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Severn Estuary Rapid Coastal Zone Assessment Survey

PHASE 2 FIELDWORK REPORT
Volume 1: Text and Figures

for English Heritage (NHPCP project 3885)

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Summary

This project report outlines the main stage of archaeological fieldwork undertaken for Phase 2 of the Severn Estuary Rapid Coastal Zone Assessment Survey (RCZAS), undertaken for English Heritage. The extensive project area includes both banks of the Severn Estuary in England, extending from Beachley near the First or 'Old' Severn Crossing up to Maisemore Weir north and upstream of Gloucester on the right bank of the Severn, and from Maisemore Weir south-west to Gore Point, west of Porlock Weir in Somerset. The wider project survey area investigated includes the intertidal zone and foreshore at Lowest Astronomical Tide (Chart Datum), and extends 1km inland of the Mean High Water level, although fieldwork concentrated on the inter-tidal zone. The total area covered by the survey is approximately 575km².

Phase 1 of the project comprised a desk-based assessment of information from the Marine and Terrestrial Archaeology Databases in the NMR; the National Hydrographic Office, Taunton; the Maritime and Coastguard Agency's Receiver of Wreck; County HERs, County Record Offices; aerial photographic collections and academic research papers. The Phase 1 assessment also included analysis of aerial photographs and lidar data undertaken as part of English Heritage's National Mapping Programme (NMP), in order to confirm the location of known historical and archaeological features and to identify new ones. Phase 2a consisted of an initial pilot fieldwork project, undertaken during April-June 2009, and this stage was reported on in an earlier report. This report presents the results of the main Phase 2 reconnaissance and field survey programme undertaken during April-October 2010 and March-April 2011, although results from the Phase 2a pilot fieldwork have been incorporated in this document.

The pilot and main phases of fieldwork recorded 801 survey lines and points, the vast majority of which were fishing-related structures. Perhaps most significantly, the survey identified a form of wooden stake-built V-shaped fish trap not previously recognised as a distinct type, and has recorded many previously unknown examples of such features. In addition, the survey verified the locations of many of the structures identified in the Phase 1 NMP project but conversely also indicated that some features have either now disappeared or might have been misidentified in the past. During the Phase 2a and Phase 2 fieldwork a limited number of samples of wood and peat were taken for possible species identification and dating purposes and the result of assessment and further work on these samples is presented in this report.

This document also identifies the state of preservation and archaeological potential of features in different areas within the overall RCZAS study area, considers the impacts of factors such as erosion, and the potential archaeological implications of proposals contained within the Severn Estuary Flood Risk Management Strategy.

1 Introduction and project background

1.1.1 This project report outlines the main Phase 2 fieldwork phase of the Severn Estuary Rapid Coastal Zone Assessment Survey (RCZAS). It has been prepared by Gloucestershire County Council Archaeology Service on behalf of English Heritage and the relevant local authorities. It has been structured according to the framework set out in *Management of Research Projects in the Historic Environment* (MoRPHE: English Heritage 2006), *Commissioned Archaeology Programme Guidance for Applicants* (English Heritage 2002) and *A Brief for Rapid Coastal Zone Assessment Surveys v.10* (Murphy 2007).

1.1.2 Aims and objectives were drawn up with reference to *A Brief for Rapid Coastal Zone Assessment Surveys* (Murphy 2007) and in discussion with Buzz Busby, Vanessa Straker and Peter Murphy of English Heritage.

1.1.3 Phase 1 of the Severn Estuary RCZAS project comprised an archaeological aerial survey undertaken by GCCAS staff as part of the National Mapping Programme (Crowther and Dickson 2008), an archaeological assessment of Environment Agency lidar data (Truscoe 2007), and a desk-based assessment of all known archaeology within the intertidal zone and its immediate hinterland (Mullin 2008).

1.1.4 Phase 2a of the Severn Estuary RCZAS consisted of a pilot fieldwork project, designed to assess survey methodologies and the practicalities and logistics of future fieldwork, in addition to verifying and characterising known sites and identifying new archaeological features not previously recorded through aerial survey. This pilot fieldwork was undertaken during April-June 2009, and the results were reported on in an earlier report (Catchpole and Chadwick 2010a). The Phase 2a work included an aerial photographic progression study of the early modern hulks and wrecks beached between Purton and Sharpness on the east bank of the Severn in Gloucestershire (Dickson 2009; Dickson, Catchpole and Barnett 2010), and an update of the original Phase 1 desk-based assessment (Mullin, Brunning and Chadwick 2009). These reports were submitted to English Heritage prior to the main Phase 2 fieldwork. The Phase 2a pilot phase also informed the equipment and methodologies used during the main Phase 2 fieldwork phase (see sections 8.1, 8.5 and 8.6 below).

1.1.5 The updated Phase 1 desk-based assessment, the results of the 2009 Phase 2a pilot fieldwork and further reconnaissance visits made early in 2010, and the recommendations of the recent South West Archaeological Research Framework or SWARF (Webster 2008) were used to identify areas of high and low archaeological potential. In addition, the Phase 2 fieldwork was informed by a risk-focused approach where areas of likely threat were identified from the revised Shoreline Management Plans (SMP2s) for the Severn Estuary (Atkins Ltd 2009) and North Devon and Somerset (Halcrow Group Ltd 2009) and the Severn Estuary Flood Risk Management Strategy (Atkins Ltd 2010, Environment Agency 2011a), and thus which areas and groups of features should be targeted for further recording and investigation. The results from all of the different phases of the Severn Estuary RCZAS will be used to inform the management of the coastal archaeological resource by evaluating the nature of this resource and the ways in which it can be recorded, and its state of preservation and vulnerabilities to threats assessed.

1.1.6 This project report outlines the methodology adopted and the results obtained from Phase 2 fieldwork undertaken during April-October 2010 and March-April 2011, as well as incorporating the results of the Phase 2a pilot survey. This volume comprises a brief summary of the research aims and objectives of the Severn Estuary RCZAS (see section 2 below), a brief summary of Phase 1 work (section 3), an outline of project interfaces (section 4), details of communications and publications (section 5), a review of health and safety issues (section 6), an examination of the constraints on fieldwork (section 7), the Phase 2a and main Phase 2 project methodology (section 8), an assessment of the

fieldwork methodologies and technologies (section 9), the archaeological results of the Phase 2 fieldwork (section 10), an assessment of artefacts and samples recovered during the fieldwork (section 11), interpretation and discussion (section 12), an assessment of distribution, preservation, archaeological potential and threat (section 13), suggestions and recommendations for further work (section 14), a bibliography (section 15), acknowledgements (section 16) and abbreviations used (section 17). Figures are located at the end of this volume. Volume 2 comprises the plates and Volume 3 the appendices.

2 Research aims and objectives

2.1 SHAPE compliance

2.1.1 SHAPE (**S**trategic Framework for **H**istoric Environment **A**ctivities and **P**rogrammes in **E**nglish Heritage – April 2008) requires projects seeking English Heritage funding to identify a Primary Driver from those listed in *Making the Past Part of Our Future* (English Heritage Strategy 2005-10), and an Activity Type, Research Programme and Sub-Programme from those listed in SHAPE.

2.1.2 The **Primary Driver** for the Severn Estuary RCZAS project is Aim 4: "*Help Local Communities to Care for Their Historic Environment*", more specifically Aim 4a: "*Help local authority members and officers develop the skills, knowledge, advice and capacity to make the most of their historic environment*"

2.1.3 The **Activity Type** is 1. Research

2.1.4 The **Research Programme** is A2: "*Spotting the gaps: Analysing poorly understood landscapes, areas and monuments*"

2.1.5 There is a specific **Sub-Programme** detailed in SHAPE for Rapid Coastal Zone Assessment Surveys as reproduced in the table below:

Sub-Programme Name	**Rapid Coastal Zone Assessments: The historic environment in Shoreline Management Plans**			
Sub-programme Number	**41112.110**			
Corporate Objective	4A: Help local authority members and officers develop the skills, knowledge, advice and capacity to make the most of their historic environment			
Activity Type and Programme	RESEARCH A2: Spotting the gaps: Analysing poorly understood landscapes, areas and monuments			
Sub-Programme Description	Specific projects developing coastal and intertidal datasets for inclusion within local authority Shoreline Management Plans.			
Reason for EH Support	Critical requirement to build up evidence-base for littoral landscapes, structures, artefact or ecofact concentrations, and palaeoenvironmental resources to feed in to marine planning.			
Research categories	***NABS***	***SETI Primary purpose***	***Frascati Definition***	***Research Areas***
	1.2	B	Strategic-Applied	Humanities
Similar Sub-Programmes	Distinct from the seabed mapping and characterisation programmes as this specifically relates to audits to building into Shoreline Management Plans			

2.1.6 The fieldwork outlined in this project report meets the above through the accurate location and recording of known and new sites and the transmission of updated information to local authority records and Shoreline Management Plan (SMP) teams. This phase also specifically assesses methodologies that might increase knowledge of the archaeological resource in the intertidal zone and coastal hinterland of the Severn Estuary.

2.2 Project specific aims and objectives

2.2.1 The overarching aim of the Severn Estuary RCZAS project was outlined in the Phase 1 project design (Mullin 2005: 7):

- To provide an enhanced understanding of the resource in order to develop management and research priorities in respect of specific sites and areas of potential.

2.2.2 A more specific Aim of the Phase 2a pilot fieldwork stage was:

- To formulate and field-test a methodology for a survey-based Phase 2 of the RCZAS.

2.2.3 Following the results of the three Phase 1 assessment reports (Crowther and Dickson 2008; Mullin 2008; Truscoe 2007), and based on the English Heritage Brief for Phase 2 Field Assessment of RCZAS projects (Murphy 2007), the following objectives were identified for the Phase 2a pilot:

- To verify, characterise and assess archaeological sites or features previously identified as a result of the desk-based assessment reports, lidar survey results and NMP aerial photographic mapping;

- Locate, characterise and assess additional archaeological sites and features previously undetected by the desk-based assessments;

- Determine the geomorphological or sedimentary context for features where possible;

- Assess the degree of preservation of archaeological features, and whether or not they are actively eroding;

- To test fieldwork methodologies and data recording strategies, and assess the practicalities and logistics of future fieldwork.

2.2.4 With the exception of the last point, these Objectives also applied to the main Phase 2 fieldwork phase.

3 Summary of previous project phases

3.1 Introduction

A desk-based Phase 1 of the RCZAS was undertaken during 2006 and 2007 (Mullin 2005, 2008). Three reports were produced during that phase:

- A Phase 1 report that provided a record of all known archaeology within the intertidal zone and its immediate hinterland, an assessment of current erosion patterns and threats this poses to the archaeological resource, an overview of coastal change from the Palaeolithic to the present day, and a list of sites which required further fieldwork investigation as part of Phase 2 (Mullin 2008). This document was updated following the completion of the Phase 2a pilot fieldwork (Mullin, Brunning and Chadwick 2009);

- A National Mapping Programme (NMP) report (Crowther and Dickson 2008) covered the entire RCZAS area of 575km² (Figs 1 and 2). A total of 930 new monument records were created in the National Monument Record (NMR) AMIE database and 376 existing records were revised, making a total of 1306 records either updated or created as a result of the Severn Estuary RCZAS NMP. In addition, the Mendip Hills AONB NMP, undertaken by Somerset County Council, resulted in 16 records being updated and 46 new records being created within the RCZAS survey area. During the early phases of the preparation of the updated project design for pilot fieldwork, only an interim report on the RCZAS NMP work was available (Crowther and Dickson 2007), covering areas of the upper estuary near Gloucester, and from Brean Down southwards. These areas were thus the focus of the Phase 2a pilot fieldwork;

- An assessment of Environment Agency lidar data was undertaken for two selected sections within the RCZAS survey area (Truscoe 2007), and the technique was recognised as being a useful complementary methodology to aerial photographic mapping and field survey.

3.2 Sites identified as requiring further study

3.2.1 The Phase 1 reports (Crowther and Dickson 2008; Mullin 2008; Truscoe 2007) listed types of features and some specific sites and areas where fieldwork could be potentially productive. The results of the Phase 2a pilot fieldwork stage also informed targeting of the main Phase 2 fieldwork (Catchpole and Chadwick 2010a). A targeted and prioritised list of sites and features to be investigated further by fieldwork was outlined in section 3.2 of the updated project design (Catchpole and Chadwick 2010b).

3.2.2 In addition, English Heritage recognised that two areas within the overall Severn Estuary RCZAS project area required further work:

- A short, stand-alone archaeological report should be produced on the wrecked and beached vessels at Purton using aerial photographs, NMP mapping and other Gloucestershire sources to examine how this group of vessels developed over time and provide baseline information for any future detailed assessment of these wrecks nationally by English Heritage. Such a wider national assessment is beyond the scope of this RCZAS project;

- In earlier drafts of the UPD it was proposed that a rapid assessment of aerial photographs could facilitate understanding of the development of Avonmouth during

the twentieth century. English Heritage decided that this was beyond the scope of a RCZAS, however, and that it would be better accomplished through Environmental Impact Assessments in advance of proposed developments in the Avonmouth area.

3.2.3 The publication of draft consultation versions of the Severn Estuary Shoreline Management Plan and the Severn Estuary Flood Risk Management Strategy (Atkins 2009, 2010; Environment Agency 2011a) have also been an important consideration when identifying areas and sites requiring further study. These reports identify areas of the coast and hinterland along both the Welsh and English Severn Estuary where defences will be maintained or improved, where there will be managed realignment of defences, or where no further maintenance of defences is envisaged and 'natural' processes will be allowed to continue, effectively meaning increased flooding and/or erosion of these areas. These preferred options and procedures are envisaged as operating over 0-20 year (short term), 20-50 year (medium term) and 50-100 year (long term) periods. During the planning of the main Phase 2 fieldwork, those areas at greatest short or medium term risk from managed realignment or from no further maintenance were prioritised in the updated project design (Catchpole and Chadwick 2010b, also see sections 4.1 and 13.5 below).

3.2.4 In addition, as part of the main Phase 2 work a series of initial reconnaissance visits were made to areas of unknown potential not previously visited during the pilot fieldwork. These visits were also used to identify areas of higher or lower archaeological potential. For example, the coastline between Clevedon and Kilkenny/Woodhill Bay at Portishead consists mostly of cliffs or wave-cut rock platform, with few or no archaeological features visible. Similarly, the 'New Grounds' at Lydney on the right bank of the Severn, and at Slimbridge on the left bank between Purton and Frampton on Severn, also have very little archaeological potential as they consist mostly of post-medieval and early modern reclamations, and, in the case of Lydney, substantial sloping rubble 'rock armour' bank defences that would obscure earlier phases of revetment such as cribbing.

3.3 Excluded areas

3.3.1 Due to the proposed development of the Bristol Deep Sea Container Terminal and other schemes in the Avonmouth area, and the various Environmental Impact Assessments undertaken as part of the planning of these developments, at an early stage English Heritage advised that this area should be excluded from RCZAS fieldwork.

3.3.2 Similarly, the coastline at Hinkley Point is also subject to an Environmental Impact Assessment and other archaeological work in advance of the proposed construction of a new nuclear reactor by EDF Energy. This area was thus also excluded from the Severn Estuary RCZAS. Archaeological evaluation of the landward area of the development has been undertaken by Cotswold Archaeology (Saunders, Reynish and Cook 2010), and GCCAS staff normally employed on Severn Estuary RCZAS work were able to carry out a survey of the intertidal area affected by the proposed development work. In the event, no archaeological features were identified (Chadwick and Catchpole 2010).

3.3.3 The Steart Peninsula is currently the focus of proposed managed realignment and associated compensatory habitat creation by the Environment Agency. Some areas of the Steart Peninsula were therefore excluded from the Severn Estuary RCZAS as these would be covered by Environmental Impact Assessments and any necessary follow-up work. Much archaeological work has been undertaken by Wessex Archaeology in connection with the schemes at Steart (e.g. Hamel and Bryant 2008, Thompson 2011).

4 Phase 2 fieldwork

4.1 Scope of the Severn Estuary RCZAS

4.1.1 The overall survey area for the Severn Estuary RCZAS runs from Maisemore Weir, north of Gloucester, along both banks of the Severn Estuary in England as far as Beachley Point, Tidenham, on the right (west) bank and Gore Point, on the west side of Porlock Bay, on the left (south and east) bank (Figure 1). The width of the survey area is from Lowest Astronomical Tide (Chart Datum) up to 1km inland of Mean High Water (Fig. 2). The total extent of the Severn Estuary RCZAS survey area is 575km².

4.1.2 The aims and objectives of the Severn Estuary RCZAS were outlined in the English Heritage project brief (Murphy 2007). Although some earlier RCZAS projects attempted systematic recording of entire project areas, such as the Norfolk RCZAS (NAU 2005), for budgetary and logistical reasons this was not considered possible for the Severn Estuary. The following key points were made in the project brief:

> "2.4 The *first* aim of the RCZAS…is to provide 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 (Murphy 2007, 4).
>
> 6.2 The project study area should be clearly defined within the initial project design and accompanied by appropriate justification of its scale and extent. It will generally be less extensive than the study area for Phase 1. It should cover both the open coast and the tidal estuarine coast where necessary, and should encompass both the intertidal zone and the immediate coastal hinterland. It should, however, focus primarily on the intertidal area where historic assets are most likely to be under threat and where HER and NMR records are most in need of enhancement and regular review. (*ibid,* 10).
>
> 6.4 The survey methodology will be adapted to suit the environmental constraints of the study area and be informed by the Phase 1 Desk-Based survey. Aims are to enhance the HER by locating known recorded features and sites to update their records, and to record and map new features identified during the fieldwork. Ideally, the methodology should enable existing records to be examined, verified or amended in the field and should focus on enhancing the number of records within the HER and rapidly updating records rather than on detailed recording of individual sites and monuments. (*ibid,* 10).
>
> 6.6 The prioritisation of survey areas within the intertidal areas should be based on an assessment of the following:
>
> - Previously recorded or reported sites or features
> - Features located by aerial photographic sources
> - Peat shelves and 'submerged forests', or other organic deposits
> - Palaeochannels
> - Estuarine foreshores
> - Areas of known rapid erosion. (*ibid,* 11).
>
> 6.7 The records maintained by HERs are often more extensive along the coastal hinterland and inland in areas at a lower threat from coastal erosion. As the prioritisation of survey areas is partly based on the level of risk to the historic assets from damage or destruction, areas at a lower risk from erosion or development than in the intertidal zone may be approached using a targeted sampling strategy. This should be based on the following:

- Level of threat from development
- Level of threat from erosion
- Level of archaeological importance of the area
- Quality of representation of the area within the HER records." (*ibid,* 11).

4.1.3 For the purposes of the Phase 2a pilot fieldwork, the proposed survey areas were restricted to those sections of the Severn RCZAS previously covered in the interim NMP report (Fig. 2, Crowther and Dickson 2007). The majority of the Phase 2a fieldwork targeted the intertidal zone, as called for in the brief (Murphy 2007), as these areas are most under threat from coastal change, and require the most careful consideration in terms of Health and Safety issues and the development of quick and efficient recording methodologies. A range of other coastal environments (e.g. rocky foreshore, salt marsh and salt grazing) and a broad geographic spread of target zones were covered during Phase 2a survey work. The results of this fieldwork and Phase 2 reconnaissance visits, however, indicated that many such locales would probably have less archaeological potential, and that this could not in any case be established through what is relatively rapid walkover survey.

4.1.4 At an early stage during the planning of Phase 2a and Phase 2, therefore, a targeted approach to the fieldwork was adopted. This was based partly on the recommendations in the project brief, but also the proposals of the consultation versions of the Severn Estuary Shoreline Management Plan and the Severn Estuary Flood Risk Management Strategy, as outlined in sections 3.2 and 3.3 above.

4.2 Summary of survey areas

The following list of historical and archaeological assets to be targeted by the main Phase 2 survey was compiled for the updated project design (Catchpole and Chadwick 2010b, section 9.6). The areas or sites were grouped as high, medium and low priority, based on a combination of factors as outlined in sections 3.2, 3.3 and 4.1 above:

High priority

- Intertidal areas at Hills Flats and Oldbury Flats (peat deposits, prehistoric artefacts and footprints, Romano-British stone structures and associated artefacts, wooden structures, post-medieval shipwrecks and post-medieval fishing structures);

- Intertidal areas at Berrow Flats (prehistoric peat deposits, prehistoric faunal remains and artefacts, wooden structures, post-medieval shipwrecks and medieval/post-medieval/early modern fishing structures);

- Intertidal areas at Stockland Reach, Fenning Island, Stert Point, Stert Island and Stert Flats (wooden structures, post-medieval shipwrecks and medieval/post-medieval/early modern fishing structures);

- Intertidal areas at Stolford Bay/Stolford Beach (prehistoric peat deposits and submerged forest, wooden structures, and medieval/post-medieval/early modern fishing structures);

- Intertidal areas at St Audrie's Bay (prehistoric peat deposits and submerged forest, prehistoric faunal remains and artefacts, wooden structures, and medieval/post-medieval/early modern fishing structures);

- Intertidal and foreshore areas at Blue Anchor Bay/Dunster Beach (wooden structures, medieval/post-medieval/early modern fishing structures and Second World War structures);

- Intertidal areas at Minehead Bay (prehistoric peat deposits and submerged forest, prehistoric artefacts, wooden structures, and medieval/post-medieval/early modern fishing structures).

Medium priority

- Intertidal and foreshore areas at Beachley (unknown archaeological potential, requires assessment);

- Reclaimed grazing land south-west of Waldings Pill and south-east of Wibdon, and west of Beacon Sand (subcircular earthwork feature of unknown date and archaeological potential, requires assessment);

- Intertidal areas at Woolaston and Stroat (peat deposits, prehistoric wooden structures and undated wooden fishing structures);

- Reclaimed grazing land at Awre (medieval and post-medieval earthworks, riverbank structures);

- Reclaimed grazing land at Rodley (medieval and post-medieval earthworks, riverbank structures);

- Reclaimed grazing land at Elmore (Roman?, medieval and post-medieval earthworks, riverbank structures);

- Reclaimed grazing land at Longney (medieval and post-medieval earthworks, riverbank structures);

- Intertidal areas at Aust Rock and English Stones (Iron Age and Romano-British artefacts, post-medieval/early modern fishing structures and piers and slipways);

- Intertidal areas at Gravel Banks (prehistoric peat deposits and submerged forest, post-medieval/early modern fishing structures);

- Intertidal areas between Royal Portbury Docks and Portishead Pier (largely unknown archaeological potential, requires assessment);

- Intertidal areas at Woodhill Bay and Kilkenny Bay, Portishead (largely unknown archaeological potential, requires assessment);

- Intertidal areas at Redcliff Bay, Portishead and Walton Bay, Farley (largely unknown archaeological potential, requires assessment);

- Intertidal areas at Ladys Bay and Salthouse Bay, Clevedon (unknown archaeological potential, requires assessment);

- Intertidal and foreshore areas at Woodspring Bay and St Thomas' Head (wooden fish traps, shipwrecks, but much of area also requires assessment);

- Intertidal areas between St Thomas Head and Middle Hope, subject to further discussion with Defence Estates (unknown archaeological potential, requires assessment);

- Intertidal areas at Sand Bay (largely unknown archaeological potential, requires assessment);

- Intertidal areas at Weston Bay (largely unknown archaeological potential, requires assessment);

- Intertidal and foreshore areas at Lilstock (post-medieval or early modern fishing structures, post-medieval and early modern harbour features and Second World War structures);

- Intertidal areas at Greenaleigh Point and Selworthy Sand (unknown archaeological potential, requires assessment);

- Reclaimed grazing land at Porlock Marsh, although this area is currently being monitored by Richard McDonnell, location of features using GPS would be beneficial (medieval or earlier wooden structures, post-medieval or early modern waterfowl decoy);

- Intertidal areas along the edges of Porlock Bay, although once again this area is currently being monitored by Richard McDonnell (prehistoric features and faunal remains, wooden structures);

- Intertidal areas at Gore Point, Porlock (medieval/post-medieval/early modern fishing structures).

Low priority

- Sloping agricultural land near Bollow south-east of Bays Court near Westbury-on-Severn (possible round barrow or windmill mound indicated by NMP lidar survey);

- The small intertidal area and cliff tops on the island of Steep Holm (medieval earthworks, early modern fishing structures and early modern/Second World War structures);

- Riverbank areas alongside the River Parrett at Combwich (Romano-British structures, occupation deposits and artefacts, medieval structures);

- Reclaimed grazing land at Steart Peninsula (although the Environment Agency proposals and associated Environmental Impact Assessments meant that this area was left out of the Phase 2 RCZAS fieldwork as it would be covered elsewhere by other projects);

- Cliff edge and cliff top features at Watchet (Second World War structures, if not already recorded in detail);

- Reclaimed grazing land at Ker Moor (medieval and post-medieval earthworks).

5 Communications and project products

5.1 Communications and outreach

5.1.1 Consultation sessions took place with Dr Richard Brunning, Richard McDonnell, Nigel Nayling and Vanessa Straker.

5.1.2 Several progress meetings and numerous informal discussions were held with the English Heritage Project Assurance Officers responsible for the Severn RCZAS, Buzz Busby (until summer 2011) and Helen Keeley, and other key English Heritage staff (mostly Vanessa Straker and Peter Murphy) during the fieldwork.

5.1.3 Consultation meetings were arranged for the steering group created for Phase 1 of the RCZAS, comprising local authority curators and English Heritage curatorial and specialist staff. Further consultation was carried out via e-mail requests for advice, and through the circulation of draft documents with requests for comments.

5.1.4 Other organisations with an interest in the Severn Estuary were consulted and informed about the project, and relevant permissions obtained. These included Environment Agency staff and consultants producing SMPs and the Severn FRMS; Natural England; the National Trust; the Ministry of Defence; the Coastguard and the Harbour Masters of Gloucester, Lydney, Watchet and Bridgwater Bay; and the Beachmaster of Berrow Sands. Other researchers with an interest in the Severn Estuary were notified, including Professor John Allen, Dr Alex Brown, Professor Michael Fulford and Professor Martin Bell of the University of Reading, and Paula Gardiner of the University of Bristol. Dr Sîan Rees of Cadw and Deanna Groom of the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) were also informed of progress. Contact was also maintained with groups such as the Friends of Purton, the Severn Estuary (nets and fixed engines) Fishermen's Association and the Black Rock Lave Net Fishermen's Association.

5.1.5 The principal formal method of sharing information with other researchers continued to be via the Severn Estuary and Levels Research Committee (SELRC), through papers delivered to its annual meeting. Toby Catchpole delivered a summary PowerPoint presentation on the results of the Phase 2a pilot fieldwork at a SELRC meeting in Chepstow on the 7th November 2009, and another paper at the SELRC 'Fish and Ships' conference in Cardiff on the 12th September 2010. The latter paper comprised an introduction to the project methodology, together with a summary of the results of the NMP work undertaken during Phase 1. A paper outlining the survey and dating of fishing related structures recorded during Phase 1, Phase 2a and the main Phase 2 fieldwork was submitted to *Archaeology in the Severn Estuary* in August 2011. A final summary paper was presented at the SELRC meeting in November 2011.

5.1.6 Adrian Chadwick presented two evening talks on the results of the Severn Estuary RCZAS to Gloucester and District Archaeological Research Group (GADARG) in Gloucester on the 3rd February 2011, and to the Chepstow Archaeology Society in Chepstow on 3rd March 2011. Toby Catchpole delivered talks for the Committee for Archaeology in Gloucester annual meeting in March 2010, for a Somerset University of the 3rd Age conference in October 2011 and to Somerset Archaeological and Natural History Society (SANHS) in January 2012.

5.1.7 Brief reports on the Severn Estuary RCZAS project were published in *Severn Tidings* 11 for spring 2009, the online newsletter of the Severn Estuary Partnership, and also in *Current Archaeology, BBC History Magazine,* and the Gloucestershire Archaeology Service newsletter. An audio-visual installation based on the work of the Severn Estuary RCZAS was presented at the Cheltenham Science Festival on the 9th-13th June 2010 and exhibition boards displayed in the Gorge Cafe, Newnham on Severn for the Heritage Open

Days weekend in September 2012. Some of the photographs taken during the Severn RCZAS fieldwork were, with English Heritage permission, passed on to Mr Charles Johns, Senior Archaeologist for Cornwall Council, for possible use in their Historic Seascape Characterisation report (Taylor *et al.* 2011). A photograph of GCCAS survey team member Nick Witchell recording a stone fish weir at Minehead appeared on the cover of the *IfA Yearbook* for 2011, and the project was featured in the IfA Maritime Archaeology Group newsletter for autumn 2010.

5.2 Project products

5.2.1 This report will be circulated to English Heritage, the Historic Environment Records (HERs) of Gloucestershire County Council, South Gloucestershire Council, Bristol Council, North Somerset Council, Somerset County Council, Exmoor National Park and to other relevant stakeholders. Documents will also be submitted to the Archaeological Data Service or another appropriate repository for digital archiving as directed by English Heritage. Copies of all project reports in pdf format will be made freely available to download via the English Heritage and Severn Estuary and Levels Research Committee websites.

5.2.2 The principal digital products of the main Phase 2 fieldwork programme are a GIS-based database of survey records in shape file format, together with accompanying digital photographic records to be supplied to English Heritage, the HERs listed above and other relevant stakeholders. Details of records and formats are included at Appendix B (vol. 3).

5.2.3 A synthetic academic report outlining the results of the Severn Estuary RCZAS Phase 2 fieldwork specifically with regard to fishing-related structures, and also drawing on information included in the Phase 1 and Phase 2a reports, was published in the journal *Archaeology in the Severn Estuary* in August 2011 (Chadwick and Catchpole 2011).

6 Health and safety

6.1 Risk management strategies

6.1.1 A series of working practices was adopted to minimise the risks from the potential Health and Safety hazards identified in the updated project designs for the Phase 2a pilot and the main Phase 2 fieldwork (Catchpole and Chadwick 2009, 2010b). Richard Brunning, Richard McDonnell, Nigel Nayling and Vanessa Straker were all consulted in this regard, as was Neil Chatten, the Gloucestershire County Council Health and Safety advisor responsible for the Environment Directorate.

6.1.2 The relevant coastguard station (Swansea) was always notified prior to staff entering the intertidal zone, and following their safe return to shore. The Harbour Masters' offices at Watchet and Bridgwater Bay and the Beachmaster at Berrow Beach were also contacted prior to the commencement of survey work in the intertidal zone of their areas. The beach wardens at Berrow Beach and Brean Beach were also contacted prior to and during fieldwork and they proved extremely helpful, arranging access through locked gates and providing information about changing sediment conditions in recent years.

6.1.3 A series of forms were produced to help minimise and manage risk (see appendix A of Catchpole and Chadwick 2009). A generic risk assessment of fieldwork tasks was produced. Survey sites were always visited in advance and potential hazards noted on a site specific risk assessment form. This was a 'tick-list' type form, drawn up to ensure that all necessary pre-survey safety checks were made, including tide and weather conditions, safe working window times, Coastguard and GCCAS office contact telephone numbers, and any relevant landowner permissions. Access points and rights of way were also identified along with parking, toilet and other welfare facilities, and the nearest Accident and Emergency hospital departments. The type of terrain to be covered was included in the assessment of each survey location in advance of fieldwork. The information collected was summarised on a survey log form, which required further details to be completed on-site on a daily basis.

6.1.4 Tide tables were consulted during the detailed scheduling of fieldwork in order to timetable the optimum periods for access to foreshores and intertidal zones, and survey work was usually designed to follow the tides out. Arrowsmith printed tide tables and the BBC and Admiralty Easy Tide online tide tables (www.bbc.co.uk/weather/coast/tides; http://easytide.ukho.gov.uk/EASYTIDE/EasyTide/index.aspx) were used for this purpose. Local wind and weather conditions were also monitored to ensure the safety of staff.

6.1.5 The time taken to walk to sites was often difficult to predict in advance due to the variability of ground conditions, and the amount of surveying and recording kit being carried. It was sometimes necessary for fieldworkers to return to shore via a different route to that walked out, and extra time was allowed for this as a sensible safety precaution. Project team members were also made aware of the potential threat of headlands cutting off retreat or limiting communications. Local knowledge was sought wherever possible – for example, there is only one safe route out onto Stert Flats, and Richard McDonnell and Richard Brunning provided valuable advice on this.

6.1.6 The basic field team usually consisted of three people (Adrian Chadwick, Briege Williams and Nick Witchell), with other GCCAS staff substituting on occasion (Toby Catchpole, Jon Hoyle and Andrew Walsh). One person used the handheld GPS datalogger to survey features, one person provided additional descriptions using the digital voice recorder, and the third person took digital photographs This was also considered the minimum number of people for safe working in the intertidal zone, for if one member of the team were to get into difficulties or injure themselves, there would be two other people

present to get help and/or to physically evacuate the team member from the intertidal zone, in advance of an incoming tide for example.

6.1.7 Richard Brunning joined the field survey team for many of the survey visits in Somerset. This provided added flexibility, and allowed for two teams of two people, although these stayed in visual range of one another. This enabled much more extensive areas and numbers of features to be rapidly surveyed in locales such as Stert Flats, Blue Anchor Bay and Dunster Beach.

6.2 Health and safety equipment

6.2.1 The following equipment was deemed essential for both the Phase 2a pilot and the main Phase 2 field survey programmes:

- A daily safety plan including tide times and emergency plan with arrangements and contact details;
- A charged satellite telephone and a charged mobile telephone;
- An accurate waterproof watch;
- Paper maps and waterproof map cases in case of IT failure;
- First Aid kit;
- Washing solution/eye wash;
- Antiseptic wipes;
- Clean water and towels;
- Access to suitable welfare facilities.

6.2.2 In addition, every team member had access to the following clothing and equipment:

- Wet weather gear, in a lightweight breathable fabric;
- Breathable thermal base layers suitable for winter or summer work;
- Safety Wellington boots;
- Self-inflating lifejackets to British Standard EN 394:1994 with a buoyancy of not less than 100 Newtons, and with built-in harnesses suitable for helicopter or boat recovery;
- High-visibility clothing if necessary;
- Sunscreen and hats where necessary;
- Compasses;
- Signal flares;
- Throwing strops (for pulling out stuck team members);
- Whistles.

6.3 Assessments of health and safety equipment and methodology

6.3.1 There were no Health and Safety incidents during the duration of the Phase 2a pilot and main Phase 2 fieldwork, and the methodology and practices developed during the Phase 2a pilot worked well.

6.3.2 Deep sucking mud was encountered in places at Guscar Rocks, Lydney Harbour, Oldbury and Hills Flats, Severn Beach, Woodspring/Kingston Bay, Berrow Flats and Stert Flats, and staff had to retreat from such localised soft areas. The gently shelving, slippery clay intertidal surface at Beachley was also potentially hazardous, as some archaeological features were located right on the edge of the fast-flowing main river channel. Although they were carried on each visit to the intertidal zone, it was fortunately never necessary to use either the throwing strops or the flares.

6.3.3 On two occasions, at Hayward Rocks and Oldbury both in South Gloucestershire, the level of the tide rose faster than staff had expected. On one occasion this was due to a failure to convert the Greenwich Mean Time tide tables to British Summer Time (an hour later) for that survey visit. The team members were nevertheless able to recognise that water levels were rising faster than expected, and were able to leave the intertidal zone and proceed to shore without incident.

6.3.4 There is no doubt that wearing Wellingtons, salopettes, waterproof coats and self-inflating lifejackets whilst carrying equipment in waterproof rucksacks often felt bulky and uncomfortable. Nevertheless, in hot weather GCCAS staff members were able to strip down to wickable T-shirts and shorts. In wet and windy weather however, the waterproof clothing kept survey team members warm and dry, and the lifejackets provided added reassurance. Sealskinz socks were found to be very effective if water overtopped Wellington boots. The sensible compromise reached was that GCCAS staff wore clothing appropriate to the conditions, but lifejackets and other equipment were always carried in case of emergencies and changing weather conditions. The waterproof rucksacks proved to be particularly useful items of kit. Separate high visibility clothing was not thought to be necessary during the Phase 2a and main Phase 2 surveys, as the waterproof clothing that had been purchased was in bright colours and also had built-in reflective panels and 'high-visibility' hoods.

6.3.5 The daily check-in with the Coastguard worked well, and their staff members always seemed pleased that they had been properly notified of the survey work.

6.3.6 During the Phase 2a pilot, use of the Burnham-on-Sea rescue hovercraft at Berrow Flats for two days allowed team members to visit with confidence archaeological features that were quite far out from the shore, and to get across deep and soft mud. It also saved tremendous amount of time and effort by greatly reducing the need to walk for long distances. Unfortunately, the prohibitive cost of commercial hovercraft rental and the lack of any other available craft prevented the use of such vehicles during the main Phase 2 field programme (Catchpole and Chadwick 2010b). In order to minimise hazards and exhaustion in two specific areas, Berrow Flats and Stert Flats, an Argocat 8x8 tracked All Terrain Vehicle (ATV) was hired for three weeks to assist the survey work. Although its use was problematic at Berrow (see section 9.4.2 below), at Stert it proved its worth in transporting team members rapidly across large distances.

6.3.7 At Berrow Flats, Stert Flats, Blue Anchor Bay and Dunster Beach, where there were extensive areas to survey and/or complex groups of archaeological features, Dr Richard Brunning and Richard McDonnell also assisted with survey work. This allowed two teams to range out over larger areas and record more features during the same tidal window than would otherwise have been possible. The two teams always remained within sight of one another in case of emergency (Catchpole and Chadwick 2010b, section 12.4).

6.3.8 In certain situations, however, such as on recording riverbanks along the River Parrett, the inner Severn estuary and its tributaries, it was possible following appropriate Risk Assessments to have just two team members undertaking the survey work.

7 Constraints

7.1 Environmental designations

7.1.1 Numerous statutory designations apply within the Severn Estuary, giving it one of the highest levels of protection in the United Kingdom, and these cover most of the Severn RCZAS survey area. These include Sites of Special Scientific Interest, Special Areas of Conservation, Special Protection Areas, Ramsar sites, Areas of Outstanding Natural Beauty (AONB), and a National Park. These different designated areas were illustrated in the updated project design for the Phase 2a pilot fieldwork (Catchpole and Chadwick 2009). It was recognised as essential that working methods were employed that minimised any disturbance to plant and animal communities in the intertidal zone, salt marsh and grazing land behind. These categories formed all of the RCZAS survey area outside built up urban areas. Charlotte Pagendam, the Natural England Severn Estuary Officer, and her colleague Bob Corns were contacted for information and advice regarding fieldwork. Based on the methodology proposed, they agreed to issue blanket permissions for fieldwork provided that none took place during December and January in the area between Stert Island and Fenning Island, and that details of proposed visits to particular areas were forwarded to them in advance.

7.1.2 During the main Phase 2 fieldwork, John Leese of Natural England was able to facilitate access for the Argocat ATV onto Stert Flats via Robin Prowse of Dowell's Farm, one of the wardens of the Bridgwater Bay National Nature Reserve.

7.2 Landowner permissions

7.2.1 The Crown Estate owns approximately 55% of the intertidal foreshore nationally. The Managing Agent for the marine estate over the entire Severn RCZAS survey area is Knight Frank, Bristol. Christopher Smith at Knight Frank was contacted and provided permission to access Crown Estate land. The National Trust's Somerset and Devon Archaeology Officer, Shirley Blaylock, was also contacted regarding fieldwork in Porlock Bay, although in the event NT land was not visited there.

7.2.2 Defence Estates have land holdings in the RCZAS area at Beachley, south of Portishead and St Thomas' Head (used by QinetiQ), but, apart from the intertidal zone at Beachley, no Defence Estates land was accessed during Phase 2 fieldwork.

7.2.3 Initial enquiries were also made to the Commercial Services department of the Land Registry in order to try and obtain information concerning the names and address of private landowners within the Severn Estuary RCZAS study area. ESRI ArcMap GIS Shape files of the absolute minimum survey area (comprising the intertidal zone up to the immediate foreshore) were sent to their Merseyside offices, but they quoted a £400 information extraction fee, plus a charge of £2 per record for each separate land title under their Polygons service, rising to £3 per record for their Polygons Plus service – only the latter actually provides the names and addresses of the landowners concerned. Such charges would have amounted to several thousand pounds, and so as a result the Land Registry was not contacted for information ahead of Phase 2 fieldwork.

7.2.4 In the event, almost all areas visited during Phase 2 were publicly accessible from footpaths, harbours and/or car parks. Where access was necessary across privately owned land, the individual farmers or other landowners concerned were contacted in advance.

7.2.5 There were a few places where it was not possible to arrange access, however, as with the intertidal area between Bullo and Cullow Pill, near Newnham in Gloucestershire.

7.3 Other constraints on field survey work

7.3.1 Past or present military bombing or firing ranges are present at Aust, Brean Down, Stert Flats, Lilstock (all disused) and between St Thomas' Head and Kingston Seymour in Woodspring Bay (in use). Defence Estates (Michael Russell at Tidworth) provided mapping of their current land holdings in the survey area and were consulted regarding access and hazards represented by former military use. These areas were not visited as part of the pilot Phase 2a of the Severn Estuary RCZAS. Only the disused ranges at Aust and Lilstock were accessed during the main Phase 2 fieldwork, and the danger areas at Stert Flats and Woodspring/Kingston Bay were avoided.

7.3.2 Additional constraints were presented by the physical environment and restrictions encountered at some of the survey areas, detailed in section 9.1 below, and also occasionally by the handheld digital recording unit and associated software, discussed in section 9.2.

7.3.3 Following reconnaissance visits in April 2010 the main Phase 2 survey work itself commenced in June 2010 on arrival of survey equipment. This unfortunately meant that some of the lowest tides of the year had already been missed, and consequently it was simply not possible to gain access to all of the features in the Severn RCZAS project area at the remaining times of lowest tides. These areas were therefore targeted for additional survey work in March-April 2011. In addition, there were several weeks when the actual times of low tides were unfavourable, either being too early in the morning (before 5 AM) or too late in the evening (after 8 PM). In general, however, flexible staff working practices meant that in practice there were relatively few weeks when no survey visits at all were possible. This survey downtime was in any case utilised productively in necessary post-survey tasks including keeping up to date with processing the digital records and photographs, transcribing digital voice recordings, updating the GIS shape files and writing site narratives.

7.3.4 Although there were several days of extremely inclement weather conditions experienced during field survey work, in practice the generally excellent performance of the Magellan hand-held datalogger GPS units, the use of digital voice recorders and the effective waterproof clothing meant that GCCAS staff continued with their work. There were no days lost to bad weather.

8 Methodology

8.1 Methodological guidance

8.1.1 The Phase 2 fieldwork followed the methodological guidelines outlined in version 10 of the English Heritage Brief for RCZAS projects (Murphy 2007), and these were reiterated in the updated project design (Catchpole and Chadwick 2010b). It was also informed by the Phase 1 desk-based assessment (Mullin *et al*. 2009) and the results of the Severn Estuary National Mapping Programme (Crowther and Dickson 2007, 2008). Important innovations and improvements to the survey methodology were also made as a result of experience during the Stage 2a pilot fieldwork (Catchpole and Chadwick 2010a, see 8.5 below).

8.1.2 As recommended in the English Heritage brief (Murphy 2007), during the Phase 2a pilot and main Phase 2 survey stages open coast and upper estuarine areas were targeted, and although the work concentrated on the intertidal zone, other landscape types were also selected for fieldwork. In addition to recording and mapping previously unknown features, many known features mapped by the NMP in areas such as Minehead Bay, Dunster Beach and Blue Anchor Bay were targeted in order to assess and photograph their current state of preservation, and to enhance their existing HER entries.

8.2 Updated NMR and HER data

The NMR record for the RCZAS survey area was significantly enhanced by Phase 1 of the Severn Estuary RCZAS, and the HER data was similarly updated. The 2009 Phase 2a pilot fieldwork also added additional information to the relevant HERs. These updated records were therefore requested from the NMR and HERs, and loaded onto the project GIS prior to the commencement of the main Phase 2 fieldwork in 2010.

8.3 Preparatory and desk-based tasks

8.3.1 As outlined in section 6.1 above, a risk assessment of each site or area to be surveyed was undertaken, initially through study of imagery on Google Maps, Bing and the GCCAS project GIS, and then through preliminary site reconnaissance visits at which potential hazards were identified. This introductory work identified access points and rights of way, possible hazards, parking and toilet facilities, and the nearest Accident and Emergency hospital departments. The type of terrain to be covered was included in the risk assessment of each survey location carried out in advance of fieldwork, along with the reasons why each area was selected (for example, to examine fish weirs, or to investigate areas of submerged forest).

8.3.2 The list of areas or sites to be visited during the Phase 2 fieldwork was outlined in initial drafts of the updated project design (Catchpole and Chadwick 2010b) and circulated in advance to English Heritage staff and other relevant stakeholders for comments, and several amendments were made following their advice.

8.4 Staff training

8.4.1 The fieldwork staff received the following training and familiarisation sessions prior to or during the course of the main Phase 2 fieldwork:

- Dave Shandley of Digiterra spent three hours demonstrating the use of the Magellan MMCX GPS-equipped handheld data-logging equipment and associated Digiterra 5 software;
- Gary Handley of Gloucestershire County Council facilitated trailer towing training for Adrian Chadwick, Briege Williams and Nick Witchell;
- Richard Walsh of Richard Walsh Specialist Vehicles Ltd spent an afternoon demonstrating the use of the Argocat 8x8 ATV to Briege Williams and Nick Witchell.

8.4.2 No other additional training was required in 2010, following the training that GCCAS staff had already received in 2009 for the Phase 2a pilot fieldwork (Catchpole and Chadwick 2010a, section 8.4). The half day training in the use of the Magellan handheld datalogger was considered to be insufficient by the survey team, and in hindsight two to three days training in its use as well as the uploading and downloading of data would have been preferable.

8.5 Phase 2a recording methodology

8.5.1 Following recommendations from the Head of English Heritage Technical Survey Trevor Pearson, it was decided that during the Severn Estuary RCZAS Phase 2a pilot project the equipment used would consist of the Trimble Geo XT handheld datalogger and GPS loaded with base map, NMP, NMR and HER data. The Trimble GeoBeacon was used as a real-time differential correction source to provide the necessary accuracy with the Egnos satellite available as backup. The Trimble Geo XT, GeoBeacon and WorkFlow software were hired from a commercial survey equipment supply firm.

8.5.2 The Norfolk Archaeological Unit context sheet (NAU 2005) was used as the basic template for a paper version of a manual survey sheet devised for the Severn Estuary RCZAS (Catchpole and Chadwick 2010a, appendix B) and digitised for use on the Geo XT as data fields linked to GPS survey Shapefiles. This also to note of comments outlined in a review of previous RCZAS methodologies (Merritt and Cooper 2005). Paper versions were carried in the event of equipment failure, and to record certain features in more detail. Another paper recording sheet was devised specifically to record timber structures and wrecks (Catchpole and Chadwick 2010a, appendix B), following advice from Richard Brunning, Buzz Busby and Nigel Nayling. Draft copies of these recording sheets were circulated for comments and criticisms prior to the final versions being used in the field.

8.5.3 Due to the repeated failure of the digital equipment paper sheets proved absolutely necessary during the pilot fieldwork, but the speed of recording using this method was unacceptable.

8.5.4 Standard GCCAS planning sheets were also carried in case sketches or rapidly measured plans were required for more complex features that could not be adequately surveyed using the simple point, string and polygon formats available with the GPS. These sheets were not utilised, however, during the course of the Phase 2a fieldwork.

8.5.5 Digital photographs of features and areas were taken with a shock and water resistant Ricoh Caplio 500SE camera. Photographs were automatically georeferenced via an inbuilt GPS module and were capable of being linked using a Bluetooth connection and FotoFlow software to the data and survey records for each feature. As many non-record specific photographs were taken, however, it was not possible to link the photographs to the database until the record-specific photographs were separated from the overall digital photographic archive. It was possible using FotoFlow to display accurate positional information for the photographs on GIS, along with their orientations.

8.5.6 The RCZAS brief required that the geomorphological and sedimentary context of features should be recorded. A Van Walt gouge auger was purchased for this purpose, but during the Phase 2a pilot the only times this was actually used were at Stert Flats and Oldbury Flats. It was also suggested that quickly-dug spade slots would also be an effective method of ascertaining the nature of underlying sediments (Richard Brunning pers. comm.).

8.6 Phase 2a recording methodology – digital records

8.6.1 During the drafting of the UPD for the pilot fieldwork, it was hoped that use could be made of the trackplot facility of the GPS to produce 'snail trails' indicating the areas that were actually traversed during field visits by recording the location of the surveyor at set time intervals. In the event, however, it proved too time consuming switching between modes for efficient use of this facility in between making survey records and it was not used during the Phase 2a pilot fieldwork.

8.6.2 Extensive use was made of digital photography during the Phase 2a pilot fieldwork, with some modern features (such as net hangs formed by metal scaffolding poles) recorded solely using digital images. The GPS camera was found to be an excellent method of very rapidly recording and locating features that either did not merit the time taken to record fully, or when incoming tides or equipment failure made full recording difficult.

8.6.3 In theory, a site record was generated for each feature or deposit identified or visited during the pilot fieldwork. Each record included a unique identifier, a feature description, and photographic references. Site conditions and an estimate of stability or vulnerability to erosion were also meant to be recorded. When the GPS and handheld datalogger were working correctly, a co-ordinate was taken with a differential correction (DGPS) that was meant to improve the accuracy of data to ± 1m.

8.6.4 During the pilot fieldwork, however, considerable problems were encountered with the reliability of the hired datalogger and the associated software (Catchpole and Chadwick 2010a, section 9.2). It was not possible to navigate onto known features as the OS maps and HER data would not load correctly, and sometimes the GPS only worked intermittently, and kept losing its satellite fix. The Z or height co-ordinates displayed were clearly inaccurate by at least 60m, and were not logged and saved in the Fastmap records. In addition, the pull-down menus for the recording were slow to access and work through in the field, and some supposedly saved data was lost. No telephone calls or e-mails made to the supplier regarding these issues were returned, and so the backup service was non-existent.

8.7 Phase 2 recording methodology

8.7.1 Due to the problems outlined above, for the main Phase 2 RCZAS fieldwork programme, alternative suppliers, equipment and software were sought. After reviewing several options GCCAS staff decided to purchase Magellan Mobile Mapper CX digital handheld GPS-equipped dataloggers, operating Digiterra 6 software. These had been purchased by GCC Property Services, and a unit was also bought for the Forest of Dean lidar follow-on survey (EH pnum 5291REC, Hoyle 2011). This gave the advantage that the equipment and software would be familiar to the IT department at GCC, although in the event their advice was rarely required. One Magellan was purchased for the Severn Estuary RCZAS, and as Phase 2 work began after the conclusion of the Forest of Dean survey, this made two GPS-equipped dataloggers available, allowing two survey teams to be operating in the same area simultaneously and providing greater flexibility and reducing survey time.

Using Digiterra 6 software, GCCAS staff members devised a series of simple pull-down menus and 'tick-box' style records (see Appendix B for the digital records).

8.7.2 Additional post-processing software was purchased that would allow the post-survey correction of data to sub-metre accuracy. The post-processing software was found to be unnecessary though, due to the accuracy of the raw data. It also resulted in the corrected data losing the Z (height) records. Digiterra were notified of this problem, but their technicians could not resolve this issue.

8.7.3 A TruPulse 360B laser rangefinder was also purchased for the Severn Estuary RCZAS Phase 2 fieldwork. This was capable of being Bluetooth-linked to the Magellan hand-held units, and allowed GPS-based coordinates to be recorded for features impossible to access directly because of deep water or mud from up to 200m away, and also where a GPS signal could not be located, such as under trees or cliffs, using 'offset' measurements taken from a position where a clear signal was safely achievable (**Plate 1**). It also massively improved the rate at which large features could be recorded compared with having to walk the datalogger along the line of a feature.

8.7.4 In order to overcome the problem of recording additional information concerning features in as rapid a manner as possible, the main Phase 2 survey abandoned the use of paper recording sheets altogether. Instead, in addition to the pull-down recording menus contained within the Digiterra software on the hand-held dataloggers, two Olympus VN-5500 digital voice recorders were used to record additional observations and comments. The digital audio records were saved as MP3 files that were downloaded after survey visits, and then transcribed into Word documents during non-survey days. The digital voice recorders were kept in waterproof carry cases during survey work, and headset microphones facilitated 'hands-free' operation (**Plate 2**). Small laminated versions of the Phase 2a record sheets were carried by team members for use as prompts.

8.7.5 Following the successful trials of the Ricoh Caplio 500SE waterproof camera during the RCZAS Phase 2a pilot, another unit was purchased by GCCAS, again allowing two survey teams to operate simultaneously.

8.7.6 During the Phase 2a pilot fieldwork one small section of a wider area with large numbers of archaeological features at Dunster Beach/Blue Anchor Bay was selected for more intensive survey and recording, during which even relatively recent features such as net hang lines formed from scaffolding poles, ground line gullies and lines or circular mounds of net weight stones were recorded. During the main Phase 2 survey work, only relatively small numbers of these features were formally recorded, and no metal hang net lines at all were recorded. Some lines or mounds of stone net weights and net hang post supports were photographed using the GPS-equipped cameras to give them a rough position, but due to their numbers and the relatively recent date of many, only a few of these extremely numerous features were formally recorded using the Magellan Mobile Mapper dataloggers.

8.8 Sampling and artefact retention

8.8.1 During the Severn Estuary RCZAS Phase 2a pilot fieldwork, only limited samples were taken from stakes at Berrow Flats and Stert Flats. At Dunster Beach, wooden stakes were observed at the apex of one stone fish weir, and these were sampled. In line with the RCZAS brief (Murphy 2007, 6.12); the collection of artefacts was also kept to an absolute minimum. Black-stained animal bone found in association with previously unrecorded peat deposits at Berrow Flats was recovered for species identification and possible radiocarbon (^{14}C) dating. A fragment of a post-medieval ceramic vessel possibly associated with a stake-built feature at Berrow Flats was also retained.

8.8.2 Dr Richard Brunning and Vanessa Straker had advised that samples suitable for wood species identification and potential dendrochronological and ^{14}C dating should be taken wherever possible, especially from features in intertidal areas that are difficult to access and/or rarely visited, those that are poorly preserved and highly susceptible to erosion, and/or those thought to be potentially early in date. Prior to the commencement of the main Phase 2 survey programme therefore, it was agreed with Peter Murphy of English Heritage that limited sampling of wood, artefacts and faunal remains would take place (Catchpole and Chadwick 2010b, section 10.8). It was interesting that, when the stone weir at Dunster Beach with wooden stakes at its apex was revisited during the main Phase 2 fieldwork, no wooden stakes were visible, and they had either been eroded completely or buried by sediments. This highlights the importance of taking samples wherever possible.

8.8.3 During Phase 2 fieldwork, samples of wood were taken from stake-built fish traps at Beachley, Oldbury Flats, Brean Beach/Berrow Flats, Stert Flats and Blue Anchor Bay (**Plate 3**), and from beneath a stone-built fish weir in Blue Anchor Bay. A possible blade from a wooden oar was also recovered at Beachley. Initial descriptions of the wooden stakes and recommendations for further analysis and dating were made by Dr Richard Brunning and Nigel Nayling. The wooden stakes have been identified to species wherever possible and two phases of radiocarbon dating arranged through the English Heritage scientific dating team (see 11.2 and Appendices A and E). Two further finds of ceramic vessels in association with stake-built intertidal features were made (see section 11.3 below).

8.8.4 Spade-dug slots and auger cores were used during the Phase 2 fieldwork at Brean Beach/Berrow Flats, Blue Anchor Bay and Stolford to take sample sections through peat deposits that were then measured and described in the field.

8.9 Staffing

8.9.1 The GCCAS core team who undertook the Severn Estuary RCZAS Phase 2 survey programme consisted of Dr Adrian Chadwick, Briege Williams and Nick Witchell, all of whom had undertaken the Phase 2a pilot fieldwork. Toby Catchpole managed the project for GCCAS, and assisted with surveying when a member of the core team was unavailable. Jon Hoyle and Andrew Walsh of GCCAS also assisted with some fieldwork.

8.9.2 Dr Richard Brunning, Senior Levels and Moors Heritage Officer for Somerset Council Heritage Service, was also one of the core RCZAS staff for Phase 2 fieldwork along the Somerset coast. In addition, he provided crucial expertise regarding sampling and waterlogged wood, and he undertook most of the preliminary species identification and assessment of the wood samples.

8.9.3 Richard McDonnell, archaeological consultant, also assisted with Phase 2 survey work at St Audrie's Bay, Brean Beach/Berrow Flats and Stert Flats. He has invaluable knowledge of the intertidal archaeology of the Somerset region, and local ground and tidal conditions.

8.9.4 Richard McDonnell and Richard Brunning have both undertaken much archaeological work in the intertidal zone of the Severn Estuary in areas such as Porlock Bay, Minehead Bay, Stert Flats and Bridgwater Bay (e.g. Brunning 2008; McDonnell 1980, 1995, 2001). Their contribution to the Phase 2 fieldwork programme was critical to its success and safe progress.

8.9.5 Nigel Nayling of Trinity Saint David, University of Wales helped to store and analyse the waterlogged wood samples from the Phase 2a and Phase fieldwork, and made preliminary recommendations for the dendrochronological analysis of selected samples. He played a key role in producing an application to English Heritage for additional funding to

analyse and date some of the wood samples from the Severn Estuary RCZAS. Toby Jones of the Newport Medieval Ship Project assisted with the storage and preliminary analysis of some samples, and took detailed photographs and scanning laser images of the oar or paddle blade recovered from Beachley.

9 Fieldwork assessment

9.1 Access issues

9.1.1. There were instances during the main RCZAS Phase 2 fieldwork where deep sucking mud prevented safe access to archaeological features. This occurred at Slime Road (Sedbury), Awre, Hills Flats, Oldbury Flats, Northwick Oaze, Severn Beach, Woodspring/Kingston Bay, Brean Beach/Berrow Flats, along the River Parrett, Stolford, Stert Flats and Blue Anchor Bay. In some areas these sediments had also masked known archaeological features (R. Brunning and R. McDonnell pers. comm.), including structures plotted by the Phase 1 NMP aerial survey (Crowther and Dickson 2008).

9.1.2 Anecdotal evidence from Beach Rangers at Brean and Berrow beaches suggests that mud deposits there have increased significantly in depth during the past 5-10 years. At Stert Flats, mud and recent drifting sand bars have covered many features within the past 5 years (R. Brunning and R. McDonnell pers. comm.).

9.1.3 In many cases, however, it was still possible to take readings on features using the TruPulse laser rangefinder Bluetooth-connected to one of the Magellan hand-held dataloggers. This facility proved especially useful along steep, mud-covered riverbanks such as along the River Parrett and beside the numerous pills along the upper Severn Estuary. In areas such as Northwick Oaze, Oldbury Flats and Hills Flats there were many features such as putcher ranks that could not be safely accessed directly, but which were still recorded using the laser rangefinder. Only features more than *c*. 200m away were not able to be recorded using the laser equipment.

9.1.4 The incoming tide and/or deep water also prevented direct access to many features on occasion. Some features such as stone weirs could be recorded even when the tide prevented direct access if the top sections of their stonework were visible above the water. The water did, however, impede the laser recording more than mud, as it struggled to record a measurement under these circumstances. These records were thus generally less accurate.

9.2 Recording accuracy and other IT issues

9.2.1 The Magellan handheld GPS dataloggers proved to be sturdy and reliable units. In contrast to experiences during the Phase 2a pilot, there were relatively few occasions where satellite signal acquisition proved difficult or where they failed to function properly. They were certainly waterproof, as on the 25th August 2010 they were used at Minehead Bay during torrential rain that did not let up for the duration of the survey work that day.

9.2.2 Problems were experienced, however, in setting up the Magellan dataloggers correctly in order to take readings that could be corrected at the post-survey stage using the Mobile Mapper Office and NGS CORS software. When this facility was used on the dataloggers it actually prevented any Z or height co-ordinates from being retained. Enquiries were made to Digiterra's head office in Hungary regarding this problem, but although they dealt with all enquiries rapidly and in an extremely helpful manner no solution was forthcoming from their technicians.

9.2.3 Nevertheless, even without this facility and post-fieldwork processing, the GPS shapefile survey plots indicated that with adequate satellite coverage sub-metre accuracy to within ± 0.50m was usually obtained. In some instances such as when plotting lines of stakes in dense concentrations of overlapping features at Beachley and Stert Flats, it was

apparent from the subsequent shapefiles that a horizontal X and Y co-ordinate accuracy of ± 0.20m had been achieved.

9.2.4 The data conversion process did not allow for the individual height or Z co-ordinates taken with every GPS reading to be translated into the record shapefiles accompanying the survey data. The accuracy of the Z co-ordinates obtained by the Magellan handheld dataloggers was in any case significantly less than that of the X and Y two-dimensional spatial records. GCCAS staff members were advised by the Digiterra representative that the margin of error for Z co-ordinates was ± 3m. Given this level of accuracy, it was not thought worthwhile including any specific height data in this report and the digital project records.

9.2.5 Differential GPS equipment would have allowed a much greater degree of accuracy, particularly for Z height co-ordinates. During discussions held with English Heritage prior to the fieldwork phase, however, it was decided that two handheld dataloggers could be purchased for a similar amount to one set of differential GPS equipment, and that this arrangement would offer greater flexibility and would ultimately prove much more cost effective. In the event the recording accuracy was still significantly better than that specified in the project brief.

9.2.6 The digital voice recorders and associated headset microphones generally worked well, and only a few of the individual feature descriptions that were made during especially windy conditions proved partly indecipherable upon transcription.

9.3 The use of an all terrain vehicle

9.3.1 During the Phase 2a pilot fieldwork at Berrow Flats, GCCAS team members accompanied one of the Burnham-on-Sea Area Rescue Boat (BARB) hovercraft as part of training flights (Catchpole and Chadwick 2010a, section 9.4). Despite some disadvantages in the use of this vehicle, it was effective in transporting GCCAS staff to archaeological features located across deep sucking mud deposits that would have presented safe access on foot. With the need to repeatedly visit extensive intertidal areas such as Berrow Flats and Stert Flats during Phase 2 fieldwork, the use of a hovercraft was considered advantageous (Catchpole and Chadwick 2010b, section 10.7). Unfortunately, commercial hovercraft rates were prohibitively expensive, and it was not possible to secure access to any other hovercraft. Instead, an Argocat 8x8 tracked semi-amphibious all terrain vehicle (ATV) was hired for three weeks specifically to assist survey work at Berrow Flats and Stert Flats. Briege Williams and Nick Witchell were trained in its use when it was delivered.

9.3.2 The GCCAS team first used the Argocat ATV at Berrow Flats on 1st September 2010, when it was driven out onto the mud flats. Unfortunately this was not a success. The mud at Brean/Berrow Beach was too liquid to provide much traction, and although the ATV was capable of moving forwards through it, this gradually created 'bow waves' of denser mud that necessitated frequent changes in direction. Furthermore, underneath the mud there were hidden channels and depressions in the intertidal surface and the Argocat very quickly bogged down in one of these (**Plate 4**). Although the vehicle was fairly easily freed because the incident took place only *c*. 20m from the edge of the firmer sand, it was clear that the Argocat would not permit the GCCAS team access to any of the more distant archaeological features across deep mud deposits.

9.3.3 The Argocat's main use at Berrow was therefore restricted to carrying staff and equipment north and south along the beach at the edge of the firm sand, rather than westwards across any mud. The intertidal zone was scanned with binoculars during these journeys, and staff halted at intervals to investigate possible features and to proceed on foot out onto the mud flats. The use of the Argocat in this methodology did allow a much larger

area to be covered in a faster time than would otherwise have been possible, however, and it greatly eased the transport of samples of wooden stakes.

9.3.4 The Argocat ATV came into its own at Stert Flats where the intertidal surface generally consisted of firmer sand, shingle or clay (**Plate 5**). Here, the journey from the Natural England car park at Dowells Farm out to the furthest fish traps, a distance of nearly 3.5 kilometres following the safe route, normally takes an hour and a half on foot, but the Argocat was able to cover this distance in *c*. 20 minutes. This allowed staff to stay out safely longer in the intertidal zone, and the vehicle also greatly facilitated the transport of heavy samples of wooden stakes.

9.3.5 At Brean Beach and Berrow Flats, therefore, only hovercraft might be able to reach any archaeological features far out in the intertidal zone that are currently isolated by extensive deposits of thick mud. No features were visible through binoculars, so if they are still present then their remains must be relatively slight and low-lying. Present sedimentary conditions in the area continue to make it impassable. It is possible, however, that following winter storms and scouring tides some of these structures might be accessible on foot.

10 Recorded archaeological features

10.1 Introduction

10.1.1 The main Phase 2 fieldwork resulted in the formal surveying of 801 records and the recording by GPS photograph of many more. The majority of these records related to fishing or fishing-related structures. Fishing structures were defined as net and line fishing features, stone fish weirs, wooden fish traps (including V-shaped fish traps, stake 'hedges', 'zigzag' traps and individual woven baskets) and putt and putcher ranks. In addition, a variety of stone structures was recorded in the intertidal zone that were relatively enigmatic but nevertheless seemed to have been related to fishing activities, along with several wooden structures that also might have played a role in fishing. Structures such as fish houses have also been described as fishing-related.

10.1.2 The next most frequent groups of records, in order of the number of features recorded, related to peat deposits; revetments, groynes and related intertidal, foreshore or riverbank structures; wharfs, quays and jetties; Second World War structures; boats; and find scatters or areas of eroding archaeological stratigraphy.

10.2 Net and line fishing related features

10.2.1 Extremely large numbers of net and line fishing features were present along the Severn Estuary. The relatively recent date of many of these meant that during Phase 2 fieldwork, most obviously recent net hangs were not normally formally recorded using the handheld GPS data loggers but groups of them were photographed instead – with the GPS-equipped cameras this still provided them with locational fixes. Some of the cleared gullies and lines or rings of stone that also related to hang net lines were recorded, but in many cases these were usually examples of net lines previously interpreted by the NMP as possible fish traps, and/or those that could also have been eroded stone fish traps. Recording them was thus a means of updating and modifying the initial records for these features. In some instances just one or two selected examples of groups of such features were recorded.

10.2.2 Many V and U-shaped features recorded by the Phase 1 RCZAS NMP aerial survey along the Somerset coastline were provisionally interpreted as fish traps of wood or wooden and stone construction (Crowther and Dickson 2008, 102, fig. 5.25). Some of these, however, turned out to be linear and curvilinear arrangements of stone that acted as the footrope weights for upright *net hangs*. Metal posts or scaffolding poles were sometimes present with these lines, usually lying horizontally on the intertidal surface, but in many cases the wooden or metal poles had been removed. There were lines and arcs formed by single larger boulders spaced 2-15m apart, often difficult to identify especially on cobbled beaches (**Plate 6**), and also more continuous features two to three stones in width (**Plate 7**). The latter were sometimes very hard to distinguish from the arms of eroded and dispersed stone fish weirs, particularly as in some instances there were net hangs set up along or parallel to the arms of stone weirs, and also appended at angles to them. A contemporary net hang still in use at Dunster Beach (**Plate 8**) provides good evidence for the likely original appearance of these features, especially the use of stones as weights.

10.2.3 Net hang posts were also present along the upper estuary, particularly in areas such as Beachley, Woolaston, Lydney, Hills Flats and Oldbury. These net hangs were often little more than single lines of wooden stakes, although more recent examples were made of coniferous wood, sawn fence posts or metal (**Plate 9**). Some putt and putcher ranks were also re-used as later net lines, as at Oldbury and Hills Flats (**Plate 10**), where the net poles were often taller than the original putcher posts. One extremely large V-shaped fishing

feature at Hayward Rock near Hills Flats (**Line Nos. 10310, 10213, 10320 & 10322**) re-used earlier putcher rank posts and wattle leaders as net lines, the nets acting as the leader arms for putcher baskets at the apex of the 'V'. These net leaders would presumably also have been capable of catching smaller fish (**Plate 11**). At Lydney, several fairly recent structures were photographed consisting of wooden posts set parallel to the shoreline, but jutting out at angles of 45-60 degrees to the sloping shore (**Plate 12**). These posts may have supported nets used to catch fish on the ebbing tide.

10.2.4 Another common variant of net hang related features found along the Somerset coastline consisted of lines or gently curving arcs of stone rings or 'doughnuts', these stones would have originally formed supports for vertical wooden or metal posts. Sometimes the vertical metal posts were still in place within these stone clusters, or else disused poles were lying horizontally nearby on the intertidal surface (**Plate 13**).

10.2.5 These stone supports sometimes appeared rather more like small cairns than rings, especially where stones had fallen inwards, presumably following the withdrawal of vertical posts (**Plate 14**). In such instances the stones were often upright or tilted at steep angles. Such features were present at Minehead Bay, Dunster Beach, Blue Anchor Bay, St Audrie's Bay and near Lilstock. At Minehead Bay and St Audrie's Bay, there were examples of net hang lines where low, eroded remains of wooden posts survived within the stone support cairns (**Line Nos. 10227 & 10160**; **Plate 15**).

10.2.6 On the cobbled beaches of Somerset net hangs were sometimes identifiable as narrow lines of clearance in the intertidal zone where stone had been cleared to either side, presumably so that nets were not tangled, with vertical metal poles or smaller metal pegs again present (**Plate 16**). Between Warren Point and Minehead Bay there were a few lines of clearance that, although largely free of stone nevertheless, had identifiable spaced boulders surviving at intervals within them, and/or lines of stone rings (e.g. **Line Nos. 10240, 20090 & 20093**). These were clearly further remains of net weights and net post supports. Several such features were also recorded at Dunster Beach (**Line Nos. 10136-10138**; **Plate 17**), and may have been for hang nets or were ground line gullies (see below).

10.2.7 It was difficult to differentiate net hang clearance lines from *ground line gullies*. These features were also linear strips cleared of beach cobbles, roughly perpendicular to the shoreline. In these gullies, lines of baited hooks were set out, with the catch collected on the falling tide. Ground line gullies were previously recorded in Minehead Bay (McDonnell 2001, 23) (e.g. **Line Nos. 20084, 20086, 20087 & 20089**; **Plate 18**; **Fig. 5a & 5b**). Previously unrecorded examples of these features were also identified at Minehead Bay and at Dunster Beach by the NMP aerial survey and during Phase 2 fieldwork, though many more examples were not formally recorded. Of course, some ground line gullies may have been re-used as net hangs, and *vice versa*.

10.2.8 Many net hangs and ground line gullies were associated with metal posts and/or had been appended to pre-existing stone-built fish weirs, and it is likely that most were twentieth century in date. Modern net hangs consisting solely of metal poles, with no additional stone or wooden features, were encountered all along the Severn's shores within the RCZAS project area. Digital photographs only were taken of some of these. Many possible wooden fish traps recorded by the NMP at Stolford (Crowther and Dickson 2008, 97, 104, fig. 5.26), however, were actually modern net hangs consisting of metal or wooden poles. Some of these had been used in the recent past by the Sellick family, the surviving mud-horse fishermen of Stolford.

10.2.9 Some of the double lines of paired posts or stakes recorded at locales such as Kilkenny Bay (Portishead), Severn Beach, Northwick Oaze and Oldbury Flats seem to have utilised stakes that were too small to support putchers adequately, and these may have formed some kind of net hang line instead.

10.3 Stone-built fish weirs

10.3.1 Within the Severn Estuary RCZAS project area, stone-built fish traps or weirs are associated predominantly with the Somerset coastline, and several groups of these structures at Gore Point, Porlock Bay and Minehead Bay had formed the focus for previous survey work (Canti *et al.* 1996; McDonnell 1980, 1995, 2001, 21-23; Riley 1996; Riley and Wilson-North 2001).

10.3.2 The Phase 1 NMP aerial survey identified numerous stone-built fish weirs, with the main concentrations at Porlock, Minehead, Dunster Beach and Blue Anchor Bay (Crowther and Dickson 2008; **Figs. 4-6**). There are also two known examples at Black Point immediately to the south of Brean Down, and the NMP survey identified several possible examples at Lilstock, two of which were subsequently recorded by the main Phase 2 fieldwork. Seven almost contiguous small stone weirs have been previously noted at Stolford (McDonnell 1995, 98), and these were accessed during the Phase 2 survey. Two stone-built weirs were also recorded at English Stones during the Phase 2 fieldwork, only one of which had been previously identified (Allen 2005; Crowther and Dickson 2008).

10.3.3 During the Phase 2a and Phase 2 survey the locations of the vast majority of the stone weirs recorded by the Phase 1 NMP aerial survey were directly accessed and recorded by the GCCAS field survey team. Some structures at the lowest extent of the intertidal zone at Gore Point, Minehead Bay, Warren Point and Dunster Beach could not be reached in 2010, however. The most advantageous spring tides had already passed by the commencement of Phase 2 fieldwork, and the remaining favourable tides during the summer and autumn of 2010 were allocated to surveying the more vulnerable and more difficult to access structures. It was therefore necessary to return to Gore Point, Minehead Bay and Stolford in April 2011 in order to finish surveying the stone weirs and other features in these areas.

10.3.4 Most stone fish weirs were V or U-shaped in plan with their apices pointing seawards, and were thus designed to catch fish on ebb tides. Their leader arms were usually straight or gently curved, though much more sinuous examples have been recorded, and these leader arms consist of banks of stone 1.5-10m wide and up to 1.5m in height formed from beach boulders and cobbles, the size of materials usually dependant on those locally available. Most fish weirs at Minehead, Dunster Beach and Blue Anchor Bay used boulders less than 0.4m long but at Gore Point, near Porlock Weir, boulders up to 1m in length were utilised as large boulders were readily available there (**Plates 19-20**). Stone fish weirs varied greatly in size, some examples having leader arms up to 10m wide and/or hundreds of metres long, enclosing areas of hundreds of square metres, but others were only 20-30m across at their widest 'landward' angle (**Plates 21-25**).

10.3.5 At the apex of each fish weir there was usually a higher triangular area with a narrow outflow channel or *gut* between 0.5-1.5m wide, often marked by internal facing on the bank terminals and occasionally everted 'horns' extending outwards (**Plates 26-29, 32**). In larger stone weirs the guts could be up to 2m wide and additional guts were often located along the leader arms, with some having no guts at their actual apices at all. At these guts, the remains of structures used to support catch baskets are often visible. A few examples of wooden posts or stakes have been recorded, but most of those now visible are metal road pins or scaffolding poles (**Plates 22, 28, 30-31**). In some stone fish weirs that were used until recently it is clear that nylon netting supplanted catch baskets. As noted above, some stone weirs also had metal posts and nets from hang net lines placed along the tops of the leader arms or their inner or outer faces, or appended at angles to them.

10.3.6 Whilst the landward, 'inner' sides of the arms were usually steeply faced or vertical in order to channel fish more effectively towards the guts, the outer faces were often less steep and sometimes little more than loosely piled rock. This gently concave, sloping glacis shape would also have minimised wave damage (McDonnell 2001, 21). The landward area encompassed by the leader arms was often cleared of stone, this being used to construct the arms, and sometimes such areas appear to have been deliberately levelled or hollowed. Several stone weirs at Gore Point, Porlock, Minehead Bay and Blue Anchor Bay had carefully sorted and coursed stonework resembling drystone walling (e.g. **Line Nos. 10221, 10237, 10246 & 10145**; **Plates 33-35**), but the leader arms of others seemed to have always been little more than roughly piled linear banks of stone.

10.3.7 A few stone weirs were interlinked to form large contiguous W-shaped structures, as with **Line No. 10145** at Blue Anchor Bay (**Plates 22, 35**), **Line Nos. 10237 & 10240** in Minehead Bay and **Line No. 20103** at Lilstock. Some stone fish weirs spanned natural depressions or gullies in the intertidal zone, and others were appended to natural boulder ridges extending outwards form the shoreline. In areas such as Minehead Bay and Warren Point, it was evident that careful, subtle use had been made of the natural topography in order to maximise the amount of water flowing through the fish weir structures. Groups of weirs were seemingly intended to operate together, channelling water from one to the other as it ebbed away across the intertidal zone. This would have increased the chances of catching fish. A few stone fish weirs (e.g. **Line Nos. 10145, 10190 & 10196**) also seem to have had small structures incorporated or added to their external faces, usually by the outflow channels (**Plates 36-37, 43**). The purpose of these smaller additions is not clear, but they may have been used to store equipment, or might even have functioned as catch pools in which to store live fish until it was time to transport them back to the shore.

10.3.8 Not all stone weirs followed the general form and layout outlined above. **Line No. 20032-20034** at Dunster Beach had three outflow channels, but whereas one was a conventional gut the other two had narrow, slightly convex lines of boulders and cobbles bulging seawards from the line of the weir (**Plate 38**). Lines of boulders on the internal side of the structure led towards these two outlets which were 2-3m wide and were *c*. 2m apart. One of the largest stone fish weirs recorded in Minehead Bay and one apparently still in occasional use had at least two guts along its leader arms (**Line Nos. 20096-20098/10380**), but the main gut at its apex had scaffolding poles welded together to form an arching hoop across it (**Plate 39**). This may be used to secure an especially large, deep net or catch basket. An adjacent large fish weir (**Line No. 10246**) had at least four separate guts in its westernmost leader arm.

10.3.9 Stone weirs in the geographically outlying groups also differed slightly in their construction. Just west of Lilstock, two conjoined V-shaped stone weirs formed a W-shaped structure on the sloping, rocky intertidal zone (**Line No. 20103**, **Plate 40**). Despite being eroded and partly dispersed by the tide, these seem to have been much less well-built than the majority of stone weirs further to the west in Blue Anchor Bay, Dunster Beach and Minehead Bay. They were probably never more than loose rubble banks, with roughly defined outflow channels. At English Stones, one stone weir (**Line Nos. 10332 & 10333**) had been previously noted (Allen 2005, 41-42, ES-5; Crowther and Dickson 2008), but the second (**Line No. 10331**) was not fully visible on aerial images with only hints of a possible structure noted. Phase 2 fieldwork confirmed the presence of two stone weirs, constructed from large angular fragments, many over 1m in length (**Plate 41**). Both were associated with net hang lines that may have been contemporary. Again, these features were cruder in construction than the majority of fish weirs in Somerset, although this may be partly due to the available materials.

10.3.10 During the Phase 2a pilot fieldwork, a stone weir at Dunster Beach (**Line No. 40039**, **Point No. 50038**) was identified with the remains of eroded wooden stakes in the gut, which were sampled by Richard Brunning (see section 11.1 below). By the time of the

main Phase 2 fieldwork the remaining wooden stakes were no longer visible and may have eroded completely or been buried by silt. This highlights the importance of sampling such features when they are first identified. A wooden stake structure was also identified in an earlier survey of Minehead Bay (McDonnell 2001, 22); this was either a V-shaped wooden fish trap or perhaps wooden structural elements of an eroded stone weir. Wooden stakes were identified and sampled from 'within' the eroded arm of a stone fish weir at Blue Anchor Bay during Phase 2 fieldwork (**Line No. 20039**; **Plate 42**). It is not clear if these were from an earlier structure, or were integral to the construction of the stone leader arm. Those stakes sampled and identifiable to species were all oak and they displayed axe cuts made by iron blades (Brunning 2010). Two samples from 20039 have been radiocarbon dated indicating a probable 11th century date (see 11.2 below and Appendix A). A small group of wooden stakes was identified near the south-eastern end of the leader arm of the stone fish weir at Black Point, immediately south of Brean Down (**Line No. 10261**, **Point No. 72**), but these were identified as softwood and thus of relatively recent date and not retained.

10.3.11 The preservation of stone fish weirs varied tremendously. A few stone weirs in Minehead and Blue Anchor Bays are still in occasional use and so are in excellent repair (**Plate 35 & 43**). Others still survive well by virtue of their size (**Plates 44-47**). Several stone weirs located by aerial survey at the eastern end of Blue Anchor Bay and one of two stone weirs at Black Point off Brean Down, are now buried underneath deep mud, while some of the westernmost weirs at Dunster Beach are increasingly buried under sand (**Plate 48**). Other weirs recorded by the NMP survey, even large examples, have degraded to the extent that they are now barely identifiable. They may appear as broadly rectilinear but dispersed spreads of cobbles only one layer of stone in height, or only their original inner and outer faces may be noticeable (**Plates 48-51**). Tidal erosion is the main contributory factor, but at Minehead Bay, several stone weirs visible on 1940s and 1950s aerial photographs were probably deliberately cleared as part of beach management, leaving only dispersed stone spreads. Many weirs were probably deliberately robbed in the past in order to build new structures.

10.3.12 On rare occasions it was possible to identify stratigraphic relationships between different features and establish sequences of construction and use, as with three overlapping weirs at Minehead Bay (**Line Nos. 10189**, **10187 & 10188**; **Plate 52**). One of the largest stone weirs in Minehead Bay (**Line No. 10383**) partly overlies an earlier structure, and its easternmost leader arm 'kinks' noticeably where it was built across the line of this pre-existing feature (**Line No. 10382**; **Plate 53**). The earlier structure has been partly robbed for the construction of the later feature and is also denuded through erosion, but it is still partly visible. Exactly why the leader arm of Line No. 10383 has this 'dogleg' form is not clear, especially as building it straight across the earlier feature (Line No. 10382) would have taken less effort. It may have been considered important to physically incorporate part of the earlier fish weir into the later construction for some reason, perhaps as a claim to ownership or tenure.

10.3.13 McDonnell (1995, 98) identified a unique group of seven V-shaped stone weirs at Stolford (**Plates 54-58**). These were also accessed during RCZAS Phase 2 fieldwork, and were still visible although their remains are increasingly obscured by seaweed (**Plate 55**). They consisted of 0.20-0.30m wide channels or slots cut into the rock, most arranged side by side to form a near-continuous 'zigzag' pattern. These slots were packed with angular boulders and slate fragments and given the narrow nature of the slots, it seems unlikely that they could have supported much of a stone superstructure. Instead, the stones within the slots were probably packing for upright timber or wattling/hurdle structures. The 'open' arms of these features extended outwards to face east or south-eastwards and each was 4-5m across, narrowing to an apex up to 1.2m wide. McDonnell recorded a central slot within the apex (Plate 56), suggesting that each weir had two narrow outflows on either side of a central stone and timber upright feature. At least five, possibly six such structures were

recorded during the Phase 2 RCZAS fieldwork (**Line Nos. 10411-10414, 20121-20122**), most in just one 'row'; but more may once have been present.

10.4 Other stone-built fishing related structures

10.4.1 At least five of the V-shaped stone structures recorded during the Phase 2 RCZAS survey at Minehead Bay, Dunster Beach and Blue Anchor Bay did not appear to have any guts or outflow channels (e.g. **Line Nos. 10140 & 40029**, **10200**). It is possible that stone may have eroded off the leader arms and into the outflow channels, masking the evidence for guts; and/or that some outflows were deliberately blocked at a later date. In some instances (e.g. **Line No. 10221/10384**; **Plate 46**), however, these features were still quite substantial and well-preserved, suggesting the lack of such channels was a deliberate design feature rather than simply a product of erosion and poor preservation (**Plates 46**, **59-60**). These features thus seem to have been designed to hold back water on ebb tides, yet without any apparent places for baskets or nets to be secured it is difficult to see how they could have functioned as fishing structures; they could have simply been 'dams' to trap fish for subsequent hand netting or even spearing. Alternatively, they may have had a role in water management across the intertidal zone. Several features recorded at Warren Point, Minehead Bay, for example, appeared to be natural hollows in the beach, but with additional anthropogenic clearance which had created low banks along one or more of their sides (e.g. **Line Nos. 10211 & 10202**; **Plates 61-62**).

10.4.2 A small and eroded feature in Minehead Bay *c*. 150m south-west of the old harbour, appears to have been horseshoe-shaped or subrectangular in plan (**Line No. 10219**), with its open side facing to the south-west (**Plate 63**). On its north-western arm there was a slight gap apparent that could have been the remains of a gut, but this could equally well have resulted from erosion. There was certainly no clear apex or outflow channel, and once again it is not clear what the purpose of this feature could have been.

10.4.3 An unusual feature that was recorded during Phase 2 survey work at St Audrie's Bay consisted of a line of small and medium sized boulders placed sideways on to one another, forming a low 'drystone wall' one course high and up to 0.5m thick with a gap *c*. 1.2m wide almost exactly in the centre of the line (**Line No. 20059**; **Plate 64**). It is not clear if this gap was a gut or outflow channel, or merely the result of later erosion. The single course of stones actually formed the western edge of a subrectangular, shallow, partially cleared pool, whose other edges were marked by rougher lines of loose clearance. The pool may have been some form of weir, or simply the remains of a 'dam' to create a pool where fish could be gathered by hand. It could perhaps also have functioned as a catch pool to store live fish after they had been caught. At Lilstock there was a small tidal pool quite high up the intertidal zone that had a line of stones extending out across it (**Line No. 20104**; **Plate 65**), and once again this may have used to trap or store fish. No firm evidence for the usage of the stone features lacking guts was encountered, however.

10.4.4 At Madbrain Sands near Warren Point on the eastern side of Minehead Bay, running tangentially across a small natural channel on the beach was a south-east to north-west aligned stone bank approximately 20m long, *c*. 1.2m wide and 0.25m high (**Line No. 10214**). The south-eastern end of this feature had a distinctly rounded terminal, but the north-west end was marked by a gap 1m wide that may have been the original outflow through this feature (**Plate 66**). It was not clear if the bank had originally extended further to the north-west, as it was rather dispersed at that point. It is likely that this structure would have dammed up the natural water channel or stream; and fish could have been caught by installing a net or basket across the outflow gap.

10.4.5 At Minehead Bay, several straight, narrow cobble banks up to 1.2m wide were apparently appended to the leader arms of stone fish weirs. Clearly more than net hang lines, the areas 'behind' and landward of them were cleared of cobbles and boulders in order to create quite deep subrectangular tidal pools. Only a few of these were formally recorded (e.g. **Line No. 10241**; **Plate 67**). The function of these features is unclear.

10.4.6 At Gore Point, Porlock, in addition to the V-shaped fish weirs there were additional straight stone banks, some again apparently appended to pre-existing stone weirs (**Fig. 6**). One linear stone bank (**Line No. 10233**; **Plates 68-70**) aligned WNW-ESE was originally recorded as a V-shaped stone weir added to earlier weir (**Line No. 10230/10232/10404**). Phase 2 fieldwork, however, suggested that it was more likely to have been a straight bank added between 10230/10232/10404 and the broadly north-south aligned bank **Line No. 10234**. Line No. 10234 was previously plotted by the NMP aerial survey as a V-shaped stone weir, but the Phase 2 fieldwork suggested that 10234 actually extended further to the north, beyond the putative apex of the fish weir, and no outflow channel was visible at the presumed apex. Line No. 10233 did, however, have a narrow gap *c*. 1m wide at its western end between it and 10234, but this apparent channel did not appear to have had any wooden or metal supports for any form of catch structure. The trapezoidal flat-bottomed pool created to the south and landwards of bank 10233 had been extensively cleared of stone, as had the area to the north of it (**Plates 69-70**), and they therefore appeared to have been used more as tidal pools rather than fish weirs. The bottom of these areas was covered in crushed sea shells, unusual at Gore Point where there are so many pebbles and cobbles. Two small metal pegs driven into the intertidal surface were recorded within the southern cleared area. It is possible that they were used as oyster beds. The Exmoor National Park HER records indicate that there was an oyster bed located 1km offshore in the main area of Porlock Bay to the east of Gore Point (Exmoor HER 18074), and this was apparently shown on a map of 1710, though it was probably abandoned by the end of the nineteenth century (Exmoor National Park 2007, 28). The V-shaped stone fish weirs in Porlock Weir may even have been re-used as keep areas or 'perches' for the bagged oysters, to keep them alive and fresh. It is therefore possible that Gore Point was also a location for shellfish harvesting and/or cultivation.

10.4.7 Some 10-12m to the north-west of Line No. 10234 there was a cleared line or gap several metres wide, after which there was another linear bank (**Line No. 10406**). This was also a linear bank constructed of large beach cobbles, and may have been created by the clearance activity; its southern end may actually have been appended to 10234, although this was not clear. Line No. 10406 was on a gently curving south-west to north-east alignment, but at its north-eastern end there was a right-angled length of boulder walling extending to the north-west (**Plates 71-72**). Approximately 15m to the north-east of Line No. 10406, on the other side of a *c*. 15m wide area of rectilinear clearance, there was a further linear stone bank (**Line No. 10407**) also on a gently curving south-west to north-east orientation. The right-angled length of Line No. 10406 nearly met Line No. 10407, although there was a slight gap approximately 2m wide. In the cleared space between banks 10406 and 10407 there were the remains of two stone 'cairns' or heaps, although these could not be formally recorded due to the incoming tide. These were similar to other features recorded at Gore Point (see below) and at Minehead Bay.

10.4.8 These linear stone banks therefore created a series of cleared embayments. The unrecorded north-eastern end of line No. 10407 also appeared to turn to the north-west, creating another small cleared embayment, although this could not be recorded before it was covered by the incoming tide. There were many more linear banks located to the north-west, only some of which could be recorded (e.g. **Line Nos. 10390-10395**; **Plate No. 73**). These were again separated by areas of deliberate stone clearance, and it is likely that the banks were built using cleared cobbles. Some again had heaps or 'cairns' of stone within the otherwise cleared areas (e.g. **Point No. 142**). They are anthropogenic features rather than geological in origin but although highly visible on aerial photographs they do not seem

to have been identified in previous surveys (e.g. Crowther and Dixon 2008; Riley and Wilson-North 2001, 159), perhaps because they were mistaken for natural rock bedding planes or exposed strata.

10.4.9 Some of the linear stone features at Gore Point themselves appeared to have been formed from lines of heaped stones separated by gaps, rather than continuous banks. Phase 2 field survey identified at least eight such linear stone features consisting of large circular piles of stone 5-6m in diameter and up to 1m high, linked by low-lying banks of similar width but only up to 0.30m in height (**Plates 74-75**). Only a few of these features were formally recorded, initially as a series of points, until the survey team realised how many of these stone heaps existed (**Line No. 10231**, **Point Nos. 63-67**). The large 'cairns' on top of these low broad banks were spaced between 0.5-2m apart, and the lines were arranged broadly perpendicular to the shore. The original functions of these structures are currently unknown (but see section 12.2.3 below).

10.4.10 The final Phase 2 fieldwork in Minehead Bay in April 2011, approximately 150m to the north-east of the Old Harbour, identified a series of very similar stone 'cairns' or heaps. A group of five to six such features were recorded as just one point (**Point No. 137**; **Plates 77-78**). These had not previously been identified, but they were very similar to the features at Gore Point, being 2-4m across and up to 1m in height. Some were almost perfectly circular in plan, whereas others were more irregular, some of this due to erosion. Many are too neat and symmetrical simply to be piles of ballast or clearance. The function of these features is unclear (see section 12.2.3), and although they were superficially similar to conger eel traps, they seemed rather dense and compact, without the spaces necessary for the fish to enter them. They were also smaller, lacking in surrounding banks and most were higher in the inter-tidal zone than the positively identified conger eel traps.

10.4.11 Two much larger conger eel traps or *heaps* have been previously recorded in Minehead Bay and are visible on historic aerial photographs, consisting of annular rings of stone up to 20m across with central piles of stones within them (Dennison 1986; McDonnell 2001, 26), the stone being derived from circular cleared areas. The eels were flushed out of the central stone heaps, possibly with the aid of specially-trained dogs; and were caught within the outer rings where fishermen then set about them with stout cudgels (Crowther and Dickson 2008, 98-99). Both these sites were accessed during RCZAS fieldwork, but one of the features (Som HER FIS 683 NMR 1455313) is no longer visible and seems to have been completely eroded, only a very general spread of stones remaining. The other example is still well-preserved, however, and the low circular stone bank 19m in diameter and 2-2.5m wide is still extant, although the central heap of stones is now denuded (**Line No. 10377**; **Plates 79-80**). Broadly similar conger heaps have been identified in Scotland (Dawson 2004, 7), but no other examples were identified from the Severn Estuary RCZAS area.

10.4.12 In addition to these examples, there were a variety of other possible eroded or fragmentary remains recorded along the Somerset coastline that might have been fishing-related structures, though many were highly ambiguous. As these were generally somewhat indeterminate in size and form, in most instances they were only photographed and not formally recorded.

10.5 Wooden stake and wattle fish traps

10.5.1 Gloucestershire and South Gloucestershire

10.5.1.1 The RCZAS Phase 2 field survey recorded at least four definite V-shaped, stake-built fish traps on the gently sloping intertidal surface at Beachley, Glos. (**Line Nos. 10004,**

10005 & 10006, 10007 & 10343) and a minimum of nine at Oldbury Flats (including Aust), South Glos. (**Line Nos. 10030, 10031, 10032, 10038, 10039, 10041 & 10342, 10337 & 10338**) (**Figs. 7, 8a and 8b**). None of these features was identified by NMP aerial survey (Crowther and Dickson 2008, Small and Stoertz 2006) due to the insubstantial nature of their remains. These structures had leader arms of vertical or steeply angled stakes up to 0.06m across, mostly roundwood but with some split stakes. These arms sometimes consisted of lines of single stakes, varying in spacing from 0.05-0.20m apart but more often they were formed from lines 2-3 stakes in width (**Plates 81-83**). They were up to 20m long, and the splayed 'open' angles of the fish traps were up to 10-15m wide. Remains of finer horizontal hurdling were evident on some leader arms, in some cases lengths of narrow diameter roundwood, but in others brushwood branches that may have been cuttings from hedgerows (**Plates 83-85, 93**). This evidence indicates that the leader arms would once have supported upright woven wattle panels that would have channelled fish towards the apices of the traps. A few examples of these features had the remains of withy ties and more finely woven fragments of possible fish baskets associated with them (**Plate 86**).

10.5.1.2 Some of the V-shaped stake built fish traps recorded at Beachley and Aust/Oldbury Flats were largely complete in plan and despite being very low and eroded, were in a surprisingly good state of preservation (e.g. **Line Nos. 10006**; **10030-10032**; **Plates 87-89**). Others were more fragmentary, with just the apex or short stretches of leader arm recognisable (**Plates 90-91**). In some instances it seemed possible that several structures may have overlapped with one another, and thus represented different phases of construction and use. These features seem similar to examples previously recorded by Townley (1999, 83, fig. 2a, 2b) just south-west of Waldings Pill and also at Woolaston/Grange Pill. The example south-west of Waldings Pill was photographed in 1998 by Toby Catchpole during a visit made to the site with Elizabeth Townley (**Plate 92**). The original sketch map, however, and inspection of the site using aerial photographs indicate that in Townley's 1999 publication map the V-shaped structure was incorrectly positioned at Waldings Pill itself, rather than its true position approximately 450m to the south-west.

10.5.1.3 These features were probably originally constructed in small groups of 3-6 fish traps. Within the apices of some V-shaped traps were clusters of posts that supported one or more individual fish baskets (**Plates 93-94**). The evidence was sometimes equivocal as to whether these fish traps had the wide open angle of their leader arms facing downstream, or the opposite way round. It appears that the narrowing of the estuary in the area now occupied by the M48 Severn Bridge funnelled the incoming tide to the extent that these structures could be built to utilise either flood or ebb tides. At least one fish trap in each group faced upstream to catch fish on the ebb tide (**Plates 95-96**). One or more of the features at Beachley had a circular structure at the apex (**Line No. 10343**; **Plates 97-100**) and a series of circular baskets were recorded at Aust (**Plates 90-91, 96, 101-102**). At least three were directly associated with the apices of fish traps, with the others surviving as isolated circular settings, probably where the leader arms had eroded (**Line Nos. 10339, Point Nos. 25, 95, 98 & 101**). At least two of the V-shaped stake-built fish traps with circular baskets at Aust faced upstream, and one downstream (**Line Nos. 10030 & 10031, 10338 & 10339**), and the one recorded at Beachley right on the eroding river channel edge faced downstream (**Line No. 10343**). These circular settings were approximately 1-1.2m in diameter, and consisted of vertical stakes with finer horizontal hurdling woven tightly in between them. These probably functioned as catch baskets, and short, narrow 'necks' or 'funnels' were visible in some of these V-shaped fish traps leading from the apices into the circular features.

10.5.1.4 Aside from the example south-west of Waldings Pill, the V-shaped structures at Beachley or Aust/Oldbury Flats had not been previously archaeologically recorded. The Beachley examples however, were known to the Black Rock Lave Net Fishermen's Association; and one of the Oldbury examples recorded in 2010 (probably **Line No. 10021**) had been previously identified and photographed in 2000 by Simon and Ann Cooper and

placed on a website concerning salmon fishing (http: www.salmonboats.co.uk) (**Plates 103-104**). The example photographed at Beachley in 2009 by Richard and Martin Morgan of the Black Rock Lave Net Fishermen's Association seems to have had sharp stakes pointing inwards into the circular structure to discourage fish from leaving (**Line No. 10343**; **Plates 99-100**). Unfortunately, when the GCCAS survey team recorded this structure in 2010, ongoing erosion of the river channel meant that the circular structure had partly disintegrated and the inward pointing stakes were no longer visible.

10.5.1.5 At Aust, **Line No. 10021** was a large, V-shaped stake-built structure facing upstream to the north-east with an apex pointing to the south-west that had another additional line of stakes at approximately 60 degrees to its north-western side to create another V-shaped angle facing downstream to the south-west (**Line No. 10022**; **Plates 104-106**). This may have been an added line of stakes, or the remnants of a different, earlier or later, phase of V-shaped structure. Line No. 10021 had no clusters of stakes within the upstream facing area of its apex, although a few individual stakes visible to the south-west may represent the remnants of a 'neck' and circular catch basket structure photographed in 2000. The downstream facing angle formed by the additional line of stakes in 10022, however, did contain stakes that could have supported baskets. Another nearby group of stakes within the downstream facing angle may represent the apex of a separate phase of V-shaped fish trap (**Line No. 10373**, **Point No. 22**; **Plate 105**). Clearly, this was a complex group of structures consisting of potentially several different, overlapping phases. Approximately 100m to the south-west of Line 10021 there was also an apparently 'T-shaped' stake-built structure (**Line Nos. 10015-10016**). Whilst the north-west to south-east orientated arm of this feature (10015) was similar in form to the V-shaped traps, the south-west to north-east line (10016) was formed by single, widely spaced stakes (**Plates 107-108**). Additional, parallel lines of single spaced stakes appeared to extend to the north-west and north-east (**Line Nos. 10369-10370**). Near the north-eastern end of 10016 was a cluster of stakes that may have been a separate basket setting (**Line No. 10371**, **Point No. 19**). It was unclear what the overall plan of this feature was and whether or not it actually represented the fragmentary remains of a larger group of features and/or different phases.

10.5.1.6 The initial impression gleaned from the Phase 2 survey is that the V-shaped fish traps with circular baskets might actually have been integral to and thus contemporary with those that had the dense clusters of stakes within their apices. It may also have been the case that the 'internal' apex baskets and the circular catch basket structures were designed to catch different fish species, or alternatively, this might be a chronological difference reflecting different periods of construction and use.

10.5.1.7 Some features recorded during the Phase 2 survey at Woolaston in 2010 (**Line No. 10326**) may have formed part of two V-shaped fish traps recorded in 1998 (Townley 1999, 83, fig. 2), although the scale of the previously published plan does not allow the features identified during Phase 2 to be directly correlated with those drawn by Townley. Alternatively, the recorded Phase 2 features may form part of additional but similar structures. Without limited cleaning back of the intertidal zone at Woolaston to expose more remains, it was not possible to ascertain exactly how many V-shaped structures are present, as the lines of stakes and the remains of several baskets were partly buried by mud and gravel, and line 10326 as surveyed represents an area of complex archaeology, rather than an individual feature. Also at Woolaston, stakes and horizontal wattling were recorded broadly parallel to the existing channel, representing either the remains of lower and more eroded V-shaped fish traps or perhaps revetments to consolidate the bank there (**Line No. 10328**; **Plate 109**). At Beachley, the fish trap right on the eroding edge of the channel (**Line No. 10343**) appeared to have been physically linked into horizontal and vertical wooden elements that had some resemblance to the riverbank cribbing reinforcement recorded elsewhere (**Plate 110**).

10.5.1.8 All of these potentially highly significant groups of features at Beachley, Woolaston and Oldbury Flats would greatly benefit from more detailed planning and investigation than was possible during the RCZAS fieldwork. Recording the location of each stake and plotting these on large-scale plans would provide a much better idea of their form, and may also reveal evidence for multiple, overlapping phases. Such work would necessitate some cleaning up of the features and even partial excavation to expose more of them, and this would, of course, be very time consuming. The full extent of these groups of features is also still unclear. For example, to the south-east of the main group of V-shaped fish traps plotted at Beachley, on a steeper and more stony section of bank, further lines of stakes arranged at oblique angles to the shoreline may have been the remains of leader arms of further V-shaped fish traps (**Line Nos. 10011 & 10012, 10346 & 10347, 10348**; **Plate 111**), but this was by no means clear. At Aust/Oldbury, some lines of stakes at oblique angles to the bank may have been the fragmentary arms of additional V-shaped fish traps (e.g. **Line Nos. 10015, 10036, 10037 & 10341**).

10.5.1.9 At both Woolaston and Oldbury Flats, several stake-built structures were recorded during Phase 2 fieldwork that consisted of smaller V-shaped, U-shaped or subcircular stake groups apparently not associated with leader arms, and up to *c*. 3m long and 3m wide (for example, **Line Nos. 10017 & 10336**, **Point No. 19**; **Plate 112**). These were possibly settings for individual fish baskets called *putcheons* (from which putchers derive) and *weels*, used for catching eels, lampreys and lamperns (Peate 1934; Taylor 1974). Also at Woolaston and Oldbury Flats, the fragmentary remains of finer baskets were recorded with narrow rods only 5-10 mm wide set within slightly thicker frames 10-20mm in thickness (**Plates 113-118**). These might have been individual fishing baskets similar to examples excavated at Sudbrook (Brown *et al.* 2008), with the smallest examples even similar to or the same as the individual *frails* used to transport fish away from putcher ranks (Jenkins 1974b, 56). It is also possible that some of those at Oldbury Flats in particular were woven remnants of putt *forewheels* and putcher baskets that had become detached from their original locations on putt or putcher ranks further to the north-east, and which had drifted downstream. Some of these basket settings may, of course, have been originally associated with leader arms that have not survived or were not visible when visited.

10.5.1.10 A series of ^{14}C dates from samples that were taken at Beachley, Aust/Oldbury and Woolaston are now available (see 11.2 below for sample descriptions and Appendix A for full dating results). At Beachley two stakes were taken from the western end of the western leader arm of fish trap line no. 10343 indicating construction of the feature between the late 8th and 10th centuries AD. At Woolaston, eight stakes from four baskets within the complex represented by line no. 10326 and two stakes from the hurdle structure line no. 10328, indicate a fishery in use during the period between the 8th and early 11th centuries. At Aust/Oldbury Flats four structures have been dated indicating use of the fishery over many centuries and demonstrating the difficulty of dating these features on typological grounds alone. Two of the V-shaped stake-built traps (10021 and 10339) were constructed in the late seventh or eighth century AD. Two samples were taken from each arm of a further V-shaped trap (10032). Three of these indicate construction of the trap during the late eleventh to early thirteenth centuries AD, whilst a fourth and later date might be a statistical outlier or indicate repair and reuse up to the late thirteenth century. Finally at Aust, T-shaped structure 10015 was of post-medieval date.

10.5.2 Somerset and North Somerset

10.5.2.1 On Stert Flats in Somerset, the Phase 2a and Phase 2 RCZAS surveys revisited many of the V-shaped wooden fish traps recorded in earlier surveys (e.g. Brunning 2008; McDonnell 1995, 2003b), but also identified several new structures not previously recorded (Figs. 9-10). The wooden fish traps on Stert Flats were generally quite large, V or 'tick-shaped' structures with apices pointing to the west or north-west, designed to catch fish on the falling tides draining in these same directions. They had long leader arms formed of

lines of single or double stakes up to 0.08m in diameter, usually less densely packed and more fragmentary than those recorded at Beachley, Oldbury Flats and Berrow Flats. These stakes, mostly roundwood but with some split examples, were very low and eroded due to tidal scouring (e.g. **Line Nos. 10284, 20107-20109, 20117-20118 & 20120**; **Plates 119-123**) and parts of the leader arms were also often buried by drifting sediments. These fish traps were consequently often extremely hard to identify and plot. Their apices either consisted of clusters of further small stakes, or groups of split oak posts up to 0.20m across that presumably once supported woven catch baskets (**Line Nos. 10267 & 10271**; **Plates 124-125**). Dendrochronological and ^{14}C dating work already undertaken on previous samples has indicated that some of these fish trap structures were constructed during the eighth to thirteenth centuries AD (Brunning 2008, 70, 72). Samples taken from stake line 20120 by the RCZAS produced radiocarbon dates in the latter part of this period (Appendix A).

10.5.2.2 Although exact figures are complicated by fragmentary and overlapping features, the NMP aerial survey recorded more than 80 of these structures at Stert Flats and north-west of Stert Island (Crowther and Dickson 2008, 91-93, fig. 5.27), but the RCZAS fieldwork found that many of these had either eroded completely away or had been buried by highly mobile sand and silt deposits. Those in the southern part of the main western group at Stert Flats were simply not visible, and this area could not be accessed due to quicksand and thick mud. Similarly, although the area of features to the north-west of Stert Island was accessed in April 2011, no structures were visible. Some of these may have been net hang lines, whilst others might have eroded or become masked by mud deposits. Some of the fish trap structures previously visited and recorded by Richard McDonnell and Richard Brunning were also no longer visible during Phase 2 survey work in 2010. Structure 204, for example (Brunning 2008, 72, fig. 4), had been largely buried by drifting sand deposits, including the stone cairn at its apex of which just a few stones were visible (**Point No. 30020**; **Plate 126;** Fig. 10). This indicates how mobile the sediments at Stert Flats are, and how quickly the character of the intertidal zone can change.

10.5.2.3 Of the new and previously unidentified structures, most consisted only of very fragmentary remains of stake-built leader arms or small groups of stakes. The Phase 2 survey did show that some previous recorded structures such as Structures 203, 307 and 308 (Brunning 2008, 72, fig. 4) were probably just part of a much more complex sequence of three to four different builds or rebuilds, all in the same approximate location (**Line Nos. 10267, 10268, 10269, 10271 & 10272**; Fig. 10). Two stakes taken from line 10271 have been radiocarbon dated, suggesting construction of the feature between the mid-11th and mid-12th centuries (Appendix A).

10.5.2.4 During the Phase 2 survey it was possible to reach a shingle ridge approximately 100m west of the known group of Anglo-Saxon and later fish traps at Stert Flats. No stakes were visible at this location, however. Although it is possible that any wooden features once present may have been eroded and/or buried, this might suggest that McDonnell and Brunning's features 204 and 054 marked the westernmost extent of the north-western group of such structures on Stert Flats. Further to the south-west, the NMP aerial survey identified many more structures extending further to the west, but these could not be safely accessed and no features were visible through binoculars.

10.5.2.5 Direct comparison between the earlier survey plots of features at Stert Flats and the GPS-based RCZAS work indicates that the original survey of the fish trap features at Stert Flats made with a handheld GPS (McDonnell 2003b) was usually highly accurate to within 2m (Fig. 10). In contrast, the difficulties of providing fixed reference points for the available aerial photographs of Stert Flats (Crowther and Dixon 2008, 63-64) seems to have created a noticeable but consistent spatial error in the NMP transcriptions, and comparisons between the Phase 2 GPS survey and the NMP mapping reveals that most of the fish traps at Stert were actually some 10m to the south-west of their plotted positions (Fig. 9). The

relative positions of the features in relation to one another do seem to have been preserved in the NMP aerial survey though.

10.5.2.6 Another structure previously recorded at Stert (Brunning 2008, 78-79, fig. 14; McDonnell 2003b, no. 045) consisted of an extremely large and broadly V-shaped fish trap with leader arms formed by tightly spaced vertical stakes, some lines of which were firmly set within a low compact bank of stone and gravel. In addition shifting gravel appears to be burying parts of its southern arm (R. McDonnell *pers. comm*.) Several different sizes and colours of roundwood stakes in different stages of preservation were identified (**Plates 127-128**), which were allocated four record numbers (**Line Nos. 10293-10296**). One of the lines within this feature was made up of very closely spaced roundwood or angular stakes up to 0.08m across, and these were a distinct reddish-brown colour, contrasting with the other dark brown or black examples; at least one line of stakes also extended to the north-east beyond the current apex (**Line No. 10297**; **Plates 129-131**). This suggests that there had been several different phases of construction and use of this feature. There was a noticeable kink in its length that might also reflect different builds and a line of stakes at right angles to the main structure (Line No. 10303) may also be from a different phase. Some of the stakes previously sampled from this structure were made from spruce and larch; these species were post-medieval introductions to Britain that are likely to post-date the sixteenth century (Brunning 2008, 80). This does not however, necessarily date the origins of this feature. The feature appears similar to certain Breton examples presented by Vincent Bernard at the 2010 'Fish and Ships' SELRC conference.

10.5.2.7 Within the apex of this large structure, several groups of vertical posts were probably settings for individual catch baskets. There was also a pronounced gap *c*. 20m wide along the northern arm of this large fish trap, with just a few single stakes situated within it (**Plate 132**). The gap was probably filled with brushwood and hedge offcuts during the fishing season, and these were then removed over winter to prevent the trap catching small fish out of season (B. Sellick *pers. comm.*). More detailed planning and sampling of this feature should be undertaken in the future to try and establish some stratigraphic sequences and absolute dating for the different phases evident within it. Later wooden features including a possible putcher rank (**Line Nos. 10300 & 10301**) were also appended to it or cut across it.

10.5.2.8 At Brean Sands/Berrow Beach, the NMP aerial investigation had plotted examples of V and U-shaped fishing structures (Crowther and Dickson 2008, 97), but in the Phase 2 RCZAS fieldwork many of these were no longer visible and/or could not be accessed due to thick mud deposits. The V or U-shaped structures that could be accessed usually proved to be net hangs made from wooden posts of fairly recent date (e.g. **Line Nos. 10248 & 10258**). Nevertheless, during the Phase 2a pilot and main Phase 2 fieldwork some additional stake-built features were identified consisting of relatively straight lines of low and eroded stakes, some arranged in dense multiple rows or 'hedges' up to 1m in width (**Line Nos. 50021, 40017, 40018, 40019, 10251, 10252, 10257 & 10260**; Catchpole and Chadwick 2010a, plates 21-22; **Fig. 11**; **Plates 133-135**). The largest stakes were 20-30mm in diameter, some slightly bigger, but most stakes were small roundwood only 10-20mm in diameter. It is not clear if the multiple stakes reflected more than one phase of construction or repair. One of these features (10257) was at least 150m long, whilst it is possible that **Line Nos. 40017** and **40018** were originally part of a much larger V or U-shaped structure at least 230m across.

10.5.2.9 In some instances there were also single wooden stakes 1.5-3m away from the western, seaward sides of some stake hedges that were angled eastwards back towards them at between 45-60 degrees (**Plate 136**). These were probably additional supports or braces. In places the multiple stakes had been driven through prehistoric peat deposits, and this had exacerbated the erosion of the latter by causing the peat to break up (**Plate 137**). It is not clear, however, if all of the rows of stakes in each feature belonged to the same

phase. Along part of **Line No. 40018**, it appeared that some of the once upright 'sails' supporting the hurdle panels in the leader arm had fallen over, but still survived, lying horizontally in the mud of the intertidal surface (**Plate 138**).

10.5.2.10 Due to their severe erosion and/or burial by sediments, the overall shape and form of these features could not be discerned during the RCZAS survey, and no apices, basket supports or guts/channels were visible. It is therefore uncertain how these features functioned as fish traps, if indeed that was their purpose. One example (**Line No. 10257**) also featured some horizontal hurdle elements, but it is not clear if others with this 'hedge' type of construction relied on multiple vertical stakes alone. Stakes taken from approximately half way along the length of 10257 were of post-medieval date (11.2.5 below, Appendix A). One of the stake hedges (**Line No. 10251**) was orientated north-east to south-west and could have been part of a V-shaped fish trap, or part of the unusual trapezoidal shaped fish trap recorded here by the NMP (Crowther and Dickson 2008, 100, fig. 5.24; NMR 1450737, Som. HER 27771). Most others were aligned north-south parallel to the existing shoreline, however, and although the ends of these features were not plotted it is nevertheless unclear how these would have operated as fish traps. They may have functional and/or chronological similarities with the large wood and stone V-shaped structure at Stert Flats (see above), or may be very different.

10.5.2.11 During the RCZAS Phase 2a pilot in 2009, several stake-built linear features further to the west were identified and recorded using the BARB hovercraft (**Line Nos. 40017-40019; Point No. 50021**; Catchpole and Chadwick 2010a, plate 18). Only fragments of these features were recorded, consisting of short lengths of leader arms two to three stakes in width. Although they did not display the same dense hedge construction as those closer to the shore, they were certainly not modern net hangs. It was not possible to access these features again during the main Phase 2 programme in 2010 due to the thick mud, and they were also not visible through binoculars. These features were not identifiable on images examined during the Phase 1 NMP aerial survey either, probably being too low and slight to show up clearly on aerial photographs.

10.5.2.12 At Woodspring/Kingston Bay, two conjoined V-shaped stake-built fish traps associated with hurdle panels and baskets have previously been recorded by the Phase 1 NMP aerial survey, and also by earlier fieldwork carried out in the intertidal zone (Crowther and Dickson 2008, 84-85; Hilditch 1998, 100). Unfortunately, these features were not visible at all during the Phase 2 RCZAS fieldwork in 2010, and they now seem to be buried underneath deep mud deposits. It is possible that scouring winter storms might reveal them again in the future. A V or tick-shaped structure has also been identified from Google Earth and Bing! aerial imagery at Kilkenny Bay near Portishead, but this was not recorded by the Phase 1 NMP survey. A survey visit to the intertidal zone at Kilkenny Bay could not reach its location due to deep mud deposits, and no feature was visible through binoculars from a distance.

10.6 Conjoined 'zigzag' V-shaped wooden fish traps

10.6.1 On aerial photographs of Stert Flats these features appear as continuous 'zigzag' lines (Crowther and Dickson 2008, 93, fig. 5.17). Previous field survey at Stert Flats had recorded two rows of smaller V-shaped stake-built settings north of the Gutterway (Brunning 2008, 74-76; McDonnell 2003b, nos. 054 and 202). Two of these features were investigated during earlier fieldwork, and consisted of lines of small roundwood stakes and it has been suggested that these were leader arms for hurdle panels, used to direct fish towards small catch baskets at the apex of each 'V' (Brunning 2008, 76). Radiocarbon dates of AD 1410-1630 and AD 1440-1660 were obtained from an oak and an ash stake in structure 202, indicating a later medieval or post-medieval origin. Though barely visible when visited in

2010, Phase 2 fieldwork using the laser rangefinder recorded line 054 as **Line No. 10283**, and after a short gap its continuation southwards as **Line No. 10282**. Thick mud prevented the features from being accessed directly, and relatively few stakes were actually visible, so they were recorded as a group (in a straight line) using the laser rangefinder to verify their location. They were found to continue further south than previously recorded. Part of line 202 was recorded as **Line No. 20106**. The gap in between these features may have been caused by the migration of the Gutterway over time.

10.6.2 Aerial photographs of Stert Flats indicated that there were additional rows of these structures located further to the south-west (**Fig. 9**), but this area was simply not accessible during Phase 2 fieldwork due to thick mud. Brunning (2008, 76) noted that to date such features have only been identified at Stert Flats and nowhere else along the Somerset coast. They have many similarities with wooden fish traps recorded off Magor Pill and Sudbrook, however, that have also produced medieval or post-medieval dates (Godbold and Turner 1994, 23-26; Nayling 2000a, 105-109).

10.7 Putt and putcher ranks

10.7.1 The typology and history of putt and putcher ranks, as well as those of other basket types used on the Severn, have been usefully summarised by Godbold and Turner (1994). In summary the larger, three-part putts, are thought to be of the general type used since at least the medieval period, whereas the ranks using smaller putcher baskets were introduced around the beginning of the nineteenth century. Putcher ranks contained three or four tiers of baskets but putt ranks were only one tier in height. Both putt and putcher baskets were used in large ranks and historically made large catches. Salmon Fisheries Acts of 1861 and 1865 introduced a requirement that these 'fixed engines' along the Rivers Severn and Parrett required *Certificates of Privilege* in order to operate legally. Only established fishing locations were issued with these certificates and no new applications were permitted. Theoretically therefore all sites located by the RCZAS should date to before the mid-nineteenth century. The probability of some sites being illegally fished, however, cannot be overlooked. Charles Crundwell of the Environment Agency kindly provided GCCAS with edited versions of these Certificates of Privilege that detail when the structures were last used, and in some cases even list the numbers of baskets they used to support.

10.7.2 Fifty-eight probable putt and putcher ranks were surveyed during the Phase 2a and main Phase 2 archaeological survey work of the Severn Estuary RCZAS. These structures are legally termed *fixed engines* but were also often referred to as *weirs* in the past, and their archaeological remains generally consist of 'ranks' formed by vertical wooden posts, usually arranged in two principal lines perpendicular to the shore. Sometimes the two lines were formed by pairs of posts or smaller stakes set opposite one another 0.5-2m apart, or alternatively there were clusters of 2-12 posts set opposite one another. Occasionally these clusters seem to have been the result of multiple rebuilds and repairs, but this also seems to have been a constructional form associated with the largely earlier putt ranks. With putt ranks in particular, many more such stakes were necessary in order to support and anchor the more complex three-part *kype*, *butt* and *forewheel* arrays (Jenkins 1974b, 45-47; Taylor 1974, 12-13).

10.7.3 As noted in above in section 10.5.1.9, the remains of finely woven baskets were recorded at Woolaston and at Aust. Although some of the examples recorded might have been individual putcheons or weels, others may well have been the remains of woven putt or putcher baskets that had become detached from their frameworks and drifted away before settling (e.g. **Plates 114 & 118**). There is one notable example of a relatively well-preserved putt rank approximately 300m to the north-east of Littleton Pill, Aust parish, South Gloucestershire, where the remains of the woven baskets themselves still survive, probably

the butts (**Line Nos. 10052 & 10054**; **Plates 139-142**). Putts are generally considered to be earlier in date than putcher ranks (see section 12.2.5 below), and in this regard it is interesting that the Environment Agency Certificates of Privilege records do not appear to list this particular structure. There are photographs of putt ranks still in use in the 1960s, however (e.g. Taylor 1975, 13), so the two main types of fishing rank clearly overlapped.

10.7.4 Several other probable putt ranks were recorded during the Severn Estuary RCZAS fieldwork (e.g. **Line Nos. 10029 & 10020**; **Plates 143-144**). The large and relatively well-preserved fishing structure at Slime Road, Sedbury, Glos, that was used until 1999, may also have originally been a putt rank (**Line No. 10072**; **Plates 145-146**), although Environment Agency Certificates of Privilege records (EA RHB 002 15/62) note that as during nearly all states of tide the river current flows strongly downstream at this point, this feature required an especially large supporting framework. These records also note that it once supported 754 baskets. Disused wire putcher baskets were also identified near this feature during the RCZAS field survey. Nevertheless, there were clearly many different phases of construction and use at this locale, and the dense clusters of posts and the large number of outlying stakes and posts on the downstream side of the feature suggest that the original structure could have been a putt rank.

10.7.5 As noted above, putcher ranks seem to have been more usually constructed from two main lines of posts, although sometimes additional posts and braces are in evidence, particularly on the downstream sides, that were used to support the structures against the strong current. These outlying posts and stakes on each side of the main ranks were usually fewer in number than with the possible putcher ranks. A few examples of twentieth century putcher ranks south of Awre and to the south-west and north-east of Gatcombe still have horizontal wooden basket supports surviving in addition to the vertical posts (e.g. **Line Nos. 10069 & 10350**; **Plates 147-148**). More recent twentieth century putcher ranks along the inner Severn utilised squared timbers, fencing posts or telegraph poles in their construction, as well as metal rails and concrete, although in most instances these were replacing earlier structures that were probably built solely of wood (e.g. **Line Nos. 10064, 10321, 10329, 10330, 10350-10352**; **Plates 149-152**). The remains of wire putcher baskets are still present in association with some of these structures, either discarded in the intertidal zone itself or nearby on the riverbank (e.g. **Line Nos. 10072, 10320-10322, 10350, 10352**; **Plates 153-154**).

10.7.6 Notable examples of putcher ranks include an example at Hayward Rock, Hills Flats, Ham and Stone parish, Glos. that had extensive leader arms at least 300m long. Some of these leaders were based on earlier putcher ranks and had originally featured hurdle panels, but more recently replaced with nylon netting (**Line Nos. 10310, 10313, 10320-10322**; **Plate Nos. 10, 155-157**). A broadly east-west orientated line of paired posts and horizontal timber elements (**Line No. 10321**) would have probably supported putcher baskets, but this may only have been the final phase of a series of structures built on the same site, with the lines of earlier putt or putcher ranks converted to leader arms. This structure was owned by the Berkeley Estate and was last used in the 1990s (EA LHB 019 24/10). Also on Hills Flats by White House, Hill parish, South Glos, the remains of a north-west to south-east orientated putt or putcher rank were indicated by another line of low and eroded paired posts. It was also re-used as a more modern putcher and net hang line, however, with 2m tall coniferous posts (**Line No. 10097**; **Plates 158-160**). This used to support up to 500 putchers and was last used in 1994 (Hill Fishery, EA LHB 018 30/11). At the north-western end of this rank, small eroded roundwood and trimmed posts were arranged in a gently curving arc extending to the north-east (**Line Nos. 10099 & 10100**). Around 10-15m of the SW-NE alignment this line consisted of double posts, but these then became a single line of more widely spaced, extremely eroded posts. This structure has been identified by several previous studies (Allen 2005, 34, fig. 2; Small and Stoertz 2006, 69, fig. 30). It is not clear if the north-east to south-west line of stakes was linked to and in use at the same time as the long putcher rank. The initial paired stakes suggested another

putcher rank, but the single arc was more like a net line. It is likely, however, that many of the stakes formed part of a stake and hurdle panel leader for the putcher rank (Allen 2005, 34).

10.7.7 Most of the putcher ranks recorded during the Severn RCZAS fieldwork consisted simply of lines of paired posts, though there was a great deal of variety in their location, size and state of preservation (**Plates 161-168**). Many of the posts were low and eroded, suggesting that they were at least early twentieth century in date, but in some instances potentially nineteenth century in origin. Whilst the lines of most putcher ranks were straight, some were notably sinuous and curved, perhaps to resist the tidal currents (e.g. **Line Nos. 10059, 20000**; **Plates 169-170**). Some of the putcher structures were once extremely large, and extended hundreds of metres out into the channel. At Oldbury Flats for example, in Aust parish, South Glos, there are two putcher ranks that are now fragmented but which would have originally extended at least 450-500m from the shore line (**Line Nos. 10055 & 10056**; **Plates 139, 171**). Far out into the river channel there are additional small clusters of isolated posts that were probably originally associated with these features, the outlying posts making use of rock outcrops or raised bars of gravel and sand as foundations. These structures cannot now be safely accessed on foot due to thick mud deposits although they could be partly surveyed with the laser rangefinder, but it may be that the furthest sections of these were only ever accessible by boat or at the very lowest tides. The Environment Agency Certificates of Privilege data records Line Nos. 10055 and 10056 as Little Weir and Far Weir respectively, the former with 208 putcher baskets and the latter with 520 baskets (EA LHB 007 43/23 and LHB 006 43/27). These structures were last fished in 1992.

10.7.8 Only two putcher ranks are still in operation on the upper Severn. One smaller example at Broadoak of 60 putcher baskets is rebuilt each year using wooden posts sunk into permanent footings in the riverbed (EA RHB 014). A larger, permanent structure south-west of Awre is also still in use, and is situated close to a fish house (**Line No. 10062; Plates 172-174**) (EA Awre Long Row RHB 011 329/43, 400 baskets). Piles of disused wire putcher baskets and the remains of an earlier wooden putcher structure (**Line No. 10063**) are also further indications that this fishing station has been in use for some time. Another indication of the longevity of some fishing stations was recorded south of Poulton Court near Brims Pill, where two fishing stations (for putcher ranks **Line Nos. 10349-10351**) were associated with stone steps that had been built into the sea wall defences, probably in the late nineteenth century (**Plates 175-176**). The Certificates of Privilege records identify both these two stations as Poulton Court (EA RHB 009) with up to 300 putchers, and which were last fished in the 1970s.

10.7.9 Only the largest and most recent putt and putcher ranks were recorded by the RCZAS NMP and previous aerial surveys, however, partly due to the scarcity of oblique aerial images for many of these areas (Crowther and Dickson 2008, 61-62). The difficulty in distinguishing between where lines of eroded paired posts represent former putcher ranks or jetties or other structures also needs to be borne in mind. Phase 2 field survey recorded 53 putt and putcher ranks along the upper estuary at Slime Road Pill near Sedbury, near Gatcombe and Awre, and at Hills Flats, Oldbury Flats, Aust and Northwick Oaze, 21 of which had been previously identified by the NMP and other earlier surveys (e.g. Riley 1998a, 1999). Only one other definite putt or putcher rank was identified by the Severn Estuary NMP outside of the inner or upper Severn Estuary – at Black Rock Clyce on the River Parrett in North Somerset (*ibid*, 77), a structure apparently used until 2000 (EA LHB 000). When visited during the Phase 2 field survey this appeared to be a modern net hang of metal posts (**Point No. 2**) built on the remains of an earlier wooden structure, though the nature of the latter could not be ascertained. A field reconnaissance visit also identified the eroded posts of a possible small putcher rank in the intertidal zone west of Dowlais Farm, Woodspring/Kingston Bay, North Somerset (**Plate 177**), although this structure was not re-visited for formal recording.

10.7.10 On Stert Flats, features comprising double lines of posts had been noted by earlier surveys (Brunning 2008; McDonnell 1995, 2003b) and were also plotted by the Severn Estuary NMP aerial survey (Crowther and Dickson 2008, 84, fig. 5.27) (**Fig. 9**). The RCZAS Phase 2 field survey recorded many double lines of wooden posts, four or five of which extended across the Gutterway near the mouth of the River Parrett (Brunning 2008, 77-78, fig. 13; Catchpole and Chadwick 2010a, plate 27; McDonnell 1995, 99; **Line Nos. 10274, 10279 & 10280, 10277 & 10278, 10285 & 10286, & 10287 & 10288**; **Plates 5, 178-180**). The posts in the two lines were often offset, with the 'front' posts on the eastern, inland side, presumably representing the mouths of baskets designed to catch fish on the ebb tide. The eastern posts were often larger, or arranged in groups of two to six posts. The width of the spaces between these double lines (3-5m) suggests that they might originally have been for securing large putt baskets rather than putchers, and their position across the Gutterway indicates that they probably post-dated the late eighteenth century breach in the Stert Peninsula (McDonnell 1995, 99). Multiple rows of narrower ranks made up of single or small groups of stakes were also recorded at Stert, and these were possibly for smaller putcher baskets (e.g. **Line Nos. 10266, 10276, 10281, 10300 & 10301, & 20112-20116**; **Fig. 9**; **Plates 181-182**). One of these features (**Line No. 10293 & 10294**) appeared to have been appended to the larger stone and stake fish trap **Line Nos. 10293-10296** (see section 10.5.2.6 above). The later feature was on a different alignment to the earlier V-shaped feature, but followed the same orientation of the other double post lines (**Plates 183-184**). Site records indicate the interpretation of these features as putcher ranks due to the similarity of the resultant stake lines to known putcher ranks elsewhere, but this interpretation is open to question as no historical reference to putcher ranks (unlike putts) at Stert has, so far, been located. It is perhaps possible that they result from shrimp netting similar to those still used by the Stolford mudhorse fishermen.

10.7.11 RCZAS Phase 2 survey work at Hayward Rock, Ham and Stone parish, Glos. identified numerous postholes from earlier putt or putcher ranks cut into the outcropping soft marl rock and these features were filled with smaller gravel and stone fragments and/or the low eroded remains of wooden stakes and stumps (**Line Nos. 10157-10159, 10311, 10312, 10314, 10317-10319, 10323 & 10324**; **Plates 185-189**). These overlapping lines probably represented several different phases of putt or putcher ranks pre-dating the large fishing structure now present there, but these features were, of course, invisible on aerial photographs. Paired rock-cut postholes for at least two possible putcher ranks were also identified *c*. 900m to the north-east of Gatcombe, south of Poulton Court, Glos. (**Line No. 10353; Point Nos. 107-115**; **Plate 190**), and for at least four putcher ranks between 350m and 650m south-west of Gatcombe (**Line Nos. 10362-10365**; **Plate 191**). Postholes and posts from at least three putcher ranks were also recorded south of Sharpness Docks (**Line Nos. 10358-10360**; **Plates 192-193**), whilst postholes from wooden hang net posts dug into intertidal gravel deposits were noted at St Audrie's Bay in Somerset (**Line No. 10163**). In other areas of softer rock, clay and gravel along the Severn Estuary there may well be more putt and putcher structures that survive largely as postholes, but sediments will have buried much of this evidence and it would not be visible except in exceptional circumstances.

10.7.12 As noted above in section 10.2.9, some of the possible alignments of paired stakes recorded at Kilkenny Bay (Portishead), Severn Beach, Northwick Oaze and Oldbury Flats utilised stakes that seem to have been too widely spaced and too insubstantial to adequately support putcher baskets. Although much of their superstructure and intervening posts may have eroded away of course, it is also possible that such examples may have formed some kind of net hang line instead (**Plate 194**).

10.8 Other possible wooden fishing-related structures

10.8.1 At Northwick Oaze in South Gloucestershire, *c*. 750m north-east of New Passage, a right-angled or L-shaped structure formed of roundwood stakes and larger upright posts was noted in 2007 and interpreted as a fish trap. A circular setting of stakes and rods around 0.9m across was also identified a few metres to the south-west of the 'corner' of the 'L' (Allen and Haslett 2007, 171). The L-shaped feature was revisited during the Phase 2 RCZAS fieldwork (**Line No. 20017**). The stakes of the NE-SW arm were relatively small in diameter, quite badly eroded and more widely spaced, but the NW-SE aligned stakes were larger and more closely spaced, the large stakes being grouped with two to three additional smaller supporting stakes (**Plates 195-196**). Many stakes are of soft coniferous wood, and large irregular branches had been used in the NE-SW alignment. Additional silt had built up around the structure since the photographs published in 2007 were taken and only a few stakes from the circular setting were visible. Additional features recorded next to the L-shaped structure include iron poles, a concrete block and stone slabs.

10.8.2 Allen and Haslett (2007, 170) interpreted this structure as a fish trap, asserting that the smaller roundwood stakes would have been an unusual choice for a riverbank revetment but as the long axis of the 'L' was parallel to the existing shoreline this is an unusual orientation for a V-shaped fish trap, and a revetment function may nevertheless be more likely. The circular structure they reported, however, is extremely similar to the round 'catch baskets' associated with the V-shaped fish traps at Beachley and Oldbury Flats. The Phase 2 fieldwork recorded paired stakes from a possible putt or putcher rank, or alternatively a net line, extending out from the bank into the area defined by the right-angle and perpendicular to the long axis of the 'L' (**Plate 197**). There were thus several different phases of construction and perhaps use evident at this locale and further detailed planning and perhaps excavation would be necessary to establish these.

10.8.3 The Severn Estuary RCZAS NMP identified several linear wooden features extending horizontally from the bank at Arlingham Passage that may have been associated with long netting (Crowther and Dickson 2008, 81, fig. 5.9). At Oldbury Flats, just north-east of Littleton Warth in Aust parish, the Phase 2 field survey identified a north-west to south-east orientated line of hurdle panels lying horizontally on the intertidal surface for a distance of *c*. 15m at right angles to the shoreline (**Line No. 10057**; **Plates 198-200**). At least three woven panels 0.5-0.6m in width were visible, although the structure was partly buried in silt and more of its length and width may originally have been present, particularly to the south-east where it partly underlay salt marsh silt deposits. The *sails* of the hurdles had slight grooves in them to assist the closely woven hurdle rods in lying flat against them. Withy ties had been used to secure the hurdle panels to several vertical stakes. Outlying stakes to the north and south of this structure were also probably associated with it, and the whole structure appeared to end to the north-west in a T-shaped arrangement of stakes. This probable trackway was possibly built either for long netting, or to reach boats.

10.8.4 On the northern side of the Gutterway, *c*. 500m west of Stert Island, three low and eroded vertical wooden stakes were recorded approximately 20m north of the active channel (**Line No. 10387**). Some possible horizontal hurdle elements were also noted. It was not clear if this was the remains of a fish trap, or of a wooden bridging structure pre-dating the stone causeway.

10.9 Additional fishing-related structures

10.9.1 Just south of Black Rock Clyce on the eastern bank of the River Parrett at Pawlett Hams, *c*. 50m from the existing riverbank, there was an artificial, flat-topped mound of stone approximately 1.2m high and 30m across on the salt grazing floodplain (**Point No. 3**). This

mound has been used as the foundation for a metal secure store. Two small rowing boats are currently berthed next to it, and there is a large hand-operated metal winch next to the metal structure (**Plates 201-202**). This would seem to be a fishing station, used for seine or long net fishing where the boats are used to take nets across the river, and then the nets (probably stored in the secure shed) can be winched back in again. Several square and rectangular 'tanks' in the mound lined with concrete blocks may be used for storing fish or bait. The complex appears to be still in use, or to have only recently fallen out of use.

10.9.2 Several small buildings were recorded by RCZAS field survey close to the Severn's riverbanks east and south-west of Awre village, near Minsterworth and at Elmore Back, and at least some of these were probably originally built as fish houses (**Point Nos. 5, 13, 14, 30 & 30001**). These were usually single storey structures, commonly with fireplaces and chimneys, and often with a loft above (**Plates 203-205**). The loft would have stored equipment and protected it from any flooding. These are similar to The Fish Hut on the north side of Newnham, restored and utilised as a fishing museum by the Environment Agency (Catchpole and Chadwick 2010a, plate 8). Most were brick-built, though the example east of Awre seems to have been constructed of wood and corrugated iron sheeting, with a brick chimney stack (Catchpole and Chadwick 2010a, plate 7). Fishing gear was stored in them, and fishermen would often have to spend the night in them when collecting fish on early or late ebb tides. The smoking of fish might also sometimes have been undertaken in them. Only the example south-west of Awre (**Point No. 30**) might still be used as a working fishing structure, associated with the last operational putcher rank **Line No 10062**.

10.9.3 A small stone building set into the cliffs at Middle Hope on St Thomas' Head in Somerset (**Plate 206**) was described in an earlier survey as a 'fish-processing structure' (Hilditch 1998, 99), but the archaeological or historical evidence for this is unclear. There was no landing place at this part of the rocky coast. Accordingly, it was not formally recorded by the RCZAS.

10.10 Mooring-related features

10.10.1 At Warren Point on the eastern edge of Minehead Bay, a subrectangular flattened area or 'platform' had been cleared of large cobbles, and a large vertical wooden post 0.80m tall, possibly the mooring post for a beached vessel, was situated almost centrally within it (**Plate 207**). Along the north-eastern or seaward side of the cleared platform, a low stone bank associated with another stone fishing structure (**Line No. 10211**) displayed a distinct 'notch' along its length that may have resulted from the hull of a vessel being repeatedly drawn over it and onto the flat, cleared area. This clearance feature and the post were photographed but not formally recorded.

10.10.2 Approximately 300m south-east of the Old Harbour at Minehead was another subrectangular patch of clearance, with a broadly NE-SW orientated line of cleared stone forming a rough, low bank on its eastern edge with a vertical metal pipe at its northernmost end. Immediately alongside and parallel to this rough bank was a short line of at least six large boulders on a similar alignment. This too may have been a boat mooring. It was photographed but again not formally recorded. Approximately 180m to the north-west of Watchet Harbour, an unusual upright stone 'megalith' nearly 1m high and set on its end within the rocky intertidal zone was probably also once used as a mooring post (**Plate 208**).

10.10.3 At Gore Point, Porlock, there is a much more pronounced example of clearance, where a large, subrectangular swathe of the intertidal zone up to 70m long and 20m wide was cleared to allow boats or ships of potentially some considerable size to come in at high tide, presumably beach themselves at low tide, and then float out again at the next high tide

(**Line No. 10402**; **Plate 209**). At the base of the cliffs to the south of this feature there is a small stone storage building or boathouse in a deliberately 'archaic' style with a fake arrow slit. This was probably another feature that formed part of the post-medieval 'polite' landscape of the nearby estate at Worthy, which also featured Italianate gardens (Riley and Wilson-North 2001).

10.10.4 Wooden or occasionally metal mooring posts were encountered all along the Severn Estuary within the RCZAS project area. These were generally free-standing wooden or metal posts set in isolation on the intertidal zone, as with examples in Minehead Bay and at Slime Road, Sedbury (**Plates 210-214**), although it is also possible that some of the larger examples might once have supported beacon lights. Many were much smaller wooden posts or iron pipes not more than 0.5m high, used as temporary moorings for rowing-boat sized craft. Some of these individual posts and stakes were situated along the banks of the many small pills along the upper Severn. Purpose-built metal mooring posts were evident at harbour and canal side areas at, for example, Lydney, Castle Meads on Alney Island (Gloucester), Sharpness and Watchet, and were used for boats to tie up. During the Phase 2a and 2 fieldwork most of these features were photographed but not otherwise recorded.

10.11 Wharves, quays, jetties and other waterfront/riverbank structures

10.11.1 Waterfront structures along the Severn have formed the focus of work by other researchers (e.g. Allen 2003a; Green 1997, 1999, 2010; Jordan 1977; Parkhouse 2001; Putley 1999). Several stone-built wharves or quays and wooden piers or jetties were photographed but not otherwise recorded along the upper Severn at Lydney, Purton (west, Forest of Dean), Gatcombe and Bullo. The partly overgrown stone wharf at Gatcombe is now cut off from the modern river channel by the nineteenth century railway line (**Plate 215**). Wooden remains of the medieval quay at Woolaston/Grange Pill (Fulford *et al.* 1992) were photographed during the Phase 2a pilot survey. The disused harbour at Lilstock was also partly recorded and photographs taken to indicate its current condition (**Line No. 20101**).

10.11.2 The stone and concrete ramp at Beachley associated with the old ferry crossing was photographed, as were the remains of the wooden pier and associated ferry buildings at Old Passage, Aust, on the opposite bank of the Severn (**Plates 216-217**). The older phases of ferry piers at Aust (Allen 2003a; Crowther and Dickson 2008, 122, fig. 5.37) were also photographed (**Plate 218**). A stone and concrete ramp at Newnham probably related to the chain ferry that was proposed to cross the river from there to Arlingham, replacing an earlier small boat ferry (Jordan 1977, 67-68), and it was just south-west of the early modern quay used for commercial cargoes. An early modern warehouse nearby at Newnham has since been converted into a dwelling. These structures were all photographed but not otherwise recorded. The concrete bases from the pier at Minehead demolished during the Second World War were also photographed.

10.11.3 The wooden remnants of an old wooden jetty at Portishead Dock were photographed but again not otherwise recorded. A wooden structure recorded at Cobbs Leaze Clyce on the River Parrett at Pawlett Hams may have been a putcher rank, or more likely a small jetty (**Plate 219**). Approximately 100m south-west of Horse Pill near Stroat in Gloucestershire there was a small collapsed structure consisting of two horizontal roundwood poles 'sandwiched' in between two sets of much more closely spaced roundwood elements at right angles to them, forming a small trackway or platform (**Point No. 128**; **Plate 220**). This fairly modern structure could have been the landing stage for a small boat, or an access trackway for long-net or lave net fishing.

10.11.4 At Watchet in Somerset, lines of large posts up to 0.40m in diameter were recorded just outside of the modern harbour during the Stage 2a pilot fieldwork (**Line No. 40010**; Catchpole and Chadwick 2010a, plate 14). These were elm piles used to construct a temporary breakwater following a destructive storm in 1900 that severely damaged or destroyed Watchet harbour and many vessels at anchor within it and the Mineral Quay. The elm trees were apparently donated from the Dunster Estate.

10.11.5 At Goblin/Red Ledge by New Passage, South Gloucestershire, Phase 2 fieldwork recorded the remains of two post-medieval or early modern wharves or jetties associated with old ferry crossings and noted on the NMP and HER, and also on early editions of Ordnance Survey maps. One consisted of two upright timber posts with sawn settings for horizontal planking, situated at the end of a line of further hardwood timber posts and piles up to 0.40m in diameter driven into the rocky foreshore (**Line No. 20021**; **Plate 221**). Two fragmentary lines of large boulders were probably also part of the foundations for this structure, which overall was approximately 30m long and up to 5m wide and orientated roughly north-west to south-east. This was once called Robin's Quay.

10.11.6 Another nearby wharf or jetty recorded on the NMP and HER at Red Ledge consisted of a rectilinear stone structure orientated roughly east-west with faced sides and a horizontal paved surface, made of irregular mortared, hard metamorphic stones (**Line No. 20022**; **Plate 222**). The uppermost stones were flat and tabular, whilst the facing stones were more 'blocky'. This wharf was up to 2m wide and 15m long, but like the first example it was incomplete and did not extend all the way back to the current shoreline. This may imply considerable shoreline retreat, and/or the partial demolition or robbing of these structures. Set at the south-western end of the stone structure were two upright but eroded timber posts, presumably all that remained of a once more extensive timber extension. A stone wall and a timber structure associated with some form of early modern small wharf were photographed at Strand just south of Westbury-on-Severn (**Plate 223**), but these features were not otherwise recorded.

10.11.7 On Berrow Flats near Burnham-on-Sea, during Phase 2 survey work Richard McDonnell recalled making an earlier discovery in 1994 of a linear brushwood trackway some 200m south-west of the wooden lighthouse. More detailed investigation of this area eventually found the remains of two slightly sinuous lines of stakes approximately 2-2.5m apart, and orientated approximately north-west to south-east (**Line Nos. 10264 & 10265**; **Plates 224-225**). There were larger stakes set vertically or at acute angles (70-80 degrees), up to 0.06m in diameter, and in groups of 2-3 stakes. Between these were much smaller vertical or acutely angled stakes only 0.03-0.04m across. In general there were two lines of single stakes, but in places the lines were several stakes wide, and there were sometimes additional smaller stakes. In a few places there were also short lines of stakes visible running down the central area between the two lines, and there were also outlying stakes, especially on the NE side of the feature.

10.11.8 Smaller twigs up to 0.01m in diameter were laid horizontally between some vertical stakes in Lines 10264 and 10265, and even finer material was present that may have been the edges of the brushwood, although much of the central brushwood itself was underneath several centimetres of mud (**Plates 226-227**). Samples of stakes from each of the two main alignments were taken for species identification (**Point Nos. 74, 76 & 77**) and two stakes from the northern alignment (10264) have been radiocarbon dated to the post-medieval period (11.2.5 below, Appendix A). The larger stakes were driven at least 0.20-0.25m through sticky, dark grey clay and into underlying compact sand deposits, and it was not possible to recover their tips. One roundwood stake up to 0.06m in diameter had clearly been trimmed into a point that was square in cross-section, although the tip itself was not retrieved. Some samples of the horizontal woven elements were also taken for species identification. The trackway was broadly parallel to the current course of the River Parrett, and it may have been constructed to facilitate access for fishing or to reach beached boats.

Richard McDonnell had recorded another trackway some distance further to the north and higher up the intertidal zone, but this feature could not be found and its location has probably now been buried in drifting sand deposits.

10.12 Boats

10.12.1 At Lydney in Gloucestershire, north of the harbour and just north of the old shipyard and slipway, the possible fragmentary remains of a wooden boat were recorded during the Phase 2a pilot, including a large wooden beam with iron bolt fittings (**Point Nos. 5000-5002**; **Plate 228**). This may be the keelson of the *Jonadab*, a trow that was hulked in 1963 but which floated free on a high tide in the late 1970s and drifted across the Severn to partially block the entrance to the docks at Sharpness. It was apparently towed back across the river and broken up 'above the yacht club' (Parkhouse 2001, 72), presumably upriver and to the north-west of the harbour. Alternatively, and perhaps more likely, the timber may be from an unidentified wooden trow sunk in the 1930s that was partly excavated and recorded by archaeologists in 1991 (Williams and Clark 1992). Once recorded, the surviving hull was backfilled with sandbags and reburied in order to try and protect it, but it may be that it has now almost completely eroded away.

10.12.2 The remains of three early modern boats were also recorded south of Lydney harbour in 2009, some of at least eight vessels that were hulked and used to reinforce the riverbank during the 1950s and 1960s (**Line Nos. 40006, 40053 & 40054**; **Plates 229-230**). One of these was a large, flat-bottomed vessel with iron keelson ribs, whilst another was a much more streamlined vessel with wooden keelson and ribs and surviving stern and bow posts (Catchpole and Chadwick 2010a, plates 9-10). One of these may be the remains of the Stroudwater barge *Nibley* (Parkhouse 2001, 72). Fragments of sternposts, rudders, hull and deck planking and iron fittings from more fragmented vessels were also evident (**Point Nos. 50004-50006**). Some of the hulks had been partly filled with concrete and/or stone rubble prior to being used as revetments.

10.12.3 There was a similar programme of beaching decommissioned old barges and trows to stabilise and reinforce the riverbank between Sharpness and Purton (east) in Gloucestershire. This group of early modern vessels formed the focus for a separate aerial photographic progression study during phase 2a of the RCZAS (Dickson 2009; Dickson, Catchpole and Barnett 2010). One of these vessels (the *Harriet*) was recently designated as a Scheduled Monument. These vessels were briefly revisited in 2011, however, so that photographs could be taken of them in order to document their current condition (**Plates 231-232**). They were not formally surveyed by the RCZAS as they are the subject of several on-going research projects by the Friends of Purton and the Nautical Archaeological Society.

10.12.4 Along the northern Awre peninsula some 850m north-east of Northington Farm, the remains of at least one other previously unrecorded trow or barge were identified (**Point No. 132**; **Plates 233-234**). The vessel may have been hulked in order to stabilise the eroding riverbank, and has been moved and damaged by tidal currents. Close examination of the succession of images available via Google Earth indicates the breakup of the vessel over the last decade. It was originally orientated north-east to south-west, whereas much of what remains is now lying along a north-west to south-east alignment.

10.12.5 South of Whitescourt, Awre, Glos, approximately 10m from the shoreline, a gently curving part of the wooden hull of a boat held together with iron brackets and bolts was identified (**Point Nos. 28-29**). These bolts were not very rusted and appeared to be machine-made and possibly galvanised, perhaps indicating a relatively recent date for the vessel (or at least repairs to it). Two attached sections may have been part of a rudder

(**Plate 235**). The riverbank there had been reinforced with modern stone rubble, so the boat hull section had been re-used as a timber bank revetment. To the north-east of Gatcombe, Glos, a large wooden rudder from a trow or barge was also recorded, with its iron tiller surviving (**Point No. 107**). This was held together with iron bolts and brackets, and the iron tiller was also apparent (**Plate 236**). No other boat remains were identified with this find, so its origin is unclear. It could have broken free from one of the hulks at Lydney or Purton and Sharpness, and drifted across and upstream.

10.12.6 Next to the pier at Portishead Dock there were the remains of a wooden boat, consisting of the keelson and some of the transverse ribs (**Plate 237**). This was a known wreck listed on the North Somerset HER (HER MNS 1877). It was photographed but not otherwise recorded.

10.12.7 At Severn Beach, approximately 60m from the shore at Chittening Warth and below the power station were the remains of a wooden vessel with part of the keelson and ribs surviving, along with iron fixtures (**Line No. 10087**; **Plate 238**). This had been previously recorded by a GGAT survey and the Phase 1 NMP aerial survey (HER no. 1279; NMR no. 1465116). This may the remains of a vessel called the *William*.

10.12.8 In Woodspring/Kingston Bay are the remains of two late nineteenth century steel ships. One was HMS *Staghound*, built in 1894 but commandeered by the Admiralty during the First World War and used as a distillery vessel, presumably to manufacture medical alcohol (NMR 1427649). It was used as a block shop in Torquay harbour early during the Second World War; and was sunk by German aircraft in 1942 but recovered. Along with HMS *Fernwood*, the other ship in Woodspring Bay, it was later used as a bombing target (http://www.british-genealogy.com/forums/archive/index.php/t-18684.html). During Phase 2 survey work the wrecks were clearly visible, but as they were located beyond the edge of the low water mark and within deep sucking mud they were not accessible.

10.12.9 At Berrow Flats, in Phase 2a the wooden hull of the SS *Nornen* was visited and its state of preservation noted (**Point No. 50017** Catchpole and Chadwick 2010a, plate 20). This nineteenth century barque was wrecked in 1897 (Crowther and Dickson 2008, 120-121, fig. 5.36; McDonnell 1995, 106) but its position may have moved by *c*. 60m since then. An unidentified wooden wreck recorded by the NMP aerial survey on the west bank of the River Parrett at North Clyce was photographed during Phase 2a fieldwork, largely buried in thick, inaccessible mud (Catchpole and Chadwick 2010a, plate 23).

10.12.10 At Gatcombe in Gloucestershire, the surviving nineteenth century stone quay (see section 10.11.1 above) is located just west of the Gloucester to Chepstow railway line and so is now cut off from the riverbank. The remains of three wooden boats are situated on top of the quay platform, which were once used for stop-net fishing in Wellhouse Bay. Similar boats, for example, are visible on a 1930s photograph of the village (http: www.salmonboats.co.uk). Two of the boats have now almost totally disintegrated, however, and the third boat has been burnt and badly damaged by vandals (**Plates 239-240**).

10.12.11 The nets used in stop-net fishing were held taut between two large beams or poles called *rames* or *rimes*, remains of which are also present at Gatcombe. Up to three boats would be tethered across the flow of the tide, originally on poles fixed into the riverbed but later they were held on station by a steel cable fixed to the shore at one end, with an anchor set into the riverbed at the other (Taylor 1974, 13). This mode of fishing ceased in the 1970s, and it is likely that these boats were abandoned around that time.

10.13 Revetments, groynes and miscellaneous structures

10.13.1 The remains of riverbank revetment works were recorded eroding out of stretches of riverbank along the upper or inner estuary and tributaries. Post-medieval and early modern documents, tithe and estate maps refer to the practice of *cribbing*, sometimes called *faggoting*. This often took the form of horizontal layers of brushwood, probably originally placed in bundles, and held in place by vertical wooden stakes and horizontal wooden elements, these materials clearly being derived from coppiced poles. Alternatively, hurdle panels were employed and/or unmortared stone.

10.13.2 At Minsterworth Ham and along the River Parrett at Pawlett Hams, the cribbing was mainly of the brushwood type, although some of the different phases of revetment identified at Pawlett Hams clearly also included stone (**Line Nos. 10001 & 10309**; **Plate 241**). At Elmore Back, much of the visible cribbing consisted of horizontal brushwood held in place by vertical wooden stakes and woven wattling, arranged in small sub-rectangular 'bays' 2-3m across (**Line Nos. 40000 & 40003**; Catchpole and Chadwick 2010a, plate 3).

10.13.3 At Beachley remnants of brushwood-type cribbing were recorded on the very edge of the current river channel (**Line No. 10344**), but adjacent to one of the V-shaped stake-built fish traps there were also larger horizontal timber elements eroding out of the clay (**Line No. 10345**; **Plate 242**). It appeared that one fish trap had actually been physically connected or tied into to this structure and it may be that some revetments were specifically designed to reinforce the riverbank at fishing stations. It is also possible that the vertical and horizontal hurdling parallel to the river channel at Woolaston might also have been part of a revetment rather than another V-shaped fish trap (**Line No. 10328**).

10.13.4 On the south-western side of Lydney harbour and constructed parallel to the shoreline there was an alignment of at least two rows of vertical wooden stakes, the two rows being approximately 1m apart and the gaps between the stakes varying between 0.40-1m (**Line No. 40007**; Catchpole and Chadwick 2010a, plate 11). In places there were additional stakes set parallel to or at right angles to the main rows, and a linear stone dump was also associated with this feature. Hull planking and other parts of the hulked trows and barges also seem to have been deliberately reused and incorporated within this structure. The north-eastern end of 005 curved northwards towards the drainage outlet and channel present on the southern side of the harbour. This structure was likely to have been revetment, possibly of different phases, but all probably early modern in date.

10.13.5 An L-shaped, stake-built structure recorded at Northwick Oaze in South Gloucestershire (**Line No. 20017**) may have been the remains of wooden riverbank revetment rather than a fishing structure as has been previously proposed (Allen and Haslett 2007; see section 10.8.2 above).

10.13.6 Numerous lines of wooden stakes parallel to the riverbank that were probable revetment structures, were identified along the Rivers Severn and Parrett. Many consisted of dumps of loose stone rubble, supported by vertical or angled wooden posts (e.g. **Line Nos. 40045, 50029 & 40020**; **Plate 243**). Most of these are probably of relatively recent nineteenth or twentieth century date, and were photographed not otherwise recorded.

10.13.7 Just to the north-east of Hayward Rock and Severn House Farm, Phase 2 survey work recorded a wooden structure aligned NNW-SSE parallel to the riverbank and made from two lines of tall coniferous roundwood posts up to 2.5m in height and 0.45m wide (**Line No. 10106**; **Plate 244**). Some of the 'outer', western timbers were shorter and more heavily eroded, but although this may indicate they were older or part of a different phase, greater erosion might be expected on those closest to the water in any case. This structure may have been a riverbank revetment, and was associated with dumps of loose stone rubble designed to stabilise the bank. It is also possible that it formed a temporary wharf, although

on the 1925 1: 2500 Ordnance Survey map this place is only marked as 'Saltings', but a possible structure is shown on the 1900 map of the same scale.

10.13.8 Along the Somerset coastline, wooden structures were identified that were probably groynes, used to minimise the lateral movement of beach material. These included lines of spaced posts set out at right angles and parallel to the shore. Most were of early modern or more recent date and were photographed, but examples at Madbrain Sands to the east of Minehead, where a broadly east-west line of posts spaced about 8-10m apart also had a north-south line of similar posts appended to it, were recorded in more detail (**Line Nos. 10192-10194**). These were probably groynes as they do not correspond to anti-invasion defences plotted by the NMP (Crowther and Dickson 2008, 251, fig. 10.9). At Madbrain Sands/Warren Point, a structure embedded in the beach consisted of a curving line of angled timbers, associated with at least two horizontal planks (**Line No. 10199**; **Plate 245**). Most planks were rectangular in cross-section, with some iron fixtures. This might have been part of a wooden ship hull re-used as beach revetment. Coniferous roundwood posts were also present, although these may represent later repairs of the structure. The Somerset HER records a possible shipwreck site only 50m to the north-west of Line 10199 (Somerset HER 35391), however, and these remains may be the vessel in question.

10.13.9 At St Audrie's Bay, a subtriangular stone and wooden structure designed to protect part of an early modern 'grotto' at St Audrie's Bay from tidal erosion was photographed but not otherwise recorded (**Plate 246**). The grotto itself, a 'polite landscape' feature (Som HER 33342) had a rear wall built into the cliff that is now precariously balanced on one surviving mortared stone pedestal (**Plate 247**). This feature will collapse in the next few years. Another possible groyne at St Audrie's Bay consisted of a NNW-SSE line of 27 stumps of large vertical wooden posts 0.30-0.50m in diameter (**Line No. 10164**; **Plate 248**), possibly made of elm or lime and of fairly recent date (R. Brunning pers. comm.). The posts appear to have been inserted into an excavated trench, then backfilled with gravel and clay. This may have been one of a series of wooden structures shown on early Ordnance Survey maps of St Audrie's Bay.

10.13.10 South of Fretherne, Glos. at Hock Ditch, *c*. 90m from the riverbank, Tony Roberts of GCCAS/Bristol University and Dr Andy Howard of Birmingham University identified a wooden timber in the side of a large drainage ditch or rhyne, by a modern footbridge (during a separate fieldwork project). Further investigation by the RCZAS team revealed at least two separate stone and wooden structures. One consisted of unmortared, roughly dressed ashlar stones and both horizontal and vertical wooden timbers, including a curved timber possibly reused from a boat, along with a large wooden beam with a metal spike sunk into a mortice hole within it and held in place with wooden wedges (**Point Nos. 31-32**; **Plate 249**). Another structure contained more stone, and was supported on vertical and angled timber piling (**Point Nos. 33-34**; **Plate 250**). These features may represent different phases of sluice gates for regulating water levels in the rhyne, or they might have been the footings of earlier bridges.

10.14 Sea walls and flood defence banks

10.14.1 The Phase 1 NMP aerial survey identified different phases of land reclamation and sea and flood defence banks along the upper Severn in Gloucestershire (Crowther and Dickson 2008, 201-209) and also along the Rivers Severn, Parrett and Brue in Somerset and across the Somerset Levels (*ibid*, 175-178, 210-213). Along the upper Severn, for example, such phases of flood defence banks are especially apparent in the reclaimed 'loops' of the river at Awre, Rodley, Minsterworth Ham, Elmore Back, Longney and Arlingham, and also at Pawlett Hams along the River Parrett. Networks of sea walls, rhynes and gripes have also been mapped in the Somerset Levels and along other parts of the

lower Severn. There has been much archaeological and historical research undertaken concerning the scale, sequence and likely date of these reclamation events throughout the wider Severn Estuary (e.g. Allen 1992, 2001; Allen and Fulford 1987, 1990a, 1990b, 1992; Allen and Rippon 1995; Rippon 1997), much of it based on detailed documentary and cartographic studies as well as topographic observations and survey, and fieldwalking. Due to this previous mapping work and the need to concentrate on intertidal archaeology, it was not thought necessary to investigate and record such features during the Phase 2a and Phase 2 fieldwork. Some sea and flood defence banks were photographed but not otherwise recorded during survey work (**Plate 251**).

10.14.2 Within the loop of the River Severn south-west of Elmore Back is the so-called 'Great Wall of Elmore' (Fig. 12), a 490m long earthen bank with stone revetments orientated approximately north-west to south-east, running from just north-west of Farley's End to the southern corner of the large trapezoidal field named The Shark (recorded as such on the 1st Edition Ordnance Survey map of 1884-1889, but which on the 1841 Tithe Map is shown as three separate fields called Lower Piece, Dineware and Carloon (Gwatkin 1841)). This linear earthwork feature was suggested by Allen and Fulford (1990b) to be a Romano-British flood bank that defended possible Roman land reclamation east of the wall, defined by surviving fragments of possible Roman-period flood defence banks. They also proposed that the earthwork had continued much further to the north, but the aerial photographs and the lidar data analysed during the Phase 1 NMP survey did not support this (Crowther and Dickson 2008, 147, fig. 7.2; Truscoe 2007, 7-8), although an additional 30m northwards continuation of its length was visible in the lidar data.

10.14.3 In order to try and determine if the earthworks of the 'Great Wall' had continued further to the north-west and/or to the south-east, it was visited during the Phase 2a pilot fieldwork. A small bank to the south of the Shark may have been a flood defence or part of the medieval field system (**Line No. 40005**). The field boundary along the western side of The Shark was not noticeably different in character from other nearby field boundaries. In addition, Allen and Fulford proposed that there was a probable silted up ditch on the eastern side of the Great Wall (1990, 21, fig. 3), but the RCZAS field survey found that this was generally indistinguishable from adjacent ridge and furrow. Although the lidar data had found only a 0.07m difference in height between the land on either side of the 'Great Wall' (Truscoe 2007, 8), on the ground there appeared to be a more noticeable difference, with the land to the west of the earthwork visibly higher by up to *c*. 0.30m (Catchpole and Chadwick 2010a, plate 4).

10.14.4 Another earthwork south-east of Elmore Back was recorded during the main Phase 2 fieldwork in 2010, however (**Line No. 10014**; **Plate 252**). The earthwork was 4-5m wide and 0.40-0.50m in height, and was traced from a point near Medbridge Covert for at least 300m, though it probably extended for another c. 350m all the way to the bottom of the slope by Elmore Court. This earthwork is also called 'Great Wall' on the 1841 Tithe Map, and is likewise marked as an 'old road'. This feature has considerable bearing on the Allen and Fulford (1990b) model of reclamation and their interpretation of the 'Great Wall' of Elmore, and this will be discussed further in section 12.4 below.

10.15 Second World War features

10.15.1 Numerous features associated with the defence of Britain during the twentieth century were identified and recorded by the Phase 1 NMP aerial survey, using historical aerial photographs (Crowther and Dickson 2008, 243-266). These included First World War and Second World War armaments factories and stores, along with Second World War pillboxes, anti-invasion beach obstacles, barbed wire complexes and trenches, anti-aircraft batteries, barrage balloon and decoy sites, training facilities, military firing and testing

ranges and Prisoner of War and military camps. Stretches of the Green, Taunton and GHQ Stop Lines were also identified (Foot 2006). Many of the Second World War sites were previously recorded by the Defence of Britain Project (Council for British Archaeology 2006).

10.15.2 Most of these features were demolished or removed during the 1950s and 1960s, and little evidence of their original number and extent now survives. The Phase 2a and Phase 2 fieldwork confirmed the presence of several surviving pillboxes, however, including examples near Beachley, Arlingham, Purton, Pawlett Hams, Portishead, Weston-super-Mare, Sand Bay, Dunster Beach, Minehead and Porlock Weir. Most were photographed (**Plates 253-258**) and several were surveyed in more detail (e.g. **Point Nos. 12, 118-122, 50037 & 50039**). Several of the pillboxes along the river bank near Arlingham have either slipped off the riverbank, or have sunk into soft underlying alluvial silts so that only the tops of the structures are now visible (**Plates 259-261**).

10.15.3 Examples of a rare type of infantry section post that were located between Blue Anchor Bay and Porlock were recorded by the Phase 1 NMP aerial survey (Crowther and Dickson 2008, 254, fig. 10.14), all but one of which is now destroyed. This surviving example at Blue Anchor Bay was recorded and photographed (**Point No. 30009**; **Plate 262**). Smaller observation posts were photographed on the eastern side of Watchet Harbour, on the cliff tops at Kilve (**Point No. 54**) and along the coastal shingle ridge at Lilstock (**Plates 263-265**). The Watchet example is likely to fall off the eroding cliff in the next 5-10 years. On Pawlett Hill near Pawlett Hams, the surviving hangar of a barrage balloon used for balloon cable-cutting experiments by the Royal Aircraft Establishment was photographed. A possible gun emplacement on Bossington Hill was also recorded during the Phase 2a pilot (**Line Nos. 40008 & 40009**; Catchpole and Chadwick 2010a, plate 13), whilst several other nearby Second World War related features were also photographed (**Plate 266**).

10.15.4 Some more ephemeral remains of Second World War features were also photographed during Severn RCZAS fieldwork. These included a brick-built sentry box at the end of the lane north of Sheepway and Atherton House near Portbury Wharf, painted in black and white stripes and probably associated with an anti-aircraft and searchlight battery (Nth. Som HER 1483, NMR 1467888), that was positioned to protect the nearby docks (**Plate 267**). Along Berrow Beach, several concrete posts were photographed lying in the intertidal sands and mud that were probably part of an anti-invasion grid of post alignments (Crowther and Dickson 2008, 251, fig. 10.10) (**Plate 268**).

10.16 Peat, palaeochannels and submerged forest deposits

10.16.1 It was recognised at an early stage of the Severn Estuary RCZAS that significant prehistoric peat and submerged forest deposits would be encountered at many locations along the project area (Mullin 2008, 35, 46-48; Mullin, Brunning and Chadwick 2009). This assessment of potential was based on previous palaeoenvironmental sampling and survey work, undertaken along the inner Severn at Woolaston/Grange Pill, Hills Flats and Oldbury Flats (Allen 1997, 1998b; Allen and Fulford 1996; Bell 2001, 2007; Brown 2005, 2007a, 2007b; Brown *et al.* 2006; Druce 2001; Riley 1998b; Timpany 2005). Along the outer Severn coast, extensive peat and submerged forest deposits have also been previously recorded or investigated in detail at Avonmouth, Severn Beach/Gravel Banks, Brean Beach/Berrow Flats, Burnham-on-Sea, Stolford, St Audrie's Bay, Blue Anchor Bay, Minehead Bay, and Porlock Bay (Bell 1990, Canti *et al.* 1996; Carr 1965; Carter *et al.* 2004; Druce 1998, 2001; Heyworth 1985; Heyworth and Kidson 1982; Hosfield *et al.* 2008; Jennings *et al.* 1998; Jones *et al.* 2005; Kidson and Heyworth 1973; Lawler, Parkhouse and Straker 1992; Locock 2000; Moore *et al.* 2003; Riley 1998a, 1999; Ritchie *et al.* 2008; Straker *et al.* 2004).

10.16.2 The purpose of the Severn Estuary RCZAS was not, of course, to take an extensive suite of detailed samples of palaeoenvironmental deposits and to arrange a programme of analysis and dating of these. Given the previous archaeological evidence from the English Severn Estuary and also the Welsh Severn shoreline, these areas of peat and submerged forest nevertheless had a high potential to preserve prehistoric wooden structures and other features, footprints, artefacts and faunal remains. The updated project design for the main Phase 2 survey work therefore suggested that wherever possible, peat deposits should be accessed and limited collection of any artefacts and faunal remains should take place (Catchpole and Chadwick 2010b, 24, section 9.3.5). Peat deposits would be sampled using an auger and/or a spade, but following consultation with Peter Murphy and Dr Vanessa Straker of English Heritage, and Dr Richard Brunning of Somerset County Council, it was agreed that except in exceptional circumstances no samples of peat would be retained for further analysis, and sampling would merely facilitate the recording of the thickness, colour and composition of the peat in the field.

10.16.3 During the Phase 2 RCZAS fieldwork, the edges of the most extensive visible 'shelves' of peat were plotted using the GPS handheld dataloggers, although more fragmentary and/or isolated exposures were not usually recorded in detail. The height information for these records forms part of the digital records of the project, although it should be reiterated from section 9.2.4 above that as differential GPS equipment was not used, the accuracy of the Z co-ordinates obtained by the Magellan handheld dataloggers was rather less than that of the X and Y two-dimensional spatial records, in the region of ± 3m. Peat and submerged forest deposits were also photographed, whilst audio descriptions were made of the thickness, colour and consistency of the peat. In some areas such as Oldbury Flats, Hills Flats, Blue Anchor Bay and Minehead Bay for example, the peat was very dark brown or black in colour and extremely 'twiggy' or 'woody', consisting of compressed fragments of roots, branches, twigs or tree leaves. In contrast, at Brean Beach and Stolford much of the peat was more orange-brown in colour, and seemed to consist more of compressed reed swamp vegetation.

10.16.4 At Berrow Flats a sinuous, curvilinear and concave area of peat associated with other peat deposits seemed to mark the presence of a hitherto unrecorded palaeochannel, where peat had formed in a channel and had then been compressed into a concave shape. Once the surrounding deposits had eroded away, this left a meandering and upstanding area of peat with a concave profile (**Line No. 20105; Plates 269-270**). Additional concave peat deposits, either deformed by the weight of overlying sediments or perhaps representing another possible palaeochannel, were also noted on the eastern side of Minehead Bay (**Line No. 10218**), and also at Hills Flats just north of Hill Pill, where it was recorded as part of a larger peat exposure (**Line No. 10102**; **Plate 271**).

10.16.5 Many of the peat deposits at Blue Anchor Bay and Minehead Bay in particular were very fragmentary, and were clearly being rapidly eroded. This erosion was not only due to wave and tidal action, but was also the result of marine wood-boring molluscs that had drilled deep into wooden tree root boles and peat. This created a weaker spongy texture in the wood and peat, thus exacerbating their break-up by tidal forces (**Plate 272**). Some of the linear stake-built features on Brean Beach/Berrow Flats had been constructed through earlier peat deposits, and where the stakes had penetrated the peat this had often caused linear erosion gullies (see **Plate 137**). Due to drifting sand deposits, the peat and submerged forest deposits in Porlock Bay had been largely covered over (e.g. McDonnell 2005), and so could not be accessed. The peat deposits at Woodspring/Kingston Bay were only partially accessible due to deep overlying mud, and a lower eroding peat edge further out on the intertidal zone had to be recorded using the laser rangefinder. Much of the submerged forest and peat at Stolford was also buried underneath thick mud, and some peat was only visible where later intertidal outwash channels had cut down through it exposing it in section. At Hills Flats, Woodspring/Kingston Bay, Brean Beach/Berrow Flats and parts of Blue Anchor Bay, the eroding faces of the peat shelves were often quite

substantial in height and stepping off them usually resulted in staff members sinking into deep, sucking mud at least 0.5m thick. For this reason it was rarely possible to progress westwards/seawards beyond these points.

10.16.6 No structures or features were recorded in association with peat deposits. The palaeochannels at Woolaston/Grange Pill and at Oldbury Flats were visited during Phase 2 fieldwork specifically for their potential to preserve such evidence, but no wooden structures likely to have been associated with these palaeochannels were identified, only features much later in date. At Brean Beach/Berrow Flats and Blue Anchor Bay wooden stakes were identified that had been driven down through peat deposits, but these stakes appeared to be intrusive and much later in date.

10.16.7 The most well-preserved submerged forest remains encountered during the Severn Estuary RCZAS along the inner Severn were at Woolaston/Grange Pill, at Hills Flats and south-west of Berkeley Power Station. Substantial remains of tree root boles and tree trunks survive at both locales. The deposits at Woolaston were not surveyed due to the previous detailed palaeoenvironmental work (Brown 2007b; Brown *et al.* 2006), but some of the peat and submerged forest remains were photographed (**Plates 273-275**). The Hills Flats exposures were recorded, however (e.g. **Line Nos. 10101-10103, 10107**; **Plates 276-278**). Putative animal hoof prints were only identified at one location in peat deposits at Hills Flats just west of Hill Pill (on **Line No. 10102**), perhaps from deer or cattle (**Plate 279**), but this was the only occasion where such possible features were noted. Without excavating these features it was not possible to determine if they truly were tracks or merely natural depressions in the peat surface. Along the outer Severn Estuary, the most well-preserved submerged forest remains were those at Blue Anchor Bay, despite the problems of erosion from wood-boring molluscs and tidal forces. Large tree root boles and branches survive there, although many have also been compressed through the weight of once overlying sediments.

10.16.8 One piece of worked, burnt flint with a noticeable bulb of percussion was retrieved from near a peat edge (**Line No. 20002**) south-west of Oldbury Power Station at Oldbury Flats, but although retained it was clearly unstratified so its location was not mapped. No *in situ* scatters of lithic material were identified there or at Hills Flats, as in previous work (Allen 1997; Brown 2007a, 2007b; Brown and Allen 2007). A large mammal vertebrae possibly from cattle/aurochs, and a partly split leg bone, also from a bovid, were identified nearby at Oldbury Flats (**Point Nos. 30002 & 30003**). Both of these bones had been stained dark brown or black so although not *in situ* it was reasonably certain that they had eroded out of the same peat exposure Line No. 20002.

10.16.9 The peat-stained remains of a deer pelvis were found at Brean Beach/Berrow Flats during the 2009 Phase 2a pilot work (Catchpole and Chadwick 2010a, 35, section 10.10, plate 19; **Point No. 50015**), and had eroded out of a peat exposure there (**Line Nos. 40014 & 10250**). During the Phase 2 fieldwork another stained animal bone (**Point No. 30005**) was recovered from just below an eroding face of the possible palaeochannel peat deposit Line No. 20105, approximately 550m to the south of the 2009 find spot.

10.16.10 The peat/submerged forest deposits recorded during the Phase 2a and Phase 2 Severn Estuary RCZAS fieldwork, their physical characteristics and possible stratigraphic attributions can be summarised as follows:

- *Woolaston/Grange Pill:* Laminated, dark grey-black peat up to 0.40-0.50m thick, associated with large tree root boles up to 1.50m across and substantial tree trunks and branches that were up to *c*. 8m long and 0.40m in diameter. Previous palaeoenvironmental work (Brown *et al.* 2006, fig. 79, fig. 10; Timpany 2005) suggests that most of the remains photographed by the GCCAS team probably

consisted of the Lower Peat investigated at Woolaston, spanning a date range of 5775-4245 cal. BC, and part of the middle Wentlooge Formation.

Berkeley Power Station to Hayward Rock: Approximately 300m to the north-east of Hayward Rock were extensive peat exposures (**Line Nos. 10109 & 10110**; **Plate 277**). These peat deposits were laminated and eroding at differential rates along the laminations, and were also undercut. In places very large, waterlogged, dense and dark-stained timbers projected from these deposits, up to *c*. 2.5m long and 0.30m in diameter, with trunks, branches and roots all represented. Several different peat deposits seemed to be present, separated by thin bands of blue-grey and reddish-brown clays and silts, but overall these deposits were at least 0.40-0.50m thick. In places the peat was above the mottled blue-grey clay with rootlet remains, but in others it seemed to lie directly above the shingle and sandstone geology. Although some deposits (10109) were accessed directly, others further to the north (10110) were recorded with the laser rangefinder.

Further to the south-west the exposed peat shelf covered by a quite thick layer of silt, and undercut and eroded by the tide, quite badly in places. The laminated peat was at least 0.15m thick, dark reddish-brown or black and quite fibrous, associated with some fairly large waterlogged timbers associated with it that were projecting horizontally out from the existing sloping shoreline, up to *c*. 2m long and 0.20m in diameter. In some places patches of the underlying blue-grey clay were visible. There was no visible wood actually within the peat itself, but layers of compressed orange-brown organic material (reeds?) were apparent.

- *Hills Flats – White House to Hill Pill:* The first peat shelf recorded in this area (**Line No. 10096**) consisted of laminated dark grey-black material as well as brownish-red peat layers, together up to 0.15-0.20m thick; lying on top of blue-grey clay with rootlets visible within it. The peat contains some small branches and twigs and carbonised material. Several isolated blocks of peat associated with large pieces of wood further westwards across the intertidal surface (**Line No. 10103**; **Point Nos. 42 & 43**) may be eroded remnants of this peat shelf – the wood was stained very dark grey or black and was clearly not just recent driftwood. The peat shelf has a fairly flat or gently sloping upper surface and extends underneath the bank, beneath *c*. 2m of silts in the side of the eroding salt marsh. It is likely that this is Wentlooge peat. Further to the north-east, two further eroding shelves of peat were recorded (**Line Nos. 10101 & 10102**), extending across the modern mouth of Hill Pill. These were extensive exposures with eroding edges up to 80m from the existing salt marsh edge (**Plate 276**). The peat was 0.05-0.15m thick and again laminated with dark grey-black and more reddish-brown material. It contained numerous small twigs and leaves, as well as larger branches up to 0.50m long and 0.10m thick. The peat was either above further blue-grey clay mottled with rootlet remnants, or where the clay had eroded, directly on top of the shingle and gravel surface. Previous palaeoenvironmental work, including a coring transect beginning 200m north of Hill Pill (Allen and Fulford 1996; Brown 2007a), has indicated the presence of several separate peat layers, of which the base of the peat has produced calibrated radiocarbon dates of 4320-3980 and 4240-4040 BC. This suggests that most of the peat and submerged forest remains at Hills Flats were again part of the middle Wentlooge Formation.

  Just 60-70m north-west of Hill Pill, possible animal tracks were photographed on the upper surface of peat deposit 10102 (see section 10.15.7 above). Approximately 150m north of the existing mouth of Hill Pill, a more sinuous line of peat leading out towards the modern river channel at roughly right angles to the shoreline had a gently concave surface (**Plate 271**), and this may well represent an earlier palaeochannel of Hill Pill. Given that worked flint of Neolithic and Bronze Age date

has been found near the mouth of Hill Pill, along with a near-complete Neolithic polished stone axe (Allen 1990a, 1997), this is another area where more research and detailed sampling should take place in the future.

- *Oldbury Flats – Oldbury Pill to Oldbury Power Station tidal reservoir:* Approximately 300m to the south of the tidal reservoir of Oldbury Power Station, Phase 2 fieldwork recorded part of an eroding peat deposit, although much of it was covered in sticky silt and mud up to 0.10m thick, obscuring much of the surface, although it could be clearly felt underfoot. The peat exposures in this part of Oldbury had already been investigated and published in some detail (Allen and Fulford 1992; Brown 2007b; Riley 1998b, 1999; Timpany 2005), with the uppermost of five peat deposits dated to 3650-3100 cal. BC. Only a small section of a peat shelf was therefore plotted by the GCCAS team (**Line No. 20002**). The visible peat was dark grey-black in colour, laminated and at least 0.10m thick. Large quantities of roots and branches were associated with the peat and were visible at the exposed edges of the deposits, and some of these were clearly burnt with carbonised charcoal replacing the wood. Although not *in situ*, two finds of animal bone were made – one a very large mammal vertebra, possibly from cattle/aurochs, and a large limb bone, this partly split. Both of these bones were stained black so although not *in situ* they were probably derived from the peat deposits, and so were retained for species identification and possible ^{14}C dating (**Point Nos. 30002 & 30003**).

- *Aust – Blackstone to Littleton Pill:* South of Littleton Pill/Warth were several peat shelves that were identified eroding out from underneath 0.05-0.10m of sticky silt deposits, and which had been cut through in places by the stakes of later putcher ranks. These probably represented separate, truncated remnants of the same overall peat deposit (**Line Nos. 10040, 10043 & 10045**; **Plate 280**). The peat was dark grey-black in colour and at least two *in situ* tree root boles were associated with it, along with some smaller preserved branches. Although charcoal was evident, no worked wood was identified and no artefacts or faunal remains were recovered. This may be a previously unrecorded peat exposure, lying to the south-west of the deposits that have been recorded to the north-east of Littleton Pill (Brown 2005, 2007b; Riley 1998b, 1999).

- *Woodspring/Kingston Bay:* The thick mud deposits present at Woodspring/Kingston Bay during Phase 2 fieldwork probably masked several archaeological features, but an eroding peat shelf was identified, extending roughly north-south on a sinuous line for several hundred metres at the northern end of the bay, off Dowlais Farm. The edge of this deposit was plotted both by walking along it but also with the laser rangefinder (**Line Nos. 10081-10083**). Even where the peat could not be visually identified, it could be 'felt' underfoot when walking, but in places it had been cut by tidal outflow channels and these were filled with deep sucking mud that was hazardous to cross (**Plate 281**). Some of these channels were too deep and wide to wade through. Moving westwards or seawards off the peat shelf was also extremely hazardous as the mud here was at least 0.50m thick. The dark grey-black peat was between 0.08-0.10m thick and lay above a compact sticky blue-grey clay, the latter pierced by many preserved rootlets and root holes. Amongst the compressed vegetation of the peat were many dark orange-brown broad, linear leaves that were probably from reeds or rushes, but only a few small branches and twigs were identified, and apart from one small tree root bole there were relatively few larger branches or roots. This may indicate that the peat was formed predominantly from reed swamp/water edge type vegetation. No artefacts, charcoal or animal tracks were noted.

  Approximately 100m to the west and seawards of the peat exposures noted above; and *c*. 2-4m lower in height (as indicated by the laser) was another peat shelf, just

visible at the edge of the breakers of the incoming tide (**Line No. 10084**). The mud overlying it was too deep to allow direct access, so the approximate line of this lower peat was plotted using the laser rangefinder. As it was lower down the foreshore, this was perhaps an earlier peat deposit possibly lying underneath the blue-grey clay, but it was not possible to ascertain their relative stratigraphic and depositional relationships, and no physical characteristics of this peat could be recorded. There are no previous HER/NMR records for peat exposures at Woodspring/Kingston Bay, although there is an important find spot of Palaeolithic, Mesolithic and Bronze Age lithics at Blackstone Rocks (Gardiner 2001; Hosfield *et al*. 2008, 52; Somerset HER FIDs 574-576). During the survey visit made to Blackstone Rocks during the Phase 2 survey, no lithics were identified, however. This is clearly another area where further research and detailed sampling should be undertaken.

- *Brean Beach/Berrow Flats – Unity Farm to Brean Down:* Extending roughly north-south in a sinuous line along the central and northernmost part of Brean Beach, Phase 2a and Phase 2 fieldwork identified and recorded a series of eroding peat exposures. Part of the peat shelf identified in 2009 during Phase 2a work (**Line No. 40014, Point No. 50019** Catchpole and Chadwick 2010a, plate 19) was rerecorded as a more extensive exposure (**Line Nos. 10249, 10250, 10253, 10254 & 10259**) that became more fragmentary to the north, although there were also several isolated and heavily eroded blocks of peat further seawards to the west (**Plate 282**). The peat was quite thin and varied in thickness from 0.02-0.10m. The undulating peat was quite clayey with lots of visible organic content such as compressed reeds. In places there were two peat layers visible with a layer of blue-grey clay in between them, the clay itself containing many organic remains such as reeds, especially at the top of it at the interface with the upper peat. In other exposures the peat appeared to lie directly on top of the blue-grey clay. There was little obvious wood visible within the peat. A sample of this peat was taken (**Point No. 30014**). At this sample point the top few centimetres and the bottom few centimetres were taken from the layer which was 95mm thick. The deer pelvis fragment found at Brean Beach/Berrow Flats during the 2009 Phase 2a pilot work was derived from Line Nos. 13/10250.

  Also present in this central area and associated with these peat deposits was a broadly east-west aligned but also highly sinuous band of peat with a notably concave profile and upraised edges that probably marked the course of a palaeochannel approximately 1.5-2m in width (**Line No. 20105**; **Plates 269-270**). The eastern end of this feature snaked out to sea where it was underneath the tide, whilst the westward, landward end disappeared under mud deposits. The peat was up to 0.22m thick in the middle of the 'dished' channel fill deposits, but became thinner towards the edges of the channel, with underlying blue-grey clay. A black-stained bovid bone that was probably derived from the peaty channel fill was found on top of the blue-grey clay next to an eroding 'face' of peat (**Point No. 30015**). Richard Brunning (pers. comm.) thought that the feature was originally a sinuous channel in the salt marsh, and that there had then been a period of regression, followed by the formation of a peat layer over the salt marsh, which in-filled the channel.

  Peat deposits had been previously investigated *c*. 3.4km to the north of Point No. 15, at the northern end of Brean Beach just south of Brean Down (Bell 1990, 104). These deposits produced a late Mesolithic radiocarbon date of 4655-4360 cal BC. Some 6.5km to the south of Point 15 by Burnham-on-Sea, peat deposits investigated there produced late Mesolithic and Neolithic dates of 5440-3370 cal BC (Druce 1998, 18). The peat layers and possible palaeochannel identified and recorded during Phase 2 of the Severn RCZAS by the GCCAS team in the central section of Brean Beach/Berrow Flats may thus be of considerable

palaeoenvironmental and archaeological significance, and dating the faunal remains recovered should be undertaken if possible. This area would clearly repay more research and detailed sampling in the future, especially the possible palaeochannel.

Much of the northern part of Brean Beach/Berrow Flats was inaccessible due to thick mud deposits, but at Black Point approximately 150m south of the cliffs on the southern side of Brean Down, some eroding peat shelves were identified. These were flat-topped and had a roughly L-shaped north-south and east-west orientated erosion edge (**Line No. 10262**; **Plate 283**), with some additional isolated raised areas further south out in the mud flats. This peat was dark reddish-brown with lots of compressed organic plant material including reeds within it. It was even less 'woody' than the peat deposits further to the south, and Richard Brunning (pers. comm.) speculated that it may have been from a lower and earlier peat formation/bed.

- *Stolford:* Many areas of the submerged forest to the north and north-west of Stolford could not be accessed during Phase 2 fieldwork in 2010 and 2011 due to the presence of deep mud deposits. Peat deposits and remains of tree trunks and tree root boles from several different deposits in this area have been previously sampled and dated to *c*. 5000-1000 BC (Carr 1965; Heyworth and Kidson 1982; Kidson and Heyworth 1973; McDonnell 1995). It was possible, however, to access some peat and submerged forest deposits to the north-east of Stolford Farm, and north of Goose Marsh. Here, there were peat deposits and preserved wood only 50m from the shoreline (**Line No. 10304**). The dark reddish-brown peat was quite eroded and blocky, varying in thickness from 0.05-0.40m, and was very 'woody' with branches and tree trunks at least 5m long and 0.5m in diameter visible, along with roots and tree boles (**Plate 284**). At least some of these were oak. These deposits extended westwards but then disappeared underneath mud deposits. The inland, eastwards part of these deposits lay below later stone and cobble layers. These may be the upper peat deposits previously dated to *c*. 1000 BC (Kidson and Heyworth 1973), although the oak samples produced a variety of dates.

  There were some tidal outflow channels that had been cut through the mud by the ebbing tide, and one of these enabled GCCAS staff members to walk out further into the intertidal zone than would otherwise have been possible. In the sides of the channel there were two distinct layers of peat (**Line Nos. 10306, 10307 & 10308, Plate 285**). The upper layer was a very dark grey-black laminated peat approximately 0.05m deep, with the remains of reeds visible along with the occasional snail shell. The second, lower layer was light brown and between 0.10-0.15m thick, with occasional pieces of reed still visible and concentrations of snail shells. This became more clayey towards its base, and lay above a blue-grey clay deposit with mottles of orange-brown organic material. These two peat layers were very different to peat deposit 10304 recorded closer to the shoreline, and they may therefore be from a different formation that reflects different palaeoenvironmental conditions, perhaps equivalent to the lower material dated to *c*. 5000 BC (Kidson and Heyworth 1973).

- *St Audrie's Bay:* At St Audrie's Bay there was an area where a Pleistocene mammoth tooth had been found eroding out of peat deposits (R. Brunning pers. comm.). Unfortunately, only a few small lenses of peat were visible around the find spot, in a thin layer exposed amongst beach cobbles (**Point No. 53**). The peat was very organic and quite silty and had grey clay lying on top of it, with blue-grey clay underneath. The peat was only about 0.05m thick, and it was not clear if this was an *in situ* peat bed, present as a thin layer interdigitated with Pleistocene gravel and cobble deposits, or if it was an eroded block derived from somewhere else further up the foreshore. The peat seemed to be contained within a possible palaeochannel

about 1m wide, cutting through red marl on either side of it and with cobbles lying above. No faunal remains were identified, and it is therefore unclear if the mammoth tooth find therefore came from this channel, or from the deposit it was cutting.

- *Blue Anchor Bay:* To the north and north-west of Blue Anchor Station, towards the western side of Blue Anchor Bay and north of the western end of the concrete sea wall, a series of severely eroded peat deposits were identified beginning approximately 200m north of the existing shoreline. The peat deposits consisted of a series of raised blocks and 'islands' up to 0.40m above the rest of the intertidal surface, many badly eroded and undercut by tidal action forming oddly-shaped small stacks (**Plate 286**). The bulk of the exposures lay within an irregular area *c*. 250m and 80-100m wide, the rough outline of which was recorded using the laser rangefinder (**Line No. 10142**), though several other large outlying blocks were recorded as points (**Point Nos. 30010 & 30011**). The main area of surviving peat exposures is significantly smaller than that recorded on the Somerset HER (35432), and this may reflect the active, ongoing erosion.

  The peat was mainly dark reddish-brown and extremely woody, with many of the blocks formed by peat surviving around masses of tree root boles and fallen branches. There was an upper peat layer up to 0.15m thick, separated from a lower peat by a dark, mottled grey brown clayey marine silt turning into a bluish-grey clay, with flecks and small pieces of charcoal within the upper mixed marine silt deposit. The lower peat was at least 0.25m thick and very dense and compressed, probably by the weight of overlying sediments that had long since eroded away, with flattened but complete roundwood branches. Most of the wood was non-oak but deciduous. Leaves and some reeds were also identifiable within the upper peaty material. The lower peat was often exposed in broad, level shelves with only some mud above, where the overlying clayey silts and upper peat had been eroded away. The lower peat also had root boles, roots and roundwood branches preserved within it, again very compressed. Some of the flattened branches lay in dense accumulations that initially appeared structural (**Plates 287-288**), but closer inspection indicated that this was not the case. The upper and lower peat, and especially the wooden remains, had been subjected to intense boring by marine bivalve 'shipworm' molluscs, with calcite-lined burrows penetrating deeply into the peat and wood. Samples were taken of the wood from the top layer of peat (**Point No. 46**).

  Richard Brunning noted a small projecting piece of wood above the surface of the upper peat, which on excavation proved to be a wooden deciduous roundwood stake at least 0.25m in length imbedded in a lower wooden branch or plank and the lower peat. It is possible that the upper peat had formed around this stake, rather than it having been driven through it, so the stake was sampled for possible future dating purposes (**Point No. 47**). The separate block of peat 20m in length and recorded as Line No. 30011 was further inland than the main peat exposures. The peat was about 0.16m thick, overlying clay, and had some reeds and burnt wood associated with it but much less wood than in the layers recorded further to the north-east. It may be slightly higher and thus a separate peat band than the others recorded at Blue Anchor Bay. Very little work has been done on the peat deposits in Blue Anchor Bay, and given the rapid progress of erosion there should clearly be additional research and detailed sampling in the future as a matter of some urgency.

- *Minehead Bay:* Peat and submerged forest deposits in Minehead Bay have been previously plotted, analysed and dated as part of the Minehead Sea Defence Scheme mitigation work (Jones *et al.* 2005; McDonnell 2001, 33-36; Riley 1996), so this formed a lower priority for the RCZAS fieldwork. The main area of submerged forest at Minehead Bay to the north of Warren Point was associated with finds of prehistoric lithics (Boyd Dawkins 1870; Somerset HER PRNs 35064 & 33782), but

this area could not be accessed at all during the Phase 2 RCZAS fieldwork as the tide levels were unfavourable. The intertidal peat and forest beds indicate a complex mosaic of salt marsh, reed beds and alder carr woodland, fluctuating in extent between *c*. 5670-4360 BC. No peat or submerged forest remains were recorded here during the Minehead Sea Defence Scheme mitigation work, (McDonnell 2001, 33), so it may be that these have already been eroded or buried by sediments. In the centre of Minehead Bay, Phase 2 RCZAS fieldwork recorded a small isolated area of eroded peat less than *c*. 10m across (**Point No. 60**), although as the tide was not very low it was partly submerged and was being inundated by the incoming tide. The peat was very dark grey or black in colour and extremely woody, but was being badly damaged and degraded by wood-boring molluscs. Other small, isolated patches of peat less than 2m across in this general area were photographed but not otherwise recorded.

Approximately 300m to the south-east was a larger area of rapidly eroding peat deposits. Large branches and the remains of tree root boles were associated with a black, twiggy peat 0.10-0.15m thick, occurring in isolated, flat-topped blocks no more than 20m across (**Plate 289**). The peat appeared to lie above the underlying beach sands. Where marine-boring organisms and/or tidal scoring had removed the larger pieces of wood, peat erosion seems to have quickly followed. The peat was recorded both as two points and as a very rough line around the main concentration of eroding blocks (**Line No. 10217**; **Point No. 59**). Some 400m further east on the eastern side of Minehead Bay was another area of eroding peat exposures (**Line No. 10218**; **Point No. 56**), similar to those seen within Line No. 10217 but only 0.05-0.10m thick. Several peat blocks were slightly concave on their upper surface, however, either where they had been deformed by the weight of overlying sediments, or perhaps indicating that some of the peat had formed within a palaeochannel like the example at Berrow Flats. Approximately 200m north of this area, further eroded peat deposits was also recorded (**Line No. 20100**). These were especially fragmented and degraded.

RCZAS Phase 2 Point No. 60 broadly corresponds with the 1996-1999 sample location 027, thought to derive from alder carr and freshwater reed swamp followed by marginal salt marsh; with the base of the peat dated to 5630-5380 cal. BC and the top to 5330-4990 BC (Jones *et al.* 2005, 55, 59, 63, fig. 5, table 3d). RCZAS Line No. 10217 corresponds with sample location 044, where there was a more complex mosaic of alder carr, drier ground and reed swamp fringing standing open pools of water (*ibid*, 56, 59, fig. 5, table 3d). This was replaced by a sequence of alder carr, reed swamp and ultimately marginal salt marsh. The base of the peat at sample location 044 was dated to 4830-4490 cal. BC, and the top of the sequence to 4830-4520 BC. RCZAS Phase 2 Line No. 10218 is probably equivalent to the previous sampling locale 046, where reed swamp or freshwater swamp was identified and the base of the peat was dated to 4710-4360 cal. BC, overlapping with a date for the top of this deposit of 4830-4520 BC (Jones *et al.* 2005, 57, 59, fig. 5, table 3d). Line No. 20100 may mark a western exposure part of sample 047, probably similar in composition and formation to 046 and with its base dated to 4830-4520 cal. BC. Any future palaeoenvironmental research on the peat and submerged forest exposures in Minehead Bay should be in the next five to ten years, as the severe rate of erosion indicates that after this many deposits will have disappeared altogether.

- *Porlock Bay:* The submerged forest and thin peat beds in Porlock Bay have been surveyed and sampled in previous investigations (Canti *et al.* 1996; Edwards 2000; Jennings *et al.* 1998; Straker *et al.* 2004), and were thus a lower priority for the Severn Estuary RCZAS. The remains of alder and oak have been dated to approximately 6000-3000 BC. Part of the submerged forest was accessed in 2009 during the Phase 2a pilot fieldwork, however, and one surviving tree stump was

recorded (**Point No. 50008**; **Plate 290**). Much of the area of submerged forest appeared to have been buried underneath drifting sand deposits, which Richard McDonnell notes as having formed largely within the past ten years (McDonnell 2005, pers. comm.). The previous palaeoenvironmental analyses indicate a complex sequence from the Mesolithic through into the Neolithic, with alder carr followed by a marine transgression and brackish salt marsh, in turn followed by willow and alder carr, and freshwater pools behind a shingle ridge, and then a series of further alternating marine transgressions and alder carr or salt marsh (Canti *et al.* 1996; Jennings *et al.* 1998; Straker *et al.* 2004). Finds of Mesolithic lithics have also been made in the area of the submerged forest, along with a partial aurochs skeleton excavated on the foreshore (Boyd Hawkins 1870; Canti *et al.* 1996, 54; Catchpole and Chadwick 2010a, plate 16; McDonnell 1998). Some timber samples from the submerged forest at Porlock are currently stored at Bristol University but remain undated (P. Gardiner pers. comm.), and any future sampling may be hampered by the sand deposits.

10.17 Finds scatters and eroding archaeological stratigraphy

10.17.1 There are several specific locations within the Severn Estuary RCZAS project area where archaeological stratigraphy and artefacts are actively eroding out of the riverbank or foreshore, or where artefact scatters have been found within the intertidal zone. Although it was clearly not part of a Rapid Coastal Zone Assessment Survey to investigate these sites in detail, the GCCAS team did visit these known occurrences in order to record their current state of preservation/erosion. These results may help inform any future long-term management decisions regarding these sites.

10.17.2 Above Hock Cliff to the south-west of Fretherne in Gloucester, the earthworks of a probable medieval settlement were identified from aerial photographs (Allen 2002, 80-83), and finds of medieval pottery, stone, tile and other artefacts have been made from the cliff top and the foreshore below the cliff. The intertidal area below Hock Cliff was visited during the Severn RCZAS Phase 2 fieldwork, but no artefacts or stratigraphic units were identified.

10.17.3 At Hills Flats near Hill Pill there have been previous finds of prehistoric flint and a Neolithic stone axe (see section 10.15.10 above), in addition to late Iron Age, Roman, medieval and post-medieval pottery (Allen 1990a, 1997, 1998a, 2003b; Allen and Fulford 1987). No artefacts were identified in this area during Phase 2 fieldwork, although the survey was undertaken at a time of low-energy tides when sediment deposition had increased, thus obscuring much of the intertidal surface.

10.17.4 At Oldbury Flats south of Oldbury Power Station, two Neolithic stone axes and Neolithic and early Bronze Age flintwork including cores, blades, scrapers and barbed and tanged arrowheads have been identified by previous researchers (Allen 1990a, 1998b; Brown 2007a, 2007b), close to a known palaeochannel and peat deposits (see section 10.15.10 above). RCZAS Phase 2 fieldwork identified only one piece of worked flint in this locale, however. This single find was unstratified and clearly not *in situ*, but two animal bones associated with peat deposit Line No. 20002 was recovered from this locale (see section 10.15.10 above). Prehistoric flints and wood were also recorded during the construction of the silt lagoon for Oldbury Power Station (Hume 1992).

10.17.5 The rescue excavation work in advance of the lagoon construction also revealed a series of Romano-British features, and it is clear that there was a significant port and/or settlement site located here during this period. Finds from archaeological deposits eroding out of the low sea cliff on the edge of the salt marsh deposits have included pottery, animal bone, iron slag, iron ore, stone, tile including flue tiles and *tegula*, a slate palette and a

dressed stone shaft (Allen 1998a; Allen and Davidson 2007; Allen and Fulford 1987, 1992; Allen and Rippon 1997; Green and Solley 1980). Together with similar finds made 200-300m inland, this evidence suggests a significant Romano-British settlement of potentially high status associated with the series of tidal palaeochannels in this area, perhaps linked to iron production and riverine trade (Allen 2009; Allen and Fulford 1987). A possible Roman-period iron billet was recently found at Oldbury Flats (Kurt Adams pers. comm.).

10.17.6 Part of this area of eroding stratigraphy and finds was visited during Phase 2a and Phase 2 of the RCZAS fieldwork, and the extent of the finds then visible on the foreshore was plotted (**Line No. 20001**). No archaeological features other than finds exposed in the alluvial deposits were visible but a small assemblage of finds was recovered including Romano-British pottery, animal bone, and some of the smaller pieces of iron slag.

10.17.7 On the western bank of the River Parrett at Combwich, underneath the present village, there was probably a small Romano-British settlement and port, evidenced by a series of building floors, pits, skeletal remains and quantities of Romano-British pottery and other finds discovered in the late 1930s and 1950s during clay quarrying (Dewar 1941; Pike and Langdon 1981). Erosion of the western bank of the Parrett at Combwich Pill from 1968-1977 and in 1988 revealed extensive occupation layers, structural remains and further finds, perhaps from the port area (Dennison 1986; Langdon 1988). Although the riverbank along this area was visited during the RCZAS Phase 2a fieldwork, no eroding stratigraphy or finds were identified. Further archaeological work is to be undertaken at Combwich Wharf, in relation to the proposed Hinkley C power station.

10.17.8 North of Horse Pill, Woolaston, an increase in the amount of slag on the foreshore lead the survey team to note a dense layer of slag eroding from under 1.5m of alluvium at the edge of the salt marsh. As the tide and the weather were increasingly menacing this was recorded by GPS photograph only (NGR SO 5826 9751). Although this has not been verified by a specialist the material appeared to include furnace material fused to the slag. No pottery was recovered but this site probably relates to slag and finds of Romano-British date previously reported by Allen and Fulford (1987).

10.18 Field systems, ridge and furrow, rhynes and gripes

10.18.1 In the updated project design for the main Phase 2 fieldwork, it was made clear that any detailed topographic surveys of these earthwork features would be undertaken only as a low priority (Catchpole and Chadwick 2010b, section 9.4, 25). Although earthwork remains of ridge and furrow, rhynes, gripes and other features were mapped as part of the NMP (Crowther and Dickson 2008), the Phase 2a pilot fieldwork suggested that in certain areas such as the river loop at Awre there may be greater archaeological complexity visible on the ground than was apparent from the transcription of the aerial photographs. The updated project design, however, also made clear that topographic earthwork survey of such areas must have a low priority, and that most effort should be concentrated on the intertidal archaeological features.

10.18.2 For these reasons, no such survey work took place during the main Phase 2 fieldwork. As with flood defence banks, in some instances notable examples of ridge and furrow were photographed (**Plate 291**), but they were not otherwise recorded.

10.18.3 During reconnaissance visits made by Adrian Chadwick in April 2010 prior to the start of Phase 2 fieldwork, it became clear that although most of the earthworks forming part of a possible prehistoric or medieval field system on St Thomas' Head, Kewslake, had been plotted by the Phase 1 NMP and earlier surveys, there were several unrecorded banks that could potentially be added to the plotted features. Nevertheless, as noted above,

topographic earthwork survey of this relatively unthreatened area remained a low priority, and no further work was undertaken as part of the Severn Estuary RCZAS.

10.18.4 As discussed below in section 14, at a future date it may be possible for some additional archaeological work to be undertaken in these areas, though not as part of the Severn Estuary RCZAS.

11 Samples and artefacts

11.1 Introduction

11.1.1 This section lists the samples taken from wooden structures during the Phase 2a and Phase 2 fieldwork of the Severn Estuary RCZAS, and the few artefacts recovered during the course of this work.

11.1.2 Assessment of the samples was undertaken by Dr Richard Brunning of Somerset County Council Heritage Service during 2010 and 2011. This preliminary work identified the wood to oak or non-oak species, and assessed which samples might be suitable for dendrochronological and/or radiocarbon dating. Samples recommended for dendrochronological dating were assessed by Nigel Nayling of Trinity Saint David, University of Wales. A prioritised list of structures for radiocarbon dating was drawn up in consultation with English Heritage, who also assessed the individual pieces of wood for suitability. Alex Bayliss at English Heritage arranged for the dating of a preliminary round of samples in late 2011.

11.1.3 It was then agreed that a second round of dating would be undertaken in 2012 and a revised prioritised list of structures was produced. Unfortunately one of three boxes of samples was lost by the courier on route to English Heritage at Fort Cumberland. A further modified programme was then devised in agreement with Peter Marshall at English Heritage and samples assessed for suitability. Those sent for dating were identified by Zoe Hazell. Calibrated dates from both rounds of dating are included below, the results of the radiocarbon dating programme are presented in full in Appendix A.

11.1.4 The final phase of work on the samples comprised species identification of the remaining undated non-oak samples, which has been undertaken by York Archaeological Trust. YAT also produced illustrations of several samples, as recommended by Richard Brunning.

11.1.5 This section presents the results of Richard Brunning's assessments, with the addition of calibrated dates and available species identifications. Samples listed below with no species identifications are mostly those lost by the courier, although a few samples were discarded by the project team or English Heritage Scientific Dating staff due to their poor condition. It also provides brief contextual details of the areas and features from which samples were taken and artefacts recovered. Further collated information regarding the wood samples, including illustrations and photographs of the samples, has been included at Appendix E.

11.1.4 In most cases multiple samples of vertical stakes and in some instances horizontal hurdling were taken from each sample point, but all within a distance of *c*. 0.5-1m from where the GPS reading was taken. Given the accuracy of the handheld GPS dataloggers, it was not considered appropriate to take GPS readings on every single piece of wood retrieved from the intertidal zone. The finds were normally recorded as a GPS point.

11.2 Wooden samples and artefacts

11.2.1 Beachley

11.2.1.1 The archaeological features sampled at Beachley, Gloucestershire, were located in the intertidal zone south between Slime Road, Sedbury and Lyde Rock, with concentrations around NGR ST 5510 9170 and ST 5515 9135.

11.2.1.2 The principal features sampled consisted of a group of two or three V-shaped stake-built fish traps, apparently designed to trap fish on both the incoming and outgoing tides (**Line No. 10004**, **Point Nos. 11 & 104**; **Line No. 10005**, **Point No. 10**; and **Line No. 10006**, **Point Nos. 9 & 105**). Another structure located to the north of this group had a circular stake and hurdle built 'catch basket' located on the outside of the apex of the 'V' (**Line No. 10343**, **Point No. 106**), whereas the other examples had groups of small stakes within the apices, although circular catch baskets may have been present but could not be identified due to the mud present.

11.2.1.3 These fish traps are very similar in appearance to examples recorded and sampled at Oldbury Flats, Aust (see below), but are a type not previously identified or dated, though they share some similarities in form and construction with medieval examples previously investigated at Sudbrook and Magor Pill on the Welsh side of the Severn Estuary (Godbold and Turner 1994; Nayling 1999).

11.2.1.4 In addition, samples were taken from a possible revetment structure that seemed to be associated with one of the fish traps. An isolated worked timber that was sticking out of the mud was also retrieved, and this appears to be the blade of a paddle or an oar, possibly made of ash (**Point No. 6,** identification by Nigel Nayling). It was not associated with any structure, and might have been re-used as a mooring post or an anchoring stake (**Plates 292-295**).

11.2.1.5 The samples obtained from Beachley are:

Line No. 10343, Point No. 106 (fish trap) ***Plates 97-98***
Sampled 8/10/10.

A-D were horizontals, E-G were verticals. All were roundwood with broken ends. Verticals have surface erosion and one eroded end. A, E, and G were oak with *c*. 14, 4 and 11 rings respectively to bark edge. A was cut at one end leaving 1 facet.

106E produced a date of cal AD 775-970 and 106G a date of cal AD 770-970 (Appendix A).

Beachley Point No. 106 (fish trap)										
Point /wood No	Species	Length mm	Diam. /width Mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
106A	Quercus	225	38		Chisel		80	38	flat	20
106B		110	15							
106C		140	25							
106D	Quercus (immature)	104	23							
106E	Quercus	140	51							
106F		140	49							
106G	Quercus	140	58							

Line No. 10343, Point No. 106 (revetment?) ***Plate 242***
Sampled 8/10/10.

Roundwood with ends broken.

Beachley Point No. 106 (revetment)										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
106A (r)		368	69							

Line No. 10004, Point nos. 11 & 104 (fish trap) ***Plates 83, 87 and 88***

Two roundwood stakes; point 11 was immature oak with 11 annual rings, cut in winter. Point 104 was also oak.

Line No. 10005, Point No. 10 (fish trap) and Line 10006, Point Nos. 9 & 105 (fish trap) were all roundwood stakes, lost by couriers before being measured. The stake taken at point 105 was elm.

11.2.2 Woolaston/Grange Pill

11.2.2.1 The archaeological features sampled at Grange Pill, Woolaston, Gloucestershire, were located in the intertidal zone south-east of Woolaston Grange at approximately NGR ST 5918 9800. The principal features sampled consisted of the stakes and woven hurdles, apparently of individual fish baskets, within an area of complex archaeology featuring many such structures (**Line No. 10326**). These features were situated amongst the peat, preserved tree root boles and trunks of late Mesolithic and Neolithic submerged forest deposits, although care was taken to try and ensure that only fish trap structures were sampled. Several different individual features were sampled (**Point Nos. 86, 88, 89 & 90**). Unfortunately, with the exception of Point No. 86, it is not possible to correlate the photographs with the exact sample points, due to differences in the GIS accuracy for those two sets of records on the survey day. Points 88, 89 and 90 thus have to be considered as somewhat generic points and features within the overall spread of these fish baskets.

11.2.2.2 These fish traps are similar in appearance to examples previously recorded and sampled at Grange Pill in 1998 (Townley 1999, 83, fig. 2), although the scale of the published plans does not allow the features identified and recorded during the RCZAS to be directly correlated with the illustrations produced by Townley. Although she took samples, Townley was unable to obtain any ^{14}C dates for these due to lack of funding. Some of the individual basket features at Woolaston are, however, extremely similar to examples found at Sudbrook close to the Second Severn Crossing that produced medieval radiocarbon determinations (Brown *et al.* 2008). There is also an outside possibility that some of the structures sampled may relate to prehistoric occupation near the palaeochannel.

11.2.2.3 In addition, samples were taken from a possible stake and hurdle revetment structure that seemed to be associated with the fish traps but was right on the water's edge of the river channel; as it was only partially visible this could also be the leader arm of another V-shaped fish trap structure (**Line No. 10328**, **Point No. 87**).

11.2.2.4 The samples obtained from Grange Pill, Woolaston are:

Line No. 10326, Point No. 86 (fish basket?)
Sampled 5/10/10.

Four roundwood stakes, all broken or eroded ends. A and B sampled for ^{14}C dating, producing dates of cal AD 880-995 and 895-1025 respectively (Appendix A).

Woolaston Point No. 86										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
86A		348	61							
86B		288	33							
86C		140	21							
86D		112	17							

Line No. 10326, Point No. 88 (fish basket?)
Sampled 5/10/10.

All roundwood stakes with broken bottom ends. All retain bark edge or bark at bottom end. All sampled for species identification. A and D sampled for ^{14}C dating. 88A produced a date of cal AD 900-1025 and 88D a date of cal AD 890-1025 (Appendix A).

Woolaston Point No. 88										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
88A		195	32							
88B		80	26							
88C		100	38							
88D		135	33							
88E		40	33							
88F		70	26							
88G		105	25							
88H		105	25							
88I		105	25							
88J		95	13							

Line No. 10326, Point No. 89 (fish basket?)
Sampled 5/10/10.

Seven stakes, all roundwood with broken or eroded ends and all having at least some bark present. Stakes E-G were all oak with 15, 16 and 7 rings respectively, possibly all branch material. Stakes A-C all had small side branches removed.

89B produced a date of cal AD 900-1025 and 89G a date of cal AD 890-1025 (Appendix A).

Woolaston Point No. 89										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
89A	Alnus	310	34							
89B	Alnus	344	27							
89C		168	25							
89D		298	27							
89E	Quercus	300	67							
89F	Quercus	399	44							
89G	Quercus	450	34							

Line No. 10326, Point No. 90 (fish basket?)
Sampled 5/10/10.

All roundwood stakes with broken ends and eroded tops. Most have bark edge and C and D have bark present. 90B produced a radiocarbon date of cal AD 895-1025 and 90M a date of cal AD 775-980 (Appendix A).

Woolaston Point No. 90										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
90A		82	31							
90B		123								
90C		60	16							
90D		110	16							
90E		80	25							
90F		110	12							
90G		73	11							
90H		110	12							
90I		100	12							
90J		90	15							
90K		45	12							
90L		80	14							
90M		65	15							
90N		145	21							

Line No. 10328, Point No. 87 (revetment/ fish trap leader arm?) **Plate 109**
Sampled 5/10/10.

Four roundwood stakes, all eroded with poor surface condition. A and D were oak with 30 and 14 rings respectively to the bark edge. B and C were sampled for species identification; and A and D sampled for ^{14}C dating. 87A produced a date of cal AD 685-885 and 87D a date of cal AD 830-990.

Woolaston Point No. 87										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
87A	Quercus	245	39							
87B		138	45							
87C		95	22							
87D		168	48							

11.2.3 Unstratified wooden finds from Hills Flats and Oldbury Flats

11.2.3.1 At Hills Flats, approximately 500m north-west of Severn House Farm a rounded piece of wood was discovered lying on top of the intertidal surface, not related to any identifiable archaeological features (**Point No. 44**). It was approximately 0.25m in diameter and 0.12m thick. It appears to have been trimmed or sawn on two sides, but whether its roundedness was intentional or the result of weathering or erosion is not clear. As an unstratified find of unknown function, date and context, its archaeological potential is extremely limited.

11.2.3.2 At Oldbury Flats, 600m south-west of Oldbury Power Station, a short wooden object approximately 0.12m long and 0.01m thick was identified on top of the intertidal surface (**Point No. 30004**). It was circular in cross section with rounded ends, and narrower in the middle than at each end. It may have been a small peg or similar fitting. Although it too was not directly related to any identifiable archaeological features, it was found within a

few metres of three fragmentary stake-built structures (**Line Nos. 20010, 20011 & 20012**); and so might have been associated with one of them. Again, its potential is limited.

11.2.4 Aust

11.2.4.1 The archaeological features sampled from the intertidal zone at Aust were located between Blackstone and Littleton Pill (the southern part of the coastal area referred to as Oldbury Flats), from approximately NGR SO 5735 9035 to SO 5780 9065.

11.2.4.2 The principal features sampled consisted of the stakes and woven hurdles of V-shaped stake-built fish traps. Some examples had groups of small stakes within the apices, for fish baskets, but others had the remains of circular catch baskets attached to the outside of the apices. It is thus not clear if they were all one phase, and designed to trap fish on both the incoming and outgoing tides; if they were targeting different species, or if different phases are represented. The former seems likely. Several isolated circular catch baskets were also recorded, probably the eroded remnants of once larger V-shaped structures.

11.2.4.3 One sample (**Point No. 94**) was taken from the apex of a V-shaped fish trap (**Line No. 10339**) north of Potato Tump, at NGR SO 5767 9054 south-west of the large putcher rank. Most of the leader arms of this structure had eroded away or were not visible, but the apex was relatively well preserved. The apex pointed to the north-east, and the open leader arms to the south-west. To the north-east of the large putcher rank there was a group of three, possibly four V-shaped fish traps, centred at NGR SO 5788 9066. A well-preserved example of one of these (**Line No. 10032**) was sampled, with one sample point on the southern leader arm (**Point No. 99**) and another sample point on the northern leader arm (**Point No. 100**). The apex of 10032 also pointed north-east, and the arms to the south-west. Approximately 170m to the north-east was another group of at least three fish traps centred at NGR 5805 9077. The northernmost of these (**Line No. 10041/10342**) had a relatively well preserved apex, and samples were taken from this (**Point No. 102**).

11.2.4.4 In addition to the V-shaped fish traps, there was also a different, V or T-shaped structure (**Line Nos. 10015 & 10016**), the north-west to south-east aligned 'cross-arm' of which (10015) was sampled (**Point No. 92**).

11.2.4.5 Another large V-shaped stake-built structure faced upstream to the north-east with an apex pointing to the south-west (**Line No. 10021**). This had an apparently later additional line of stakes appended at approximately 60 degrees to its north-western side to create another V-shaped angle facing downstream to the south-west (**Line No. 10022**). The larger V-shaped feature had no clusters of stakes within the upstream facing area of its apex, although a few individual stakes visible to the south-west may represent the remnants of a circular catch basket structure. The downstream facing angle formed by the additional line of stakes, however, did contain stakes that could have supported baskets. A sample was taken from the earlier V-shaped structure 10021 (**Point No. 93**).

11.2.4.6 These fish traps are mostly similar in appearance to the examples recorded and sampled at Beachley (see above).

11.2.4.7 Oldbury Flats is the name used on maps for the coastal area north of the M48 Severn Bridge and was thus also used in the by those on site and most samples labelled Oldbury actually came from Aust parish. The samples obtained from Aust/Oldbury Flats are:

Line No. 10015, Point No. 92 (fish trap) ***Plate 108***
Sampled 7/10/10.

Five stakes in total, with A, D and E broken both ends, B eroded at one end and broken the other. A and B were oak, aged c. 10 years, and both were probably branch material – 92B had several side branches broken off and was placed in the intertidal zone the right way up (i.e. as it grew in life). D still had one spine attached. E was a very knotty small branch with 15 side branches broken off. A-C were sampled for 14C and for species identification. 92A produced two radiocarbon dates with a weighted mean of cal AD 1665-1950 and 92C a date of cal AD 1660-1955 (Appendix A).

Oldbury Point 92										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
92A	Quercus	260	49							
92B		365	65							
92C	Quercus	140	20		CV		50	14	flat	
92D		150	17							
92E		270	18							

Line No. 10021, Point No. 93 (fish trap) ***Plates 104-106***
Sampled 7/10/10.

Four roundwood stakes, with eroded tops and broken bottom ends. 93B had the beginning of a cut to point at its broken end. 93A was oak with *c*. 8 years of growth to bark edge. C was torn over a third of its circumference down all its surviving sides. 93A produced a date of cal AD 660-775 and 93B a date of cal AD 650-775 (Appendix A).

Oldbury Point 93										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
93A	Quercus	230	53							
93B		310	28							
93C		459	80		P	459	100	42	flat	8-20
93D		47	36							

Line No. 10339, Point No. 94 (fish trap)
Sampled 7/10/10.

Two stakes, both roundwood. Both were broken at their bottom ends, B was broken at top end and A was eroded at top end. 94B had quite a few side branches broken off but was pretty straight over its surviving length. 94A and 94B were sampled for ^{14}C dating producing dates of cal AD 660-775 and cal AD 660-780 respectively (Appendix A).

Oldbury Point 94										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
94A		85	29							
94B		95	42							

Line No. 10032, Point No. 99 (fish trap) ***Plates 89 & 93***
Sampled 7/10/10.

Two stakes. A was oak, *c*. 31 rings of which 16 sapwood. Eroded at top, broken at bottom. Radial split and cut on narrow tangential faces over surviving length. B was eroded at top. B was sampled for identification, A was sampled whole for ^{14}C dating. 99A produced a radiocarbon date of cal AD 1025-1205 and 99B a date of cal AD 1180-1280.

Oldbury Point 99										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
99A	Quercus	279	54	31						
99B		70	39							

Line No. 10032, Point No. 100 (fish trap) ***Plates 89 & 93***
Sampled 7/10/10.

All eroded roundwood stakes with broken bottom ends, apart from F where the cut end was retrieved. B-D all had 1 side branch broken off. E had some modern spade damage. A and E sampled for ^{14}C, producing dates of cal AD 1040-1215 and 1045-1225 respectively (Appendix A).

Oldbury Point 100										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
100A		240	42							
100B		170	18							
100C		145	16							
100D		70	19							
100E		240	53							
100F		135	37		CV	135+	59	28	flat	10-14

Line No. 10041/10342, Point No. 102 (fish trap) ***Plate 91***
Sampled 7/10/10.

Radially split oak timber cut to a point over its entire length with *c*. 25 surviving facets. About 20 heartwood rings. Sampled for ^{14}C but may be a problem because no sapwood.

Oldbury Point 102										
Point /wood No	Species	Length mm	Diam /width mm	Thick-Ness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
102A	Quercus	394	55	48	P	394+	100+	40	flat	1-8

11.2.5 Brean Beach, Berrow Flats and Burnham-on-Sea

11.2.5.1 Samples of wood were taken from Brean Beach, Berrow Flats and Burnham during the 2009 Phase 2a pilot fieldwork and during the main Phase 2 survey in 2010. The majority of these samples were taken from a series of locations between approximately NGR ST 2895 5495 in the south, to ST 2895 5647 in the north. There were several samples taken in 2009 from outlying features to the west of this main distribution, and in 2010 from west of Burnham-on-Sea at ST 2976 5020. The bulk of these samples were from wooden stake-built fish traps, with some stakes also being sampled from the arm of a stone-built weir at Black Point (later discarded) and from a stake and brushwood alignment/trackway at Burnham-on-Sea.

11.2.5.2 During the Phase 2a pilot fieldwork in 2009, the use of the Burnham-on-Sea (BARB) rescue hovercraft allowed the GCCAS team to progress further west out across the mud flats than was possible on foot, as deep sucking mud deposits made this area extremely hazardous. Several fragmentary stake alignments were identified and recorded in 2009, though it was difficult to interpret them as the sediment obscured much of the surviving remains. These were 300-400m further west than the features recorded during the main Phase 2 survey work (see below), and indeed, in 2010, it was not possible to access this area at all. The features consisted of short lengths of leader arms formed from lines 2-3 stakes in width. They did not display the same dense 'hedge' construction as those recorded closer to the shore (see below), but they were certainly not modern net hangs. **Point No. 8/50021** was located at ST 2860 5547, and here samples were taken from a small line of stakes, probably part of the same overall structure as **Line No. 9/40017** which was not sampled. To the south-west and centred at ST 2855 5517, samples were also taken from a north-west to south-east orientated series of stakes (**Line No. 11/40018**, **Point No. 14/50024**), and a north-east to south-west alignment (**Line No. 12/40019**, **Point No. 13/50023**). These were not visibly conjoined, and may have been part of two different but abutting structures, or one overall construction. It is also possible that **Line Nos. 9/40017** and **11/40018** were originally part of a much larger V or U-shaped structure at least 230m across. Along part of **Line No. 11/40018**, it appeared that some of the upright 'sails' supporting the hurdle panels in the leader arm had fallen over, but still survived.

11.2.5.3 During the main Phase 2 survey work, more extensive stake-built structures were identified. **Line No. 10251** was orientated north-east to south-west, and it consisted of a line of densely spaced stakes up to 30m long and 0.40m wide, with multiple stakes making up its width. Its north-eastern and south-western extents were both buried under sediment, and the stakes had been inserted through much earlier prehistoric peat deposits. It was sampled part of the way along its length (**Point No. 68**). **Line No. 10252** was some 20-30m north of 10251 but was very similar in construction, though a much greater length of it (*c*. 100m) could be identified. It was on a NNE-SSW orientation, and it is possible that it may have originally been linked with 10251 to form an acute V or 'tick-shaped' fish trap. Several stakes were sampled from near its northern end (**Point No. 69**). An unusual trapezoidal

shaped fish trap was recorded here by the NMP (Crowther and Dickson 2008, 100, fig. 5.24), and it is possible that 10251 and/or 10252 were originally part of this structure.

11.2.5.4 Further north, **Line No. 10257** was again similar in construction and consisted of densely packed stakes forming a 'hedge-like' structure. It was orientated predominantly north-south, but with a very gentle convex curve out to the west. It was traced for at least 180m, but its original northern and southern limits were unclear due to mud, and especially to the north it appeared much more fragmentary and poorly preserved. On its western, seaward side there were several outlying stakes 1-2m away from 10257, set at angles of 45-60 degrees into the intertidal surface and perpendicular to 10257 which may have been 'braces' for the main structure. If this was a fishing structure, it was at an unusual gently oblique angle to the shoreline, unless it had more acute tangential leader arms that were buried by sediment. Samples were taken from approximately halfway along its length (**Point No. 70**). Another short length of this form of densely packed stake structure was recorded *c*. 350m to the north of 10257 and due west of Brean (**Line No. 10260**), and this was sampled (**Point No. 71**) although this was a much more fragmentary and less well-preserved feature. It too was probably once on a predominantly north-south alignment.

11.2.5.5 At the northern end of Berrow Flats at Black Point, Brean Beach, a small group of wooden stakes was identified near the south-eastern end of the leader arm of a stone fish weir. These were sampled, but initial inspection suggested that they were softwood and relatively recent in date. The wood was therefore not retained.

11.2.5.6 At the opposite, southern end of Berrow Flats, approximately 300m from the shoreline on the north-western edge of Burnham-on Sea were the remains of a north-west to south-east orientated wooden structure, identified by Richard McDonnell in 1994 and centred at ST 2975 5020. This consisted of two slightly sinuous lines of stakes 2-2.5m apart, each line featuring a mix of larger stakes and smaller examples. In a few places there were also short lines of stakes visible running down the central area between the two lines, and there were also outlying stakes, especially on the north-east side of the feature. Smaller twigs up to 0.01m in diameter were laid horizontally between some of the vertical stakes, and finer material was also present that may have been the remains of brushwood that Richard McDonnell had noted. This may have been a trackway.

11.2.5.7 Samples of stakes from each of the two main lines were taken for species identification and possible dating purposes (**Line No. 10264, Point No. 76**; **Line No. 10265, Point No. 74**), as well as from a short line of central stakes (**Point No. 77**).

11.2.5.8 During the Phase 2a pilot two stakes were noted embedded in a peat deposit at Brean – one was clearly driven into it, but the other may have been associated with the peat, so this was sampled (**Point No. 3/50016**). It was not possible to determine what this structure may have been.

11.2.5.9 The samples obtained from Berrow Flats/Brean Beach/Burnham Beach are:

Point No. 50016 (2009 point no. 3) (unknown)
Sampled 27/04/09.

Oak roundwood, but with insufficient rings for dendrochronological analysis. Lost by courier.

Point No. 50021(2009 point no. 8) (fish trap?)
Sampled 28/04/09.

An assortment of small roundwood posts. Lost by courier.

Line No. 40018 (2009 no. 11), Point No. 50024 (2009 no. 14) (fish trap?) ***Plate 138***
Sampled 28/04/09.

Nine pieces of roundwood. Lost by courier.

Line No. 40019 (2009 no. 12), Point No. 50023 (2009 no. 13) (fish trap?)
Sampled 28/04/09.

An assortment of roundwood. These pieces are not suitable for dendrochronological analysis. Lost by courier.

Line No. 10251, Point No. 68 (fish trap?) ***Plate 137***
Sampled 01/09/10.

Samples 68A-N were all roundwood stakes, all with eroded tops and most broken off near the tips because they were so hard to extract. Bark was still present on many of the stakes (A, B, C, H, I and M). About half the stakes had one or more side branches cut off. It was possible to determine the orientation of five stakes (D, F, I, J and K), all of which had been inserted into the intertidal surface the right way up (i.e. as they grew in life). All stakes were willow. L and N were cut in spring, the remainder in winter. 68A and 68E have been drawn (Appendix E).

Berrow Flats Point 68
Photographed wood in bold

Point /wood No	Species	Length mm	Diam/ width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
68A	Salix	268	32		Pencil 5+2+2	195	67	25	flat	5-6
68B	Salix	45	23+		Wedge variant	45+	45+	-	flat	-
68C	Salix	90	23		Wedge variant	90+	-	16	Flat	5-10
68D	Salix	275+	32	Tip missing	pencil	140+	37	23	Flat	3
68E	Salix	290+	37	10mm of tip missing	Wedge variant	290+	80	25	Flat	4-5
68F	Salix	75+	29		Beginning of cut on one side at broken end					
68G	Salix	50+	35							
68H	Salix	70+	22							
68I	Salix	160+	45	Tip missing	Wedge?	53+	53+	34	Flat	4
68J	Salix	90+	37							
68K	Salix	158+	38	Tip missing	Wedge?	77+	-	26	Flat	-
68L	Salix	60+	30	Tip missing	Wedge?	60+	-	23	Flat	-
68M	Salix	96+	24							
68N	Salix	123+	30	Tip missing	Wedge?	57+	-	19	Flat	-

Line No. 10252, Point No. 69 (fish trap?) ***Plates 133-134***
Sampled 01/09/10.

Samples 69A-X. These 24 pieces were all roundwood stakes that had been sampled for species identification and potential ^{14}C dating. All had erosion at their upper ends and were broken off at their lower ends. None retained any bark. All were moderately knotty and nine had had 1-4 side branches cut off. It was possible to determine the orientation of 8 pieces (B, C, D, M, O, U, W and X), all of which had been inserted into the intertidal surface the right way up (i.e. as they grew in life).

Berrow Flats Point 69										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
69A	Alnus	138+	42+	Cut on one side over 45mm						
69B	Salix	103+	31							
69C	Salix	150+	33							
69D	Salix	180+	32							
69E	Salix	110+	30							
69F	Salix	79+	32							
69G	Salix	89+	35							
69H	Salix	102+	26							
69I	Salix	75+	28	Beginnings of cuts on two sides so poss. wedge point						
69J	Salix	77+	21							
69K	Salix	65+	16							
69L	Alnus	40+	16							
69M	Alnus	70+	22							
69N	Salix	98+	22							
69O	Alnus	95+	30							
69P	Salix	125+	30							
69Q	Salix	75+	31							
69R	Salix	95+	25	Beginning of cuts on two sides						
69S	Salix	70+	26							
69T	Salix	65+	24							
69U	Viburnum opulus L / V Lantana L	70+	24							
69V	Salix	80+	38							
69W	Alnus	235	26		wedge	110	-	21	flat	1-2
69X	Salix	100+	37							

Line No. 10257, Point No. 70 (fish trap?) ***Plates 135-136***
Sampled 02/09/10.

Samples 70A-X. Stakes A-E were roundwood 'braces' for a possible fish weir, set at angles into the intertidal surface. The others were stakes from the same structure, apart from 70S that was a tangential woodchip cut at both ends and is probably broken down one side, so was probably wider originally. The stakes retained their bark and were eroded at their top ends, and all their bottom ends were broken with the tips of the stakes remaining *in situ*. Stake 70B was inserted upside down and stakes 70E, F, H, K-R and V were placed the right way up (i.e. as they grew in life). Samples 70W and X were very small and were perhaps woven horizontals. All were sampled for species identification. Stake 70B produced a radiocarbon date of cal AD 1665-1950 and 70U a date of cal AD 1650-1955 (Appendix A).

Berrow Flats Point 70
Photographed wood in bold

Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
70A	Salix	98+	22							
70B	Alnus	340+	28							
70C	Salix	182+	22							
70D	Alnus	203+	26							
70E	Alnus	118+	28							
70F	Corylus avellana L	68	16							
70G	Corylus avellana L	74	16							
70H	Alnus	73	16							
70I	Alnus	80	26							
70J	Alnus	95	25							
70K	Alnus	85	29							
70L	Alnus	95	24							
70M	Corylus avellana L	130	22							
70N	Fraxinus excelsior L	110	32							
70O	Corylus avellana L	88	23							
70P	Alnus	130	27							
70Q	Alnus	119	30							
70R	Alnus	110	25							
70S	Pinus sylvestris L	39	42	8				42+	flat	
70T	Corylus avellana L	62	16							
70U	Corylus avellana L	200	35							
70V	Salix	53	17							
70W	Salix	86	11							
70X	Alnus	64	6							

Line No. 10260, Point No. 71 (fish trap?)
Sampled 02/09/10.
Samples 71A-O. These were all samples from stakes in structure 10260. All were broken off at their bottom ends, leaving the cut tips *in situ*. It was possible to determine the orientation of 8 of the pieces, 7 of which (B, C, D, G, H, J and M) had been inserted into the intertidal surface the right way up (i.e. as they had grown in life); and one (A) upside down. Several of the stakes had side branches cut or broken off. Stake 71I had the beginnings of a cut point that included a 'jam curve', where the axe blade had come to rest in the wood leaving the impression of the cutting edge. This was 36mm wide and flat.

Berrow Flats Point 71
Photographed wood in bold

Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
71A	Salix	99+	19							
71B	Alnus	146+	26							
71C	Alnus	140+	25							
71D	Alnus	100+	21							
71E	Alnus	50+	32							
71F	Alnus	53+	30							
71G	Alnus	180+	28							
71H	Alnus	205+	31							
71I	Alnus	340+	40		wedge	115+	115+	36	Flat	1-4
71J	Alnus	60+	21							
71K	Alnus	110+	35							
71L	Alnus	120+	35							
71M	Salix	110+	25							
71N	Alnus	80+	35							
71O	Alnus	180+	28							

Line No. 10265, Point No. 74 (trackway?)
Sampled 20/09/10.

Stakes 74A-M. All roundwood, broken off at their bottom ends. No facets visible on extracted lengths. Bark only present on 5 examples (B, C, E, F and G). Stakes D-K were all inserted into the intertidal surface the right way up (i.e. as they grew in life). It was not possible with the other examples to identify which way they had been put in. The stakes had between 1 and 4 (C) side branches cut off.

Burnham-on-Sea Point 74

Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
74A		175+	17							
74B		215+	15							
74C		180+	16							
74D		180+	19							
74E		120+	16							
74F		150+	17							
74G		85+	13							
74H		160+	21							
74I		120+	23							
74J	Salix	210+	33							
74K		160+	29							
74L		110+	31							
74M		90+	34							

Line No. 10264, Point No. 76 (trackway?)
Sampled 07/09/10.

Sample 76 consisted of roundwood, moderately knotty. Numerous side branches removed but quite straight. Four side branches were cut off. The last part of the tip was broken off *in situ*.

Samples 76A-76R were all short samples from the stake lines, all missing their tips, which were left *in situ* apart from 76B. Stakes A-M were vertical elements, and N-R were horizontal elements. Stakes 76 S-U were stakes set at an angle (braces?). All were roundwood that retained their bark, apart from 76B which did not have bark left on it. In 7 cases it was possible to determine which way up the stake had been inserted into the intertidal surface. Five examples (D, F, I, M and T) had been inserted in the same way as they grew; and two (H and S) were placed upside down. 76B has been drawn (Appendix E).

Sample 76C produced a radiocarbon date of cal AD 1650-1955 and 76M a date of cal AD 1640-1955 (Appendix A).

Burnham-on-Sea Point 76
Photographed wood in bold

Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
76		450	42		Pencil	210+	40	30	flat	2-4
76A	Salix	130+	20							
76B	Salix	184+	16		Wedge variant		61	16	flat	6-15
76C	Salix	130+	17							
76D	Salix	185+	18							
76E	Salix	240+	19							
76F	Salix	240+	20							
76G	Salix	250+	19							
76H	Salix	310+	26							
76I	Salix	260+	20							
76J	Salix	140+	16							
76K	Salix	114+	20							
76L	Salix	198+	38							
76M	Salix	290+	37							
76N	Salix	148+	15							
76O	Salix	139+	7							
76P	Salix	63+	7							
76Q	Salix	57+	8							
76R	Salix	63+	6							
76S		120	14		Chisel	76	46	11	-	-
76T		230+	22							
76U		300+	20							

Line No. 10264-10265, Point No. 77 (trackway?)
Sampled 07/09/10.

Sample points 77A-C. Three roundwood stakes. Stake 77A still had bark attached, but the other two did not. No facets were visible. All were broken off at their tips.

Burnham-on-Sea Point 77

Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
77A	Salix	90+	27							
77B	Salix	160+	23							
77C	Salix	110+	33							

11.2.6 Stert Flats

11.2.6.1 Fish strap structures at Stert Flats were recorded during the Phase 2a and Phase 2 RCZAS surveys, accessing many of the V-shaped wooden fish traps recorded in earlier surveys (e.g. Brunning 2008; McDonnell 1995, 2003b). Some of these structures have been dated to the Anglo-Saxon period, as early as the eighth and ninth centuries AD, with the construction and use of others extending into the thirteenth century. The state of preservation of some previously recorded structures was noted, but the RCZAS survey work also identified several new structures not previously recorded.

11.2.6.2 Although later putt or putcher ranks were recorded at Stert, the survey and sampling targeted the V-shaped fish traps, with the exception of **Line No. 10274**, a probable putt or putcher rank of post-medieval medieval or later date, and **Line No. 10282**, one of the 'zigzag' wooden fish traps plotted by the NMP aerial survey and recorded and sampled by previous researchers (Brunning 2008, 76, structure 054). This may possibly be fifteenth to seventeenth century in date. The large fish trap of densely packed 'hedge' stake construction and its associated stone bank was also not sampled, as previous sampling work has confirmed that exotic tree species of post-medieval date form part of its construction. Although the origins of this structure may be earlier, only very detailed recording and planning would be able to ascertain the likely development of this feature, and this was not possible in a RCZAS survey.

11.2.6.3 In the rush to take and record as many samples as possible from this challenging area of intertidal zone, not all samples taken were assigned a sample point number, but they retain their line number attributions instead. This does, however, mean that whereas with the sample points the samples can be located to within *c*. 0.5m, the position these samples were taken from has not been recorded, other than somewhere along the line of that feature.

11.2.6.4 The wooden fish traps on Stert Flats were generally quite large, V or tick-shaped structures, designed to catch fish on the falling tides draining to the west or north-west. They had long leader arms formed of lines of single or double stakes up to 80mm in diameter, usually less densely packed and more fragmentary than those recorded at Beachley, Oldbury Flats and Berrow Flats. These stakes, mostly roundwood but with some split examples, were very low and eroded due to tidal scouring (e.g. **Line Nos. 10284, 20107-20109, 20117, 20118 & 20120**), and parts of the leader arms were also buried by drifting sediments. Of the new and previously unidentified structures, most consisted only of very fragmentary remains of stake-built leader arms or small groups of stakes. The Phase 2 survey did show that some previously recorded structures such as Structures 203, 307 and 308 (Brunning 2008, 72, fig. 4) were probably just part of a much more complex sequence of three to four different builds or rebuilds, all in the same approximate location (**Line Nos. 10267, 10268, 10269, 10271 & 10272**).

11.2.6.5 The samples obtained from Stert are:

Line No. 10269, Point No. 78 (fish trap) ***Plate 121***
Sampled 08/09/2010.

Six small samples were taken (78A-F) for species identification from the tops of roundwood stakes. None retained their bark. Four of these roundwood were young oak aged 18 (A), 16 (C), 13 (D) and 9 (F). Samples A and E had the beginnings of cutting to a point on 1 and 3 sides respectively, hence their maximum diameter is uncertain. Two larger samples (G and H) were also taken. 78G was a piece of 14 year old oak (no bark) that was broken at both its top and bottom but had traces of cutting to a point on one side. 78H was a piece of roundwood that retained its bark on one side.

Stert Flats Point 78										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
78A	Quercus	70+	49+							
78B	Salix	75+	54							
78C	Quercus	90+	41							
78D	Quercus	60+	54							
78E	Salix	75+	65+							
78F	Quercus	55+	40							
78G	Quercus	250+	45		Chisel	62+	28	19	Flat	2
78H	Salix	290	68		Chisel	76	70	39	Flat	1-12

Line No. 10267, Point No. 79 (fish trap)
Sampled 08/09/2010.

Two oak posts were sampled from this line. 79A was a radially split oak post of rectangular cross section with *c*. 100/110 heartwood rings. No sapwood was noted. It was badly eroded over the top 200mm, had suffered from probable spade damage near its cut end and had broken in two during extraction. The final part of the tip was left *in situ*. The maximum facet width of 82mm was measured in several places, suggesting that that might be the full blade width. No sharp jam curves were noted but in several the rough impression of the blade edge was left, which was straight. Eroded top discarded after dendrochronological sampling.

79B was a radially split oak post of rectangular cross section with *c*. 145 heartwood rings. No sapwood was noted. It was eroded over its top 130mm. It has a fairly flat top suggesting that it may have been previously sampled. If this was the case the previous sample did not reflect the full dimensions of the timber. About 100mm of the tip was not recovered but left *in situ*. Some slight spade damage was suffered during extraction. It had been cut to a point over its surviving uneroded length on its two narrow sides, with additional reduction on its split radial sides over the last 170mm. Eroded top discarded after dendrochronological sampling.

Both these samples have been submitted to Nigel Nayling for dendrochronological dating outside of the RCZAS programme. They are due to be reported upon in a revised version of Centre for Archaeology report 43/2004 (Groves *et al* 2004).

Stert Flats Point 79 Photographed wood in bold										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
79A	Quercus	590+	120	58	Pencil	390+	65	82	Flat	1-8
79B	Quercus	480+	127	51	Pencil	350+	116	52	Flat	1-9

Line No. 20120, Point No. 81 (fish trap)
Sampled 08/09/2010.
The top of one stake was sampled from this point. It was a very eroded piece of oak roundwood over 7 years of age. Further samples (point 30018 below) were taken from this line the next day. The GPS location recorded for this structure was significantly removed (by 185m) from line 20120. Although this could have been due to GPS error, this would have been a unique aberration by the equipment used during the project, and the likelihood that the sample was not from the feature resulted in a decision to suggest dating of samples from point 30021 only.

Stert Flats Point 81										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
81	Quercus	140+	33+							

Line No. 10271 (fish trap) ***Plates 120 & 125***
Sampled 08/09/2010.

Two samples were taken from this line. 10271A was a half split piece of straight grained oak with only about 37 rings. No bark was present and one side branch had been removed. The top 200mm was very decayed and eroded. Below that it had been cut on all four sides towards a point, leaving 66 facets. Some modern spade damage is present, sustained during its extraction. It is probably missing *c*. 100mm of its tip, which could not be extracted. The widest facet was concave in its cross section profile but several of the others were fairly flat.

10271B was a knotty 11 year old oak roundwood, branching into three at its top end with another branch just below that. The pith was not central and it is probably a branch timber. Traces of bark were present in places. It was cut on three sides to a point but the last part of the tip was not recovered. The tool used had a blade edge profile that was flat over at least 55mm (the widest surviving facet. Facet junctions were a mixture of stepped and clean. 14 facets were visible. The facets were also very slightly concave along their length. It had suffered considerable modern spade damage during extraction.

Sample 10271A produced a radiocarbon date of cal AD 1020-1170 and 10271B a date of cal AD 1030-1215 (Appendix A).

Stert Flats Line 10271 Photographed wood in bold										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
10271A	Quercus	725+	135	65	Pencil	500+	75	80	Concave	2-6
10271B	Quercus	510+	75		Pencil		53	55	Flat to sl.concave	4

Line No. 10274 (putt/putcher? rank)
Sampled 08/09/2010.

Eleven samples were taken from this structure, a double line of stakes that probably represents a post-medieval putt or putcher rank. Samples A-F were taken from on the inshore side, samples G-K were from the offshore side. All the samples were just the eroded tops of small stakes, so none of the recorded diameters represented the original dimensions of the roundwood. None had any bark as they had all suffered from erosion. No tool marks were visible. If they had been present that high up on the stakes all traces would probably have been removed by erosion.

Stert Flats Line 10274										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
10274A		50+	56+							
10274B		85+	49+							
10274C	Ulmus	60+	34+							
10274D		60+	50+							
10274E		60+	42+							
10274F		60+	38+							
10274G		75+	49+							
10274H	Ulmus	70+	31+							
10274I		98+	46+							
10274J		38+	38+							
10274K		40+	40+							

Line No. 10282 ('zigzag' line of fish traps)
Sampled 08/09/2010.

10282/3A was a radially split piece of oak with *c*. 45 heartwood rings surviving and a classic triangular cross section, with a small side branch removed at the outer edge. This was only a sample from the top of the stake so its dimensions further down are probably larger. The top part of the stake had been heavily eroded and at the contact point with the ground surface had worn away to almost completely nothing. After a little more erosion the top would have broken off and it would have been hard to spot the stake on the surface.

The sample has been submitted for dendrochronological dating outside of the RCZAS programme. It is due to be reported upon in a revised version of Centre for Archaeology report 43/2004 (Groves *et al* 2004).

Stert Flats Line 10282 Photographed wood in bold										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
10282/3A	Quercus	480+	75	42						

Line No. 10292 (fish trap)
Sampled 08/09/2010.

A single sample was taken from this structure. This was a radially split oak with *c*. 47 heartwood and sapwood rings. It was very eroded at its top end and the tip (*c*. 70mm) broke off during extraction and was left *in situ*. It had been cut towards a point on its two narrow sides over 130mm.

Stert Flats Line 10292 Photographed wood in bold										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
10292	Quercus	220+	72	32	Pencil?	130+	57	27	Flat	8-11

Line No. 20108, Point No. 30016 (fish trap) ***Plate 123***
Sampled 08/09/2010.

A single timber was removed from this structure. This was a radially split oak post of *c*. 36 heartwood rings. It had been cut to a point on four sides with 12 well preserved facets, some of which were stepped. A jam curve was present where the cutting blade came to rest in the wood showing the blade profile was dead flat over a 42mm length. This was probably not the full blade width as the maximum facet width was 67mm. The stake has been drawn (Appendix E).

Stert Flats Point 30016 Photographed wood in bold										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
30016	Quercus	570	68	46	Pencil	245	64	67	Flat	1-10

Line No. 20111, Point No. 30017 (fish trap)
Sampled 08/09/2010.

Two timbers were sampled from this line, both of which were the eroded tops of stakes, the worked ends being left *in situ*. 30017A was a radially split oak timber with only *c*. 41 heartwood rings. No facets were visible on the sample extracted.

30017B was a roundwood stake with no bark. It had been cut on two sides over its surviving length. Its radius was 38mm.

Stert Flats Point 30017										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
30017A	Quercus	220+	72	29						
30017B	Corylus avellana L	145+	56	55	wedge?	145+	55	54	Flat	2

Line No. 20117, Point No. 30018 (fish trap)
Sampled 09/09/2010.

Three stakes were sampled from this line, none of which were complete lengths. 30018A was a piece of roundwood that had been cut on all sides towards a point. Several jam curves reflected a straight blade edge over at least a 28mm width. It was finely finished and some stepped facets had been trimmed flat.

30018B was a roundwood stake with surviving bark, which had been inserted into the intertidal surface the right way up (i.e. as it grew in life).

30018C was a roundwood that had traces of bark. It had been cut on all side towards a point. A jam curve showed the profile of the cutting blade was straight over at least a 34mm width.

Stert Flats Point 30018										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
30018A	Alnus	205+	47	47	Pencil	205+	60	28	Flat	1-3
30018B		115+	59							
30018C		80+	48		Pencil	80	-	34	Flat	1-10

Line No. 20118, Point No. 30019 (fish trap)
Sampled 09/09/2010.

The samples included 6 small fragments of oak heartwood (max. 140mm long) derived from radially split timbers. They had 20 or less heartwood rings. These presumably represent the broken remains of oak stakes. One larger piece of radially split oak had *c*. 20 heartwood rings. It was 420mm long, 50mm wide and 32mm thick and had broken into two pieces. It had one big knot but no clear tool marks. It presumably represents the top of a very eroded stake.

Stert Flats Point 30019										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
30019	Quercus	420+	50	32						

Line No. 20120, Point No. 30021 (fish trap)
Sampled 09/09/2010.
Eight roundwood samples were taken from this structure, none of which had bark remaining or any trace of side branches. None were complete, but four had traces of cutting to a length. One of these (30021H) had a jam curve, showing that the cutting blade had a straight profile over at least a 24mm width.

Sample 30021G produced a radiocarbon date of cal AD 900-1030 and 30021H a date of cal AD 1020-1170. The dates are statistically different and either one is an outlier or the later date represents a repair (Appendix A).

Stert Flats Point 30021										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
30021A		120+	50+		Pencil			25	Flat	2-3
30021B		60+	45+							
30021C		65+	42+							
30021D		70+	38+							
30021E		50+	39+							
30021F		115+	30+		Pencil	115+	-	31	Flat	1-2
30021G	Corylus/ Alnus	145+	40+		Pencil	145+	-	27	Flat	1-3
30021H	Corylus/ Alnus	197+	37+		Pencil	197+	-	24	Flat	1-3

11.2.7 Blue Anchor Bay

11.2.7.1 At Blue Anchor Bay in Somerset, samples were taken of wood from peat deposits (**Line No. 10142, Point No. 46**), centred at NGR ST 0205 4375. Wood samples were taken from both the upper and lower peat deposits. In addition, a wooden stake from the same location that penetrated both peat bands was excavated and retained (**Point No. 47**).

11.2.7.2 A series of wooden stakes were identified from underneath the dispersed leader arm of a stone fish weir in Blue Anchor Bay, centred at ST 0193 4403. These were also sampled (**Line No. 20039**, **Point No. 30008**).

11.2.7.3 The samples obtained from Blue Anchor Bay are:

Line No. 10142, Point No. 46 (peat) ***Plate 286***
Sampled 28/07/2010.

Lower peat – A single sample was taken from the lower peat. This was a piece of very compressed roundwood. The sample was taken from a much longer horizontal timber, which was well stratified in the lower peat, and is therefore broken at both ends. The length of the sample was 195mm, width 125mm and thickness 40mm. There was considerable attack by marine molluscs on its upper side that had tunnelled into the wood.

Upper peat – Four samples were taken from the upper peat deposit. All of them were very compressed and had suffered considerable attack from marine molluscs that had tunnelled into the wood. Samples C and D were lifted as one block that, upon examination, proved to be mainly the detrital muddy peat with two separate pieces of wood.

A – very knotty roundwood, possibly root. Length 100mm, width 40mm, thickness 32mm. Outer edge present.

B – Knotty roundwood, bark present on one side. Length 120mm, width 39mm thickness 11mm.

C – Roundwood fragment with some bark still attached. Length 90mm, width 27mm and thickness 15mm

D – Knotty roundwood, possibly root. Bark on one side. Length 60mm, width 34mm and thickness 16mm.

Line No. 10142, Point No. 47 (wooden stake in peat)
Sampled 28/07/2010.

Stake driven through upper peat and into lower peat where the end rested against a horizontal timber that prevented further downward progress. The stake was 258mm long and 26mm in diameter. It was formed from a radially split piece of wood that had been turned into the round. The top end was very eroded and decayed and projected *c*. 80mm above the upper peat surface. The bottom end showed no sign of cutting to a point but instead appeared to have been snapped or broken off. The stake appears to have been a handle or shaft from a tool that was broken and inserted into the peat. It was very solid and is probably not of any great antiquity.

Blue Anchor Bay Point 47										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
47		258	26							

Line No. 20039, Point No. 30008 (stakes underneath stone fish weir) ***Plate 42***
Sampled 28/07/2010.

All the samples from this weir were vertical stakes taken over a distance of *c*. 1.2m. The stakes were densely packed, forming a near continuous line with no gaps. Only some stakes projected above the turbid water so it was not possible to see them all, and many were located by touch rather than by sight. The short length of many extracted stakes suggests that others could have been lost to erosion in the recent past. This may explain the absence of other stakes in the structure, although it is possible that additional ones could have been obscured by the stones and water. The considerable suction meant that many of the pieces are broken as the tip could not be extracted. All the stakes showed signs of erosion and decay, and several had evidence of recent attack by wood-boring marine molluscs. The remaining stakes are at considerable risk of erosion and decay.

Some of the timbers displayed axe cuts made by iron (or steel) blades.

30008-1 was not sapwood. Well preserved over lower half. Tip virtually all present. Radial conversion. Cut on four sides to form a point, on (narrower) tangential faces over whole length and radial faces over 70mm. Facets flat, cut at 9-12 degrees, max width 27mm. Oak. Around *c*. 46 heartwood rings visible. Possible candidate for dendrochronology.

30008-2 was not sapwood. Tip broken off during extraction. Radial conversion. Cut on 4 sides to form point, facets flat, cut at 5-8 degrees, max width 41+mm. Poor surface condition except at very tip. Oak. Around *c*. 46 heartwood rings visible. Possible candidate for dendrochronology.

30008-3 was radially split and reduced tangentially. No sapwood. Radial conversion. Cut on 4 sides to form point, longest cuts on narrow radial sides. Tip crushed but intact. Facets flat, 30mm+ wide, cut at 1-8 degrees. Oak. Around *c*. 55 heartwood rings visible. Possible candidate for dendrochronology.

30008-4 had both ends broken. Whole conversion. No bark. Oak. Around *c*. 9 sapwood rings visible. It produced a radiocarbon date of cal AD 1015-1155 (Appendix A).

30008-5 had both ends broken. Whole conversion. No bark. Oak. Around *c*. 9 sapwood rings visible.

30008-6 had both ends broken. Whole conversion. No bark. One side branch cut off near one end with part of flat facet. Oak. Around *c*. 9 sapwood rings visible. It produced a radiocarbon date of cal AD 985-1120 (Appendix A).

30008-7 had both ends broken. Whole conversion. No bark. Three axe facets showing lower end is where it is beginning to be cut to a point, facets flat, 20mm wide, cut at 10-15 degrees. Good surface condition near tip. Unknown species, for species identification?

30008-8 had both ends broken. Whole conversion. No bark. Only part of the tip was broken off upon extraction, therefore almost full length. Cut on all sides to form pencil point, with flat facets, 20mm wide, cut at 3-12 degrees. Unknown species, for species ID?

30008-9 was an unused number.

30008-10 had no bark. Whole conversion. Cut to a pencil point, facets flat, 20mm wide, cut at 5-12 degrees. Oak. Around *c*. 18 sapwood rings visible.

30008-11 had no bark. Cut on all side to form pencil point, facets flat, 26mm wide, cut at 2-4 degrees. Oak. Around *c*. 13 sapwood rings visible.

30008-12 had no bark. Whole conversion. Trace of axe cut on one side. Bottom end broken. Oak. Around *c*. 6 sapwood rings visible.

30008-13 had no bark. Tip broken. Whole conversion. Trace of axe cut on one side. Oak. Around *c*. 13 sapwood rings visible.

30008-14 had its tip broken off. Tangential in cross section, probably from a radial split that was subsequently split tangentially. Cut over whole surviving length on the 2 narrow radial sides towards a point. Facets flat, 20mm wide, cut at *c*. 2 degrees. Oak. Around *c*. 16 heartwood rings visible.

30008-15 was almost complete to tip, probably only *c*. 10mm missing. Radial conversion. Cut on narrow sides to form point and possibly on the other sides too but poor surface survival. Oak. Around *c*. 35 heartwood rings visible.

30008-16 was radially split from the very centre of the tree. Radial conversion one eighth. Cut to a point on all three sides. Flat facets, 20mm wide, cut at 5-15 degrees. Poor survival of tool marks due to decay. Oak. Around *c*. 22 heartwood rings visible.

30008-17 was tangential in cross section, probably from a radial split that was subsequently split tangentially. Tip missing. Cut on narrow sides and one of the larger sides to form a point. Facets flat, 31mm wide, cut at 1-10 degrees. Oak. Around *c*. 6 sapwood rings visible.

30008-18 had a complete tip. Radial conversion. Cut on 5 sides to from a pencil point. Facets flat, 26mm wide, cut at 1-10 degrees. Oak. Around *c*. 10 heartwood rings visible.

30008-19 had a complete tip. Radial conversion. Cut on 5 sides to produce pencil point, with one radial side left uncut. Facets flat, 35mm wide, cut at 1-12 degrees. Oak. Around *c*. 30 heartwood rings visible.

30008-20 was radially split from the very centre of the tree. Radial conversion. Cut to a point on all three sides. Flat facets, 48?mm wide, cut at 1-4 degrees. Oak. Around *c*. 36 heartwood rings visible.

Blue Anchor Bay Point 30008 Photographed wood in bold										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
1	Quercus	321	50	35						
2	Quercus	267+	50	39						
3	Quercus	290	60	47						
4	Quercus	100+	-	34						
5	Quercus	40+	-	34						
6	Quercus	35+	-	35						
7	Quercus (immature)	75+	-	33						
8	Alnus	122+	-	44						
10	Quercus	88	-	47+						
11	Quercus (immature)	78+	-	47+						
12	Quercus (immature)	34+	-	34						
13	Quercus (immature)	47+	-	33						
14	Quercus (immature)	110+	40	16						
15	Quercus (immature)	125	47	20						
16	Quercus (immature)	118	29	28						
17	Quercus	135+	32	18						
18	Quercus (immature)	197	44	34						
19	Quercus	257	45	34						
20	Quercus	284	50	31						

11.2.8 Minehead Bay

11.2.8.1 The location of sample **Point No. 61** was situated at approximately NGR SS 9769 4695, at the northernmost visible end of probable stone fish weir **Line No. 10226**.

11.2.8.2 The samples obtained from Minehead Bay are:

Line No. 10226, Point No. 61 (stone fish weir)
Sampled 23/08/10.

Both stakes felt very solid and the wood was well-preserved, suggesting that they are recent in date. Both were sampled for species identification. They were regarded as probably too recent to warrant ^{14}C dating, which was confirmed by their identification as probably Douglas Fir.

61A – Stake. Complete tip, top eroded. Length 204mm, width 37mm, thickness 37mm. Cut on four sides over whole surviving length. Facets flat cut at 3-8 degrees. Max. facet width 37mm. The stake has been drawn (Appendix E).

61B – Stake. Tip and top broken off. Length 105+mm, width 40mm, thickness 35mm. Cut on four sides over whole surviving length. Facets flat cut at 1-18 degrees, max. width 30mm.

Minehead Bay Point 61										
Point /wood No	Species	Length mm	Diam /width mm	Thickness mm	Point type	Cut to point over	Facet length max	Facet width max	Facet cross profile	Angle of cuts
61A	cf Pseudotsuga menziesii	204	37	37		4 sides		37mm	Flat	3-8°
61B	cf Pseudotsuga menziesii	105+	40	35		4 sides		30mm	Flat	1-18°

11.3 Ceramics

11.3.1 Pottery

by Dr Jane Timby

Three sherds recovered from the Severn Estuary RCZAS project were submitted for identification. These sherds are:

Line No. 10149. *Blue Anchor Bay*. Phase 2. 29/07/2010.

Rimsherd from a plain, glazed red earthenware large, deep bowl or pancheon. Clear glazed. Water worn break with barnacles adhering. Weight: 415g. Date: 17th -19th century. Found adjacent to a V-shaped stone fish weir.

Point No. 8. *Beachley*. Phase 2. 11/06/2010.

Rimsherd from a large North Devon gravel-tempered bowl with an internal green glaze. Weight: 229g. Date: Late 17th -18th century. Found adjacent to a group of large stakes (**Point No. 8**), some possibly set at an oblique angle to the river channel.

Point No. 50022. *Berrow Flats*. Phase 2a. 28/04/2009. **Plate 296**

Rimsherd from a large shallow dish. Internally white-slipped with a clear glaze. S-graffito spiral-style decoration on the rim flange, and an incised, bisected circle in the centre surround by impressed stab marks. Possibly South Somerset ware. Weight: 437g. Date: Late 17th -18th century. Found adjacent to a wooden stake-built structure (**Line No. 40017**) that may be the leader arm of a fish trap.

11.3.2 Clay pipe

Line 10054. *Littleton, Aust*

Clay pipe, bowl and 60mm of stem, no stamps or any form of decoration, pronounced spur. Burnt tobacco in bowl when found. Possibly early 19th century? Retained as located immediately adjacent to putt rank 10054.

11.4 Other finds collected

Point 6. *Beachley*

Oar blade recovered at Beachley, Glos (**Plates 292-295**). Richard Brunning recommended The artefact for further assessment dependant on its suitability for dendrochronological dating. The following report was subsequently received from Cathy Tyers (English Heritage):

"The sample from Beachley [Find no 1] is ash (*Fraxinus excelsior* L.) and it represents a radial section. It has in the region of 70 annual rings, though this is an estimate from the radial surface rather than an actual ring count. The estimated average ring width is 1.25mm. There is no trace of the outermost rings of the tree from which it was derived and this, combined with its radial nature, means that it is not possible to provide any estimate of the age (i.e. how long it lived) of the tree from which it was derived. As a single ash sample, even though it intrinsically has sufficient rings, it is not suitable for dendrochronological analysis - a whole series of contemporary ash samples from other timbers would be required in order to even attempt dendrochronological dating."

In the light of this report no further work has been undertaken or is proposed.

Line 20001 *Oldbury on Severn*.

A small collection of unstratified Roman pottery and flint was picked up in the known area of Roman activity to the south-east of the tidal lagoon at Oldbury during several visits. As several such unstratified assemblages have previously been collected this material has not been submitted to a specialist.

Point 30015 (02/09/2010) and **Point 50016** (27/04/2009). *Brean*.

A deer or cattle pelvis fragment was collected from within a peat deposit at point 50016 and a long bone (probably from cattle) was collected from within a different peat deposit at point 30015.

Line 10375. *Minehead*. 18/04/2011

A large sherd of post-medieval glazed redware that was lying on top of a stone fish weir was collected in Minehead Bay after the pottery listed at 11.3 above had been identified.

12 Interpretation and discussion

12.1 Negative evidence for archaeological features

12.1.1 The results of the Phase 2a and Phase 2 Severn Estuary RCZAS fieldwork indicated that several proposed fishing-related features previously transcribed from aerial photographs were unlikely to be of anthropogenic origin. Unsurprisingly some features recorded from high level vertical photographs were found to be of different construction on the ground (net hang lines rather than stone fish weirs, for example). In other instances, features recorded from historic aerial photographs have probably subsequently been destroyed or have eroded/degraded to the point where they are no longer readily identifiable. The Phase 2a and Phase 2 work has thus illustrated the importance of follow-up RCZAS field survey as a correlation of, and corrective to, previous studies.

12.1.2 At English Stones and Gravel Banks in South Gloucestershire, a previous study of historic aerial photographs had identified a series of possible fishing structures (Allen 2005, 40-42), including stone-built weirs and wooden putt or putcher ranks. The GCCAS field survey team, however, could find no surviving archaeological evidence for some of these structures. Allen's fish weir feature ES-5 on the southern end of English Lake was indeed a large V-shaped weir, incorporating stone rubble leader arms and also metal net hang posts (**Line Nos. 10332 & 10333, 10334 &10335**; **Plate 41**), with another previously unidentified stone-built fish trap located just to the south-west of it (**Line No. 10331**). Feature ES-4, however, proved to be a shelf in the underlying hard geology that curves out across a natural tidal pool. On the aerial photograph published by Allen (2005, 33, fig. 2h), water flowing over this natural feature gives the appearance of a slight weir, but this was identified on the ground as an outcropping seam of bedrock.

12.1.3 Allen's features ES-3 and ES-8 also appeared on the ground to be natural ridges in the gravel and shingle intertidal surface, but no traces could be identified of the putt rank and fish weir thought to be present (Allen 2005, 33, 41-42, fig. 2g) (**Point No. 41**). It is possible that features once existed here and have now been completely destroyed, or that the natural shingle and gravel ridges have formed over the remnants of eroded structures. Walkover survey of the intertidal surface and scanning for possible features with binoculars did not reveal any indications of features ES-6 and ES-9, although the latter feature was recorded as a possible fishing site during the phase 1 NMP work (Crowther and Dickson 2008, NMR 1463226).

12.1.4 Allen also proposed that on the northern edge of Salmon Pool there was a complex fishing structure (ES-10) consisting of a U-shaped, dammed tidal pool with two artificial rock-cut channels leading into it (Allen 2005, 42, fig. 10). This was again recorded as a possible fishing site by the RCZAS phase 1 NMP team (NMR 1463224). Although it was not possible to access the main part of this feature directly during Phase 2 survey work, the channels were observed and appeared to be natural eroded fault lines in the bedrock. Some blocks of stone visible in this area seem more likely to have been associated with the construction of the Second Severn Crossing. Similarly, the western part at least of Allen's feature ES-2 was accessed directly and was thought to be another natural channel.

12.1.5 Only a few wooden and metal stakes from a recent net hang line were identified at the location of Allen's feature ES-7, and if an earlier structure was once present there then no traces of it now survive. Allen's feature ES-1, however (Allen 2005, 41; Riley 1998a, 1999), is probably the putcher rank listed on the Certificate of Privilege at NGR ST 53513 83724, and described as having 225 putchers on its lower extent and 300 on its upper, last being fished around 1950 (EA LHB 002 50/31). Only a few recent wooden and metal posts from a hang net line were identified in this location during the Phase 2 RCZAS fieldwork though, and the Environment Agency record photograph also shows only a few surviving low wooden posts. Most of these are probably now completely buried in mud.

Table 1: Concordance of RCZAS results with Allen (2005)

Allen (2005) feature	RCZAS result
Hills Flats	
HF1	Surveyed. Line nos. 10097-10100
HF2	No sign on ground and not identified by NMP
HF3	Surveyed. Line no.10104 (and possibly 10105)
Oldbury Flats	
OF1	Surveyed. Probably line no. 20003 but several were recorded on the ground in this area.
OF2	Possibly line no. 20009 but not exactly the same location
OF3	Destroyed by reservoir. Recorded by NMP (NMR 1385238)
OF4	Destroyed by reservoir. Recorded by NMP (NMR 1385234)
OF5	Destroyed by reservoir. Recorded by NMP (NMR 138151)
OF6	Destroyed by reservoir. Recorded by NMP (NMR 1389916)
OF7	Destroyed by reservoir. Recorded by NMP (NMR 1389911)
OF8	Destroyed by reservoir. Recorded by NMP (NMR 1385148)
Aust Rock	
AR1	Surveyed. Line no. 20000. Only the eastern part was seen.
English Stones	
ES1	No sign on ground and not identified by NMP but known historically (Certificate of Privilege LHB002)
ES2	No sign on ground and not identified by NMP, possibly geological.
ES3	No sign on ground and not identified by NMP, possibly geological.
ES4	No sign on ground and not identified by NMP, probably geological.
ES5	Surveyed. Line nos. 10331-5
ES6	Not reached. Not identified by NMP.
ES7	No sign on ground (apart from netting) and not identified by NMP
ES8	No sign on ground and not identified by NMP
ES9	No sign on ground. Recorded by NMP (NMR 1463226)
ES10	Recorded by NMP (NMR 1463224) but appeared to be geological on the ground.

12.1.6 At Kilve in Somerset, the Phase 1 NMP aerial survey had recorded possible stone fish weir structures in two locations approximately 650m apart (Som HER FID 748 UID 1366938 and FID 1107 UID 1366936). These locations were visited during Phase 2 fieldwork. At the first site, on a gently sloping rock shelf covered in loose boulders, one possible V-shaped spread of stones was identified (**Line No. 10184**), with a putative apex 5-6m across and remains of two arms. The stones were very dispersed by the tide, however, and could also have been a natural accumulation of boulders. The rock surface would allow a great deal of movement of material, especially during winter storms. Just to the north was an even more ambiguous line of boulders and cobbles that may have been a remnant of one arm of a fish weir (**Line No. 10185**). At the second locale (**Point No. 55**) there was what appeared to be a natural accumulation of cobbles, and only a modern metal net hang line was visible 20-30m away.

12.1.7 There were also occasions when features recorded from aerial photographs by the Severn Estuary RCZAS Phase 1 NMP had definitely disappeared. The most notable example of this occurred on the southern edge of Minehead Bay, where a series of V-shaped fishing features weirs had been plotted (Crowther and Dickson 2008; NMR 1455343, 1455346-1455349, 1455351-1455353). When accessed during Phase 2 survey work, it became clear that only a few scattered and dispersed boulders and cobbles are now left in this area of the intertidal zone. Although a few of these features might originally have been net hang lines, some at least were probably V-shaped stone weirs, and it is possible that several decades of beach management and improvement associated with the holiday resort have removed most traces of them.

12.2 Further discussions of fishing structures

12.2.1 Introduction

Although detailed analysis and a synthesis of the information gathered during all phases of the project are beyond the remit of a RCZAS, in the following sections some limited documentary information has been used in the discussion of types of fishing practices and structures encountered, mostly restricted to selected locations within the study area.

12.2.2 Net hangs and fish species

12.2.2.1 Information provided by the weir fisherman John Martin to the County Planning Department of Somerset (Somerset HER 22248) concerning intertidal fishing structures in Minehead Bay suggested that, although many net hangs were either still in use or had been in use until recent decades, the sites on which they were located were used by particular families and could have been in use for many generations.

12.2.2.2 Based on John Martin's testimony, McDonnell (2001, 25-26) noted that the majority of net hangs in Minehead Bay were probably for herring and kettle nets, and perhaps seine and gill nets. Mullet, skate, whiting, sole, and sprats could all have been caught in addition to herring (Jenkins 2009, 117; Rutter 1829). The mud-horse fishermen of Somerset used to employ fixed nets at the lowest tidal reaches to catch cod, plaice, whiting and sprats in winter; skate, sea bass, Dover sole, grey mullet, conger eels and ling in the summer; and shrimps in the autumn. Lampreys were once an important high-status food, especially during the medieval period (Taylor 1974; Turner 2007), and were caught either in putts or in individual weels. Their numbers declined drastically in the nineteenth century and remain very low (Henderson 2003; Lloyd 1941). Along the upper estuary, net hangs targeted species such as salmon, and allis and twaite shad. Some marine species including flat fish also find their way into the upper estuary. Sturgeon were once caught on a relatively frequent basis in the Bristol Channel and Severn Estuary, with particularly large examples being landed at Stolford in the 1930s, Purton in 1921 and Lydney in 1937 (Brown 1980; B. Sellick pers. comm.; Tierney-Jones 2008). Sturgeon are probably now locally extinct in the Severn, however, the last recorded example caught between Newport and the Severn Bridge in the late 1980s (www.glaucus.com), whilst both types of shad and eels are now in serious decline.

12.2.2.3 The Guise family at Elmore were prominent members of the nobility and major landlords in the Elmore area, they are still the largest landowners in the parish, with several tenant farmers. The National Archive holds many of their old family documents, and one dated from the 19th February 1332/3 records a lease at Elmore granted to 'Robert atte Berew and Will[iam] Dake of Elmor and son William for 1 selion arable land in Elmore lying at Dake ende in Longacr', on the condition of the provision of '100 *lampridulas* [lampreys]

each year after the Feast of Cineris' (Ash Wednesday) (National Archive D326/T17/13). Guise family court rolls from 1716 also note the landing of a sturgeon at Rodley (D326/M10).

12.2.3 Stone-built fish weirs

12.2.3.1 Stone fish traps or weirs are a type of feature recorded along the English, Welsh, Scottish and Irish coasts (Bathgate 1949; Dawson 2004; James and James 2003; Jenkins 1974a; Lewes 1924; Nayling 1998, 2000b; O'Sullivan 2001; Salisbury 1991; Turner 2002; Went 1946, 1964). Weirs built with their guts below the mean low water neap tide level could only be fished on spring tides and were known as spring tide weirs, whereas those higher up the intertidal zone were called neap tide weirs and could be fished on spring and neap tides (McDonnell 2001, 21).

12.2.3.2 The testimony of Minehead Bay fisherman John Martin suggests that, in addition to quotidian repair work, many weirs were rebuilt at the same location over generations (McDonnell 2001, 22). Along with the documentary evidence for rentals in Minehead Bay in 1299 and 1380 (SMR 33348) it may therefore be that some of those in Minehead Bay may well be located on sites fished since the medieval period, although it seems likely that the majority of extant examples are of post-medieval or early modern origin. The only example dated through this project, at Blue Anchor (**Line 20039**, 11.2 above and Appendix A), produced earlier dates than might have been expected, centred on the 11th century, although the difficulty of proving the contemporaneity of a stone weir and stakes located beneath it need to be remembered.

12.2.3.3 Attempting to establish the date and function of stone fish weirs through any narrow typological approach is extremely problematic, partly as a result of the continuous rebuilding but also the likelihood that there were numerous variations based on local and family traditions or individual whims. The unusual stone-built structures at Gore Point near Porlock Weir and those previously recorded by Richard McDonnell at Stolford, together with some of the more individual stone weirs recorded at Minehead Bay, Dunster Beach and Blue Anchor Bay, all indicate probable local variations in form.

12.2.3.4 The unusual linear arrangements of stone piles or cairns off Gore Point near Porlock Weir were rather enigmatic. They did not seem to be groynes of any form, and the gaps between the mounds of stone would make them unsuitable for preventing longshore drift. It may be that the mounds or cairns originally supported upright posts for hang net lines, and were so large because of the exposed nature of Gore Point and the strong winds and currents there, but there were no visible traces of any surviving associated wooden or metal poles. These structures may be similar to Scottish *croys,* cairns that created swirling eddies and backwaters which attracted fish. The fish were then snared in gill nets secured to one or more of the croys, and the nets were suspended from the water's surface on lines of floats (Robertson 1998, 27). Further research is clearly required concerning these features.

12.2.4 Wooden stake and wattle fish traps

12.2.4.1 V-shaped stake-built features at Beachley (11.2.1 above), Woolaston (11.2.2 above) Aust (11.2.4 above) and Stert Flats (11.2.6 above) have been radiocarbon dated as part of this project (Appendix A), which together with previous dates from Stert Flats (Brunning 2008) indicate that the V-shaped stake built traps were used in the English Severn Estuary from the seventh until the thirteenth century, with the majority of dated examples being of the earlier part of this date range. Dating of further examples might

extend this period of use in both directions. The headline result of the RCZAS dating programmes is that, certainly in the upper estuary, as shown at Aust, Beachley and Woolaston, the fish-traps appeared earlier in the Anglo-Saxon period than previous studies have indicated. Townley was unfortunately unable to date the structures that she recorded previously at Waldings Pill due to lack of funding (Townley 1999, 83). The V-shaped structures have some resemblance to medieval examples recorded near Magor Pill and Sudbrook on the Welsh Severn shore (Godbold and Turner 1994; Nayling 2000a). Some of the individual basket features at Woolaston are also extremely similar to some found at Sudbrook close to the Second Severn Crossing that produced medieval radiocarbon determinations (Brown *et al.* 2008, 2010). The V-shaped stake-built fish traps recorded by the Severn Estuary RCZAS also share many features with broadly similar but generally larger tenth to fourteenth century structures from the Welsh Severn Estuary (Brown *et al.* 2008, 2010; Godbold and Turner 1994; Nayling 1999); fifth to thirteenth century examples from Strangford Lough and the Shannon Estuary in Ireland (McErlean and O'Sullivan 2002; O'Sullivan 2001, 2003); seventh to tenth century fish traps from the Blackwater and Stour Estuaries, Essex and seventh to eleventh century examples at Holbrook Bay, Suffolk (Everett 2007; Hall and Clarke 2000; Murphy 2010; Strachan 1998); sixth to tenth century fish traps from the north Norfolk coast at Holme (Robertson and Ames 2010); and the seventh to eleventh century structures at Stert Flats (Brunning 2008). All these other examples lack circular catch baskets, however, and many were much larger in size, so some of the upper Severn Estuary examples may represent a distinct, previously unrecorded type.

12.2.4.2 Documentary evidence records that fisheries were an important part of Tidenham parish (which includes the Beachley peninsula and the settlements of Sedbury, Tidenham and Stroat) from the late Saxon period when a charter and survey of Tidenham manor from AD 956 listed 64 basket-weirs or *cytweras* in the River Severn and 36 in the River Wye, and also 4 hackle-weirs or *haecweras* on the Wye (Godbold and Turner 1994, 45-46; Morgan and Smith 1972a). The former have been identified with wattled basket weirs, with the *cyts* comparable to later putts. *Haecweras* were interpreted as 'hedge weirs' (Seebohm 1890, 151-153), or structures where wattle fences were used in conjunction with nets or putchers in order to create fish traps. The tenth century charter also records that the 64 *cytweras* on the Severn were present at three locations, 30 at Stroat, 13 at Beachley and 21 at Sedbury. That these locations correspond to sites where V-shaped stake-built fish weirs were recorded by the Severn RCZAS fieldwork and also by Townley (1999) seems unlikely to be coincidental, and is broadly supported by the dating evidence now available. Nevertheless, the presence of V-shaped fishing structures at Beachley and Oldbury, Waldings Pill and possibly Woolaston Pill with wattle or hurdle panels forming leader arms might perhaps indicate that Seebohm's interpretation of the Anglo-Saxon terms is incorrect, although, given the difficulty in identifying the types of fishing represented by the terms used in far more recent documents, we should perhaps not expect strict and unvarying use of terminology in the tenth century. In 1066 56½ fisheries were recorded in Tidenham manor: in the Severn there were 11 demesne fisheries and 42 held by the *villain,* and in the Wye there was one demesne fishery and 2½ of the *villani* (Morgan and Smith 1972a, 68-73).

12.2.4.3 As Godbold and Turner have noted (1994, 44-46), there are also references to putts in later documents but these may not have been putt ranks as such, but perhaps groups of individual baskets. There are also references to weirs, possibly suggesting ranks, but this term does seem to have been used to describe different types of structure. In the fifteenth century, St Augustine's Abbey in Bristol is recorded as holding weirs at Rodley, Arlingham and Ashleworth, Llanthony Priory had weirs close to Gloucester and at Tidenham and Awre, and Tintern Abbey held fishing rights at Woolaston and Alvredstone (Bond 1988; Sawyer 1968). Maintenance of these 'weirs' was a prominent item in the services of the *geburs* of the manor, these being the Anglo-Saxon term for peasants or *ceorl*s who were essentially tied labourers that were nevertheless one social class up from serfs. As part of their weekly works they had to supply 40 large rods or a *fother* of small rods, and 'build 8

yokes for three ebb tides', which it has been suggested involved the construction of wattle hedges of varying heights to match changes in the tide-level (Morgan and Smith 1972a, 68-73). The lord of the manor took every alternate fish and every rare fish of value from all the weirs on the manor, and when the lord was on the estate no tenant was allowed to sell a fish without informing him. Sturgeon, porpoises, and herrings were specified as among the fish taken.

12.2.4.4 Documentary sources record fisheries in 1086 at Woolaston and Aluredston. The former was included in the gift of the lordship of Woolaston to Tintern Abbey in 1131, and in 1223 William, Earl Marshal granted Tintern Abbey the right to make 'fish-pools' between Aluredston and Walden Pill (Morgan and Smith 1972b). It is not clear what such features would have consisted of. Although not necessarily an artificial feature, one 'tidal pool' used for catching salmon called Gale Pool was the subject of dispute between the lords of Tidenham and Woolaston manors in *c*. 1540, and this was presumably somewhere near Horse Pill. A fishery at Aluredston mentioned in the Domesday Book of 1086 might have been that called 'Aluredeswere' in the fee of Woolaston that in 1131 was granted by Walter de Clare to Tintern Abbey but by 1148 exchanged for other Woolaston fisheries. There is, however, no record of the Aluredston fishery after 1290 (Morgan and Smith 1972b). Woolaston Grange, formerly owned by Tintern Abbey, came into the ownership of the Earl of Worcester in 1551 along with the right to fish in the Severn, and the abbot had the privilege to 'fish and make Puttes and engens in the river of Severn in the parish of Woolaston' (Williams 1976, 125). Confusingly though, there is also a documentary reference to a feature called a *Pucherewe* in 1493 in the manor of Awre, where fisheries were recorded from the early fourteenth century (Baggs and Juřica 1996, 37-38). Putcher ranks are thought to have been a more recent post-medieval or early modern innovation (Godbold and Turner 1994, 46), so this illustrates the danger in trying to attribute what might potentially have been interchangeable terms used in the historical past to specific types of archaeological feature.

12.2.4.5 A fishery at Lyde Rock to the north of Beachley Passage was bought by a John Philpot in 1573, and other Severn fisheries in the Tidenham area belonged to the estate which William Batherne sold to Alexander James in 1620, to the Madocke family's estate in 1599, and to Waldings Manor in 1696 (Morgan and Smith 1972a). It is possible that some of the wooden features recorded at Slime Road may date back to this period, although it seems more likely that the putt or putcher rank footings were of more recent date (see section 12.2.5.6 below).

12.2.4.6 In the intertidal zone at Aust in two separate locations, fragmentary and highly eroded traces of at least three possible V-shaped structures (**Line Nos. 10024 & 10339, 10036, 10037 & 10341**) were in close spatial association with one or two putcher ranks nearby (**Line Nos. 10026 & 10027, 10034 & 10035**). If, as seems likely, many of the V-shaped stake-built fish traps were constructed on intertidal sites with firmer underlying surfaces, it is possible that some of the later putt and putcher ranks were constructed in the same locales, thereby destroying some of the earlier features. Indeed, in the past Severn fishermen may well have been able to recognise the traces of earlier fishing structures and use these as indicators that such locales would be favourable (q.v. O'Sullivan 2003, 466).

12.2.4.7 One striking feature of the chronological patterning across Britain and Ireland established so far is the apparent paucity of evidence for prehistoric and Romano-British intertidal fishing structures. A small number of Bronze Age and early Iron Age fishing structures have been found at Wooton-Quarr on the Isle of Wight, along the Shannon Estuary and Lough Begg (Loader *et al.* 1997; Mitchel 1965; O'Sullivan 2001), and possibly also on the Welsh shore of the Severn near Peterstone (Neumann *et al.* 2000, 307, 310). These few examples do not compare to the many known early medieval and medieval examples, however, and people do not seem to have been exploiting marine and river fish (or sea mammals) in later prehistory to any great extent (Bell *et al.* 2000; Dobney and

Ervynck 2007; Jay and Richards 2007), certainly outside Scotland, the Western Isles and the Orkneys. If rivers and the sea were used for the disposal of human remains, as finds of human bone around the Severn Estuary suggest (Bell *et al.* 2000, 64-73; Brett 1997, 118), then beliefs regarding death and the afterlife might perhaps have placed dietary prohibitions on fish consumption (Hill and Willis 2010, 153, 165-166).

12.2.4.8 Although during the culturally diverse Romano-British period oceanic fishing was clearly practiced and shellfish were also harvested, intertidal fishing does not seem to have taken place (Walsh *et al.* 2010, 183). The apparent florescence of this form of fishing during the early medieval period is thus all the more striking. This may have been for economic reasons and also the development and spread of the requisite knowledge, but social or cultural factors too may have been important, at least some of these developments might have been associated with the early church, and/or the movements of Saxon and Scandinavian immigrants into Britain. This is clearly a vital topic for future research.

12.2.5 Putt and putcher ranks, lave and stop-net fishing, and eels

12.2.5.1 Documentary evidence suggests that ranks of putts were an earlier form of fishing structure than ranks of putchers (Jenkins 1974b, 60; Godbold and Turner 1994, 45-46; Taylor 1974, 13), although some putts were still in use on the inner Severn until the 1970s or early 1980s. Putt ranks were able to trap a wide variety of species including salmon, shad, eels, dabs, and shrimp, due to the relatively close weave of the putt baskets. They may have developed from earlier individual fishing baskets and shorter linear arrays (Nayling 1999, 112). Shrimp fishing at Woolaston has been carried out since at least 1707, the year in which inhabitants of the manor were presented to the manorial court for throwing shrimps' heads in the highway (Morgan and Smith 1972b). Putcher ranks may have come into use during the late eighteenth or early nineteenth centuries, and these were more usually associated with salmon fishing. Some were still in use until the late 1980s but the Certificates of Privilege data confirm that only two putcher ranks are now in operation within the English Severn Estuary, a semi-permanent structure that can be dismantled outside the fishing season located at Broadoak (EA RHB 014, 60 putchers), and a permanent installation on the upper estuary south of Awre (Awre Long Row, EA RHB 011, 400 putchers; **Plates 172-173**).

12.2.5.2 The locations for putt and putcher ranks seem to have been quite carefully selected, and would have been linked to astute observations and understandings of the daily and seasonal movements of tides and fish and changes to these. They were also constructed at sites with the necessary physical characteristics, for example, they often seem to have been built in slightly concave embayments with gently shelving intertidal surfaces. Outcrops of hard rock were generally avoided, yet at the same time firmer clay or gravel surfaces were preferred. Gravel, stone and in more recent examples concrete slabs and metal sheeting sometimes appears to have been used to provide firmer footing. Many putt and putcher ranks were modified and rebuilt several times; and/or were also later re-used as the footings of net hang lines. One fishing station could therefore have multiple structures built on the site over many human generations. It is also the case that sites with traces of previous, older fishing structures may have been preferred (O'Sullivan 2003, 466), and so it is possible that some earlier V-shaped stake-built fish traps may have been destroyed by these later structures.

12.2.5.3 Some of the lengthier examples of putcher ranks in particular in areas such as Aust/Oldbury Flats may only have been accessible at the lowest tides, or using boats. All larger wooden posts from putt and putcher ranks would have had to have been driven or bored into the underlying intertidal surface, the latter involving a rock auger and bar, the debris being removed with long-handled ladles (Jenkins 1974b, 58).

12.2.5.4 The Crown, aristocratic landowners and monasteries were the traditional owners of fishing rights along the Severn (Bond 1988, 87-88). By 1860 the Severn Estuary supported one of the largest commercial salmon fisheries in the British Isles, with the majority of fisheries being operated on behalf of three large estates (Beaufort, Berkeley and Lydney). Others were still owned by the Crown and the Church of England, in addition to minor gentry and freehold farmers (Jenkins 1974b, 54; Taylor 1974, 14). Following the Salmon Fisheries Acts in 1861 and 1865 that attempted first to ban, and then subsequently to regulate fixed engine fishing on the Severn, Special Commissioners for English Fisheries mapped and listed the locations, ownership and size of licensed ranks (the maps are reproduced in Jenkins 1974b, 49-55). Nineteenth century reports, however, were often concerned about large numbers of unlicensed structures that depleted fish stocks and were a potential hazard to navigation.

12.2.5.5 Comparison of the survey results of the Severn Estuary RCZAS with the 1865 maps published by Jenkins and the Certificates of Privilege issued after 1866 make it clear that there were once far more fishing structures of this type than seems to have been officially permitted during the later nineteenth century. Many of the putt and putcher ranks recorded during Phase 2 field survey were thus probably either earlier in date than the 1860s, or in many cases were probably unofficial 'illegal' or illicit structures.

12.2.5.6 In 1820, the Duke of Beaufort claimed all the fishing rights in the whole stretch of the estuary adjoining Tidenham, but the tenant of the duke's fishery complained that the level of poaching was so great that he was unable to make any profit from it (Morgan and Smith 1972a). At this time the main part of the fishery was in Beachley Bay (between Lyde Rock and Sedbury Cliffs, at Slime Road) where there were putcher weirs and boats using stop-nets. In 1837 it is recorded that the tenants of the fishery had 14 'hedges of stakes' containing over 1700 putchers in Beachley Bay, and the conservator of the Duke of Beaufort's fisheries took action against the tenants for hindering the progress of salmon upstream to their spawning-grounds. In 1866 the duke's fishery at Tidenham had 754 putchers just south of Slimeroad Pill and 375 at Lyde Rock, and there were nine boats using stop-nets in Beachley Bay and four boats operating near Pill House (*ibid.*). During the later nineteenth century the Duke of Beaufort's Severn and Wye fisheries were leased by the firm Miller Brothers of Chepstow who exported salmon to London, Bristol and other centres. The Environment Agency Certificates of Privilege data indicate that the putcher weir just south-west of Slimeroad Pill licensed to have up to 754 baskets was last used in 1999 (**Line No. 10072**; EA RHB 002 15/62).

12.2.5.7 The fishery at Woolaston may have been located near Guscar Rocks in the late nineteenth century, but there are no records of it having been fished since *c*. 1875 (Morgan and Smith 1972b). The Duke of Beaufort also owned the rights to 400 salmon putchers at Horse Pill, and in *c*. 1820 the tenant complained of losses caused by poaching (*ibid.*). The Duke of Beaufort's fisheries were conveyed to the Crown in 1901, then by the Crown to the Wye Board of Conservators in 1924, finally the fishing rights ended up vested in the Wye River Authority in 1969.

12.2.5.8 Documentary sources relating to Awre record that in 1547 the *gale* of fishing between Brimspill and Gatcombe Pill belonged to Poulton Manor, and that rights in that stretch of river descended with the manor to the Hagloe Estate (Baggs and Juřica 1996). The next documentary records from 1770 and 1779 note that James Thomas, Lord of Poulton, leased to groups of fishermen the right to use long nets, lave nets, stop nets and other kinds of net, although he reserved the right to claim 'royal fish' (such as sturgeon) for the manor. Poulton Manor also claimed rights over several putcher weirs that were apparently attached to individual farms. Poulton Court, the site of a manor from the early Middle Ages, was later absorbed into the large Hagloe Estate, centred on the early eighteenth century Hagloe House (*ibid.*).

12.2.5.9 The documentary evidence for Awre also records that in 1737 a house at Gatcombe that belonged to the Oatfield Farm estate, probably the later Sloop Inn, had a fishery attached. Two ranks there were worked by the owners of Court House, who had bought rights from the Hagloe Estate (Baggs and Juřica 1996). These were probably the two structures recorded by the Certificates of Privilege as Hagloe Farm Rank (EA RHB 007), listed as still operational with 70 putchers, and Hagloe Farm Milkmaid Rock (EA RHB 008), recorded as having had 250 putchers but dilapidated and last used in 1993. The Environment Agency grid references for these structures are slightly inaccurate, but they appear to correspond with the features recorded by the RCZAS as Line Nos. 10069 and 10352 respectively. The survey evidence suggests that neither of them is now in use, however. The low eroded wooden posts and rock-cut wooden postholes recorded SSE of Hagloe House (**Line No. 10353, Point Nos. 107-115 & 116-117**) were thus probably part of an earlier fishery belonging either to the Hagloe Estate or to Poulton Court. The fact that a prominent holloway led down from Little Hagloe south-eastwards down to the foreshore near these structures is further evidence that this was a significant fishery in the medieval and/or post-medieval periods.

12.2.5.10 There is a reference to ranks of putchers being leased along with Poulton Court in 1792. In 1913 the tenant of Poulton Court had *c*. 600 putchers on a fishing station adjoining the farm (Baggs and Juřica 1996). The putcher ranks Line Nos. 10350 and 10351 may represent these twentieth century ranks, with the eroded wooden posts of Line No. 10349 possibly representing a pre-existing post-medieval or early modern structure. The farmer still operated a rank there in 1989, and the Certificates of Privilege record two ranks at Poulton Court (EA RHB 009) with 300 putchers licensed in total, to be fished either in one rank of 300 putchers, or two ranks of 150 baskets each. The grid references of rank 1 correspond to Line No. 10350, and this is recorded as operational; and rank 2, corresponding to Line No. 10351 and which is recorded as not having been fished for *c*. 30 years. The RCZAS fieldwork evidence indicates that rank 1 is no longer fished, however.

12.2.5.11 To the south-west of the Hagloe Farm and the Hagloe Farm Milkmaid Rock ranks, the Certificates of Privilege records provided by the Environment Agency list a putcher rank near Lydney owned by the Lydney Park Estate (EA RHB 004 9/56), and one in Wellhouse Bay at Naas Cliff and known as The Cliff (EA RHB 006 69/53). These two structures are also recorded on the Gloucestershire HER (as HER 26105 and 9513 respectively), but neither of these two examples was accessed as part of the Severn Estuary RCZAS fieldwork. Interestingly though, a series of additional probable putcher rank structures are listed on the Gloucestershire HER and/or were recorded by Phase 2 survey between Naas Cliff and Gatcombe, but these are not listed by the Certificates of Privilege records. These include a possible putcher rank at Wellhouse Rock itself, not accessed during the RCZAS but listed on the HER (HER 9512). There were also the metal-sheathed posts photographed at Purton, and listed on the Gloucestershire HER (HER 9506) as a fish trap structure, and just to the north-east a series of eroded, low wooden posts forming another possible putcher structure (**Line No. 10067**). There is the still relatively well-preserved timber-built putcher rank at Gatcombe (**Line No. 10069**) that does not appear to have been listed by the Certificates of Privilege, whilst the paired timber posts of at least four earlier putcher ranks were recorded south of Gatcombe (**Line Nos. 10362-10365**). This evidence again all suggests that there were many more unlicensed structures along the estuary than allowed for under the Certificates of Privilege.

12.2.5.12 A fishery belonging to Etloe Duchy manor in 1283 presumably comprised rights below or to the south-west of Gatcombe. The right to use two stop nets was confirmed to the owner of the Duchy manor in 1866; one net was used off Purton and the other between Purton and Gatcombe (Baggs and Juřica 1996). From 1878 the rights belonging to Etloe Duchy, together with rights of the Bathurst family to use stop nets in Wellhouse Bay were leased by Charles Morse, owner of the Court House at Gatcombe. His descendants, who later bought these rights as well as those to the putcher ranks noted above, worked the

fishery from Gatcombe for the next 100 years, and in the 1920s the family still owned 10 stopping boats. These boats were built and repaired in outbuildings at the Court House. Most of the salmon caught were sent by rail to London. In 1922 over 70 men from Blakeney and the surrounding area fished with lave nets off Gatcombe, selling their catch to the Morses, and a few men still used lave nets there in 1989. Three stop net boats were kept at Gatcombe by Mrs. Ann Bayliss (*née* Morse) in 1989, but they had not been used for about three years due to difficulties in getting them repaired and renewing the nets. These are likely to be the examples that were photographed by the RCZAS team members in 2010, and which are unfortunately now partly disintegrated with at least one having been vandalised.

12.2.5.13 Eels and elvers were taken from many different locations along the River Severn, and the rights to do so could and still can often be fiercely contested. Typical techniques for catching adult eels involved barbed eel spears, nets and woven basket putcheons or weels; whereas elvers were taken using hand nets (Taylor 1974, 8-10). One major collecting site was near the Anchor Inn at Epney, south of Gloucester; where elvers were taken each year and exported abroad (Morgan and Smith 1972c, 205). There are documentary records of a fishing weir belonging to the manor there in 1216, and by 1630 there were references to a fish house. Interestingly, there was a depot belonging to the German government that was maintained at Epney from 1908-1914, and then following the First World War again until at least the mid-1930s (Wild 1934, 207). Sometimes the Director of German State Fisheries personally supervised the collection of elvers from Epney, which were then exported live via Grimsby to Hamburg, where they were then used to restock German rivers and ponds. Four large live storage tanks were built at Epney, but it is unknown if any traces of these features still remain.

12.3 Cribbing and flood defence walls

The cribbing or ‘faggoting’ recorded at Beachley, Minsterworth Ham, Elmore Back and Pawlett Hams was a common type of construction along the upper estuary and other rivers, and it was the obligation of the parish to maintain such revetment works (S. Draper pers. comm.). Church wardens were responsible for maintaining sea walls. These defences were funded from parish land charities, tithes, donations from wealthier individuals and through donations left in wills.

12.4 The ‘Great Wall of Elmore’ – Romano-British land reclamation?

12.4.1 The area of land enclosed by the bend in the river at Elmore has been extensively discussed by previous authors, as one of a series of land reclamations in the inner Severn estuary, suggested as originating in the Roman period. Previous research by Allen and Fulford (1990a) suggested that the area within the loop of the River Severn at Elmore was formed by three main phases of deliberate land reclamation.

12.4.2 Reclamation I (*c*. 279 ha), below the level of the highest tides and river floods at 6-8m OD, was bounded to the west by the earthwork known as the ‘Great Wall of Elmore’ (Fig,12, A), described as such on the 1841 Tithe Map and later OS plans (Allen and Fulford 1990a, fig. 1). The Great Wall earthwork extends for *c*. 800m from the base of a short but steep slope, just to the north-west of Farley’s End, to a point approximately 500m from the existing channel at SO 7620 1600. In places along the Great Wall remnants of stone revetment were visible (*ibid,* 21-22, fig. 4), on the south-western face of the bank, suggesting that it was originally a sea defence, rather than a flood defence for already reclaimed land. Allen and Fulford also suggested that there was a broad ditch on the north-

eastern, inner side of the Great Wall, now largely silted up and only visible with the eye of faith. The original northern extent of the Great Wall has not been established, although a field called 'Carloon and Wall End' on the 1841 Tithe survey (Gwatkin 1994) may be a good candidate and the RCZAS survey team did identify an indistinct earthwork on the east side of this field (**Line no. 40005,** Fig. 12, B) but were not certain whether this was an almost levelled sea bank or plough headland.

12.4.3 Reclamation II (suggested as being *c*. 74ha in extent) was thought by Allen and Fulford to be slightly higher than Reclamation I, and might have encompassed an area between the Great Wall to the north-east, and a now abandoned flood/sea defence bank to the south-west that began near Bridgemacote Farm, extended westwards to the house called The Doodings (Fig. 12, C), which was encircled by the seabank, and then curved to the north-west (Allen and Fulford 1990a, fig. 1). Reclamation III was more elevated still at 8-9m OD and extends across a smaller area of *c*. 35ha to the south-west of Bridgemacote Farm, south of the Reclamation II sea bank. Its western extent is now marked by a sea bank constructed in the early 1960s. Ridge and furrow earthworks were present across the north and east of Reclamation I, most of Reclamation II and all of Reclamation III.

12.4.4 A scatter of Romano-British pottery, mostly of third to fourth century date, was found through surface collection to the north-west of Windmill Hill (Allen and Fulford's area A), along with slag and also medieval and post-medieval pottery. A smaller scatter of artefacts recovered from fields 500m to the north-west of Bridgemacote Farm included a small number of Roman-period sherds and tile, Saxon, medieval and post-medieval pottery (Allen and Fulford 1990a, 27-28). Area A was within Allen and Fulford's Reclamation I; and area B within Reclamation II. Allen and Fulford stated that there:

> '…can be little doubt but that the earliest reclamations and defences are at least as old as the later Roman period. The artefacts and industrial materials – abundant and varied – from near Windmill Hill in the earliest reclamation point unmistakably to settlement, which implies the presence of a defence…We can be less conclusive about the pottery from near Bridgemacote in the second reclamation, but this also belongs to the later Roman period, the only definitely earlier wares again being possibly residual samian. The presence of a range of artefacts and industrial residues almost as great as at Windmill Hill, although far less abundant, hints at occupation.' (Allen and Fulford 1990a, 29).

Together with the sedimentary evidence that suggested the inner soils in the Elmore loop were denser, heavier clays whilst the outer soils were finer silts, Allen and Fulford concluded that Reclamations I and II were Romano-British or earlier in date, and perhaps linked to pressure for land from the growing Colonia at *Glevum* (Gloucester).

12.4.5 The general, if disputed, model of the underlying deposits in the area proposes that the deposits of the inner estuary, where the major peat layer is overlain by a deposit of clay, record a succession from freshwater peat to estuarine salt marsh (Allen 1990b, 1991). Hewlett (1997) has analysed sediment samples from the Elmore area, whilst Anthony Brown (1982a, 1982b) took samples at Longney, and at Walmore Common on the opposite (western) bank of the Severn. These palaeoenvironmental analyses suggest that the clay deposits found at Longney and Elmore were primarily fresh water in origin, unlike Allen's model of estuarine salt marsh accretion. A thin layer of fine sandy silt found above the peat and below the clay at Elmore and Longney might imply a change from a low to high energy depositional environment, but the clay itself seems to have been the result of marsh sedimentation in still water conditions (Hewlett and Birnie 1986, 57). Furthermore, the generally sharp contact between the peat and the clay suggests a relatively sudden rather than gradual initial period of sedimentation. Brown (1982b) obtained a radiocarbon date of 2830 $\pm$ 50 BP from the top of the peat at Longney; whilst Hewlett obtained a date of 2340 $\pm$ 60 BP from the interface between the peat and clay at Longney, and 2360 $\pm$ 60 BP at

Elmore (Hewlett and Birnie 1996, 56). This evidence together suggests a period of increased floodplain sedimentation along the inner Severn Estuary. Brown (1982b) suggests that these changes could have been the result of anthropogenic woodland clearance, something Hewlett and Birnie (1996, 59) are rather sceptical about, whilst Druce (2005) attributes them to a more widespread first millennium BC phase of marine transgression around the British Isles.

12.4.6 Hewlett did agree, however, that the western Great Wall was probably constructed to prevent tidal rather than fluvial flooding, and that after it had been built sediment was excluded from the main bulk of the Elmore wetland and confined to the seaward side of it, as the clay was substantially thicker (up to 1.26m) on this side. Hewlett also suggested that the Roman finds at Elmore might have been residual, and he reports one farmer at Elmore as stating that the ground there was recently 'made up'. More significantly, the proposed 'Roman' date for reclamation at Elmore and Longney appears to be contradicted by a radiocarbon date of 1570 $\pm$ 60BP (349 to 614 cal. AD) for a peat deposit which is overlain by 1.88m of sediment, suggesting that this area was not reclaimed until well after this date (Hewlett 1997, 242). Hewlett (1997, 306) thus went so far as to state that 'There would appear to be very little substantive proof to support the hypothesis that most of the wetlands were reclaimed during the Roman period'; and he suggested that the majority of the reclamation was probably of late medieval date at the earliest.

12.4.7 In summary it appears that, whilst existing evidence can be interpreted to suggest that the earliest reclamations at Elmore took place during the Romano-British period, this evidence is equivocal at best. At present no finds of stratified artefacts have been made in the area, and there is no direct archaeological dating for any of the defences. There are additional problems with Allen and Fulford's proposed sequence at Elmore. The first documentary reference to a Great Wall is in the early 1700s (S. Draper pers. comm.), which seems unusually late for such a significant landscape feature if it was Romano-British in date. The possibly Roman sea wall of Reclamation II diverts around the Doodings (Fig. 12, C), first recorded in 1575, and so either the wall postdates the house, or it was significantly modified to accommodate the house or the Doodings reuses a Roman site.

12.4.8 Although Allen and Fulford refer to the 1841 Tithe survey map (Glos. R.O. GDR T/77; Gwatkin 1994), they do not mention the large earthwork 1.35-1.40km to the east of the Great Wall that is also termed 'Great Wall or Old Road' on the same map (Fig. 12, D). The feature was later referred to as Broadmeadow Bank Ditch, under which name it appears on the 1st Edition OS map of 1884-1889. This feature was partly surveyed during the Phase 2 fieldwork (**Line No. 10014**), and consists of a broad earth bank up to *c*. 1m high and 4-5m wide. It is possible that this earthwork originally extended to the south-east, to the base of the hill on which Elmore Court is situated (**Plate 252**). Interestingly, this feature is roughly parallel to the western Great Wall, and its northern surviving extent matches the southern extent of ridge and furrow earthworks on the slightly higher ground behind Elmore Back.

12.4.9 The road between Farley's End and Elmore Back was known as 'Lake Street' from at least 1340 (Draper 2010a). The area approximately between the two Great Walls was used as flood meadows and pasture and was known as the Moors (Draper 2010b). The open arable field in the area, known as the 'Marsh Field', is to the east of Elmore Back and north-east of the eastern Great Wall. It therefore seems that in the late medieval and early modern periods the two Great Walls served to define the low lying seasonally flooded land and the areas suitable for arable cultivation were located to their seaward sides. That the medieval Marsh Field was protected by sea defences on roughly their current location is suggested by the fact that Groundless Pool (Fig, 12, E) was recorded by that name in 1301 and was conjectured by Rudder to have resulted from a breach of the defences (Draper 2010a). It also seems likely that the ridge and furrow behind Elmore Back hamlet is later than the recorded open fields, as it clearly overlies two earlier enclosures (Fig. 12, F), first

reported by Allen and Fulford, which are thought to be of medieval origin and possibly to have continued in use until the seventeenth Century (Allen and Fulford 1990, 23).

12.4.10 All of this evidence implies a more complex and certainly a more protracted sequence of reclamation and changes in land usage at Elmore than that proposed by Allen and Fulford. Hewlett's assertion that reclamation did not take place until the later medieval period at the earliest seems highly unlikely, however, given that the area between Elmore Back and Windmill Hill (The Marsh) was an open field in the medieval period (Draper 2010b).

12.4.11 A programme of further detailed archaeological work is clearly needed at Elmore before the sequence can be resolved. It is of course possible that the lower land preserved behind Roman sea defences became the seasonally flooded land used for post-medieval water meadows due to rising tidal levels but there is currently insufficient evidence to make confident assertions. The priority for this work should be the recovery of material for samples for absolute dating (such as waterlogged wood or charcoal) from within or beneath the various sea walls and flood defence banks, including both of the Great Walls.

12.4.12 The surveying equipment used by the RCZAS was not suitable for detailed recording of subtle height differences (see 9.2.5 above) and also the Lidar of the area analysed as part of the NMP aerial survey was not at sufficient resolution to pick up these differences (Truscoe 2007). Analysis of more recent Lidar or use of differential GPS across the area would provide further useful data in this regard.

12.4.13 In the draft Severn Estuary Flood Risk Management Strategy document (Atkins Ltd 2010), much of the area of Elmore north of Bridgemacote Farm, Farley's End Elmore Court and Windmill Hill is proposed as having managed realignment of the existing flood defences in the medium to long term (20-100 years), although Elmore Back itself will have additional ring defences. During this period it is possible that some low-lying parts of Elmore will be allowed to become inundated and/or revert to salt marsh, so archaeological investigations and/or mitigation work need to take place before such operations commence.

13 Assessment of distribution, preservation, potential and threat

13.1 Distribution

13.1.1 The main Phase 2 fieldwork reinforced the results of the Phase 2a pilot which indicated that rocky foreshore areas in the intertidal zones outside Watchet Harbour, in Helwell Bay/Doniford Bay, St Audrie's Bay, between Watchet and Blue Anchor Bay and at Guscar Rocks have generally low archaeological potential. The reconnaissance visits made during the early part of Phase 2 fieldwork also failed to identify any significant new archaeological features along the rocky coastline between Weston-super-Mare and Portishead. Most fishing structures in these areas were modern net hangs made of metal road pins or scaffolding poles, which can be more easily hammered and wedged into rock.

13.1.2 The principal areas of stone fishing weirs were at Gore Point, Minehead Bay, Dunster Beach and Blue Anchor Bay, with much smaller groups at Porlock Bay, Culver Cliff, Kilve, Lilstock, Stolford and English Stones. Unsurprisingly, these areas generally correspond to flat or gently sloping intertidal areas with ample supplies of boulders and beach cobbles. It was noticeable, however, that a few areas where stone weirs *could* have been built did not in fact produce any evidence for them, this included parts of Severn Beach and St Audrie's Bay, and perhaps Kilve. Even where population centres were nearby, as at Watchet, such features were not built. The availability of suitable building materials alone is thus not sufficient explanation for the location of stone fish weirs and tides, currents and the behaviour of fish species were undoubtedly also important factors.

13.1.3 Wooden V-shaped fish traps and individual fishing baskets were recorded at Beachley, Woolaston/Grange Pill, Aust/Oldbury Flats and Stert Flats, although with the case of Oldbury Flats the northernmost extent of these features could not be ascertained due to the deeper mud deposits encountered either side of Littleton Pill. The northernmost identified examples of the stake-built V-shaped features appear to be at Waldings Pill and Woolaston/Grange Pill. Some of the fragmentary stake alignments recorded immediately south of Oldbury Power Station (**Line Nos. 20004, 20005 & 20011**) may have been leader arms from these structures, as several were on different alignments to the putt and putcher ranks. The closely spaced stake 'hedge' fish traps were identified at Stert Flats and Brean Beach/Berrow Flats, but nowhere else along the Severn.

13.1.4 The remains of putt or putcher ranks survive at Slime Road and below Sedbury Cliffs, between Horse and Grange Pill, at Wellhouse Bay, Purton (west) and Gatcombe, south of Poulton Court and Awre, Hills Flats, Aust/Oldbury Flats, Northwick Oaze, Severn Beach/Gravel Banks, and possibly Woodspring/Kingston Bay and Stert Flats. The remains at Severn Beach/Gravel Banks and Woodspring/Kingston Bay are fragmentary and poorly preserved. Outside the inner Severn estuary, they were only recorded at Woodspring/Kingston Bay and Stert Flats, and so were largely a phenomenon of the upper or inner Severn estuary. The 'zigzag' wooden fishing ranks seem to have been confined to Stert Flats within the RCZAS survey area but similar examples have been recorded at Magor Pill, Gwent (Nayling 2000a).

13.1.5 As listed in section 10.16 above, the Severn Estuary RCZAS fieldwork recorded peat and/or submerged deposits at Woolaston/Grange Pill, Hills Flats, Oldbury Flats, Woodspring/Kingston Bay, Brean Beach/Berrow Flats, Stolford, Blue Anchor Bay, Minehead Bay and Porlock Bay. Previously recorded deposits at Severn Beach/Gravel Banks and Avonmouth were not identified, whilst only small remnants of deposits at St Audrie's Bay and Porlock Bay were accessed.

13.1.6 Structures relating to the Second World War were photographed and/or surveyed at Beachley, Arlingham, Purton (east), Portbury Wharf, Portishead, Sand Bay, Weston-super-

Mare, Berrow Flats, Stert Flats, Lilstock, Kilve, Watchet, Blue Anchor Bay, Dunster Beach, Minehead, Bossington Hill and Porlock Weir.

13.2 State of preservation

13.2.1 The state of preservation of the stone fish weirs varied enormously, but was largely dependent on where they were located in the intertidal zone. In general, those features highest up the intertidal zone and furthest inland had often been destroyed or extensively damaged by beach management activities, as at Minehead Bay, or had probably been robbed to construct sea walls and flood banks. Others have been disturbed by holidaymakers and beachcombers. Similarly, those stone features furthest out to sea are being and have been most actively eroded by tidal forces. Not including those few examples still in occasional use and which have been repaired, the best preserved specimens are generally those located in the middle of the intertidal zone, exposed to high tides but also lower than most beach management and flood defence practices. Another major contributory factor is, of course, exactly how large and well constructed the fish weirs originally were.

13.2.2 Some of the stone fish weirs in the northern, central part of Minehead Bay are particularly well preserved, even excluding the few still in occasional use, and indeed, four of these are the only fish weirs in the Severn Estuary designated as Scheduled Monuments (33730). Some of the examples at Warren Point, Dunster Beach and Blue Anchor Bay lower down the intertidal zone are also still in quite god preservation, though this does vary greatly from one feature to the next. Many stone weirs recorded by the Phase 1 NMP along the upper part of the intertidal zone at Warren Point, Dunster Beach and Blue Anchor Bay have, however, either disappeared completely or are now only visible as dispersed linear spreads of stone, low and barely identifiable banks or merely lines reflecting the original inner and outer facing stones (**Plates 49-51**). At Gore Point, Porlock, although the stone fish weirs, linear banks and heaps are all generally rather robust, being constructed out of large beach cobbles and boulders, the area is exposed to the full force of westerly storms. The result is that even the largest features are losing their integrity and definition, whilst the gaps in between them are filling up with loose boulders and cobbles, effectively 'blurring' the structures (**Plate 297**).

13.2.3 The V-shaped stake-built fish traps at Aust, though currently relatively well preserved, are extremely vulnerable to tidal forces that scour the intertidal surface and erode the relatively small, soft and fragile wooden stakes. This area is in a relatively 'low-energy' part of the inner Severn, however, and the situation is potentially much more serious at Beachley and Woolaston, where more active and forceful scouring takes place. Similarly, the stake-built structures at Woolaston/Grange Pill, though protected in some instances by the earlier submerged forest tree trunks and root boles, are also at great risk from scouring tidal forces. More delicate woven fish baskets and other objects such as withies survive in places at Woolaston/Grange Pill and Aust (**Plates 86, 113-118**). At Aust, the probable putt rank north of Littleton Pill (Line No. 10052) still has the remains of woven butt and forewheel sections surviving *in situ*, along with withy ties (**Plates 140-142**). Preservation is often noticeably poorer on the steeper and/or rockier intertidal surfaces, whereas it is better on flatter mud flats.

13.2.4 Aside from the larger oak posts at their apices, the V-shaped stake-built fish traps at Stert Flats are generally more poorly preserved, and are eroding rather rapidly. This rate of erosion has been estimated at 0.16m per year (Brunning 2008, 82), although the Phase 2 fieldwork indicated that the localised erosion of particular features may actually be much greater. Similarly, the stake-built wooden 'hedges' on Brean Beach/Berrow Flats are also poorly preserved and under threat from tidal scouring. At Stert Flats and Brean

Beach/Berrow Flats, increased sedimentation is also a problem (see section 13.4 below), and might effectively render much of the archaeology inaccessible for the long term.

13.2.5 The putt and putcher ranks vary a great deal in their state of preservation. Although the older putt ranks at Slime Road, Sedbury and Oldbury Flats are relatively well preserved, some of the more recent putcher ranks at Slime Road, Purton (west), Gatcombe, Hills Flats, Aust/Oldbury Flats, Northwick Oaze and Severn Beach/Gravel Banks are poorly preserved and highly fragmentary. This apparent contradiction is due to the fact that the putt ranks often used larger deciduous timber posts in their construction, and/or more numerous posts, whilst the more recent putcher ranks utilised much softer coniferous wood. Even relatively recent putcher ranks at Purton and Gatcombe where horizontal timber elements survived until recently are now also disintegrating under the impact of scouring tides. As with stake-built features, preservation is poor on rocky and/or steep intertidal surfaces. That notwithstanding the huge numbers of fishing structures attested in medieval documents are certainly not immediately apparent now, suggesting that the majority of putt ranks have either not survived, or their constituent timbers were mostly reclaimed once they had gone out of use.

13.2.6 The peat and submerged forest deposits at Woolaston/Grange Pill, Hills Flats, Oldbury Flats and parts of Brean Beach/Berrow Flats are still relatively well-preserved, although erosion again seems to be greater on steeper intertidal surfaces where peat deposits can be undercut more easily, as at parts of Woolaston/Grange Pill and along the northern part of Hills Flats. The peat and submerged deposits on parts of Brean Beach/Berrow Beach, at Blue Anchor Bay and Minehead are particularly poorly preserved, and are being eroded both by tidal forces and by the impact of burrowing marine molluscs.

13.3 Archaeological potential and further work

13.3.1 The main areas within the overall Severn Estuary RCZAS area have been assessed in terms of their overall archaeological potential, and are subdivided into individual assessments of the principal types of archaeological features. The results of this assessment are summarised in Table 2, along with the possible future archaeological work required to realise this potential, which is also explored below.

13.3.2 The greatest archaeological potential lies within the intertidal areas at Beachley, Woolaston/Grange Pill, Hills Flats, Aust/Oldbury Flats, Woodspring/Kingston Bay and Brean Beach/Berrow Flats. Here it is likely that unrecorded stake-built and woven features survive. Important palaeoenvironmental evidence is also preserved here and prehistoric structures may be preserved in these areas, with the potential for finds of national significance. Increased sediment deposition at Porlock Bay, Stolford, Woodspring/Kingston Bay, the southern part of Severn Beach/Gravel Banks, the northern extent of Blue Anchor Bay, the northern or north-western areas of Brean Beach/Berrow Flats, Northwick Oaze and Oldbury Flats (north of Littleton Pill) nevertheless means that there is at present little point in attempting to undertake more detailed survey and sampling work unless these areas can be accessed soon after scouring storms or tides that will strip away the deep mud away from the intertidal surface.

13.3.3 The lowest archaeological potential is from rocky intertidal areas such as the coastline between Blue Anchor and Watchet, between Watchet and St Audrie's Bay and between Clevedon and Portishead. Sand Bay, Weston Bay and Doniford Bay would also appear to have little further archaeological potential. The relatively recent 'New Ground' post-medieval areas of reclamation south of Lydney and at Slimbridge also have a relatively low archaeological potential as the current shoreline is formed by post-medieval and early modern sea wall defences, and any older archaeological deposits will be quite deeply

buried underneath reclaimed soils. *In situ* archaeological deposits may survive at depth, but these are not likely to be affected in the short to medium term by coastal erosion or development. The results of the RCZAS fieldwork suggest that riverbank areas at Awre, Minsterworth Ham, Arlingham, Longney and Pawlett Hams must also be seen as having relatively little surface archaeological potential.

13.3.4 In terms of feature categories, the Phase 2a pilot has reinforced the findings of the Phase 1 desk-based assessment, NMP aerial survey and the Phase 2a pilot fieldwork (Catchpole and Chadwick 2010a; Crowther and Dickson 2008; Mullin 2008; Mullin *et al.* 2009) that the areas of greatest archaeological potential for stone fishing weirs are Minehead Bay, Blue Anchor Bay and Dunster Beach. Whilst additional detailed, systematic survey of these areas might identify a few further features not recorded by the Phase 1, Phase 2a and main Phase 2 work, such as those features only accessible at the very lowest tides; this would not add greatly to the archaeological knowledge of their form and function that has now been acquired through the RCZAS investigation and previous studies.

13.3.5 Dating the stone fish weirs is still problematic, however. At Minehead Bay, Dunster Beach and Blue Anchor Bay, the most visible surviving features probably date from the post-medieval through into the modern periods. The one feature dated by the RCZAS was considerably earlier (Appendix A) but a single feature cannot be used to date a monument type comprising several hundred examples. The Phase 2a pilot and main Phase 2 RCZAS fieldwork suggests that wooden posts or stakes are sometimes present, associated with the guts and leader arms of stone features but these are now rarely visible and easily accessible without small-scale excavation. It remains unclear therefore whether their presence is the norm or unusual. Few stakes are likely to be suitable for dendrochronological analysis, having too few rings, so an additional programme of ^{14}C dating would probably be necessary. It is also possible that, given the extensive or even total rebuilding of the stone weirs subsequent to their construction, any dates obtained from wooden posts or stakes underneath the stonework may only date a previous phase of build altogether, *not* the extant structure. Conversely, it could be argued that the stone features have protected wooden stakes from the levels of erosion experienced by the stake-built fish traps and that this is a compelling reason to investigate them further. Dating stakes from beneath stone weirs would at least date the use of these fishing sites, even if it was not the existing weirs themselves.

13.3.6 The Severn Estuary RCZAS was never meant to be a comprehensive survey of all of the archaeological features within the intertidal zone of the project area. Nevertheless, the vast majority of surviving stone weirs previously recorded on the relevant HERs and also plotted by the Phase NMP aerial survey (Crowther and Dickson 2008) were directly accessed during the RCZAS fieldwork, and records made of them. For time and logistical reasons it was simply not possible to access and record all of the stone weirs, however, and there are some remaining features and groups of features where additional detailed survey work would complement the work of the RCZAS. There are some known features between Warren Point and the western side of Dunster Beach, many only accessible at the lowest tides, which could be recorded in more detail. Additional unrecorded features may also exist here. Similarly, to the north and north-east of the surviving large circular conger eel trap in Minehead Bay (**Line No. 10377**), there were additional net hang lines of stone supports surviving, only a few of which were recorded. Time restrictions meant that it was not possible to undertake a speculative reconnoitre in this area devoid of any other records and it is possible that further seawards there may be remnants of fish weirs only accessible during very low spring tides. The small complex of fish weirs and possible ground line gullies at Culver Cliff Sand, west of Minehead, also require further field survey. Finally, the group of linear banks and shallow pools to the north and north-west of the recorded fish weirs at Gore Point, Porlock Weir, would also benefit from more detailed field survey, which might also identify additional eroded V-shaped stone weirs. Although only readily accessible at particularly low tides, many of these features have not been previously recorded, and the

Phase 2 RCZAS fieldwork was only able to provide a basic record of what was clearly a far more complex group of structures.

13.3.7 The V-shaped, stake-built fish traps at Beachley and Oldbury Flats have not been formally recorded before. The limited dating programme undertaken for this project indicates that they are mostly early medieval with some later medieval in date (Appendix A). These areas require more detailed scale survey involving the plotting of each individual stake, in order to fully establish their layouts, details of construction and any phasing that may be apparent. Any woven or hurdle structures associated with these would also need to be recorded in detail. Although some individual stake-built and woven features at Woolaston/Grange Pill have been previously recorded (Townley 1999), the whole intertidal zone at that locale needs to be planned in detail. At all of these locations, such detailed planning would involve 'cleaning up' or limited excavation of the intertidal surface to remove some of the overlying sediment and expose more of the features concerned and establish their extent.

13.3.8 Peat and submerged forest deposits at Blue Anchor Bay, Brean Beach/Berrow Flats, Woodspring/Kingston Bay, Oldbury Flats and Hills Flats in particular should be investigated in more detail. The exposures at Blue Anchor Bay, Woodspring/Kingston Bay and at Oldbury Flats south of Littleton Pill have had little or no work undertaken on them. The possible palaeochannel deposits at Brean Beach/Berrow Flats and Hills Flats, and the palaeochannel at Woolaston/Grange Pill could be targeted for small-scale excavation in order to retrieve artefacts and faunal remains. In addition, the deposits at Blue Anchor Bay are under severe threat from erosion (see section 13.4.1 below). The fragmentary submerged forest deposits in Minehead Bay may also require further investigation, for although these have been investigated in the past they are also experiencing severe erosion and will not survive for much longer.

13.3.9 It is vital that there should be effective long-term archaeological monitoring of the changing sedimentary and erosional conditions and their effects on historic assets. Long-term monitoring has proved very effective elsewhere, as at Porlock Bay for example (e.g. McDonnell 2005). The digital data compiled during the RCZAS could therefore serve as an invaluable baseline survey against which future changes can be measured.

13.3.10 It is especially important that areas of peat exposures are regularly monitored. These areas have the greatest archaeological potential for preserving internationally and nationally important prehistoric remains. The history of archaeological investigations on the Welsh Severn intertidal zone indicates that it is the erosion of sediments overlying the peat that often reveals uniquely detailed evidence of prehistoric structures and practices (e.g. Bell *et al*. 2000, Bell 2007b; Nayling 1998, 2000a). These may include Mesolithic and Neolithic human footprints and animal tracks, and Neolithic, Bronze Age and Iron Age structures including buildings. Although the erosion of exposed peat shelves is generally incremental and progressive, it can often accelerate very quickly after powerful storms or tidal surges. It is therefore vital for archaeologists to visit areas of high potential after such events, as well as during routine inspections.

Table 2: Preservation, potential and threat in areas visited during RCZAS fieldwork

Name of area	SMP units	Types of feature & state of preservation	Types of feature & erosion risk	Archaeological potential	Comments
		1 Good, 2 Fair, 3 Poor, 4 Very poor , 5 Uncertain	1 Stable - minimal erosion 2 Low erosion risk (50+ years) 3 Moderate erosion risk (<50 years) 4 Severe erosion risk (<5 years)	Low, Medium, High	
Gloucestershire					
Beachley & Slime Road, Sedbury	TID1	Stake-built fish traps – **2-3** Cribbing/revetment – **2-3** Putt ranks – **2-3** Putcher ranks – **3-4**	Stake-built fish traps – **4** Cribbing/revetment – **3-4** Putt ranks – **2-3** Putcher ranks – **3-4**	High Low Medium Low	At least 1 of the fish traps will erode completely in the next 5-10 years.
Waldings Pill, Grange Pill & Woolaston	TID1	Stake-built fish traps – **2-4** Woven fish baskets – **2-3** Cribbing/revetment – **2-3** Peat, palaeochannel & submerged forest deposits – **2-3** Putcher ranks – **2-3** Eroding stratigraphy - **5**	Stake-built fish traps – **4** Woven fish baskets – **3-4** Cribbing/revetment – **3-4** Peat, palaeochannel & submerged forest deposits – **2-3** Putcher ranks – **2-3** Eroding stratigraphy – **3-4**	High Medium Low High Low High	The stake-built and the woven structures are extremely vulnerable to erosion here. Peat, palaeochannel & submerged forest deposits contain important prehistoric evidence.
Lydney	LYD1	Hulks – **3-4** Revetment – **2-3**	Hulks – **3-4** Revetment – **2-3**	Low Low	Most hulks are fragmented; or only keelsons & lower timbers survive.
Wellhouse Bay, Purton (west) & Gatcombe	GLO1	Cribbing/revetment – **2-3** Putcher ranks – **2-3** Piers/jetties/wharves – **2**	Cribbing/revetment – **2-3** Putcher ranks – **3-4** Piers/jetties/wharves – **1-2**	Low Low Low	The scouring is stronger on these steeper, partly shingle and rock intertidal zones.
Brim's Pill & Awre	GLO2	Cribbing/revetment – **2-3** Putcher ranks – **1-3** Fish houses – **2** Hulks – **3**	Cribbing/revetment – **2-3** Putcher ranks – **2-3** Fish houses – **3** Hulks – **4**	Low Low Low Low	Threatened by the Severn FRMS proposals. Unknown vessel could be recorded in more detail before it disappears.
Bullo, Collow & Newnham	GLO3 GLO4	Piers/jetties/wharves – **2**	Piers/jetties/wharves – **1**	Low	The dock basin at Bullow Pill seems relatively stable.
Lower & Upper Dumball & Rodley	GLO5	Piers/jetties/wharves – **3**	Piers/jetties/wharves – **3**	Low	Stone and wooden features at Strand are eroding, but are recent in date.
Minsterworth & Minsterworth Ham	MAI1	Cribbing/revetment – **2-3**	Cribbing/revetment – **2-3**	Low	This cribbing and revetment was relatively recent in date.

Name of area	SMP units	Types of feature & state of preservation	Types of feature & erosion risk	Archaeological potential	Comments
Maisemore, Maisemore Ham & Alney Island	MAI2 MAI3 MAI5	Cribbing/revetment – **1-2**	Cribbing/revetment – **2-3**	Low	This cribbing and revetment was probably fairly recent in date.
Elmore	SHAR1	Cribbing/revetment – **1-2** Putcher ranks – **3-4** Fish houses – **2**	Cribbing/revetment – **2-3** Putcher ranks – **2-3** Fish houses – **2**	Low Low Low	These features will be threatened by the Severn FRMS proposals.
Longney	SHAR2	Fish house – **3**	Fish house – **2**	Low	Possibly affected by future Severn FRMS proposals.
Arlingham	SHAR4	Pillboxes – **2-3**	Pillboxes – **3-4**	Low	One pillbox has collapsed into the river, several others are almost completely sunk into riverbank silts.
Hock Cliff & Hock Ditch	SHAR5 SHAR6	Stone & timber bridge/sluice structure – **2-3**	Stone & timber bridge/sluice structure – **2**	Low	Maintenance of the rhyne might affect these remains.
Berkeley Pill to Sharpness	SEV1	Putt? and putcher ranks – **3-4**	Putt? and Putcher ranks – **3-4**	Low	Very low, eroded wooden posts.
Hills Flats north – UA boundary to Berkeley Power Station	SEV3	Cribbing/revetment – **2-3** Peat & submerged forest deposits – **2-3** Putcher ranks – **2-3**	Cribbing/revetment – **2-3** Peat & submerged forest deposits – **3-4** Putcher ranks – **2-3**	Low Medium Low	Peat & submerged forest deposits contain important prehistoric evidence, and are very vulnerable to erosion here.
South Gloucestershire					
Hills Flats south – The Ledges to UA boundary	SEV3	Peat, palaeochannel & submerged forest deposits – **2-3** Putcher ranks – **2-4**	Peat, palaeochannel & submerged forest deposits – **2-3** Putcher ranks – **3-4**	High Low	The peat, palaeochannel & submerged forest deposits contain important prehistoric evidence.
Oldbury Flats– Oldbury Pill to Oldbury Power Station	SEV5	Stake-built fish traps – **4** Peat & submerged forest deposits – **2-3** Putcher ranks – **3-4** Finds & eroding stratigraphy – **5**	Stake-built fish traps – **4** Peat & submerged forest deposits – **2-3** Putcher ranks – **3** Finds & eroding stratigraphy – **3**	Low High Low High	The peat, palaeochannel & submerged forest deposits contain important prehistoric evidence. The eroding Romano-British deposits are also vulnerable.
Aust/Oldbury Flats – Littleton Pill to Oldbury Pill	SEV5	Putt rank – **2** Woven fish baskets – **2-3** Putcher ranks – **1-3** Wooden trackway – **2-3**	Putt rank – **3** Woven fish baskets – **3-4** Putcher ranks – **2-3** Wooden trackway – **3**	Low Medium Low Low	The stake-built and especially the woven structures are very vulnerable to erosion here.
Aust – Blackstone Rock to Littleton Pill	SEV5 SEV6	Stake-built fish traps – **2-3** Woven fish baskets – **2-3** Putcher ranks – **2-3**	Stake-built fish traps – **3-4** Woven fish baskets – **3-4** Putcher ranks – **2-3**	High Medium Low	The stake-built and especially the woven structures are extremely vulnerable to erosion here.

Name of area	SMP units	Types of feature & state of preservation	Types of feature & erosion risk	Archaeological potential	Comments
Old Passage & Aust Rock	SEV6	Putcher rank – **1-2** Piers/jetties/wharves – **3**	Putcher rank – **2-3** Piers/jetties/wharves – **2-3**	Low Low	
Northwick Oaze – The Pill to Cake Pill	BRIS1	Stake-built fish trap? – **2-3** Putcher ranks – **2-3**	Stake-built fish trap? – **3** Putcher ranks – **3**	Low Low	
Severn Beach – New Pill Gout & English Stones to The Pill	BRIS2	Stone fish weirs – **1-2** Cribbing/revetment – **1-2** Putcher ranks –**3-4** Piers/jetties/wharves – **2-3**	Stone fish weirs – **1-2** Cribbing/revetment – **1-2** Putcher ranks – **4** Piers/jetties/wharves – **2-3**	Low Low Low Low	The remains of putcher ranks have largely disappeared already.
Bristol					
Gravel Banks – Stup Pill to New Pill Gout	BRIS2	Putcher ranks – **3-4** Shipwreck – **3**	Putcher ranks – **3-4** Shipwreck – **2-3**	Low Low	
Portbury Wharf	BRIS6	Piers/jetties/wharves – **3-4**	Piers/jetties/wharves – **3**	Low	
North Somerset					
Portishead to Clevedon	PORT2 PORT3	Putcher ranks? – **3**	Putcher ranks? – **3**	Low	These are relatively recent structures.
River Yeo to Blackstone Rocks	KIN1	Peat & submerged forest deposits – **5** Shipwrecks – **3**	Peat & submerged forest deposits – **5** Shipwrecks – **3**	High Low	The peat and submerged forest have not been characterised or dated and their full extent is not known. The ships are already heavily bombed.
Middle Hope & St Thomas's Head	KIN2	Earthworks – **1-2**	Earthworks – **2**	Low	Some unrecorded banks were recognised during a walkover survey.
Sand Bay	KIN3	Pillbox – **2**	Pillbox – **2**	Low	
Uphill & Weston Bay	7e06 7e05 7e04	Pillbox – **3**	Pillbox – **2**	Low	
Somerset (inc. Exmoor National Park)					
Brean Down	7e01 7d46	Earthworks – **1-2**	Earthworks – **2**	Medium	Scheduled Monument
Brean Beach & Berrow Flats	7d46 7d45 7d44 7d43	Stake-built fish traps – **3-4** Stone fish weirs – **3** Wooden trackway – **2-3** Peat & palaeochannel deposits – **2-3** Beach obstacles – **4**	Stake-built fish traps – **4** Stone fish weirs – **3** Wooden trackway – **3** Peat & palaeochannel deposits – **3-4** Beach obstacles – **4**	Medium Low Low High Low	The peat-filled palaeochannel at Berrow Flats is now extremely vulnerable as it stands proud of the intertidal surface and is being eroded into separate blocks.

Name of area	SMP units	Types of feature & state of preservation	Types of feature & erosion risk	Archaeological potential	Comments
River Parrett, east bank from River Brue to Pawlett Hams	7d42	Hulks – **4** Cribbing/revetment – **2-4** Fishing station – **1** Pillboxes – **2-3**	Hulks – **3** Cribbing/revetment – **2-3** Fishing station – **2** Pillboxes – **2**	Low Low Low Low	
River Parrett, west bank from Combwich to Fenning Island	7d38 7d37	Cribbing/revetment – **1-2**	Cribbing/revetment – **2-3**	Low	No eroding Romano-British deposits were seen during RCZAS visits.
Stert Flats & Stert Island	7d36	Stake-built fish traps – **2-4** Putt/putcher ranks – **2-3**	Stake-built fish traps – **4** Putt/putcher ranks – **3-4**	Medium Low	Many of the known Anglo-Saxon fish traps are now buried or severely eroded.
Stolford	7d34 7d33	Stone fish weirs – **2-3** Peat & submerged forest deposits – **2-4**	Stone fish weirs – **2** Peat & submerged forest deposits – **3**	Low High	
Lilstock	7d30 7d29 7d28	Stone fish weirs – **3-4** Piers/jetties/wharves – **2-3** Observation post – **3**	Stone fish weirs – **3** Piers/jetties/wharves – **3-4** Observation post – **2-3**	Low Low Low	The peat & submerged forest deposits are being buried by thick mud.
Kilve	7d28	Stone fish weirs – **4** Observation post – **2-3**	Stone fish weirs – **4** Observation post – **3**	Low Low	The stone weirs have been almost entirely dispersed.
St Audrie's Bay	7d27	Stone fish weirs – **3** Peat deposits – **3-4** Revetments/groynes – **2-3** Folly/grotto – **4**	Stone fish weirs – **3** Peat deposits – **4** Revetments/groynes – **2-3** Folly/grotto – **4**	Low Medium Low Low	Only thin lenses of peat appear to be present.
Helwell Bay	7d26 7d25	Wooden posts – **4**	Wooden posts – **3-4**	Low	
Watchet	7d25	Revetments – **3** Observation post – **2-3**	Revetments – **2-3** Observation post – **4**	Low Low	
Blue Anchor Bay, Dunster Beach & Minehead Bay	7d23 7d22 7d21 7d20 7d19	Stone fish weirs – **2-4** Peat & submerged forest deposits – **4** Revetments/groynes – **2-3** Pillboxes – **2-3**	Stone fish weirs – **3-4** Peat & submerged forest deposits – **4** Revetments/groynes – **3** Pillboxes – **3**	Medium Medium Low Low	The stone fish weirs vary greatly in their preservation. The peat & submerged forest deposits containing important prehistoric evidence are eroding fast here.
Culver Cliff	7d18	Stone fish weirs – **3-4**	Stone fish weirs – **3**	Low	
Bossington Hill	7d18	Observation posts & gun positions – **3-4**	Observation posts & gun positions – **2-3**	Low	

Name of area	SMP units	Types of feature & state of preservation	Types of feature & erosion risk	Archaeological potential	Comments
Porlock Beach & Porlock Weir	7d17 7d16	Stone fish weirs – **3-4** Peat & submerged forest deposits – **5** Revetments/groynes – **2-3**	Stone fish weirs – **3-4** Peat & submerged forest deposits – **5** Revetments/groynes – **3-4**	Low Low Low	The peat & submerged forest deposits are being buried by drifting sand deposits.
Gore Point	7d14	Stone fish weirs – **2-3**	Stone fish weirs – **3**	Low	The full complex could be recorded in more detail before erosion destroys the smaller banks and heaps.

13.4 Threats to archaeological assets and research

13.4.1 Erosion

13.4.1.1 The intertidal areas that experience the highest rates of erosion are Beachley, Woolaston/Grange Pill, Hills Flats, Oldbury Flats, Gravel Banks, Stert Flats, Kilve, Blue Anchor Bay, Warren Point on the eastern side of Minehead Bay and Gore Point near Porlock Weir. These locales are those most exposed to winds and currents, and/or those with large or rapid tidal rises and falls.

13.4.1.2 Many of the stone fish weirs at Blue Anchor Bay and Warren Point in particular are now merely low and somewhat diffuse spreads of stone, and several features recorded on historic aerial photographs by the NMP aerial survey (Crowther and Dickson 2008) have already disappeared altogether. Many of the other stone-built features in these areas will become dispersed during the next 10-20 years. The possible fish weirs at Kilve recorded by the NMP, if they were ever anthropogenic features, have almost totally dispersed. The active channel at Beachley is moving westwards, and the V-shaped fish trap located right on the present channel edge is especially at risk and will have been destroyed altogether within the next 5-10 years. The steep clay bank at the water's edge at this point has a tendency to become undercut and then sheers off in large blocks. Comparison of the GCCAS survey records and digital images with the 2009 photographs taken by Richard and Martin Morgan of the Black Rock Lave Net Fishermen's Association indicates that the structure has visibly eroded within the intervening period (**Plates 97-100**). The remaining stake-built structures along the intertidal zone at Beachley are also at severe risk of erosion.

13.4.1.3 The stake-built fish traps at Woolaston/Grange Pill, Aust/Oldbury Flats and Stert Flats are also highly vulnerable to erosion. Comparison of a photograph recorded by the Phase 2 fieldwork in 2011 of a V-shaped fish trap with a circular catch basket with a photograph taken in 2000 for a website on salmon fishing (http: www.salmonboats.co.uk) indicates that the once obvious circular basket has eroded greatly in 10 years (**Plates 103-104**). The delicate woven fish baskets, withies and other similar objects at Woolaston/Grange Pill and Oldbury Flats are even more susceptible to erosion.

13.4.1.4 Erosion is also a factor on steep hillsides and coastal cliffs. The Second World War observation post on the eastern side of Watchet Harbour is situated at the top of very soft marl cliffs, and its concrete base is already partially undermined by the erosion of the slope (**Plate 263**). Without any remediation work it is likely to erode completely during the next 5-10 years. The brick observation post on the cliff top at Kilve (**Point No. 54**; **Plate 264**) is also highly vulnerable in this regard, as are some of the Second World War features on Bossington Hill. The remains of the early modern folly and grotto north of Home Farm at St Audrie's Bay (Som HER 33342) will also likely survive for only another 5-10 years (**Plate 247**).

13.4.1.5 Many of the other surviving Second World War features identified in the Severn Estuary RCZAS project area are also at risk. The pillboxes at Porlock Weir, one of the pillboxes at Dunster Beach and the infantry section post at Blue Anchor Bay are all crumbling, largely due to 'rotting' of their concrete. The concrete was clearly originally of poor standard and it contains many large stone and cobble inclusions, rendering it more susceptible to weathering and causes it to crumble. One pillbox at Porlock Weir is tilting steeply as the beach cobbles underneath it erode away (**Plate 258**). At Arlingham, several pillboxes have either fallen off the Severn bank into the active channel, or are sinking into softer underlying alluvial sediments (**Plates 260-261**).

13.4.2 Sedimentation

13.4.2.1 Anecdotal evidence from fishermen encountered along the RCZAS project area and beach wardens at Brean Beach and Berrow Flats, along with specialist observations by Richard Brunning, Richard McDonnell, Nigel Nayling, Hazel Riley and Vanessa Straker all suggest that in certain areas sedimentation has increased noticeably in the past 10-20 years. The northern extents of Hills Flats and Oldbury Flats, the south-western area of Northwick Oaze, the south-western part of Severn Beach/Gravel Banks, Woodspring/Kingston Bay, the northern part of Brean Beach/Berrow Flats and the eastern parts of Blue Anchor Bay all currently have thicker mud deposits than in the past. At Brean Beach, this thick mud has buried stone fish weirs recorded by the Phase 1 NMP, whilst wooden fish traps recorded from aerial photographs have been buried at Brean Beach and Woodspring/Kingston Bay.

13.4.2.2 At Stert Flats and Porlock Bay, drifting sand deposits have buried previously recorded stake-built fish traps and an area of submerged forest respectively. The sedimentary conditions on the Welsh side of the Severn Estuary are also changing, with drifting sand deposits burying previously recorded medieval fishing structures off Magor Pill (N. Nayling pers. comm.). Conversely, although some overlying mud deposits at Stolford appear to have increased in thickness, the Sellick family of mud-horse fishermen claim that some silt deposits there have actually been scoured in recent decades (B. Sellick pers. comm.), and that the mud was once much thicker and more extensive, especially on the western side of Stolford Bay. Many fishermen along the Severn Estuary believe, even if it is erroneously, that the construction of the Second Severn Crossing and the nuclear power station at Hinkley Point adversely affected local currents and sedimentation patterns.

13.4.2.3 Patterns of sedimentation in such a complex hydrological system as the Severn Estuary are currently extremely hard to model, understand and predict. Human activities such as channel dredging, drainage schemes and land reclamation, flood defences and major infrastructure projects may all affect underlying 'natural' processes, which themselves may be varying over time due to isostatic rebound, sea level rises, sea temperature changes and long-term climatic changes.

13.4.2.4 Sedimentation is not necessarily a direct threat to archaeological assets – it could even be argued that it might represent a form of preservation *in situ*, through burying features underneath a protective covering of mud and silt (although the possible effects of compression would have to be considered). What increased sedimentation does mean, however, is that the full extent of archaeological assets in some areas cannot be determined by fieldwork such as the Severn Estuary RCZAS, and consequently the full impact of future coastal changes (natural or anthropogenic) on archaeology cannot always be ascertained. Furthermore, the buried archaeological features are effectively removed from investigation for the short-term and potentially the long-term too. They may therefore be lost to any future archaeological research.

13.4.3 Beach, sea wall and channel management

13.4.3.1 Beach management activities have probably destroyed several stone fish weirs in the southern part of Minehead Bay, and this continues to be a threat to the surviving fish weirs and peat deposits, especially at the south-eastern side of Minehead Bay where large earth moving machinery is used to deposit sand and remove obstructions such as stone. Similarly, the maintenance of sea walls and flood defence banks may also potentially impact on archaeology, especially in areas such as Stolford and Hills Flats where known peat and submerged forest exposures are very close to the existing defences and actually extend underneath them. Hard flood defences can affect historic assets nearby, such as at Brean

where the defences appear to channel waves towards the (Scheduled) sand cliff at the base of Brean Down.

13.4.3.2 The results of the Severn Estuary RCZAS will hopefully inform the planning of future construction work of sea or flood defences resulting from the final outcomes of the Severn Estuary Flood Risk Management Strategy and the Severn Estuary Shoreline Management Plan (Atkins 2009, 2010; Environment Agency 2011a).

13.4.3.3 Any activities associated with the maintenance or improvement of existing river channels, drainage features and harbours may have potential archaeological impacts. In 2009, for example, earth moving plant was observed dredging out the channel leading into Porlock Weir harbour (**Plate 298**), apparently without any archaeological monitoring. In such cases normal planning procedures need to be followed and any archaeological mitigation or monitoring implemented as a result.

13.4.4 Infrastructure construction projects

13.4.4.1 Any large scale proposed construction projects require detailed Environmental Impact Assessments and usually field evaluation prior to planning permission being granted and construction taking place. For this reason, as outlined in section 3.3 above, the area of proposed development at Avonmouth of the Bristol Deep Sea Container Terminal was excluded from Severn Estuary RCZAS fieldwork, as was the coastline within the 'footprint' of the proposed construction of a new nuclear reactor by EDF Energy. Proposals for the new nuclear reactor at Hinkley Point, for example, include an expansion of the dock facilities at Combwich to enable construction equipment and materials to be off-loaded there (EDF Energy 2010) and archaeological considerations have formed part of the EIA for this proposal.

13.4.4.2 In October 2010 it was announced that "In the light of the findings of the feasibility study the Government does not see a strategic case to bring forward a Severn tidal power project in the immediate term" (DECC 2010, 70). There was to be no review of this position until 2015 at the earliest, although press reports suggest it has been raised by government ministers during 2012. Any renewed future studies of the feasibility of such schemes would require detailed Environmental Impact Assessments.

13.5 Potential impact of the Severn Estuary FRMS

13.5.1 The Severn Estuary Shoreline Management Plan (SMP) and the Severn Estuary Flood Risk Management Strategy (FRMS) make a series of recommendations regarding preferred options for future management (Atkins 2009, 2010; Environment Agency 2011a, 2011b). These recommendations include proposals for managed realignment, coastal squeeze and compensatory habitat creation. The historical and archaeological assets considered in existing strategic documents still only take into account Listed Buildings, Scheduled Monuments and registered Historic Landscapes and Historic Parks and Gardens, rather than the much more numerous archaeological assets recorded on Historic Environment Records and the National Monuments Record. This is despite suggestions by GCCAS and English Heritage regarding the importance of non-designated archaeology. A full discussion of the possible implications of the SMP was included in the updated project design for the main phase 2 RCZAS fieldwork (Catchpole and Chadwick 2010b, appendix A).

13.5.2 The following proposals were made by the Environment Agency in their consultation draft, FRMS for the Severn Estuary (Environment Agency 2011a). The draft proposals as

are discussed below, in turn from the southern extent of the right bank at Beachley up to Gloucester, and from Gloucester back down the left bank to just west of Hinkley Point in Somerset. Areas where current defences will be maintained or improved are not necessarily included except where known significant archaeological deposits are at risk of erosion through coastal squeeze:

- *Beachley and Sedbury*: The draft FRMS appears to exclude the Beachley Peninsula and Sedbury to as far north as where the Gloucester-Chepstow railway nears the shore at Tidenham village. The SMP2 preferred option for cell TID1 was no active intervention. **Archaeological impact –** all intertidal features recorded by the Severn RCZAS in this area will be at risk of increased erosion as sea level rises.

- *Tidenham to Lydney*: The Environment Agency is proposing to leave defence of the shoreline in this area to Network Rail, which may lead to increased flooding behind the railway embankment. **Archaeological impact –** features recorded by the Severn RCZAS and other projects in the intertidal zone, including peats and submerged forest, early medieval fisheries and stratified Roman deposits, will be at risk from coastal squeeze up to the railway embankment, as will the Scheduled Monument at Woolaston Roman Villa. Known archaeological features, including the Broad Stone Scheduled Monument, in 100ha of low lying land behind the railway will also be at risk of flooding, dependant on decisions to be made by Network Rail.

- *Lydney:* Much of the area of New Grounds will not be defended after 2060, and defences will instead be aligned further back to the railway line to the north-west and the southern harbour sea wall to the north and north-east. An area of *c*. 200ha will revert to mud flats and salt marsh. **Archaeological impact** – there would probably be little overall impact, as any Wentlooge peat and submerged forest deposits will be underneath many metres of reclaimed ground. The direct effects of the construction of realigned defences would have to be considered, however.

- *Lydney to Poulton Court:* Defences in this area will not be maintained. Most of the area steeply slopes away from the foreshore to as far north as Hagloe. **Archaeological impact** – several early modern and modern putt and putcher ranks will be susceptible to greater erosion through coastal squeeze.

- *Brims Pill* Managed realignment and the transition to salt marsh at Brims Pill is stated as being already underway (Environment Agency 2011c, 11), although no archaeological impact assessment for this process appears to have been undertaken. This area consists of a roughly triangular-shaped parcel of land mostly on the east side of the pill and to the south of Hall Farm. **Archaeological impact** – several early modern and modern putcher ranks will be susceptible to greater erosion as a result of these developments. The Phase 1 NMP survey recorded medieval or post-medieval ridge and furrow and drainage channels in this area, but this has not been followed up with detailed earthwork survey. A GCCAS team visited the area in March 2011 and did not identify any wooden stake-built features along the Pill. At the mouth of the Pill on the north-east bank, a line of stakes parallel to the eroding salt grazing edge were interpreted as the remains of post-medieval or early modern cribbing or riverbank revetment. The palaeoenvironmental potential of Brims Pill and the surrounding area is unknown, however.

- *Awre:* The Environment Agency expects that the defences at Awre will fail within the next five years; and an area of *c*. 153ha will revert to mud flats and salt marsh. Defences will be realigned on a broadly north-south line extending from just east of the large pylons at the north of the peninsula and following the 10m contour just to the east of occupied properties. **Archaeological impact** – several early modern and modern putcher ranks and a fish house will be susceptible to greater erosion as a

result of these developments. The Phase 1 NMP and Phase 2a pilot survey work recorded medieval or post-medieval ridge and furrow, drainage channels and older phases of flood defence banks and reclamation in this area, but this has not been followed up with detailed earthwork survey. The palaeoenvironmental potential of this area is currently unknown. The direct impact of the construction of realigned defences would also have to be considered.

- *Newnham and Westbury:* Existing defences will be raised between 2020-2110 (Environment Agency 2011c, 13). **Archaeological impact** – there would probably be little overall impact, although the direct effects of the construction of improved defences would have to be considered.

- *Rodley:* At Rodley, defences will be maintained until 2060, after which time they may be realigned further inland (Environment Agency 2011c, 15). This would be likely to result in the Lower Dumball area reverting to mud flats and salt marsh; in addition to *much* of the Upper Dumball area south-east of Rodley. **Archaeological impact** – the Phase 1 NMP survey recorded medieval or post-medieval ridge and furrow, drainage channels and older phases of flood defence banks and reclamation. No features were visible in the intertidal zone or along the riverbank at Upper Gumball when it was visited in March 2011, however.

- *Bollow to Minsterworth:* The Environment Agency state that existing defences will be improved after 2060. **Archaeological impact** – there would probably be little overall impact, but the direct effects of the construction of improved defences would have to be considered.

- *Minsterworth Ham:* The defences at Minsterworth Ham will be realigned during 2010-2030, to a line much further inland creating *c*. 270ha of mud flats and salt marsh (Environment Agency 2011c, 19). The new line begins south-east of Highcross Farm, and extends north-eastwards across Corn Ham and Minsterworth Ham just to the east of Clark's Cottages and Moorcroft House, where it terminates by the pronounced eastwards loop in the river. **Archaeological impact** – the Phase 1 NMP survey recorded some medieval or post-medieval ridge and furrow, drainage channels and older phases of flood defence banks and reclamation, but this has not been followed up with detailed earthwork survey. The unoccupied Highlay House would also be under threat. The palaeoenvironmental potential of this area is currently unknown, and the direct impact of the construction of realigned defences would also have to be considered.

- *Rea:* After 2030 the existing defences at Rea will be raised to increase protection. **Archaeological impact** – there would probably be little overall impact, but the direct effects of the construction of improved defences would have to be considered.

- *Elmore Back:* At Elmore Back, it is proposed that after 2030 the defences will be moved southwards to a new alignment from the northern edge of Windmill Hill extending westwards just to the north of Elmore Court, Farley's End and Bridgemacote Farm. There would either be ring defences around Elmore Back (Atkins 2010), or properties would need to 'become more resilient to flooding to remain habitable' (Environment Agency 2011c, 17). This will create extensive areas of mud flats and salt marsh. **Archaeological impact** – post-medieval cribbing and other jetty and fishing structures west of Elmore Back and a fish house north of Groundless Pool will be susceptible to greater erosion as a result of these developments. The Phase 1 NMP recorded medieval or post-medieval ridge and furrow, drainage channels and older phases of flood defence banks and reclamation in this area, but this has not been followed up with detailed earthwork survey. Both the 'Great Walls' at Elmore recorded in Phases 2a and 2 would be at risk from

erosion and/or burial by sediments, and these are currently undated. The Listed Buildings in Elmore may be threatened, and the direct impact of the construction of realigned defences would also have to be considered.

- *Longney:* The defences at Longney will be realigned between 2030 and 2060. From Wicks Green Farm in the north, the line of the set back defences will extend southwards just to the west of Yew Tree Farm, Downend, Castle End Farm, Hillfield Farm, Ellis's Farm and Longney, terminating at Longney Crib. 165ha of agricultural land will be at increased risk of flooding (Environment Agency 2011a, 73) **Archaeological impact** – Few visible features were noted in the intertidal zone in this area during Phase 2 field survey. The Phase 1 NMP recorded medieval or post-medieval ridge and furrow, drainage channels and older phases of flood defence banks and reclamation in this area, but this has not been followed up with detailed earthwork survey. Some limited palaeoenvironmental work has been undertaken, but the results have been contradictory. The direct impact of the construction of realigned defences would also have to be considered.

- *Longney to Fretherne:* Between Longney to Fretherne, defences will be raised from 2030 to increase protection. **Archaeological impact** – there would probably be little overall impact, but the direct effects of the construction of improved defences would have to be considered.

- *Arlingham:* At Arlingham, defences will be maintained until 2060 but may then be realigned further inland, to create *c*. 356ha of mud flats and salt marsh. The new set back defences would protect the village itself but four occupied properties, including the Old Passage Inn and a listed milepost will be under threat of flooding (Environment Agency 2011a, 74). **Archaeological impact** – the Phase 1 NMP recorded medieval or post-medieval ridge and furrow, drainage channels and older phases of flood defence banks and reclamation in this area, but this has not been followed up with detailed earthwork survey. Four pillboxes would be at increased risk from erosion. Some limited palaeoenvironmental work has been undertaken, but the palaeoenvironmental potential of this area is largely unknown. The direct effects of the construction of realigned defences would also have to be considered.

- *Slimbridge:* During 2010-2030 there will be realignment inland of the existing defences at Slimbridge, on a line from Splatt Bridge in the north extending southwards to Ryall's Farm and then south-west to New Grounds, just north of the Slimbridge Wildfowl and Wetland Trust. **Archaeological impact** – the Phase 1 NMP recorded drainage channels and older phases of flood defence banks and reclamation in this area, but this has not been followed up with detailed earthwork survey. Aside from this there would probably be little overall impact, as any Wentlooge peat and submerged forest deposits will be underneath several metres of reclaimed ground. The direct effects of the construction of realigned defences would have to be considered, however.

- *Hills Flats and Oldbury Flats to Aust:* Existing flood defence walls will be maintained, but in the next 5-10 years embankments at Hill Pill will be strengthened and increased in height, and after 2030 those at Oldbury nuclear power station (Environment Agency 2011b, 9) will be. At Hills Flats defences may need to be moved further inland. Defences at Aust to Littleton will be improved. **Archaeological impact** – the strengthening of existing embankments or the construction of new defences could impact directly upon nationally important peat and submerged forest deposits that also contain evidence for human and animal footprints of Neolithic date. There have also been finds of Neolithic and Bronze Age stone tools and debitage in this vicinity. There are also significant peat deposits at Oldbury Flats just south of the power station, and important prehistoric and Romano-British deposits

and artefact scatters have been found eroding out of the coastal cliff and also just inland. Along with the remains of post-medieval or early modern fish traps, there is an extremely high potential risk that any groundwork would affect archaeological assets. Improving existing defences at Hills Flats is also likely to lead to greater erosion of the area in front of the defences and the important archaeological assets within it, and moving defences inland might lead to greater erosion of the peat deposits underneath the salt marsh alluvial silts. At Aust to Littleton "retaining the existing defence line will result in significant negative impacts on the Severn European site through coastal squeeze" (Environment Agency 2011a, 76), which indicates the early medieval and later fisheries identified by the RCZAS will also be under significant threat of erosion through this process.

- *Aust to New Passage:* At Northwick Oaze, the Environment Agency state that improvements will be made to existing defences before 2030 (Environment Agency 2011b, 11). **Archaeological impact** – the Phase 1 NMP recorded medieval or post-medieval ridge and furrow, drainage channels and older phases of flood defence banks and reclamation in this area, but this has not been followed up with detailed earthwork survey. The Phase 2 fieldwork recorded post-medieval or early modern fishing-related structures. As long as construction work was away from the existing intertidal zone there would probably be little impact, although the direct effects of the construction of realigned defences would have to be considered, however and coastal squeeze is likely to increase the erosion of intertidal features.

- *Severn Beach to Avonmouth:* After 2060 a secondary line of defences may be constructed further inland to the east of the existing railway line embankment, if the existing embankment has not been raised by that date. Drainage improvements may also be required to deal with any wave over-topping. **Archaeological impact** – the proposed position of any new secondary defences is not shown in the Environment Agency document, but the Phase 1 NMP recorded medieval or post-medieval ridge and furrow and drainage channels in this general area. Any deep construction work might impact upon buried prehistoric palaeoenvironmental and archaeological deposits, and the direct effects of the construction of realigned defences would have to be considered.

- *Avonmouth:* Although existing defences at Avonmouth, Royal Portbury Dock and Portishead Dock and marina will be maintained, and upgraded after 2030, and significant coastal squeeze is therefore expected (Environment Agency 2011a, 77). The sea wall embankment protecting the area inland of the low-lying salt marsh area between Royal Portbury Dock and Portishead Dock will not be maintained. Instead, the inland defences further inland to the south, extending broadly east-west just to the north of Atherton House, will be relied upon instead. **Archaeological impact** – the palaeoenvironmental potential of this area is unknown as no work has been undertaken there. There would probably be little overall archaeological impact, but the direct effects of the construction of any improved inland defences would have to be considered.

- *Woodhill Bay, Portishead:* The Environment Agency does not propose to maintain the sea frontage at Woodhill Bay because there are no homes within that localised floodplain area. The promenade, road and park will thus be allowed to flood to reduce the risk to adjacent land. **Archaeological impact** – the palaeoenvironmental potential of this area is unknown. Coastal squeeze and increased erosion may affect any surviving wooden fishing structures in Woodhill Bay.

- *Woodspring/Kingston Bay:* Along the southern extent of Woodspring/Kingston Bay, during the next 50 years defences will be realigned further inland in two broad phases of proposed work. During 2010-2030 proposed realignment will create *c*.

78ha of mudflats and salt marsh, up to a line from north-west of Channel View Farm and extending south-westwards to Wharf Farm, then south-eastwards to the bank of the River Yeo north of Tutshill Ear. Between 2030 and 2060, a further 281ha of such habitat will be created through a much more extensive realignment on both sides of the River Yeo. North of the river, the set back defences will begin to the north-west of Channel View Farm once again, but will then extend to the south-east and south on a line just west of Channel View Farm, Ham Farm and Yeo Bank Farm. South of the River Yeo, much of the area north of Icelton, Wick St Lawrence and Lower Wick Farm will be abandoned; along with the narrow coastal strip of Wick Warth between the Rivers Yeo and Banwell (Environment Agency 2011d, 15). There is also another area between the River Banwell and Woodspring Priory that is also being allowed to revert to mudflats and salt marsh. **Archaeological impact** – the Phase 1 NMP recorded medieval or post-medieval drainage channels and older phases of flood defence banks and reclamation in this area, but this has not been followed up with detailed earthwork survey. Phase 2 fieldwork recorded extensive peat deposits in the southern part of Woodspring/Kingston Bay, and the palaeoenvironmental and archaeological potential of these is currently unknown. Previously recorded medieval, post-medieval or early modern wooden fishing structures might also be affected by greater erosion or sedimentation, along with the two Second World War shipwrecks. Any possible impacts on Woodspring medieval priory would have to be very carefully assessed, along with the direct effects of the construction of realigned defences. Marshall's Bank, the large sea wall south of Wain's Hill and extending around and on either side of Clevedon Pill, may itself be relatively early in origin, potentially medieval in date (Hollinrake and Hollinrake 2005).

- *Sand Bay:* This area was visited during reconnaissance visits ahead of Phase 2 fieldwork, but was thought to have little visible archaeological potential. Only one V-shaped fishing structure was recorded by the NMP aerial survey, approximately 800m from the existing shoreline. This was not accessed by the GCCAS survey team. The Environment Agency state that extra sand will be added to the beach and dunes when necessary to repair localised damage. **Archaeological impact** – there would probably be little overall archaeological impact, although the palaeoenvironmental potential of this area is unknown, and any increased erosion through coastal squeeze may affect surviving wooden fishing structures in Sand Bay.

- *Brean Down and the River Axe:* Between 2030 and 2060 the embankments at Brean Beach and alongside the River Axe will become inadequate and there will need to be a realignment of those defences further inland. This realignment appears quite radical in the published plan (Environment Agency 2011b, 18-19), with Brean Down effectively becoming a tidal island. Two areas on either side of the River Axe will be essentially abandoned and allowed to revert to mud flats and salt marsh. On the eastern side of the Axe, the low-lying area to be abandoned is bordered to the north by Uphill, to the east by the railway line and to the south by a line running between Summerways Bridge and Stroud Pill. The northern half of Bleadon Level will therefore be affected. On the western side of the River Axe, the affected area is bordered to the north by Brean Down and Brean Farm and to the south, with the Axe to the east. The western boundary of this area begins at the shoreline, and then extends to the south-east on a line just to the north-east of Brean Farm, Warren Farm, Turnbourne Farm and Diamond Farm. In total, the areas on both sides of the River Axe amount to *c*. 300ha. **Archaeological impact** – previous work on the sand cliff immediately south of Brean Down revealed an extremely well-preserved Bronze Age settlement and midden deposits, and some of the earliest dated evidence in Europe for salt extraction. Earlier erosion of some of this stratigraphy revealed two Bronze Age gold bracelets. There is also a post-Roman cemetery in this locale. This archaeological site is therefore of national and international significance, and further

erosion of the sand cliff is extremely likely if it is no longer defended. Important prehistoric peat deposits in the northern part of Brean Beach may be more susceptible to erosion, and this might also affect post-medieval or early modern wooden fishing structures. Across Bleadon Level, the Phase 1 NMP recorded medieval or post-medieval drainage channels, older phases of flood defence banks and reclamation, stack stands and an undated ditched enclosure in this area, but this has not been followed up with detailed earthwork survey. Any deep construction work or migration of the River Axe channel might impact upon buried prehistoric or Romano-British palaeoenvironmental, palaeochannel and archaeological deposits, and the direct effects of the construction of realigned defences would have to be considered. No archaeological impact assessment of this process appears to have been undertaken so far.

- *Pawlett Hams:* It is proposed to hold the line for twenty years, followed by managed realignment to a line west of Gaunt's Farm (Environment Agency 2011a, 80). **Archaeological impact** – the Phase 1 NMP recorded medieval or post-medieval ridge and furrow, drainage channels and older phases of flood defence banks and reclamation in this area, but this has not been followed up with detailed earthwork survey. Field system remains of earlier medieval date have been excavated within this area, and the palaeoenvironmental potential of this area is unknown as no work has been undertaken there. A Second World War pillbox might experience greater erosion. At the Walpole Landfill Site, approximately 4km to the east of Pawlett Hams but also on the floodplain of the River Parrett, excavation revealed peat samples dated to 4800-4200 cal. BC along with a later prehistoric and Romano-British land surface on a buried 'island' associated with charcoal, worked flint, Romano-British pottery; and animal bone. These remains were 1.5-3.5m below the modern ground surface (Cameron *et al*. 2004; Hollinrake and Hollinrake 2001; Somerset HER PRN 17904). Palaeochannels, wooden Neolithic structures and faunal remains including aurochs bones have been found in subsequent work (Hollinrake and Hollinrake 2006). Depending on what happened to the existing channel of the River Parrett there would probably be little overall archaeological impact, but the direct effects of the construction of any improved inland defences would have to be considered, especially any deeper work.

- *Steart village and the Stert peninsula:* This area is also the focus for a major programme of proposed managed realignment and compensatory habitat creation by the Environment Agency that may create *c*. 324ha of mud flats, salt marsh and other habitats by 2030 (Environment Agency 2011d, 20-21). In the short term, by 2015, some embankment defences south of Steart village will be realigned inland. The northern extent of the realigned defences is just to the south of Steart and Church Farm, curving round to the south-east and the River Parrett to the south-east of Dewells Farm. The new north-west defence line will be just south of Brufords and Marsh Farm, and from Marsh Farm it will extend south-eastwards to the Parrett once more near North Clyce. After 2030 these defences will not be maintained and the village may be regularly cut off by high tides. Wall Common, Fenning Island and the entire northern part of the Stert peninsula including Steart village will then be at risk from regular flooding. **Archaeological impact** – the Phase 1 NMP recorded medieval or post-medieval ridge and furrow, drainage channels and older phases of flood defence banks and reclamation in this area, but this has not been followed up with detailed earthwork survey. The Phase 2 fieldwork recorded medieval, post-medieval and early modern fishing-related structures to the north of Stert peninsula on Stert Flats, but the area north of Wall Common is largely unknown in archaeological terms, though deep sucking mud deposits here make access very difficult. Increased erosion or sedimentation may affect any surviving wooden fishing structures off Stert Flats. The palaeoenvironmental potential of Stert peninsula is largely unknown, although important peat and submerged forest deposits are found

to the west and east at Stolford and Berrow Flats both of which are at risk from coastal squeeze. There may be prehistoric palaeoenvironmental and archaeological deposits under later alluvial silts; and several palaeochannels have been identified from lidar data (Hamel and Bryant 2008). The southern boundary of the proposed area is close to known Romano-British occupation evidence at Combwich, which may have extended further north. The direct effects of the construction of realigned defences would have to be considered.

13.5.3 In addition to these specific proposals, between Tidenham and Lydney the Environment Agency are predicting greater flooding by 2060. This may cause greater erosion of archaeological features and peat and submerged forest deposits at Woolaston/Grange Pill and Guscar Rocks, and might threaten the Broad Stone Scheduled Monument.

14 Future work

14.1 Further English Heritage funded work

14.1.1 No further field work is planned following the Severn Estuary Rapid Coastal Zone Assessment Survey. At present, the only academic publication to result from the Severn Estuary RCZAS is a paper focusing on fishing-related structures, published in the annual journal *Archaeology in the Severn Estuary* (Chadwick and Catchpole 2011). It is proposed to publish a short update in the same journal, including the radiocarbon dates undertaken for the RCZAS in 2012.

14.2 Further curatorial monitoring

14.2.1 As noted above in section 13.3; it is strongly recommended that regular monitoring of particular areas of the Severn estuary coastline should take place, either by or on behalf of the relevant local authority curatorial archaeologists.

14.2.2 This approach would be especially warranted for areas of peat and submerged forest deposits that are especially vulnerable to erosion and where unexpected but important prehistoric remains can be exposed after strong tidal scouring and storms.

14.2.3 Regular monitoring should also be conducted at locales such as Aust/Oldbury Flats and Woolaston where stratified archaeological deposits and artefacts of probable late Iron Age and Romano-British date are actively eroding out of the banks at the edge of the salt marsh. If possible, some joint strategy for dealing with such deposits should be formulated by the relevant local authority archaeologists, in conjunction with English Heritage. As these are threatened by natural forces rather than development, however, securing funding to undertake any necessary rescue excavation and/or to protect them in the long-term may be problematic.

14.2.4 Further revisions are due to be made to the Severn FRMS by the Environment Agency (13.5 above) and the implications of revised proposals will need to be assessed.

14.3 Further research-led investigations

14.3.1 Despite the fact that no future English Heritage funded work is possible, one valuable outcome of the Severn Estuary RCZAS is that it has highlighted areas where future research-based fieldwork undertaken by university-based researchers and/or local archaeological societies would be extremely productive.

14.3.2 Given current rates of erosion and their vulnerability, it is considered a matter of some urgency that more archaeological surveying work takes place on the complexes of stake-built fish traps and woven structures at Beachley, Waldings Pill, Woolaston/Grange Pill and Aust/Oldbury Flats. This needs to take the form of detailed scale planning in order to show each visible timber element, at a scale of 1: 50 or 1: 100; and/or detailed scanning or photogrammetric recording. This will not only constitute a form of preservation by record, as some of these structures are now rapidly eroding, but might also draw out further details of the construction and phasing of these features. Some limited ‘cleaning’ of the intertidal surface would undoubtedly be necessary in order to resolve details of these structures. There also remains an urgent need to investigate the origins and developmental sequence of stone built weirs.

14.3.3 Additional samples of wooden stakes could be taken as part of this work, provided that adequate funding for such a dating programme has been secured in advance. It might also be highly productive for a research project to examine wood-producing and timber conversion techniques on varied fishing-related structures of different periods and from different locales. Such comparative work might be able to identify local traditions of tree cultivation and wood working, for example.

14.3.4 Although peat and submerged forest deposits at Woolaston/Grange Pill, Hills Flats and Oldbury Flats have been the focus of previous work (e.g. Allen 1998b; Brown 2007a, 2007b; Brown and Allen 2007; Brown *et al*. 2006), some of these areas would benefit from additional future research investigations, especially the palaeochannel deposits at Grange Pill and Hill Pill. Future erosion might expose prehistoric structures associated with these palaeochannels. The palaeochannel identified by the Severn RCZAS Phase 2 fieldwork at Brean Beach/Berrow Flats (Line No. 20105) has the potential to preserve important palaeoenvironmental, faunal and artefactual remains.

14.3.5 The peat deposits recorded at Woodspring Bay have had no known work undertaken on them, and dating and characterising them is therefore an important goal. The peat and submerged forest deposits at Blue Anchor Bay and Minehead Bay are rapidly disappearing due to erosion. The Blue Anchor Bay deposits have had little work undertaken on them, and although the deposits at Minehead have been previously investigated, the next 5-10 years probably offer the last window of opportunity for researchers to carry out any further analyses of them at both of these locales.

14.3.6 In the absence of any local authority or English Heritage funding becoming available for the preservation *in situ* of eroding archaeological stratigraphic deposits or their preservation by record, then it might be possible for research-led archaeological projects to investigate such locales instead. Geophysical survey and targeted excavation could be used to characterise and date these deposits, and might also establish the extent and nature of the Romano-British sites. If these remains are derived from small estuarine ports (Allen 1998a, 2009; Allen and Fulford 1992), then such work would provide extremely important additional evidence for trade and communications along the Severn. Any surviving remains of Roman period harbours and quays would have great national significance, as there have been few excavated outside London (Walsh *et al.* 2010, 175). Within the Severn RCZAS study area for example, efforts to locate the Roman and early medieval waterfronts at Gloucester have to date proved negative (Hurst 1999: 123), and it is likely that there were waterfronts in the vicinity of Woolaston, Lydney, Oldbury and Combwich at least. Alternatively, beaching and unloading/loading craft directly onto shores may also have been commonplace (Walsh *et al.* 2010, 175), and there is thus the potential for finds of lost cargoes and artefacts. Several Roman-period iron billets in one corroded lump were recently found at Oldbury Flats (Kurt Adams pers. comm.).

14.3.7 Clearly, there is also considerable scope for a research project focusing on the post-medieval and early modern fishing practices and lifeways along the Severn. This could combine the results of the Severn Estuary RCZAS with archive document and photographic research, the Environment Agency records of Certificates of Privilege and oral history testimonies, in order to document these ways of life which are now almost outside living memory. Some smaller-scale historical studies have been published (e.g. Jenkins 1974a, 1974b, 2009; Taylor 1974), but these have not been linked to the archaeological evidence.

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17 Abbreviations

ASE	Archaeology in the Severn Estuary (SELRC journal)
CHAMP	Coastal Habitat Management Plan
DEFRA	Department for Environment, Food and Rural Affairs
EH	English Heritage
FRMS	Flood Risk Management Strategy
GCCAS	Gloucestershire County Council Archaeology Service
HEEP	Historic Environment Commissions Programme (Now NHPCP)
HER	Historic Environment Record
NHPCP	National Heritage Protection Commissions Programme (formerly HEEP)
NMP	National Mapping Programme (English Heritage aerial survey programme)
NMR	National Monuments Record
OD	(Above) Ordnance Datum
RCZAS	Rapid Coastal Zone Assessment Survey
SELRC	Severn Estuary and Levels Research Committee
SCC	Somerset County Council
SMP	Shoreline Management Plan
SMR	Sites and Monuments Record (now HER)
UKHO	United Kingdom Hydrographic Office

Figure 1: Severn Estuary RCZA Survey Area

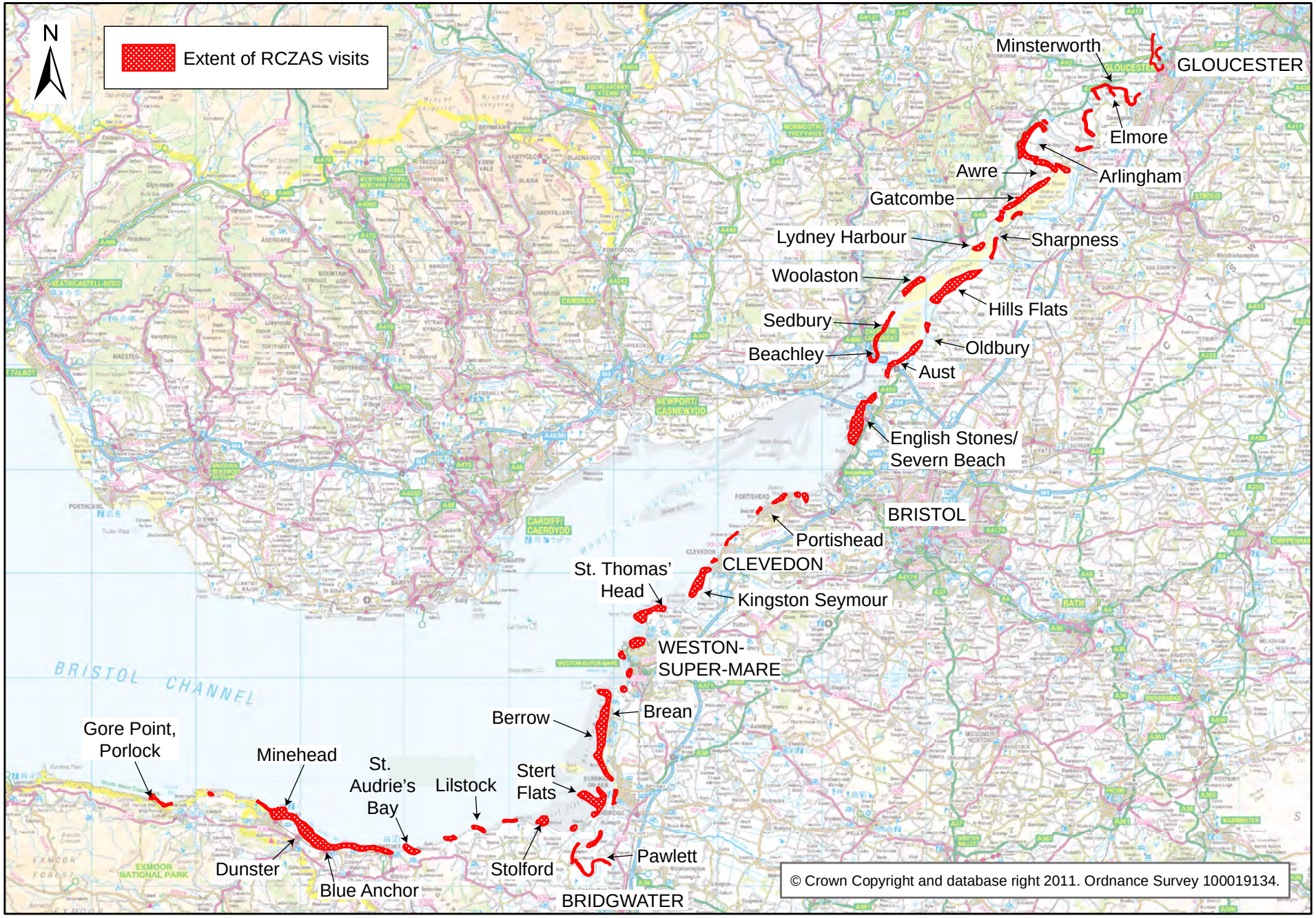

Figure 2: Extent of areas visited during Severn RCZAS field survey and selected locations mentioned in the text.

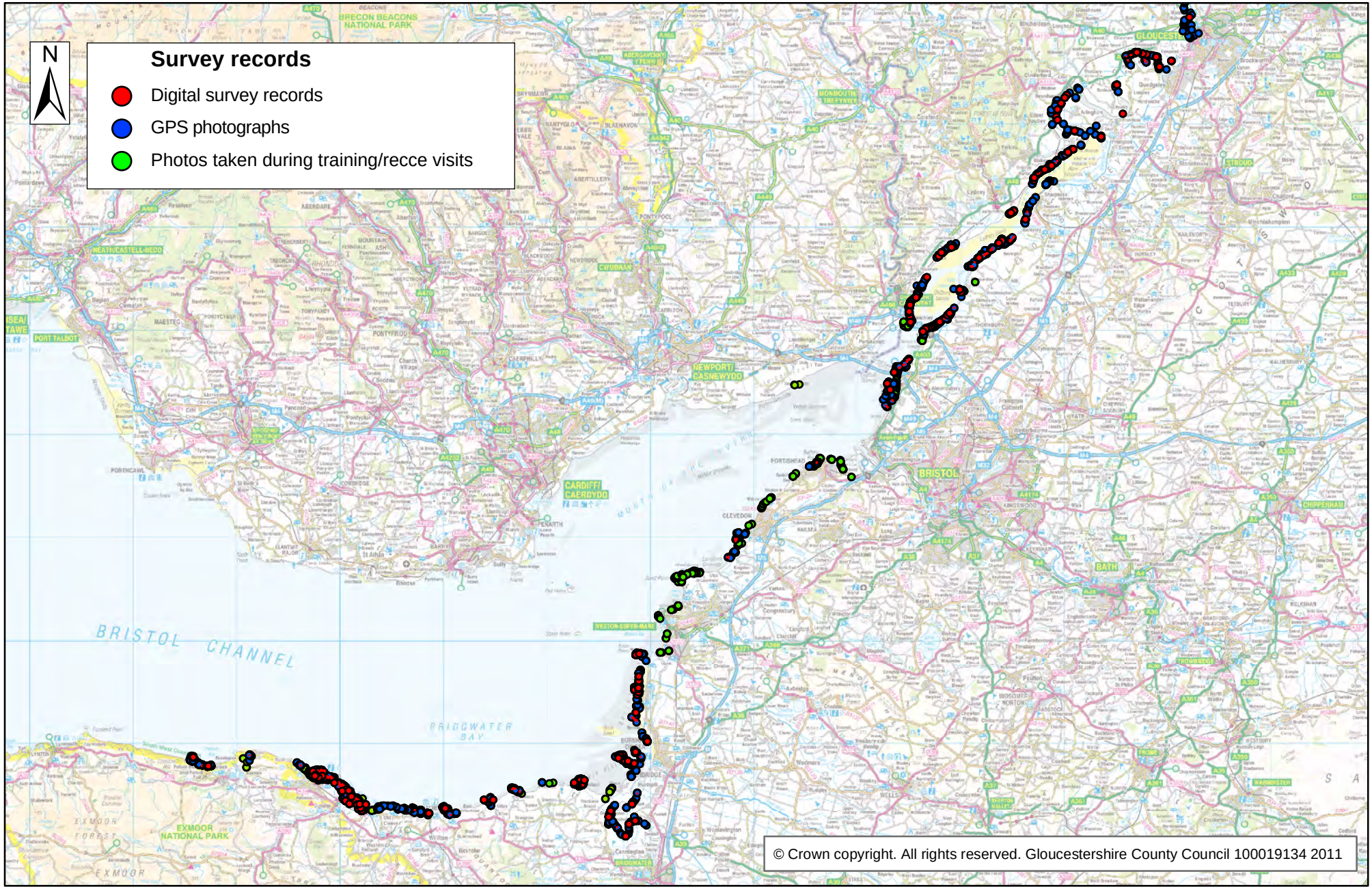

Figure 3: Plot of all GPS survey and photographic records made during RCZAS fieldwork

1:500,000

0 25 km

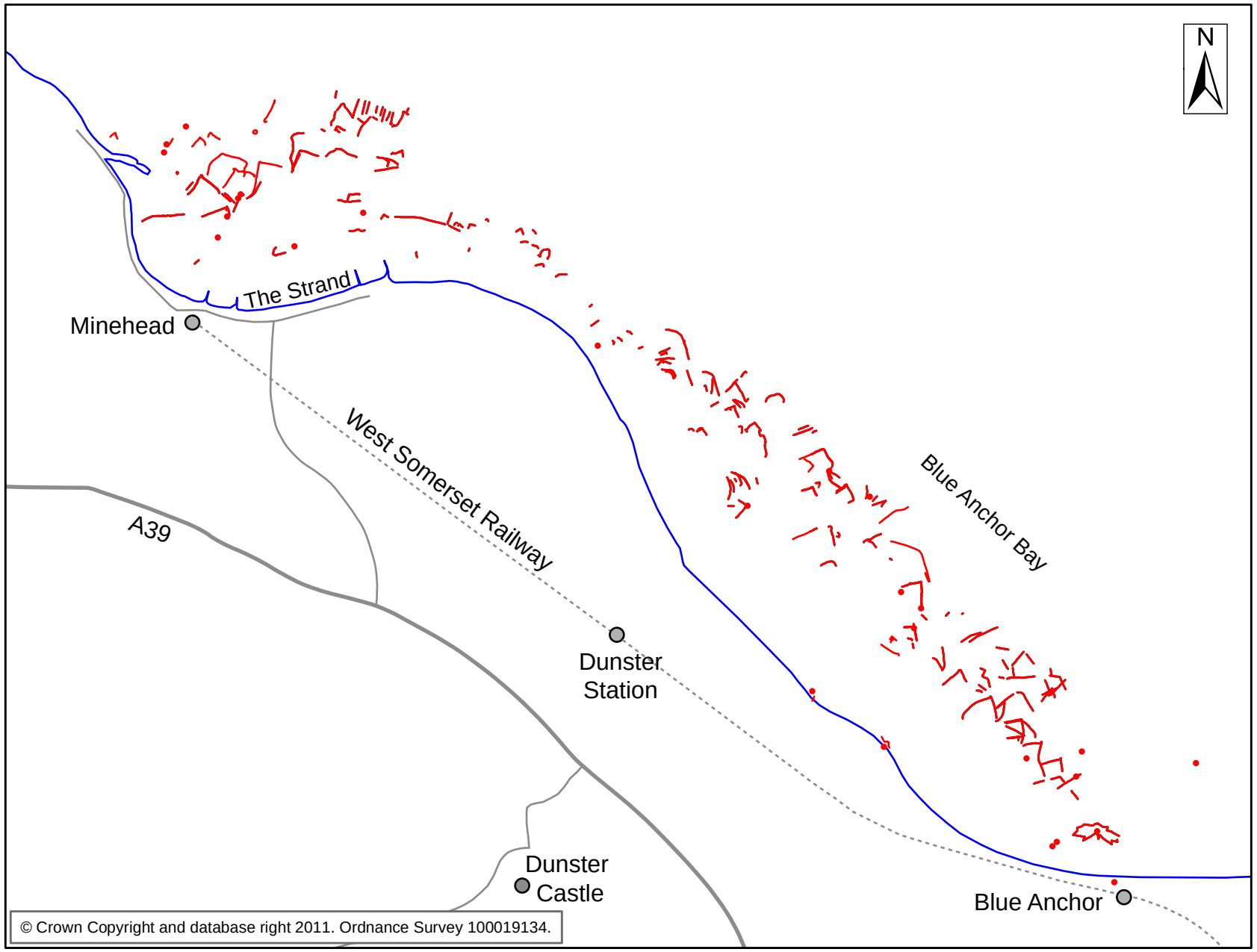

Figure 4: All surveyed features at Minehead, Dunster Beach and Blue Anchor Bay

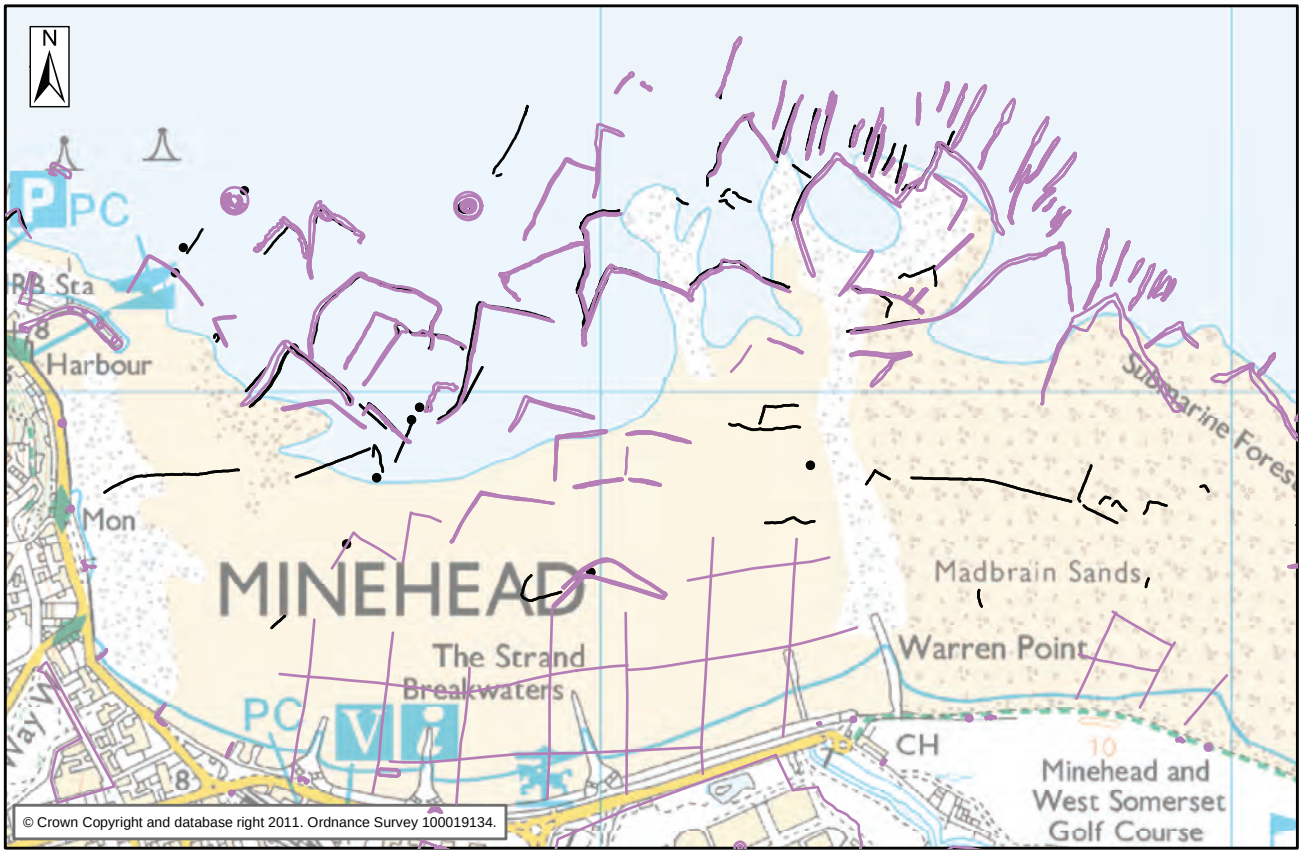

Figure 5a: Field survey records (black) and NMP records (pink) at Minehead

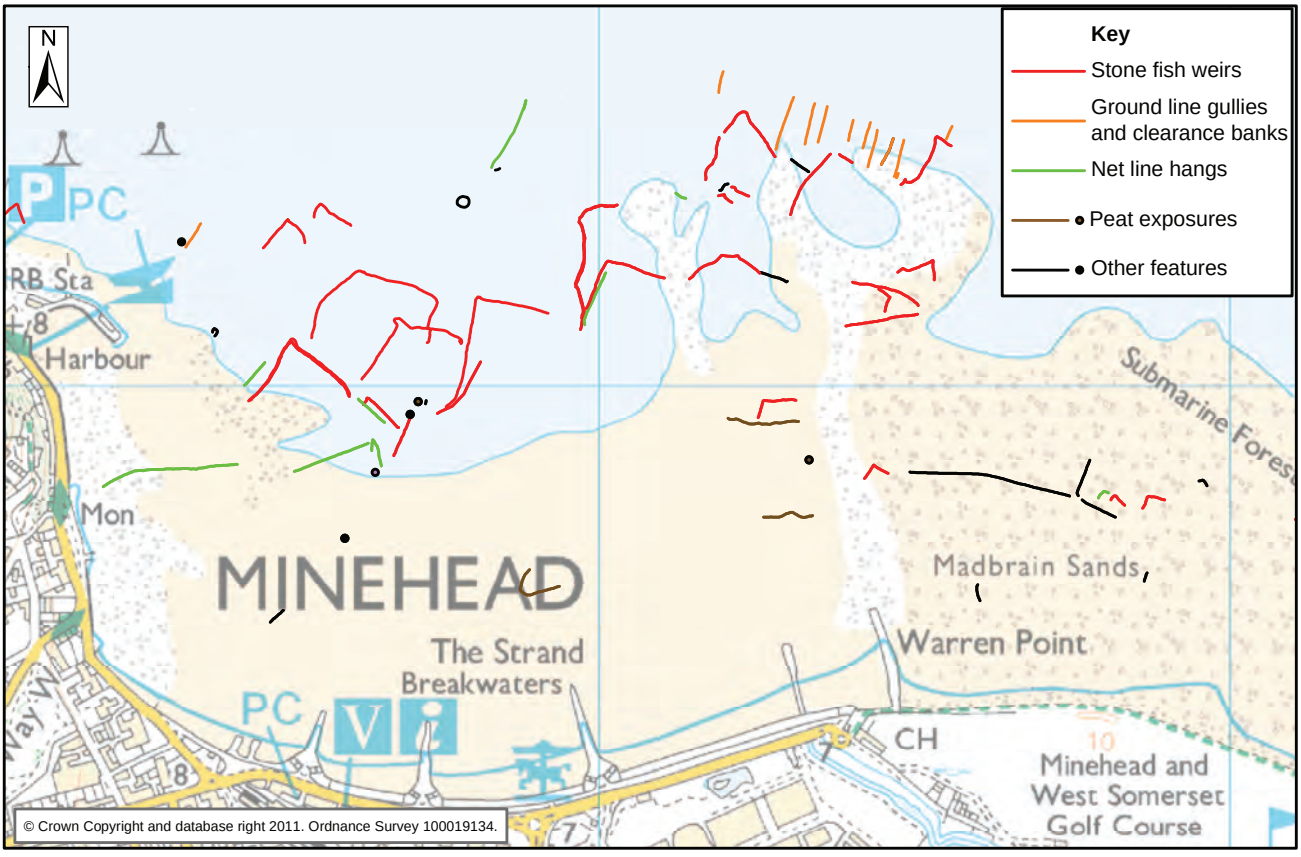

Figure 5b: Surveyed features at Minehead by type

Figure 5: Field survey results from Minehead

0 500m

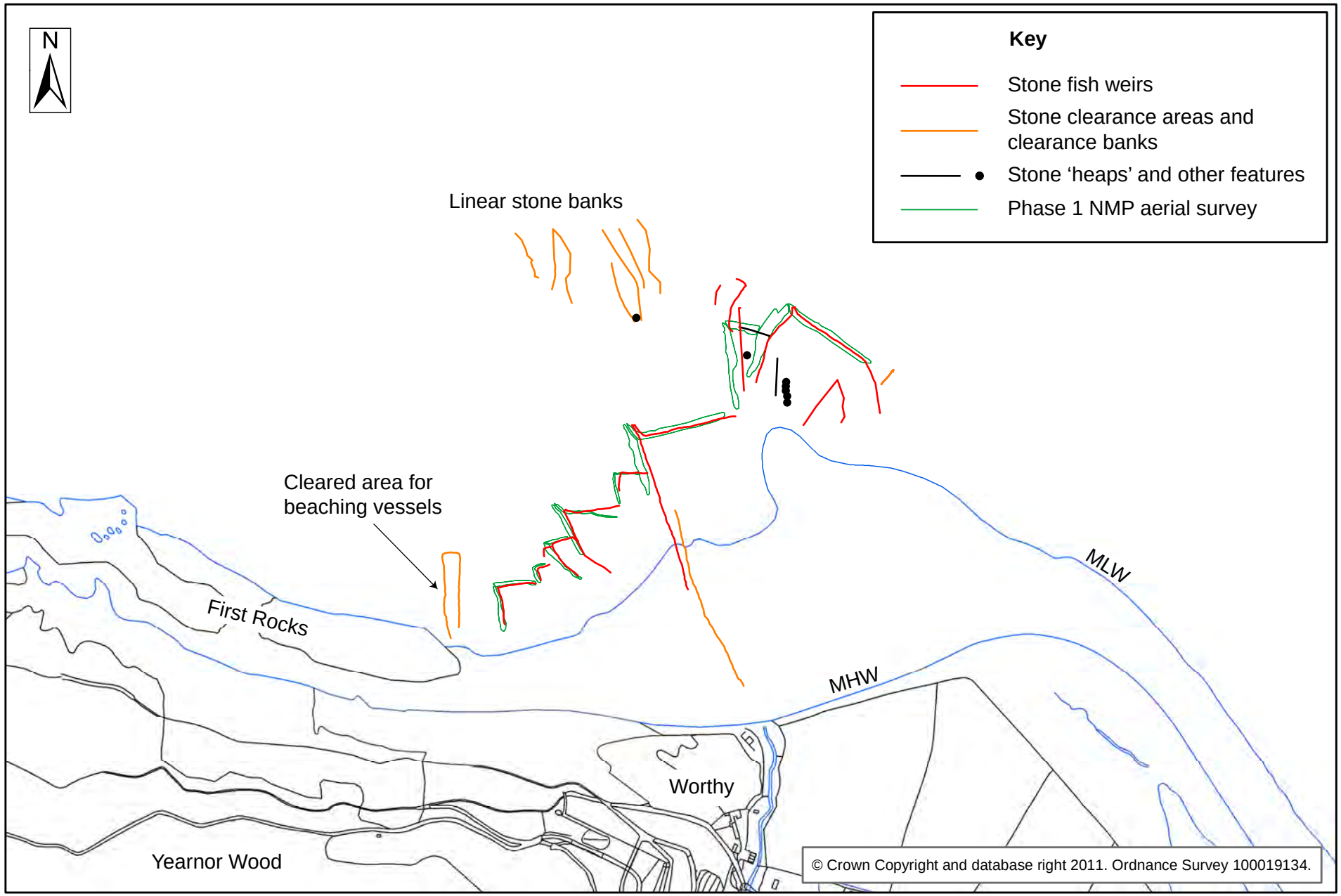

Figure 6: Surveyed features at Gore Point, Porlock, Somerset in comparison with the phase 1 NMP aerial survey records

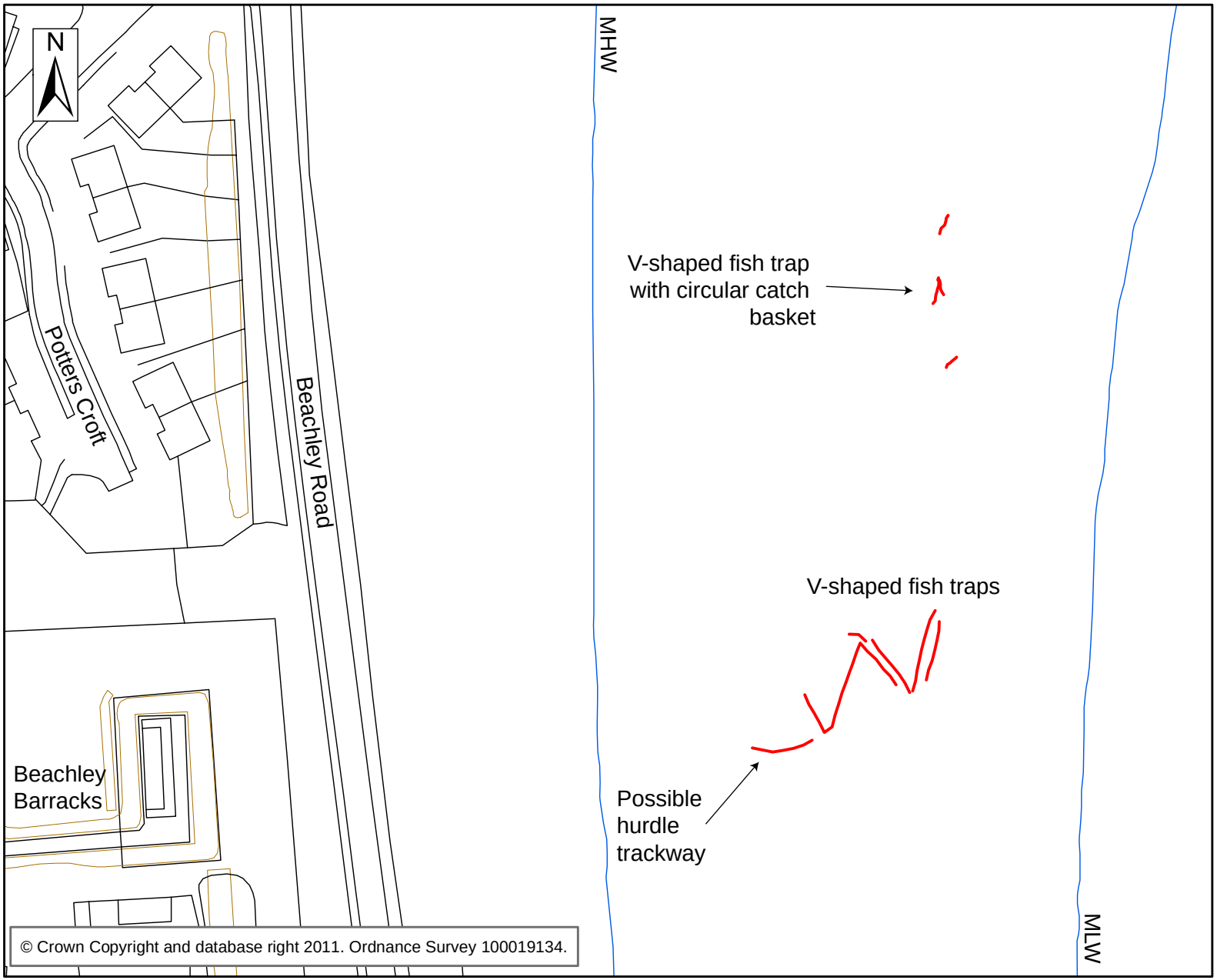

Figure 7: Features surveyed at Beachley, Glos

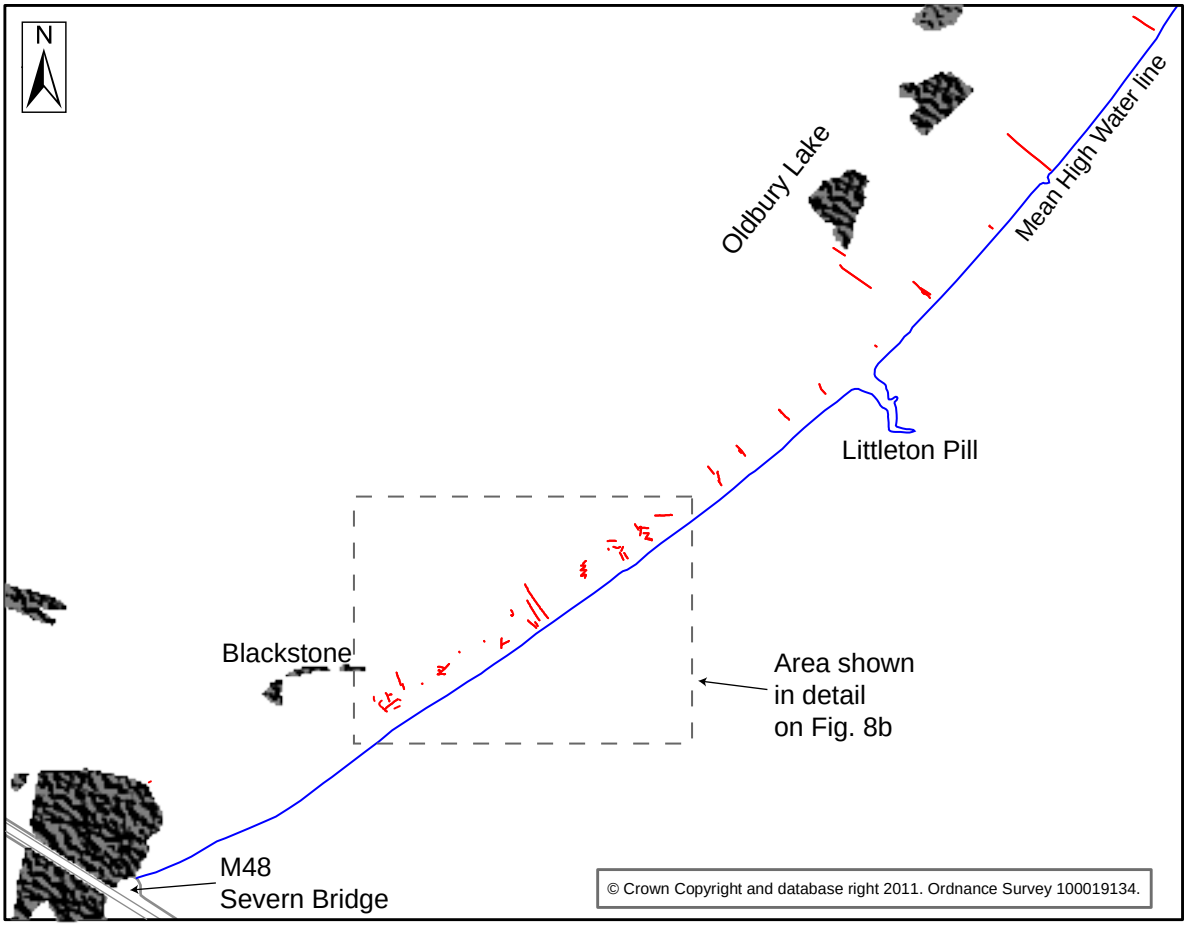

Figure 8a: Features surveyed between Aust and Cowhill Pill, Oldbury

0 500m

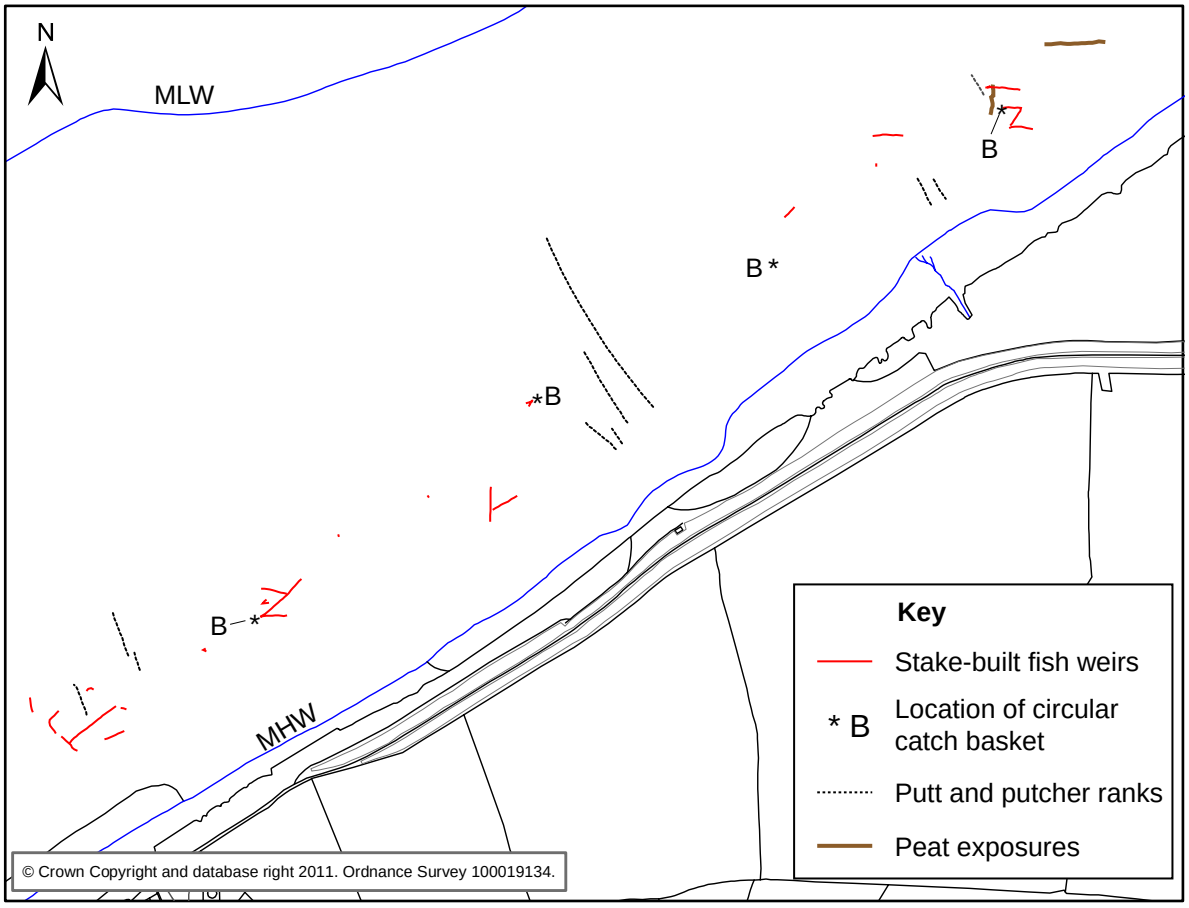

Figure 8b: Detail of features recorded at Aust

0 100m

Figure 8: Features recorded at Aust and Oldbury, South Gloucestershire

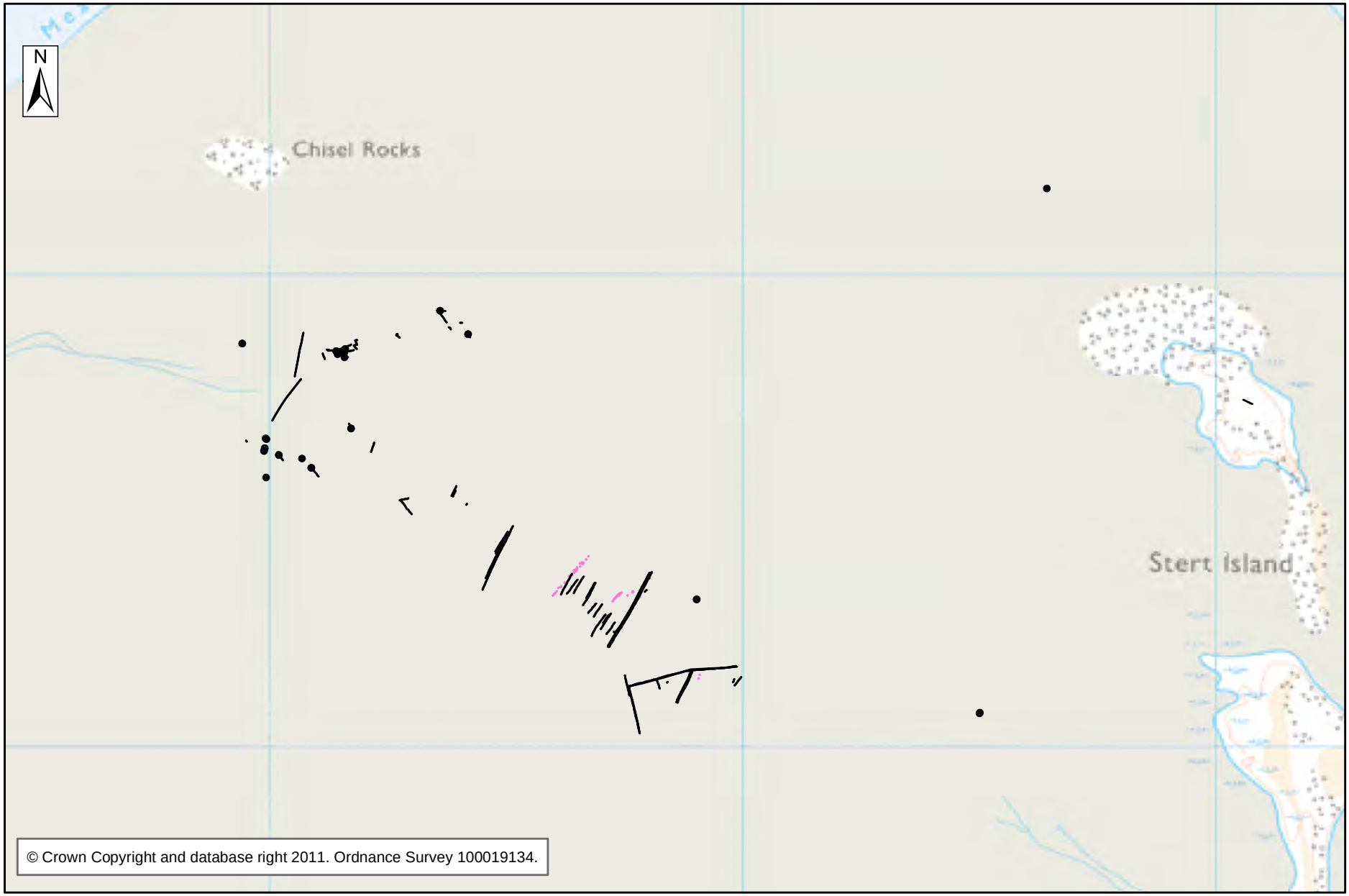

Figure 9: Field survey records at Stert Flats (black) overlying NMP mapping (pink)

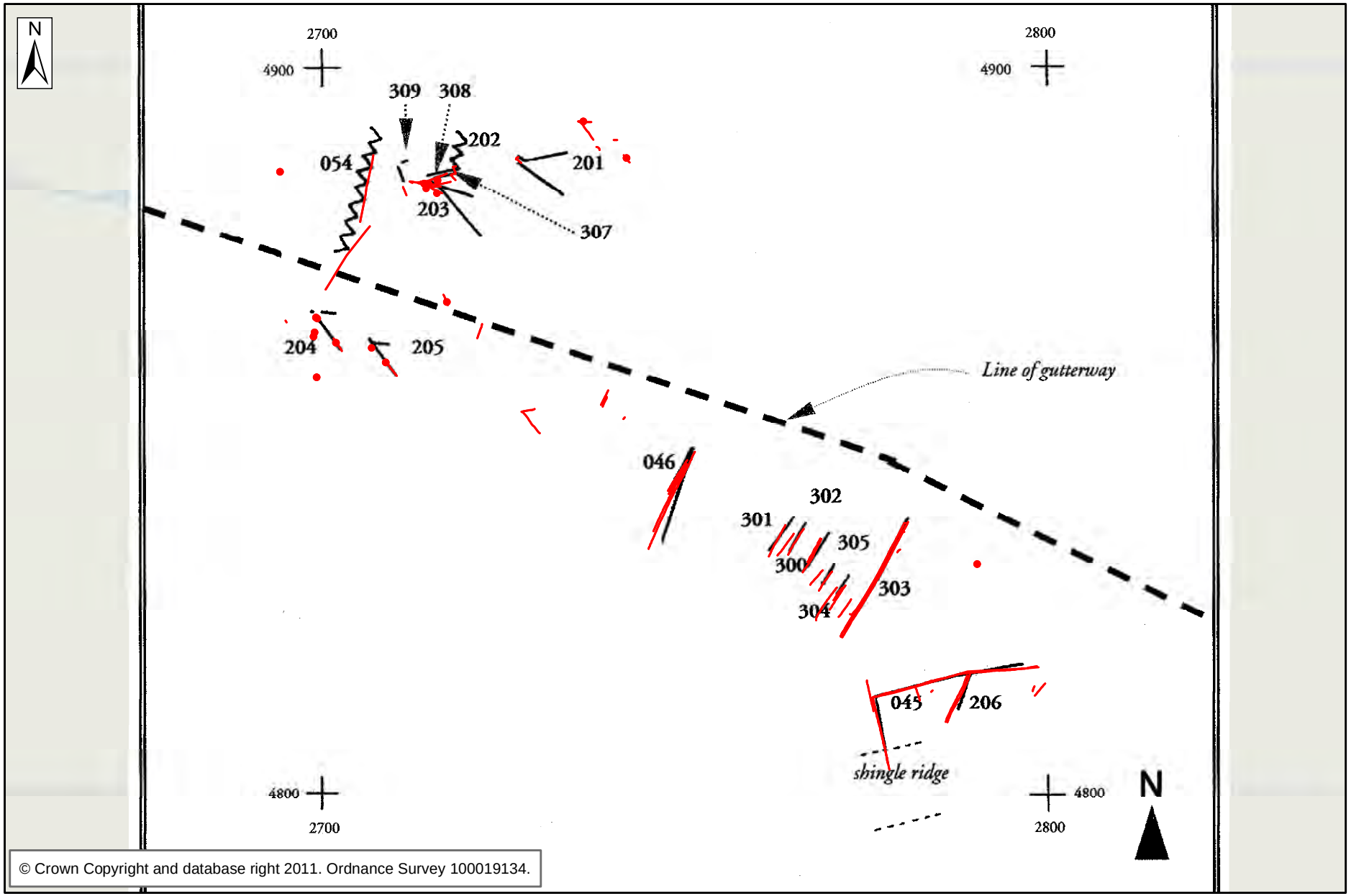

Figure 10: Recorded features at Stert Flats (in red) overlaid on earlier survey (Brunning 2008, Fig 1.)

0 500 m

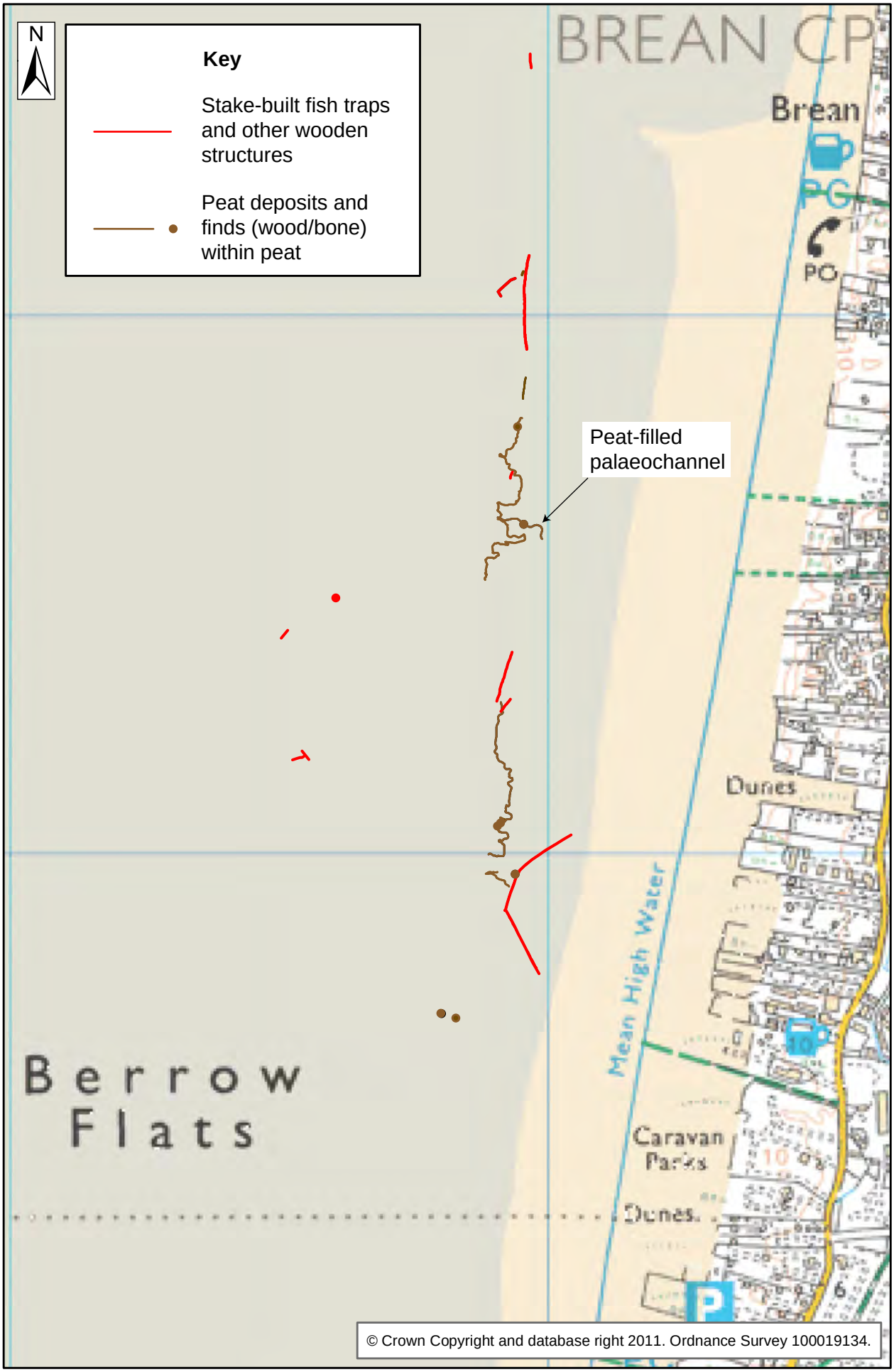

Figure 11: Features recorded at Brean and Berrow

0 500 m

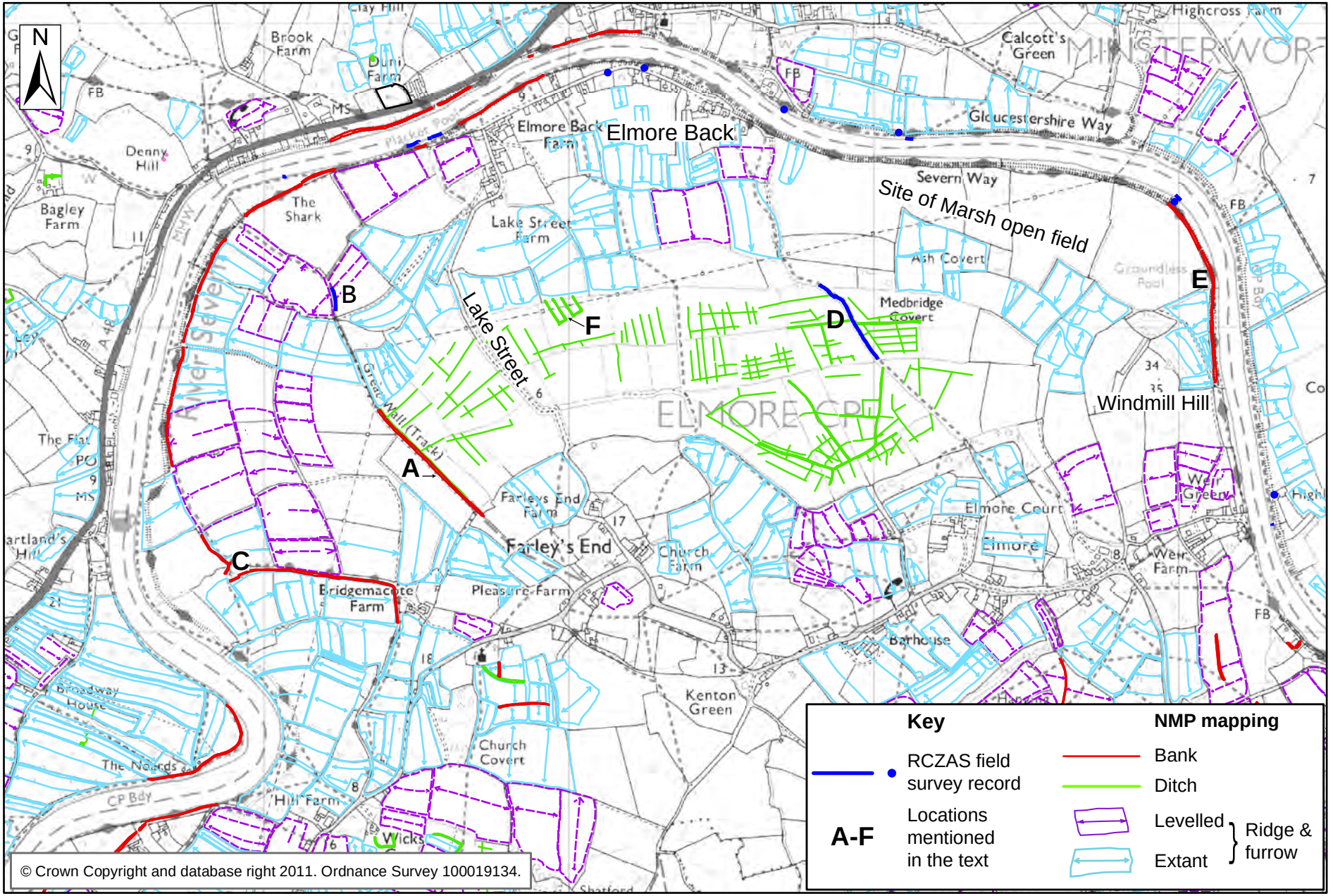

Figure 12: Features recorded by the RCZAS NMP and field survey at Elmore

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