (Waterhouse 1985). A third monument, Seascale Howe circle (NY 03340238; HER 1288 C) was partly-excavated and reconstructed in 1953. The site consisted of a small oval circle with a central cairn, which contained a burial, associated flint finds and a jet ornament. A final, possible circle, was located above the River Duddon (SD 192873; HER 1479 LDNPA), where two stones (one fallen), may represent a circle mentioned in 1794. The whereabouts of this circle is now unknown, but it is recorded as having originally comprised a circuit of 22 stones with an entrance to the south-west through which the Duddon Estuary could be seen (Burl 1976).

Two Bronze Age occupation sites are located in the southern part of this stretch of coastline, at Roanhead (SD 195757; HER 1498 C) and at Roose quarry (SD 22956795; HER 40768 C). The Roose quarry site was found in advance of quarrying activity and a number of truncated pits and postholes, associated with Carinated Bowl, fragments of polished stone axes and lithics were recovered. The Roanhead site, originally found in 1950, was partly excavated in 2003, and a group of 11 postholes forming a small sub-circular structure were found on a low shingle ridge. Previous finds recovered from the vicinity included over 200 lithics and a small Group VI axe. No direct dating of the site was undertaken. However, on typological grounds, the site is thought to date from the Late Neolithic or Early Bronze Age. The excavators suggest that erosion may well have removed any associated hearths or other features (Evans and Coward 2004). The draft SMP 2 policy for this area is NAI and further archaeological investigation should be considered a priority. A lithic working site, dating from the Bronze Age, was also found close to Eskmeals (SD 079935; HER 1381 LDNPA) comprising predominantly Bronze Age lithic material, recovered from amongst the sand dunes (Cherry 1963). The SMP 2 policy in this area is MR and, as with the nearby Neolithic sites, further investigation is deemed necessary.

8.4.3 Bronze Age findspots

A total of seven Bronze Age findspots have been recovered from this part of the study area, all of lithics.

8.4.4 Iron Age sites

Five Iron Age/Romano-British field systems have been recorded as part of the APM exercise within this stretch of coastline. They are presented in table 8.3 and figure 8.10. The site at Watch Hill is sub-rectangular and only visible on two sides, which measure 76m and 53m respectively with a possible out-turned entrance to the south. It is recorded in the HER as a possible milefortlet, however it is considered more likely to be a univallate enclosure. Another site, near Nethertown, is an irregular sub-rectangular site with intermittently visible ditches, which measures 76m in length and 29m in width with a possible entrance in the north-west corner. The site at St Bee's is a curvilinear enclosure, 76m in diameter and formed by a 5m wide ditch, with a possible internal roundhouse. The additional two sites are linear field systems, which may also be related to more recent field enclosures or drainage. None of the sites are presently under threat from coastal erosion.

Table 8.3 Iron Age/Romano-British field systems in Block 4

NMR No	Grid reference	Site location
1491102	SD 174 813	North-east of Millom
1492892	NY 033 027	Seascale
1492904	NY 0172 0418	Watch Hill
1494274	NY 002 061	Nethertown
1493117	NX 982 097	South of St Bee's

One additional possible Iron Age site is located in the dune system at Eskmeals (SD 079934; HER 1395 LDNPA). The HER entry records a series of finds, including lithics and pottery, as well as Medieval finds and one Iron Age bead.

No other Iron Age findspots are recorded within this stretch of coastline.

8.5 Roman and Romano-British (Fig. 8.5)

8.5.1 Roman military sites

The Roman Fort at *Glannaventa*/Ravenglass (SD 0819581; SAM 13569; HER 1378 LDNPA) was built on the site of earlier milefortlet and formed the major centre for the coastal Roman sea defences between the 2nd and the 4th centuries AD. The site is situated on the periphery of the River Esk estuary on a low rise which, on the western side is subject to coastal erosion. The fort measures almost 130m in length and the eastern rampart rises to a height of 1.5m with an outer double ditch 5m in width, whilst the northern and southern ramparts survive to 1m in height and only have one outer ditch. The western wall and defences have already been at least partially lost to coastal erosion. A well-preserved Roman bath house (HER 2965 LDNPA) is still located just to the north-east of the fort. Part of the site has been damaged by trees and, also on the western side, by a railway cutting. The SMP 2 policy in this area is NAI and further erosion of the interior of the fort will therefore undoubtedly occur. The site is therefore seen as a priority for further work.

8.5.2 Other Roman sites

Four possible Roman bloomery sites are located at Eskmeals (SD 0894; HER 30021 LDNPA), two at Drigg (SD 04639860; HER 15922 LDNPA: and SD 06799660; HER 4428 LDNPA), and a further site at Barn Scar (SD 04639860; HER 15922 C). The Eskmeals site consisted of seven small bowl hearths with associated Roman and Medieval artefacts. The Drigg sites are situated very close to MHWS (indeed the latter is

situated in the intertidal zone given its grid reference) and the SMP 2 policy for these areas is NAI, making the sites again at risk of coastal erosion.

A ford (SD 08859714; HER 1463 LDNPA) is located in the River Mite, near Ravenglass and is recorded as possibly Roman. Although the dating of the feature is unclear.

8.5.3 Roman findspots

A total of 14 Roman findspots are located within the study area.

8.6 Early Medieval (Fig. 8.6)

8.6.1 Early Medieval ecclesiastical sites

A nunnery was founded at St Bee's (NX 96871212; NMR 8497; HER 1193 C) in the middle of the 7th century AD and was destroyed by the Danes shortly thereafter. Carved fragments from this early site include a lintel, known as the Dragon Lintel which depicts a scene variously described as being St George, St Michael, or possibly part of Norse mythology, a cross head and a cross shaft all thought to be of 10th or 11th century date (Pevsner 1967).

Other early Christian cross fragments are located at Waberthwaite (SD 10039510; SAM 23779; HER 3984 LDNPA) and at Muncaster (SD 1039996550; SAM 23783; HER 4723 LDNPA). The Waberthwaite cross shafts are located in the churchyard of St John's Waberthwaite. One piece stands 2m high with interlace decoration on three sides with animal figures on the face and the second, smaller fragment, showing interlace decoration on three sides. They were both placed in their present position in the late 19th or early 20th century, the latter piece having previously been used as the doorstep to the church. Both are dated to between the 7th century and the 10th century AD, probably the latter end of the period, as both Anglian and Scandinavian artistic traditions are present on the fragments (Pevsner 1967). At Muncaster a 1.2m high Anglo-Scandinavian cross shaft of late 10th or early 11th century AD date has a cross head of the 10th century located beside it, with an old socket hole, thought to have been used to support an early Christian cross, in front of both. The shaft is of red sandstone and decorated on all four sides with twist, ring chain and plait carving whilst the head, half a metre wide has a crude linear cross carved across the centre with plait decoration surrounding. Both sets of crosses show the importance of Waberthwaite and Muncaster in pre-Conquest Christianity.

8.7 Medieval (Fig 8.7)

8.7.1 Medieval ecclesiastical sites

The largest medieval ecclesiastical site in this part of the study area is St Bee's Priory. This occupies the site of the nunnery destroyed by the Danes (above), which was refounded as a Benedictine Priory in 1120. It was dissolved in 1539 and its surviving remains reused in 1611 as the parish church dedicated to St Mary & St Bega, a Grade I Listed Building (LB 76164). Earthworks of uncertain date to the south west of the present church and graveyard were mapped as part of the APM exercise for this project and are assumed to relate to the priory. The area, covering approximately 0.4 hectares, has both bank and ditch elements. At its southern extent the area has three ditch elements almost forming three sides of a sub-square feature. To the north of this are two parallel ditch features approximately 25m in length with two larger and one smaller banked linear features to their west running north-south and east-west. These banked features appear to create or join around a sub-square ditched feature and a smaller

ditched curvilinear feature to their north which may well date to the occupation of the priory.

Medieval churches and chapels are recorded at St Mary's, Barrow-in-Furness (SD 18546859; HER 2727 C), St Cuthbert's, Kirkby-Ireleth (SD 23388220; HER 2131 C), St Mary Magdalene, Broughton (SD 20938738; HER 2149 LDNPA), St John's, near Waberthwaite (SD 10029511; HER 3109 LDNPA) and the Church of St Michael and All Angels, on Muncaster Fell above Ravenglass (SD 10399658; HER 4329 LDNPA). St Mary's Church was shown on Saxton's Map of Lancashire of 1577 as a chapel, but is probably much earlier. It was rebuilt in the late 17th century and extended westward in the mid-18th century. The site is now occupied by an early 20th century church. St Cuthbert's was first mentioned 1190 and a 12th century doorway and 16th century north aisle survive amongst 19th century restorations (Farrer and Brownbill 1916). The church of St Mary Magdalene has some 12th century remains including the south doorway and several 16th century windows. The church of St John lies very close to MHWS on the River Esk, where the SMP 2 policy is NAI. The church of St John was probably founded in the 13th century and two cross shafts, of possible earlier medieval date, are also present in the churchyard, one located in a socket stone. If the site does have early medieval precedents, these could be subject to erosion. The church of St Michael is thought to be 16th century, although it may have some Norman walling still present (Pevsner 1967).

8.7.2 Medieval Military sites

Piel Castle (SD 232763600; SAM 13566; LB 388354; NMR 37706; HER 2618 C), located on Piel Island off Barrow-in-Furness was originally built *c.* 1327. The castle was possibly built on the ruins of a 12th century castle and it was in ruins by 1530. The castle guarded the approach to the harbour at Barrow-in-Furness and consisted of a keep, gatehouse, inner and outer baileys, inner and outer moat, curtain walls and towers. The keep is extremely unusual, comprising three parallel "compartments" though the easternmost of these has fallen into the sea and its walls now lie on the beach. The castle was built from roughly-coursed stone, probably collected from the beach, with its architectural features constructed of red sandstone ashlar, which will have been quarried in the vicinity of Furness Abbey. The keep was positioned within an inner ward, the south and east walls of which have also been eroded by the sea. The outer curtain wall still survives to the north-east of the castle. On the western and north-western sides the wall does not survive above foundation level, while remains of its southern side lie tumbled on the beach. Flanking the northern and western sides of the outer curtain is a dry moat that measures up to 13m in width and 3m in depth. During the mid-19th century the Duke of Buccleuch undertook renovations to the monument including construction of sea defences which slowed the pace of erosion on the southern and eastern sides of the castle. The site also saw extensive excavation and survey in the mid-1980's prior to renovation work. Very few archaeological remains were identified which related to the occupation of the castle but phasing of the site's development was possible (Pevsner 1969; Newman 1987). Piel Castle is a Grade I Listed Building and Scheduled Ancient Monument. Major damage has already been caused to the castle by coastal erosion. The SMP 2 policy for Piel Island is NAI and further erosion of this significant monument will undoubtedly take place.

Millom Castle (SD 17118133; Sam CU 360; LB 76333; HER 2703 C), as it is known, is more accurately described as a moated manor house, built in the early 14th century. A license to crenellate was granted in 1335. Partial demolition of the site occurred in 1644, but a tower was built in 1660, and this, the hall and a ruined gatehouse, along with the

dry moat to the west and south, still survive, incorporated into a more modern farmhouse. The site was mapped as part of the APM exercise for this project.

Muncaster Castle (SD 10359634; LB 76270; HER 3981 LDNPA), near Ravenglass, incorporates a 13th century pele tower with three storeys and a basement at its south-west corner (Pevsner 1980). The castle itself is largely 19th century in date.

A 15th century beacon was located at St Bee's (NX 9414; HER 4453). The exact location is unknown and it is possible that the site has been obscured by the present lighthouse.

8.7.3 *Medieval Rural sites*

There are five possible deserted medieval villages in this part of the study area, although none have been mapped as part of the APM exercise for this project. They are presented in table 8.4 and are either of unknown location or, in the case of Cocken, have been destroyed by modern development

Table 8.4 Deserted Medieval Villages

HER No	Easting	Northing	Name
Cumbria			
1485	317100	481200	Millom Deserted Medieval Village
2715	319120	470580	Cocken Deserted Village
2711	319650	472520	New Park / Sellergarth Deserted Village
LDNPA			
1454	310500	496600	Muncaster
1455	310000	495120	Waberthwaite

Medieval ridge and furrow has been identified at several locations in the study area, such as on Walney Island, above the Duddon estuary and in the Ravenglass area, with a small area of lynchets present on Muncaster Fell. No associated structures are located with these field systems and none of the possible DMV sites, other than Cocken, sited on the mainland opposite Walney Island, are close to the pockets of ridge and furrow.

Three medieval fish traps have been mapped as part of the APM exercise for this project to the south of St Bee's. They are presented in table 8.*. The sites are possibly associated with the priory and none appear on recent aerial photography, although they are marked on Ordnance Survey mapping. Their location in the intertidal zone obviously makes them susceptible to erosion if they still exist.

Table 8.5 Medieval fish traps at St Bee's

NMR No.	Grid reference	Site type
1493112	NX 9990 0588	Fish trap
1493094	NX 9890 0699	Fish trap
1493459	NX 9672 1055	Fish trap

8.7.4 *Medieval Industrial sites*

Two medieval bloomery sites are recorded in this part of the study area at Sandscale Haws (SD 19067562; HER 3974 C) and Millom Castle (SD 1882; HER 1495 C) as well as possible medieval activity at the sites presented in the Roman section above. The exact location of these sites is not now known. According to the HER the Sandscale

Haws site could not be found on a recent site visit (although it does not state when) The SMP 2 policy for this area is NAI. The NWRRF states that bloomery sites, particularly in Furness, should be a focus of investigation by geophysics and excavation if appropriate (Brennand 2007, 112), however as the whereabouts of these sites is unknown further work may not be possible.

Two saltworking sites are also present along this stretch of coastline at Barrow-in-Furness (SD 21686880; HER 2594 C) and Millom (SD 175808; HER 41709 C). According to the HER no sign of the Barrow site, at Salthouse, was seen in a field visit in 2001, and the Millom site, at Salthouse Farm, appears to be the only surviving saltworks in this part of the study zone. The site, comprising a possible sleeching mound with nearby low mounds and hollows, may be the remnants of a saltworks that could have been associated with St Bee's Priory, Calder Abbey, or Furness Abbey, all of which had saltworks at Millom. The site is presently protected by flood defences and the SMP 2 policy is HTL for the next 20 years. Thereafter Managed Retreat, at least to the railway line, is the preferred option and this could detrimentally affect the saltworks.

8.8 Post-Medieval (Fig. 8.8)

8.8.1 Post-medieval rural sites

There are a nine rural buildings present within this stretch of coastline and they are presented in table 8.6. Many of the sites recorded as part of the APM exercise for this project comprised post-medieval ridge and furrow, which is present along the entire stretch of coastline and is even present in the inner bailey of Piel Castle. This part of the study area, whilst important for early iron mining and later shipbuilding, is predominantly a rural economy with only Barrow-in-Furness forming a conurbation of any size and the town only developed from the mid-19th century onwards. The prevalence of ridge and furrow along this coast is therefore not surprising and forms the early evidence for practices that still dominate the area today.

Table 8.6 Post medieval farm sites in Block 4

HER No	Easting	Northing	Name	Site Type
Cumbria				
41720	315612	478908	Midtown Farm, Main Street, Haverigg	Farmhouse
41882	317334	471077	North End Farm, Walney, Barrow-in-Furness	Farmstead
41922	317408	479458	New Hall Farm, Mainsgate Road, Millom	Farmstead
2714	319189	471365	Ormsgill Farm, Barrow in Furness	Farmhouse
41458	319216	466169	Piel View Farm, Biggar Village, Walney Island	Farmhouse
41853	296830	512040	Low Abbey Farm, St Bees	Farmstead
41411	320163	468264	Little Close Field Barn, Barrow Island	Field barn
LDNPA				
12611	346500	481165	-	Barn
30291	333080	481570	-	Barn

Thirteen post-medieval fishtraps have been recorded as part of the APM exercise for this project, although some are grouped together under one record. There is one between Barrow and Walney, eight in the Duddon estuary and four in the Esk estuary. They are presented in table 8.7 and an example is shown in figure 8.11. None of the sites appear on recent aerial photography and their present status is therefore unknown. Their location in the intertidal zone makes them exceptionally susceptible to erosion if they are still present.

Table 8.7 Post-Medieval Fish traps in Block 4

NMR Number	Grid Reference	Site Type
1491193	SD 205 842	Fish trap
1491194	SD 2230 8223	Fish trap
1490267	SD 2053 7936	Fish trap
1491153	SD 191 805	Fish trap
1491635	SD 072 940	Fish trap
1491632	SD 072 945	Fish trap
1492529	SD 0480 9721	Fish trap
1157584	SD 086 957	Fish trap
1490033	SD 212 664	Fish trap

An oyster bed (SD 18907335; NMR 1488661) in the Duddon estuary was mapped as part of the APM exercise for this project. The site does not appear on aerial photography from 1985 and may no longer survive or have been buried by the shifting sands of the Duddon estuary.

8.8.2 *Post-medieval industrial sites*

Very few industrial sites dating to the post-medieval period are recorded along this section of the NWRCZA study area. Four possible salt pans (SD 070966; NMR 1492717), not recorded in the HER, were mapped from aerial photography on the Esk estuary, near Saltcotes as part of the APM exercise for this project. The SMP 2 policy for this area is NAI and the sites are therefore at risk from erosion. Lime Kilns and small quarries form the majority of the rest of the post-medieval industrial sites.

8.8.3 *Post-medieval maritime features*

Two post-medieval lighthouses are present at Walney (SD 23036204; LB 27110; HER 18992 C) and St Bee's (NX 94141438; HER 16539 C). Walney lighthouse with its attached pair of cottages and a storeroom was built in 1790 of sandstone in an octagonal tapering form. It is a Grade II* listed building. The original, coal-fired lighthouse at St Bee's, built in 1718, was replaced in the 19th century after it had been destroyed by fire.

Four quays were built at Barrow-in-Furness at the end of the 18th century and it was from these that the port and shipbuilding facilities of Barrow evolved. The Barrow Iron Ore Quay (SD1980968867; HER 41413 C), the Messrs Town and Rawlinson Iron Ore Quay (SD 2003268746; HER 41414 C), the Harrison Ainslie and Co Iron Ore Quay (SD 1997368792; HER 41415 C) and the Schneider and Company Coal and Iron Ore Yard (SD 2029468595; HER 16316 C), with associated quay were all set up to transport iron ore from the Furness peninsula. The latter site no longer survives, and the other three sites are no longer visible, having been subsumed into the later dock complex, although of course it is possible that some traces exist, buried within the modern shipyard.

Post-medieval flood defences (SD18296714; NMR 37126; HER 2733 C), located on the west side of Walney Island, have been mapped as part of the APM exercise for this project. Built prior to 1537, probably by the monks of Furness Abbey, the earthen bank, which survives up to 2m in height and 4m in width, and is over 1km in length. It was probably built to assist in reclamation of parts of Walney Island for agriculture, as attested by the ridge and furrow, mentioned above. The SMP 2 policy in this area is HTL. Development of sea defences in this area could therefore have an impact on this post-medieval earthen bank.

Three post-medieval wrecks were mapped as part of the APM exercise for this project.

8.9 Industrial and Modern

8.9.1 Shipping and infrastructure

The major maritime facility in this part of the study area is the dock complex and associated buildings at Barrow-in-Furness. Prior to the development of the iron mining industry Barrow was a small hamlet and the four small quays mentioned above, provided the only harbour facilities. The two surviving docks, Ramsden Dock (SD 2031567741; HER 19768 C) and Cavendish Dock (SD 215684; HER 19769 C) were built in 1878 and 1879, to allow the increasing quantities of iron ore to be shipped from the Furness peninsula. Further developments in the late 19th century saw the erection of furnaces to smelt steel and by 1876 Barrow boasted the largest steelworks in the world, fuelled by the nearby haematite and coal deposits. This also saw the development of Barrow as a shipbuilding port and the burgeoning Industrial Revolution saw the town's population expand from less than a thousand in the mid-18th century to over 47,000 by 1881. In 1871 the Barrow Shipbuilding Company was formed, but was subsequently taken over, in 1897, by Vickers, then a Sheffield steel firm. The shipyard was engaged in the construction of warships for the Royal Navy and for export, with the Navy's first submarine, *Holland I*, being built there in 1901, and the most advanced submarine fleet in the world having been constructed by the start of World War I, as well as having been involved in the construction of many other surface warships (OAN 2003).

8.9.2 Industry

Iron ore mining and processing forms the major industry in the area, located at Millom and in the Askam and Roanhead area on the Furness peninsula, exploiting the rich haematite ore deposits. A full list is presented in table 8.7, along with the sulphur mine at Underhill, Millom. Hodbarrow mine, at Millom, the largest of the haematite mines, had its own sea defences (HER 4301 C) and lighthouse (HER 2705 C). The site is now predominantly a nature reserve.

Table 8.7 Mines

HER No	Easting	Northing	Name	Site Type
Cumbria				
18407	320507	475189	Roanhead Iron Mines	Ironstone Mine
18400	320796	476349	Woodhead Iron Mines	Ironstone Mine
40358	321013	476640	Askam Pit No 5, Askam and Ireleth	Ironstone Mine
5529	317577	478703	Hodbarrow Mine	Ironstone Mine
41733	317997	483040	Underhill Sulphur Mine, The Hill, Millom	Sulphur Mine/Iron pyrites mine

Iron works, processing the haematite ore, were located at Barrow, Askam and Millom.

8.9.4 The World Wars

A World War I Anti-Aircraft Battery (SD 205679; NMR 1473698) was mounted at Barrow docks in 1917, armed with a 12-pounder gun. The site no longer exists. The Hilpsford coastal battery (SD 2301162031; NMR 1429214) was located on the south end of Walney Island and was constructed in 1915, armed with two quick-firing 4.7 inch guns and searchlights. A small network of First World War practice trenches (SD 16877171; NMR 1488706) are located on the north side of Walney Island, close to the airfield and

were mapped as part of the APM exercise for this project. The area is very low-lying and very close to MHWS. The SMP 2 policy for this area is NAI and the sites are therefore at risk of erosion.

Barrow-in-Furness was a target for the *Luftwaffe* during World War II, as they sought to disable the shipbuilding capabilities of the country. The town and surroundings therefore had extensive defensive systems and protection for the civilian populace shown in figure 8.12.

Two airfields, on Walney Island (SD 175712; NMR 1383764; HER 15626 C) and at RAF Millom (SD 139791; NMR 1107992), were transcribed as part of the APM exercise for this project. Walney airfield opened in 1941 and closed in 1946. It was used by the RAF Air Gunnery School of 25 Group Flying Training Command and comprised three tarmac runways with hard-standing and various hangars. RAF Millom had a very similar layout and was also used by Flying Training Command between 1941 and 1945 by an Advanced Flying Unit (Willis and Hollis 1987). The site has been used as a prison since 1967.

Four anti-aircraft batteries were located on Walney Island and one anti-aircraft battery was located at the Barrow dock complex which have been transcribed as part of the APM exercise for this project. Heavy Anti-Aircraft Battery Barrow H3 (SD 202671; NMR 1471345; SMR 16899 C) was located at Ramsden in 1941, although it is not known what guns it was armed with and it is no longer extant. Heavy Anti-Aircraft Battery Barrow H5 (SD 2119661986; NMR 1471349; HER 19875 C), was preceded by a World War I coastal battery, according to the HER record. The site, with associated ancillary buildings has been partially destroyed by coastal erosion and the SMP 2 policy for this area is NAI, so further destruction of the site will occur and it should therefore be recorded as a matter of urgency. Heavy Anti-Aircraft Battery Barrow H2 (SD 183663; NMR 1471337) was fitted with 3.7 inch guns in 1942 and equipped with a GL Mark II fire-control radar. The site is no longer extant. Heavy Anti-Aircraft Battery Barrow H1 (SD 173701; NMR 1471334) was located to the south of Walney airfield with the same equipment as battery H2 and is again no longer extant. An further, unnamed battery (SD 177678; NMR 1489518) was located between Battery H2 and Battery H1.

Further anti-aircraft defences include 23 Barrage Balloon sites and six searchlight batteries.

A bombing decoy sites was located at Ravenglass (SD 083879; NMR 1469360) and has been transcribed as part of APM exercise for this project. The site, protecting the Vickers-Hycemore works at Ravenglass, was built in 1941 and comprised a 'QL' and a 'QF' type, replicating factory lighting and a target struck by bombs.

As with the area around Merseyside, anti-invasion defences can be divided into gun batteries and pillboxes that provided offensive fire and anti-aircraft obstacles, minefields, beach defences and barbed wire entanglements that provided a passive defensive system. The search light batteries have already been detailed above. Two coastal gun batteries were located on Walney Island. The Hilpsford battery was recommissioned in 1940, armed with two 6-inch guns and various ancillary buildings and searchlights, manned by 370 Battery of 565 Coast Regiment. The SMP 2 policy for this section of coastline, which is very low-lying, is NAI and the site is therefore under threat of erosion. North Scale Battery (SD 173690; NMR 1489733; HER 19876 C), with a 1902 observation tower, was also mapped as part of the APM exercise for this project.

A total of 65 pillboxes were located within the study area and 15 air raid shelters were recorded as part of the APM exercise.

Three ordnance factories were located within this part of the NWRCZA study area and have been mapped as part of the APM exercise for this project. The Royal Ordnance Factory Sellafield (SD 025038; NMR 1075104) produced TNT between 1943 and 1945 and is illustrated in figure 8.13. It is now the site of the Sellafield Nuclear Power Station. The Royal Ordnance Factory Drigg (SD 055990; NMR 1075121) was manufacturing high explosives by May 1941 in a small complex to the north of the River Irt. The site is thought to be used now to store nuclear waste from Sellafield. A third factory was located at Hycemoor (SD 091891; NMR 1490893), south of the Esk estuary.

8.10 Conclusion

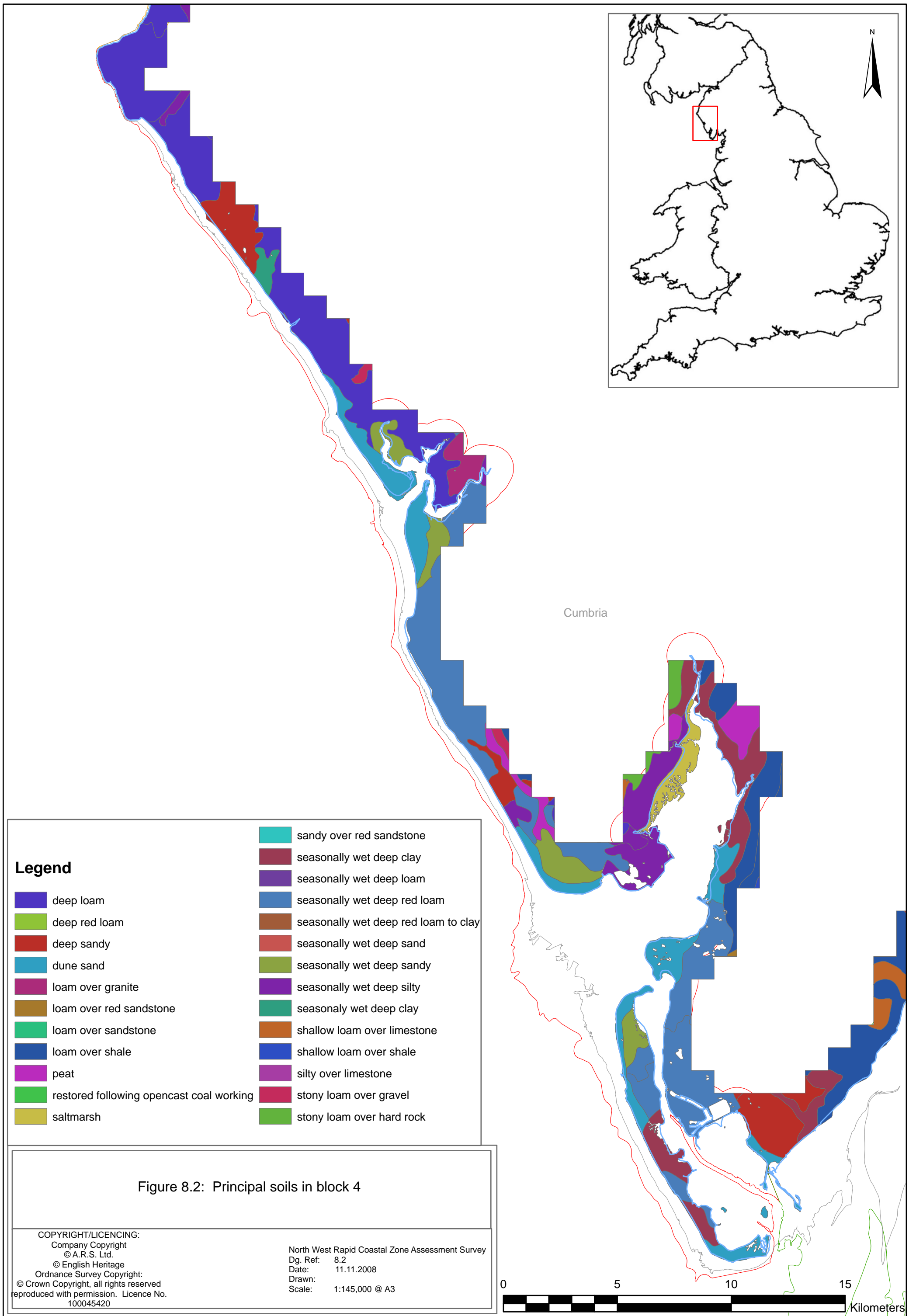
This stretch of coastline, with its varied topography, has produced evidence of both prehistoric and historic heritage assets. Evidence of Mesolithic, Neolithic and Bronze Age occupation has been discovered, predominantly as part of fieldwalking programmes in the northern part of this part of the study area for example around Eskmeals, but also further south on Walney Island. When excavated, these sites, including Williamson's Moss, Ehenside Tarn and various sites on Walney Island, significant archaeological features have been shown to survive. There is therefore significant potential for the survival of important archaeological deposits at many of the other lithic scatter sites located within this stretch of the coastline and further work on Walney Island and the Eskmeals area should be considered, particularly as they are under imminent threat from sea level rise and coastal erosion.

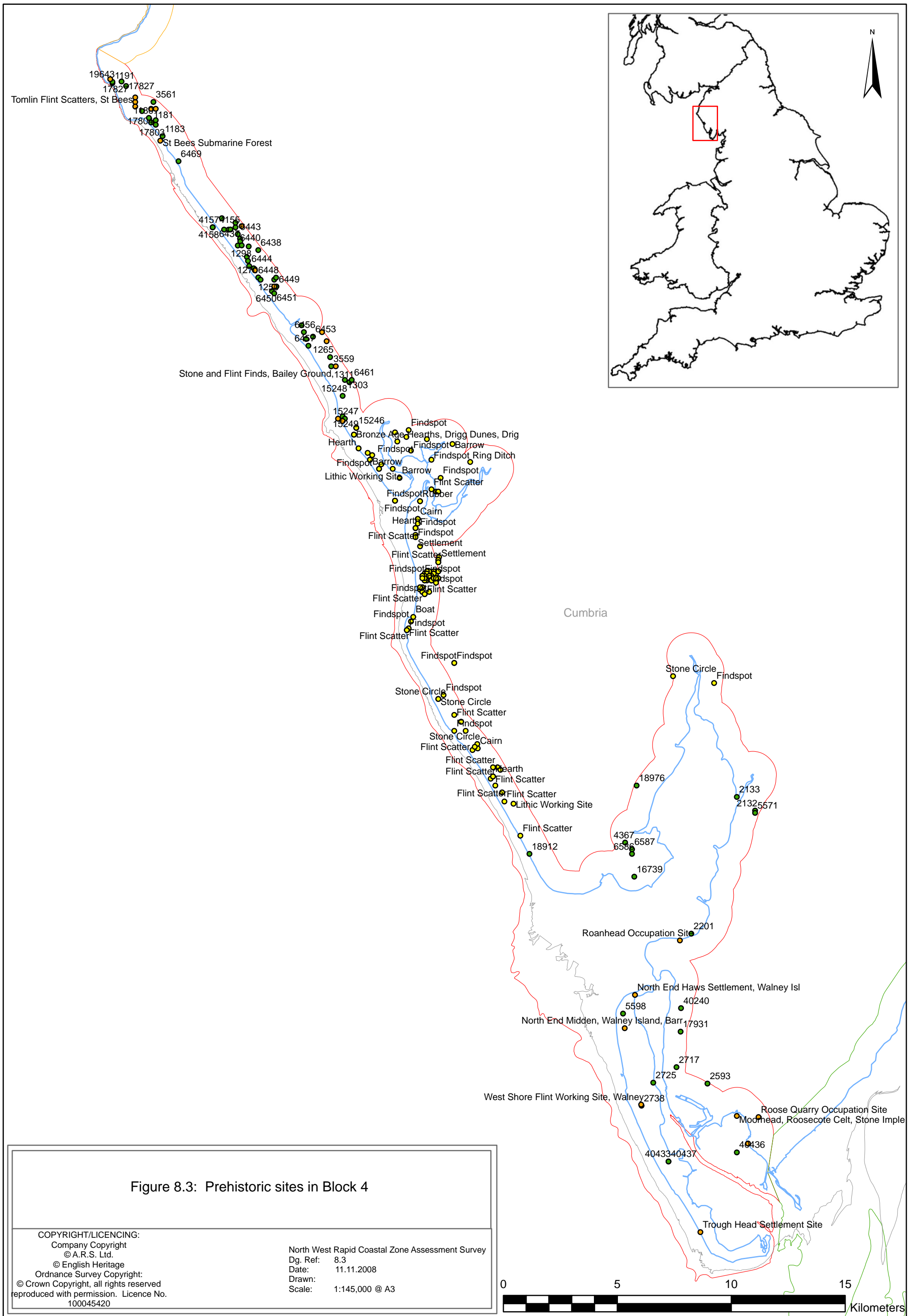
Whilst there are few Iron Age and Roman or Romano-British sites known from this stretch of coastline there are significant sites, such as the fort at Ravenglass, which are being actively eroded by the sea and the Roman bloomeries, which are important early examples of the iron working industry, which became an important part of the Cumbrian economy in later centuries. As with other parts of the NWRCZA the early medieval record is limited to a handful of ecclesiastical sites, with early Christian centres at St Bee's, Waberthwaite and Muncaster. In contrast to the limited early Christian sites there are extensive and significant assets dating from the Medieval period present within this part of the study area, with a number of church and chapel sites and the castles of Piel and Millom and the pele tower at Muncaster, as well as bloomery sites and evidence for medieval rural agriculture and settlement. Piel Castle, with its original and unusual design, is being actively destroyed by coastal erosion.

There are few significant post-medieval sites in this section of the study area, with the record being dominated by evidence of agriculture, in the form of ridge and furrow, and fishing in the form of traps in the estuaries. Industrial evidence is limited to several bloomeries and possible saltworks in the Eskmeals area, with the early development of the harbour at Barrow limited to four quays, all of which appear to have been destroyed. The development of the dock complex at Barrow in the Industrial Revolution saw the expansion of these early quays into a system to service the largest steel manufacturing industry in the country during the 19th and 20th centuries, with the expansion of the shipbuilding industry as an additional industry developing from the supply of steel and coal. Barrow's shipbuilding prowess saw it become a major target for the *Luftwaffe* and led to the port being defended by extensive anti-aircraft batteries and coastal batteries on

Walney Island, as well as within the dock complex itself. The Walney Island defenses are being actively destroyed by coastal erosion.

Overall, this section of coastline contains significant archaeological remains, particularly from the prehistoric, industrial and modern periods. These sites are often located in areas where coastal erosion is having a significant detrimental impact upon them and archaeological intervention should be seen as a priority before they are destroyed for ever.





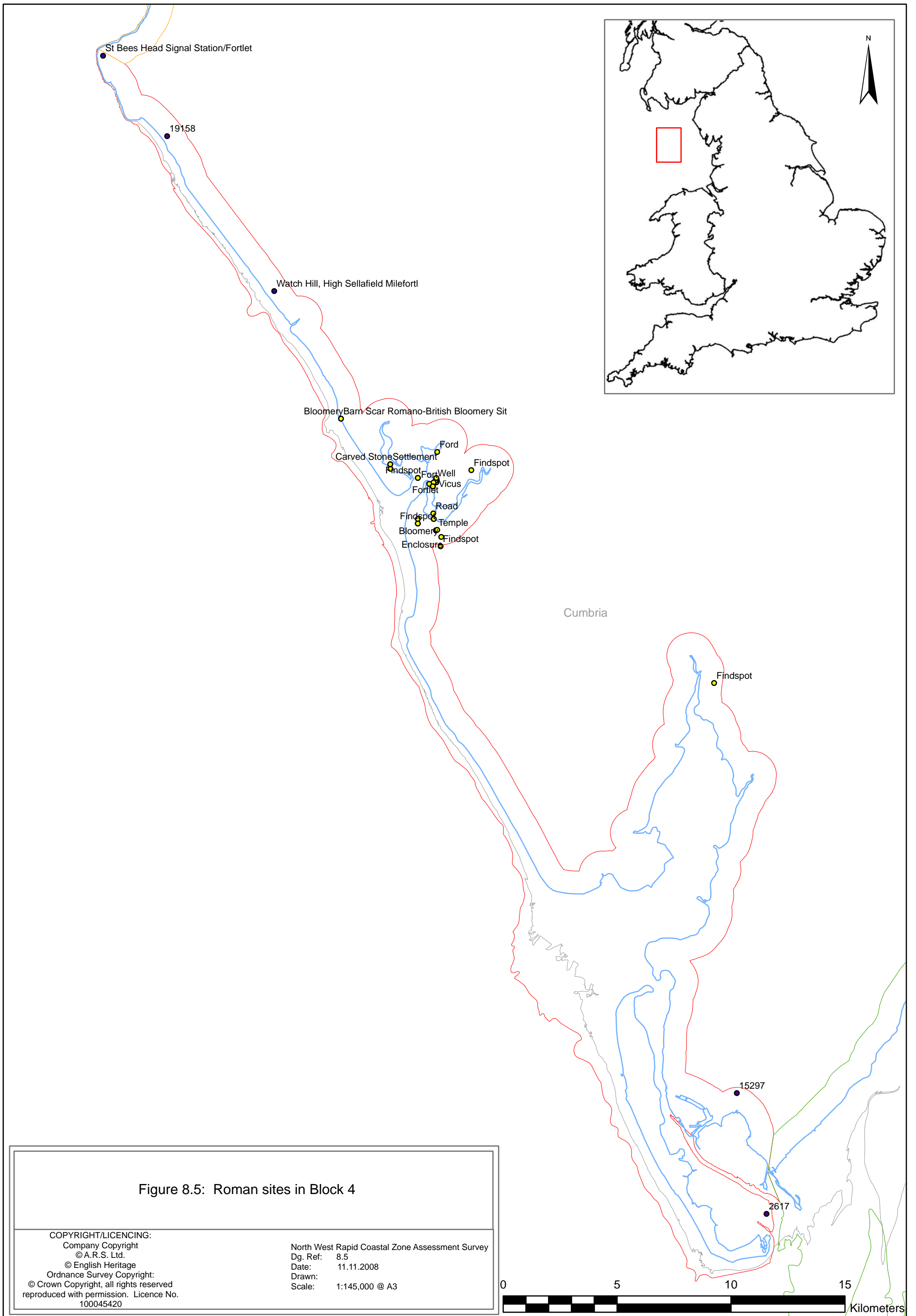


Figure 8.5: Roman sites in Block 4

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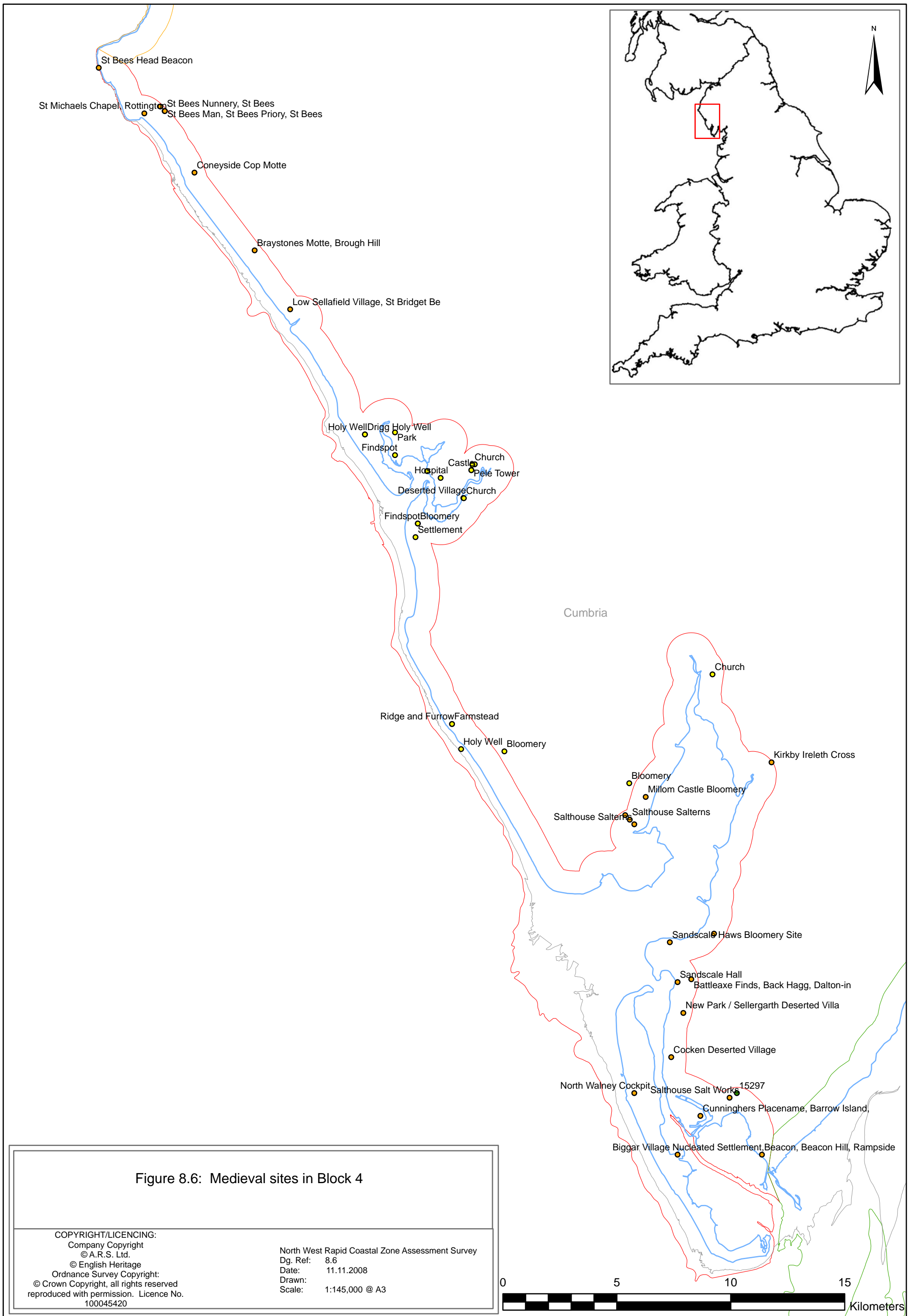


Figure 8.6: Medieval sites in Block 4

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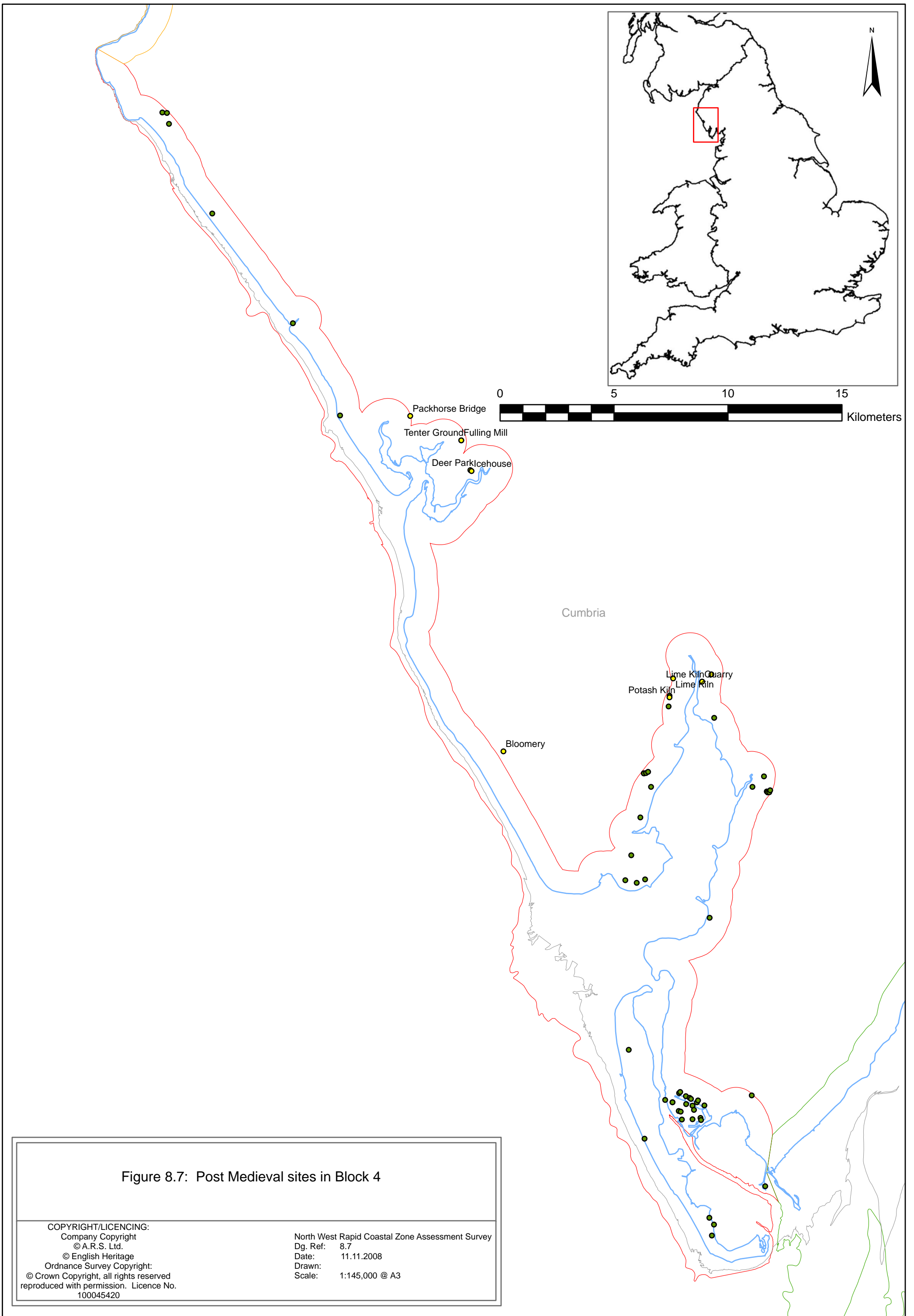
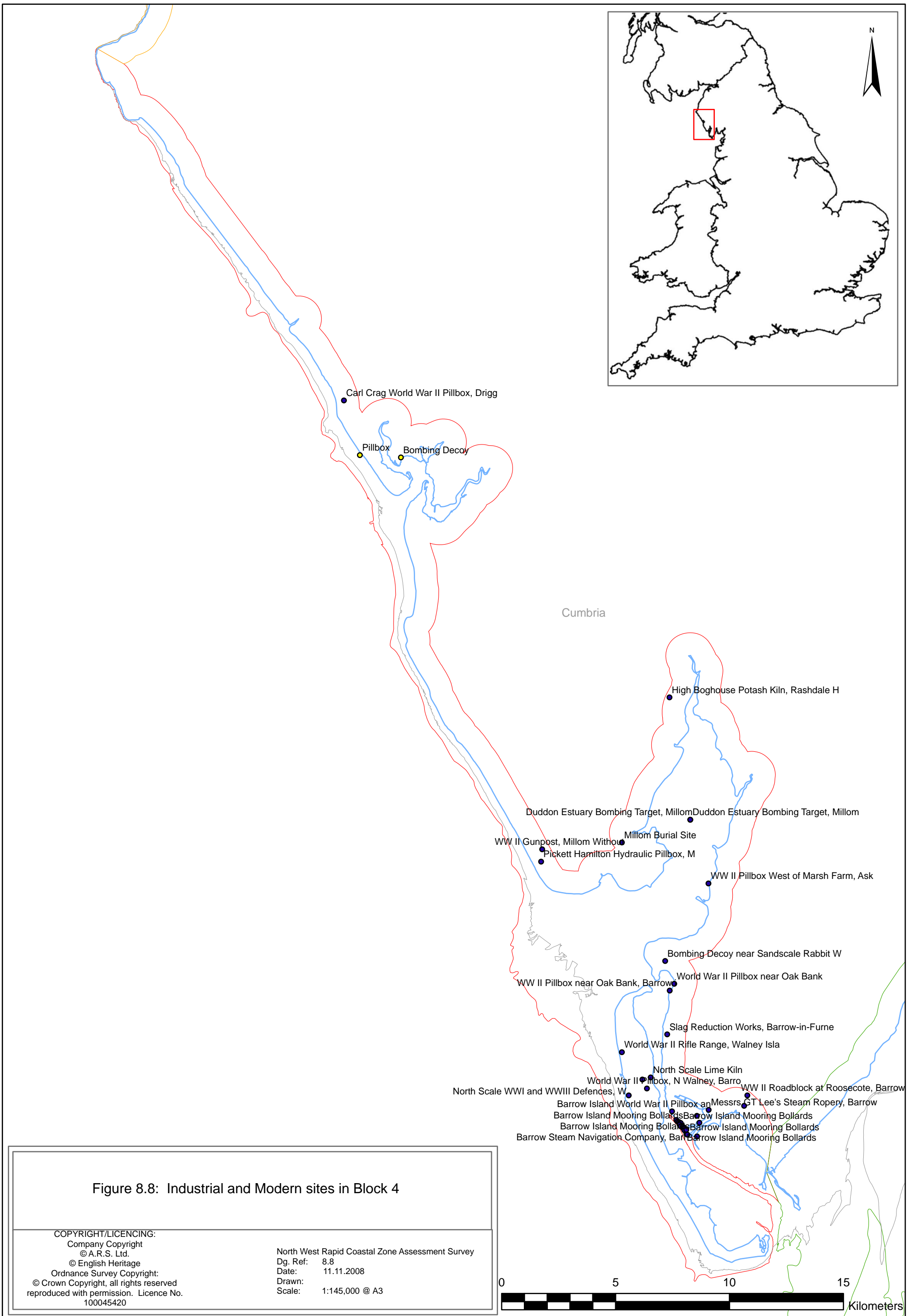
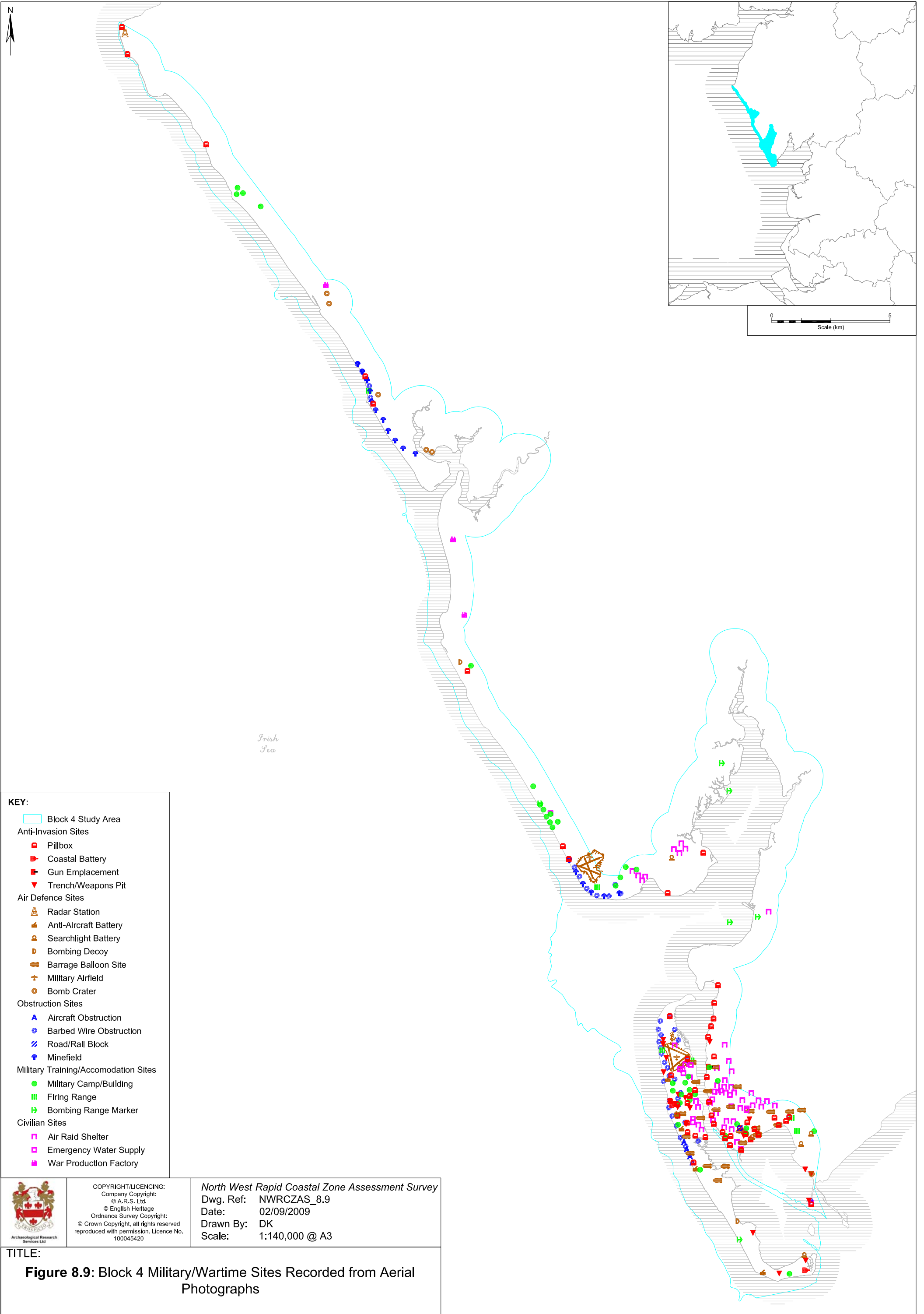


Figure 8.7: Post Medieval sites in Block 4

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KEY:

- Block 4 Study Area
- Anti-Invasion Sites**
- Pillbox
- ▣ Coastal Battery
- Gun Emplacement
- ▼ Trench/Weapons Pit
- Air Defence Sites**
- ▲ Radar Station
- ▲ Anti-Aircraft Battery
- ▲ Searchlight Battery
- D Bombing Decoy
- ▲ Barrage Balloon Site
- ✈ Military Airfield
- Bomb Crater
- Obstruction Sites**
- ▲ Aircraft Obstruction
- Barbed Wire Obstruction
- ▨ Road/Rail Block
- ▲ Minefield
- Military Training/Accommodation Sites**
- Military Camp/Building
- ▨ Firing Range
- ➔ Bombing Range Marker
- Civilian Sites**
- Air Raid Shelter
- Emergency Water Supply
- War Production Factory


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<p>TITLE: Figure 8.9: Block 4 Military/Wartime Sites Recorded from Aerial Photographs</p>		



Fig 8.10 Iron Age/Romano-British Sites in Block 4

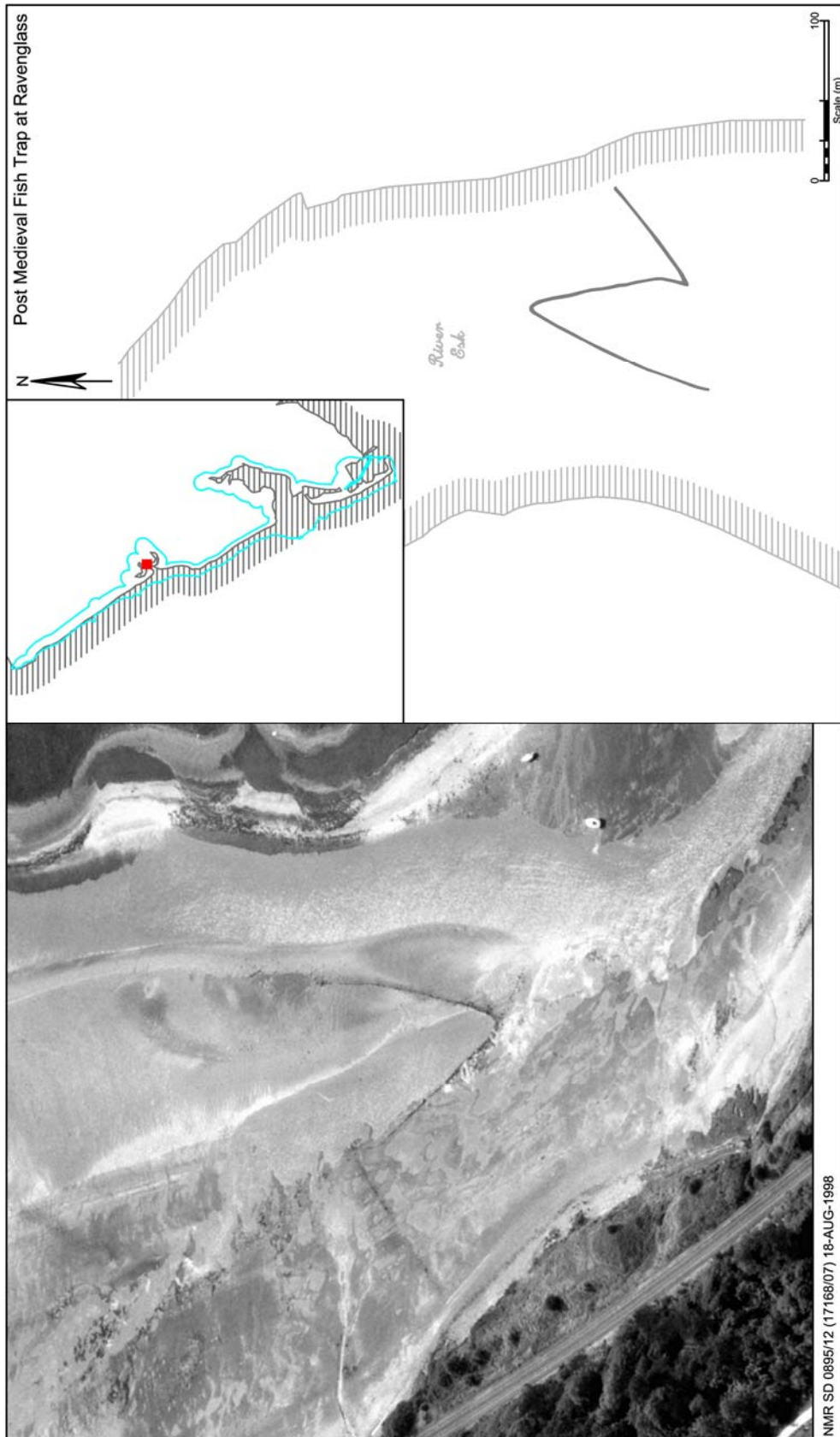
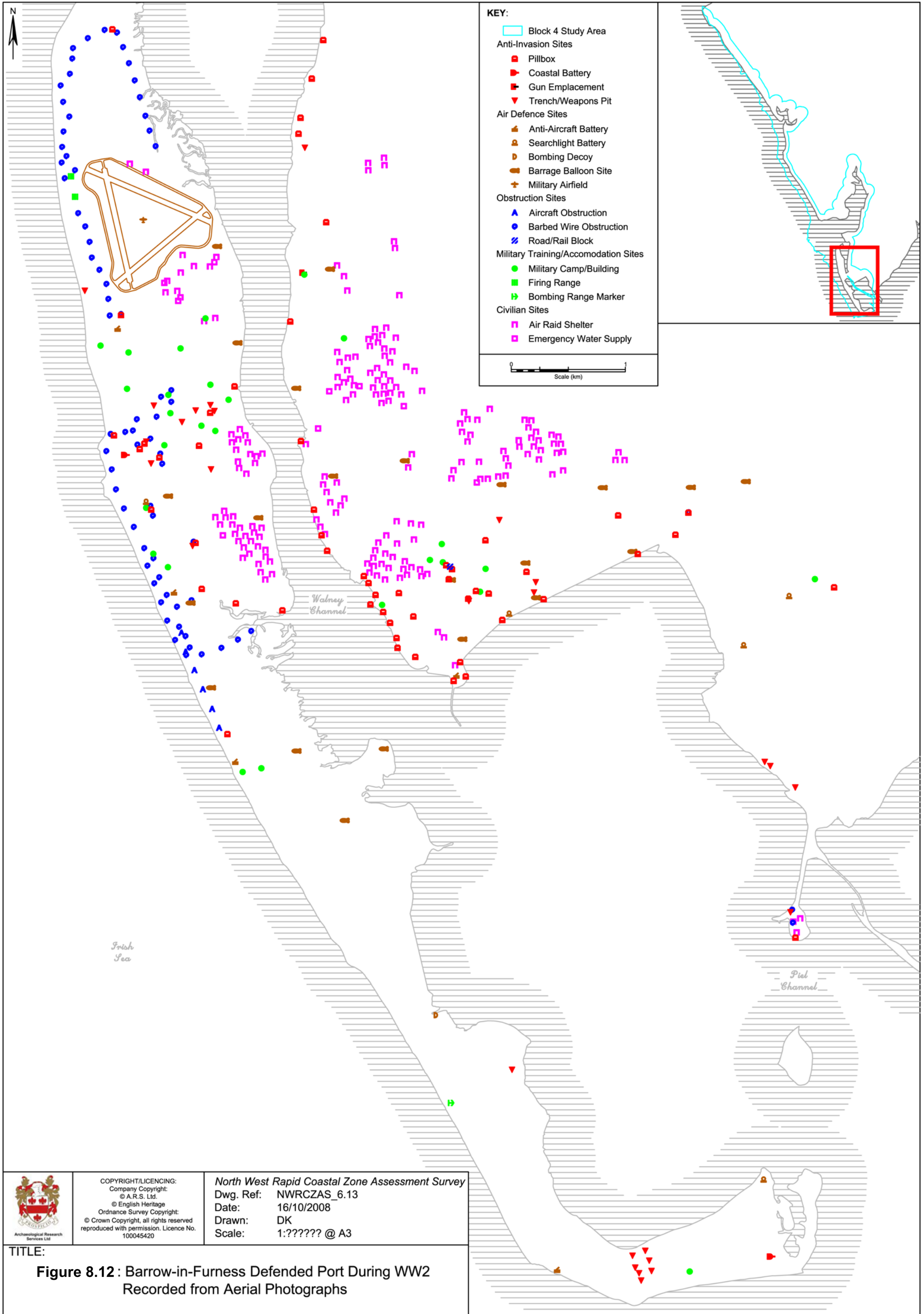


Fig 8.11 Example of a Post-Medieval fishtrap in the Esk estuary



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**Figure 8.12 : Barrow-in-Furness Defended Port During WW2
 Recorded from Aerial Photographs**

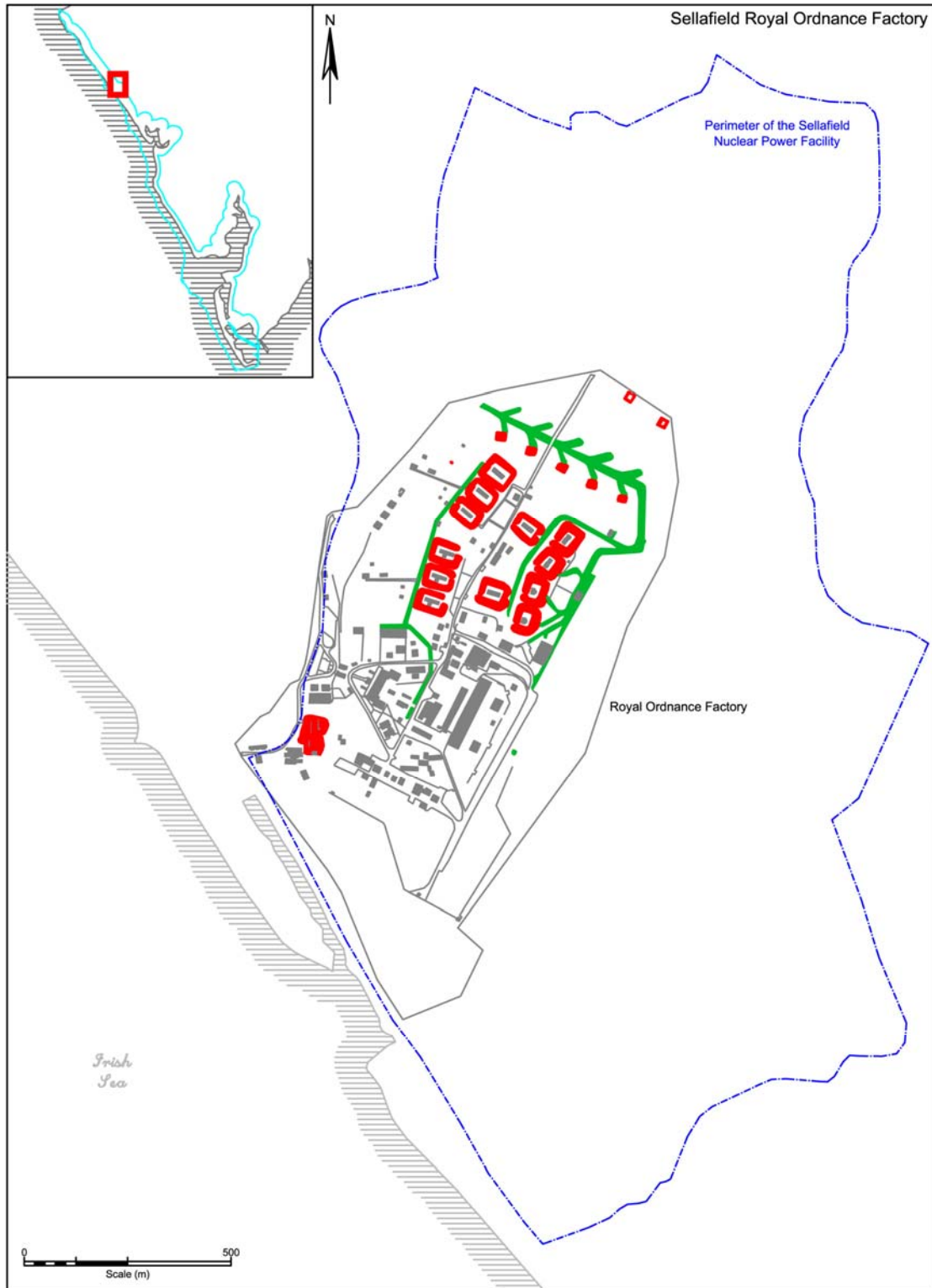


Fig 8.13 The Second World War Ordnance factory at Sellafeld mapped from aerial photography

CHAPTER 9

A REVIEW OF THE ARCHAEOLOGY FROM ST BEE'S HEAD (CUMBRIA) TO THE RIVER SARK (CUMBRIA)

9.1 Introduction

The area discussed in this chapter extends from St Bee's Head to the River Sark in Cumbria (Fig. 9.1), which demarcates the Anglo-Scottish border. This section of coastline incorporates the clifftop of St Bee's Head, at over 140m above sea level, the highest point of the NWRCZA area and the wide tidal sand and mud flats of the Solway Firth through which drains the River Eden. The only urban conurbations in this part of the study zone are the ports of Whitehaven, Workington and Maryport. The Historic Environment Record analysed for this section comprised the dataset maintained by Cumbria County Council. The SMP 2 units within this section are presented in table 9.1 and figure 9.1.

Table 9.1 Shoreline Management Plan Policy Units and preferred scenario

General Policy Unit Area	Specific Policy Unit Location	SMP Policy Unit	Preferred Scenario		
			0-20 years	20-50 years	50-100 years
St Bees to Whitehaven	St Bees Head to Saltom Pit	11e 1.1	NAI	NAI	NAI
	Saltom Pit	11e 1.2	HTL	HTL	NAI
	Saltom Pit to Whitehaven	11e 1.3	NAI	NAI	NAI
	Whitehaven South Beach	11e 1.4	NAI	NAI	NAI
Whitehaven to Workington	Whitehaven Harbour and North Beach	11e 2.1	HTL	HTL	HTL
	Bransty to Parton	11e 2.2	HTL	HTL	HTL
	Parton	11e 2.3	HTL	HTL	HTL
	Parton to Harrington Parks	11e 2.4	HTL	HTL	HTL
	Harrington Parks to Harrington Harbour	11e 2.5	HTL	NAI	NAI
	Harrington Harbour	11e 2.6	HTL	HTL	HTL
	Harrington to Steel Works Site	11e 2.7	HTL	HTL	HTL
	Steel Works Site	11e 2.8	HTL	HTL	HTL
	Steel Works to The Howe	11e 2.9	NAI	NAI	NAI
	The Howe to Workington Harbour South Breakwater	11e 2.10	MR	MR	MR
	Workington Harbour	11e 2.11	HTL	HTL	HTL
Workington to Maryport	Workington Harbour to Siddick	11e 3.1	HTL	MR	MR
	Siddick to Risehow	11e 3.2	HTL	HTL	HTL
	Risehow to Maryport Marina	11e 3.3	NAI	NAI	NAI
	Maryport Harbour/Marina	11e 3.4	HTL	HTL	HTL
Maryport to	Maryport Harbour to	11e 4.1	HTL	HTL	HTL

			Preferred Scenario		
Dubmill Point	Roman Fort				
	Roman Fort to Bank End (Maryport Promenade)	11e 4.2	HTL	NAI	NAI
	Maryport Golf Course to Allonby	11e 4.3	MR	MR	MR
	Allonby	11e 4.4	HTL	HTL	HTL
	Allonby to Seacroft Farm	11e 4.5	NAI	NAI	NAI
	Seacroft Farm to Dubmill Point	11e 4.6	HTL	NAI	NAI
Dubmill Point to Silloth	Dubmill Point to Silloth	11e 5.1	MR	MR	MR
Silloth to The Grune	Silloth Harbour	11e 6.1	HTL	HTL	HTL
	Silloth to Skinburness (open coast)	11e 6.2	HTL	HTL	HTL
	The Grune	11e 6.3	NAI	NAI	NAI
Moricambe Bay	Skinburness (east)	11e 7.1	HTL	HTL	HTL
	Skinburness to Wath Farm	11e 7.2	HTL	MR	HTL
	Wath Farm to Saltcoates including Waver to Brownrigg	11e 7.3	MR	MR	MR
	Newton Marsh	11e 7.4	MR	MR	MR
	Newton Marsh to Anthorn including Wampool to NTL	11e 7.5	MR	MR	MR
	Anthorn	11e 7.6	HTL	HTL	HTL
	Anthorn to Cardurnock	11e 7.7	MR	MR	MR
Cardurnock to Scottish Border	Cardurnock to Bowness-on-Solway	11e 8.1	MR	MR	MR
	Bowness-on-Solway	11e 8.2	MR	MR	MR
	Bowness-on-Solway to Drumburgh	11e 8.3	MR	MR	MR
	Drumburgh to Dykesfield	11e 8.4	MR	MR	MR
	Dykesfield to NTL Kingsmoor (Eden)	11e 8.5	MR	MR	MR
	NTL Kingsmoor (Eden) to Rockcliffe	11e 8.6	MR	MR	MR
	Rockcliffe	11e 8.7	HTL	HTL	HTL
	Rockcliffe to Demesne Farm	11e 8.8	MR	MR	MR
	Demesne Farm to Metal Bridge (Esk)	11e 8.9	MR	MR	MR
	Metal Bridge (Esk) to the River Sark	11e 8.10	MR	MR	HTL

NAI: No Active Intervention
HTL: Hold The Line
MR: Managed Realignment

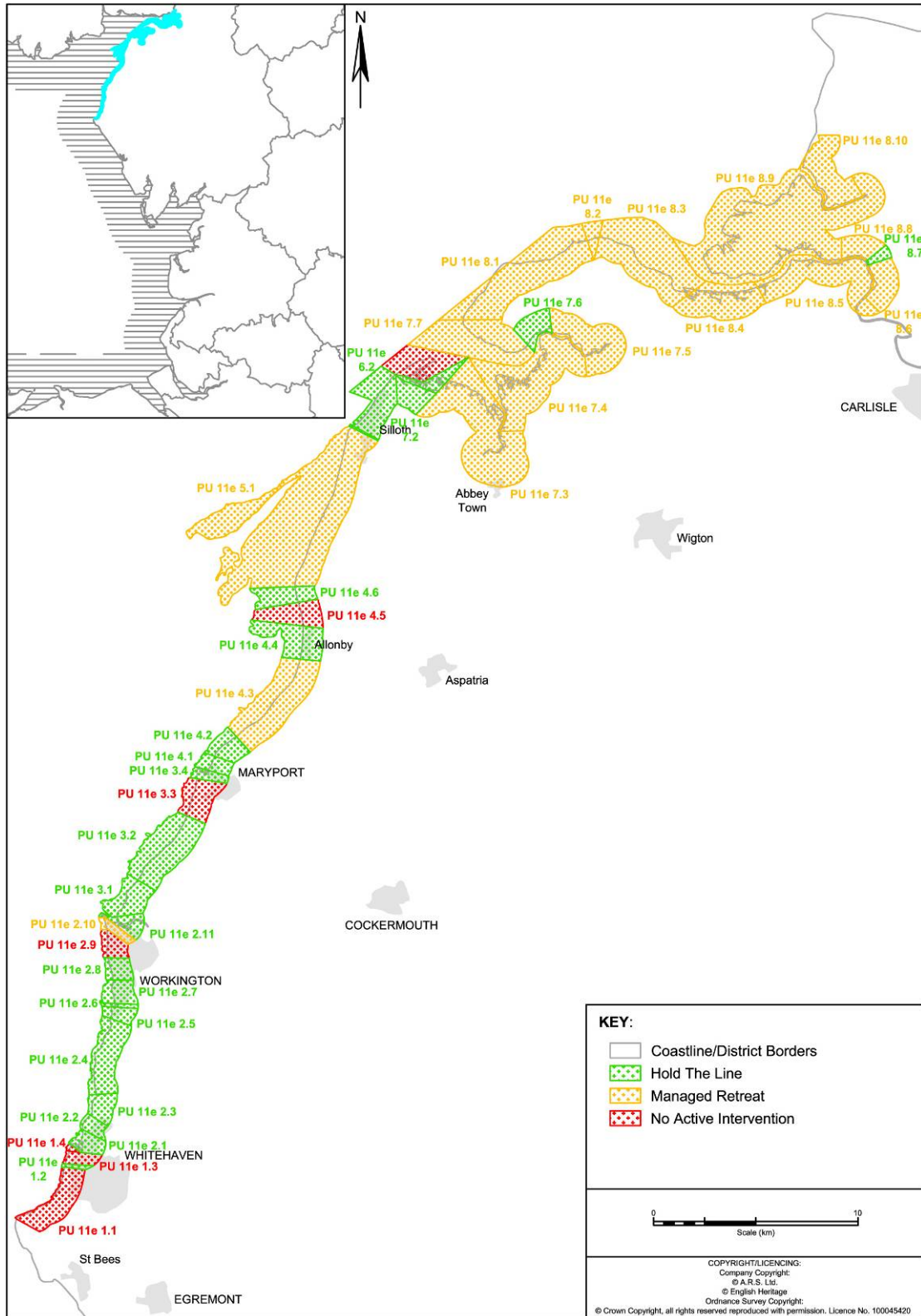


Figure 9.1 Location of Block 5 and SMP 2 policy units indicating preferred option for the next 20 years

9.2 Topography, Geology, Soils and Landuse

The dominant topographic features of this part of the study area are the high sandstone cliffs of St Bee's Head, which demarcate the southern edge of this part of the study area, and, in sharp contrast, the wide estuary and low-lying landscape of the Solway Firth. Between St Bee's Head and Workington the coastline consists of a cliff lined backshore, between 20m and 100m in height, inland of a sequence of shingle beaches sitting on rock-cut platforms, which occupy the intertidal zone. North of Workington sand and shingle beaches are backed in places by low-lying dune systems, as at Allonby. Sands and muds are located within the intertidal zone from the southern extent of Moricambe Bay and northward into the Solway Firth, backed by low shingle ridges with marshes behind. From St Bee's, the height of the study area above sea level decreases from over 140m aOD to 90m aOD above Workington (although Workington itself is predominantly situated on low-lying land on either side of the mouth of the River Derwent). North of Workington the land falls away markedly and much of the rest of the shoreline within the study zone is below 30m aOD and in many cases is below 10m aOD, particularly around the Solway Firth.

Geological mapping at 1:50,000 is only available as far north as Beckfoot, to the south of Moricambe Bay. North of Beckfoot bedrock and superficial geology mapping at 1:625,000 has been examined with a corresponding loss of resolution with regard to areas of geological classification. The St Bee's Sandstone Formation outcrops at St Bee's Head and underlies the area around Allonby Bay, outcropping immediately north of Maryport, but only over a very limited extent. Between St Bee's Head and Beckfoot a series of fractured mudstones, siltstones and sandstones overlay the Middle Pennine Coal Measures, a sequence that continues to the north of Allonby Bay around the southern shore of the Solway Firth. The superficial geology here is dominated by glacial deposits of diamicton between St Bee's Head and Allonby Bay, with raised marine sediments between Workington and Maryport, whilst for the area north of Allonby Bay (for which the resolution of the dataset is much poorer) raised marine sand and gravel deposits predominate, with isolated pockets of blown sands around Beckfoot and Silloth. Alluvial deposits are located in the estuaries of the Rivers Eden and Esk, which drain into the Solway Firth and peat deposits are located both around the northern fringes of Allonby Bay and to the north side of Moricambe Bay.

The principal soils located within this block are presented in Table 9.2 and Fig. 9.2.

Table 9.2: Soils, landuse and preservation potential St Bee's Head to the River Sark. Data derived from Farewell 2007 and NSRI database

Simple Description	Land Use (when not urban)
Seasonally wet deep red loam	Cereals and grassland. some potatoes in Staffordshire; grassland In the Northern Region
Deep loam	Dairying and stock rearing on permanent and short term grassland; some arable crops where flood risk low.
Seasonally wet deep silty	Cereals and permanent and short term grassland in Cumbria. arable and horticultural crops in the Fens.
Saltmarsh	Saltmarsh habitats some summer grazing; recreation
Deep sandy	cereals. sugar beet and potatoes; dairying on short term grassland in Cheshire and Wales
Peat	Lowland bog and wet moorland habitats of low grazing value, some coniferous woodland; peat extraction

Simple Description	Land Use (when not urban)
Seasonally wet deep red loam to clay	Dairying on short term and permanent grassland. some cereals in drier districts
Dune sand	Sand dune and some wetland habitats: recreation; very limited agriculture and coniferous woodland: some gravel extraction in the South East Region.
Seasonally wet deep loam	Stock rearing and some dairying on permanent grassland; grassland and winter cereals in drier lowlands
Restored following opencast coal working	Permanent grassland and some cereals
Loam over sandstone	Stock rearing and dairying: some arable land and coniferous and deciduous woodland

The dominant landuse in this area is agriculture, predominantly pastoral, with remnants of the shipbuilding and coal mining industries at the towns of Whitehaven, Workington and Maryport, all of which are undergoing transformation to a more tourist driven economy.

9.3 Early Prehistory: Palaeolithic and Mesolithic (Fig. 9.3)

9.3.1 Palaeolithic sites and findspots

There are no Palaeolithic sites or findspots listed within the HER data for this stretch of coastline. A single Mesolithic site (NX 946149; HER 3678 C) was recorded near the cliff edge at St Bee's in the early 1970's. Two further small scatters have since been recorded to the north and south of this site (Cherry 1983).

9.4 Later Prehistory: Neolithic, Bronze Age and Iron Age (Fig. 9.3)

9.4.1 Neolithic sites and findspots

There is evidence for one Neolithic burial within this part of the study area, found during excavations of Roman signal tower 21b in the late 19th century, which consisted of humans remains and associated finds (Robinson 1880). A further 14 findspots of Neolithic artefacts, predominantly of stone axes are known from this stretch of coastline.

9.4.2 Bronze Age sites

The Romano-British settlement at Ewanrigg (NY 0353352; HER 791 C), above Maryport, may have a Bronze Age precedent. Bewley (1992) records that a pit containing barley was radiocarbon dated to the late 2nd millennium BC. However, no other features on the site were known to pre-date the Romano-British period.

Seven Bronze Age burial sites are located within this part of the study area, four mentioned in the HER and three new sites, were found as a result of the aerial photographic mapping for the Hadrian's Wall NMP project. At Ewanrigg, near Maryport a Bronze Age cremation cemetery (NY 03403515; HER 13691 and 3692 C) was found whilst fieldwalking a Romano-British settlement site. Excavations found 26 cremation and two inhumation burials, the inhumations being associated with a Beaker and a Food Vessel which had been disturbed in antiquity. Collared Urns and Food Vessel pottery were also found, in association with a clay "connecting rod" used in a furnace for producing metalwork (Bewley 1992). At Moresby Hall (NX 9835020955; HER 1019 C) four skeletons were found when alterations were made to the entrance hall in 1860. These may be Bronze Age, or possibly burials associated with the nearby Roman fort. Two other burial sites were also located around Moresby but both were destroyed in

antiquity. In 1838 a labourer, working on road improvements found an urn containing bones (NX 9820; HER 6238 C) and the slope of the road apparently suggested that a barrow had been cut through by the road. Also, sometime in the 19th century, a labourer clearing stones from a field found a large cream pot containing cremated bones (NX 983209; HER 6239 C). Over 600 cartloads of stone were removed, suggesting a sizeable cairn had been destroyed. A further barrow (NY 03393501; NMR 926094) is located close to Ewanrigg and two barrows (NY 10225070; NMR 1471465; and NY 10485088; NMR 1472004) are located in close proximity to each other near Wolsty Hall, south of Silloth.

9.4.3 Bronze Age findspots

A total of seven Bronze Age findspots are located along this stretch of coastline which consist of bronze and stone weapons as well as flint tools.

9.4.4 Iron Age sites and findspots

A hillfort is located at Swarthy Hill (NY 06934029; SAM 27727; NMR 9143; HER 609 C), north of Maryport and overlooking Allonby Bay (Fig. 9.10). The southern and eastern limits of the site are visible on aerial photographs, although no trace is visible on the ground. The site measures approximately 130m from north to south with an internal measurement of around 70m. A putative entrance is located to the south-east. The hillfort was the focus of an excavation in the late 1980's which confirmed that significant buried deposits still survive at the site. Two of the three ditches were excavated. The outer ditch measured 3m in width and 0.8m in depth and the inner ditch, which measured over 5m in width and 1.3m in depth, was separated from the inner two by the remnants of a clay and turf bank. No diagnostic pottery was recovered, although flint flakes and charcoal were found, which mean the site may well have been used in the Neolithic and/or Bronze Age periods (Bewley 1992). The north-west limit of the site is not known and the cliff in this area has been lost to erosion by the sea. The site is a Scheduled Ancient Monument. The SMP 2 policy for this area is MR. The gaining of an understanding of the later Iron Age is highlighted by the NWRRF as an important research aim. The NWRRF states in initiative 3.8;

“There is a need for stratified and dated material from all LPRIA sites, including...hilltop sites...rigorous application of sequences of radiocarbon dates are required to produce secure chronologies”

And Initiative 3.9;

“There is a need to look for any evidence for the fortification, or re-fortification, of enclosed sites...and for evidence of either continuous occupation or abandonment”

The Swarthy Hill hillfort, located within the Hadrian's Wall frontier system is presently being destroyed and the SMP 2 policy of MR as well as the aims of the NWRRF would appear to make this a prime candidate for further archaeological intervention

A defended enclosure is located at Salterbeck (NX 991258; SAM CU533; NMR 8582; HER 4403 C) on the south side of Workington. The site is situated on a promontory and consists of two concentric ditches and a rampart, defining an inner area measuring 70m north-south and 55m east-west. The site appears to have been eroded by ploughing on its north-east side. In addition a curvilinear enclosure is located at Crosscannonby (NY

07763998; NMR 8979; HER 3693 C), less than a kilometre east of the Swarthy Hill hillfort. It is formed by a broad ditch and encloses a sub-oval area measuring 71m north-south and 82m east-west. No excavations have been undertaken at these sites but they are interpreted as enclosures dating to the Iron Age based upon their morphology.

The area around Wolsty, to the south of Silloth, is particularly rich in Iron Age sites (Fig. 9.10). North of Wolsty Hall an oval enclosure (NY 10455110; SAM CU6; NMR 9664; HER 350 C) is visible on aerial photographs and was excavated in 1958. The enclosure, which measures 71m east-west and 60m north-south, was defined by a timber palisade with an external ditch and single entrance on the north-east side. An internal hut circle, measuring 11m in diameter, had opposed entrances, a cobbled floor encircled by a turf wall and four central timbers to support the roof structure (Blake 1960). No direct dating evidence was recovered from the excavation but Hadrianic pottery was found in the upper fill of the ditch, suggesting the site is pre-Roman in origin. The site is also associated with later, Romano-British, field systems and an enclosure, which are discussed below. Approximately 250m to the south a second curvilinear enclosure (NY 105509; SAM 27663; NMR 9683; HER 6053 C) with associated field system has been located. Measuring 58m east-west and 65m north-south, the entrance on the west side leads to a trackway which runs west for over 160m. Internal divisions are also visible within the enclosure. 350m to the south a rectilinear enclosure (NY 105505; NMR 9684; HER 9598 C) may be connected into the same field system as the previous enclosure. Measuring 59m east-west by 33m north-south, it contains a second, inner enclosure, which measures 18m square. Also near Wolsty, a series of three overlapping sub-rectangular settlement enclosures (NY 10294991; SAM CU13; NMR 9533; HER 608 C) with a possible hut circle are visible on aerial photographs.

A second cluster of enclosures and associated field boundary systems are present in the area around Beckfoot. A curvilinear enclosure (NY 09044763; NMR 9122; HER 3183 C) is situated at the southern end of the cluster and could be a settlement nucleus, with annexes surrounding the main enclosure which measures 46m east-west and 40m north-south. Large pits were also visible on aerial photographs. Two rectilinear enclosures (NY 09284766; NMR 9125; HER 3186) are located around 100m to the east. Both are around 25m in width but are not fully visible on aerial photographs. Around 600m further north the corner of another rectilinear enclosure (NY 09154827; NMR 9124; HER 3185 C) has been mapped. Two further rectilinear enclosures (NY 09314891; NMR 926311 and NY 09424916; NMR 9126; HER 3187 C), both with associated field systems are located a further 640m north and 900m north respectively. The former measures 22m square whilst the latter measures 20m by 10m and is situated between two lines of field boundaries which run east-west for almost 300m. A further sub-rectangular enclosure is located at Hall Farm, Crosscannonby (NY 072395; NMR 1466731; HER 812 C). Its morphology appears almost rectangular with rounded corners, which suggests a Roman camp, rather than an Iron Age site. One of the rounded corners was mapped as part of the Hadrian's Wall NMP. Two further curvilinear enclosures with associated features have also been recorded from aerial photography at Crosby (NY 06343834; NMR 1466720) and Allonby (NY 087433; NMR 926375). These are most likely Iron Age or Romano-British in origin and are recorded as "prehistoric" within the AMIE database. Twenty-one further, more isolated sites, listed as Iron Age/Roman have been mapped as part of the Hadrian's wall NMP and for this project. They are predominantly boundaries and field systems, although some have associated small enclosures.

A palisade, found by peat diggers in 1903, was located south-west of Bowness-on-Solway. One metre long stakes were driven 0.3m into the sand and protruded by a further 0.7m, cut to a uniform height. The site was overlain by over 2m of peat deposits but no direct dating evidence was recovered (Hodgson 1904). The dating of the site is therefore hypothetical.

9.5 Roman and Romano-British (Fig. 9.5)

9.5.1 Roman military sites

The major Roman site within this section of the study area is Hadrian's Wall, which runs east from Bowness-on-Solway to Wallsend on the east coast, although only the section between Bowness-on-Solway and Burgh-by-Sands is present within the study zone. However, the defences continued west and south from Bowness-on-Solway, where a series of watchtowers, milefortlets, roads and other defensive features, punctuated by forts at Drumbrugh, Beckfoot, Maryport, Burrow Walls and Parton, maintained surveillance along the exposed coastline as far south as St Bee's Head (Higham 1986). The World Heritage Site of Hadrian's Wall encompasses this defensive system as far south as the fort at Maryport. Comprehensively reviewing this extensive system is beyond the remit of this project and emphasis is, of necessity, placed upon the sites which are deemed most significant for this project, primarily due to their risk of erosion.

Excavations at *Congavata*/Drumbrugh (NY 26475987; HER 387 C) revealed a clay and timber earlier fort, which had been replaced by a later, smaller version, constructed in stone. It is one of the least well-known of the wall forts and it has been recorded that the foundations of the fort and much of the defences had been removed in the later part of the 19th century (Whelan 1860). The excavations in 1899 and 1947 seem to refute this evidence and recent work by North Pennines Archaeology in 2003 found heavily truncated evidence for the fort during a watching brief through the fort interior (NPA unpub). No evidence for the fort was mapped as part of the Hadrian's Wall NMP.

Little of the fort at *Bibra*/Beckfoot (NY 08964884; SAM CU255; NMR 9087; HER 625 C) survives as surface expression but internal details are still clearly visible on aerial photographs and have been mapped (Fig. 9.11), along with the extensive *vicus* (NMR 9087; HER 626 C) which survives to the north and south of the fort, as part of the Hadrian's Wall NMP. The site is situated on a low-lying sloping ground with the highest point on the western edge which overlooks a low till sea cliff. The site is not considered to be at risk of erosion in the near future however (M. Collins, pers. comm.)

The fort at *Alauna*/Maryport (NY 03873723; SAM 27746; NMR 9001; HER 4494 C) is situated on a till-capped sandstone ridge at 50m aOD (Fig. 9.11). Although extensively robbed for stone, much of the fort still survives, and the ramparts still stand to over 3m high in places. Built around 122 AD the site has seen numerous excavations, the earliest of which, in 1870, found the largest number of Roman inscriptions on a series of altars which had been deliberately buried to the north-east of the fort (Birley 1961). The fort has a number of associated features surrounding it including a parade ground to the south (NY 03743705; HER 828 C), a possible temple, seen in the eroding cliff face to the west (NY 03823742; HER 825 C), from a location near which an altar (HER 793 C) and other finds (HER 19309) have been found eroding from the cliff face. Further finds and/or features may also be present within this cliff slope to the west of the fort. To the north of the fort the largest *vicus* (NY 04143745; SAM 27746; NMR 926084; HER 4494 C) associated with the frontier has been revealed by excavation and geophysical

prospection (Biggins *et al.* 2000). The SMP 2 policy for this location is HTL for the next 20 years although thereafter NAI is proposed as sea defences fail.

The fort at Burrow Walls (NY 00360040; SAM CU292; HER 841 C) between Workington and Seaton, lies almost wholly outside the landward boundary of the study area. Approximately a third of the site has been destroyed by a railway cutting which runs north-south through the western part of the fort. The focus of excavation in 1955 it appears to have been Hadrianic in origin, with a smaller, later fort contained within it (Bellhouse 1955).

The fifth and final fort located within this part of the study area is located at Moresby (NX 982210; SAM CU277; NMR 8593; HER 1009 C) and has been identified as *Gabrosentum* (Rivet and Smith 1979). The full extent of the fort has been mapped as part of the APM exercise for this project. The site is located on a low till ridge overlooking Parton Bay. Limited excavation in the mid-20th century found two altars, as well as inscribed stones, one with a Hadrianic inscription. All the Roman forts within this part of the study area are Scheduled Ancient Monuments and those at Maryport, Beckfoot and Drumburgh lie within the Hadrian's Wall World Heritage Site.

A total of 64 milefortlets, turrets and signal towers are located within this section of the study area and a full list can be found in Appendix I. Of these 22 are hypothetical, being recorded where they would be expected to be located within the defensive system, although no evidence for the sites at these locations has been revealed. Milefortlet 15, a Scheduled Ancient Monument, located immediately south of Beckfoot, is recorded in the HER as known from aerial photographs, although it was not mapped as part of the Hadrian's Wall NMP and excavations there in 1954 did not find evidence of the fortlet (Bellhouse 1954). In 1978 features relating to the fort were visible as surface expression and material was noted eroding from the fortlet at the high tide line (Bellhouse 1981). The site therefore appears to be at further risk of coastal erosion (see also Beckfoot Cemetery below) as the SMP 2 policy in this location is MR. Milefortlet 17, at Dubmill Point, on the north side of Allonby Bay, has been mapped from aerial photographs as part of the Hadrian's Wall NMP. Its western extent lies underneath the B5300 and within the area of modern sea defences. Any work on the sea defences in this area could have an impact on any surviving western extent of the milefortlet. The SMP 2 policy in this area is HTL for the next 20 years with a change to NAI dependent upon the outcome of further study. HTL may require work on the sea defences which could impact upon the remains of the milefortlet. Few Roman structures have been recorded in the Allonby Bay area. The next known feature is milefortlet 20, at Lower Mire. The reason for this gap is unclear, but could be due to coastal erosion having destroyed sites within Allonby Bay. NWRRF Initiative 3.7 states "absence of known distributions should not be regarded as genuine gaps and should be addressed positively through site assessments and evaluations" (Brennand 2007, 57). The SMP 2 policy in this area is HTL, although this will only be activated when the village of Allonby is at significant risk of flooding. Further erosion and/or the construction of sea defences in this area could impact on this section of the Roman frontier. Milefortlet 20B at Swarthy Hill, to the immediate north of the Swarthy Hill hillfort, is also under threat as it lies very close to the cliff edge which is actively eroding. The SMP 2 policy at this location is MR.

Surviving sections of Hadrian's Wall and the *vallum* have been mapped from aerial photographs between Drumburgh and Bowness-on-Solway. None are at immediate risk

of erosion although the landscape in this area is only a few metres above sea level and they would be threatened by a significant rise in sea level. They are presented in table 9.3.

Table 9.3 Hadrian's Wall

NMR No.	Grid Reference	Site Type
9697	NY 1903 6078	Frontier defence
1008193	NY 2093 6199	Frontier defence
1009473	NY 1701 5817	Frontier defence
1011421	NY 2354 6207	Vallum
1011422	NY 2342 6213	Vallum
1011434	NY 2460 6123	Vallum
1011436	NY 2449 6133	Vallum
1011437	NY 2433 6148	Vallum
1011438	NY 2425 6157	Vallum
1011439	NY 2409 6173	Vallum
1011441	NY 2400 6181	Vallum
1370061	NY 2584 6008	Vallum
1369954	NY 2560 6096	Wall
1369958	NY 2567 6068	Wall
1374925	NY 2449 6137	Wall

Roman roads have been mapped around Bowness-on-Solway, where they are associated with Hadrian's Wall, as well as at Beckfoot fort and running north from Maryport fort. The line of the road running north from Maryport lies within 50m of the cliff edge around Swarthy Hill and could be at risk of future erosion in this area. The SMP 2 policy in the vicinity is MR. Full details of the roads present within the study area are presented in table 9.4.

Table 9.4 Roman Roads

NMR No	Grid Reference	Site Type
1374781	NY 2361 6210	Road
10123	NY 2235 6257	Road
10048	NY 2295 5732	Road
1364016	NY 2305 5747	Road
1364013	NY 2335 5725	Road
1009473	NY 1701 5817	Road
9087	NY 0896 4884	Road
1326393	NY 0396 3718	Road
938805	NY 040 374	Road

A temporary camp is located at Knockcross, Bowness-on-Solway (NY 23026272; SAM 26036; NMR 10085; SMR 158 C). Mapped from aerial photographs as part of the Hadrian's Wall NMP, it encloses 0.6 ha with entrances to the east and west. The site lies at 4m aOD and is at serious risk of erosion from coastal processes. Assessment of the GIS data indicates that the northern limit of the site has apparently been lost already. The site is a Scheduled Ancient Monument and the SMP 2 policy for this area is MR.

9.5.2 Other Roman sites

There are seven Romano-British enclosures mapped from aerial photography within this part of the study area, as well as three possible enclosures. At Ewanrigg (NY 03463520;

SAM 27667; NMR 9002; HER 791 C) a double-ditched enclosure measuring 120m north-south and 90m east-west was mapped as part of the Hadrian's wall NMP. It was the focus of excavation in the mid-1950s and the mid-1980s (Bewley 1992). These excavations demonstrated that the site was occupied during the second to the fourth centuries AD and may have had Bronze Age precedents (see 9.4.2 above). A much smaller rectilinear settlement (NY 03413506; NMR 926038) is located to its south-west. Further Romano-British domestic sites are located in this part of the study area At Mealo Hill, above Allonby Bay, a small, 9m square rectilinear enclosure is associated with a large field system (NY 086414; SAM CU181; NMR 9140; HER 631 C) which covers around 10 hectares. At Belmont House, less than a kilometre south of Beckfoot fort a rectilinear enclosure (NY 09004792; SAM 21664; NMR 9105; HER 604 C) was mapped as part of the Hadrian's Wall NMP. A possible enclosure (NY 08994790; HER 592 C) is mentioned in the HER at Bank House, located around 150m south-west, although this was not mapped as part of the Hadrian's Wall NMP. At Wolsty Hall a large rectilinear enclosure (NY 10545115; SAM 27662; NMR 9664; HER 350 C) measuring 65m east-west and 45m north-south is associated with an extensive, possibly multi-phase field system encompassing over 10 hectares. A rectilinear enclosure was mapped at Silloth (NY 115537; NMR 6976; HER 4196 C) which formed the focus of excavations in 1977 prior to the destruction of the site by housing. A univallate enclosure, 0.6 ha in extent defended a solitary roundhouse and was associated with a field system extending to the north. The site may be a continuation of that to the north where a second, larger enclosure (NY 11355403; SAM 27735; NMR 9687; HER 6487 C), measuring 150m east-west is located. Approximately 80m north of Milefortlet 9 on Grune Point the HER records a sub-rectangular enclosure (NY 13045621; HER 6908 C), smaller than the milefortlet, which is visible on aerial photographs. This site was not mapped as part of the Hadrian's Wall NMP. To the immediate south-east of Knockcross temporary camp the HER located an area of cropmarks denoting a settlement (NY 231626; HER 3293 C). No features were recorded in this area as part of the Hadrian's Wall NMP. None of the above enclosures are considered at risk of erosion from coastal processes and most lie over 500m from the present high tide line.

Beckfoot Cremation cemetery (NY 08654850; HER 591 C) is located 400m south of the Roman fort, adjacent to the location of Milefortlet 15. The site has been known about for over a hundred years and was revealed by coastal erosion. The first excavation revealed a funeral pyre in 1948 (Hogg 1949). Continuing erosion has produced further finds of pottery, wood and metalwork. Whilst the HER states that erosion and shifting dunes have obliterated the site recent geophysical survey and trial trenching suggests otherwise, with finds of coins and other material. *British Archaeology* magazine for September-October 2009 records that as recently as June 2009 a complete pottery vessel containing cremated human bone was found on the foreshore. Coastal erosion in this location has been recorded at over 0.3m a year by English Heritage and milefortlet 15 (mentioned above), may have already been completely eroded. The site is obviously of enormous importance, particularly given that little is known of the cemeteries associated with the Roman frontier defences and, given the years of erosion, which may have seen over 30m of land lost to the sea, the site is seen as a priority for further work. The SMP 2 draft policy for this section of coastline is MR.

A further small cremation cemetery (NY 17505993; HER 357 C), situated 100m north of Milefortlet 4, was excavated in 1954. Traces of one cremation, with associated pottery and metalwork, as well as traces of two further possible cremations were found (Bellhouse 1955).

The importance of such cremation sites was indentified in the NWRRF, which stated in Initiative 3.36;

“Wherever identified, cremated remains should receive full and integrated analysis to investigate the range of practices and their distributions and associations” (Brennand 2007, 68).

Clearly the site at Beckfoot is in need of urgent archaeological intervention.

9.5.3 Roman maritime sites

A possible coastguard tower (NY 082435; HER 17811 C) is mentioned in the HER. The tower was the focus of geophysical survey in 1983 but the survey revealed no traces of such a feature (NMR Excavation Index 1031246). A possible wharf (NY 03263611; HER 829 C) was found in Maryport in the early 20th century. The substantial wall, running 250m north-south, before turning at ninety degrees and heading west for a further 100m metres was apparently mirrored on the north side of the river (Bailey 1923). This area is now built over.

9.5.3 Roman findspots

A total of 31 Roman findspots are located within the study area predominantly of coins, altars and pottery.

9.6 Early Medieval (Fig. 9.6)

9.6.1 Ecclesiastical sites

Two churches with early medieval origins are known from this part of the study area at St Michael’s, Workington (NX 99732895; LB 72305; HER 1011 C) and St John’s, Crosscannonby (NY). St Michael’s was devastated by fire in 1994, which gave an opportunity to excavate the interior of the church. The 12th century floor plan was revealed during the excavations, along with inhumation burials, as well as three early medieval fragments of sculpture, which included one cross fragment. This brought the total of surviving 8th to 11th century sculptural fragments at St Michael’s to twelve, demonstrating the importance of the locale of St Michael’s Church in the early Christian period.

A complete wheel-head cross (NY 3589361616; LB 77942; HER 195 C) of tenth century date, decorated with knotwork and two animal carvings stands in the grounds of St Mary’s Church, Rockcliffe. It is Grade I Listed. A further fragment of 10th century sculpture (NX 99132564; HER 1013) was found at Harrington, south of Workington in 1923. Neither of these sites is at risk of coastal erosion.

9.6.2 Other Early Medieval sites

Placename evidence suggests that a possible early medieval saltworks was located at Salta, near Mawbray (NY 077499; HER 41704 C). The placename evidence is obvious but it has been suggested that the actual salt making site has been lost to coastal erosion (Cranstone 2006).

9.7 Medieval (Fig. 9.7)

9.7.1 Medieval Ecclesiastical sites

There are five churches within this section of the study area that are medieval in origin. The chapel of St John's (NY 13665644; HER 345 C) was located at Grune Point, north of Skinburness. According to the HER it was still standing in 1704, and was the focus of excavations of an unknown date which found a large number of internments. The SMP 2 policy for Grune Point is NAI and the site is at continuing risk of erosion as it lies close to MHWS. In addition to St Michael's Church at Workington, mentioned above, a chapel, known as the Watch Chapel (NY 9866128445; HER 40485 C), recorded on a mid-16th century plan as having been built in 1282 was destroyed in the 20th century. St Michael's Church (NY 22376264; LB 71895; HER 4584 C) at Bowness-on-Solway is late Norman in origin, although it was extensively rebuilt in the 19th century using stone from Hadrian's Wall. The church is Grade II* listed. The church of St John the Baptist at Holme East Waver (NY 19875524; LB 71793; HER 3730 C) is a fortified church built of red sandstone in the early 14th century and is Grade I Listed. At Moresby, there is a chancel arch of an earlier church (NY 9827520992; LB 76417; HER 4472 C) which was built in the 13th century and is all that remains of the church that was demolished to make way for the present church of St Bridget.

9.7.2 Medieval Military sites

Wolsty Castle (NY 10495060; SAM 27666; NMR 9669; HER 366 C) is located on the landward boundary of the study area south of Silloth. No date of construction is known but it is recorded as having been attacked by the Scots in 1216 and 1322. The castle was built to protect the nearby abbey of Home Cultram (outside the study area). Mapped as part of the Hadrian's Wall NMP the castle is protected by a wide, dry moat that encloses an area approximately 60m square. The surviving stonework was demolished in the mid-17th century and taken to Carlisle (Perriman and Robinson 1988). A second castle was located at Rockcliffe (NY 3539361920; HER 185 C). Founded in 1539 and newly built when Camden saw it in 1607, it was demolished by 1659 (Curwen 1913). Traces of the castle were revealed during road widening in the 20th century, although it was not mapped as part of the Hadrian's Wall NMP. The site location, recorded within the HER, lies within 50m of Mean High Water Springs but the extent of the site is not known. The SMP 2 policy for this area is MR so the site has to be considered at risk of future erosion.

The location of a further four fortified houses and one pele tower are recorded within this section of the study area. None of these sites are at risk of erosion and are presented in table 9.5.

Table 9.5 Small medieval fortified houses

HER No	Easting	Northing	Site Name
13612	299900	525300	Hall Green Fortified Manor House
163	322430	562595	Bowness Tower, Bowness on Solway
191	333200	566750	Gardes Fortified House, Kirkandrews
196	335000	564000	Thornwhathill/Rockcliffe Fortified House
4688	325300	560539	Barracks House, Glasson

The Anthorn cross (NY 1895757588; HER 3994 C), a crude 12th century cross, purported to mark the site of a battle with the Scots is located at Bowness-on-Solway although the HER records the cross was moved to make way for Cardurnock Airfield (Collingwood 1927).

9.7.3 Medieval Rural sites

Three deserted medieval villages have been located by circumstantial documentary evidence within this part of the study area. They are presented in table 9.5. The site at Skinburness was the victim of coastal erosion in the 14th century which destroyed the site.

Table 9.6 Deserted Medieval Villages

HER No	Easting	Northing	Site Name
818	304302	536603	Netherall Park Deserted Medieval site
628	309120	548590	New Mawbray Deserted Village
17589	312500	556100	Skinburness Deserted Medieval Village

As with the other parts of the NWRCZA study area most of the ridge and furrow recorded as part of the mapping of aerial photographs within this part of the study zone is recorded as post-medieval, however a small number of surviving medieval field systems were recorded.

9.7.4 Medieval Industrial sites

There is considerable documentary evidence of salt extraction within this part of the study zone and fifteen saltworks, listed as medieval in date due to documentary evidence (Cranstone 2006), are located within the HER for this area, although the only saltworks mapped as part of the aerial photographic transcription is listed as post-medieval. The locations of the potential medieval saltworks are therefore listed in table 9.7 below and discussion of the salt industry in this part of the study area will be undertaken more fully in section 9.8.4 below.

Table 9.7 Medieval Saltworks

HER No	Easting	Northing	Site Name
2910	296300	517300	Wetheral Priory
1193	296300	517300	St Bees Priory
41708	297300	518800	Bransty Saltworking Site, Whitehaven
40489	298510	528950	Workington Salt Pans
41705	298700	526600	Salterbeck Saltworking Site, Moss Bay, Harring
41699	319900	556100	Newton Marsh Saltworking Site, Newton Arlosh,
41695	322000	563000	Bowness Manor Saltmaking Site, Bowness-on-Solw
4567	329000	560000	Lanercost Augustinian Priory, Burtholme
2910	329000	560000	Wetheral Cathedral Priory
5309	329000	560000	Carlisle Cathedral Saltworks
41694	333900	563700	Salt Cote Hills, Esk Boathouse, Rockcliffe

Two medieval ports are located within this section of coastline at Skinburness (NY 13585634; NMR 9637) to the south of St John's Chapel and at Sandsfield, Burgh-by-Sands (NY 33156165; HER 194 C). The site at Skinburness survives as earthworks, mapped from aerial photographs as part of the Hadrian's Wall NMP, and was founded in the late 12th century for supplying the English fleet. However by 1305 the site had apparently been washed away by the sea and the approach road destroyed. The NMR record for the port suggests that the site survives as substantial walls, building foundations and earthworks. However it also notes that the features may be the remains of Second World War firing ranges around Skinburness on Grune Point. The site is at serious risk of erosion as it lies on MHWS and the SMP 2 draft policy for Grune Point is NAI. The site at Sandsfield was apparently the 12th century port for Carlisle, although

there is conflicting evidence for its development and it appears that any surviving features are post-medieval in origin according to the HER.

9.7.5 Other Medieval sites

Medieval sea defences were built at Skinburness (NY 13345520 centred; NMR 9624; HER 346 C) in the 14th century, presumably at the time that Skinburness port was inundated by the sea. The earth bank survives to a height of 1.8m in places and extends for almost 2km from Skinburness along the south side of Moricambe Bay. A length of just over 1.5km of the feature was mapped as part of the Hadrian's Wall NMP.

9.8 Post-Medieval (Fig. 9.8)

9.8.1 Post-Medieval ecclesiastical sites

Trinity Church (NX 97451792; HER 12845 C) and St Nicholas' Church (NX 97411792; LB75906; HER 12846 C), both in Whitehaven, are the only two post-medieval ecclesiastical sites present within this part of the study zone. Trinity Church, built in 1715, was completely demolished in 1949. St Nicholas' church, which began life as a chapel prior to 1642, was rebuilt in 1693 and enlarged in 1746. The church was replaced in 1886 and then gutted by fire in 1971, leaving only the southernmost tower surviving. This tower is a Grade II Listed building.

9.8.2 Post-Medieval military sites

The Old Fort (NX 96811834; LB 75900; HER 1176 C), was built on the south side of Whitehaven harbour around 1741. It has a long history, in part due to Whitehaven's expansion in the 18th century into one of England's main ports. The original fort, a gun platform surmounted by ten guns, was surrounded by a perimeter wall with embrasures made from turves. A guardroom and magazine were housed within the fort. In 1745 the guns were sent to Carlisle to assist against the Jacobite rebellion and replacements were sent out the following year. Failure to substantially improve the defences through the 1760's contributed to a successful attack on the harbour by John Paul Jones, during the American War of Independence, which led to an immediate increase in the number of batteries defending the port to six. Developments continued throughout the Napoleonic wars and later ended in the 1870's when most of the guns were removed and landslip buried those that remained. The site was partially excavated in the 1970s. The area to the north of the modern road, which separates the site, was consolidated into four portions of wall between 0.6m and 2.1m in height. This now forms a harbourside feature, whilst the area to the south of the road was reburied. The excavations found no material culture associated with the military use of the fort, but this was probably the result of the northern part of the fort was partially converted into a lime kiln in the 1820s. The southern section was badly affected by the development of Wellington colliery from 1840 onwards. The site is a Grade II Listed building.

9.8.3 Post-Medieval rural sites

Unlike the coastal zone to the south of St Bee's Head, there are no records of halls or country houses dating to the post-medieval period in this part of the study zone and very few rural structures. The distribution of structures is mirrored at a coarse scale by the distribution of post-medieval ridge-and-furrow with concentrations of agricultural landscapes between Whitehaven and Maryport, and fewer field systems present around the southern edge of Moricambe Bay and Burgh-by-Sands. Very few field systems have been mapped as part of the Hadrian's Wall NMP or for this project between Allonby and Skinburness. The listed buildings of Orchard House farmhouse and barn are the only

agricultural structures not located within an area of ridge-and-furrow field systems, being sited over 2km to the north of the nearest recorded field system near Allonby.

9.8.4 Post-Medieval industrial sites

There is evidence for post-medieval industrial activity within this part of the study area, particularly in the southern extent around Whitehaven, Workington and Maryport, where coal mining began before 1800AD. A full list of all collieries is given in table 9.8. The site at Saltom Bay (NX 96431737; SAM 27801; NMR 8484; HER 2754 C) is considered to be one of the most important for the early history of coal mining, having been sunk in 1729 and being the first undersea mine in Cumbria (Marshall and Davies-Shiel 1977). Sited on a rock platform 6m above high tide level the winding engine house, chimney, gin circle, the mine shaft, the footings of houses, a shed and a stable, together with the buried remains of a number an ancillary buildings all survive. However, some, including 2 early engine houses, are buried under cliff collapse caused by coastal erosion. A sandstone seawall protects the site from erosion by the sea and a survey of the engine house, horse gin and chimney was undertaken in 2000, when the remnants of a pier, built in 1732, were also identified (Wild 2000). The site is a Scheduled Ancient Monument. The current SMP 2 policy of HTL is to be superseded between 20 and 50 years from now with a policy of NAI as the maintenance of the present sea defences becomes impossible for technical and/or financial reasons. At this time these important industrial archaeological features will be at great risk of damage from coastal erosion.

Table 9.8 Post-medieval collieries

HER No	Easting	Northing	Site Name
2754	296439	517374	Saltom Coal Pit, Whitehaven
4873	296898	518193	No.2 Howgill Staithes, Whitehaven (Colliery)
4166	296972	518069	Duke Pit, Whitehaven
4174	297397	519003	William Pit, Whitehaven
41974	298050	522324	Micklam Pit / Harrington Colliery No 5 Pit, Lowca
11673	298890	522838	John Pit, Lowca
16811	298878	522558	Hodgeson Pit, Moresby
4764	296650	517400	Ravenhill Pit
12840	296880	517620	Thwaite Pit, Whitehaven

Seven post-medieval saltworks were located in the southern extent of this part of the study area and are presented in table 9.9. The site at Allonby (NY 067401; SAM CU22; NMR 9147; HER 3061 C) was mapped as part of the Hadrian's Wall NMP and appears to be the only surviving example of early saltworking along this stretch of coastline as none of the other sites identified within the HER records to the north of Whitehaven were mapped. The date at which the pans were constructed is not clear, possibly in 1684, but they had certainly closed by 1790 due to competition from the Cheshire salt industry (Cranstone 2006). The seawater storage tank and brine pond at Allonby still survive and the associated cottages were only demolished in 1970 but were mapped from aerial photography as part of the Hadrian's Wall NMP. The site appears to have been a direct-boiling site, rather than sleetching, and is possibly the best preserved such site in England, as well as having unusual features that differ from similar Welsh and Scottish sites (*ibid.* 2006). The site is a Scheduled Ancient Monument and is located on MHWS, in an area where the SMP 2 policy is MR. The site could therefore be at considerable risk of erosion, although is not currently eroding as gabions have been deployed to protect them. The use of gabions, large metal cages filled with rocks, effectively defend the site from erosion and are a good example of where localised defences can be deployed to

defend archaeological sites without impacting upon sites such as SSSI's or AONB;s (M. Collins, pers. comm.)

Table 9.9 Post-medieval saltworks in Block 5

HER No	Easting	Northing	Site name
41707	297715	520387	Parton Salt pans, Sump Rock, Parton
6509	297825	521623	Lowca Salt pans, Providence Bay, Lowca
3061	306690	540141	Allonby Salt Pan, Crosscannonby
5554	296900	518299	Whitehaven Pier Salt Works, Whitehaven
41706	298600	524200	Harrington Salt pans, Walton Wood, Copperas Hil

Given that the NWRRF identified that “little field evidence has been recorded for the post-medieval coastal salt industry” (Brennand 2007, 128) it is suggested that such an important site as Crosscannonby is a priority for future fieldwork, as it could be at risk of future erosion.

Other post-medieval industrial sites, including an early blast furnace, a bottle works and a dye works are present in the study area. None of these sites, where their location has been confirmed, are at risk from coastal erosion.

9.8.5 Post-Medieval maritime sites

There are four quays recorded in the HER record. These are the Old Quay at Whitehaven (NX 96971837; LB 75894; SMR 4218 C), South Quay (NX 99342902; HER 40498 C) and the Merchant's Quay (NX 99342911; HER 40499 C), both at Workington, and the Stone Quay at Maryport (NY 03353670; HER 3591 C). The Old Quay at Whitehaven, a Grade II Listed building was preceded by a pier, built in the early 17th century by Sir Christopher Lowther and the present structure, with later additions, was built around 1634. A Lighthouse (NX 97031843; LB 75895; HER 1669 C) was built on the end of the pier in the later part of the 17th century. South Quay, Workington, was built around 1777, is now known as Town Quay and was capped by a road constructed at a later date. Stone Quay, Maryport was built before 1745. Two additional quays, not listed in the HER, are located at Whitehaven, the delightfully named Old New Quay (NX 9677818453; LB 75896) which was built in 1741 and lengthened in 1767 and the North Quay (NX 9708018538; LB 75899), built in the 18th century. Both are Grade II Listed Buildings.

An early shipyard, to the north of North Quay, was present in Whitehaven (NX 97351855; HER 11956 C). The shipyard was built by Daniel Brocklebank in the mid-1770s and expanded by his sons, who later moved the shipyard business to Liverpool. The shipyard then passed through two stages of being owned by the Whitehaven Shipbuilding Company, however the shallow waters off Whitehaven were not conducive to the building of large vessels and the yard was then primarily used for boat repair until its closure in 1901.

No wreck sites were recorded within the HER records or as part of the APM exercise for this project.

9.9 Industrial and Modern

9.9.1 Shipping and infrastructure

The port of Whitehaven expanded further in the 19th century with the construction of the West Pier (NX 9665818571; LB 75897) built between 1824 and 1839, and its lighthouse (NX 9670718683; LB 75898), built in 1839. The development of Workington saw the creation of Lonsdale Dock (NX 99132943; HER 40495 C) in 1865. The site was redeveloped in the early 20th century to take ships of up to 10,000 tons. Maryport harbour also increased in size with the development of South Quay (NY 03323664; HER 3074 C) and the North and South piers (NY 031733682; HER 3075 C; NY 028369; HER 4193) in the mid-19th century. A lighthouse (NY 02983681; LB 71863; HER 10940 C) is located at the shoreward end of the south pier. Two 19th century docks were also built at Maryport, the Elizabeth Dock (NY 03153640; HER 3886 C) in 1857 and the Senhouse dock (NY 03003655; HER 5495 C) in 1884.

Two further shipyards were located at Whitehaven. Kennedy shipyard (NX 97371841; HER 12855 C) and Scott & Whiteside's shipyard (NX 97351865; HER 41158 C) were built in the early 19th century. Maryport also saw the development of two shipyards, Mote Hill (NY 03246322; HER 3864 C) and Maryport Harbour shipyards (NY 03263638; HER 2976 C) in the mid-19th century. All but the Mote Hill sites saw later redevelopment and it is not clear that any of the former shipyards survive, although the HER mentions some foundations at Mote Hill which may relate to the former yard.

No wreck sites were recorded within this stretch of coastline.

9.9.2 Other industry

There is extensive evidence for other industrial activity within this part of the study area. However none is directly associated with coastal activity, and comprises mines, foundries, glass blowers and so on. The industries are located near the urban conurbations in general, allowing easy access to goods transport by sea.

The Barrowmouth gypsum and alabaster mine appears to have opened prior to the very end of the 18th century, before 1794, to mine alabaster and later expanded to include three levels with buildings, platforms, enclosures, spoil heaps and an inclined plane (rail haulage system), used to transport the raw material to the cliff top. The site is located below cliffs, overlooking Saltom Bay, to the south of Whitehaven and much of the site still survives as one of the finest examples of a gypsum mine in the country, although it is threatened by coastal erosion as the SMP 2 policy for this section of coastline is MR. It is a Scheduled Ancient Monument and was mapped as part of this project.

9.9.3 Industrial and Modern military sites

Two gun batteries dating to the mid-19th century were located at Maryport harbour (NY 031366; HER 3838 C) and Chapel Hill, Workington (NX 98652847; HER 40485 C). Both were removed by the end of the 19th century and no other information is available regarding the sites.

9.9.4 The World Wars

In comparison to the south of the study area the north Cumbrian coast is relatively lightly covered with Second World War sites and no evidence at all of any First World War sites is recorded within the available records or has been mapped from aerial photographs (Figure 9.9).

Silloth Bay airfield (NY 124436; NMR 1409920), on the south side of Moricambe Bay, opened in 1939 and operated initially as a military and then commercial airfield until

1960. The site had three concrete runways, a variety of hangars and a mixture of permanent and temporary accommodation for over 1600 personnel, who formed an Operational Training Unit. Anthorn (Cardurnock) Airfield (NY 183582; NMR 1369329), on the north side of Moricambe Bay, operated as a naval Receipt and Dispatch station from 1944 until 1957. It is now used as a NATO radio research station.

Two coastal gun batteries are located at Northside Shore, Maryport and at Redness Point, above Whitehaven. Northside Shore (NX 990298; NMR 1427839; HER 12740 C) was built during the Second World War as part of the Western Command's coastal defences, mounting two 4-inch guns operated by 406 Battery of 561 Coast Regiment. The site, comprising the gun emplacements, engine house, magazine and searchlight was subsequently destroyed by coastal erosion and modern development of the site. Whitehaven Emergency Battery (NX 973175; NMR 1427840) at Redness Point was also built as an emergency battery during the Second World War, mounted two 6-inch guns, later replaced by 138mm pieces, and was manned by 422 and 401 batteries of 561 Coast Regiment. The site was mapped as part of the APM exercise for this project although it.

A bombing decoy site, C37A, was located between Workington and Maryport (NY 011325; NMR 1413056) to protect the Workington Iron and Steelworks and a possible decoy was located to the north (NY 021345; NMR 1495758). The former site was built over by the mid-1980s and the latter site appears to have been covered by sand. Both were mapped as part of the APM exercise for this project.

Anti-invasion defences are almost exclusively passive in this part of the study zone, although there are 18 pillboxes present along this stretch of coastline. The southern shore of the Solway Firth, between Drumburgh and the River Eden has an extensive network of anti-aircraft obstructions and a series of minefields, tank traps and barbed wire entanglements line low-lying stretches of the coastline.

A firing range is located at Skinburness (NY 193533; NMR 1467459). The site comprises a large earthen bank around which targets would have travelled for air gun practice.

Four war production factories were located at Workington. They are presented in table 9.10. The Workington Iron and Steel Company and the Drybread Works produced steel and shell casings and the Harrington site produced magnasite and magnesium. There is no record of what the fourth site produced. All were mapped as part of the APM exercise for this project.

Table 9.10 War Production factories

NMR No	Grid reference	Site Name
1413053	NX 998 302	
1413051	NX 989 251	Harrington
1413048	NX 991 289	Drybread Works
1413049	NX 989 288	Workington Iron & Steel Co

A total of seven air raid shelters were recorded as part of the APM exercise in this part of the study area.

9.10 Conclusion

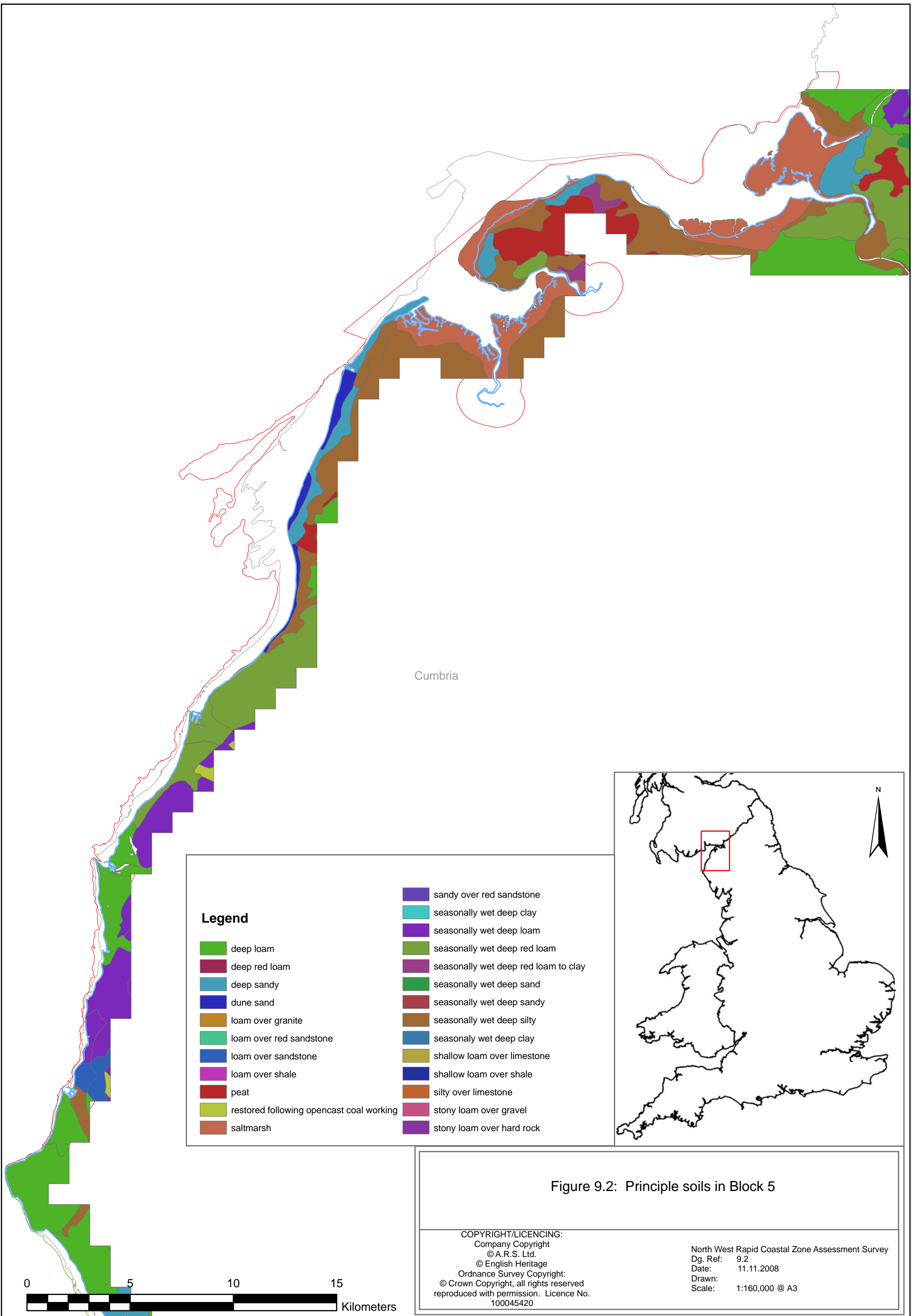
This stretch of coastline, from the heights of St Bee's Head to the low-lying estuary of the Solway Firth, contains evidence of both prehistoric and historic heritage assets. There is limited evidence of Mesolithic and Neolithic activity in the area, although a Neolithic burial was found during excavation of a Roman milefortlet. Bronze Age burial is more common with seven located within the coastal zone, three of which are new sites mapped as part of the NWRCZA project. This stretch of coastline also contains the only Iron Age hillfort in the NWRCZA project area as well as clusters of probable Iron Age field systems and enclosures in the Silloth and Beckfoot areas.

However, it is the Roman period which is best represented in this part of the study area. The World Heritage Site of Hadrian's Wall runs from Maryport in the south, along the coastal fringe, until it leaves the study area to the west of Burgh-by-Sands. The series of watchtowers, milefortlets, roads and the Wall itself in the northern part of the study zone maintained surveillance along the coastline with support from forts at Drumbrugh, Beckfoot, Maryport, Burrow Walls and Parton. The important Roman cemetery site at Beckfoot, to the south of the fort, is one of the most significant sites identified as part of the NWRCZA which is subject to active erosion by coastal process and therefore requires immediate archaeological fieldwork. A small number of Romano-British enclosures have also been recorded in this part of the study area.

Early medieval archaeology is limited to two churches, at Workington and at Crosscannonby. The site at Workington has been subject to extensive excavation after being badly damaged by fire. The excavations revealed further sculptural fragments to those which had already been known from the site and demonstrated the importance of the locale of St Michael's in the early Christian period. There are two medieval castles, at Wolsty and at Rockcliffe, recorded in this part of the study zone, although comparatively little is known about them and the same is true of the handful of smaller fortified settlements. Saltworking formed an important early industry in the area and documentary and placename evidence suggests fifteen medieval saltworks were present in the study area with a further seven being created in the post-medieval period. At Skinburness the possible remains of a medieval port have also been mapped from aerial photographs.

The post-medieval period saw the development of early coastal gun batteries such as the Old Fort at Whitehaven, to protect coastal shipping and those involved in the growing Atlantic trade, as well as the creation of early quay facilities at Whitehaven, Workington and Maryport. Coal mining, an industry that came to form a vital part of the North-West economy, was also begun at an early date in this part of the study area, with the site at Saltom Bay being considered as one of the most important examples of its kind as well as being the first undersea mine in Cumbria. The development of the shipbuilding industry and the mining industry then drove the economy of this part of the North-West during the Industrial Revolution and saw the expansion of the shipping facilities at Whitehaven, Workington and Maryport as well as an expansion in the number of collieries and other industrial sites producing raw materials and manufactured goods.

Overall, this section of coastline contains significant archaeological remains, particularly from the Iron Age, Roman, post-medieval and Industrial periods. A significant number of these sites are located in areas where coastal erosion is destroying them and they should therefore be seen as priorities for archaeological intervention before it is too late.



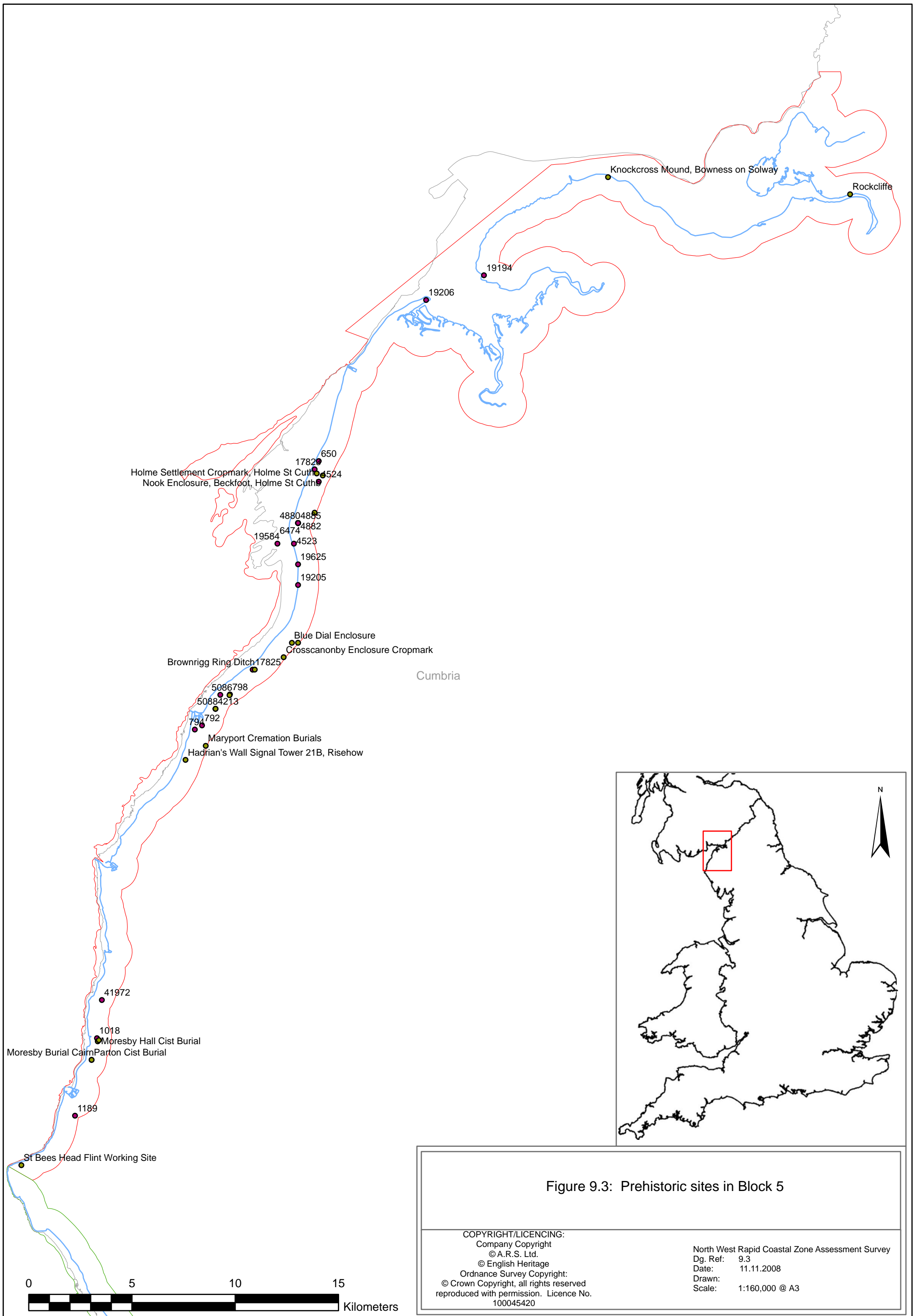


Figure 9.3: Prehistoric sites in Block 5

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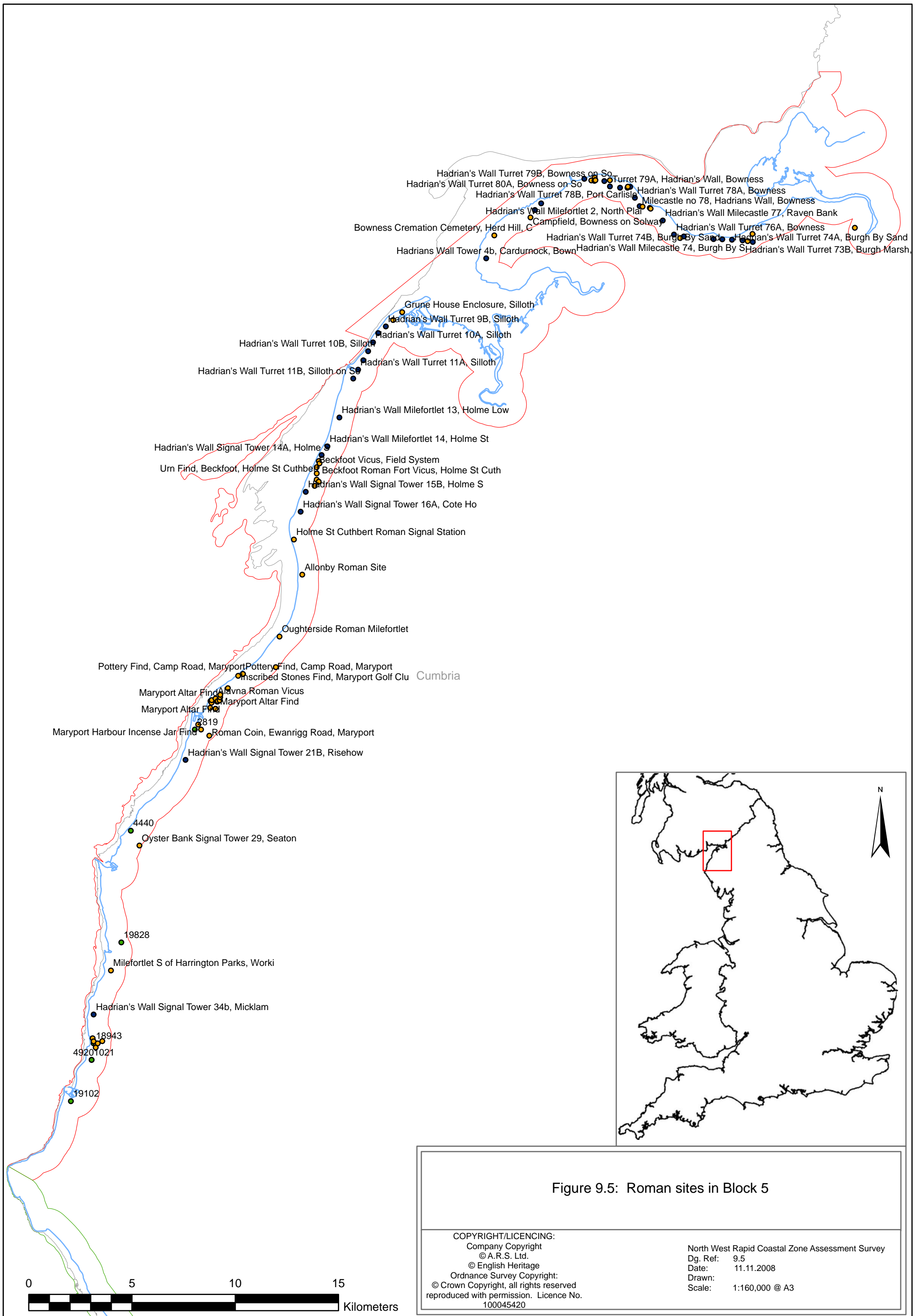


Figure 9.5: Roman sites in Block 5

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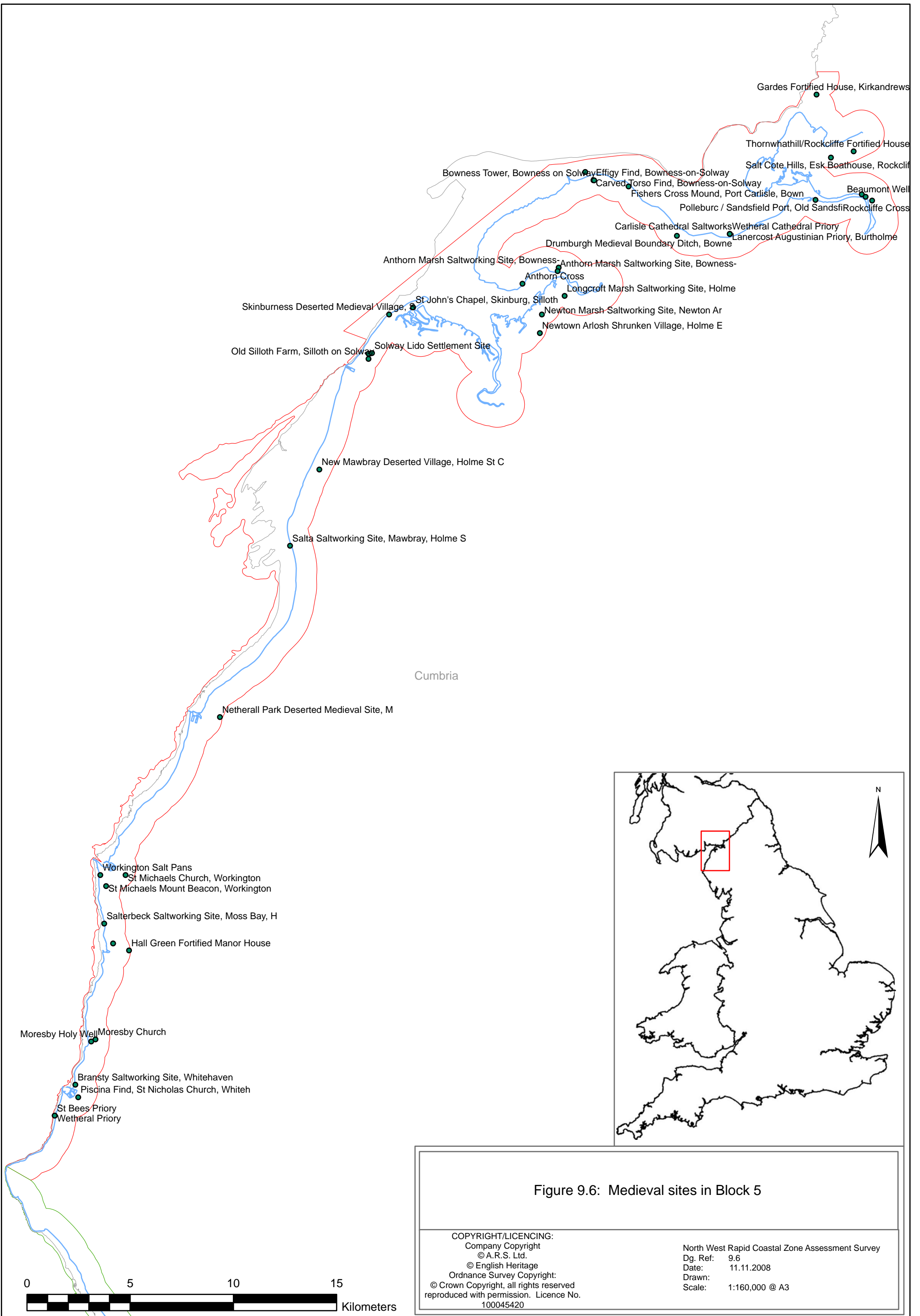
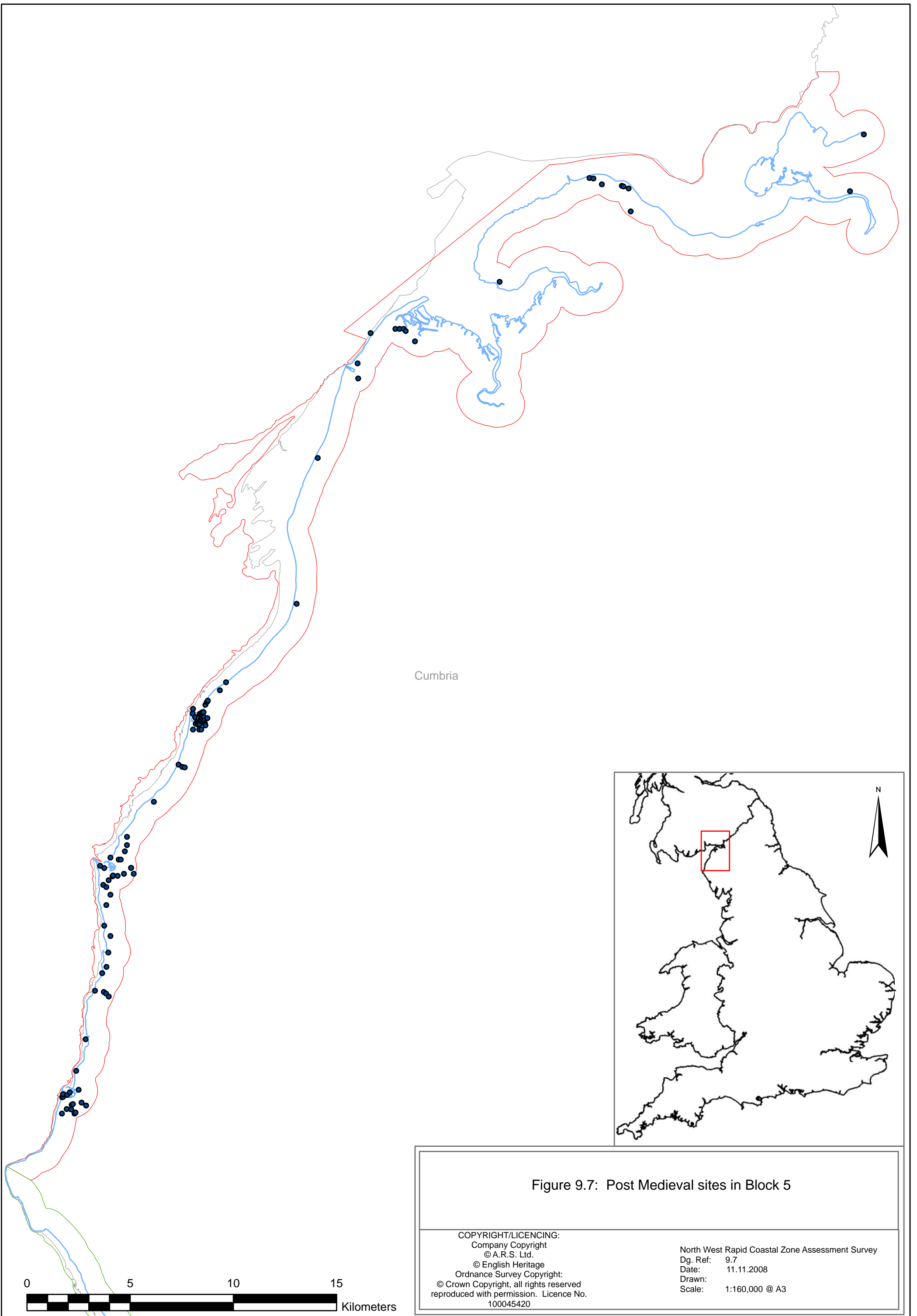
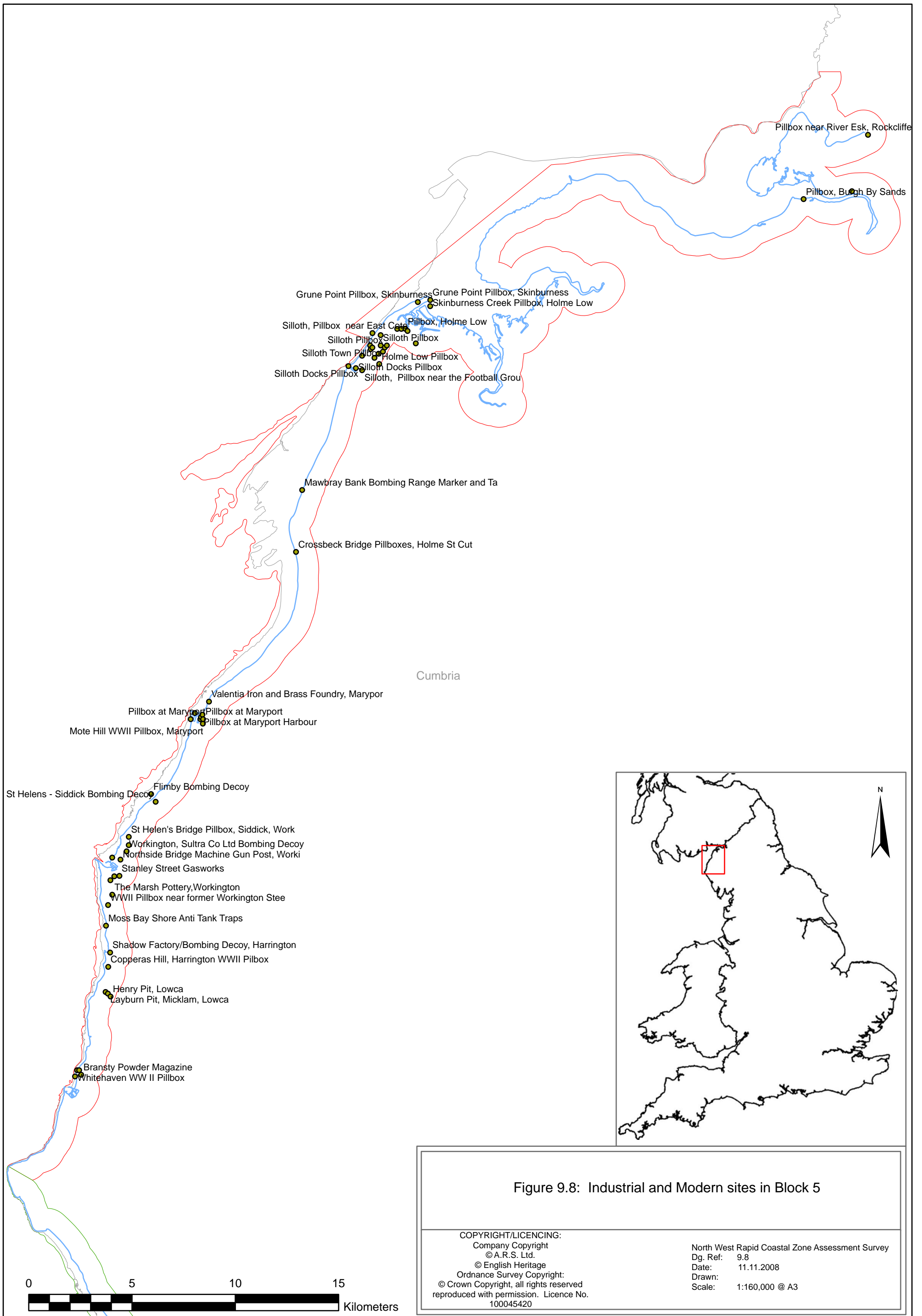


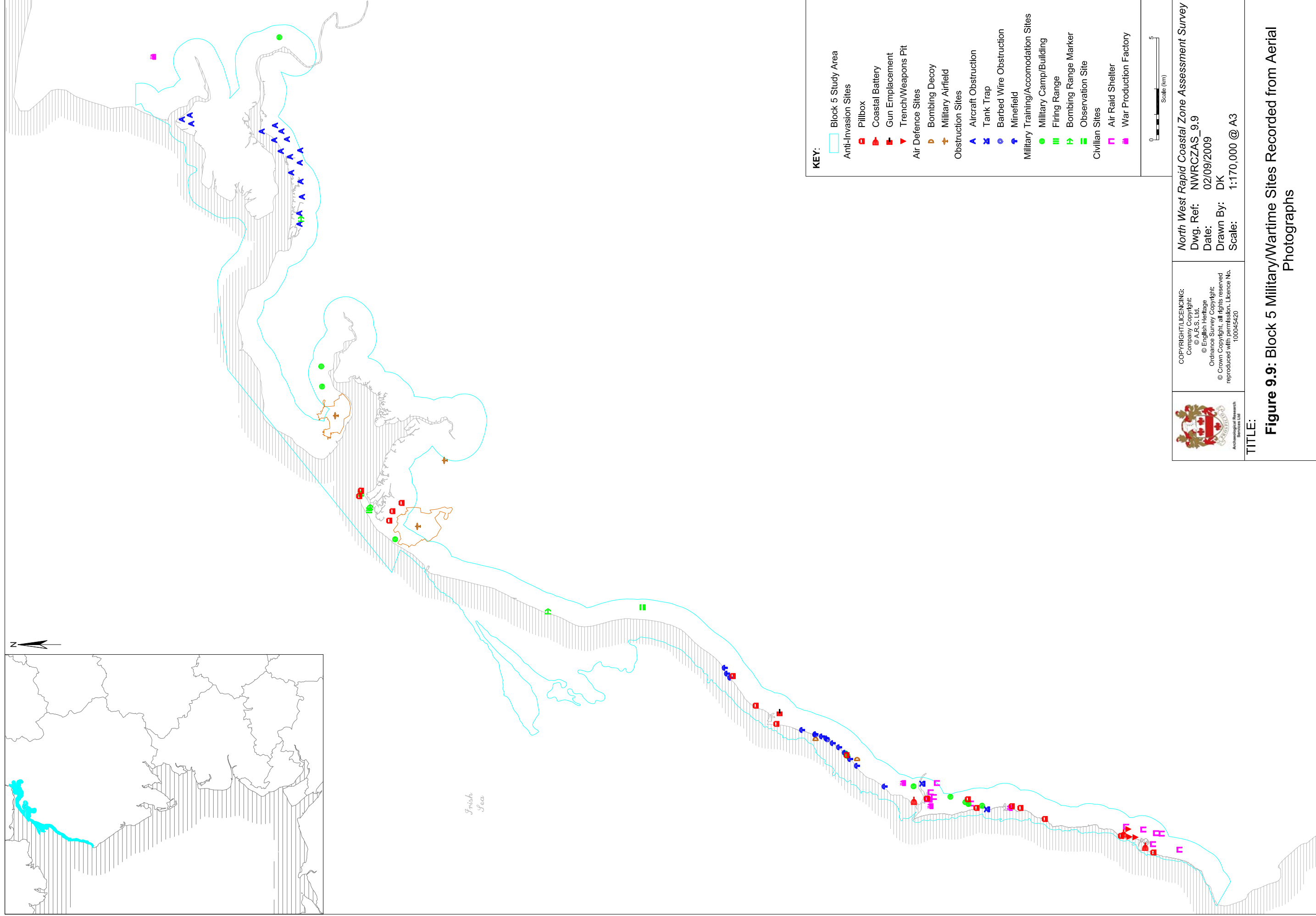
Figure 9.6: Medieval sites in Block 5

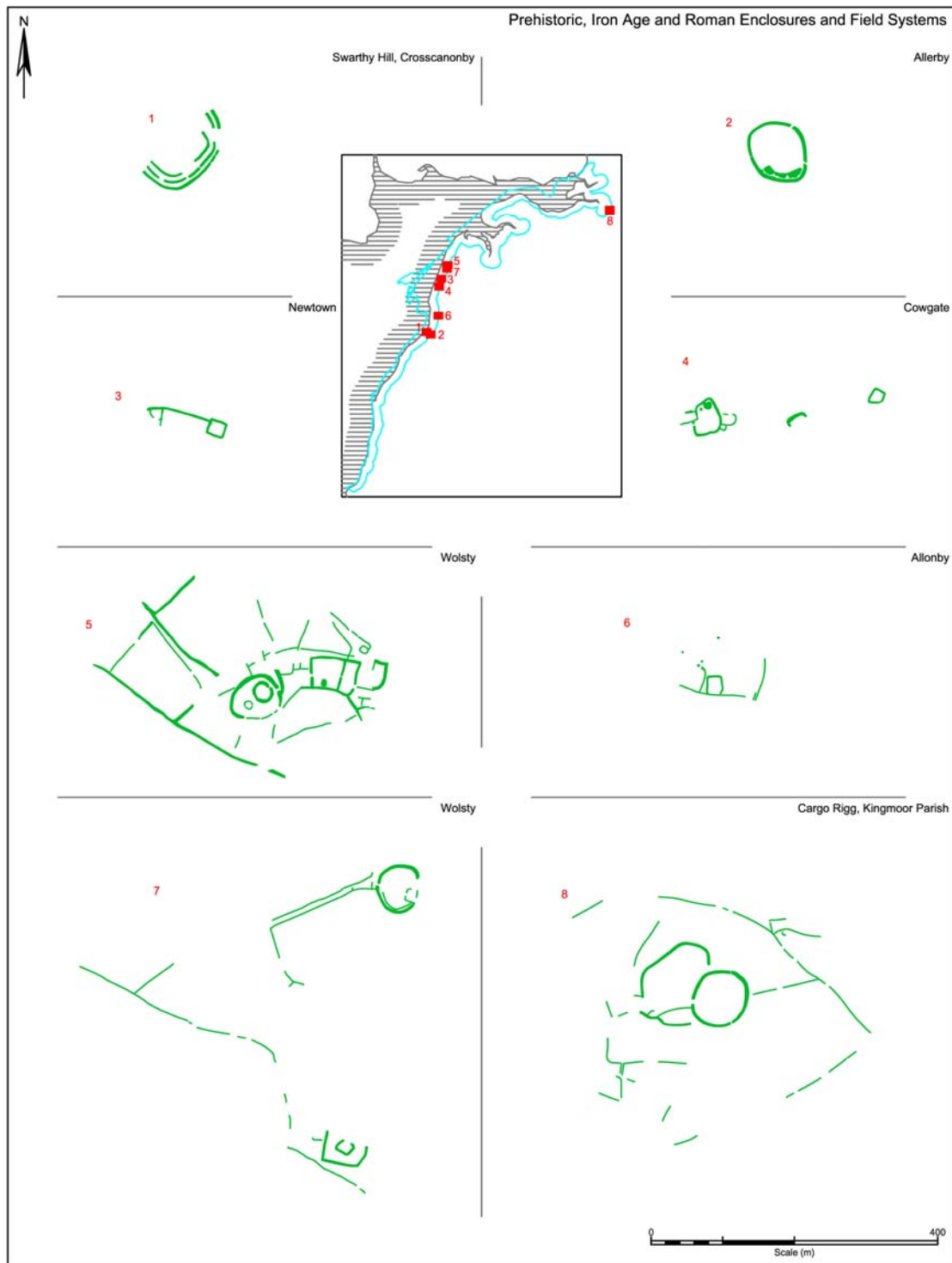
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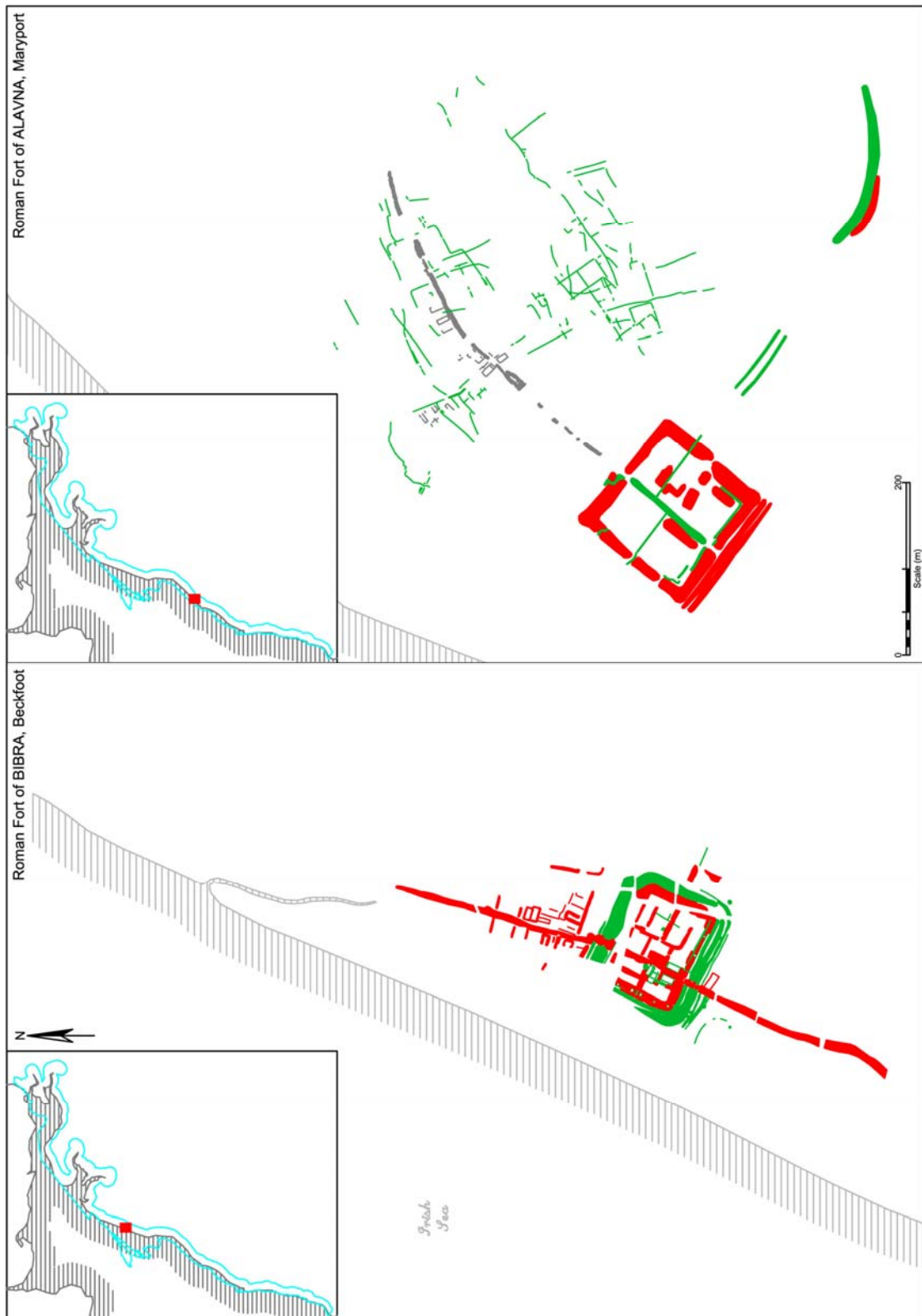


Figure 9.11 The Roman forts of Maryport and Beckfoot mapped from aerial photography

CHAPTER 10

RECOMMENDATIONS FOR FURTHER WORK AND REVIEW OF THE RESEARCH AGENDA

10.1 Introduction

Chapters 5 to 9 have provided a rapid, baseline assessment of the heritage assets of the North-West coastline, based upon the datasets outlined in Chapter 2, and of the threats to which they are exposed by coastal erosion. This final chapter identifies the broad research themes, primarily taken from the NWRRF (Brennand 2007), to which contributions to knowledge and understanding can be made by further investigation of sites and landscapes identified as part of this assessment. These include diverse topics such as providing data to assist in our understanding of the Mesolithic-Neolithic transition, the development of early coal mining, or the environmental context for coastal occupation throughout the historic and prehistoric periods. Additionally this chapter presents a list of the specific sites identified as part of this Rapid Coastal Zone Assessment which are considered to be at imminent risk of coastal erosion and therefore require an immediate field visit and rapid survey. This investigation will provide information that will enable the preparation of proposals for the management of the risk and mitigation of the damage that the assets face. These sites have been abstracted from those identified within chapters 5 to 9 and further information on the sites can be found in those chapters.

10.2 Research Agenda Themes

A range of cross-period themes, relating to the coastal heritage resource, have been identified within the *North West Regional Research Framework*. The need for coastal survey is repeated throughout the NWRRF, with specific initiatives outlined in the major period agendas for assessing palaeoenvironmental, site and artifact distributions and datasets. The Industrial section states “within the region there is a need to record and interpret the marine and intertidal archaeological remains in the context of the still surviving remnants of marine exploitation in the region” (Brennand 2007, 141) and the same statement holds true for all preceding periods from the prehistoric onwards. Additionally the impacts of climate change, sea level rise and increased rainfall, will lead to more episodes of flooding and erosion which “will affect a large part of the [heritage] resource including...substantial areas of coastal ... landscapes” (Brennand 2007, 170). The priority for future work and funding should clearly be sites at risk and those which will contribute to the research initiatives identified as part of the NWRRF. Such work will also increase archaeological interest and knowledge by improving datasets such as the HERs and NMR and informing future management plans including SMP revisions.

A final general point is that there is a need for provision of a short-notice mitigation response if regionally and nationally important remains are exposed in the inter-tidal zone.

10.2.1 *Inter-tidal peats*

The wetlands of the north-west have been *foci* of activity from the Mesolithic onwards. This lowland resource was assessed through the North West Wetlands Survey (e.g. Cowell and Innes 1994) and a comprehensive list of the inter-tidal and coastal peats has been compiled for English Heritage (Hazell 2008; English-Heritage.org.uk > Research & Conservation >

Archaeology & Buildings > Scientific Techniques > Environmental Studies > Resources > Intertidal and Coastal Peat Database). The latter does not contain full location information on the deposits (many of which are only recorded from antiquarian sources) but, where possible, these have been collated into Table 10.1 below. These sites are all located in the intertidal zone and are therefore subject to active erosion by wave action. The table outlines only the sites for which geoarchaeological prospection is thought necessary, based upon the quality of information available in the database and whether or not previous work has been undertaken, for example as part of the North West Wetlands survey. If previous scientific work has been undertaken at or near the site (*i.e.* boreholes/augering and radiocarbon dating of deposits), or if the location of the site is unclear or below LAT, then they have not been included in the table. The deposits may also provide palaeoenvironmental contextual information for sites identified as significant in the baseline assessment.

Coastal Peat Database ID	Grid reference	Location	Description in database
Not entered	SD 305 744	Bardsea, Cumbria	-
225	SD 414 620	Heysham, Lancashire	Bed of peaty mud
252	SD 430 645	Morecambe, Lancashire	Peat horizon
496	SD 321 483	Fleetwood, Lancashire	Submerged forest
611	NY 244 613	Glasson, Cumbria	Subterraneous forest
646	NY 08521 49769	Beckfoot, Cumbria	Forest soil, peat and organic fragments
Not entered		Bootle	Awaiting confirmation
Not entered		Walney Island	Awaiting confirmation

Table 10.1 Inter-tidal peat deposits identified for geoarchaeological prospection

At the Bardsea site, red deer bones were excavated after having been found eroding from foreshore peats and silts in 1992 (Hodgkinson *et al.* 2000). The site would benefit from investigation by geoarchaeological techniques to assess whether further remains are present, or have the potential to be present, within the vicinity. The site has produced evidence of Neolithic hunting, possibly nearby settlement, and “may be a fragment of a much larger picture” (*ibid.*). Numerous peat deposits are listed in Morecambe Bay, predominantly found during the 1970’s and have been subject to some palaeoenvironmental work (Hazell 2008). However, the sites listed in table 10.1 above have not been subject to any systematic investigation by modern geoarchaeological techniques. In order to assess the threat to such deposits posed by erosion their full extent needs to be established, together with their date and their archaeological and palaeoenvironmental potential. This will also assist in characterising the deposits and evaluating their relative importance which in turn will assist with future management decisions relating to the coastline. This work would also assist with NWRRF initiatives 2.4, 2.7, 3.21, 3.47, 5.6 and 5.7 as well as a general point made throughout the NWRRF that more palaeoenvironmental sampling is required across the North-West region as a whole. For example Initiatives 3.21 and 3.47 state:

“The nature of the [Roman] coastal defences could be investigated in tandem with a programme of research aimed at improving understanding of coastal and estuarine change” (Brennand 2007, 62)

and

“Systematic survey of coastal, estuarine and river environments is required to assess the surviving resource and the potential for Roman-British buried land surfaces and structures” (Brennand 2007, 71)

10.2.2 Deflation and blow-out of sand dunes

While sand dunes are a dominant feature of the North-West coast, especially at Formby, Point, on the North Wirral peninsula, the north Fylde coast, Walney Island, the Duddon Estuary, the Esk estuary, and at other less significant sites, the history of these systems is not well understood. Even where some management has been undertaken, dune systems are dynamic and constantly on the move. Part of this movement is the process of deflation and blow-out in which the sand of the dune is re-deposited through wind action and underlying deposits exposed. At a number of locations where this has occurred, archaeological deposits have been exposed, examples being the Mesolithic and Neolithic footprints sites at Formby Point, Neolithic settlement at Roanhead and multi-period activity at Eskmeals. Rapid survey of such locations, where archaeological features have already been revealed, is considered a priority of future work to ascertain whether further sites are at risk in the vicinity.

10.2.3 Wreck sites (Fig. 10.2)

All shipwrecks documented between LAT and MHWS have been listed, and are presented in figure 10.2, but in the majority of cases the evidence is only of a documentary nature. Curiously no wreck sites were recorded in northern Cumbria. This may be due to the small intertidal zone and rocky foreshore, where wrecks are rapidly destroyed. It will be necessary to undertake a survey of the foreshore in order to establish where actual vessels survive and when identified these should be fully documented although such a project is probably beyond the remit of any Phase 2 work for the NWRCZA. Lying between LAT and MHWS such assets, like other features on the foreshore, are particularly vulnerable to the effects of sea level rise, either exposing them to accelerated erosion or further limiting access. Only when survey fieldwork has been undertaken can an assessment be made of the extent to which individual wrecks are under threat. The study of shipwrecks is highlighted NWRRF Initiative 5.44 which states a need for studies to identify medieval wreck sites and the exploration of the same (Brennand 2007, 114). The same holds true for later periods with Liverpool Bay forming the entrance to one of the world’s most important ports and therefore having the potential to contain numerous wreck sites (Brennand 2007, 141).

10.2.4 WWII anti-invasion features

Over 70% of the heritage resource mapped as part of the APM exercise for the NWRCZA consisted of Second World War features. Most of these features have been identified on aerial photographs taken during the course of the war or in its immediate aftermath and many of these sites were temporary in nature. As a result many sites will no longer exist, having being cleared in the immediate aftermath of the War and by later development projects or coastal erosion. However some features, such as air-raid shelters, pillboxes and anti-tank blocks, do survive. Therefore the establishment of which sites recorded by the APM exercise are still extant requires field visits and is beyond the scope of the current desk-based study. It is proposed that a sample of sites recorded by the APM exercise should be investigated ascertain the probable survival of World War heritage assets. This work could also integrate with the Sefton Coast Landscape Partnership project, a Heritage Lottery funded programme, which is undertaking the recording of wartime defensive structures in

the coastal region of the Hightown and Crosby area.

10.2.5 Recreation

The recreational use of the coastline and foreshore is only just beginning to emerge as a topic of interest and associated facilities do not generally feature in the HERs, although sites such as Blackpool Pleasure Beach and the Midland Hotel at Morecambe are noteworthy exceptions. The huge increase in tourism to coastal towns during the Industrial Revolution, facilitated by the development of the railways, led to the development of many of the resorts on the North-West coast. Detailed research into the expansion of heritage assets associated with leisure activities is thought to be a worthwhile avenue of investigation, although none of the sites identified during this assessment are considered to be at immediate risk and therefore do not require rapid survey at this stage.

10.2.6 Transitional periods

A number of locations in the North-West coastal zone could address issues raised in the NWRRF relating to transitional periods. Early indicators of changes in subsistence economy and settlement type between the Mesolithic and the Neolithic have been identified on the Cumbrian coast (Brennand 2007). Further archaeological investigation, around the Eskmeals area in particular, although possibly on the Wirral peninsula as well, could profitably shed light on the transformation from hunter-gatherer subsistence to farmer economies.

The impact of the Roman occupation on native settlement in the areas beyond the immediate environs of the defensive system is also poorly understood (Brennand 2007). Given the extensive Roman defensive system and Iron Age/Romano-British farmsteads, enclosures and at least one hillfort, in northern Cumbria, research in this part of the North-West could provide data to be used in assessing and interpreting the changes the Roman presence had upon the native population.

The third “transitional period” into which additional research in the coastal zone could contribute information is that of the Norman conquest and following centuries as the history and archaeology of this period is poorly understood (Brennand 2007). Earthwork castles from this period are often only dated on morphological grounds and so investigation of the motte-and-bailey sites identified as part of the NWRCZA, particularly the site at Aldingham which is being destroyed by coastal erosion, should be a priority for further research (Brennand 2007, 174).

10.2.7 Coastal economies

The resource assessment has highlighted numerous economic practices specifically associated with the coast, such as salt extraction and fish trapping, which have received little attention in terms of archaeological research. It has also been noted that offshore fishing, shipbuilding and transatlantic trade were particularly important to the development of the towns and cities of the North-West coast from Liverpool to Whitehaven, and these have also been little studied, particularly the smaller wharves and jetties that traded along the coastal fringes. Research into these coastal industries and their associated economies is considered to be a worthwhile future avenue of study.

10.3 Site specific issues

In the following section details are provided of 39 localities (see figure 10.3) within the NWRCZA study area where coastal erosion is either known to be currently destroying heritage assets, or is thought highly likely to do so in the near future, due to present shoreline management policies. In each case the situation needs to be assessed through rapid field survey and proposals for the management of the risk and the mitigation of future damage prepared. Such proposals are likely to entail surveys of the surviving remains.

10.3.1 Sites at risk located in Block 1

Site name	Section in report	SMP 2 policy at this site	Special Interest	Risk
Hilbre Island lithic sites and midden	5.3.1	HTL	High	High
St Hildeburgh's Chapel, Hilbre Island	5.6.1	HTL	High	High
Dungeon Lane saltworks	5.8.3	NAI	High	High

Table 10.2 Sites at risk identified in Block 1 of the NWRCZA

Hilbre Island, off the north-west tip of the Wirral peninsula, has Mesolithic and Neolithic material actively eroding from low cliff deposits at MHWS and also contains the important early Christian site of St Hildeburgh's chapel. The organic midden remains are a very scarce resource in the North-West and also at a national scale. The creation of sea defences, as part of the policy of HTL, could damage the resource as the development occurs. Either scenario will require management and mitigation procedures and an initial rapid field survey of the present status of the identified heritage assets is essential.

10.3.2 Sites at risk located in Block 2

Site name	Section in report	SMP 2 policy at this site	Special Interest	Risk
Formby Point Mesolithic and Neolithic palaeoenvironmental remains and footprints	6.3	MR	High	High

Table 10.3 Sites at risk identified in Block 2 of the NWRCZA

The Formby Point footprints, associated palaeoenvironmental evidence and other associated assets, are being exposed and destroyed through the actions of coastal erosion and dune deflation. The presence of prehistoric footprints at this location is of great importance to our understanding of the periods and is an extremely rare resource of international interest providing information on hunting practices, social groupings and so on. MR of the dune systems will see increasing erosion of the footprints and any potentially associated structures or other archaeological features. Liaison with local groups, already involved with assessing the resource is crucial and this area could provide an opportunity for a long-term monitoring project that engages the voluntary sector. A rapid field survey to identify and locate the assets and the erosional threat they face is therefore recommended.

10.3.3 Sites at risk located in Block 3

Site name	Section in report	SMP 2 policy at this site	Special Interest	Risk
Cockersand Abbey	7.7.1	HTL then MR	High	High
Medieval Fish traps	7.7.3	Intertidal	Medium	High
Jenny Brown's Point, Silverdale	7.9.2	NAI	Medium	High
Aldingham Motte-and-Bailey	7.7.2	NAI	High	High
Greenodd , Ulverston and Baycliff quays	7.8.5	NAI	Medium	High
Post-Medieval fish weirs	7.9.1	Intertidal	Medium	High

Table 10.4 Sites at risk identified in Block 3 of the NWRCZA

The two most significant sites at risk on this block are the medieval abbey at Cockersand and the motte-and-bailey castle at Aldingham, both of which are presently being actively eroded by the sea. The recent survey of Cockersand (Burn 2009) has established that the monastery is located on a low sandstone ridge and is at risk of flooding. The precinct is being actively eroded with, in places, over 3m of coastline lost in the last 50 years or so. The SMP 2 policy is HTL but this is due to change within 20 years to MR and a need to preserve at least part of the monastery is considered to be a necessity. Rapid field survey of the site with reference to the actions of erosion will complement the recent survey and allow appropriate mitigation measures to be drawn up to preserve or record the archaeology of this Premonestarian Abbey. Aldingham motte-and-bailey was subject to rescue excavation due to coastal erosion in 1968 and was found to be a rare and important example of medieval defensive archaeology with at least three phases of activity. The site is currently being actively destroyed by coastal erosion and is in desperate need of rapid field survey to assess its present condition and advise whether further mitigation measures are required to preserve this site by record before it is lost for ever.

The copper works at Jenny Brown's Point has seen recent erosion that has revealed further buildings at the site, but details about operations there are very limited. A rapid survey is therefore required to assess the present condition of the site. The status of the fish traps and weirs, which are possibly associated with the extra-cloistral activity of the medieval abbeys of the region, is not known. They were identified as part of the APM exercise, but were not visible on recent aerial photographs and so a field visit is required to ascertain whether they survive and if so to undertake a rapid field survey, as their location in the intertidal zone inevitably means they are at high risk of erosion. The quays, important examples of post-medieval shipping infrastructure around Morecambe Bay are also under threat from erosion given their location and a rapid field survey of their surviving fragments is therefore required.

10.3.4 Sites at risk located in Block 4

Site name	Section in report	SMP 2 policy at this site	Special Interest	Risk
Piel Castle	8.7.2	NAI	High	High
WWI and WWII Hilpsford battery, Walney	8.9.4	NAI	Medium	High
WWI and WWII Battery H3, walney	8.9.4	NAI	Medium	High
Trough Head lithic scatter	8.3.1	NAI	Medium	High
Cow Leys Lane lithic scatter	8.3.1	NAI	Medium	High
North End Midden Mesolithic flint scatters	8.3.1	NAI	Medium	High
WWI Practice trenches, Walney	8.9.4	NAI	Medium	Medium
North End Haws Neolithic site, Walney	8.4.1	NAI	Medium	Medium
Sandcale Haws medieval bloomery	8.7.4	NAI	Medium	High
Roanhead Neolithic structure	8.4.2	NAI	Medium	Medium
Bronze Age lithic scatter at Eskmeals	8.4.2	MR	Medium	High
St John's Church, River Esk	8.7.1	NAI	Medium/High	High
Ravenglass Roman Fort	8.5.1	NAI	High	High
Post-Medieval saltworks, River Irt	8.8.2	NAI	Medium	High
Eskmeals Neolithic site	8.4.1	MR	Medium	High
Burnt Mound, Drigg	8.4.1	NAI	Low	High
Drigg Roman bloomeries	8.5.2	NAI	Medium	High
St Bee's medieval fish traps	8.7.3	Intertidal	Medium	High

Table 10.5 Sites at risk identified in Block 4 of the NWRCZA

Within this block the Roman fort at Ravenglass and the medieval castle on Piel Island are the two most significant sites endangered by coastal erosion.

Ravenglass, a Scheduled Ancient Monument is believed to have been an important site during the Roman period in supporting the coastal defences by housing a fleet in its natural harbour. The site is suffering from active erosion of the western defensive perimeter of the fort where the low sea cliffs occasionally collapse. The SMP 2 policy at this location is NAI and erosion will therefore continue.

Piel Castle may have been built on an early 12th century fortification and has been subject to partial excavation and fabric survey of its interior, which contains a very rare style of keep construction (Newman 1987). However the southern end of the keep has already collapsed due to coastal erosion and the southern and eastern defensive circuit are also badly damaged.

Erosion will continue as the SMP 2 policy for this area is NAI and a rapid field survey to record the present condition and assess whether there is a need for further mitigation at the site is seen as a priority for further work.

There are a number of Mesolithic, Neolithic and Bronze Age lithic scatter sites which have been identified as eroding from the sand dunes on Walney Island, the Duddon estuary and the Esk estuary. The spatial extent of these sites is not known and the degree to which they are being damaged by coastal erosion is also unclear. Field assessment to ascertain their present condition and whether any additional sites are present in the vicinity is required as sites excavated elsewhere, both in this part of the study area, and further afield, have shown that important archaeological features can survive beneath lithic scatter sites.

St John's Church may have been the site of an early Christian centre, as evidenced by the early Medieval cross fragments and was definitely a site of a medieval period building. The SMP 2 policy in this area is NAI and a rapid field survey of the site is required to assess whether there is the potential for an early Christian site to exist and to inform as to whether coastal erosion is threatening it or the medieval period structures.

The bloomeries and saltworks are important examples of early industrial practices about which comparatively little is known and require a rapid field survey to assess their present condition, as they will be lost to coastal erosion given that the SMP 2 option for the coastline where they are located is NAI. As with the fish traps of Morecambe Bay, those at St Bee's are important evidence of medieval fishing practices most probably associated with the priory at St Bee's itself. Mapped from aerial photographs they were not visible on recent photography and a rapid field survey to assess their present status is required. The two gun batteries, built in the First World War and recommissioned in the Second World War on Walney Island are being eroded and a full record of each is required.

10.4.5 Sites at risk located in Block 5

Site name	Section in report	SMP 2 policy at this site	Special Interest	Risk
Barrowmouth alabaster and gypsum mine	9.9.2	NAI	Medium	High
Saltom Bay colliery	9.8.4	HTL to NAI in 50 years	High	High
Roman Road	9.5.1	MR	High	Medium/High
Roman milefortlet 20B	9.5.1	MR	High	High
Swarthy Hill hillfort	9.4.4	MR	High	High
Roman milefortlet 15	9.5.1	MR	High	High
Beckfoot Roman cemetery	9.5.2	MR	High	High
Medieval Port, Skinburness	9.7.4	NAI	High	High
St John's Chapel. Skinburness	9.7.1	NAI	High	High

Site name	Section in report	SMP 2 policy at this site	Special Interest	Risk
Roman temporary camp at Knockcross	9.5.1	MR	High	High
Rockcliffe Castle	9.7.2	MR	Medium/High	Medium

Table 10.6 Sites at risk identified in Block 5 of the NWRCZA

The hillfort at Swarthy Hill, where the SMP policy is MR, is being actively eroded by coastal processes with part of the north-western defensive circuit already destroyed. This is the only coastal hillfort in the whole of the North-West and is a Scheduled Ancient Monument. Given the identified research themes surrounding the Iron Age of the North-West such as the interaction between Roman and native population the site is seen as particularly significant and rapid field survey must be undertaken to record its present condition and inform on future management and mitigation procedures before the hillfort is destroyed.

The Roman defensive features north of Maryport, also within the World Heritage Site are also eroding, including at least two milefortlets, and possibly the defensive line at Allonby Bay if it has not already been lost to the sea. The coastal defences of Hadrian's Wall are of importance in understanding the system as a whole as there are significant differences in the morphology of milefortlets depending, for example, upon the legion undertaking the construction (Breeze and Dobson 2000). Therefore there is a need to undertake rapid field survey of these sites to ascertain both their present condition and whether further mitigation is required. Of particular significance in this block is the cemetery at Beckfoot, located within the World Heritage Site, where cremated Roman remains have been found eroding from the cliff face for at least the past fifty years. Fieldwork in 2000 did not reveal any evidence of the cemetery behind the present MHWS. However, even more recently further cremation burials have been identified eroding from the cliff edge (see section 9.5.2). Little is known of the cemeteries associated with the Roman frontier defences and, given the years of erosion that have caused over 30m of land lost to the sea in the past century, the site is seen as a priority for further work. The SMP 2 policy for this section of coastline is MR and erosion of the site will continue.

Grune Point, to the north of Skinburness, contains features which are thought to represent a medieval port, which the NMR record suggests survives as substantial walls, building foundations and earthworks. The SMP 2 policy in this area is NAI and a field visit to assess the present status of the site and record its condition is required.

Finally the two mines north of St Bee's, both important early examples of industry, including the first undersea coal mine in Cumbria and the only example of a gypsum mine in the coastal zone, are at risk of erosion in the near future, and parts of both sites have already been lost or damaged due to the actions of coastal erosion. Part of Saltom Bay colliery has been recorded and renovated into a museum, although it is not clear to what extent the damage caused by erosion and the potential for future erosion has been mapped (see Section 9.8.4 for further details). At present very little work has been done at Barrowmouth alabaster mine. Rapid field survey of these sites are therefore required to assess and record their condition.

10.5 Conclusion

The NWRCZA has identified 39 important sites that are at risk dating from the prehistoric period through to the Second World War. The development of a suitable Phase 2 to rapidly survey and record the sites at risk and to inform future mitigation strategies for them is therefore seen as a priority for further funding. Additionally a series of research themes have been put forward that archaeological features recorded within the baseline assessment of the NWRCZA could inform on and provide valuable data in addressing some of the initiatives presented in the NWRRF.

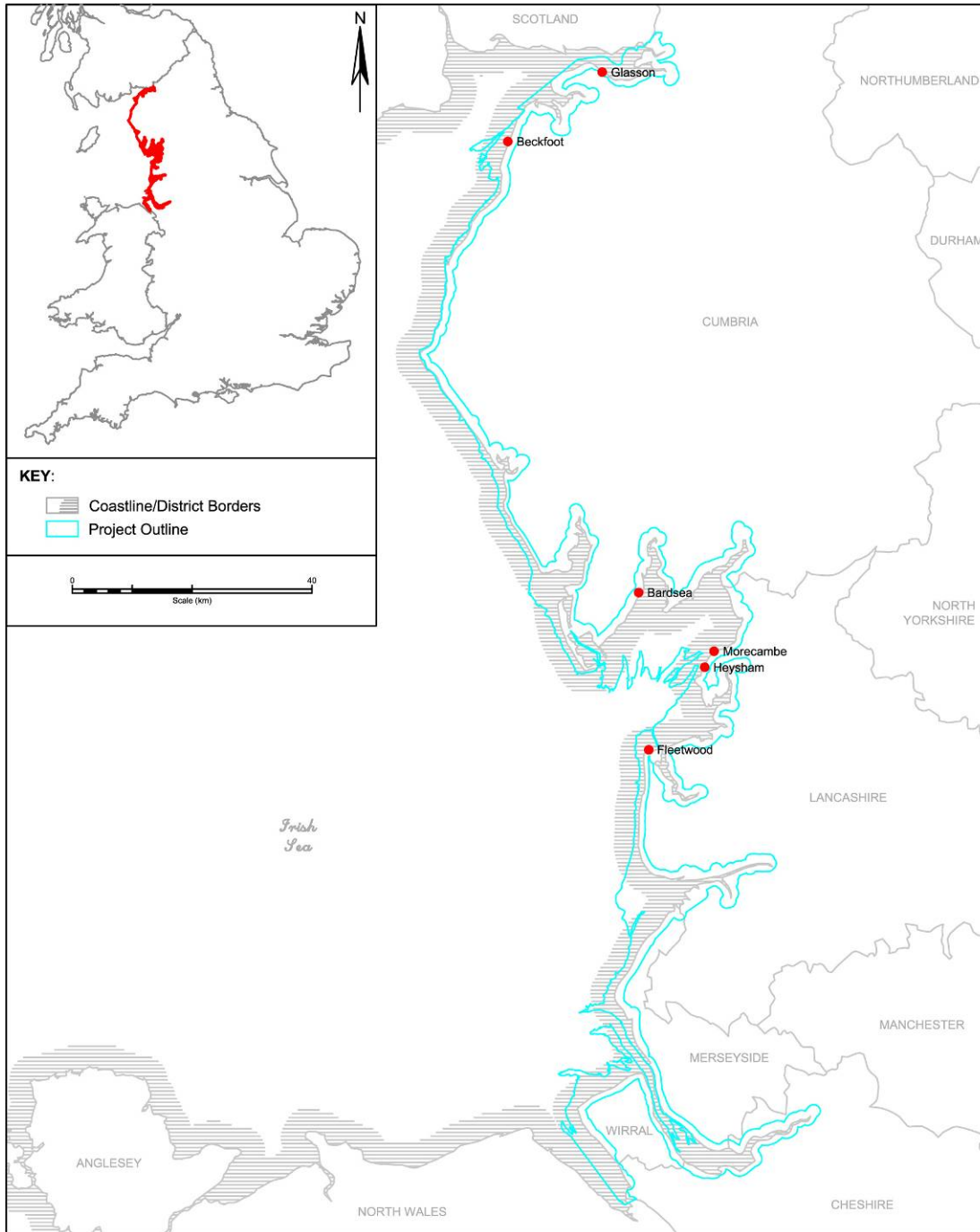


Fig. 10.1 Location of intertidal peat deposits selected for geoarchaeological investigation

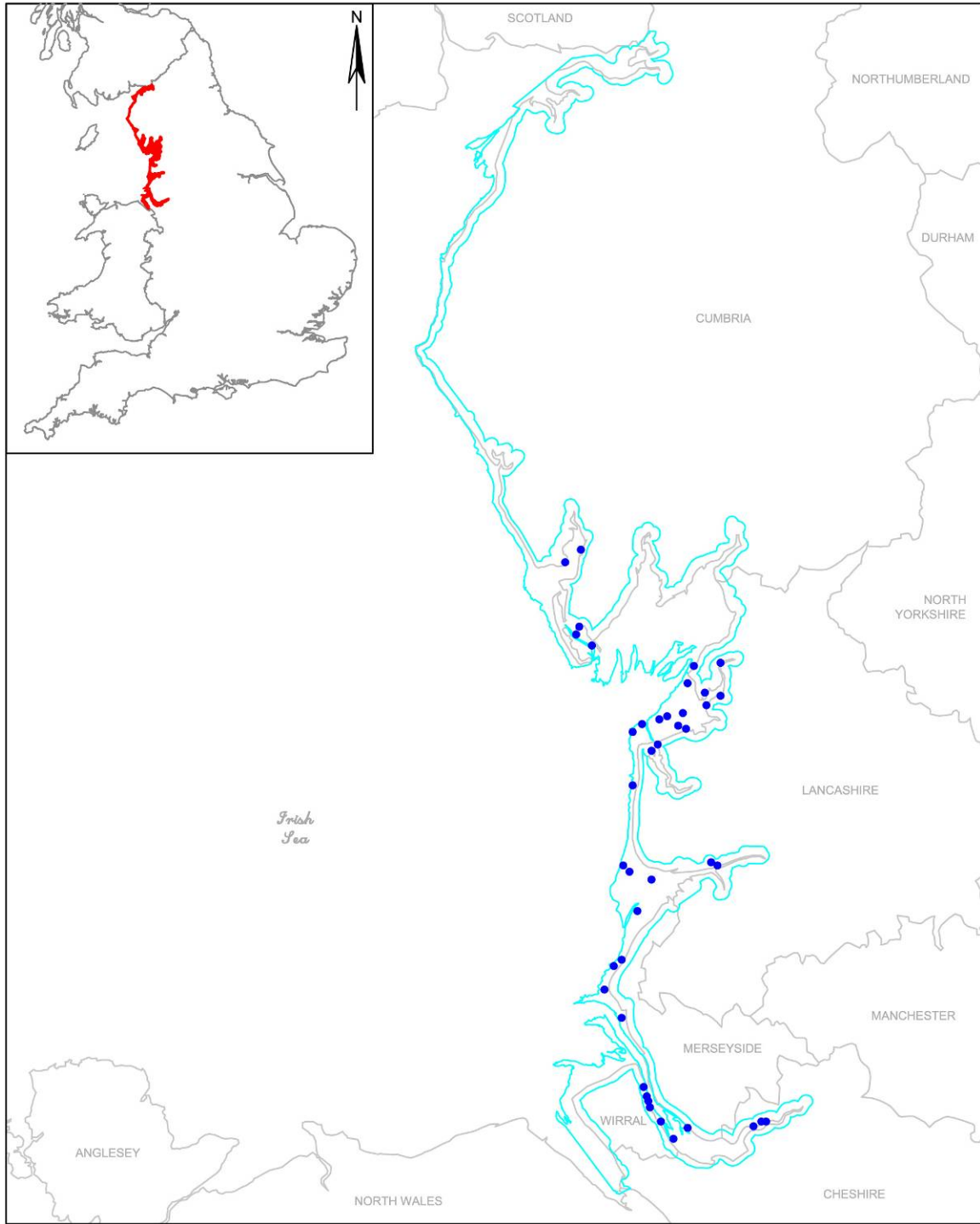


Fig. 10.2 Approximate location of wreck sites

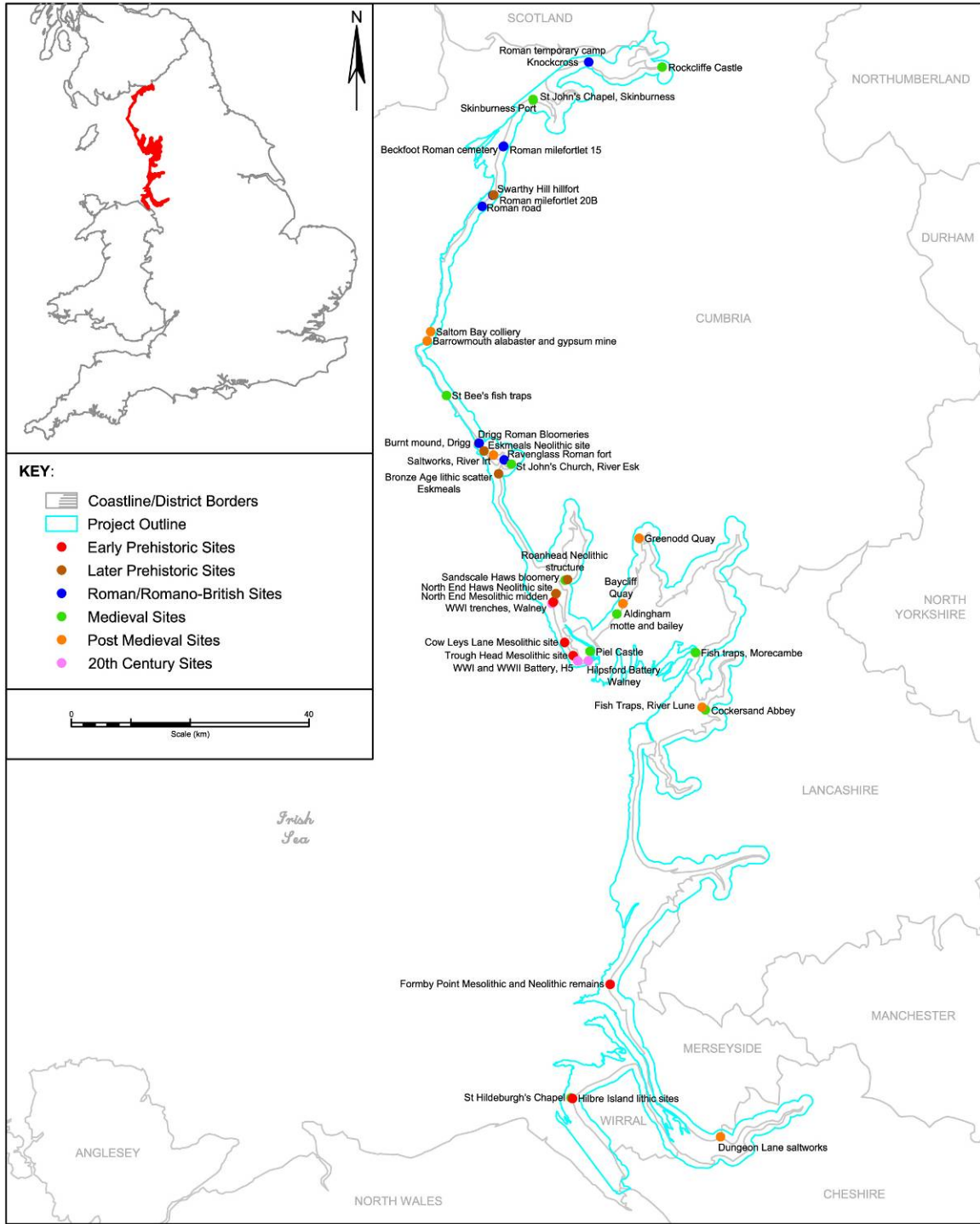


Figure 10.3 Sites identified in the Phase 1 NWRCZA as being at high risk of coastal erosion.

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Appendix I:

Gazetteer of sites within the NWRCZA study zone from the HER and NMR records

Merseyside Archaeological Service HER entries

Policy Unit	Policy	HER No.	Site Type	Easting	Northing	Special Interest	Risk
11a5.11	TBC	MME44	Air Raid Shelter	318525	387895	-	-
11a5.6	NAI	MME244	Anti-Aircraft Battery	323895	383235	-	-
11a6.3	HTL	MME882	Anti-Aircraft Battery	327850	392350	-	-
11a6.4	HTL	MME1662	Anti-Aircraft Battery	330050	394050	-	-
11a7.1	HTL	MME2943	Anti-Aircraft Battery	334150	385650	-	-
11a7.9	HTL	MME4162	Anti-Aircraft Battery	337250	386850	-	-
11a8.1	HTL	MME1054	Anti-Aircraft Battery	329950	401250	-	-
11a9.1	MR	MME1090	Anti-Aircraft Battery	329250	404650	-	-
11a9.1	MR	MME704	Anti-Aircraft Battery	327550	406650	-	-
11a8.4	HTL	MME1082	Barn	329360	404930	Low	Low
11a7.1	HTL	MME1663	Battery	330965	394485	-	-
11a7.1	HTL	MME1980	Battery	331385	393345	-	-
11a7.1	HTL	MME3432	Battlefield	335630	383150	-	-
11a8.1	HTL	MME10224	Beach Defence	330610	398930	-	-
11a7.9	HTL	MME2640	Boat Yard	333745	390885	Low	Low
11a5.9	HTL	MME101	Burial	321955	386905	Medium	Low
11a5.11	TBC	MME12	Burial	318450	387950	Medium	Low
11a5.11	TBC	MME42	Burial	318900	387400	Medium	Low
11a5.10	NAI	MME64	Cairn	319850	386750	Medium	Low
11b1.1	HTL	MME2462	Castle	333070	416580	Medium	Low
11a7.9	HTL	MME3446	Cement Works	335125	387925	Low	Low
11a7.9	HTL	MME4158	Cement Works	337025	386495	Low	Low
11a5.9	HTL	MME87	Cemetery	321785	386415	Medium	Low
11a5.11	TBC	MME27	Cemetery	318445	387965	Medium	Low
11a7.9	HTL	MME4762	Cemetery	340415	384325	Medium	Low
11a5.11	TBC	MME5	Chapel	318445	387965	High	High
11a8.1	HTL	MME1992	Chapel	331645	398095	Medium	Low
11a7.1	HTL	MME2260	Chemical Works	332115	390435	Low	Low
11a7.1	HTL	MME1915	Chemical Works	331955	390365	Low	Low
11a5.5	NAI	MME570	Church	326595	381215	Medium	Low
11a5.9	HTL	MME86	Church	321795	386425	Medium	Low
11a6.1	HTL	MME163	Church	321775	389215	Medium	Low
11a6.1	HTL	MME148	Church	321885	389395	Medium	Low
11a6.1	HTL	MME233	Church	322075	389455	Medium	Low
11a6.4	HTL	MME1627	Church	330655	393895	Medium	Low
11a7.1	HTL	MME1629	Church	330815	393885	Medium	Low
11a7.1	HTL	MME2222	Church	332830	388550	Medium	Low
11a7.1	HTL	MME2264	Church	332275	390755	Medium	Low
11a7.1	HTL	MME2273	Church	332055	391415	Medium	Low
11a7.1	HTL	MME1938	Church	331825	391605	Medium	Low
11a7.1	HTL	MME1963	Church	331610	392170	Medium	Low
11a7.1	HTL	MME2172	Church	332285	391055	Medium	Low
11a7.3	HTL	MME3851	Church	336035	380015	Medium	Low

11a7.9	HTL	MME2628	Church	333955	390485	Medium	Low
11a7.9	HTL	MME2629	Church	333925	390485	Medium	Low
11a7.9	HTL	MME2687	Church	333660	395180	Medium	Low
11a7.9	HTL	MME2292	Church	332125	397625	Medium	Low
11a7.9	HTL	MME3028	Church	334265	390125	Medium	Low
11a7.9	HTL	MME4755	Church	340395	384285	Medium	Low
11a7.9	HTL	MME4761	Church	340395	384295	Medium	Low
11a7.9	HTL	MME3447	Church	335455	387735	Medium	Low
11a7.9	HTL	MME3891	Church	336915	387065	Medium	Low
11a7.9	HTL	MME3908	Church	336185	387665	Medium	Low
11a7.9	HTL	MME4310	Church	338175	386235	Medium	Low
11b1.1	HTL	MME2470	Church	333705	417295	Medium	Low
11b1.1	HTL	MME2474	Church	333775	417915	Medium	Low
11a7.1	HTL	MME2229	Churtyard	332850	388550	Medium	Low
11a6.1	HTL	MME152	Coastguard Station	321565	389375	Low	Low
11a7.9	HTL	MME2959	Copper Works	334545	389295	Low	Low
11a7.9	HTL	MME4751	Copper Works	340105	383665	Low	Low
11a6.1	HTL	MME294	Cremation	323500	390500	Medium	Low
11a8.2	MR	MME1063	Deserted Settlement	329500	402500	Medium	Low
11a8.3	HTL	MME1313	Deserted Settlement	330105	403635	Medium	Low
11a7.9	HTL	MME2633	Dock	333925	390275	High	Low
11a7.9	HTL	MME2958	Dock	334495	389295	High	Low
11a7.9	HTL	MME2985	Dock	334265	389795	High	Low
11a7.9	HTL	MME9516	Dock	339435	384235	High	Low
11a7.9	HTL	MME9517	Dock	339925	383845	High	Low
11a7.9	HTL	MME9520	Dock	339655	383965	High	Low
11a7.9	HTL	MME9529	Dock	340115	383425	High	Low
11a7.9	HTL	MME9537	Dock	333495	393245	High	Low
11a7.9	HTL	MME9551	Dock	333771	390579	High	Low
11a7.9	HTL	MME9552	Dock	333940	390040	High	Low
11a7.9	HTL	MME9563	Dock	333535	391215	High	Low
11a7.9	HTL	MME9566	Dock	333525	391795	High	Low
11a7.9	HTL	MME9572	Dock	333465	392495	High	Low
11a7.9	HTL	MME9573	Dock	333395	392095	High	Low
11a7.9	HTL	MME9575	Dock	333535	392105	High	Low
11a7.9	HTL	MME9576	Dock	333735	392115	High	Low
11a7.9	HTL	MME9591	Dock	334165	389995	High	Low
11a7.9	HTL	MME9593	Dock	334435	389365	High	Low
11a7.9	HTL	MME9595	Dock	334305	389315	High	Low
11a7.9	HTL	MME9596	Dock	334455	389015	High	Low
11a7.9	HTL	MME9597	Dock	334305	389585	High	Low
11a7.9	HTL	MME9598	Dock	334105	389735	High	Low
11a7.9	HTL	MME9681	Dock	334915	387925	High	Low
11a7.9	HTL	MME9684	Dock	334565	388735	High	Low
11a7.9	HTL	MME9689	Dock	334435	388605	High	Low
11a7.9	HTL	MME9691	Dock	334715	388395	High	Low
11a7.9	HTL	MME9710	Dock	335215	387535	High	Low
11a7.9	HTL	MME9712	Dock	335475	387335	High	Low
11b1.1	HTL	MME2481	Dock	333115	417135	High	Low
11a7.1	HTL	MME2248	Dock	332505	390595	High	Low
11a7.9	HTL	MME2634	Dock Basin	333865	390415	High	Low
11a7.1	HTL	MME9968	Dockyard	332085	389605	High	Low

11a7.9	HTL	MME9690	Dockyard	334495	388545	High	Low
11a7.9	HTL	MME2973	Dry Dock	334045	389875	High	Low
11a7.9	HTL	MME2975	Dry Dock	334445	389385	High	Low
11a7.9	HTL	MME2978	Dry Dock	334020	389970	High	Low
11a7.9	HTL	MME2984	Dry Dock	334175	389975	High	Low
11a7.9	HTL	MME3029	Dry Dock	334055	390135	High	Low
11a7.9	HTL	MME9518	Dry Dock	339787	383772	High	Low
11a7.9	HTL	MME9527	Dry Dock	340035	383525	High	Low
11a7.9	HTL	MME9715	Dry Dock	335545	387125	High	Low
11a7.9	HTL	MME9716	Dry Dock	335585	387165	High	Low
11a7.9	HTL	MME9717	Dry Dock	335615	387195	High	Low
11a7.9	HTL	MME9718	Dry Dock	335665	387225	High	Low
11a5.5	NAI	MME405	Farm	325950	381350	Low	Low
11a5.5	NAI	MME408	Farm	325865	382235	Low	Low
11a5.5	NAI	MME584	Farm	326635	381255	Low	Low
11a5.8	HTL	MME174	Farm	322655	385255	Low	Low
11a5.8	HTL	MME175	Farm	322725	385325	Low	Low
11a5.10	NAI	MME123	Farm	321115	387315	Low	Low
11a5.10	NAI	MME127	Farm	321185	387645	Low	Low
11a5.10	NAI	MME128	Farm	321085	387765	Low	Low
11a5.10	NAI	MME129	Farm	321125	387925	Low	Low
11a5.10	NAI	MME130	Farm	321155	387595	Low	Low
11a5.10	NAI	MME132	Farm	321045	387455	Low	Low
11a6.1	HTL	MME288	Farm	323305	390155	Low	Low
11a6.1	HTL	MME237	Farm	322650	389850	Low	Low
11a6.1	HTL	MME238	Farm	322525	389965	Low	Low
11a6.1	HTL	MME239	Farm	322665	389955	Low	Low
11a6.1	HTL	MME243	Farm	322905	390175	Low	Low
11a6.1	HTL	MME297	Farm	323750	390750	Low	Low
11a6.1	HTL	MME298	Farm	323750	390750	Low	Low
11a6.2	HTL	MME683	Farm	326775	391145	Low	Low
11a7.1	HTL	MME2574	Farm	333415	386775	Low	Low
11a7.1	HTL	MME2610	Farm	333165	386745	Low	Low
11a7.1	HTL	MME2613	Farm	333875	386085	Low	Low
11a7.1	HTL	MME2929	Farm	334565	384195	Low	Low
11a7.1	HTL	MME3406	Farm	335765	382195	Low	Low
11a7.3	HTL	MME3861	Farm	336115	380165	Low	Low
11a7.3	HTL	MME3868	Farm	336125	381545	Low	Low
11a7.3	HTL	MME4141	Farm	337165	380135	Low	Low
11a7.9	HTL	MME3011	Farm	334155	390265	Low	Low
11a7.9	HTL	MME3896	Farm	336745	387375	Low	Low
11a7.9	HTL	MME4151	Farm	337655	386215	Low	Low
11a7.9	HTL	MME4306	Farm	338145	386035	Low	Low
11a7.9	HTL	MME4460	Farm	339525	385195	Low	Low
11a7.9	HTL	MME4748	Farm	340345	383965	Low	Low
11a8.2	MR	MME1298	Farm	330475	401955	Low	Low
11a8.2	MR	MME1303	Farm	330305	402305	Low	Low
11a8.3	HTL	MME1321	Farm	330135	403615	Low	Low
11a8.4	HTL	MME1315	Farm	330245	403965	Low	Low
11a8.4	HTL	MME1336	Farm	330265	404145	Low	Low
11a9.1	MR	MME743	Farm	327965	407065	Low	Low
11a9.1	MR	MME890	Farm	328515	405815	Low	Low
11a9.1	MR	MME892	Farm	328455	405595	Low	Low

11a6.2	HTL	MME543	Farmhouse	325185	391025	Low	Low
11a6.1	HTL	MME282	Flint Scatter	323150	390650	Medium	Low
11a6.3	HTL	MME697	Flint Scatter	326650	392150	Medium	Low
11a7.9	HTL	MME9560	Flour Mill	333785	391285	Low	Low
11a7.1	HTL	MME1659	Fort	330965	394485	Medium	Low
11a7.9	HTL	MME2632	Fort	333945	390455	Medium	Low
11a7.9	HTL	MME9946	Fort	333655	390935	Medium	Low
11a7.9	HTL	MME2962	Glass Works	334425	389615	Low	Low
11a7.9	HTL	MME4782	Grange	340405	384515	Medium	Low
11a8.4	HTL	MME1086	Grange	329375	404905	Medium	Low
11a5.11	TBC	MME61	Gunpost	318425	388035	-	-
11a7.9	HTL	MME9592	Half Tide Dock	334045	389875	High	Low
11a7.9	HTL	MME9701	Half Tide Dock	334555	388435	High	Low
11a5.10	NAI	MME65	Inhumation	319850	386750	Medium	Low
11a6.2	HTL	MME689	Inhumation	326505	392055	Medium	Low
11a5.8	HTL	MME183	Iron Working Site	322660	385190	Low	Low
11a7.1	HTL	MME2947	Iron Working Site	334355	385285	Low	Low
11a7.9	HTL	MME2968	Iron Working Site	334215	389735	Low	Low
11a5.7	HTL	MME251	Jetty	323035	383955	Low	Low
11a7.1	HTL	MME2948	Jetty	334365	385315	Low	Low
11a7.1	HTL	MME2945	Jetty	334295	385425	Low	Low
11a5.11	TBC	MME46	Lifeboat Station	318375	388235	Low	Low
11a6.1	HTL	MME153	Lifeboat Station	321515	389405	Low	Low
11a6.1	HTL	MME156	Lifeboat Station	321455	389365	Low	Low
11a7.1	HTL	MME1986	Lifeboat Station	331045	394045	Low	Low
11a9.1	MR	MME703	Lifeboat Station	327055	406295	Low	Low
11a6.1	HTL	MME157	Lighthouse	321485	389365	Low	Medium
11a6.1	HTL	MME158	Lighthouse	321455	389005	Low	Medium
11a6.2	HTL	MME542	Lighthouse	325285	391305	Low	Medium
11a6.4	HTL	MME1649	Lighthouse	330895	394695	Low	Medium
11a8.2	MR	MME1057	Lighthouse	329485	402645	Low	Medium
11a8.4	HTL	MME1092	Lighthouse	329385	405205	Low	Medium
11a5.5	NAI	MME406	Lime Kiln	325450	381450	Low	Low
11a5.6	NAI	MME319	Lime Kiln	324075	382885	Low	Low
11a5.7	HTL	MME168	Lime Kiln	322245	384825	Low	Low
11a5.7	HTL	MME249	Lime Kiln	323055	383945	Low	Low
11a7.1	HTL	MME2233	Lime Kiln	332750	388250	Low	Low
11a7.1	HTL	MME2620	Lime Kiln	333775	386135	Low	Low
11a7.1	HTL	MME2625	Lime Kiln	333045	387095	Low	Low
11a7.1	HTL	MME3880	Lime Kiln	336025	382715	Low	Low
11a5.9	HTL	MME68	Lithic Working Site	319895	386735	Medium	Low
11a5.9	HTL	MME69	Lithic Working Site	319895	386735	Medium	Low
11a6.1	HTL	MME71	Lithic Working Site	320350	388450	High	High
11a6.4	HTL	MME1292	Lithic Working Site	329965	394075	Medium	Low
11a5.9	HTL	MME63	Lithic Working Site	319895	386735	Medium	Low
11a5.10	NAI	MME126	Midden	321150	387950	Medium	Low
11a5.10	NAI	MME66	Midden	319850	386750	Medium	Low
11a5.11	TBC	MME45	Midden	318395	388045	Medium	Low
11a5.11	TBC	MME51	Midden	318355	388245	Medium	Low
11a7.9	HTL	MME2642	Midden	333645	390675	Medium	Low
11a5.11	TBC	MME62	Military Base	318495	388015	-	-

11a7.1	HTL	MME1964	Military Camp	331745	392075	-	-
11a7.9	HTL	MME4766	Mill	340415	384375	Low	Low
11a7.9	HTL	MME3445	Mill	335135	387845	Low	Low
11a7.9	HTL	MME4143	Mill	337845	385725	Low	Low
11a7.9	HTL	MME9708	Mill	335425	387985	Low	Low
11a5.11	TBC	MME29	Monastic Dwelling	318445	387965	Medium	Low
11a6.1	HTL	MME292	Occupation Site	323500	390500	Medium	Low
11a6.4	HTL	MME1657	Occupation Site	330500	394500	Medium	Low
11a7.9	HTL	MME2974	Pier	334025	389895	Low	Low
11b1.1	HTL	MME9759	Pier	333015	417885	Low	Low
11a7.1	HTL	MME2621	Pillbox	333850	386150	-	-
11a7.1	HTL	MME2936	Pillbox	334195	384405	-	-
11a7.1	HTL	MME2221	Priory	332805	388555	Medium	Low
11b1.1	HTL	MME2168	Priory	332915	416875	Medium	Low
11a7.1	HTL	MME10168	Quarry	332425	387605	Low	Low
11a7.1	HTL	MME10169	Quarry	332425	387725	Low	Low
11a7.1	HTL	MME10170	Quarry	332395	387755	Low	Low
11a7.1	HTL	MME2934	Quarry	334705	384185	Low	Low
11a7.3	HTL	MME3875	Quarry	336125	381115	Low	Low
11a7.9	HTL	MME4760	Quarry	340295	384235	Low	Low
11a7.9	HTL	MME3451	Quarry	335495	387675	Low	Low
11a7.9	HTL	MME3454	Quarry	335415	387695	Low	Low
11a5.5	NAI	MME557	Quay	326565	379985	Medium	Low
11a5.8	HTL	MME192	Rock Carving	322255	385875	Medium	Low
11a5.11	TBC	MME48	Salt Works	318405	388035	Medium	Low
11a7.9	HTL	MME9519	Salt Works	339885	383785	Medium	Low
11a8.1	HTL	MME9501	Sea Defences	329625	401305	-	-
11a6.3	HTL	MME883	Searchlight Battery	327850	392350	-	-
11a7.1	HTL	MME10166	Shipyards	332950	388250	Medium	Medium
11a7.9	HTL	MME3442	Shipyards	335675	387035	Medium	Medium
11a7.9	HTL	MME9528	Shipyards	340025	383555	Medium	Medium
11a7.1	HTL	MME9967	Signal Box	332115	389522	-	-
11a5.11	TBC	MME54	Signalling Structure	318395	388055	-	-
11a6.1	HTL	MME166	Sound Mirror	321650	389150	-	-
11a8.1	HTL	MME1994	Sound Mirror	331650	398050	-	-
11a9.1	MR	MME1802	Sound Mirror	331750	415350	-	-
11a9.1	MR	MME701	Sound Mirror	327850	405650	-	-
11b1.1	HTL	MME2170	Sound Mirror	332450	416750	-	-
11a5.5	NAI	MME318	Submarine Forest	324905	381925	Medium	Medium
11a5.8	HTL	MME84	Submarine Forest	321475	385715	Medium	Medium
11a5.8	HTL	MME85	Submarine Forest	321475	385715	Medium	Medium
11a6.1	HTL	MME287	Submarine Forest	323500	390500	Medium	Medium
11a6.3	HTL	MME688	Submarine Forest	326625	392255	Medium	Medium
11a8.3	HTL	MME1073	Submarine Forest	329550	402950	Medium	Medium
11a8.3	HTL	MME1077	Submarine Forest	329500	403000	Medium	Medium
11a5.11	TBC	MME58	Telegraph Station	318425	388035	Low	Low
11a7.9	HTL	MME9478	Telegraph Station	334000	390421	Low	Low
11a7.9	HTL	MME9479	Telegraph Station	333925	390535	Low	Low
11a7.9	HTL	MME2954	Timber Yard	334995	388195	Low	Low
11a7.9	HTL	MME3455	Timber Yard	335375	387905	Low	Low
11a5.11	TBC	MME17	Tombstone	318445	387965	Medium	Low

11a5.8	HTL	MME81	Tower	321615	385855	Low	Low
11a6.4	HTL	MME10147	Water Supply Site	330355	393545	-	-
11a7.1	HTL	MME2236	Watermill	332215	389365	Low	Low
11a7.9	HTL	MME2956	Watermill	334885	388255	Low	Low
11a7.9	HTL	MME4753	Watermill	340295	384245	Low	Low
11a5.8	HTL	MME191	Windmill	322500	385500	Low	Low
11a5.11	TBC	MME56	Windmill	318450	388150	Low	Low
11a7.9	HTL	MME2698	Windmill	333405	395465	Low	Low
11a7.9	HTL	MME2966	Windmill	334425	389685	Low	Low
11a7.9	HTL	MME3457	Windmill	335525	387995	Low	Low
11b1.1	HTL	MME2461	Windmill	333035	416985	Low	Low

Cheshire County Council HER entries

Policy Unit	Policy	HER No.	Site Type	Easting	Northing	Special Interest	Risk
11a7.7	TBC	MCH10811	Acid Works	-	-	Low	Low
11a7.6	HTL	MCH9796	Air Raid Shelter	-	-	-	-
11a7.3	HTL	MCH9840	Airfield	-	-	High	High
11a7.4	HTL	MCH10062	Alkali Works	-	-	Low	Low
11a7.7	TBC	MCH10172	Alkali Works	-	-	Low	Low
11a7.7	TBC	MCH10810	Alkali Works	-	-	Low	Low
11a7.6	HTL	MCH10158	Alkali Works	-	-	Low	Low
11a7.6	HTL	MCH10169	Alkali Works	-	-	Low	Low
11a7.7	TBC	MCH10152	Alkali Works	-	-	Low	Low
11a7.4	HTL	MCH10066	Alum Works	-	-	Low	Low
11a5.5	NAI	MCH9995	Bombing Decoy	-	-	-	-
11a7.3	HTL	MCH5991	Castle	-	-	High	Low
11a7.7	TBC	MCH10813	Cement Works	-	-	Low	Low
11a7.4	HTL	MCH10938	Cemetery	-	-	Low	Low
11a7.4	HTL	MCH10060	Charcoal Works	-	-	Low	Low
11a7.3	HTL	MCH10013	Chemical Works	-	-	Low	Low
11a7.4	HTL	MCH10054	Chemical Works	-	-	Low	Low
11a7.5	HTL	MCH10682	Chemical Works	-	-	Low	Low
11a7.5	HTL	MCH10688	Chemical Works	-	-	Low	Low
11a7.6	HTL	MCH10153	Chemical Works	-	-	Low	Low
11a7.6	HTL	MCH10155	Chemical Works	-	-	Low	Low
11a7.6	HTL	MCH10156	Chemical Works	-	-	Low	Low
11a7.6	HTL	MCH10162	Chemical Works	-	-	Low	Low
11a7.6	HTL	MCH10163	Chemical Works	-	-	Low	Low
11a7.6	HTL	MCH10168	Chemical Works	-	-	Low	Low
11a7.6	HTL	MCH10177	Chemical Works	-	-	Low	Low
11a7.6	HTL	MCH10178	Chemical Works	-	-	Low	Low
11a7.6	HTL	MCH10189	Chemical Works	-	-	Low	Low
11a7.6	HTL	MCH10190	Chemical Works	-	-	Low	Low
11a7.6	HTL	MCH10192	Chemical Works	-	-	Low	Low
11a7.6	HTL	MCH10201	Chemical Works	-	-	Low	Low
11a7.7	TBC	MCH10150	Chemical Works	-	-	Low	Low
11a7.7	TBC	MCH10151	Chemical Works	-	-	Low	Low
11a7.7	TBC	MCH10171	Chemical Works	-	-	Low	Low
11a7.7	TBC	MCH10174	Chemical Works	-	-	Low	Low

11a7.7	TBC	MCH10175	Chemical Works	-	-	Low	Low
11a7.7	TBC	MCH10180	Chemical Works	-	-	Low	Low
11a7.7	TBC	MCH10181	Chemical Works	-	-	Low	Low
11a7.7	TBC	MCH10204	Chemical Works	-	-	Low	Low
11a7.5	HTL	MCH10020	Chemical Works	-	-	Low	Low
11a7.7	TBC	MCH10021	Chemical Works	-	-	Low	Low
11a7.4	HTL	MCH6056	Church	-	-	Medium	Low
11a7.8	NAI	MCH6035	Church	-	-	Medium	Low
11a7.4	HTL	MCH11032	Churchyard	-	-	Low	Low
11a7.8	NAI	MCH11033	Churchyard	-	-	Low	Low
11a7.5	HTL	MCH10683	Clay Pit	-	-	Low	Low
11a5.5	NAI	MCH6226	Colliery	-	-	Low	Low
11a7.4	HTL	MCH10061	Copper Works	-	-	Low	Low
11a7.5	HTL	MCH10647	Copper Works	-	-	Low	Low
11a7.6	HTL	MCH10157	Copper Works	-	-	Low	Low
11a7.7	TBC	MCH10812	Copper Works	-	-	Low	Low
11a7.3	HTL	MCH6223	Dock	-	-	High	High
11a7.3	HTL	MCH5954	Dock	-	-	High	High
11a7.4	HTL	MCH8890	Enclosure	-	-	Medium	Low
11a7.6	HTL	MCH8824	Enclosure	-	-	Medium	Low
11a7.8	NAI	MCH6082	Enclosure	-	-	Medium	Low
11a7.8	NAI	MCH6066	Enclosure	-	-	Medium	Low
11a7.3	HTL	MCH6024	Farm	-	-	Low	Low
11a7.3	HTL	MCH6025	Farm	-	-	Low	Low
11a7.6	HTL	MCH10198	Fertiliser Works	-	-	Low	Low
11a7.7	TBC	MCH10173	Fertiliser Works	-	-	Low	Low
11a7.4	HTL	MCH10063	Flour Mill	-	-	Low	Low
11a7.5	HTL	MCH10668	Flour Mill	-	-	Low	Low
11a7.5	HTL	MCH10669	Flour Mill	-	-	Low	Low
11a7.5	HTL	MCH10739	Glass Works	-	-	Low	Low
11a7.5	HTL	MCH10686	Glue Factory	-	-	Low	Low
11a7.8	NAI	MCH5989	Gravestone	-	-	Medium	Low
11a7.6	HTL	MCH10166	Grease Works	-	-	Low	Low
11a7.6	HTL	MCH10194	Grease Works	-	-	Low	Low
11a7.5	HTL	MCH8889	Inhumation	-	-	Medium	Low
11a7.5	HTL	MCH10684	Iron Works	-	-	Low	Low
11a7.6	HTL	MCH10165	Iron Works	-	-	Low	Low
11a7.7	TBC	MCH10814	Iron Works	-	-	Low	Low
11a7.4	HTL	MCH10058	Kiln	-	-	Low	Low
11a7.5	HTL	MCH10680	Lead Works	-	-	Low	Low
11a7.8	NAI	MCH5951	Lighthouse	-	-	Low	Medium
11a7.5	HTL	MCH10681	Lime Kiln	-	-	Low	Low
11a5.5	NAI	MCH10582	Lime Kiln	-	-	Low	Low
11a7.3	HTL	MCH10035	Lime Kiln	-	-	Low	Low
11a7.6	HTL	MCH10179	Lime Works	-	-	Low	Low
11a7.7	TBC	MCH10170	Metal Works	-	-	Low	Low
11a7.6	HTL	MCH10202	Oil Works	-	-	Low	Low
11a7.3	HTL	MCH10077	Quarry	-	-	Low	Low
11a7.3	HTL	MCH10078	Quarry	-	-	Low	Low
11a7.4	HTL	MCH10067	Quarry	-	-	Low	Low
11a5.5	NAI	MCH6227	Quay	-	-	Low	Low

11a5.5	NAI	MCH6189	Quay	-	-	Low	Low
11a5.5	NAI	MCH9841	Radio Telegraphy Station	-	-	Low	Low
11a7.6	HTL	MCH10203	Saw Mill	-	-	Low	Low
11a7.7	TBC	MCH10167	Saw Mill	-	-	Low	Low
11a7.7	TBC	MCH10817	Saw Mill	-	-	Low	Low
11a7.3	HTL	MCH6009	Shrunken Village	-	-	Medium	Low
11a7.5	HTL	MCH10690	Soap Factory	-	-	Low	Low
11a7.4	HTL	MCH10064	Timber Yard	-	-	Low	Low
11a7.4	HTL	MCH6065	Watermill	-	-	Low	Low
11a7.6	HTL	MCH8500	Windmill	-	-	Low	Low
11a7.7	TBC	MCH5953	Windmill	-	-	Low	Low
11a7.6	HTL	MCH10678	Wire Mill	-	-	Low	Low
11a7.5	HTL	MCH10687	Wire Mill	-	-	Low	Low
11a7.5	HTL	MCH10738	Wire Mill	-	-	Low	Low
11a7.5	HTL	MCH10691	Zinc Works	-	-	Low	Low
11a7.6	HTL	MCH10191	Zinc Works	-	-	Low	Low

Lancashire County Council HER entries

Policy Unit	Policy	HER No.	Site Type	Easting	Northing	Special interest	Risk
11c2.4	HTL	PRN2793	Abbey	-	-	High	High
11b1.12	HTL	PRN1701	Abbey	-	-	Medium	Low
11c3.4	HTL	PRN19409	Air-Raid Shelter	-	-	-	-
11c6.1	NAI	PRN13599	Anti-Aircraft Battery	-	-	-	-
11c7.1	HTL	PRN26021	Anti-Landing Obstacle	-	-	-	-
11b1.8	HTL	PRN9069	Barn	-	-	Low	Low
11b1.12	HTL	PRN17044	Barn	-	-	Low	Low
11b1.12	HTL	PRN17045	Barn	-	-	Low	Low
11c1.3	HTL	PRN20018	Barn	-	-	Low	Low
11c1.1	HTL	PRN20873	Barracks	-	-	-	-
11c3.4	HTL	PRN16105	Barracks	-	-	-	-
11c6.1	NAI	PRN2546	Barrow	-	-	Medium	Low
11c5.2	HTL	PRN2547	Barrow	-	-	Medium	Low
11c5.2	HTL	PRN2548	Barrow	-	-	Medium	Low
11c5.2	HTL	PRN2549	Barrow	-	-	Medium	Low
11c3.5	HTL	PRN30032	Barrow	-	-	Medium	Low
11c6.1	NAI	PRN2344	Barrow	-	-	Medium	Low
11b2.2	HTL	PRN15470	Brickworks	-	-	Low	Low
11b2.2	HTL	PRN15473	Brickworks	-	-	Low	Low
11b2.2	HTL	PRN24287	Brickworks	-	-	Low	Low
11b3.2	HTL	PRN21186	Brickworks	-	-	Low	Low
11c3.1	HTL	PRN4767	Brickworks	-	-	Low	Low
11b1.12	HTL	PRN22784	Brickworks	-	-	Low	Low
11c3.2	NAI	PRN26496	Cairn	-	-	Medium	Low
11b2.2	HTL	PRN36	Cairn	-	-	Medium	Low
11c3.4	HTL	PRN3349	Castle	-	-	Medium	Low
11c3.4	HTL	PRN4179	Castle	-	-	Medium	Low
11b3.1	HTL	PRN5433	Cemetery	-	-	Low	Low
11c1.2	HTL	PRN24049	Cemetery	-	-	Low	Low

11c3.4	HTL	PRN18983	Cemetery	-	-	Low	Low
11c6.1	NAI	PRN420	Cemetery	-	-	Low	Low
11c3.4	HTL	PRN25283	Cemetery	-	-	Low	Low
11b1.6	HTL	PRN1338	Chapel	-	-	Medium	Low
11b1.10	HTL	PRN1332	Chapel	-	-	Medium	Low
11b1.12	HTL	PRN22723	Chapel	-	-	Medium	Low
11b1.12	HTL	PRN22781	Chapel	-	-	Medium	Low
11b1.17	HTL	PRN18266	Chapel	-	-	Medium	Low
11b1.17	HTL	PRN6751	Chapel	-	-	Medium	Low
11b2.2	HTL	PRN15446	Chapel	-	-	Medium	Low
11b2.2	HTL	PRN15447	Chapel	-	-	Medium	Low
11b2.2	HTL	PRN15487	Chapel	-	-	Medium	Low
11b2.2	HTL	PRN15491	Chapel	-	-	Medium	Low
11b2.2	HTL	PRN15585	Chapel	-	-	Medium	Low
11b2.2	HTL	PRN19433	Chapel	-	-	Medium	Low
11b2.2	HTL	PRN5918	Chapel	-	-	Medium	Low
11b2.2	HTL	PRN5919	Chapel	-	-	Medium	Low
11b2.3	HTL	PRN1314	Chapel	-	-	Medium	Low
11b2.3	HTL	PRN15094	Chapel	-	-	Medium	Low
11b2.3	HTL	PRN15402	Chapel	-	-	Medium	Low
11b2.3	HTL	PRN15411	Chapel	-	-	Medium	Low
11b2.3	HTL	PRN15426	Chapel	-	-	Medium	Low
11b2.3	HTL	PRN15443	Chapel	-	-	Medium	Low
11b2.3	HTL	PRN20361	Chapel	-	-	Medium	Low
11b2.3	HTL	PRN24273	Chapel	-	-	Medium	Low
11b2.3	HTL	PRN24289	Chapel	-	-	Medium	Low
11b2.7	HTL	PRN16543	Chapel	-	-	Medium	Low
11b3.2	HTL	PRN5436	Chapel	-	-	Medium	Low
11c1.1	HTL	PRN20850	Chapel	-	-	Medium	Low
11c1.1	HTL	PRN20852	Chapel	-	-	Medium	Low
11c1.1	HTL	PRN20859	Chapel	-	-	Medium	Low
11c1.2	HTL	PRN1398	Chapel	-	-	Medium	Low
11c1.3	HTL	PRN2227	Chapel	-	-	Medium	Low
11c1.5	HTL	PRN5457	Chapel	-	-	Medium	Low
11c2.4	HTL	PRN390	Chapel	-	-	Medium	Low
11c3.4	HTL	PRN21775	Chapel	-	-	Medium	Low
11c3.7	HTL	PRN386	Chapel	-	-	Medium	Low
11c6.2	HTL	PRN20439	Chapel	-	-	Medium	Low
11c6.2	HTL	PRN20450	Chapel	-	-	Medium	Low
11c6.2	HTL	PRN20477	Chapel	-	-	Medium	Low
11c7.4	NAI	PRN2233	Chapel	-	-	Medium	Low
11b1.12	HTL	PRN1412	Chapel	-	-	Medium	Low
11c5.2	HTL	PRN427	Chapel	-	-	Medium	Low
11c3.6	NAI	PRN2559	Chapel	-	-	Medium	Low
11c1.1	HTL	PRN4281	Chemical Works	-	-	Low	Low
11b1.6	HTL	PRN2229	Church	-	-	Medium	Low
11b1.8	HTL	PRN1341	Church	-	-	Medium	Low
11b1.11	HTL	PRN1447	Church	-	-	Medium	Low
11b1.12	HTL	PRN17085	Church	-	-	Medium	Low
11b1.12	HTL	PRN17105	Church	-	-	Medium	Low
11b1.12	HTL	PRN17110	Church	-	-	Medium	Low
11b1.12	HTL	PRN20387	Church	-	-	Medium	Low
11b1.12	HTL	PRN22713	Church	-	-	Medium	Low

11b1.17	HTL	PRN18301	Church	-	-	Medium	Low
11b1.17	HTL	PRN18322	Church	-	-	Medium	Low
11b1.17	HTL	PRN18282	Church	-	-	Medium	Low
11b1.20	HTL	PRN18354	Church	-	-	Medium	Low
11b2.2	HTL	PRN15064	Church	-	-	Medium	Low
11b2.3	HTL	PRN10625	Church	-	-	Medium	Low
11b2.3	HTL	PRN15408	Church	-	-	Medium	Low
11b2.3	HTL	PRN18871	Church	-	-	Medium	Low
11c1.1	HTL	PRN16562	Church	-	-	Medium	Low
11c1.1	HTL	PRN5439	Church	-	-	Medium	Low
11c1.5	HTL	PRN16806	Church	-	-	Medium	Low
11c3.1	HTL	PRN5378	Church	-	-	Medium	Low
11c3.4	HTL	PRN2368	Church	-	-	Medium	Low
11c3.4	HTL	PRN2374	Church	-	-	Medium	Low
11c3.4	HTL	PRN15874	Church	-	-	Medium	Low
11c3.4	HTL	PRN15946	Church	-	-	Medium	Low
11c3.4	HTL	PRN15953	Church	-	-	Medium	Low
11c3.6	NAI	PRN609	Church	-	-	Medium	Low
11c6.2	HTL	PRN15894	Church	-	-	Medium	Low
11c6.2	HTL	PRN16433	Church	-	-	Medium	Low
11c6.2	HTL	PRN16434	Church	-	-	Medium	Low
11c6.2	HTL	PRN16441	Church	-	-	Medium	Low
11c8.1	NAI	PRN10996	Church	-	-	Medium	Low
11b2.5	HTL	PRN7262	Church	-	-	Medium	Low
11b2.3	HTL	PRN5920	Church	-	-	Medium	Low
11b1.17	HTL	PRN1279	Church	-	-	Medium	Low
11b2.3	HTL	PRN1311	Church	-	-	Medium	Low
11c2.3	HTL	PRN2231	Church	-	-	Medium	Low
11c3.4	HTL	PRN2311	Church	-	-	Medium	Low
11c6.2	HTL	PRN419	Church	-	-	Medium	Low
11b1.17	HTL	PRN18262	Church	-	-	Medium	Low
11b1.17	HTL	PRN18356	Church	-	-	Medium	Low
11c3.4	HTL	PRN15774	Church	-	-	Medium	Low
11c3.4	HTL	PRN2367	Church	-	-	Medium	Low
11b1.12	HTL	PRN22367	Clay Pit	-	-	Low	Low
11b1.12	HTL	PRN22368	Clay Pit	-	-	Low	Low
11b1.12	HTL	PRN22369	Clay Pit	-	-	Low	Low
11b1.12	HTL	PRN22370	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN15084	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20357	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20358	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20359	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20360	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20362	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20363	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20364	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20365	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20366	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20367	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20368	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20369	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20370	Clay Pit	-	-	Low	Low
11b2.3	HTL	PRN20371	Clay Pit	-	-	Low	Low

11b3.1	HTL	PRN20860	Clay Pit	-	-	Low	Low
11b3.1	HTL	PRN20861	Clay Pit	-	-	Low	Low
11b3.2	HTL	PRN21185	Clay Pit	-	-	Low	Low
11c1.2	HTL	PRN21489	Clay Pit	-	-	Low	Low
11c1.2	HTL	PRN21500	Clay Pit	-	-	Low	Low
11c1.2	HTL	PRN26340	Clay Pit	-	-	Low	Low
11c1.2	HTL	PRN26341	Clay Pit	-	-	Low	Low
11c1.2	HTL	PRN26343	Clay Pit	-	-	Low	Low
11c1.2	HTL	PRN26344	Clay Pit	-	-	Low	Low
11c1.2	HTL	PRN26345	Clay Pit	-	-	Low	Low
11c1.2	HTL	PRN26346	Clay Pit	-	-	Low	Low
11c1.2	HTL	PRN26347	Clay Pit	-	-	Low	Low
11c2.4	HTL	PRN18944	Clay Pit	-	-	Low	Low
11c3.2	NAI	PRN18965	Clay Pit	-	-	Low	Low
11c3.2	NAI	PRN26506	Clay Pit	-	-	Low	Low
11c8.1	NAI	PRN12273	Clearance Cairn	-	-	Medium	Low
11c8.1	NAI	PRN12274	Clearance Cairn	-	-	Medium	Low
11b1.17	HTL	PRN15024	Corn Drying Kiln	-	-	Low	Low
11b1.12	HTL	PRN22720	Corn Mill	-	-	Low	Low
11b1.12	HTL	PRN6476	Corn Mill	-	-	Low	Low
11b2.3	HTL	PRN15093	Corn Mill	-	-	Low	Low
11c1.1	HTL	PRN24437	Corn Mill	-	-	Low	Low
11c1.2	HTL	PRN18801	Corn Mill	-	-	Low	Low
11c7.4	NAI	PRN4731	Corn Mill	-	-	Low	Low
11b1.12	HTL	PRN10722	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10267	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10401	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10402	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10404	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10409	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10417	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10418	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10428	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10429	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10408	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10432	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10437	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10444	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10445	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10446	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10449	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10707	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10712	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10714	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN10719	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN6463	Cotton Mill	-	-	Low	Low
11b1.12	HTL	PRN6622	Cotton Mill	-	-	Low	Low
11c3.4	HTL	PRN10536	Cotton Mill	-	-	Low	Low
11c3.4	HTL	PRN10538	Cotton Mill	-	-	Low	Low
11c3.4	HTL	PRN4661	Cotton Mill	-	-	Low	Low
11c3.4	HTL	PRN10537	Cotton Mill	-	-	Low	Low
11b2.7	HTL	PRN18799	Deserted Settlement	-	-	Medium	Low
11c1.1	HTL	PRN18792	Deserted Settlement	-	-	Medium	Low

11c1.2	HTL	PRN2866	Deserted Settlement	-	-	Medium	Low
11c2.4	HTL	PRN2526	Deserted Settlement	-	-	Medium	Low
11c3.2	NAI	PRN18786	Deserted Settlement	-	-	Medium	Low
11c3.4	HTL	PRN18788	Deserted Settlement	-	-	Medium	Low
11c3.6	NAI	PRN18794	Deserted Settlement	-	-	Medium	Low
11b1.12	HTL	PRN6624	Dock	-	-	High	Low
11c1.1	HTL	PRN20833	Dock	-	-	High	Low
11c8.1	NAI	PRN520	Dock	-	-	High	Low
11b1.12	HTL	PRN22374	Dock	-	-	High	Low
11b1.16	HTL	PRN6413	Dock	-	-	High	Low
11c3.1	HTL	PRN2600	Dry Dock	-	-	High	Low
11c1.1	HTL	PRN26074	Enclosed Settlement	-	-	Medium	Low
11b2.2	HTL	PRN15065	Factory	-	-	Low	Low
11c1.1	HTL	PRN24427	Factory	-	-	Low	Low
11c1.1	HTL	PRN24434	Factory	-	-	Low	Low
11b1.13	HTL	PRN17450	Factory	-	-	Low	Low
11b1.8	HTL	PRN1342	Farmhouse	-	-	Low	Low
11b1.8	HTL	PRN1343	Farmhouse	-	-	Low	Low
11b1.10	HTL	PRN1331	Farmhouse	-	-	Low	Low
11b1.12	HTL	PRN11891	Farmhouse	-	-	Low	Low
11c1.3	HTL	PRN16588	Farmhouse	-	-	Low	Low
11c1.3	HTL	PRN16630	Farmhouse	-	-	Low	Low
11c2.4	HTL	PRN20005	Farmhouse	-	-	Low	Low
11c2.4	HTL	PRN20002	Farmhouse	-	-	Low	Low
11c2.4	HTL	PRN20003	Farmhouse	-	-	Low	Low
11c3.6	NAI	PRN16344	Farmhouse	-	-	Low	Low
11c3.6	NAI	PRN16345	Farmhouse	-	-	Low	Low
11c3.6	NAI	PRN16347	Farmhouse	-	-	Low	Low
11c3.6	NAI	PRN16349	Farmhouse	-	-	Low	Low
11c3.6	NAI	PRN16350	Farmhouse	-	-	Low	Low
11c1.3	HTL	PRN4863	Farmhouse	-	-	Low	Low
11b1.17	HTL	PRN18283	Farmhouse	-	-	Low	Low
11b2.2	HTL	PRN1620	Farmstead	-	-	Low	Low
11b1.18	HTL	PRN21524	Firing Range	-	-	-	-
11b2.9	HTL	PRN20821	Firing Range	-	-	-	-
11b1.12	HTL	PRN10708	Flax Mill	-	-	Low	Low
11c3.4	HTL	PRN446	Fort	-	-	Medium	Low
11b1.14	NAI	PRN12820	Grange	-	-	Medium	Low
11b1.20	HTL	PRN15031	Gun Emplacement	-	-	-	-
11b1.12	HTL	PRN22716	Iron Works	-	-	Low	Low
11c3.2	NAI	PRN26507	Kiln	-	-	Low	Low
11c8.1	NAI	PRN507	Kiln	-	-	Low	Low
11b1.20	HTL	PRN21544	Lifeboat Station	-	-	Low	Medium
11b1.19	HTL	PRN15027	Lighthouse	-	-	Low	Medium
11b1.19	HTL	PRN21539	Lighthouse	-	-	Low	Medium
11b3.2	HTL	PRN5446	Lighthouse	-	-	Low	Medium
11c2.4	HTL	PRN10711	Lighthouse	-	-	Low	Medium
11c3.1	HTL	PRN4770	Lighthouse	-	-	Low	Medium
11b1.12	HTL	PRN22748	Lime Kiln	-	-	Low	Low
11b1.12	HTL	PRN22764	Lime Kiln	-	-	Low	Low
11b2.2	HTL	PRN5959	Lime Kiln	-	-	Low	Low
11b2.3	HTL	PRN5952	Lime Kiln	-	-	Low	Low

11b3.2	HTL	PRN5434	Lime Kiln	-	-	Low	Low
11c1.2	HTL	PRN5732	Lime Kiln	-	-	Low	Low
11c3.7	HTL	PRN11339	Lime Kiln	-	-	Low	Low
11c6.2	HTL	PRN20508	Lime Kiln	-	-	Low	Low
11c6.2	HTL	PRN4546	Lime Kiln	-	-	Low	Low
11c7.1	HTL	PRN5200	Lime Kiln	-	-	Low	Low
11c7.4	NAI	PRN20687	Lime Kiln	-	-	Low	Low
11c8.1	NAI	PRN12277	Lime Kiln	-	-	Low	Low
11c8.1	NAI	PRN7701	Lime Kiln	-	-	Low	Low
11c1.4	NAI	PRN5454	Lime Kiln	-	-	Low	Low
11b1.8	HTL	PRN6772	Malt Kiln	-	-	Low	Low
11b1.12	HTL	PRN22745	Malt Kiln	-	-	Low	Low
11b1.12	HTL	PRN12902	Mill	-	-	Low	Low
11b1.12	HTL	PRN22715	Mill	-	-	Low	Low
11c3.4	HTL	PRN4646	Mill	-	-	Low	Low
11c3.7	HTL	PRN11338	Mill	-	-	Low	Low
11c7.4	NAI	PRN5204	Mill	-	-	Low	Low
11c3.4	HTL	PRN10257	Mill	-	-	Low	Low
11c3.3	NAI	PRN2505	Mill	-	-	Low	Low
11b1.17	HTL	PRN26642	Mill	-	-	Low	Low
11b1.16	HTL	PRN21570	Mortuary Chapel	-	-	Medium	Low
11b3.1	HTL	PRN20863	Mortuary Chapel	-	-	Medium	Low
11b3.1	HTL	PRN20864	Mortuary Chapel	-	-	Medium	Low
11c1.2	HTL	PRN21488	Mortuary Chapel	-	-	Medium	Low
11b1.11	HTL	PRN284	Motte and Bailey	-	-	Medium	Low
11b1.12	HTL	PRN108	Motte and Bailey	-	-	Medium	Low
11b1.12	HTL	PRN15205	Motte and Bailey	-	-	Medium	Low
11b1.12	HTL	PRN15206	Motte and Bailey	-	-	Medium	Low
11b1.12	HTL	PRN15201	Motte and Bailey	-	-	Medium	Low
11b1.21	HTL	PRN3643	Pier	-	-	Medium	Medium
11c1.1	HTL	PRN5451	Pier	-	-	Medium	Medium
11c6.2	HTL	PRN17051	Pillbox	-	-	-	-
11b1.11	HTL	PRN1449	Priory	-	-	Medium	Low
11c3.2	NAI	PRN4654	Quarry	-	-	Low	Low
11b1.12	HTL	PRN20277	Quay	-	-	Low	Medium
11b1.12	HTL	PRN6619	Quay	-	-	Low	Medium
11c1.2	HTL	PRN26333	Rectangular Enclosure	-	-	Medium	Low
11c1.1	HTL	PRN4280	Salt Works	-	-	Medium	Low
11c3.1	HTL	PRN19051	Salt Works	-	-	Medium	Low
11c7.1	HTL	PRN26017	Salt Works	-	-	Medium	Low
11c2.3	HTL	PRN221	Salt Works	-	-	Medium	Low
11c1.3	HTL	PRN19207	Salt Works	-	-	Medium	Low
11b1.12	HTL	PRN20380	Saw Mill	-	-	Low	Low
11b1.12	HTL	PRN22717	Saw Mill	-	-	Low	Low
11b1.12	HTL	PRN22735	Saw Mill	-	-	Low	Low
11b1.21	HTL	PRN21546	Saw Mill	-	-	Low	Low
11b2.3	HTL	PRN15085	Saw Mill	-	-	Low	Low
11b2.3	HTL	PRN15088	Saw Mill	-	-	Low	Low
11b2.3	HTL	PRN15092	Saw Mill	-	-	Low	Low
11b3.2	HTL	PRN20824	Saw Mill	-	-	Low	Low
11c3.1	HTL	PRN19047	Saw Mill	-	-	Low	Low
11c3.4	HTL	PRN21749	Saw Mill	-	-	Low	Low

11c3.4	HTL	PRN21770	Saw Mill	-	-	Low	Low
11c3.4	HTL	PRN21779	Saw Mill	-	-	Low	Low
11c3.4	HTL	PRN21783	Saw Mill	-	-	Low	Low
11c3.4	HTL	PRN4164	Saw Mill	-	-	Low	Low
11c6.2	HTL	PRN20495	Saw Mill	-	-	Low	Low
11b2.1	MR	PRN12842	Sea Defences	-	-	Medium	High
11c2.4	HTL	PRN23616	Sea Defences	-	-	Medium	High
11b2.3	HTL	PRN24277	Settlement	-	-	Medium	Low
11b2.3	HTL	PRN24278	Settlement	-	-	Medium	Low
11c1.3	HTL	PRN26399	Settlement	-	-	Medium	Low
11c2.4	HTL	PRN23611	Settlement	-	-	Medium	Low
11c3.4	HTL	PRN4643	Shipyard	-	-	Medium	Medium
11b1.13	HTL	PRN6657	Shipyard	-	-	Medium	Medium
11b1.12	HTL	PRN20381	Shipyard	-	-	Medium	Medium
11b1.16	HTL	PRN19057	Shipyard	-	-	Medium	Medium
11c3.2	NAI	PRN5390	Stone Quarry	-	-	Low	Low
11c6.2	HTL	PRN4547	Stone Quarry	-	-	Low	Low
11c3.1	HTL	PRN25730	Tank Trap	-	-	-	-
11c3.1	HTL	PRN25730	Tank Trap	-	-	-	-
11b2.3	HTL	PRN15091	Timber Yard	-	-	Low	Low
11c3.4	HTL	PRN21685	Timber Yard	-	-	Low	Low
11c3.4	HTL	PRN21750	Timber Yard	-	-	Low	Low
11c3.4	HTL	PRN21756	Timber Yard	-	-	Low	Low
11c3.4	HTL	PRN21804	Timber Yard	-	-	Low	Low
11c3.4	HTL	PRN443	Watermill	-	-	Low	Low
11c3.2	NAI	PRN4723	Watermill	-	-	Low	Low
11c3.1	HTL	PRN4826	Watermill	-	-	Low	Low
11c1.2	HTL	PRN5948	Watermill	-	-	Low	Low
11b1.13	HTL	PRN1321	Watermill	-	-	Low	Low
11b1.14	NAI	PRN3525	Windmill	-	-	Low	Low
11b1.6	HTL	PRN6761	Windmill	-	-	Low	Low
11b1.14	NAI	PRN233	Windmill	-	-	Low	Low
11c2.4	HTL	PRN19053	Windmill	-	-	Low	Low
11c3.6	NAI	PRN4593	Windmill	-	-	Low	Low
11c6.2	HTL	PRN4563	Windmill	-	-	Low	Low
11c3.4	HTL	PRN4647	Windmill	-	-	Low	Low
11c2.3	HTL	PRN210	Windmill	-	-	Low	Low
11c2.3	HTL	PRN4815	Windmill	-	-	Low	Low
11b1.19	HTL	PRN2073	Wreck	-	-	-	-
11b3.1	HTL	PRN13384	Wreck	-	-	-	-
11b3.1	HTL	PRN26912	Wreck	-	-	-	-
11b3.1	HTL	PRN26913	Wreck	-	-	-	-
11b3.1	HTL	PRN26919	Wreck	-	-	-	-
11b3.1	HTL	PRN26921	Wreck	-	-	-	-
11b3.1	HTL	PRN26922	Wreck	-	-	-	-
11b3.2	HTL	PRN26906	Wreck	-	-	-	-
11b3.2	HTL	PRN26907	Wreck	-	-	-	-
11b3.2	HTL	PRN26908	Wreck	-	-	-	-
11b3.2	HTL	PRN26909	Wreck	-	-	-	-
11b3.2	HTL	PRN26910	Wreck	-	-	-	-
11b3.2	HTL	PRN26911	Wreck	-	-	-	-
11b3.2	HTL	PRN26916	Wreck	-	-	-	-

11b3.2	HTL	PRN26917	Wreck	-	-	-	-
11b3.2	HTL	PRN26918	Wreck	-	-	-	-
11b3.2	HTL	PRN26924	Wreck	-	-	-	-
11b3.3	HTL	PRN26025	Wreck	-	-	-	-
11b3.3	HTL	PRN26915	Wreck	-	-	-	-
11b3.3	HTL	PRN26920	Wreck	-	-	-	-
11b3.3	HTL	PRN26925	Wreck	-	-	-	-
11c1.1	HTL	PRN26930	Wreck	-	-	-	-
11c1.1	HTL	PRN26932	Wreck	-	-	-	-
11c1.4	NAI	PRN26927	Wreck	-	-	-	-
11c1.4	NAI	PRN26931	Wreck	-	-	-	-
11c2.1	HTL	PRN26914	Wreck	-	-	-	-
11c2.2	HTL	PRN26948	Wreck	-	-	-	-
11c2.3	HTL	PRN26940	Wreck	-	-	-	-
11c2.3	HTL	PRN26943	Wreck	-	-	-	-
11c2.3	HTL	PRN26944	Wreck	-	-	-	-
11c2.3	HTL	PRN26945	Wreck	-	-	-	-
11c2.3	HTL	PRN26946	Wreck	-	-	-	-
11c2.3	HTL	PRN26947	Wreck	-	-	-	-
11c2.3	HTL	PRN26991	Wreck	-	-	-	-
11c2.3	HTL	PRN26952	Wreck	-	-	-	-
11c2.3	HTL	PRN26958	Wreck	-	-	-	-
11c2.3	HTL	PRN26960	Wreck	-	-	-	-
11c2.3	HTL	PRN26963	Wreck	-	-	-	-
11c2.3	HTL	PRN26964	Wreck	-	-	-	-
11c2.3	HTL	PRN26968	Wreck	-	-	-	-
11c2.3	HTL	PRN26969	Wreck	-	-	-	-
11c2.4	HTL	PRN988	Wreck	-	-	-	-
11c3.1	HTL	PRN13387	Wreck	-	-	-	-
11c3.4	HTL	PRN4637	Wreck	-	-	-	-
11c3.6	NAI	PRN2219	Wreck	-	-	-	-
11c5.1	NAI	PRN26934	Wreck	-	-	-	-
11c6.1	NAI	PRN26971	Wreck	-	-	-	-
11c6.1	NAI	PRN11359	Wreck	-	-	-	-
11b2.3	HTL	PRN11193	Wreck	-	-	-	-

Cumbria County Council HER entries

Policy Unit	Policy	HER No.	Site Type	Easting	Northing	Special interest	Risk
11c13.2	HTL	19856	Anti aircraft defences	324100	467300		
11e3.3	NAI	3692	Barrow	303530	535210	Medium	Medium
11c13.2	HTL	4371	Barrow	323760	467270	Medium	Medium
11e2.9	NAI	40486	Battery	298650	528475	-	-
11e3.1	HTL	12740	Battery	299000	529800	-	-
11e3.4	HTL	3838	Battery	303100	536600	-	-
11d5.1	HTL	5330	Bog Burial	304000	502000	High	Low
11e2.6	HTL	16395	Bombing Decoy	298900	525199	-	-
11e2.10	MR	16390	Bombing Decoy	298912	528700	-	-
11e3.1	HTL	16468	Bombing Decoy	299699	530101	-	-
11e3.1	HTL	16392	Bombing Decoy	299800	530400	-	-
11e3.2	HTL	1778	Bombing Decoy	300882	532873	-	-

11e3.2	HTL	12778	Bombing Decoy	301103	532500	-	-
11e5.1	NAI	19165	Bombing Range Marker	308199	547600	-	-
11c11.5	HTL	5324	Brick Kiln	330701	476400	Low	Low
11c12.1	HTL	16073	Brick Kiln	333820	478860	Low	Low
11c16.10	NAI	4367	Burial	317000	480000	Medium	Low
11d6.1	NAI	6849	Burial	296900	512100	Medium	Low
11c12.1	HTL	2386	Burial	333363	478103	Medium	Low
11e3.3	NAI	840	Burial	302550	534530	Medium	Low
11c13.1	NAI	2368	Cairn	328801	472601	Medium	Low
11e2.3	HTL	6238	Cairn	298000	520000	Medium	Low
11e8.8	NAI	11268	Castle	334699	562451	Medium	Low
11e8.8	NAI	185	Castle	335393	561919	Medium/High	Medium
11d5.4	NAI	12213	Castle	301290	504471	Medium	Low
11e8.8	NAI	10109	Castle	335270	562030	Medium	Low
11c9.2	HTL	2489	Cave	348268	480203	Low	Medium
11c10.1	NAI	2381	Chapel	338998	475001	Medium	Low
11c13.1	NAI	2433	Chapel	330000	474000	Medium	Low
11c15.2	HTL	16272	Chapel	319220	468600	Medium	Low
11d6.2	NTL	4451	Chapel	296001	512001	Medium	Low
11e2.4	HTL	4472	Church	298275	520992	Medium	Low
11e2.11	HTL	1011	Church	299730	528955	Medium	Low
11e2.3	HTL	6389	Cist burial	298000	520000	Medium	Low
11e2.4	HTL	1019	Cist burial	298352	520955	Medium	Low
11e1.2	HTL	4764	Colliery	296650	517400	Low	Low
11e1.3	NAI	12840	Colliery	296880	517620	Low	Low
11e2.4	HTL	41975	Colliery	298680	523290	Low	Low
11e2.4	HTL	41976	Colliery	298790	523210	Low	Low
11e2.4	HTL	41977	Colliery	298920	523070	Low	Low
11e2.9	NAI	40487	Colliery	298801	528371	Low	Low
11c15.2	HTL	40872	Corn Mill	319510	469000	Low	Low
11e4.1	HTL	3695	Corn Mill	303600	537199	Low	Low
11e2.3	HTL	6239	Cremation burial	298300	520899	Medium	Low
11e8.1	NAI	357	Cremation Cemetery	317500	559931	Medium	Low
11c9.2	HTL	17368	Deserted Village	348731	480339	Medium	Low
11c15.3	NAI	2715	Deserted Village	319120	470580	Medium	Low
11c16.9	HTL	1485	Deserted Village	317100	481200	Medium	Low
11e4.1	HTL	818	Deserted Village	304302	536603	Medium	Low
11e5.1	NAI	628	Deserted Village	309120	548590	Medium	Low
11e6.2	HTL	17589	Deserted Village	312500	556100	Medium	Low
11c15.3	NAI	2711	Deserted Village	319650	472520	Medium	Low
11e2.10	MR	5315	Dock and Harbour Installation	298500	529400	High	Medium
11e3.4	HTL	3808	Dock and Harbour Installation	303100	536600	High	Medium
11e8.3	NAI	6295	Dock and Harbour Installation	324100	562200	High	Medium
11e3.4	HTL	4966	Dry Dock	303390	536500	High	Medium
11c8.6	HTL	19246	Enclosed Settlement	339230	475650	Medium	Low
11e6.3	NAI	9608	Enclosure	313040	556209	Medium	Low
11e4.3	NAI	3694	Enclosure	307300	539500	Medium	Low
11e4.3	NAI	3181	Enclosure	307700	540200	Medium	Low
11e5.1	NAI	618	Enclosure	307300	546899	Medium	Low

11e5.1	NAI	3185	Enclosure	309198	548302	Medium	Low
11d5.6	NAI	17834	Enclosure	297530	511200	Medium	Low
11d6.1	NAI	41853	Farm	296830	512040	Low	Low
11e8.2	NAI	41963	Farm	322395	562685	Low	Low
11e8.9	MR	41487	Farmstead	335490	564820	Low	Low
11e6.2	HTL	41712	Farmstead	311500	553950	Low	Low
11e2.3	HTL	5630	Fortlet	298200	520600	High	Low
11e6.2	HTL	4798	Frontier Defence	312250	555520	High	Low
11e7.2	HTL	4413	Frontier Defence	312600	555830	High	Low
11e2.3	HTL	13673	Frontier Defence, Ditches, Pottery	298300	520801	High	Low
11e8.3	NAI	165	Frontier Defence, Milecastle	323590	562240	High	Low
11e8.3	NAI	168	Frontier Defence, Milecastle	324538	561346	High	Low
11e8.3	NAI	171	Frontier Defence, Milecastle	325660	560650	High	Low
11e8.4	NAI	384	Frontier Defence, Milecastle	326680	559880	High	Low
11e8.4	NAI	385	Frontier Defence, Milecastle	328117	559749	High	Low
11e8.4	NAI	386	Frontier Defence, Milecastle	329519	559690	High	Low
11e6.2	HTL	361	Frontier Defence, Milefort	311159	553880	High	Low
11e2.4	HTL	6436	Frontier Defence, Milefortlet	298939	524330	High	Low
11e4.3	NAI	3701	Frontier Defence, Milefortlet	307101	540500	High	Low
11e5.1	NAI	629	Frontier Defence, Milefortlet	309420	549711	High	Low
11e6.2	HTL	352	Frontier Defence, Milefortlet	311880	555200	High	Low
11e8.1	NAI	148	Frontier Defence, Milefortlet	319770	561480	High	Low
11e4.6	HTL	621	Frontier Defence, Signal Station	307800	545199	High	Low
11e2.4	HTL	1007	Frontier Defence, Signal Tower	298099	522200	High	Low
11e3.1	HTL	842	Frontier Defence, Signal Tower	300316	530380	High	Low
11e5.1	NAI	620	Frontier Defence, Signal Tower	308123	546550	High	Low
11e5.1	NAI	623	Frontier Defence, Signal Tower	308371	547510	High	Low
11e5.1	NAI	627	Frontier Defence, Signal Tower	309140	549290	High	Low
11e7.7	NAI	355	Frontier Defence, Signal Tower	317110	558820	High	Low
11e5.1	NAI	363	Frontier Defence, Turret	310672	552998	High	Low
11e6.2	HTL	362	Frontier Defence, Turret	310908	553427	High	Low
11e6.2	HTL	360	Frontier Defence, Turret	311390	554322	High	Low
11e6.2	HTL	359	Frontier Defence, Turret	311630	554749	High	Low
11e8.1	NAI	149	Frontier Defence, Turret	319470	561160	High	Low
11e8.1	NAI	160	Frontier Defence, Turret	321860	562669	High	Low
11e8.3	NAI	161	Frontier Defence, Turret	322830	562560	High	Low
11e8.3	NAI	162	Frontier Defence, Turret	323101	562299	High	Low
11e8.3	NAI	169	Frontier Defence, Turret	324310	561750	High	Low

11e8.3	NAI	383	Frontier Defence, Turret	326200	559970	High	Low
11e8.4	NAI	390	Frontier Defence, Turret	328540	559739	High	Low
11e8.4	NAI	389	Frontier Defence, Turret	329010	559720	High	Low
11e8.4	NAI	431	Frontier Defence, Turret	330019	559610	High	Low
11e5.1	NAI	626	Frontier Defence, Vicus	309040	548889	High	Low
11e3.1	HTL	16200	Gun Emplacement	299401	529700	-	-
11d1.2	NAI	19850	Gunpost	313500	479699	-	-
11e2.3	HTL	40786	Hypocaust	298100	520900	High	Low
11c15.2	HTL	40873	Iron foundry	319560	469050	Low	Low
11e3.1	HTL	4663	Iron Works	299522	529782	Low	Low
11e3.4	HTL	3616	Jetty	303399	536400	Low	Medium
11c11.4	NAI	16012	Kiln	331050	477380	Low	Low
11e4.5	NAI	10079	Kiln	307980	544780	Low	Low
11e2.1	HTL	1669	Lighthouse	297034	518429	Low	Medium
11e3.4	HTL	10940	Lighthouse	302978	536771	Low	Medium
11e3.4	HTL	10945	Lighthouse	303032	536750	Low	Medium
11e8.3	NAI	10337	Lighthouse	324240	562540	Low	Medium
11c8.4	HTL	15852	Lime Kiln	346048	478153	Low	Low
11c8.4	HTL	15858	Lime Kiln	346190	478240	Low	Low
11c8.6	HTL	16109	Lime Kiln	339240	475829	Low	Low
11c9.1	HTL	12557	Lime Kiln	347613	478755	Low	Low
11c12.1	HTL	17772	Lime Kiln	333960	479441	Low	Low
11c12.2	HTL	16339	Lime Kiln	331380	482490	Low	Low
11c13.1	NAI	18072	Lime Kiln	327899	470130	Low	Low
11c13.1	NAI	18077	Lime Kiln	328460	473140	Low	Low
11c13.1	NAI	15992	Lime Kiln	328735	472638	Low	Low
11c13.2	HTL	16087	Lime Kiln	326122	468410	Low	Low
11c13.2	HTL	16086	Lime Kiln	326578	468693	Low	Low
11c13.2	HTL	16083	Lime Kiln	326972	469246	Low	Low
11c13.3	NAI	16246	Lime Kiln	323912	466097	Low	Low
11c14.1	NAI	18412	Lime Kiln	320840	463530	Low	Low
11c14.1	NAI	18413	Lime Kiln	321040	463230	Low	Low
11c14.2	HTL	16263	Lime Kiln	318263	469690	Low	Low
11c14.8	NAI	16261	Lime Kiln	317360	470660	Low	Low
11c15.2	HTL	41410	Lime Kiln	319494	468215	Low	Low
11c16.5	HTL	18159	Lime Kiln	322730	482440	Low	Low
11c16.7	HTL	18046	Lime Kiln	321050	485470	Low	Low
11c16.8	MR	12300	Lime Kiln	319090	486440	Low	Low
11c16.11	NAI	16804	Lime Kiln	318020	478379	Low	Low
11e2.2	HTL	11938	Lime Kiln	297349	519279	Low	Low
11e2.10	MR	40496	Lime Kiln	299127	528933	Low	Low
11c14.8	NAI	1496	Lithic Working Site	317530	473310	Medium	Low
11c9.2	HTL	2488	Long Barrow	348200	480200	Medium	Low
11c14.8	NAI	41881	Midden	317080	471850	Medium	Low
11e5.1	NAI	364	Milefortlet	310000	551112	High	Low
11e7.5	NAI	12485	Mill	321549	558211	Low	Low
11d5.6	NAI	3998	Motte	298200	509400	Medium	Low
11d5.4	NAI	5644	Motte	300842	505988	Medium	Low
11e5.1	NAI	4525	Mound	308800	546500	Medium	Low
11e8.3	NAI	156	Mound	323009	562751	Medium	Low
11e8.2	NAI	163	Pele Tower	322430	562595	Medium	Low

11c10.2	HTL	19831	Pillbox	337600	474600	-	-
11c10.2	HTL	19832	Pillbox	337900	474200	-	-
11c14.2	HTL	19804	Pillbox	318100	469203	-	-
11c14.2	HTL	16881	Pillbox	318200	467800	-	-
11c14.2	HTL	16882	Pillbox	318700	467699	-	-
11c14.2	HTL	16883	Pillbox	318800	467800	-	-
11c15.2	HTL	16884	Pillbox	318900	468699	-	-
11c15.2	HTL	16889	Pillbox	319606	467760	-	-
11c15.2	HTL	16887	Pillbox	319745	467828	-	-
11c15.2	HTL	16902	Pillbox	320500	468100	-	-
11c15.2	HTL	16903	Pillbox	320501	468300	-	-
11c15.2	HTL	16904	Pillbox	320600	467900	-	-
11c15.3	NAI	16894	Pillbox	318899	471199	-	-
11c15.3	NAI	16895	Pillbox	318900	472100	-	-
11c15.3	NAI	16896	Pillbox	319078	472736	-	-
11c16.2	HTL	19855	Pillbox	320799	478201	-	-
11d1.2	NAI	19836	Pillbox	313456	479161	-	-
11d4.1	NAI	16875	Pillbox	304799	498501	-	-
11d4.1	NAI	16874	Pillbox	304800	499401	-	-
11e2.2	HTL	6306	Pillbox	297199	519200	-	-
11e2.2	HTL	6305	Pillbox	297400	519500	-	-
11e2.4	HTL	12788	Pillbox	298808	524504	-	-
11e2.8	HTL	12787	Pillbox	298800	527500	-	-
11e3.1	HTL	16213	Pillbox	299802	530802	-	-
11e3.4	HTL	15256	Pillbox	302799	536500	-	-
11e3.4	HTL	15254	Pillbox	303001	536799	-	-
11e3.4	HTL	15257	Pillbox	303301	536601	-	-
11e3.4	HTL	6307	Pillbox	303389	536285	-	-
11e3.4	HTL	15255	Pillbox	303401	536500	-	-
11e4.5	NAI	1851	Pillbox	307900	544601	-	-
11e6.1	HTL	15213	Pillbox	310440	553600	-	-
11e6.2	HTL	15214	Pillbox	310800	553500	-	-
11e6.2	HTL	15209	Pillbox	311099	553399	-	-
11e6.2	HTL	15210	Pillbox	311100	554100	-	-
11e6.2	HTL	15218	Pillbox	311490	554599	-	-
11e6.2	HTL	15220	Pillbox	311598	554497	-	-
11e6.2	HTL	15227	Pillbox	311601	555198	-	-
11e6.2	HTL	15211	Pillbox	311700	554001	-	-
11e6.2	HTL	15212	Pillbox	311901	554198	-	-
11e6.2	HTL	15219	Pillbox	311931	553700	-	-
11e6.2	HTL	15226	Pillbox	312000	555100	-	-
11e6.2	HTL	15221	Pillbox	312000	554600	-	-
11e6.2	HTL	15217	Pillbox	312111	554301	-	-
11e6.2	HTL	15223	Pillbox	312200	554499	-	-
11e6.2	HTL	15222	Pillbox	312300	554600	-	-
11e6.3	NAI	3893	Pillbox	313799	556701	-	-
11e6.3	NAI	15225	Pillbox	314400	556501	-	-
11e6.3	NAI	4946	Pillbox	314401	556801	-	-
11e7.2	HTL	15228	Pillbox	312800	555400	-	-
11e7.2	HTL	15229	Pillbox	313000	555401	-	-
11e7.2	HTL	15231	Pillbox	313200	555401	-	-
11e7.2	HTL	15230	Pillbox	313300	555300	-	-
11e7.2	HTL	15224	Pillbox	313700	554700	-	-

11e8.5	NAI	15252	Pillbox	332481	561686	-	-
11e8.9	MR	16859	Pillbox	335600	564800	-	-
11c15.1	NAI	16899	Pillbox	320300	467100	-	-
11c13.1	NAI	3148	Port	328802	471599	Medium	Medium
11e8.5	NAI	194	Port	333150	561650	Medium	Medium
11e4.2	HTL	4414	Quarry	304299	537901	Low	Low
11c14.8	NAI	19874	Rifle range	317000	470798	-	-
11e4.3	NAI	813	Ring Ditch	305901	538900	-	-
11e4.2	HTL	16568	Roman Vicus	304000	537500	Medium	Low
11c8.4	HTL	13615	Salt Works	346000	478800	Medium	Low
11c15.2	HTL	2594	Salt Works	321680	468800	Medium	Low
11c16.9	HTL	41709	Salt Works	317400	480900	Medium	Low
11d5.6	NAI	13926	Salt Works	296900	510850	Medium	Low
11e1.1	NAI	2910	Salt Works	296300	517300	Medium	Low
11e1.1	NAI	1193	Salt Works	296300	517300	Medium	Low
11e2.1	HTL	5554	Salt Works	296900	518299	Medium	Low
11e2.1	HTL	41708	Salt Works	297300	518800	Medium	Low
11e2.4	HTL	41706	Salt Works	298600	524200	Medium	Low
11e2.8	HTL	41705	Salt Works	298700	526600	Medium	Low
11e2.9	NAI	40489	Salt Works	298510	528950	Medium	Low
11e3.2	HTL	13648	Salt Works	302299	534300	Medium	Low
11e4.2	HTL	4716	Salt Works	304600	538290	Medium	Low
11e7.4	NAI	41699	Salt Works	319900	556100	Medium	Low
11e8.2	NAI	41695	Salt Works	322000	563000	Medium	Low
11e8.4	NAI	4567	Salt Works	329000	560000	Medium	Low
11e8.4	NAI	2910	Salt Works	329000	560000	Medium	Low
11e8.4	NAI	5309	Salt Works	329000	560000	Medium	Low
11e8.9	MR	41694	Salt Works	333900	563700	Medium	Low
11e4.5	NAI	41704	Salt Works	307700	544900	Medium	Low
11e7.4	NAI	41697	Salt Works	321000	557000	Medium	Low
11e7.5	NAI	41696	Salt Works	320685	558285	Medium	Low
11e7.5	NAI	41698	Salt Works	322000	557500	Medium	Low
11c12.2	HTL	16342	Saw Mill	331459	482630	Low	Low
11c16.5	HTL	18153	Saw Mill	323470	482205	Low	Low
11e3.3	NAI	10950	Saw Mill	303581	536241	Low	Low
11e3.4	HTL	3067	Saw Mill	303270	536501	Low	Low
11c16.9	HTL	41743	Sea Defences	318279	482441	Medium	High
11c15.3	NAI	5385	Settlement	319198	472499	Medium	Low
11e2.3	HTL	5121	Settlement	298599	520300	Medium	Low
11e4.2	HTL	789	Settlement	304603	538002	Medium	Low
11e4.3	NAI	3045	Settlement	307999	540201	Medium	Low
11e5.1	NAI	592	Settlement	308800	547800	Medium	Low
11e5.1	NAI	3699	Settlement	308901	548400	Medium	Low
11e8.1	NAI	3284	Settlement	321300	562299	Medium	Low
11e8.3	NAI	3293	Settlement	323100	562600	Medium	Low
11e9.3	HTL	3371	Shrunken Village	349000	481300	Medium	Low
11e7.4	NAI	371	Shrunken Village	319801	555199	Medium	Low
11c15.3	NAI	41768	Slag Works	318988	471578	Low	Low
11c13.1	NAI	5626	Square Enclosure	328700	473199	Medium	Low
11c13.2	HTL	4803	Square Enclosure	325999	469499	Medium	Low
11e8.8	NAI	5393	Stone Circle	334730	561920	Medium	Low
11d5.6	NAI	4674	Submarine Forest	296700	510800	Medium	Medium

11e2.7	HTL	12777	Tank Trap	298700	526500	-	-
11c12.2	HTL	16344	Tannery	331340	482601	Low	Low
11e4.1	HTL	793	Temple	303760	537380	Medium	Low
11e4.2	HTL	825	Temple	303820	537421	Medium	Low
11e8.3	NAI	4585	Temple	323970	562290	Medium	Low
11e4.3	NAI	41727	Tile kiln	308020	542090	Low	Low
11c15.2	HTL	16245	Timber Yard	320100	468449	Low	Low
11e8.3	NAI	4595	Turret	324080	562281	Low	Low
11e8.2	NAI	13653	Vallum	322390	562610	High	Low
11e5.1	NAI	10009	Watermill	309040	549150	Low	Low
11e7.7	NAI	41725	Watermill	317850	557680	Low	Low
11c14.2	HTL	2723	Windmill	317900	469598	Low	Low
11c14.8	NAI	16262	Windmill	317300	470900	Low	Low
11e1.2	HTL	19092	Windmill	297260	517400	Low	Low
11e1.3	NAI	11964	Windmill	296850	517851	Low	Low
11e8.2	NAI	10213	Windmill	322200	562710	Low	Low
11c14.6	NAI	19876	WW defences	317300	468900	-	-

NMR entries

Policy Unit	Policy	NMR UID	Site Type	Easting	Northing	Special Interest	Risk
11e4.1	NAI	1484489	Aircraft obstruction	340190	456120	-	-
11a7.4	HTL	1464364	Aircraft obstructions	353550	384310	-	-
11b1.2	HTL	1480280	Aircraft obstructions	335700	421400	-	-
11c2.3	HTL	1484160	Aircraft obstructions	341600	452500	-	-
11d1.2	NAI	1434080	Aircraft wreck	312500	480000	-	-
11d1.2	NAI	1432933	Aircraft wreck	313001	479000	-	-
11a7.8	NAI	1410985	Airfield defence	341400	383300	-	-
11a8.3	HTL	1476647	Air-Raid Shelter	330000	403170	-	-
11b1.12	HTL	1481461	Air-Raid Shelter	350030	430200	-	-
11a7.3	HTL	1464651	Air-Raid Shelter	340310	377180	-	-
11a7.3	HTL	1466692	Air-Raid Shelter	336510	380740	-	-
11a7.6	HTL	1412950	Air-Raid Shelter	352300	385900	-	-
11b1.17	HTL	1480924	Air-Raid Shelter	335400	426960	-	-
11b1.17	HTL	1480930	Air-Raid Shelter	336920	427490	-	-
11b1.17	HTL	1481144	Air-Raid Shelter	334610	427740	-	-
11c16.10	NAI	1491150	Air-Raid Shelter	317730	480130	-	-
11e1.3	NAI	1494614	Air-Raid Shelter	296970	517980	-	-
11e2.1	HTL	1417657	Air-Raid Shelter	297500	518100	-	-
11e2.1	HTL	1417658	Air-Raid Shelter	297400	518400	-	-
11e2.1	HTL	1494607	Air-Raid Shelter	297680	518440	-	-
11b1.18	HTL	1481139	Air-Raid Shelter	334160	427590	-	-
11b1.18	HTL	1481131	Air-Raid Shelter	334450	427360	-	-
11a7.9	HTL	1411396	Air-Raid Shelters	340000	384000	-	-
11a7.9	HTL	1465122	Air-Raid Shelters	340680	384190	-	-
11c16.2	HTL	1490399	Air-Raid Shelters	321390	477220	-	-
11e1.1	NAI	1494615	Air-Raid Shelters	296700	516670	-	-
11e2.2	HTL	1494602	Air-Raid Shelters	297820	519300	-	-
11e2.8	HTL	1494961	Air-Raid Shelters	298970	526910	-	-
11b1.8	HTL	1481683	Anti glider ditches	346030	425600	-	-

11a8.2	MR	1472947	Anti-Aircraft Battery	330502	402400	-	-
11a8.2	MR	1476726	Anti-Aircraft Battery	329690	402020	-	-
11b2.2	HTL	1471583	Anti-Aircraft Battery	331300	433800	-	-
11c13.2	HTL	1489978	Anti-Aircraft Battery	324140	467160	-	-
11c14.2	HTL	1473696	Anti-Aircraft Battery	318600	468500	-	-
11c14.3	NAI	1471349	Anti-Aircraft Battery	321196	461987	Medium	High
11c14.5	NAI	1471337	Anti-Aircraft Battery	318300	466300	-	-
11c14.7	MR	1471334	Anti-Aircraft Battery	317300	470100	-	-
11c15.1	NAI	1471345	Anti-Aircraft Battery	320200	467100	Medium	High
11c15.2	HTL	1473698	Anti-Aircraft Battery	320500	467900	-	-
11c15.2	HTL	1416229	Anti-Aircraft Battery	320400	468200	-	-
11c16.2	HTL	1471350	Anti-Aircraft Battery	321000	478200	-	-
11c4.1	NAI	1472297	Anti-Aircraft Battery	342300	456300	-	-
11c6.1	NAI	1472296	Anti-Aircraft Battery	341000	461300	-	-
11b1.13	HTL	1427350	Anti-Landing Obstacle	344000	428000	-	-
11e2.7	HTL	1417655	Anti-Tank Blocks	298700	526500	-	-
11a7.9	HTL	1421391	Anti-Tank Cubes	340000	385000	-	-
11b1.18	HTL	1427344	Anti-Tank Pimples	333600	427400	-	-
11a7.9	HTL	1411397	Balloon mooring	336540	386960	-	-
11a7.9	HTL	1411401	Balloon mooring	337140	386540	-	-
11a7.9	HTL	1411402	Balloon mooring	337520	386150	-	-
11a7.6	HTL	1463045	Barbed wire obstruction	352430	385620	-	-
11a7.3	HTL	1462762	Barrage Balloon site	350780	380180	-	-
11a7.3	HTL	1462793	Barrage Balloon site	350330	380930	-	-
11a7.3	HTL	1462841	Barrage Balloon site	350410	382820	-	-
11a7.4	HTL	1463911	Barrage Balloon site	356000	384190	-	-
11a7.4	HTL	1462513	Barrage Balloon site	356230	385130	-	-
11a7.4	HTL	1462521	Barrage Balloon site	356960	385680	-	-
11a7.4	HTL	1462912	Barrage Balloon site	352280	383150	-	-
11a7.4	HTL	1464330	Barrage Balloon site	352690	383450	-	-
11a7.6	HTL	1462884	Barrage Balloon site	351130	384350	-	-
11a7.6	HTL	1463050	Barrage Balloon site	353980	385580	-	-
11a7.6	HTL	1463085	Barrage Balloon site	354640	385920	-	-
11a7.6	HTL	1463976	Barrage Balloon site	352490	385970	-	-
11a7.6	HTL	1463980	Barrage Balloon site	352490	385970	-	-
11a7.6	HTL	1463993	Barrage Balloon site	353130	385760	-	-
11a7.7	TBC	1462490	Barrage Balloon site	349100	383800	-	-
11a7.7	TBC	1462851	Barrage Balloon site	350530	384050	-	-
11a7.7	TBC	1462855	Barrage Balloon site	350210	384180	-	-
11a7.8	NAI	1465147	Barrage Balloon site	342440	382320	-	-
11a7.9	HTL	1464485	Barrage Balloon site	340600	383860	-	-
11a7.9	HTL	1466005	Barrage Balloon site	338240	385610	-	-
11a7.9	HTL	1466108	Barrage Balloon site	335370	387810	-	-
11a8.1	HTL	1476615	Barrage Balloon site	331390	398210	-	-
11c14.1	NAI	1489074	Barrage Balloon site	319270	465840	-	-
11c14.2	HTL	1489082	Barrage Balloon site	318840	466450	-	-
11c14.2	HTL	1488683	Barrage Balloon site	318330	470020	-	-
11c14.2	HTL	1489136	Barrage Balloon site	318500	468490	-	-
11c14.6	NAI	1489105	Barrage Balloon site	318090	466990	-	-
11c14.8	NAI	1488685	Barrage Balloon site	318150	470860	-	-
11c15.2	HTL	1489050	Barrage Balloon site	318850	469640	-	-
11c15.2	HTL	1489878	Barrage Balloon site	320640	468770	-	-

11c15.2	HTL	1489017	Barrage Balloon site	319170	468850	-	-
11c15.2	HTL	1489030	Barrage Balloon site	319790	468990	-	-
11c15.3	NAI	1488677	Barrage Balloon site	319130	470670	-	-
11c14.8	NAI	1383783	Battle HQ	317610	470710	-	-
11b2.1	MR	1480807	Beach defences	330600	431200	-	-
11a9.1	MR	1479038	Bomb Crater	327300	407790	-	-
11a7.6	HTL	1464017	Bomb Crater	353927	385347	-	-
11a7.7	TBC	1462559	Bomb Crater	349260	384350	-	-
11a7.9	HTL	1465129	Bomb Crater	340540	384070	-	-
11a8.2	MR	1476662	Bomb Crater	330540	402140	-	-
11c15.1	NAI	1490017	Bomb Crater	323240	466110	-	-
11d4.1	NAI	1492516	Bomb Crater	304860	499070	-	-
11a7.3	HTL	1466697	Bomb Craters	336390	380970	-	-
11c5.2	HTL	1485046	Bomb Craters	341600	460540	-	-
11d3.3	NAI	1492590	Bomb Craters	307060	496700	-	-
11a9.1	MR	1478976	Bomb Craters	330700	414100	-	-
11b1.12	HTL	1469011	Bombing Decoy	347000	428800	-	-
11a9.1	MR	1468214	Bombing Decoy	328400	404800	-	-
11c14.1	NAI	1459741	Bombing Decoy	319900	464202	-	-
11c15.1	NAI	1459740	Bombing Decoy	323500	467000	-	-
11d1.4	NAI	1469360	Bombing Decoy	308300	487900	-	-
11c3.6	NAI	1468805	Bombing Decoy	344500	458100	-	-
11d3.3	NAI	1469369	Bombing Decoy	307100	496800	-	-
11e3.2	HTL	1413056	Bombing Decoy	301100	532500	-	-
11c14.4	HTL	1488310	Bombing Range	320180	463330	-	-
11c2.2	HTL	1484030	Bombing Range	337500	449550	-	-
11c16.9	HTL	1491141	Bombing Range Marker	319410	483490	-	-
11c2.3	HTL	1484175	Bombing Range Marker	343020	450000	-	-
11c2.3	HTL	1484178	Bombing Range Marker	342930	451420	-	-
11c7.5	NAI	1486119	Bombing Range Marker	347640	473430	-	-
11c16.9	HTL	1491142	Bombing Range Target	319740	482340	-	-
11c7.5	NAI	1486126	Bombing Range Target	346870	472590	-	-
11a7.3	HTL	906619	British Barge	336983	383539	-	-
11a7.3	HTL	906625	British Barge	336732	384161	-	-
11a7.9	HTL	906617	British Barge	339471	382858	-	-
11a8.3	HTL	1364723	British Craft	328180	402800	-	-
11b1.20	HTL	1364736	British Craft	331870	428520	-	-
11a8.2	MR	1425941	Coastal Battery	329681	402327	-	-
11b1.18	HTL	1427345	Coastal Battery	333500	427300	-	-
11b1.18	HTL	1486735	Coastal Battery	333700	427300	-	-
11b3.2	HTL	1486754	Coastal Battery	332600	448300	-	-
11c14.1	NAI	1429214	Coastal Battery	323011	462031	-	-
11c14.6	NAI	1484449	Coastal Battery	317300	469100	-	-
11e2.2	HTL	1427840	Coastal Battery	297300	519500	-	-
11e3.1	HTL	1427839	Coastal Battery	299000	529800	-	-
11e3.2	HTL	1495736	Coastal Defence System	301710	533330	-	-
11a7.8	NAI	69741	Duck decoy pond	347800	382680	-	-
11b2.2	HTL	1480849	Emergency water supply	331170	434710	-	-
11b2.2	HTL	1480863	Emergency water supply	330570	432500	-	-
11c14.2	HTL	1489131	Emergency water supply	318190	468330	-	-
11c15.2	HTL	1489043	Emergency water supply	319390	469640	-	-
11c15.2	HTL	1489039	Emergency water supply	319130	469590	-	-

11c15.2	HTL	1489881	Emergency water supply	320420	468800	-	-
11c15.2	HTL	1489034	Emergency water supply	319780	469470	-	-
11c15.2	HTL	1489046	Emergency water supply	319030	469270	-	-
11a9.1	MR	1479071	Firing Range	327630	405730	-	-
11b2.7	HTL	1483224	Firing Range	331460	444520	-	-
11c14.8	NAI	1488708	Firing Range	316900	471300	-	-
11c14.8	NAI	1488714	Firing Range	318140	470910	-	-
11c7.4	NAI	1485746	Firing Range	348260	469900	-	-
11d4.1	NAI	1413082	Firing Range	304400	499200	-	-
11a7.5	HTL	1460958	Flint glassworks	359837	387929	-	-
11a7.9	HTL	1359366	Gas holder	335310	387980	-	-
11a7.9	HTL	1359388	Gas holder	340410	384200	-	-
11a7.9	HTL	1359411	Gas holder	335330	387670	-	-
11b1.19	HTL	1427346	Gun Emplacement	332400	427900	-	-
11b3.2	HTL	1427342	Gun Emplacement	332200	448200	-	-
11b3.2	HTL	1427341	Gun Emplacement	332600	448200	-	-
11c15.3	NAI	1488680	Gun Emplacement	318890	470640	-	-
11c2.2	HTL	1483629	Gun Emplacement	338610	450000	-	-
11c2.2	HTL	1484058	Gun Emplacement	337480	449600	-	-
11c2.2	HTL	1484062	Gun Emplacement	336960	449390	-	-
11c2.2	HTL	1427343	Gun Emplacement	338321	449891	-	-
11c2.3	HTL	1483580	Gun Emplacement	339100	450070	-	-
11a8.1	HTL	1476611	Gun Post	330730	398800	-	-
11a7.9	HTL	1411400	Heavy Anti-Aircraft Battery	337200	386900	-	-
11a7.8	NAI	1419539	HQ	341500	383500	-	-
11a9.1	MR	1479031	Military Building	328940	405210	-	-
11a7.3	HTL	1462572	Military Building	349520	381110	-	-
11a7.3	HTL	1467765	Military Building	339050	378300	-	-
11a7.7	TBC	1462549	Military Building	349300	384120	-	-
11b1.19	HTL	1482774	Military Building	332990	427640	-	-
11b2.1	MR	1480798	Military Building	330490	431670	-	-
11c14.3	NAI	1488323	Military Building	322290	461870	-	-
11c14.5	NAI	1489098	Military Building	318540	466290	-	-
11c14.7	MR	1489791	Military Building	317730	469400	-	-
11c3.2	NAI	1484508	Military Building	346100	458950	-	-
11e2.9	NAI	1494934	Military Building	299290	527900	-	-
11a7.3	HTL	1464193	Military Buildings	349520	378980	-	-
11b2.3	HTL	1482874	Military Buildings	330720	438610	-	-
11c1.5	HTL	1484014	Military Buildings	335700	448220	-	-
11c12.1	HTL	1439252	Military Buildings	334600	483600	-	-
11c15.2	HTL	1488996	Military Buildings	319590	467720	-	-
11c15.2	HTL	1488678	Military Buildings	319260	470060	-	-
11c15.2	HTL	1489985	Military Buildings	320440	467840	-	-
11a8.3	HTL	1476644	Military Buildings	330360	403270	-	-
11a7.9	HTL	1466059	Military Camp	337180	386970	-	-
11c14.2	HTL	1488694	Military Camp	318050	470250	-	-
11e2.11	HTL	1494874	Military Camp	299790	529710	-	-
11a8.4	HTL	1476711	Minefield	329790	404200	-	-
11e3.1	HTL	1496565	Minefield	299810	531160	-	-
11a9.1	MR	1479083	Observation Post	327740	405530	-	-
11b1.1	HTL	1414126	Observation Post	332400	416640	-	-

11c2.4	HTL	1484184	Observation post	342920	453090	-	-
11b1.12	HTL	1481420	Pillbox	350060	429450	-	-
11b1.12	HTL	1481452	Pillbox	350550	430490	-	-
11b1.12	HTL	1481593	Pillbox	349880	430820	-	-
11b1.12	HTL	1481421	Pillbox	350030	429760	-	-
11b1.12	HTL	1481664	Pillbox	349720	429270	-	-
11b1.12	HTL	1481659	Pillbox	349910	429960	-	-
11b1.12	HTL	1481690	Pillbox	347700	429720	-	-
11b1.12	HTL	1427359	Pillbox	347971	429762	-	-
11a7.3	HTL	1398081	Pillbox	336310	379990	-	-
11a7.3	HTL	1427955	Pillbox	336310	379990	-	-
11a7.3	HTL	1464661	Pillbox	342032	377070	-	-
11a7.3	HTL	1467761	Pillbox	338810	378930	-	-
11a7.3	HTL	1467762	Pillbox	338640	378610	-	-
11a7.3	HTL	1467764	Pillbox	338790	378450	-	-
11a7.3	HTL	1467770	Pillbox	339140	377860	-	-
11a7.4	HTL	1462971	Pillbox	354084	383892	-	-
11a7.9	HTL	1421390	Pillbox	339192	384442	-	-
11a7.9	HTL	1421392	Pillbox	337340	386890	-	-
11a7.9	HTL	1467451	Pillbox	336350	386840	-	-
11a8.1	HTL	1476607	Pillbox	330380	399680	-	-
11a8.1	HTL	1476614	Pillbox	331130	398440	-	-
11a8.2	MR	1425940	Pillbox	330600	401850	-	-
11b1.16	HTL	1480933	Pillbox	337790	427350	-	-
11b1.16	HTL	1480941	Pillbox	338240	428000	-	-
11b1.16	HTL	1480945	Pillbox	337880	427310	-	-
11b1.17	HTL	1480934	Pillbox	335020	427770	-	-
11b1.21	HTL	1481102	Pillbox	331410	429340	-	-
11b2.1	MR	1480797	Pillbox	330850	430640	-	-
11b2.1	MR	1480800	Pillbox	330640	431210	-	-
11b2.7	HTL	1483217	Pillbox	331720	444600	-	-
11b3.2	HTL	1483483	Pillbox	332740	447030	-	-
11b3.2	HTL	1483498	Pillbox	332980	448130	-	-
11b3.2	HTL	1483490	Pillbox	332350	447890	-	-
11c1.1	HTL	1483513	Pillbox	333220	446540	-	-
11c10.2	HTL	1418905	Pillbox	337600	474600	-	-
11c10.2	HTL	1422306	Pillbox	337900	474300	-	-
11c13.2	HTL	1489991	Pillbox	324370	466580	-	-
11c14.2	HTL	1489110	Pillbox	318720	467670	-	-
11c14.2	HTL	1418890	Pillbox	318100	469400	-	-
11c14.2	HTL	1489119	Pillbox	318010	467860	-	-
11c14.2	HTL	1489148	Pillbox	317950	468260	-	-
11c14.2	HTL	1489705	Pillbox	318300	469600	-	-
11c14.2	HTL	1383787	Pillbox	318190	469450	-	-
11c14.2	HTL	1489115	Pillbox	318310	467730	-	-
11c14.5	NAI	1489101	Pillbox	318240	466590	-	-
11c14.6	NAI	1489765	Pillbox	317510	469130	-	-
11c14.6	NAI	1489759	Pillbox	317640	469010	-	-
11c14.6	NAI	1489511	Pillbox	317570	468550	-	-
11c14.6	NAI	1489769	Pillbox	317470	469090	-	-
11c14.6	NAI	1429754	Pillbox	317500	468400	-	-
11c14.7	MR	1429755	Pillbox	317200	469500	-	-
11c14.7	MR	1489743	Pillbox	317240	469210	-	-

11c14.8	NAI	1488713	Pillbox	317970	470970	-	-
11c14.8	NAI	1488688	Pillbox	317230	472770	-	-
11c14.8	NAI	1488690	Pillbox	317300	470260	-	-
11c15.1	NAI	1443553	Pillbox	320337	467096	-	-
11c15.2	HTL	1489995	Pillbox	322170	468330	-	-
11c15.2	HTL	1489009	Pillbox	319060	468330	-	-
11c15.2	HTL	1443562	Pillbox	319315	467956	-	-
11c15.2	HTL	1490001	Pillbox	322280	468540	-	-
11c15.2	HTL	1443548	Pillbox	320177	467939	-	-
11c15.2	HTL	1429747	Pillbox	319658	467574	-	-
11c15.2	HTL	1488992	Pillbox	319870	467620	-	-
11c15.2	HTL	1429749	Pillbox	319738	467819	-	-
11c15.2	HTL	1489027	Pillbox	318880	469160	-	-
11c15.2	HTL	1489962	Pillbox	320500	468290	-	-
11c15.2	HTL	1429750	Pillbox	320352	468084	-	-
11c15.2	HTL	1489987	Pillbox	321010	467770	-	-
11c15.2	HTL	1489993	Pillbox	321660	468510	-	-
11c15.2	HTL	1443552	Pillbox	320284	467202	-	-
11c15.2	HTL	1489006	Pillbox	319430	467970	-	-
11c15.2	HTL	1429751	Pillbox	320400	468200	-	-
11c15.2	HTL	1489896	Pillbox	321660	468510	-	-
11c15.2	HTL	1489013	Pillbox	319000	468560	-	-
11c15.2	HTL	1490013	Pillbox	320220	467660	-	-
11c15.2	HTL	1443550	Pillbox	320366	467756	-	-
11c15.2	HTL	1443545	Pillbox	320512	468236	-	-
11c15.2	HTL	1488722	Pillbox	318790	470210	-	-
11c15.2	HTL	1443563	Pillbox	319128	468222	-	-
11c15.2	HTL	1443549	Pillbox	320536	467810	-	-
11c15.3	NAI	1488659	Pillbox	319280	474090	-	-
11c15.3	NAI	1488663	Pillbox	318980	472340	-	-
11c15.3	NAI	1488682	Pillbox	318920	471740	-	-
11c15.3	NAI	1488662	Pillbox	319070	472670	-	-
11c15.3	NAI	1488669	Pillbox	319100	471080	-	-
11c15.3	NAI	1488664	Pillbox	318880	471990	-	-
11c15.3	NAI	1488660	Pillbox	319100	473340	-	-
11c15.3	NAI	1488667	Pillbox	318860	471850	-	-
11c16.1	NAI	1490547	Pillbox	317150	477990	-	-
11c16.10	NAI	1490498	Pillbox	318650	479690	-	-
11c16.12	HTL	1490547	Pillbox	317150	477990	-	-
11c2.1	HTL	1484027	Pillbox	335820	448790	-	-
11c3.1	HTL	1427235	Pillbox	344500	456200	-	-
11c3.1	HTL	1427236	Pillbox	345100	455900	-	-
11c3.1	HTL	1427238	Pillbox	344900	455900	-	-
11c3.1	HTL	1427353	Pillbox	344900	456000	-	-
11c3.1	HTL	1427394	Pillbox	345971	455763	-	-
11c3.2	NAI	1484651	Pillbox	345580	457150	-	-
11c3.2	NAI	1484669	Pillbox	345680	456360	-	-
11c4.1	NAI	1484478	Pillbox	342620	455720	-	-
11c5.1	NAI	1484497	Pillbox	340410	459150	-	-
11c6.2	HTL	1427237	Pillbox	343200	464500	-	-
11c6.2	HTL	1427362	Pillbox	343900	464900	-	-
11c6.2	HTL	1427232	Pillbox	343413	464589	-	-
11c8.1	NAI	1486101	Pillbox	346130	474720	-	-

11c8.5	HTL	1487293	Pillbox	343100	479120	-	-
11d1.2	NAI	1490628	Pillbox	312700	479970	-	-
11d1.4	NAI	1490910	Pillbox	308670	487390	-	-
11e1.3	NAI	1494725	Pillbox	296560	517930	-	-
11e2.11	HTL	1417644	Pillbox	299900	529600	-	-
11e2.11	HTL	1494919	Pillbox	299200	529050	-	-
11e2.4	HTL	1495292	Pillbox	298200	523250	-	-
11e2.4	HTL	1495306	Pillbox	298220	523330	-	-
11e2.5	HTL	1495320	Pillbox	298830	524880	-	-
11e2.8	HTL	1417642	Pillbox	298900	527400	-	-
11e2.8	HTL	1418897	Pillbox	299000	527050	-	-
11e2.8	HTL	1418898	Pillbox	298800	526900	-	-
11e2.8	HTL	1494954	Pillbox	299160	527030	-	-
11e3.1	HTL	1417643	Pillbox	299800	530800	-	-
11c3.7	HTL	1427234	Pillbox	341700	456900	-	-
11a7.8	NAI	1464529	Pillboxes	342610	382460	-	-
11a7.9	HTL	1467418	Pillboxes	335320	387290	-	-
11b3.2	HTL	1483570	Pillboxes	332730	446330	-	-
11b2.3	HTL	1482880	Practice trench	331610	439350	-	-
11c14.8	NAI	1488706	Practice trenches	316870	471710	Medium	Medium
11a8.2	MR	1475724	Prisoner of war camp	329600	402500	-	-
11a9.1	MR	1413887	Radar Station	327461	405791	-	-
11b2.3	HTL	1477011	Radar Station	330500	436100	-	-
11a9.1	MR	1477507	Radar Station	327500	409800	-	-
11b1.15	HTL	1480947	Rifle ranges	339040	427570	-	-
11a9.1	MR	1479224	Road Block	332110	416140	-	-
11a7.3	HTL	1466627	Road Block	336530	381450	-	-
11a7.5	HTL	1463944	Road Block	358490	387660	-	-
11b1.18	HTL	1481148	Road Block	334290	427260	-	-
11c3.1	HTL	1484717	Road Block	345880	455550	-	-
11c3.1	HTL	1427357	Road Block	345301	455721	-	-
11c3.1	HTL	1427355	Road Block	346500	455000	-	-
11a8.1	HTL	1476617	Road Block	331380	398160	-	-
11a8.1	HTL	1476618	Road Block	331680	397820	-	-
11a8.1	HTL	1414129	Royal observer corps	329970	400670	-	-
11c10.2	HTL	1419441	Seagull trench	337400	474500	-	-
11c14.6	NAI	1489514	Searchlight Battery	317520	468600	-	-
11c3.2	NAI	1484663	Searchlight Battery	346250	456770	-	-
11c3.7	HTL	1484471	Searchlight Battery	341540	457410	-	-
11e2.3	HTL	1413046	Searchlight Battery	298400	519500	-	-
11a8.1	HTL	1476659	Searchlight Battery	330070	400270	-	-
11a8.1	HTL	1476616	Searchlight Battery	331460	398120	-	-
11e3.1	HTL	1413052	Shadow Factory	299700	530300	-	-
11b2.2	HTL	1482869	Tank trap	330570	435720	-	-
11b2.7	HTL	1483215	Tank trap	331250	444690	-	-
11a7.7	TBC	1464265	Trench	350610	384000	-	-
11a7.9	HTL	1421393	Trench	336230	387190	-	-
11a7.9	HTL	1421394	Trench	336300	387220	-	-
11a7.9	HTL	1421396	Trench	336590	386930	-	-
11a7.9	HTL	1466101	Trench	336610	386710	-	-
11c6.1	NAI	1485048	Trench	340870	461460	-	-
11c6.1	NAI	1485052	Trench	340910	461680	-	-

11e2.1	HTL	1494617	Trench	297320	519120	-	-
11e2.1	HTL	1494619	Trench	297300	518890	-	-
11a8.1	HTL	1476653	Trench	330210	400600	-	-
11a7.6	HTL	1462866	Trenches	350720	384970	-	-
11a7.7	TBC	1462861	Trenches	350180	384240	-	-
11a7.9	HTL	1421395	Trenches	337300	386960	-	-
11c11.5	HTL	1487768	Trenches	330780	476140	-	-
11c14.2	HTL	1489528	Trenches	318090	468910	-	-
11a7.3	HTL	1428460	Turret	336300	380000	-	-
11a7.3	HTL	1428461	Turret	336100	380500	-	-
11a7.3	HTL	1428462	Turret	336200	380500	-	-
11b3.1	HTL	909260	Two wrecks	330579	450386	-	-
11e2.10	MR	1413048	War production factory	299100	528900	-	-
11e2.10	MR	1413049	War production factory	298900	528800	-	-
11e2.5	HTL	1413051	War production factory	298900	525100	-	-
11e3.1	HTL	1413053	War production factory	299800	530200	-	-
11a7.6	HTL	1463966	Water storage site	352320	385810	-	-
11a7.9	HTL	1464469	Water supply tank	340460	383460	-	-
11a7.9	HTL	1464544	Water supply tank	340500	384100	-	-
11a9.1	MR	1479069	Weapons Pit	327610	405850	-	-
11b1.21	HTL	1481082	Weapons Pit	331600	429350	-	-
11b2.7	HTL	1483622	Weapons Pit	331550	445100	-	-
11b3.2	HTL	1483486	Weapons Pit	332610	447010	-	-
11c10.2	HTL	1486492	Weapons Pit	336500	473910	-	-
11c10.2	HTL	1486493	Weapons Pit	337210	473770	-	-
11c14.8	NAI	1488716	Weapons Pit	316990	470480	-	-
11c2.2	HTL	1484053	Weapons Pit	338510	449970	-	-
11c3.1	HTL	1484709	Weapons Pit	346170	455700	-	-
11e2.3	HTL	1494620	Weapons Pit	297700	519920	-	-
11a8.1	HTL	1476650	Weapons Pit	330740	400810	-	-
11b1.15	HTL	1480921	Weapons Pit	339700	427800	-	-
11c14.1	NAI	1488315	Weapons Pit	320740	463650	-	-
11c14.2	HTL	1413047	Womens Auxiliary Air Force Camp	318200	469500	-	-
11b1.20	HTL	909279	Wreck	331291	426855	-	-
11c2.1	HTL	909263	Wreck	333742	452225	-	-
11b1.17	HTL	909253	Wreck	335023	426338	-	-
11b1.19	HTL	1027068	Wreck	331070	425490	-	-
11b1.21	HTL	1027144	Wreck	330440	428540	-	-
11b3.3	HTL	909287	Wreck	333298	450516	-	-
11a8.1	HTL	892811	Wreck	329073	399938	-	-
11a9.1	MR	907014	Wreck	328163	410367	-	-
11c14.4	HTL	908215	Wreck	319400	464130	-	-
11a8.2	MR	892827	Wreck	328374	402514	-	-
11a9.1	MR	906986	Wreck	322856	405258	-	-
11b1.1	HTL	907035	Wreck	330178	418527	-	-
11a9.1	MR	906995	Wreck	325202	406890	-	-
11a8.3	HTL	892842	Wreck	328202	403258	-	-
11a9.1	MR	906992	Wreck	325574	405987	-	-
11b1.1	HTL	907037	Wreck	331948	420293	-	-
11a9.1	MR	906989	Wreck	322822	405444	-	-
11a9.1	MR	906965	Wreck	326046	404373	-	-
11a8.2	MR	906885	Wreck	329123	402039	-	-

11a9.1	MR	906999	Wreck	326192	407832	-	-
11a8.1	HTL	906837	Wreck	330163	398871	-	-
11a8.2	MR	906886	Wreck	328110	402085	-	-
11a9.1	MR	906978	Wreck	322774	404734	-	-
11a8.2	MR	906871	Wreck	329058	401421	-	-
11a8.2	MR	906895	Wreck	328777	402322	-	-
11a8.3	HTL	906918	Wreck	328458	403161	-	-
11a9.1	MR	906994	Wreck	325907	406106	-	-
11a8.1	HTL	906829	Wreck	330314	397880	-	-
11a8.1	HTL	906850	Wreck	329634	400517	-	-
11a8.1	HTL	892815	Wreck	329704	400268	-	-
11c3.2	NAI	909273	Wreck	345715	457649	-	-
11c3.6	NAI	909272	Wreck	344171	457157	-	-
11c6.1	NAI	909274	Wreck	338130	460093	-	-
11c6.1	NAI	909276	Wreck	340088	460969	-	-
11c6.1	NAI	909275	Wreck	340124	460963	-	-
11a9.1	MR	906985	Wreck	323536	405155	-	-
11d2.2	NAI	908223	Wreck	306940	493342	-	-
11c13.2	HTL	908216	Wreck	327096	464287	-	-
11c14.1	NAI	908213	Wreck	322755	463417	-	-
11c14.1	NAI	908214	Wreck	323129	464035	-	-
11c14.3	NAI	908212	Wreck	320651	461580	-	-
11d2.2	NAI	908221	Wreck	307775	492370	-	-
11d2.2	NAI	908222	Wreck	307730	492463	-	-
11a8.2	MR	906869	Wreck	328745	401395	-	-
11a8.2	MR	906901	Wreck	328449	402543	-	-
11a9.1	MR	906987	Wreck	326262	405235	-	-
11a8.1	HTL	892818	Wreck	328850	401085	-	-
11c14.4	HTL	37174	Wreck	319400	464130	-	-
11c2.3	HTL	909264	Wreck	340679	453121	-	-
11c3.6	NAI	909271	Wreck	344185	456817	-	-
11b1.20	HTL	1027038	Wreck	328880	424680	-	-
11b1.20	HTL	1027051	Wreck	329820	425080	-	-
11b1.20	HTL	1027020	Wreck	327500	424220	-	-
11c13.4	HTL	1027657	Wreck	326030	459870	-	-
11a8.1	HTL	892790	Wreck	331009	397468	-	-
11a8.1	HTL	892800	Wreck	329559	399189	-	-
11a9.1	MR	892883	Wreck	327007	405811	-	-
11a7.9	HTL	906652	Wreck	335697	386925	-	-
11a8.2	MR	892832	Wreck	328267	402716	-	-
11a9.1	MR	892885	Wreck	326071	408359	-	-
11c3.1	HTL	909267	Wreck	344941	456066	-	-
11c3.1	HTL	909269	Wreck	344380	456320	-	-
11b1.13	HTL	1480755	Wreck	343780	427370	-	-
11a7.3	HTL	892677	Wreck	337261	380816	-	-
11a7.6	HTL	1479304	Wreck	352400	384740	-	-
11a7.6	HTL	1479307	Wreck	355490	385340	-	-
11a7.9	HTL	906618	Wreck	339379	382890	-	-
11a7.9	HTL	906634	Wreck	336805	385458	-	-
11a7.9	HTL	906639	Wreck	336258	386052	-	-
11a8.1	HTL	906830	Wreck	330043	398224	-	-
11a8.2	MR	906891	Wreck	328057	402240	-	-
11a8.2	MR	906879	Wreck	328825	401858	-	-

11b1.9	MR	909254	Wreck	344160	427240	-	-
11b2.4	HTL	1483219	Wreck	330870	441840	-	-
11b3.1	HTL	909261	Wreck	330908	450459	-	-
11b3.1	HTL	1027483	Wreck	330470	449680	-	-
11c1.1	HTL	1483507	Wreck	334060	447240	-	-
11c1.1	HTL	909256	Wreck	334046	446719	-	-
11c1.1	HTL	1483595	Wreck	333970	446810	-	-
11c1.1	HTL	909258	Wreck	334029	447409	-	-
11c1.1	HTL	1483590	Wreck	334040	446710	-	-
11c1.4	NAI	909257	Wreck	334481	447162	-	-
11c1.4	NAI	1483444	Wreck	334590	447810	-	-
11c14.6	NAI	908217	Wreck	317714	467288	-	-
11c14.8	NAI	1027564	Wreck	314460	473960	-	-
11c14.8	NAI	1002052	Wreck	316363	473618	-	-
11c2.2	HTL	909288	Wreck	337520	451930	-	-
11c2.2	HTL	909262	Wreck	335099	451557	-	-
11c3.1	HTL	909266	Wreck	345596	456058	-	-
11c3.1	HTL	909265	Wreck	345633	456058	-	-
11c3.7	HTL	909270	Wreck	342559	456342	-	-
11a7.9	HTL	892684	Wreck	336337	385031	-	-
11a7.6	HTL	1462892	Wrecks	351600	384330	-	-
11a7.9	HTL	892680	Wrecks	340234	383219	-	-
11e2.10	MR	1417656	WW fire service	299200	528900	-	-

LDNPA entries

Policy Unit	Policy	HER No.	Site Type	Easting	Northing	Special Interest	Risk
11c12.1	HTL	30291	Barn	333080	481570	Low	Low
11c9.3	HTL	12611	Barn	346500	481165	Low	Low
11d3.3	NAI	1390	Barrow	306900	496400	Medium	Low
11d3.3	NAI	3969	Barrow	307200	496000	Medium	Low
11d3.3	NAI	30037	Barrow	309520	497490	Medium	Low
11c12.1	HTL	30292	Blast Furnace	333200	480800	Low	Low
11d3.3	NAI	15136	Bombing Decoy	307300	496900	-	-
11d1.3	NAI	12397	Brickworks	312300	481130	Low	Low
11d1.4	NAI	1493	Cairn	310630	484130	Medium	Low
11d2.2	NAI	1399	Cairn	308000	494200	Medium	Low
11d3.1	NAI	13969	Cairn	309500	495300	Medium	Low
11d3.1	NAI	3981	Castle	310350	496340	Medium	Low
11d3.2	HTL	12188	Chapel	308450	496210	Low	Low
11d3.2	HTL	12201	Chapel	308800	496600	Low	Low
11c16.8	MR	2149	Church	320930	487380	Medium	Low
11c16.8	MR	2149	Church	320930	487380	Medium	Low
11d3.1	NAI	3109	Church	310020	495110	Medium/High	High
11d3.1	NAI	4329	Church	310390	496580	Medium	Low
11d1.4	NAI	13965	Circular Enclosure	310900	484100	Medium	Low
11d3.1	NAI	1454	Deserted Village	310500	496600	Medium	Low
11d3.1	NAI	1455	Deserted Village	310000	495120	Medium	Low
11d1.4	NAI	4635	Ditched Enclosure	311700	483100	Medium	Low
11d1.4	NAI	5115	Enclosure	309200	486100	Medium	Low

11d3.3	NAI	1376	Enclosure	309600	497000	Medium	Low
11d2.1	NAI	1385	Flint Scatter	308400	491500	Medium	Low
11d2.1	NAI	1386	Flint Scatter	308100	491100	Medium	Low
11d2.1	NAI	3557	Flint Scatter	308500	491000	Medium	Low
11d2.1	NAI	13941	Flint Scatter	308600	491500	Medium	Low
11d2.1	NAI	13941	Flint Scatter	308600	491500	Medium	Low
11d2.1	NAI	13942	Flint Scatter	308600	491500	Medium	Low
11d2.1	NAI	13943	Flint Scatter	308700	491600	Medium	Low
11d2.1	NAI	13943	Flint Scatter	308700	491600	Medium	Low
11d2.1	NAI	13944	Flint Scatter	308800	491400	Medium	Low
11d2.1	NAI	13946	Flint Scatter	308200	491200	Medium	Low
11d2.1	NAI	13946	Flint Scatter	308200	491200	Medium	Low
11d2.1	NAI	13947	Flint Scatter	308100	491200	Medium	Low
11d2.1	NAI	13947	Flint Scatter	308100	491200	Medium	Low
11d2.1	NAI	13948	Flint Scatter	308200	491000	Medium	Low
11d2.1	NAI	13948	Flint Scatter	308200	491000	Medium	Low
11d2.1	NAI	13949	Flint Scatter	308300	490900	Medium	Low
11d2.1	NAI	13949	Flint Scatter	308300	490900	Medium	Low
11d2.1	NAI	13955	Flint Scatter	308800	491600	Medium	Low
11d2.1	NAI	18896	Flint Scatter	307600	489400	Medium	Low
11d2.1	NAI	18895	Flint Scatter	307520	489320	Medium	Low
11c9.3	HTL	12612	Flood Defences	345825	480840	Low	High
11c9.3	HTL	12613	Flood Defences	345620	480375	Low	High
11d3.1	NAI	1378	Fort	308810	495810	High	High
11d3.1	NAI	1378	Fortlet	308810	495810	Medium	Low
11d3.1	NAI	1378	Frontier Defence	308810	495810	Medium	Low
11d3.1	NAI	1379	Frontier Defence	308700	494200	Medium	Low
11d3.1	NAI	4349	Hillfort	309400	495400	Medium	Low
11c12.1	HTL	16357	Lime Kiln	333100	482680	Low	Low
11c12.1	HTL	16358	Lime Kiln	333190	481270	Low	Low
11c12.2	HTL	16346	Lime Kiln	331800	483250	Low	Low
11c16.8	MR	12303	Lime Kiln	319250	487200	Low	Low
11c16.8	MR	18041	Lime Kiln	320520	487060	Low	Low
11c9.3	HTL	12610	Lime Kiln	345370	481320	Low	Low
11d2.1	NAI	4222	Lithic Working Site	308300	491500	Medium	Low
11d3.1	NAI	1379	Milefortlet	308700	494200	Medium	Low
11d3.3	NAI	12184	Mill	309630	497730	Low	Low
11d4.1	NAI	16876	Pillbox	305500	497000	-	-
11c12.1	HTL	12829	Quarry	331870	483850	Low	Low
11c12.1	HTL	16357	Quarry	333100	482680	Low	Low
11c12.1	HTL	16361	Quarry	334510	482710	Low	Low
11c12.1	HTL	16362	Quarry	334540	482800	Low	Low
11c12.1	HTL	16364	Quarry	334710	483600	Low	Low
11c16.8	MR	12304	Quarry	319300	487860	Low	Low
11c16.8	MR	12305	Quarry	319650	488000	Low	Low
11c16.8	MR	18041	Quarry	320520	487060	Low	Low
11c8.5	HTL	12541	Quarry	343340	479650	Low	Low
11c8.5	HTL	12545	Quarry	343300	479130	Low	Low
11d3.3	NAI	4427	Rectangular Enclosure	309390	497120	Medium	Low
11d1.4	NAI	13965	Rectilinear Enclosure	310900	484100	Medium	Low
11d3.1	NAI	16766	Ring Ditch	310300	496700	Medium	Low

11c12.1	HTL	30294	Saw Mill	334580	483890	Low	Low
11d2.2	NAI	13940	Settlement	308500	491700	Medium	Low
11d3.3	NAI	1376	Settlement	309600	497000	Medium	Low
11d3.3	NAI	4428	Settlement	306790	496600	Medium	Low
11c16.8	MR	1469	Stone Circle	319200	487300	Medium	Low
11d1.4	NAI	1460	Stone Circle	309900	485300	Medium	Low
11d1.4	NAI	1460	Stone Circle	309900	485300	Medium	Low
11d1.4	NAI	1478	Stone Circle	310610	484320	Medium	Low
11d1.4	NAI	5351	Stone Circle	308900	486300	Medium	Low
11d1.4	NAI	5351	Stone Circle	308900	486300	Medium	Low
11d3.1	NAI	1393	Temple	308800	493700	Medium	Low
11d2.1	NAI	12274	Tile Works	308150	491270	Low	Low
11d3.1	NAI	1378	Vicus	308810	495810	Medium	Low
11c12.1	HTL	30294	Watermill	334580	483890	Low	Low