Severn Estuary Rapid Coastal Zone Assessment Survey

PHASE 1 REPORT

for English Heritage
(HEEP Project No. 3885)

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Version 3 Final, December 2009

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Summary

This document represents the Phase 1 report into the Rapid Coastal Zone Assessment survey for the Severn Estuary, undertaken by staff of Gloucestershire and Somerset County Councils on behalf of the local authorities of Gloucestershire, South Gloucestershire, Bristol City, North Somerset, Somerset and Exmoor National Park, and funded by English Heritage through the Historic Environment Enabling Programme.

The project has been carried out in accordance with the Project Design (Mullin 2005) and version 2 of the English Heritage brief for RCZAS projects (Trow and Murphy 1999). The aims of the project were to enhance the archaeological record of the coastal zone and contribute to the shoreline planning of the estuary by collecting and integrating information from a variety of sources including the Marine and Terrestrial Archaeology Databases in the NMR; the National Hydrographic Office, Taunton; the Maritime and Coastguard Agency's Receiver of Wreck; County SMR/HERs, County Record Offices; aerial photographic collections; post-graduate university theses and academic research papers.

The results of this phase of the project provide:

- *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 enhanced understanding of the archaeological resource;*
- *An overview of coastal change from the Palaeolithic to the present day;*
- *Identification of sites which need further investigation as part of Phase 2 of the RCZAS.*

This report is one of three printed products of the Phase 1 RCZAS. Other reports summarise the results of the NMP mapping of aerial photographic information (Crowther and Dickson 2008) and of an assessment of Environment Agency Lidar data for trial areas within the estuary (Truscoe 2007). This third version has been substantially updated and revised from earlier drafts.

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1 Introduction

1.1 This document forms the main Phase 1 report into the Severn Estuary Rapid Coastal Zone Assessment Survey (RCZAS). The project was funded through the English Heritage Historic Environment Enabling Programme and undertaken by staff of Gloucestershire and Somerset County Councils. The project was carried out in accordance with the Project Design (Mullin 2005) and version 2 of the English Heritage brief (Trow and Murphy 1999).

1.2 This version of the report is the third and final submitted draft, revised on the basis of English Heritage comments and updated after completion of the aerial photographic mapping (Crowther and Dickson 2008). Research needs identified in the South West Regional Research Framework (Webster 2008) have been added at 6.12 below. Chapters 8 and 16 have also been significantly revised. Chapter 14 has been substantially re-written due to the second round of Shoreline Management Plans.

1.3 The archaeological resource in the Severn Estuary is under threat from natural processes such as coastal erosion, exacerbated by the high tidal range and strong currents within the Estuary. Other threats include ongoing development pressure along the shoreline, marine aggregates extraction within the estuary itself and proposals for new coastal defensive and realignment measures. There is a "*desperate need to achieve a comparable level of general reconnaissance on the English side*" as that existing on the Welsh side of the Estuary, together with a synthesis of archaeological and palaeo-environmental data (Turner *et al.* 2001: 7-8). The Severn Estuary was identified as a priority area for further coastal research in *England's Coastal Heritage* (Fulford *et al.* 1997), and up-to-date knowledge of the archaeological resource will be essential to inform the second stage of the Shoreline Management Plans (SMP2). Outline consultation SMP plans for the north coast of Devon and Somerset and the rest of the Severn Estuary have been produced (Atkins Ltd 2009, Halcrow Ltd 2009). The SMP2 process is due to be completed by March 2010. Pressures on the existing coastline are many and varied, and there is an urgent need to understand more fully the extent and nature of the archaeological and palaeoenvironmental resource in order to identify the likely impact of these natural and man-made threats.

1.4 The physical environment of the Severn Estuary is such that organic and environmental evidence is often well preserved, offering data not available on dry-land sites. Extensive palaeoenvironmental work has been carried out in the estuary, particularly in the last 15 years (Bell 2001), and studies of sea level change and coastal movement have also been undertaken. Much work remains to be done, however, both on a regional scale and on individual sites (Rippon 1997a: 270-271).

1.5 Although work has been undertaken in the inland wetland areas of the Severn Estuary, systematic archaeological projects were not carried out in the intertidal zone until the early 1980s. Many of these were carried out in Gwent and elsewhere on the Welsh side of the estuary (Rippon 1997a: 18). Important work was carried out at Brean Down, Somerset, by Martin Bell between 1983 and 1987 (Bell 1990) and Richard McDonnell undertook survey work in Bridgwater Bay between 1993-4 (McDonnell 1995a). The Severn Estuary Levels Research Committee (SELRC) has published much of the research in the estuary since 1985 and this has concentrated on the area between Gloucester and the River Parrett and the right bank of the estuary between Gloucester and Cardiff. The proposed construction of the Severn Tidal Barrage prompted detailed survey between Beachley Point, Maisemore Weir and Hinkley Point (SELRC 1988, McDonnell and Straker 1989), and the building of the Second Severn Crossing included extensive archaeological evaluation and excavation, largely undertaken by Wessex Archaeology and the Glamorgan Gwent Archaeological Trust.

1.6 The limited studies carried out to date within the intertidal area have shown that the existing level of archaeological information held on national and local authority databases

significantly under-estimates the nature and extent of the resource in the coastal zone (SELRC 1988, McDonnell 1995a, Hilditch 1998).

2 Survey area

2.1 The survey area is taken as being primarily the intertidal zone of the Severn Estuary from Gore Point, Porlock Bay, Somerset, to the present tidal limit at Maisemore Weir, Gloucestershire (Figure 1). The west bank of the Severn, where it lies within England (between Maisemore and Beachley Point), was also included in the survey. As this is one of the longest stretches of coast considered by an RCZAS, with the greatest tidal range, the total survey area covered amounts to 575 square kilometres (Figure 2).

2.2 The survey includes both an assessment of surviving remains within the intertidal zone and the immediate hinterland of this area, taken as land between Lowest Astronomical Tide (Chart Datum) and 1km on the landward side of MHW. Sites located within modern urban areas, such as Gloucester, Bristol, Avonmouth and Weston-super-Mare were excluded from the study.

2.3 It is important to note that this RCZAS project does *not* examine the maritime archaeology resource of the Severn Estuary – the historical assets in the area below Lowest Astronomical Tide (Chart Datum). A separate marine archaeology survey of this resource has been undertaken by the Museum of London Archaeology Service or MoLAS (Burton, Clark and Jamieson 2007). These reports should, however, be seen as complementary to one another.

3 Methods

3.1 Introduction

3.1.1 The methodology was divided into three main tasks: the assessment of the archaeological resource, the analysis of coastal change and the mapping and recording of aerial photographic information to English Heritage national Mapping Programme (NMP) standards. These tasks were entirely desk-based, but allowed an evaluation of the threats which coastal change poses to the archaeology of the intertidal zone and its hinterland, as well as augmenting existing information about the archaeology of the Severn Estuary.

3.2 Information sources and analysis

3.2.1 Tabular and spatial data collected from Gloucestershire, South Gloucestershire, Bristol, North Somerset, and Somerset HER/SMRs was loaded as a set of ArcGIS layers within the project GIS. These data were then queried to produce chronological maps and overviews for the major periods (see Sections 7 and 8). As this data is difficult to fully exploit in the form supplied, a synthesis of the available published and unpublished data for the RCZAS project area was also produced, based on a trawl of information in the archaeological literature, the Victoria County History and theses held in the libraries at Reading and Bristol universities (see 6 below). A full list of the sources consulted is given at 17 below.

3.2.2 Data was analysed through a GIS environment, with mapping and data sources loaded into the project GIS, which was then utilised to identify significant concentrations of archaeological sites and areas of coastal erosion. Areas of archaeological significance were thus identified, and an assessment made of the threat to these from coastal change. Areas of few recorded archaeological sites were also identified as needing further work in order to verify whether this reflects a real lack of sites, or merely a lack of fieldwork in these areas.

3.3 Coastal change

3.3.1 Coastal change was assessed by the analysis of aerial photographs and cartographic sources, coupled with the synthesis of previous palaeoecological work and studies of sea-level change. The archaeological resource was assessed by reference to existing data sets such as the Maritime Archaeology Database held by English Heritage and information from a diverse range of sources including local record offices, the National Hydrographic Office, university theses and Shoreline Management Plans produced by the Environment Agency. A detailed summary of the evidence for coastal change is given at 10 below.

3.4 Aerial photographs and Lidar data

3.4.1 In order to better understand the archaeological resource in the intertidal zone and its immediate hinterland, aerial photographs of the RCZAS project area were analysed and transcribed to NMP standards by staff working at the National Monument Record, Swindon. Two sample areas of Lidar data were also analysed in order to assess the usefulness of this data in the coastal environment. The results of these analyses were presented as two separate, stand-alone reports that were submitted to English Heritage with this Phase 1 report (Crowther and Dickson 2007, Truscoe 2007).

3.4.2 The report into the RCZAS NMP (Crowther and Dickson 2008) included more detailed discussion of subjects to which the NMP work has made significant contributions, such as the typology and development of fishing structures, the development of the medieval agricultural landscape and the location of twentieth century military facilities, than has been included in this report.

3.4.3 As a result of the aerial photographic and Lidar analyses, a total of 928 new monument records have been identified and created in the National Monument Record (NMR) AMIE database, and 373 existing records have been revised. At least 334 (35 percent) of the new sites identified relate to the fishing industry in the intertidal zone, including numerous stone and/or timber built fish traps and fishing weirs that range in date from the 10th to the 20th centuries. Medieval and post-medieval period features dominated the sites identified and recorded by the NMP survey in the Severn Estuary's hinterland, and relate mainly to agricultural land-use and settlement, and land reclamation and flood defences. The number of Second World War coastal defensive sites identified by the RCZAS NMP survey was also far more than previously recorded. These results clearly demonstrate the importance and potential of aerial photography for understanding past activities along the Severn Estuary coastline, and consequently there has been a significant increase and improvement in the baseline data available for informed management of the archaeological resource and for the Stage 2 Shoreline Management Plans.

3.5 Appraisal of the success of project methodologies

3.5.1 A total of five HER/SMR databases were queried for the Severn RCZAS. None of these utilised a common data standard, or used the same GIS. The quality of the baseline data within this survey is therefore somewhat varied.

3.5.2 It is impossible to use HER/SMR data alone to undertake a survey such as the one presented here, and a good literature search was found to be a more effective tool, especially as this picked up data not recorded in HER/SMRs, such as unpublished theses and palaeoecological studies. Furthermore, general and synthetic material is very poorly represented in HER/SMR data, which is more focussed on sites and monuments.

3.5.3 The data produced by Defra's FutureCoast survey was invaluable in assessing recent coastal change and presents detailed information about projected coastal change within the Severn Estuary over the next 100 years. The document also deals with the morphology and historic change of the coast in far more detail than might be possible from a short assessment of historic maps and charts.

3.5.4 The NMP mapping of the coastline, although hugely productive in the identification and location of archaeological sites, was more time consuming than originally envisaged largely due to the tidal range and consequent lack of reference points for mapping. The estimated overall rate of progress of 20 days per quarter sheet used in the project design (Mullin 2005) proved to be insufficient for the reasons detailed below:

- Due to the extensive areas of estuarine mud and silts shown on many aerial photographs of the intertidal zone in the Severn Estuary the lack of hard reference points made the process of rectification and georeferencing oblique and vertical photographs in AERIAL5 more complicated and time consuming than encountered elsewhere on land or during other RCZAS projects in areas with a less extensive tidal range.

- Previous work on the Quantocks and in the Forest of Dean suggested that the Severn coast would contain, with a few exceptions, relatively low numbers of archaeological

features to be recorded. However, the land areas mapped proved to contain extremely complex, dense concentrations of earthworks; particularly ridge and furrow and river defences on the left bank in Gloucestershire and numerous phases of drainage channels around the Somerset Levels and the mouth of the River Parrett.

- Estimates of the number of 1km squares in the PD were based on counting km squares that were within 1km (in both directions) of the coast as mapped on digital versions of OS road atlases, which was the only mapping available at that time. The purchase of MasterMap (which includes accurate low and high water mapping and other scales of OS raster mapping) was included as a cost in the PD (Mullin 2005, Appendix A).

- Mapping narrow strips of 1km squares has only previously been attempted as part of the Suffolk RCZAS NMP project. It has become apparent that under this situation each km square cannot be mapped and recorded at the same rate as 1/25th of a quarter sheet. The estimate suggested by Helen Winton at English Heritage Aerial Survey as appropriate for dense archaeology when mapping and recording km squares is currently 30 days per 25 km squares.

- Although training time was allowed for, the time taken for newly recruited staff to come up to the same rate of progress as experienced staff was underestimated.

- Various standard tasks undertaken by NMP staff (routine supervision/monitoring, meetings, public searches, presentations, data transfer to and from HERs, fieldtrips etc.) are not included in the standard days per quarter sheet estimate for the duration of NMP work.

3.5.5 It is recommended that the above are taken into account for future similar projects.

3.6 Recommendations for methodologies to be adopted in future projects

3.6.1 SMR/HER data should be supplemented by a literature review for the survey area. This should include palaeoecological and archaeological literature, as well as a survey of unpublished PhD theses.

3.6.2 FutureCoast data should be used to assess past and projected coastal change, along with the results of the most recent Shoreline Management Plans.

3.6.3 Although historic maps and charts are useful, many were shown to have poor data value for the RCZAS in the Severn. Similarly, tithe maps were shown to have no data value in the Phase 1 RCZAS. Although it is potentially useful for Phase 2 work to include some study of historic maps and charts, Phase 1 work should be limited to identifying the location and potential usefulness of this data source, rather than its detailed analysis.

3.6.4 Detailed discussions should be held with staff of English Heritage's Aerial Survey and Investigation team before the designing of NMP projects. Issues such as a lack of control points and the time taken for new staff to become familiar with coastal monument types should be allowed for. Estimates of monument density based on surrounding areas of different landscape type (i.e. non-coastal) may be inaccurate. An accurate shapefile of the area to be covered should be an essential pre-requisite.

4 The sedimentary background

4.1 John Allen (2001a) has discussed the Holocene development of the Severn in some depth and a summary of coastal change is presented in Section 10, below. A brief introduction to the sedimentary context of the archaeological deposits in the estuary is given here, however, as these are frequently referred to in the literature.

4.2 The Holocene sediments are known as the Wentlooge Formation (Allen and Rae 1987), which can be sub-divided into the following:

- The Lower Wentlooge Formation consisting of thick silts with no or few thin peats, dating to roughly the Mesolithic/Neolithic period

- The Middle Wentlooge Formation consisting of thick peats alternating with silts, dating to the Bronze/Iron Age

- The Upper Wentlooge Formation, which consists of thick silts with no peat, dating to the Romano-British period. This formation is widely exposed intertidally due to coastal erosion.

4.3 The older Holocene deposits in the Elmore, Longney, Rodley, Arlingham, Awre and Slimbridge Levels are thick, mainly woodland peat with intertidal silts above and below it (Figure 3). The top of the peat is generally at 5m OD and has been dated to 800-200 cal. BC. Further Holocene deposits are known at Lydney Level, Berkeley Level, the Vale of Gordano, the North Somerset Levels and the main Somerset Levels. The silts within the Holocene deposits represent salt marsh and tidally influenced wetlands, as well as intertidal mudflats.

4.4 The Wentlooge Formation is incomplete over large areas of the estuary, the upper strata of the deposit being truncated in places due to the reclamation of land from the river and the construction of associated flood defences. In sheltered areas of active salt marsh, silt has been deposited over the last millennium and this reflects episodes of coastal retreat and advance during this period (Allen and Rae 1987). The Rumney Formation underlies the highest salt marshes and is divided into an Upper and a Lower deposit, dating to the medieval and early Modern periods. Hewlett (1997) has pointed out that, according to Allen, the Upper Wentlooge formation started to form at the end of the Roman period but that the Rumney formation did not start to accumulate until the 15th century, suggesting a hiatus in sedimentation between *c.* 1400 and 550 BP. The Awre Formation (Allen 2001b) lies below salt marshes at an intermediate level and appears to have been formed in the 19th century, whereas the Northwick Formation appears to have begun to be formed during the middle decades of the 20th century and is located in the lowest salt marsh.

5 Historic maps and charts

5.1 Assessment of historic map data

5.1.1 Historic maps and navigation charts for the RCZAS project area were consulted by visits to Gloucester, Bristol and Taunton Record Offices. The maps and charts were quantified and recorded in a database and their usefulness for future, field-based work assessed, based on the following scale:

- Maps and charts of high data value that can be digitised and accurately georeferenced within the project GIS;
- Maps and charts of intermediate data value that may require verification as part of Phase 2;
- Maps and charts of no data value which are either highly inaccurate or unable to be georeferenced.

Digital photographs were taken of any documents of high potential and sources consulted are listed in Appendix A.

5.1.2 Although tithe maps exist for all of the 66 coastal parishes within the RCZAS project area, an assessment of a random sample of ten from each county showed that these were of poor information quality for the RCZAS. The potential of these maps lies in the apportionment descriptions of individual fields, but analysis of this would be extremely time consuming and beyond the scope of the RCZAS at this stage.

5.1.3 The majority of historic maps were found to be of generally low potential for future work, although many have already been assessed and entered into HERs. Ordnance Survey mapping had higher potential, and MHW and MLW from the 1880, 1900 and modern maps was digitised to assess historic coastal change (see Section 12).

5.2 Collection of historic chart data from the Hydrographic Office

5.2.1 Historic navigation charts held by the UK Hydrographic Office in Taunton were also assessed for the RCZAS. As charts are generally prepared for the purpose of navigation, the surveys are more concerned with accurately mapping depth and the nature of the channel, rather than coastal archaeology and their potential is generally low. There are exceptions, however, in particular the 1849 Beechly survey of the Bristol Channel, which has good detail of fish weirs and other features, and the 1853 Alldridge survey which again shows fishing features and a submerged forest off Stolford. The accuracy of these charts has been tested in the field by McDonnell (1995a) who suggested that there is a degree of metrical accuracy to the representation of these features, but that many have been damaged or destroyed by coastal change, particularly in the area around the River Parrett. There is, however, potential for their survival elsewhere. Despite their high potential, the charts are very large-format and it was not possible to digitally scan them and assess their suitability for digitising or georeferencing into a GIS. It is recommended that this is further explored as part of Phase 2 of the RCZAS.

5.2.2 The UKHO has three catalogues of charts, spanning the period up to 1930; 1930 to 1970 and 1970 to present. A total of 154 charts covering the RCZAS project area are listed in these catalogues, most of which date to the period between 1850 and 1930. Particularly significant are the 1832 survey of the Severn by Commander Denham and the subsequent

resurvey of 1849 by Captain Beechly. The 1853 survey by Commander Alldridge is also potentially useful.

5.2.3 Also present at the UKHO is a bundle of documents and micrographs relating to the private research of the former curator, Adrian Webb. These are generally copies of material held by Gloucester and Bristol Record Offices, dating from the 18th century onwards. Of particular interest in this collection is a map (TNA MFI/54) which dates from 1768 and shows the River Parrett.

5.2.4 The Hydrographic Office also holds Sailing Directions, which describe the charts, from 1839 to present. The current Sailing Directions (UK Hydrographic Office 2005) describe stakes still in use for fishing in Weston Bay and their potential hazard for shipping.

6 Previous research into the archaeology of the English Severn Estuary

6.1 The right bank: Introduction

6.1.1 The RCZAS project area begins at Beachley Point and runs along the right bank of the Severn to Maisemore (Figures 4, 5 and 6). The inland extent of the coastal zone in this area is partly defined by the A48 road, although the RCZAS area is slightly larger, running to 1km from MHW. This part of the survey area has been discussed by Putley (1999) and Green (1997), and a number of surveys have been carried out into the nature of the coastal archaeology, in particular by Brown *et al.* (2006), Allen (2000, 2001b, 2003a), Fulford and Allen (1992) and Fulford *et al.* (1992).

6.2 Beachley to Lydney

SMP2 Process Units TID1-TID2 and LYD1, Figure 4

6.2.1 The southern extent of the survey area is dominated by the 'Old' Severn Bridge, which replaced the Old Passage Ferry when it opened in 1966. The buildings and piers associated with the ferry were surveyed by Allen (2003a), who pointed out the lack of archaeological work on Severnside waterfront features associated with ferries and other trades. River pilots are recorded as living in Beachley in the 19th century (Elrington and Herbert 1972, 71) and pilots remained in the village into the 20th century. Boatmen formed the largest group of non-agricultural workers in the parish in the 19th century (ibid.).

6.2.2 The southernmost section of Offa's Dyke extends to Sedbury Cliffs, the area north of this forming part of Tidenham Chase. The part of Offa's Dyke within the survey area is protected as a Scheduled Monument (SM 34859, Figure 22). Sea walls are mentioned at Tidenham in the 13th century (Elrington and Herbert 1972, 51) but by 1969 they were no longer maintained. Fisheries are mentioned in the Anglo-Saxon period (ibid.), with 65 basket weirs in the Manor and sturgeon, herrings and porpoise listed amongst the fish taken. At Domesday a total of 56 ½ fisheries are mentioned, 53 of which were in the Severn (the rest being in the Wye). A fishery at Lyde Rock to the north of Beachley Passage is noted in 1573. In the early 19th century the main fishery was in Beachley Bay where both putcher weirs and boats using stop-nets were used; a total of 14 hedges of stakes containing over 1700 putchers are recorded in this area in 1837 (Elrington and Herbert 1972, 51). In 1866 the fishery on the Severn at Tidenham consisted of 754 putchers to the south of Slimeroad Pill and 375 at Lyde Rock, as well as a total of 13 boats using nets. A putcher weir at Slimeroad Pill was still in use in 1969 (ibid.).

6.2.3 Townley (1999) recorded a number of new sites including fish traps, weirs and baskets during a survey of the intertidal zone between Stroat and Woolaston and also produced a plan of the fishponds at Woolaston Grange. A boat was also recorded in the side of Grange Pill and this was later excavated by Dr A.J. Parker and students from the University of Bristol, but could not be accurately dated.

6.2.4 Brown *et al.* (2006) carried out survey work at Woolaston, in an area of peat deposits and submerged forest around the mouth of Grange Pill. The lower peat here is located between –1.5 and –2.7m OD, and the jaw bone of a roe deer was found within it at –2.51m OD. This overlies a head deposit with a buried land surface at its top. The bottom of the peat is dated to 6819 ± 33 BP (5775-5635 cal. BC) and organic bands near to its top are dated to 5420±40 BP (4335-4245 cal. BC).

6.2.5 The upper peat at Woolaston lies at between –0.9 and +2.1m OD and has trunks of substantial oak trees within it. A 50m wide palaeochannel is located 120m to the west of Grange Pill and this also contains the trunks of trees. There is also evidence for woven

structures in this channel. The base of the upper peat here was dated to 5256 ± 35 BP (4230-3970 cal. BC), the top of the deposit being dated to 4910±40 BP (3770-3640 cal. BC).

6.2.6 Dendrochronological work carried out on submerged oak timbers at Woolaston suggests that these date from 4096 to 3699 cal. BC and are largely contemporary with the period of peat formation (Brown 2005, 178; Timpany 2005).

6.2.7 Also at Woolaston, Brown (2005) identified a number of periods during which quantities of charcoal were present in the palaeoenvironmental record and suggests that this is a product of the burning of the reed swamp in the Mesolithic period to encourage grazing animals which were subsequently hunted. Unfortunately very little archaeological material has been recovered from the area to support this suggestion (Brown 2005, 215).

6.2.8 The environmental (pollen) sequence at Grange Pill begins prior to 5775-5635 cal. BC, when the environment was dominated by oak, lime and elm, with lime being the dominant component. Peat formation occurred during 5775-5635 cal. BC and resulted in alder carr woodland dominating the remainder of the lower peat deposit. Alder was also present in wood samples within the peat alongside willow and hazel. The period from the top of the lower peat is characterised by transition from alder carr woodland to reed swamp and then salt marsh, between 4230-3970 cal. BC. The reed swamp appears to have been repeatedly and deliberately burned during this period, a phenomena also known elsewhere in the estuary (particularly on the Gwent Levels) during the Mesolithic period. Alder carr woodland and peat formation returned *c.* 4230-3970 cal. BC and oak wood from this deposit has been dated to between 4096–3669 cal. BC.

6.2.9 Brown (2005) suggested that Grange Pill is an artificial cut, which replaced the palaeochannels to its west in the 12th-13th century, and was contemporary with the construction of two quays surveyed by Fulford *et al.* (1992). The Lower Quay is of stone and timber construction and covers an area of 12x5m and a single dendrochronological date was obtained for this structure, giving a felling date of after AD 1172. The Upper Quay is larger (12x15m) and better preserved, but of similar construction and was dendrochronologically dated to after 1100, with a possible repair or improvement after 1206. Both quays appear to have been linked at some point, but it appears likely that the Upper Quay replaced the Lower Quay due to rising sea levels. The construction of the quays date to the period at which the Manor of Woolaston was given to Tintern Abbey (1131) and it is likely that the quays were constructed on behalf of the Abbey. The structure is not on the Estate map of 1787 and there are no surviving documentary sources referring to it, suggesting it might have gone out of use due to the development of Cone Pill in the early 18th century (Allen 2000).

6.2.10 The most extensive work to have been carried out in this area is the series of excavations at Chesters villa (inland of Guscar Rocks, Scheduled Monument GC102, Figure 22) by Fulford and Allen (1992), building on work by Scott Garrett in the 1930s (Garrett 1938), which revealed evidence for a residential range and bath block. Aerial photographs suggest that the villa also had both eastern and northern ranges and a courtyard. Iron working debris was found in the intertidal zone near the villa in the 1980s, and tap slag and charcoal was found in the same field as the villa during fieldwalking. Remains of a timber framed building were found during excavations and this contained evidence for two iron smelting furnaces. Other features, including a boundary ditch were also excavated, but none of these were directly related to iron production. The date of the iron production is no firmer than AD 250-400. It has been suggested that the activity utilised ores mined in the Forest of Dean, and may have taken place over the spring and summer on a part time basis (Allen 2008; Fulford and Allen 1992). It was one of a series of iron working sites along both shores of the Severn that were probably linked by boat.

6.2.11 Fisheries are recorded at Woolaston and Aludredston in 1086 (Elrington and Herbert 1972, 112-3) and the Duke of Beaufort had 400 putchers on Horse Pill in 1866. Salmon fishing was historically very important in the parish, but shrimp fishing was also carried out

since at least 1707. Naval frigates are said to have been built at Cone Pill up to 1646 and two sloops sailed regularly to Bristol in the 18th century (ibid.). Flour and paper were sent from the Pill in the late 19th century and sailors and boat builders are mentioned in living in the parish in 1608 with sail makers carrying out their trade here through the 18th and 19th centuries (ibid.).

6.2.12 Most of the southern part of Lydney parish has been reclaimed from the Severn (Herbert 1996, 47) and a tradition recorded in the 1770s says that the river used to flow next to the church, which is now 1.6km from the present bank. Land was being accreted by the river through the 14th century but a major episode occurred in the early 17th century when *c.* 300 acres was deposited on what is now called the New Ground (ibid.). This was subsequently washed away, but began to reform in the 18th century when it reached *c.* 280 acres in extent (ibid.).

6.2.13 A fishery belonging to either Purton or Poulton manor is recorded at Lydney in 1086 (Herbert 1996, 73-4) and there were fisheries in Purton in 1269. Putchers are recorded in 1419 and five putchers are recorded at Wellhouse Rock in 1651. Stop nets were in use in the 19th century and a weir of 650 putchers is recorded at Aylburton Warth at this date. Nass manor maintained 300 putchers at Fairtide Rock below Nass cliff, reached by a ladder down the cliff face which was still in use in the 1990s.

6.2.14 Boats were trading out of Lydney in 1270 (Herbert 1996, 73-4) and Wose Pill at Aylburton was used by Llanthony Priory to ship wood. Lydney, Purton and Wose Pills were all in use for trade in the 16th century with ships being built in the parish in 1608. Navy frigates were also built here in the 17th century. Lydney was one of the two main ports for the Forest of Dean in the post-medieval period and, when the ancient harbour was adversely affected by changes in the course of the River Severn, the principal user (the Lydney and Lydbrook Tramway) cut a new channel to the river. This channel took the form of a canal almost a mile in length with a tidal basin being added at its entrance in 1821 and a limekiln probably being constructed at around this date. The eastern end of the harbour, including a swing bridge, is a Scheduled Monument (County Number 474).

6.2.15 Allen (2001b) carried out an extensive survey of Lydney Level and discussed at length the geomorphology and soils of this area. Coastal erosion here has driven the right bank of Cone Pill inland over many metres, revealing a section of Plusterwine Lane which is associated with 17th and 18th century pottery and tobacco pipes. Two jetties have also been revealed due to exceptionally rapid coastal erosion along this section of the coast (Allen 2000). Traces of ridge and furrow cover roughly half of Lydney Level, some of which has been affected by subsequent tidal siltation. This probably dates to the 11-12th century, but is poorly dated, as only 17th to 18th century pottery has been found during fieldwalking. At least four former shorelines are present on the Level and it is suggested that the enlargement of this area started in the second millennium AD, as the earliest shoreline is overlain by ridge and furrow. At least six episodes of seabank construction were identified by Allen (2001b), and many of these survive as upstanding earthworks.

6.3 Lydney to Maisemore

SMP2 Process Units GLO1-GLO8 and MAI1-MAI2, Figures 5 and 6

6.3.1 From the early Middle Ages Purton Pill was a minor port (Herbert 1996, 73-4). NB There are two Purtons, on opposite banks in Gloucestershire (Figure 5). Three owners of boats at Purton were presented at the forest eyre of 1270 for trading regularly to Bristol in wood and venison stolen from the Forest of Dean. In 1282 seven boats were based at Purton Pill which was used for shipping coal from the Forest of Dean mines until the opening of Lydney harbour. In the late 18th and early 19th centuries it was also an outlet for navy timber

which was collected in a yard on the north side of the pill in Awre parish. Two vessels were based permanently at Purton in the late 18th century: a brig which carried navy timber to Plymouth and a sloop used in the Bristol trade (ibid.).

6.3.2 At Awre, to the north of Purton Pill, Allen and Fulford (1990a) identified two phases of land reclamation. Reclamation I is of 100ha and is dated by elevation differences to the Roman period. Reclamation II is 14ha and overlies silted ridge and furrow and is probably early modern. The existing seabank here apparently dates to 1851. At Whitescourt, Awre, the beach is littered with iron slag, furnace lining, Old Red Sandstone tile and Romano-British pottery (Allen and Fulford 1987). Pottery of the 17th to 18th century is also present and a small amount of Iron Age pottery was also recovered here.

6.3.3 The eastern tip of Awre parish is formed mainly of land reclaimed from the river, possibly before the 12th century (Herbert 1996, 14-16). Land called Hayward was reclaimed *c.* 1140 and land described as being formerly part of the Severn is mentioned in 1300. By the start of the 17th century more land was being deposited and is known as the New Warth. The *Main Sea Wall*, which survived until the early 20th century, is mentioned in 1846 and much renewal appears to have been undertaken in the 1840s. Land was also lost in the parish, notably to the south west of Awre Point. In 1234 the people of Awre sued those of Slimbridge, where new ground was accreting, for the return of their land, which was being washed away. Erosion removed several dwellings from around Woodend Lane in the 18th century resulting in the construction of new defences to the north east of Brimspill, but erosion continued at Woodend Lane into the 1980s.

6.3.4 Vessels often floundered on the Noose sandbank off Awre Point and on the point itself (ibid.: 37-38), and Awre churchyard contains several burials of the drowned. Fisheries are recorded in the manor by 1300 and in the 1320s and 30s these fisheries produced a large income. A feature, probably a fishing weir, known as *Pucherewe* is mentioned in 1493. In the 18th century the main fishery in the parish was between Hayward and Brimspill and by about 1913 a tenant of Poulton Court had *c.* 600 putchers in the river adjoining the farm, which the farmer still operated in the 1980s (ibid.). A fishery belonging to Etloe Duchy manor is mentioned in 1283 and stop nets are recorded in the 19th century in use between Purton and Gatcombe (ibid.).

6.3.5 Sailors are mentioned in Awre parish in 1608 and goods were landed at a number of places including Brimspill and Hamstalls (ibid.). At Woodend there was a limekiln at the end of Woodend Lane and limestone was loaded there in the 1820s. Most of the trade occurred around Gatcombe, which was a part of the Port of Bristol in the 15th century, and much of the trade entering the Severn went no higher. In the 18th century iron from the Blakeney furnace was shipped to Bristol and the Midlands but by the late 18th century Gatcombe became a centre of the timber trade and a large yard, called Gatcombe timber yard, was constructed to the west of the hamlet in the early/mid 19th century. Shipbuilding was established in the parish by 1608 and a shipwright is mentioned in Blakeney in 1662 (ibid.).

6.3.6 A medieval settlement known from documentary sources as Boxcliff is located near Box Rock (GSMR 19979), to the north of Awre. Slightly to the north of this settlement is Bullo Pill, originally used for boat building and subsequently developed by the Forest of Dean Tramroad Company as a port for exporting Forest of Dean coal and stone. Walker (2003) traced a track from the Forest of Dean to Portlands Nab, which was interpreted as the location of a ferry which ceased operation *c.* 1600, probably as a result of rising water levels.

6.3.7 Fisheries are recorded from the 12th century at Newnham (Elrington and Herbert 1972, 43-44). Gloucester Abbey had fishing rights on the river and a fishery called Head's Row is mentioned in 1382 and continued in use until at least 1617 when it consisted of 6 putchers. Another row of 18 putchers, called Court Row, is mentioned in 1602 and other rows included 22 in Putchmeadow row (1561) and Gilbert Row. Two fisheries are mentioned in 1803 and long net fishing continued into the 20th century (ibid.). Other fisheries recorded at

Newnham include one upstream from Newnham's Ladder held by Bristol Abbey; one belonging to Newnham manor which is mentioned in 1563 and another belonging to the Hill House estate which is mentioned in 1605 (ibid.). Two fish houses are also mentioned in the parish: one downstream of Hawkins Pill and another at Collow Pill, which was still in use in 1968 and is a Grade II listed building.

6.3.8 Ships were built at Newnham in the 18th century, and these included some of the largest ships to have been built on the river. A new quay was built at Newnham in 1755 and buildings once used as warehouses with projecting pulley beams and remains of former quays can be seen in Severn Street. The remains of the quay can still be seen along the eastern side of the modern flood defence bank at the northern end of Newnham's waterfront and consists of two courses of stone blocks plus an upper course of lintels (Putley 1999b).

6.3.9 Shipwrights are mentioned in Broadoak in 1608 and ships were built in the hamlet during the late 18th and early 19th centuries (Elrington and Herbert 1972, 80). A considerable area to the west of Rodley has been reclaimed from the river (ibid.) and an old sea wall is still visible. Reclamation continued in the 19th century and a new sea wall was constructed at the end of the century. The fishery of Garne and Rodley is recorded from 1157 and fishermen and fishmongers lived in the parish in the 18th and 19th centuries. In 1591, Rodley manor claimed keelage from boats unloading between Newnham Pill and Garden Cliff and sailors lived in the parish in the early 17th century.

6.3.10 Allen and Fulford (1990a) have identified a series of five land reclamations within a bend of the river at Rodley. Reclamation I totals 81ha and is ascribed to the Romano-British period based on height difference, but there is no archaeological evidence to support this. Reclamation II is in two parts, measuring 47ha and 90ha which are probably medieval in date and a third reclamation, measuring 170ha, is visible at Chaxhill. A fourth reclamation of 47ha is probably of post-medieval date and Reclamation V, visible at Rodley and Cleeve, is of suggested post-medieval date.

6.3.11 Salmon fishing was formerly important at Minsterworth and fishing for elvers continues today, although the archaeology associated with this activity and the archaeology of the river to the north of Minsterworth is poorly understood. Allen and Fulford (1990a) have, however, identified the flood defences from Over Old Bridge to Minsterworth, which enclose 260ha, as dating to not later than 1830, as documents from 1318 and 1784 refer to this area as water meadow.

6.4 The left bank: Introduction

6.4.1 Much work has been carried out on this side of the river and estuary by Allen (1986, 1991, 1992, 1997a, 2001a, 2003b, 2008) and surveys have been carried out of Porlock Bay (Canti *et al.* 1996), Bridgwater Bay (McDonnell 1995a), Gravel Banks, Avonmouth (Riley 1999) and Clevedon (Hilditch 1998). Extensive developer-funded work was carried out in advance of the construction of the Second Severn Crossing and the Seabank power station (see Locock 2000a, Gardiner *et al.* 2002). Rowbotham (1978) described the changes in the form of the river channel in the Gloucester area and the sedimentary sequence below Gloucester is detailed by Allen and Rae (1987). PhD research has also examined the sedimentary and archaeological sequences of this area (Hewlett 1997, Druce 2001).

6.5 Maisemore to Sharpness

SMP2 Process Units MAI4-MAI6, SHA1-SHA7, Figures 4, 5 and 6

6.5.1 The RCZAS project area begins at Maisemore Weir, but the archaeology of the stretch of river from here to Gloucester is poorly understood. The maritime/coastal archaeology of Gloucester is complex and poorly synthesised but it is known that the city acted as a major port in the Roman, medieval and post-medieval periods. No sites are recorded on the Gloucestershire SMR between Gloucester and Stonebench, although flood defences of unknown date flank the river here.

6.5.2 The area of land enclosed by the bend in the river at Elmore has been extensively discussed, due to the presence of a series of land reclamations in the inner estuary, which have been suggested to originate in the Roman period (Holbrook 2006, Allen and Fulford 1990a, Allen and Fulford 1990b, Allen 1990b). The Great Wall of Elmore runs for 800m across the alluvium at Bridgemacote and has a stone revetment along its south west side, suggesting that it is a sea defence, rather than a flood defence for already reclaimed land (Allen and Fulford 1990b). Hewlett (1997) studied the sedimentary history of this area and suggests that after the Great Wall was constructed 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 (1.26m) on this side. Hewlett also agrees that the Great Wall was constructed to prevent tidal, rather than fluvial, flooding.

6.5.3 Two reclamations, separated by the Great Wall, were identified by Allen and Fulford (1990a) at Elmore. Romano-British pottery was recovered from within this area and Saxon and medieval pottery has also been recovered from within both intakes. There is a 1.17-1.72m height difference associated with Reclamation I, which enclosed 280ha. Reclamation II takes in *c.* 74ha and is 0.16-0.28m above Reclamation I but 1.25-1.48m below the present marsh. Ridge and furrow is present across this area and a house called the Doodings, which is encircled by the seabank, is recorded from *c.* 1575. Allen and Fulford (1990b) have argued that the defences at Elmore and Longney are the first examples to be identified in Britain of Roman sea defences, although there is no direct archaeological dating for any of the defences and Hewlett (1997) has suggested that the models of salt marsh accretion suggested by Allen cannot be relied upon. According to Hewlett, the models have not been confirmed by fieldwork and, significantly, the 'Roman' reclamation at Elmore and Longney is 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 also points out the lack of precision over the dating suggested by Allen and Fulford and the absence of any radiocarbon dating evidence. Hewlett points out that six of the 11 'Roman' sites identified by Allen and Fulford's survey did not have any evidence of Roman occupation, and substantial amounts of pottery were found only at two (at Elmore and Longney). In any case, these were found in recent deposits of sand-silt and could have been derived from elsewhere: the farmer at Elmore, for example is reported as having stated that the ground there has been recently 'made up'. Hewlett (1997, 306) goes as 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 that the majority of the reclamation is probably of late medieval date at the earliest.

6.5.4 Three episodes of reclamation were identified at Longney by Allen and Fulford (1990a): Reclamation I has an area of *c.* 195ha, lies 1.3m below the level of the current active marsh and partially underlies the modern seabank. Reclamation II is smaller (*c.* 37ha) and lies 1.1m below the contemporary marsh and appears to have taken in a former course of the Bollow Rhyne. Reclamation III is 0.9m below the current marsh and occupies *c.*5ha. Roman material has been recovered from the area of Reclamation I and has been recovered from two sites: Hillfield Farm and an area 150m to its south west. Finds of medieval material dating to the 12th to 14th century are confined to discrete areas within Reclamations I and II

but metalworking residues have been found across the whole area. Allen and Fulford argue that Reclamation I must be of later Roman date and Reclamation II of a similar date (although see Hewlett's arguments to the contrary, above) and both of these phases are mentioned in medieval and later sources. Reclamation III appears to be medieval and date to no later than 1327.

6.5.5 Hewlett (1997) also carried out palaeoenvironmental work at Longney and identified an identical sequence to that at Elmore, but the lower peat had been deposited on weathered or reworked Lower Lias rather than sand and gravel. Pollen survived only below the upper 1.5m of the core, but a total of five pollen zones were identified. The lower unit was dominated by tree and shrub pollen, in particular *Corylus* (hazel*), Quercus* (oak) and *Tillia*, (lime) interpreted as local woodland which was becoming increasingly wet. Tree pollen becomes dominant in the next identified zone, dominated by a rise in *Alnus* (alder) in the subsequent zone, interpreted as representing the onset of an alder fen environment, which deposited *c.* 3m of peat. The fourth pollen zone sees a reduction in tree pollen and a marked increase in herbaceous types, such as sedge, which dominate the fifth zone. Further pollen analysis from Watts Farm identified only two pollen zones, corresponding to the interface between the peat and clay. The lower zone was dominated by *Alnus*, the upper by herbaceous pollen. It is suggested that an alder fen environment was rapidly replaced due to a rise in water table.

6.5.6 The course of the Severn at Longney may have originally been along the east side of the parish and the place name is Saxon for 'long island' (Elrington and Herbert 1972, 206). A pool-reeve was appointed to look after the water courses in the manor and a river wall was constructed between 1287 and 1300. The defences are recorded in 1540, when they were said to be in poor repair, and again in 1553. By 1625 the owner of land at Epney was obliged to maintain the sea wall, presumably due to its poor state of repair. Fisheries in the parish were granted to Pershore abbey in the 12th century and a fishing weir is mentioned at Epney in 1216 with a fishery belonging to Longney manor recorded in the 11th century. A small house called the weir house is recorded in 1553 (ibid.).

6.5.7 The, now disused, Stroudwater Navigation Canal locked into the Severn at Framilode but is now infilled. The canal was constructed between 1775 and 1779 and ran between the Severn at Framilode and Wallbridge, Stroud.

6.5.8 The sequence of coastal reclamation at Arlingham was discussed by Allen (1990b), who identified five main post-glacial morphostratigraphic surfaces:

- Surface 1 is the lowest lying and is contained by the seabanks shown on a map of 1725. These are mainly destroyed but survive as a slight ramp. Medieval ridge and furrow is located on this surface, which is interpreted as being no younger than medieval and is classified as the Oldbury Surface. Scatters of iron slag and Romano-British pottery on the alluvium to the south of Passage Pill were noted;

- Surface 2 lies between the 18th century seabanks and a clifflet which represents the 1802/1835 coast;

- Surface 3 is a clifflet-bound terrace visible on aerial photographs, but which has now been destroyed by ploughing and seabank construction. It is probably of 17th/18th century date;

- Surface 4 is a terrace of the Awre Formation of late 19th century date;

- Surface 5 is the youngest unit and is underlain by the Northwick Formation, up to 2m thick.

6.5.9 A series of boreholes were also taken by Allen that showed that there are two deposits of alluvium underlying Surfaces 1 and 2. Unit 1 is 10-15m thick and is overlain by a peat. This is earlier than Unit 2 which is *c.* 10m thick and of different lithological character. Unit 3 underlies Surface 3 and is identified as the Rumney Formation. This has cattle footprints preserved in its surface and probably dates to the 17th/18th century.

6.5.10 Allen and Fulford (1990a) also identified three early reclamations at Arlingham. Reclamation I is of 185ha and has been ascribed a Roman date, based on differences in height between it and the present-day salt marsh. Reclamation II is given a more definite Romano-British date, based on finds of this date recovered from within it. Reclamation III measures 68ha and is also ascribed a Romano-British date based on height differences. Reclamation IV measures 55ha and has extensive ridge and furrow: the area is described as one of the most remarkable, although rapidly disappearing, displays of ridge and furrow in the inner Severn Estuary. It is argued that this is not an early medieval phase of reclamation, but that it is Romano-British in date, based on elevation differences. Reclamation V covers 5.2ha and was in existence by 1725 and is probably early-modern in date. Reclamation VI has been extensively eroded by the westward migration of the river channel and appears to have been constructed between 1802 and 1835.

6.5.11 Allen (2002) identified a series of stratigraphic units within the section at Hock Cliff, Fretherne and a settlement site within the ridge and furrow shown on aerial photographs. Three flints were recovered from the beach as were five sherds of Romano-British pottery and over 1,000 sherds of medieval pottery dating from the 11th to 15th centuries. Other finds suggest that at least one of the buildings identified at the settlement site was used as a dwelling.

6.5.12 Historic changes in the course of the river at Fretherne and Saul have been noted and a 17th century sea wall is still visible (Elrington and Herbert 1972, 165). Land deposited by the river, known as warths, were considered to be common land and in the 17th century a change in the river's course increased their area by over 80a. Trows were built into the 20th century at Sanfield Bridge and mariners are recorded in the parish between the 14th and 17th centuries (ibid.).

6.5.13 The Severn has caused flooding in the parish of Frampton on Severn, notably in 1606 and in 1791 when 15 acres of the manorial estate were said to have been washed away (Elrington and Herbert 1972, 165). Land has also been added to the parish by the river: in 1615 *c.* 30 acres were deposited and are known as Bromwich's Warth. A manorial fishery existed in the parish *c.* 1225 when 6 fish traps were located at Buckpool. About 50 families in Frampton on Severn parish were employed on the River Severn in 1831 but the earliest recorded maritime activity is 1377, when a ship from Frampton was trading between Bristol and Ireland (ibid.). A shipwright lived in Frampton in 1572 and a boatyard is recorded at Frampton Pill until the late 19th century. Frampton Pill was also used to land coal in the 17th century (ibid.).

6.5.14 Allen (1986) claims that a total of 428ha has been reclaimed on Slimbridge Warth over the last 1000 years as a result of both natural and human action. He has also identified two areas of ridge and furrow on the estuarine alluvium which are enclosed by seabanks and two phases of sea defence at Slimbridge Warth. The first phase of defence occurred when Thomas Berkeley III enclosed 70 acres of marsh in 1335-6. The second Phase 1s suggested from 18th century maps and the construction of a new sea bank in 1806 and another in 1884-6. Sea defences are shown on Isaac Taylor's 1777 map along the coast from Frampton Pill to Hock Ditch and also on the Commissioners of Sewers map of 1835, but these are gone by the 1886 OS map (ibid.). This sequence appears to be supported by the stratigraphy of the area. Allen's suggested sequence is post-Roman use of the salt marsh for grazing, followed by medieval embankment and improvement of the soil for ploughing. Land was also subsequently reclaimed in the 18th and 19th centuries in this area.

6.5.15 Hewlett (1997) identified a sedimentary sequence at Slimbridge which was similar to that he identified at Longney (see above). Five pollen zones were identified here, the lowest being dominated by tree pollen, which is replaced by herbaceous pollen in the second zone, interpreted as the onset of wetter conditions associated with the deposition of sediment of a marine origin. The third zone sees an increase in *Chenopodiaceae* (goosefoot) pollen, which is common to some types of salt marsh, which continues through the following zone, although brackish conditions seem to have withdrawn by pollen zone 4. The fifth pollen zone is dominated by Poaceae (grasses) and Cyperaceae (sedge) pollen. The pollen record at Slimbridge was different to that from the other sites studied and was the only one at which a definite marine influence could be observed.

6.5.16 To the south of Frampton on Severn, a timber structure was recently revealed by coastal erosion at Purton, interpreted as a track which was intended to improve access to fishing engines on Frampton Sand (Price and Spry 2004). This may, however, be a jetty or other structure (Wright 2004). NB: There are actually two Purtons in Gloucestershire, located on opposite banks of the Severn to one another (Figure 5).

6.5.17 Parker (1999) published the initial results from the recording of a series of boats, used to reinforce the bank at Purton. A detailed plan with a standardised numbering system was produced and Parker suggested that this is used to refer to the boats in the future. The boats were deposited throughout the 20th century in order to protect the nearby Sharpness Ship Canal. Over 80 vessels are present between Purton and Sharpness and these include examples of 19th and 20th century coastal, estuarine and inland waterways vessels. The wrecks are being subjected to repeated vandalism and robbing and several have been severely damaged. Further work has been carried out by local historian Paul Barnett (SMR 27217), and the Nautical Archaeological Society has also recorded some of the vessels. The vessels have elicited a great amount of local interest including the development of an active preservation society 'The Friends of Purton' who are now co-ordinating recording and examination of the assemblage.

6.5.18 The burnt-out wrecks of the MV Arkendale H and MV Wastdale H are visible at very low tide between Sharpness and Purton. These tankers, carrying diesel and petrol, collided on the night of the 25th October 1960, then hit a pier of the Severn Railway Bridge and exploded. The wrecks settled on the sand and the next day were blown open with high explosive and remain there today.

6.5.19 The Sharpness canal runs between Sharpness and Gloucester and was opened in 1827. A series of docks and associated buildings are still in use at Sharpness Docks: the Old Dock (1827) and the New Dock (1874) which are on opposite sides of Sharpness itself. The Old Dock has a towing horse stable, a tidal basin, a lock house, and the original entrance from the Severn to the canal. This was designed by Telford who collaborated with Mylne in completing the canal. The basin is small, and was never intended as a commercial dock. By 1869 congestion was such that a new and larger dock was essential. The Old Docks are now a leisure boat marina.

6.5.20 The New Docks were opened 25th November 1874 to improve access to the Sharpness canal and thence to Gloucester Docks. A copy of a drawing by Loxton (dated to between 1885 and 1900) shows high and low level swing bridges and the outline of four large grain warehouses of which only the North Warehouse survives today. Another Loxton sketch shows the Sharpness Lighthouse, located to the south of the docks, which was mapped on the 1880 OS 25 inch plan but marked as disused on that of 1902. It had been removed by 1921 (Glos SMR 15589).

6.6 Sharpness to Aust

SMP2 Process Units SHA8, SEV1-SEV5, Figure 4

6.6.1 South of Sharpness, the alluvial estuarine environment between Berkeley and Aust was surveyed by Allen (1992), who suggested that the process of reclamation here was begun in the Romano-British period, but that the defences visible today probably do not correspond to the Romano-British ones. Ridge and furrow in this area shows that it was cultivated in the medieval period and appears to be of two phases: 'older' ridge and furrow which is S-shaped and grouped into interlocking furlongs and 'newer' ridge and furrow which is more regular and straight. Prior to the 1980s, when they were straightened, the sea defences along this stretch of coast were 20km long. These appear to overlie the ridge and furrow in some places, the result of it being 'set back' in the 17th century due to coastal erosion.

6.6.2 The coast between Berkeley Pill and Oldbury-on-Severn (which includes Hills Flats and the area now occupied by the Berkeley power station tidal lagoon) has seen extensive archaeological work over the last 25 years.

6.6.3 A survey by Allen and Fulford (1987) located 2nd to 4th century AD pottery at Hills Flats, and fieldwalking showed that material is more plentiful on the shore to the north east of Hill Pill. Other finds include iron slag and Old Red Sandstone blocks and Iron Age pottery was also recovered. Coastal erosion here has forced the mouth of the Hill Pill *c.* 350m inland and tidal silts from the palaeochannel have produced 12th to 14th century pottery (Allen 1996). A quay and a fish trap have also been exposed by coastal erosion (Allen and Fulford 1993) and an assemblage of 277 post-Roman pottery sherds was recovered from an area at the mouth of Hill Pill, which appears to have been used as a landing place during this period (Allen 2003b). The assemblage is very similar in composition to material recovered from sites in Gloucester, Chepstow and Bristol. Romano-British iron ores, furnace linings, slags and hammerscale recovered from Hills Flats, Severn House Farm, Dayhouse Farm, Home Farm near Oldbury and from Oldbury Flats indicate that there was an extensive iron smelting and iron working industry based on ores quarried or mined from deposits in the Forest of Dean (Allen 2009, Allen and Fulford 1987). This industry seems to have been particularly significant during the 3rd-4th centuries AD. Although pack horse routes may have served to carry ore to smelting sites, the many small ports of Romano-British date along the rivers Severn and Parrett such as Combwich, Oldbury Flats, Crandon Bridge and Rumney Great Wharf were probably the principal means by which iron bars and/or finished articles were distributed around the region (Allen 2009, Rippon 2008).

6.6.4 Alex Brown (2005, 241) carried out an analysis of lithic material collected by Allen (1997d: see below) from Hill Pill, noting that there is an unusually high concentration of retouched pieces and cores. Brown also carried out palaeoenvironmental sampling at Hill and dated the peat here to 5300 $\pm$ 60 BP (4230 to 4000 cal. BC). Dendrochronological sampling of five oak timbers was also undertaken, unfortunately no dates were obtainable, but the wood was identified as predominantly oak (Timpany 2005, 308). Brown also found evidence for *in-situ* burning of the reed swamp during the Late Mesolithic period, but this was not associated with any stratified archaeological features or finds (Brown 2005, 268).

6.6.5 At Hill Pill a map of 1659 shows a seabank, embayed by 175m to a sluice, which still survives (Allen and Rippon 1995). Allen and Rippon (1995) argue that the defences here began to be constructed in the Roman period (based on settlement evidence 1km away and some material on the foreshore) but there is evidence for set-back due to erosion in the early 17th century. By 1835 the sluice had been moved 75m seaward on a line with the contemporary sea defences. These remained until the late 1980s when the 17th century bank was levelled and a new bank constructed further out and this was subsequently strengthened and straightened in 1991.

6.6.6 Over 2000 flints ranging in date from Mesolithic to Early Bronze Age were recovered from a considerable distance along the banks of a tidal palaeochannel at Oldbury-on-Severn (Allen 1998b). A sondage excavated into the peat revealed five stratigraphic units, Unit 3 being radiocarbon dated to 5310 ± 70 BP (4325 to 3984 cal. BC). This appears to have been a soil which was trampled by animals, including cattle (it is not stated whether these were wild or domesticated), deer and possibly humans and Brown (2005, 237) suggests that these are the earliest dated footprints within the Severn Estuary. Flint cores and blades were also recovered from this unit.

6.6.7 The best evidence for occupation in the area comes from the unpublished excavations and monitoring of the Silt lagoon at Oldbury Power Station undertaken by Avon County Council. Unfortunately these excavations were undertaken in adverse conditions and many features were not explored (Brown 2005, 238) although a total of 53 archaeological features including ditches, beam slots, pits, postholes and a palaeochannel were recorded (Hume 1992). The work produced flint and a structural timber dated to 3400 ± 45 BP (1748-1675 cal. BC) from a depth of *c*. 1.8m. The prehistoric deposits were located at the base of the archaeological sequence on a clean fluvial sandbank or island and were overlain by in excess of 1m of archaeologically sterile alluvium, the surface of which contained structures and deposits of Roman date (A. Young pers. comm.).

6.6.8 Three Neolithic axes were found in this locale by Allen in 1988-9 (Allen 1990a), two (one Group VIII and one Group XXI) from Oldbury Flats within metres of each other, whilst the other axe (Group I) was found at Hills Flats at the mouth of Hill Pill from where worked flints including barbed and tanged arrowheads, scrapers, knives and cores were also recovered (Allen 1997c).

6.6.9 Druce (2001) sampled the peat at Oldbury as part of PhD research. Five test pits were excavated and a series of peat layers identified and radiocarbon dated. The results from the pits show a number of spatial and temporal differences, with open birch (*Betula*), hazel and oak woodland present prior to 5500 cal. BC. Conditions became wetter, probably as a result of rising sea-level by 4500 cal. BC. During the late Neolithic, conditions became fully marine with no further peat being deposited after *c.* 2500 cal. BC. Further work was carried out on the peat deposits at Oldbury by Brown (2005) who suggests that sea-level began to rise here *c.* 5500 to 5150 cal. BC, followed by the formation of the peat deposits. Brown (2005, 222) recovered further lithic material at Oldbury, alongside evidence for burning of the reed swamp during the Mesolithic period. The following sequence was suggested by Brown (2005, 234-239): prior to 5550 cal. BC there is no direct evidence for human activity, although there is a possibility that some of the lithics recovered from Oldbury may date to this period. Between 5500 and 4000 cal. BC burning of the reed swamp was carried out, which appears to be associated with lithics, probably in the late summer. Between 4000 and 3100 cal. BC the wetland continued to be exploited until peat formation ceased (implying a marine transgression) *c.* 2840 to 2138 cal. BC. The fringes of the salt marsh continued to be used during this period, and the area was grazed by cattle.

6.6.10 At Oldbury Flats, Allen and Fulford (1987) recovered 2nd-4th century AD pottery, along with iron slag, flue tile and animal bone from the southern edge of the reservoir. Similar pottery, animal bone and a bow brooch were recovered during earth moving operations at The Windbound Inn, Shepperdine. At Oldbury Pill, iron slag, Romano-British pottery and burnt iron ore were found south-west of the Yacht Club. A stone shaft also recovered from the edge of the salt marsh at Oldbury Flats may have been part of a high-status Romano-British building, matching finds of flue tile and *tegulae* from this area (Allen and Rippon 1997). Allen and Fulford (1992) argue that these scatters of occupation debris, coupled with stratigraphic analysis, imply that reclamation took place here in the Roman period. There may have been a settlement and port here, and structural remains, occupation layers and large quantities of Romano-British pottery are currently eroding out of the foreshore here.

6.6.11 Pottery recovered from an area of ridge and furrow at Home Farm, Oldbury-on-Severn also included Romano-British and medieval material (Allen 1997c). The Romano-British pottery mainly dated from the mid 3rd to mid 4th centuries and there was nothing older than the 2nd century. Pottery, iron making materials and fire cracked stone were recovered from Dayhouse Farm, Hill. The pottery included Romano-British material of 3rd to 4th century date. Waste materials from iron making were also present here (Allen 2009). At Nupdown Farm, Hill, 11th to 13th century pottery was recovered and similar dated material was found at Home Farm, Oldbury-on-Severn.

6.6.12 Allen (2005) identified eight fish traps visible on aerial photographs on Oldbury Flats and suggested that a group of features at Horse Pool may be of a kind unique to the Severn.

6.6.13 The setting-back of the coastal defences of the Severn in the early modern period is apparent as defences overlie ridge and furrow which is visible both on aerial photographs and on the ground. Allen and Fulford (1992) identify four areas around Oldbury where this has taken place: between Cowhill Pill and Oldbury Pill; along the banks of Oldbury Pill and Oldbury Village; at the mouth of Oldbury Pill on its north-east end and to the south-east of Oldbury Flats. This setting-back probably occurred in the early 17th century and is associated with the deposition of the Rumney Formation on the abandoned fields. There is no set-back downstream for Cowhill Pill or upstream from Oldbury Pill.

6.6.14 Recent work in the area between Oldbury and Aust has uncovered a new Roman settlement site and part of a minor Roman road close to the foreshore at Cowhill and further evidence of the Roman settlement at Aust first identified by Solley (1966), also close to the estuary foreshore (A. Young pers. comm., forthcoming)

6.7 Aust to Portishead

SMP2 Process Units SEV6, BRIS1-3, BRIS6, Figures 7 and 8

6.7.1 The intertidal features between Aust and Beachley were surveyed by Allen (2003a), who pointed out the lack of archaeological work on Severnside waterfront features associated with ferries and other trades. Cole (1912) also notes the Binn Wall, which runs south from Old Passage for *c.* 1.5km, as being the most impressive piece of coastal defence work on this stretch of coast, measuring *c.* 5m high and built in 1816-18. This feature is recorded as the Byndwall from at least 1646 (ibid.).

6.7.2 Extensive archaeological work took place to the south of Aust in advance of the Second Severn Crossing in 1992-4, much of it inland of the RCZAS project area. The initial phases of work were undertaken by Glamorgan Gwent Archaeological Trust (Lawler *et al.* 1992). Later work included excavations by Wessex Archaeology, summarised by Gardiner *et al.* (2002). At Hallen, two Iron Age structures were the first to have been discovered on the Avon Levels. These were revealed as three islands of *in situ* deposits, extending over 60m. Underlying these were two post-built round houses within small enclosures, separated by a small stream. Pottery (a significant proportion of which was non-local), animal bone and smaller quantities of fired clay, worked stone and worked bone were recovered with occupation occurring over the 2nd-1st century BC. No quern stones were found on site and there was very little evidence for the presence of crops or crop processing in the environmental samples. The environmental sequences suggested that the site was initially a stable salt marsh edge, following which there was a period of either negative sea-level tendency or marsh outgrowth during which period the vegetation resembled pasture, followed by increasing sea-level/marsh retreat. Sheep bone dominated the faunal assemblage but cattle and pig were also present. The site was interpreted as a short lived, seasonally occupied site used for grazing sheep and cattle.

6.7.3 A 1st century AD field system was excavated at Northwick, which was again in use for a short period and probably represents small paddocks or enclosures.

6.7.4 Environmental sampling in the wider landscape revealed fresh water peats at Awkley Lane which were dated to 4500-2600 cal. BC and further peat deposits at Vimpenny's Lane (west of Compton Greenfield) dated to 2920-2610 cal. BC. These results, along with those from a series of machine-cut test pits at Awkley Interface and an auger survey, allow a detailed understanding of the Holocene-Flandrian sedimentation of the Avon Levels. The regional vegetation was greatly affected by changes in sea-level: increasing sea-level resulting in the formation of the Lower Wentlooge Series and negative sea-level change in the accumulation of peat within a fen carr environment. An 'Upper Wentlooge transgressive event' has been identified across the Severn Levels and this occurred at Vimpenny's Lane and Awkley Lane at *c.* 2550 cal. BC. A further event, marking the change from the peat of the Middle Wentlooge to the estuarine sediments of the Upper Wentlooge formations, occurred in *c.* 390-110 cal. BC. This work enabled the model for the ways in which the Avon Levels were exploited in late prehistory devised by Locock (2001a) to be revised and expanded.

6.7.5 Druce (1998, 2001) carried out work at Gravel Banks, to the south of the Second Severn Crossing. The site was located *c.* 1.5km offshore from Chittening Warth where the peat is only exposed at low spring tides and there is also a submerged forest. Two layers of peat were analysed, the upper layer at -2.86m and the lower at -3.98m OD. The upper peat was dated to 6620 ± 70BP (5667 to 5472 cal. BC) and 6460 ±70BP (5553 to 5307 cal. BC) at its base and top, the lower peat to 7150±70BP (6211 to 5892 cal. BC) and 6440 ± 70BP (5573 to 5234 cal. BC) at its base and top. The lower profile of the peat here was divided into three zones, mainly consisting of tree pollen, suggesting the site was located close to woodland. The upper profile is also dominated by tree pollen, except at the very top of the column, where herbaceous pollen dominates.

6.7.6 Druce's work, and that carried out by others in the area, suggests an inundation *c.* 6000BC, followed by sea level rise which is followed by a short-lived regression and subsequent inundation *c.* 4000BC. The Avonmouth Levels are described as a highly complex area of mudflat, salt marsh, reed swamp and raised bog during the Neolithic, which may have been periodically inundated. There was some stabilisation in the Bronze Age/Early Iron Age, but this does not appear to have been long lasting or widespread. There is some evidence of Romano-British use of this area which is connected to occupation of the 'dry land' further from the coast.

6.7.7 Allen (2005) identified a total of ten fish traps visible in aerial photographs in the area around Gravel Banks and Riley (1999) recorded the locations of peat and submerged forest deposits here.

6.7.8 Slightly to the south of the areas excavated in advance of the Second Severn Crossing, sediment stratigraphic and palaeoenvironmental analysis was undertaken from along 6km of a pipeline corridor across the Avonmouth Somerset levels between Almondsbury and Seabank (Carter *et al.* 2004).

6.7.9 Charcoal from a feature below the alluvium at Easter Compton (also now well inland) was dated to 3550-2900 cal. BC and was associated with two flints. The lowest levels of peat at Marshwall Lane lay at 3.6m OD and were dated to 2700-2460 cal. BC and the upper levels to 2470-2190 cal. BC. The peat appears to have developed under fresh water conditions in an alder carr environment. Evidence for mixed woodland was also recovered. At Field 182, an organic silty clay within the peat at –5.56 to –5.63m OD also suggested a freshwater environment with pine, oak and hazel woodland, probably of early Holocene date. Peat in Field 186 at –1.35 to –1.45m OD had evidence for alder carr environment and local woodland of oak and hazel. This continued, with local fluctuations in alder and willow pollen, through the peat sequence, the upper level of which was at 2.06m OD. Above the peat evidence for a salt marsh environment was recovered.

6.7.10 Excavations at Farm Lane (Field 136B, the lane runs south east from Severn Beach) recovered evidence of a buried soil at 4.20m OD, dated to 3300-2200 cal. BC, but this work also indicated problems with dating buried soils in the area. The soil appears to have formed prior to the onset of rapid deposition of alluvial silts and pollen analysis showed that it developed below herbaceous vegetation cover with freshwater fen on the landward side. It was suggested that the presence of 'disturbance indicators' indicates that this area was used for (perhaps seasonal) grazing. Further excavations at Farm Lane, published by Masser *et al.* (2005) recovered evidence for a pair of parallel ditches which contained mid-2nd century AD pottery and further material of this date was recovered from a series of pits and ditches. Features dating to the 3rd to 4th centuries AD were also excavated, but there was no evidence to suggest that the site was occupied beyond AD 350. The environment during the 2nd century appears to have been open grassland with probable cereal cultivation and animal grazing nearby. By the end of the 2nd century, the site appears to have been occasionally inundated by the tide. Remains of wheat, barley and oat were recovered from the 3rd to 4th century deposits at the site, when the environment appears to have been open, disturbed grassland with few trees.

6.7.11 Excavations in advance of the expansion of a sewage treatment plant at Avonmouth (Allen *et al.* 2003) revealed evidence for a Mesolithic salt marsh environment which was subject to later alluviation. A deposit above this alluvium contained Late Bronze Age pottery and charcoal of oak, ash, elm and hazel as well as maple, yew, hawthorn and briar, interpreted as firewood charcoal. Charred plant remains included wheat and barley and imported stone and animal bone were also recovered. This deposit was dated to 1070-810 cal. BC and 1380-1010 cal. BC and was sealed by over a metre of alluvial clay. Two medieval (*c.* 13th century) ditches and three post-medieval ditches were also excavated here.

6.7.12 At Cabot Park, north of Avonmouth (Locock 2000a), there are a complex sequence of horizons, the lowest of which, dated to *c.* 2500 cal. BC, is known as the *BaRAS Layer*. This layer appears to represent a salt marsh environment with nearby woodland. A second soil layer, dated to *c.* 1500 cal. BC, was recorded and evidence for nearby hazel woodland was recovered from within it. A further upper gleyed horizon was radiocarbon dated to 1120-910 cal. BC. Archaeological deposits from this area include a dense scatter of burnt stone identified at Little Googs; a spread of charcoal dated to 910-424 cal. BC at Kites Corner and three spreads of charcoal, burnt stone and Late Bronze Age pottery at Stinkums (Locock *et al.* 1999). A site at Kites Corner produced a range of Mid/Late Bronze Age radiocarbon dates and evidence for burning, alongside cattle, fish and deer bone and probably locally produced Late Bronze Age pottery (Locock 2001b). Medieval and post-medieval material has also been recovered from the area around Rockingham Farm (Locock 1998).

6.7.13 Excavation was undertaken at Seabank in advance of the development of a power station in 1995 (Insole 1997). Organic deposits were recorded in the Upper Wentlooge Formation at 4.32 to 4.04m OD and these were radiocarbon dated to 2290-2030 cal. BC. The peat contained plant macrofossils including rush, water plantain, bulrush and other marsh species. A series of ditches, probably representing a field boundary, were also excavated and found to date to between the 11th and 14th centuries. Further work on the route of a pipeline between Pucklechurch and Seabank (Masser *et al.* 2005) revealed further evidence for Romano-British occupation at three sites. At Lower Knole Farm, a buried land surface containing Roman coarseware sherds was cut by a ditch, both of which were sealed by a thin layer of blue clay and a thicker layer of pinkish-brown clay which contained sherds of a 1st century AD tankard.

6.7.14 At Crook's Marsh, Romano-British occupation dating to the late 4th to early 5th century was identified by Everton and Everton (1980). Further work by Masser *et al.* (2005) revealed three ditches containing 3rd to 4th century pottery and environmental evidence recovered from their fills suggests that there was an open environment at the time and that wheat and barley

were grown and processed in the vicinity. An analysis of diatoms and foraminifera from the ditches suggest that they were flooded by salt water whilst they were open.

6.7.15 The archaeology associated with the construction of the Royal Edward Dock, Avonmouth (which included human remains and a Bronze Age rapier), was discussed by Brett (1997) but little archaeological work appears to have been undertaken in the Avonmouth, Portbury and Portishead dockland areas, although due to current expansion plans much development led work is likely to be undertaken in the future. The coastal strip between Avonmouth and Clevedon has attracted little research.

6.8 Portishead to Brean Down including Steep Holm

SMP2 Process Units PORT1-4, KIN1-4, HOL2; NDAS Process Units 7e06-7e02, Figures 8 and 9

6.8.1 The landscape development of the Gordano Valley area has been summarised by Jeffries *et al*. (1968) and Gilbertson *et al.* (1990) who sampled buried peat in the valley, which covered the whole of the Holocene, ranging in date from 11,020 ± 190 BP to 3820 ± 100 BP (9260-1770 cal. BC). A total of 9 pollen zones were identified which indicated a change from a cold, sub-artic environment, the arrival of oak and elm and the development of a mixed oak forest and the introduction of cereal crops.

6.8.2 To the south of Clevedon, worked flint including material of Upper Palaeolithic, Mesolithic and Neolithic date, as well as flakes and cores, were recorded at Blackstone Rocks (Sykes 1938). Hilditch (1998) carried out a rapid survey of the coastal archaeology between Wains Hill, Clevedon and Sand Point, Worle, where analysis of aerial photographs suggests that mud cover is decreasing and that erosion is taking place immediately in front of the sea wall. The majority of the sites found during the survey were fish traps and poorly defined scatters of stakes without apparent function. Also identified were a series of target vessels used for the firing range off Kingston Seymour, as well as a number of recent bomb craters and stacks of bombs ready to be destroyed.

6.8.3 The River Banwell, which enters the Severn in Woodspring Bay, was surveyed by Allen (1997a) who mapped and investigated the location of the seabanks here. The oldest seabank located ran at least as far as the bridge at Ebdon and also extended up the Sand, Kewstoke and Northfield Rhynes. The date of this defence is uncertain, but it appears on a map of 1738 (BRO 04480) and is assumed to be medieval in date, perhaps having been constructed by the Augustinian community at Woodspring Priory, which was established in 1226. These defences have subsequently been increased in height and width and their modern form is a result of work in 1990. The seabanks were also shortened: the moving of an outfall at Ebdon in *c.* 1790 shortened the banks by *c.* 3300m.

6.8.4 The coast to the south of Sand Bay is dominated by Weston-super-Mare and little archaeological research has taken place along this stretch of coastline. The intertidal zone is over 2km wide in this area, but has never been systematically surveyed, presumably due to the dangers of the mobile mud banks.

6.8.5 The island of Steep Holm lies 9km off Weston-super-Mare and 5km from the tip of Brean Down. The island has a possible Viking presence and a 12th-13th century priory. There are also Victorian military works and extensive WWII structures.

6.8.6 Stan and Joan Rendell have undertaken archaeological fieldwork on the island since 1978 (see Rendell and Rendell 1993b). Several hundred flint and chert flakes have been recovered from the excavations at the priory site (Norman 1981), whose Victorian infill also produced a La Tène III brooch, whilst a ‘Celtic’ carved stone head has been found on the

island (Green 1993). Roman pottery has also been found across the island, perhaps associated with a possible Roman signal station indicated by a circular earthwork at the west end of the island from which Roman pottery has been recovered (but which has also been described as a Bronze Age barrow or Viking defensive work).

6.8.7 Field boundaries surveyed on the island (Rendell and Rendell 1993a) are suggested as being medieval in date. Small-scale excavations have taken place on the site of the priory and its associated cemetery. Subsequent to the Dissolution the island was used as a rabbit warren by the Lords Berkeley and a tenement for fishermen was constructed in 1776.

6.9 Brean Down

SMP NDAS Process Units 7e01, 7d46, Figure 9

6.9.1 Martin Bell carried out a series of excavations at Brean Down between 1983 and 1987 (Bell 1990), the earthworks on the Down were surveyed by Riley (1996) and subsequent archaeological work has been undertaken by Allen *et al.* (1997).

6.9.2 The excavations carried out by Bell were largely a response to coastal erosion, which revealed two Late Bronze Age gold bracelets, pottery and human bone (Bell 1990, 3-8). Prior to this, erosion had exposed a pit on the foreshore which contained sherds of at least two Beakers and charcoal (Taylor and Taylor 1949), radiocarbon dated to 3460 ±80BP (2012 to 1537 cal. BC: ApSimon 2000). The excavations focused on an area of the sand cliff and revealed activity associated with Beaker pottery, followed by Bronze Age stone roundhouses associated with biconical urns and Trevisker Ware, traces of cooking and weaving, and important evidence for salt production including briquetage. The gold bracelets were recovered from a deposit which also contained Late Bronze Age plainware, sealed by a sand layer into which several post-Roman graves were cut. Extensive environmental sampling was also undertaken at Brean Down, and showed evidence for limited cereal production but the exploitation of the surrounding area for grazing cattle and sheep. Subsequent archaeological evaluation along the sand cliff at Brean Down (Allen *et al.* 1997, Locock and Lawler 1996) recovered further Beaker and Romano-British pottery, including a Dressel 20 amphora. The environmental sequence indicated a lagoon/salt marsh at the base of the sequence, overlain by a Bronze Age deposit containing pollen of plantain and grasses with sedges and bracken with some birch, pine, oak and ash present. The Romano-British environment appears to have been dry pasture but the evidence was poorly preserved.

6.9.3 On the ridge above the sand cliff, nine Early Bronze Age round barrows were identified by Grinsell (1971) and two field systems were surveyed by the Royal Commission (Riley 1996). Near the east end of the Down is an Iron Age hillfort, partially excavated by Burrow (1976), and a Romano-Celtic temple is located nearby (ApSimon 1965). At the west end of the Down is a large Palmerstonian fort, built in 1870 and re-armed in World War II as a coastal battery (Riley 1996, 19). Features also known from the coastal zone at Brean Down include stone and timber fish weirs, structures of a possible military function and an exposure of peat, radiocarbon dated to 5620 ± 100BP (4707 to 4268 cal. BC: Bell 1990, 104).

6.10 Brean Down to Hinkley Point

SMP NDAS Process Units 7d31-7d39, 7d42-7d45, Figures 10 and 11

6.10.1 The coast between Brean and Berrow, at the mouth of the River Parrett, is backed by dunes which have been recorded since at least 1301 (Rippon 2001b), but no archaeological work appears to have taken place in the intertidal area here, apart from some environmental

sampling by Druce (2001) at Burnham-on-Sea. A total of three layers of peat were recorded at –0.01m, -2.89m and –3.10m OD, the top of each of these layers was dated to 4790 ± 70BP (3699 to 3375 cal. BC), 5590 ± 70BP (4587 to 4274 cal. BC) and 6340 ± 70BP (5478 to 5081 cal. BC). The base of the uppermost peat was also dated to 5370 ± 70BP (4346 to 4005 cal. BC). Pollen from the lower profile was divided into 5 zones, showing an early transition from lower to higher salt marsh conditions, followed by brackish/freshwater and subsequent possible shift in the climate *c.* 6340-5590 BP. Both the pollen and the foraminifera showed a regressive regime prior to the formation of the lowest peat layer. A return to reed swamp appears to explain the formation of the middle peat layer.

6.10.2 The upper pollen profile was divided into four zones showing salt marsh, possibly close to a shingle shoreline, then a return to reed swamp conditions. Charcoal was also noted throughout the profiles, with a slightly higher density in the upper sequence, possibly indicating an increase in burning around 5370 ± 70BP (4346 to 4005 cal. BC). Evidence from the surrounding area suggests that a regression took place *c.* 4-4500 BC, leading to the formation of reed swamp and salt marsh and an oak fen at Stolford (west of Stert Flats). After 4-3000 BC, sea level appears to have risen, leading to a fen carr environment.

6.10.3 Samuel Nash, a local archaeologist and historian, observed 100 sites in Burnham-on-Sea during his monitoring of building work, quarries, service trenches and road construction between 1956 and 1978 (Rippon 1995a). Nash recorded a tidal creek to the south of Highbridge and another to the south of Brent Knoll (the proto-Brue and the Siger). Roman occupation is known from along the banks of both of these rivers, but much of this is outside the RCZAS project area. The site closest to the coast, at Marine Drive, provided evidence of Roman occupation. Other sites in this area form part of a wide distribution of Roman salt production sites in the Somerset Levels, particularly in the Brue Valley.

6.10.4 The area of Bridgwater Bay at the mouth of the River Parrett has an extremely complex developmental history, summarised by McDonnell (1993, 1995a, 1996 and also see Carr 1971). McDonnell's work was part of a survey of Bridgwater Bay carried out by the Royal Commission on Historic Monuments and covered 36km^2. A total of 77 records were created as a result of the survey, but complex sites such as fishing grounds, which may have been composed of up to a hundred weirs, were allocated a single number. Nearly half of these records related to sites or structures in an intertidal context, and a third of all the records were originally from dry land contexts but had been deposited in the intertidal area by geomorphological movement or rising sea level. Peat deposits and a submerged forest were also identified off Stolford and these were dated to *c.* 2500BC and *c.* 6500 BC. The archaeology was noted as being fragile and subject to erosion – vulnerable sites (consisting of over half of those recorded) could easily be destroyed by a single storm event.

6.10.5 McDonnell (1996) also used cartographic, hydrographic and documentary evidence to construct the evolution of islands in the mouth of the Parrett (Slab Island, Dunball Island, Fenning Island and Stag Island), which have changed considerably over the last several hundred years. Carr (1971) also documented erosion over the last 150 years at Steart, but noted recent accretion between Wall Common and Fenning Island. Annual monitoring of Stert Island by the Nature Conservancy since 1957 has shown that the island has stopped its extension northward and southward, but erosion is more marked on the steeper, eastern side rather than the more exposed western side.

6.10.6 The only published dates for fishing structures in the English Severn Estuary are currently from Bridgwater Bay, where wood samples from 15 structures on Stert Flats were submitted for dendrochronological analysis. Only two timbers were successfully dated with felling dates of AD 932 and AD 966 (Groves *et al.* 2004). Several wood samples were dated on the Welsh side of the Second Severn Crossing (Godbold and Turner 1994) and found to date from possibly as early as the 8th century up to the 17th century. Recent work in Stert Flats has identified four major types of fish weir and produced radiocarbon and

dendrochronological dates indicating their construction from the 10th to 17th centuries (Brunning 2008). Repairs on some structures continue to the present day.

6.10.7 Bridgwater Bay was central to the development of models for sea-level change in the estuary, in particular Kidson and Heyworth (1973) carried out sampling of submerged forest and peat deposits in the Bay and produced a map of their own boreholes and those taken by Soil Mechanics Ltd for the M5 and by the Somerset Rivers Authority. The peat in the Bay ranges in date from *c.* 3000 BP in front of the storm beach to 7000 BP at Low Water Mean Spring Tide. The basal peat overlies the Lias bedrock and is itself overlain by estuarine clays. This terminates in the 'OD clay' on which are developed horizontal peats, in places interrupted by more clay.

6.10.8 A large cemetery was present at Cannington Park Quarry, 1km to the west of the survey area, where 424 burials of late Roman to 7th or 8th century date were excavated in the 1960s. It is likely that the cemetery originally contained *c*. 2000 burials but the vast majority were lost to quarrying. The cemetery may have been a Christian burial ground (Rahtz *et al*. 2000, Somerset HER 10503). It may have had some connection with late phases of occupation at the Romano-British settlement and probable port at Combwich, where in the late 1930s and 1950s a series of building floors, pits, skeletal remains and quantities of Romano-British pottery and other finds discovered through clay quarrying may represent the edge of a larger settlement underneath the modern village (Dewar 1941; Pike and Langdon 1981), whilst 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).

6.11 Hinkley Point to Gore Point

SMP NDAS Process Units 7d14-7d31, Figures 11 to 13

6.11.1 Hinkley Point forms the westerly boundary of Bridgwater Bay and the coast between Hinkley Point and Blue Anchor Bay is predominantly rocky. Fish weirs are known off East Quantoxhead (Somerset HER 33776) and in St Audrie's Bay (Somerset HER 34711) but little archaeological work has been carried out along this stretch of coast, which includes the harbour at Watchet.

6.11.2 Palaeolithic finds of mammoth tusks and flint tools have been made in the cliffs and harbour at Watchet, and from the cliffs and foreshore areas at Kilve, West Quantoxhead beach, Doniford beach and the Doniford river gravels (Grinsell 1970; Norman 1978; Riley 2006), with material of a similar date visible in the cliff section at Doniford. St Audrie's Bay has recently produced Pleistocene faunal remains of mammoth from peat deposits in the intertidal area (R. Brunning pers. comm.).

6.11.3 As part of the archaeological mitigation of the works associated with coastal defences on Minehead beach, 7.56ha of peat, submerged forest and other features including two wrecks were surveyed and sampled (McDonnell 2002a; Jones *et al.* 2005). Two main peat forming periods were identified in the Late Mesolithic and pollen, macrofossil and insect assemblages were analysed. Microliths have been found on the foreshore at Minehead (Boyd Dawkins 1870) and there is also abundant charcoal, suggesting burning of the reed swamp/alder carr in the Mesolithic period.

6.11.4 The only fish weirs in the RCZAS project area protected as Scheduled Monuments are located off the beach at Minehead (SM no. 33730). These are of stone construction and are recorded as 'Four medieval wish weirs 500m east of the harbour', although the Somerset HER mapping (PRN 33348) suggests that additional weirs are present in the Scheduled area, with considerably more in the surrounding area. The National Mapping Programme

identified an unusually high number of stone and timber fish weirs and net lines at Minehead, Dunster Beach and all along Blue Anchor Bay (Crowther and Dickson 2008, 82, Figure 5.25)

6.11.5 A submerged forest has been known at Porlock since at least the 1830s (Boyd Dawkins 1870) and worked Mesolithic flint has been found associated with this throughout the 19th and 20th centuries.

6.11.6 Porlock Bay was extensively surveyed by Canti *et al.* (1996) in response to the threat of marine incursion through the shingle ridge of the beach and subsequent erosion of archaeological features and the submerged forest. Mesolithic material is recorded from the intertidal zone and from the eastern end of the lagoon behind the shingle ridge. Other material recorded in the intertidal zone included stone built fish weirs and pillboxes, with the remains of lime kilns were also recorded on the foreshore.

6.11.7 A programme of coring was also carried out to examine the stratigraphy and palaeoenvironment. Sediments reach a depth of more than 9m in the area surveyed and peats are recorded from –5.5m, -2.5m and –1.25m OD. More detailed palaeoenvironmental work on the same sequence was published by Jennings *et al.* (1998) who recorded the results from a total of 71 logged cores, 17 radiocarbon dates (mostly from organic/silty clay contacts), four pollen diagrams and one diatom diagram (with supplementary biostratigraphic data obtained from spot sampling) from the intertidal area at Porlock.

6.11.8 Thin organic beds were found in two stratigraphic contexts on Porlock Marsh; first, intercalated with the fine clastic sediments, and second, as thin basal deposits overlying solifluction material. The organic beds are found at depths from approximately -0.5 m OD to -8.7 m OD, and are older than *c.* 5700 cal. BP (3750 cal. BC). From the radiocarbon results and the stratigraphic context of the organic beds, it appears that there were three periods of organic deposition; at *c.* 8300–7900 cal. BP (6350-5950 cal. BC), *c.* 7400–7200 cal. BP (5450-5250 cal. BC) and the most recent period bracketed by the dates 6450 to 5490 cal. BP (4500-3540 cal. BC, through the Late Mesolithic and Early Neolithic periods.

6.11.9 The pollen assemblage from the Marsh indicated a rapid succession from salt marsh through to a brackish to freshwater stage dominated by sedge with pondweed and rushes. Four local diatom assemblages were also identified in the Marsh: an initial fresh water assemblage at the base of the sequence, followed by a rise to dominance of marine and brackish water diatoms to *c.* 60% of the sum, but with a significant freshwater component. The marine and brackish water taxa rise to values of *c.* 70–75% in the third zone, followed by a freshwater assemblage of diatoms.

6.11.10 Radiocarbon dating and biostratigraphic analyses of the submerged Forest Bed suggest as many as six periods of organic deposition alternating with fine clastic sedimentation, in addition to 'basal peat' development, between 8463 cal. BP and 5821 cal. BP (6514-3871 cal. BC). Two, possibly three, of these periods may be contiguous with organic beds below the marsh.

6.11.11 Pollen analysis here revealed two zones: a lower zone with reduced Alder and high ferns, succeeded by a zone dominated by Alder. A further pollen column from the Forest Bed showed an initial succession from a brackish, probably high salt marsh environment dated to 5931–5658 cal. BP (3981-3708 cal. BC), followed by the establishment of a Willow dominated carr and finally the return to more brackish (salt-marsh) conditions. The most extensive of the four pollen diagrams covers the period from approximately 8500 cal. BP (6550 cal. BC) to soon after 7207–6864 cal. BP (5257-4914 cal. BC) and shows an initial phase of pine, oak and hazel *c.* 8559–8375 cal. BP (6609-6425 cal. BC), probably close to a salt marsh with tidal channels. This is followed by the rapid establishment of an alder carr environment until *c.* 7937–7727 cal. BP (5987-5777 cal. BC) when salt marsh and tidal channels became established due to a transgressive marine event. The final part of the

pollen column showed that alder carr conditions returned *c.* 7207–6864 cal. BP (5257-4914 cal. BC) but that this may have coexisted with a salt marsh environment.

6.11.12 Analysis of Relative Sea Level Rise showed an early Holocene (*c.* 9000 cal. BP – *c.* 7050 cal. BC) rate of rise of *c.* 16mm per year. By *c.* 7500 cal. BP (*c.* 5550 cal. BC), this had slowed to *c.* 8.5mm per year punctuated by a period *c.* 8000 cal. BP (*c.* 6050 cal. BC) where the rate was as low as 1.5 to 3.4mm per year.

6.11.13 The following analysis of the sequence at Porlock has been suggested:

> During the early Holocene (*c.* 10 000 to 8500 cal. BP – *c.* 8050 to 6550 cal. BC), much of the present coastal area was landward of the transgressing shoreline. By *c.* 8500 cal. yrs BP (*c.* 6550 cal. BC) the first signs of advancing marine conditions are recorded, as is the first instance of alder carr. Soon after 7937–7727 cal. BP (*c.* 5987-5777 cal. BC), a marine transgression converted the site to salt marsh with tidal channels. The high-energy shoreline at Porlock was seaward of the present MLWST mark, and probably comprised a gravel barrier, which was able to undergo episodes of consolidation and perhaps growth, resulting in the establishment of alder/willow carr and organic deposition in freshwater, back-barrier areas.
>
> From *c.* 8500 cal. yrs BP to *c.* 6000 cal. yrs BP (*c.* 6550-4050 cal. BC) the position of the shoreline (as measured by the landward limit of salt marsh/mudflats) oscillated as tidal inlets opened and closed. When the inlets were open, the marine limit was landward of the present beach. This pattern continued until around 6000 cal. yrs BP (*c.* 4050 cal. BC) when a high-energy event terminated the last alder carr recorded in the Porlock marsh area.

6.11.14 McDonnell (1995b, 1998, 2002a and b, 2003a and b, 2004, 2005) has carried out regular monitoring of Porlock Beach following the breach of the shingle ridge in 1996, on behalf of Exmoor National Park Authority. Features revealed include the drainage system of the former pasture fields, palaeochannels, former land surfaces, wooden structures and the partial skeleton of a Bronze Age aurochs (McDonnell 1998, Pollard *et al.* 2008, Straker *et al.* 2004). Within the past 5-6 years, the area of submerged forest within Porlock Bay has been progressively buried by sand deposits (McDonnell 2005).

6.11.15 A piece of worked timber was found in an intertidal channel on Porlock Marsh in 2003 (McDonnell 2003a). This was a roughly hewn, radially split oak plank with two mortices cut through its thickness. The wood was radiocarbon dated to cal. AD 780 to 1020 and is the second timber with mortices to be found on the marsh.

6.12 South West Archaeological Research framework

6.12.1 The South West Archaeological Research Framework (Webster 2008) and Volume 18 of 'Archaeology in the Severn Estuary' were published after completion of Phase 1 of the RCZAS. The former identifies several relevant research themes where further archaeological investigation is required and the latter reports on significant work of relevance, therefore these have been summarised below.

6.12.2 Detailed knowledge of Palaeolithic and Mesolithic marine palaeogeography, palaeoenvironments and inhabitation sites is currently rather limited (Hosfield *et al.* 2008: 27, 40-42). The intertidal zone and salt marsh in areas such as Porlock Bay, Minehead Bay, the Somerset Levels, Burnham-on-Sea and Oldbury Levels have produced some valuable evidence for these periods (Brown 2007a, 2007b, Brown and Allen 2008, Caseldine 1984; Druce 1998, Mullin 2008, Straker 2006, Straker *et al*. 2004), but more work is required, particularly in terms of establishing absolute dates for landscape changes. The submerged

forests at Porlock, Minehead and Stolford Bays may have been associated with Mesolithic artefacts and/or other traces of inhabitation, but require more detailed investigation.

6.12.3 As noted above (section 6.8.6), excavations at Steep Holm Island have produced some earlier prehistoric lithic artefacts (Norman 1981), but these were residual in later deposits, and there has been no systematic archaeological prospection for early prehistoric sites. Along with Flat Holm, Denny Island, Guscar Rocks and other large rocks within the Severn Estuary, however, it would have formed one of a series of elevated outcrops in what would have been a broad, shallow lower river valley prior to rising sea levels during the Mesolithic and Neolithic periods. Such locales would have formed ideal locations for hunting stands, and freshwater springs would have emerged near the bases of many. Over time these prominent places in the landscape may have accrued a variety of important additional social and symbolic meanings. These areas are all susceptible to coastal erosion and sea level changes, and as a diminishing resource they would clearly repay much more intensive research in the future.

6.12.4 Open area (non-cave or rock shelter) Palaeolithic and Mesolithic inhabitation sites and/or valuable palaeo-environmental and faunal deposits have also been identified at locales such as Hawkcombe Head on Exmoor (just outside the RCZAS area), Donniford and at Brean Down (ApSimon *et al*. 1961, Gardiner 2004, Levitan 1990). Similar sites may have been located along elevated areas such as Bossington Hill and Quantoxhead, and would have been useful hunting stands and temporary camps, allowing surveillance of both the coastline and the hinterland. As sites such as Brean Down demonstrate, these are also vulnerable to coastal erosion but also damage from rabbits and livestock, in addition to visitor pressures from outdoor leisure activities such as hiking and mountain biking.

6.12.5 Prehistoric flint finds of various dates have been recovered from the 'right' bank of the Severn close to the foreshore at Gatcombe, and along the 'left' bank of the river at Oldbury; the Portishead area; Sand Point; Uphill; Kilve; Old Cleeve; West Quantoxhead, and Minehead (Allen 1998b, Brown 2007a, Brown and Allen 2008, Mullins 2008; Norman 1981; Riley 2006). In addition, recent finds at Oldbury Flats of human and animal footprints dated to the Neolithic have considerable future archaeological potential (Brown 2007b), given the evidence recovered for Mesolithic and Iron Age human and animal footprints on the Gwent Levels (e.g. Scales 2007).

6.12.6 The coastal marshes of the RCZAS study area and peat deposits along the edge of the intertidal zone have sometimes preserved important palaeo-environmental sequences including evidence for Neolithic and Bronze Age landscape and vegetational changes. These have been summarised in the recent SWARF agenda and other key reports (e.g. Bell 2001; Brown 2007a, Carter *et al*. 2004, Druce 1998, Wilkinson and Straker 2008). The potential of such low-lying locales to produce unexpected and particularly rare finds from these periods is also indicated by the waterlogged wooden artefacts associated with the fourth millennium BC Sweet Track and a mid-third millennium possible votive figurine; all recovered inland within the Somerset Levels (Coles and Dobson 1989, Coles *et al*. 1973), timber structures and aurochs remains of fourth millennium date from Walpole near Highbridge (Hollinrake and Hollinrake 2007), but within the RCZAS study area also an aurochs skeleton dated to 1740-1450 BC found in Porlock Bay (Pollard *et al*. 2008: 90), and another unpublished aurochs skeleton found on the Gwent Levels and currently stored in Newport Museum (Bob Trett pers. comm.). The fortuitous exposure of many such finds means that they are extremely vulnerable to coastal erosion and sea level rises. Many of the key finds on the Gwent Levels were initially recognised by the late Derek Upton, through repeated and prolonged visits to salt marsh and intertidal zone areas, and then followed up by researchers such as Professor Martin Bell. This has (albeit valuably) biased the discovery of important archaeological remains towards the Welsh side of the River Severn, and few of the English areas of the RCZAS have been so comprehensively investigated over such a protracted period of time.

6.12.7 Sea level rises and flooding of low-lying areas along the Severn Estuary during later prehistory has been identified at some locales (e.g. Carter *et al*. 2004, Gardiner *et al*. 2002, Jennings *et al*. 1998, Straker *et al*. 2008: 104-105, 108-110), but the nature and extent of these changes are poorly understood at present, and require further research. On the Welsh side of the Severn Estuary, later prehistoric buildings, artefacts and human and faunal remains have been recorded (e.g. Bell *et al*. 2000, Locock 2000c), and there is the potential at least that similar remains may exist in places along the English intertidal zone and salt marshes. In addition to a middle Bronze Age settlement, Brean Down produced briquetage of similar date (Foster 1990), and limited evidence for salt production has been found in other parts of the Severn Estuary (e.g. Locock *et al*. 1999). Salt production and exchange would have been of great economic and social importance during prehistory (Morris 1994), and further evidence for and research into this 'industry' would be welcome. Salt production seems to have continued into the Romano-British period, with salterns of this period identified at Huntspill in raised bog deposits (Leech *et al*. 1983, Rippon 1997a: 69-71). A model has recently been proposed for the seasonal exploitation of the Avon Levels in particular and Severn salt marshes in general for summer grazing during the late Bronze Age and Iron Age (Gardiner *et al*. 2002), to which activities might be added salt production. This theory could be tested in the future by further research-led and developer-funded fieldwork to ascertain the character and duration of inhabitation at such sites.

6.12.8. Models of wetland reclamation have been proposed for the Romano-British and medieval periods in specific parts of the Severn RCZAS such as the Somerset Levels, Avonmouth, the Oldbury Levels and areas around Lydney and Elmore (e.g. Allen 2001b, Allen and Fulford 1987, 1990a, 1990b, Rippon 1997a, 1997b, 2004). The archaeological evidence for this is sometimes rather ambiguous though, and on salt marshes and salt grazing land in particular may be restricted to finds of Romano-British or later material in the sides of large drainage ditches or rhynes, scatters of finds in reclaimed land behind dykes and banks, and map regression and aerial photographic analyses. Some of this artefactual material might be redeposited or residual in later contexts, however (q.v. Hewlett 1997).

6.12.9 Many low-lying parts of the Somerset and Avonmouth Levels in particular have revealed field systems and enclosures defined by ditches containing Roman pottery (e.g. Masser *et al*. 2005, Rippon 1997: 80-87, 91-92), in addition to some evidence for sustained or even permanent settlement (e.g. Ritchie *et al*. 2008). The Plot 4000 site, for example, revealed two roundhouses of 2nd to 4th century AD date, one associated with 'placed' deposits including a near complete pottery vessel and human bone. Cremation burials were also recovered at this site. These settlements seem to have been more permanent and perhaps associated with mixed farming, rather than pastoralism alone. Particular large earthwork features, however, such as the 'Great Wall' of Elmore and a proposed 'sea wall' south of Brent Knoll have also been claimed as being Romano-British in origin (Allen and Fulford 1990: 29, Rippon 1997: 77), but these assertions would need to be tested through fieldwork (Hewlett 1997). More detailed earthwork survey as part of the main Phase 2 fieldwork might be informative, and/or targeted excavation in the future to try and obtain material suitable for radiocarbon, dendrochronological or other forms of dating such as Optically Stimulated Luminescence (OSL).

6.12.10 Broader themes such as fishing and coastal trade could inform future work on the Severn Estuary from prehistory through to the early modern period, and recent studies of fishing structures will inform the Phase 2 fieldwork (e.g. Allen 2005, Brown *et al*. 2008; Brunning 2008). The RCZAS Phase 2a pilot and main Phase 2 surveys will undoubtedly play an important role in this, through more detailed investigation of fish weir structures and fish traps, detailed recording of known wreck sites, and identification of any previously unknown artefact scatters and small-scale structures such as jetties.

6.12.11 The West Midlands Research Framework may have some limited bearing on the northern limits of the survey area near Worcestershire. This second framework has not yet

been fully collated or published, however, but examples amongst a series of period-based draft consultative documents from initial research seminars are available online (e.g. Hurst 2002, Lockett 2002, Ray 2002a, 2002b, Wigley 2002).

6.12.12 It is hoped that the results of the River Severn RCZAS will themselves inform future research within the region.

7 HER/SMR, NMR and other datasets

7.1 Summary

7.1.1 Tabular and spatial data for the RCZAS project area were collected from the Gloucestershire, South Gloucestershire, Bristol, North Somerset, and Somerset HER/SMRs (Figure 14) and the NMR archaeological database and were loaded as a set of ArcGIS layers within the project GIS. The quantification and discussion given here reflects the state of knowledge before the NMP aerial photographic mapping was carried out as part of the RCZAS. As the different counties utilised different GIS and HER databases, the complete HER/SMR data was not used for the survey, but the following fields were requested from each HER/SMR and incorporated into individual databases:

Name

SMR/HER Number

Grid Reference

Date

Period

Description

Word files containing text descriptions of each site and their bibliographical references were also requested.

7.1.2 In total, 4,095 records were returned from the SMR/HERs within the survey area and 1,402 from the NMR database. These were provided in a range of formats, dependent on the particular system used by each HER/SMR and no two sets of data were identical. The data was 'cleaned' as far as practicable, but no attempt was made to check its accuracy. As a result the data used by the RCZAS cannot be regarded as definitive. There are also large overlaps between NMR and SMR/HER data, but again no attempt was made to clean the data.

7.1.3 A significant problem encountered when trying to utilise this data was that it is impossible to assess how representative or significant the sites within the RCZAS project survey area are. For example, there are numerous medieval sites along the Somerset coast, but it is impossible to know if this represents a significant part of Somerset's medieval archaeology or only a small, insignificant proportion of it. Furthermore, concentrations of records may often reflect where recent development-led archaeological work has been carried out, often in current urban areas, rather than reflect the true distribution of archaeological sites and deposits.

7.1.4 The nature of the data collected from the NMR and HER/SMRs means that only broad concentrations of sites and monuments can be identified, rather than important single sites. Single sites are, however, considered in the preceding discussion of the archaeology of the estuary.

7.1.5 Shapefiles and datasets will be made available to researchers. It should be remembered that datasets are incomplete and were collected in 2006. Updated data will be requested in advance of future fieldwork phases of the RCZAS.

7.1.6 The NMP mapping of information from aerial photographs carried out during Phase 1 of the RCZAS has resulted in the identification of numerous new sites and the revision of many known ones. At the time of writing this information has not yet been added to all County and Unitary Authority based databases. It is therefore essential that NMR data is

collected if an up to date record of known sites is to be examined for any project within the RCZAS project area.

7.2 Prehistoric

7.2.1 A total of 348 records for the prehistoric period are present within the data collected for the RCZAS project area. Some of these data, however, represent 'natural' deposits such as outcrops of peat or palaeochannels (Figure 15).

7.2.2 The prehistoric period is poorly represented on the right bank of the Severn, with a single Bronze Age burial at Tidenham representing the only excavated *in situ* archaeological deposits. Flint finds of prehistoric date have been recovered from fieldwalking at Warren Farm, Lydney; Elton Farm, Elton and from close to the foreshore at Gatcombe. Earthworks at Naas Cliff have also been identified as possibly relating to an Iron Age enclosure.

7.2.3 The left bank of the river has seen more archaeological work and lithic implements dating from the Palaeolithic to the Early Bronze Age have been collected from the Arlingham area; the foreshore at Oldbury; the Portishead area; Sand Point; Uphill; Kilve; Old Cleeve; West Quantoxhead; Watchet, Doniford, Minehead and finds of Mesolithic worked flint have been recovered from the submerged forests at Minehead and Porlock.

7.2.4 A series of important Palaeolithic finds were made in the Avon valley, but many of these lie outside the RCZAS project survey area. Palaeolithic material is also known from the Watchet area, and is visible in the cliff section at Doniford.

7.2.5 The Bronze Age is relatively poorly represented, with the round barrows at Pixie's Mound, Stogursey and at Sand Point representing the upstanding archaeology of this period. Middle to Late Bronze Age occupation deposits were excavated at Brean Down, where there are also possible round barrows and apparent settlement evidence was recovered from the silt pond at Oldbury Power Station.

7.2.6 Iron Age material has been excavated from Avonmouth Levels, in advance of the construction of the Second Severn Crossing and Iron Age field systems and an associated banjo enclosure have been recorded from Walton Down. Iron Age material has been recorded along the ridge to the south west of Walton Down and also at Sand Point and Weston-super-Mare. Coastal hillforts are known at Clevedon, Worlebury and Brean Down.

7.2.7 The major concentrations of prehistoric material within the RCZAS project area can be summarised as:

- the Woolaston and Stroat foreshore (see 6.2.3-6.2.8 above, SMP2 PU TID1);
- the Arlingham area (See 6.5.8 above, SMP2 PUs SHA3-SHA4);
- the foreshore at Oldbury (See 6.6.6-7 above, SMP2 PUs SEV3-SEV5);
- the Avonmouth Levels (See 6.7.2-14 above, SMP2 PUs BRIS2-BRIS3);
- the Portishead-Clevedon ridge (See 6.8.1 above, SMP2 PUs PORT1-PORT4, KIN1-KIN2);
- Sand Point, Worlebury and Brean Down (See 6.9 above, SMP2 PU KIN3, NDAS PUs 7e01, 7d46);
- Kilve to Doniford (SMP NDAS PUs 7d28-7d25);
- the upland area between Minehead and Bossington (7.2.3 above, SMP NDAS PU 7d18);

- the submerged forests at Minehead and Porlock (See 6.11.2-3 above, SMP NDAS PUs 7d20, 7d16-7d17).

7.3 Roman

7.3.1 Although there is a major Roman *Colonia* at Gloucester and a possible villa at Tidenham, the known Roman archaeology within the RCZAS area is less dense than that from the prehistoric period, with only 186 sites and monuments of Roman date within the data collected for the RCZAS project area (Figure 16). The scarcity of evidence for Roman port facilities is notable, although Combwich and Oldbury are possible ports sites, as is Crandon Bridge, the latter just outside the RCZAS study area (Rippon 2008).

7.3.2 Romano-British pottery and metalworking evidence has been recovered from the foreshore at Awre; Hills and Oldbury Flats; Clevedon; Sand Point and Donniford beach and there are scatters of pottery and other material along the Portishead Ridge (Allen 2009, Allen and Fulford 1987, 1990). The pottery from the foreshore has led to the suggestion of Roman land reclamation at Longney, Rodley and Elmore, and the Great Wall at Elmore may relate to Roman coastal defence rather than land reclamation, but there is no independent dating evidence for this. At Oldbury Flats, the structural remains, occupation deposits and large quantities of unabraded Romano-British pottery and other finds currently eroding out of the foreshore indicate the presence of a significant settlement, perhaps another small port.

7.3.3 Evidence for Roman settlement was excavated during the construction of the Oldbury to Aust pipeline and from work in advance of the construction of the Second Severn Crossing. Possible buildings of Roman date are recorded at Combwich, Crandon Bridge and Burnham on Sea (Rippon 2008) and there were possible farmsteads to the west of Hinkley Point and at Williton. A Roman temple is known from Brean Down and there are numerous Roman coin finds from Weston-super-Mare.

7.3.4 The Roman settlement at Combwich is not well understood but one of its functions is likely to have been a port, as the settlement at Oldbury, was Crandon Bridge further inland (Allen 2009, Rippon 2008). Digging in clay pits on the southern edge of Combwich in 1938 revealed cobbled building floors, pits, human remains and Romano-British pottery, and further finds were made in the 1950s (Dewar 1941, Pike and Langdon 1981). Erosion along the western bank of the River Parrett at Combwich Pill during 1969-19977 and again in 1988 revealed extensive occupation layers including wall footings, paving, cobbled surfaces and hearths, associated with finds of Romano-British pottery and metal artefacts (Dennison 1986, Langdon 1988).

7.3.5 There is surprisingly little Roman material from the coast west of the Parrett, including the Exmoor coast, although evidence for large-scale Roman iron smelting and smithing at sites such as Sherracombe Ford and Roman Lode on Exmoor (http://huss.exeter.ac.uk/archaeology/research/rexiron.shtml, Riley and Wilson-North 2001, 78-81) suggests a port may have been used to ship out the processed material.

7.3.6 The major concentrations of Roman material within the RCZAS area can be summarised as:

- Guscar Rocks and Chesters villa (See 6.2.10 above, SMP2 PU TID1);
- Awre (See 6.3.2 above, SMP2 PU GLO2);
- the Oldbury coast between Hills Flats and Aust (See 6.6 above, SMP2 PUs SEV3-SEV5);
- the Portishead ridge (SMP 2 PUs PORT1-PORT3);
- Clevedon (SMP2 PUs PORT4, KIN1);

- Weston-super-Mare (SMP2 PUs 7e06-7e05);
- Combwich (SMP NDAS PU 7d38).

7.4 Early medieval

7.4.1 Of all the periods considered here, the early medieval period is the most poorly represented with only a total of 62 records from the RCZAS project area (Figure 17). Perhaps the most distinctive archaeological feature of this period is Offa's Dyke, which ends at Sedbury Cliffs. A number of the HER records relate to church buildings and place names, but 'sub-Roman' or post-Roman cemeteries are known from Brean Down and Station Road, Portishead and finds of this date have been made at Bridgemacote. The largest and most significant cemetery, at Cannington, lay 1km outside the survey area and has been destroyed by quarrying.

7.4.2 As the records for this period are so sparse, there are no identifiable concentrations within the survey area. The coast between Portishead and Brean Down (SMP2 PUs PORT1-PORT4, KIN1-KIN4, NDAS PUs 7e06-7e01, 7d46) does; however, appear to form a minor concentration of records.

7.5 Medieval

7.5.1 A total of 631 records for the medieval period are present within the data collected for the RCZAS area (Figure 18).

7.5.2 A large number of the records for this period consist of ridge and furrow either transcribed from aerial photographs or recorded in the field. Other features relating to agriculture and subsistence include deer parks, rabbit warrens and deserted farmsteads. Fish traps of possible medieval date are recorded at East Quantoxhead, Langford grounds off Kingston Seymour; within Bridgwater Bay and in Minehead and Porlock Bays (Allen and Dennison 1988, Brunning 2008), although there is very little archaeological evidence for the date of construction of most of these features. The total number of recorded fish traps has been significantly enhanced by the NMP task of this project (Crowther and Dickson 2007), and some of these may prove to be medieval in date. It would be valuable to compare the styles and dates of these with examples found on the Welsh Severn intertidal zone (e.g. Brown *et al*. 2008, Nayling 1999).

7.5.3 Coastal defence and sea walls thought to be of medieval date are recorded at Clevedon, Severn Beach, Awre and Slimbridge, although some coastal defence features which are thought to be of Roman date may in fact belong to the medieval or later periods. Reclamation during this period was driven by the monastic estates of Glastonbury, Bristol and Gloucester and there are priories at Llantony (Secunda) and at Woodspring.

7.5.4 A medieval quay was excavated at Woolaston Pill and another is suspected at Quay Hill Pill, Hill, but there are surprisingly few medieval maritime sites recorded in the SMR/HERs for the RCZAS project area.

7.5.5 Although the medieval records from the HER/SMRs are fairly evenly spaced along the survey area, concentrations are notable at:

- Oldbury-on-Severn (See 6.6.3 and 11 above, SMP PU SEV5);
- Clevedon/Kingston Seymour (See 6.8.3 above, SMP2 PUs PORT1, KIN4);

- Uphill (south of Weston-super-Mare, SMP NDAS PUs 7e05-7e04);
- Kilve/West Quantoxhead (SMP NDAS PU 7d28).

7.6 Post-medieval

7.6.1 As might be expected, this period has the highest number of records: a total of 1,798 are present within the data collected for the RCZAS area (Figure 19).

7.6.2 As the records for this period are so diverse, it is difficult to meaningfully quantify the data. Of particular relevance to the RCZAS project are the fish weirs recorded from the intertidal zone, in particular those in Porlock, Minehead and Bridgwater bays; to the south of Clevedon; at Sand Point and at Oldbury. Again, there is no good archaeological evidence for the date of construction of the vast majority of these features, which probably cover a date range from early medieval to relatively recent (6.10.6 above) (Brunning 2008).

7.6.3 Shipwrecks are known off Brean Down, at Aust, and within the River Parrett.

7.6.4 Features such as docks and harbours are recorded on a large scale at Lydney Docks and a dockyard railway is recorded at Beachley. Smaller docks are recorded at Kilve, Lilstock and Frampton Pill. Features associated with the ferry at Aust have been extensively recorded but other crossings, such as that at Old Passage, Arlingham, have not been recorded in detail.

7.6.5 Many post-medieval sites are located to the north and south of the mouth of the River Avon and concentrations of records for this period can be summarised as:

- the area around Awre (See 6.3.2-5 above, SMP2 PU GLO2);
- from the Avon to the Severn Crossings in the north (SMP PUs BRIS1-BRIS3);
- from the Avon to Brean Down in the south (including the towns of Portishead, Clevedon and Weston-super-Mare) (SMP2 PUs BRIS6, PORT1-PORT4, KIN1-KIN4, NDAS PUs 7e06-7e01 and 7d46).

7.6.6 A major historical source for the use of the estuary by shipping from the late 16th to mid-18th centuries are the Gloucester Port Books that have been transcribed onto a database available at Gloucestershire Archives.

7.7 Modern

7.7.1 A total of 1,015 records for the modern period are present within the data collected for the RCZAS project area (Figure 20). A particular problem with this period is that some HER/SMRs record archaeological interventions as 'Modern' events, whilst others do not, thereby creating a bias in the records between different HER/SMRs.

7.7.2 The majority of the records for the modern period relate to the Second World War, and include pillboxes, anti-invasion defences and airfields and an inter-war bombing range on Stert Flats. Some sites from WWI are recorded, although these are rare.

7.7.3 The wooden and concrete beached vessels used to reinforce the bank at Purton, Sharpness and at Lydney are early modern or modern in date. Only a few instances of this practice are known from elsewhere in Britain (e.g. Tyson *et al*. 1997, 88-89), and those at

Purton are by far the largest concentration. A progression study of these wrecks based on historic aerial photographs has just been completed (Dickson 2009).

7.7.4 Unsurprisingly, there are many records of this period from the major towns such as Clevedon, Portishead and Weston-super-Mare, and modern docks such as those at Avonmouth and Sharpness are well documented.

7.7.5 Particular concentrations of modern records occur:

- at Arlingham and Rodley (SMP2 PUs SHA3-SHA4, GLO5);
- in the area of the Severn Crossings (SMP2 PUs SEV6, BRIS1);
- at Avonmouth and along the River Avon (SMP2 PUs BRIS3, BRIS6);
- Clevedon and Portishead (SMP2 PUs BRIS6, PORT1-PORT4, KIN1);
- Weston-super-Mare (NDAS PUs 7e06-7e05);
- between Porlock and Minehead (NDAS PU 7d18).

7.8 Undated/uncertain

7.8.1 A total of 376 records recorded as of Undated/Uncertain period are present within the data collected for the RCZAS project area, but only Gloucestershire and Somerset supplied data which contained records classified as of uncertain/unknown date (Figure 21). Some of these are broadly dateable to the post-medieval period, but the majority relate to undated earthworks. Significant numbers of records of unknown/uncertain date relate to fish weirs and sea defences.

7.9 Wrecks

7.9.1 The receiver of wrecks lists a total of 196 wrecks from the Bristol Channel/River Severn area (between 51 52'.889 N 002 14'.297 W; 51 12'.046 N 002 14'.085 W; 51 11'.323 N 003 41'.666 W and 51 52'.149 N 003 43'.193 W), although this includes areas outside the survey area considered here. A total of 113 of these wrecks are recorded as being charted and 114 are shown on bathymetric data supplied by SeaZone Solutions. The hulks at Purton have been the subject of several recent studies (e.g. Nautical Archaeological Society 2009, Parker 1999). A progression study of these wrecks, based on historic aerial photographs alone, identified 63 vessels deliberately beached between Purton and Sharpness, with another two wrecks off Sharpness possibly accidental sinkings (Dickson 2009). Parker (1999) recorded a total of 42 hulks reinforcing the bank of the river at Purton, but Paul Barnett (pers. comm.) has suggested that there are at least 81 vessels in this area, with a further 21 at Lydney. Further more detailed recording and excavation work on the Purton wrecks is on-going.

7.10 Scheduled Monuments

7.10.1 A total of 32 Scheduled Monuments are located within the RCZAS project area (Figure 22). These include five Bronze Age burial mounds; two Iron Age hillforts; a Roman villa; two Norman mottes; a medieval cross, monastery and deserted farm; fish weirs; Lydney Harbour and an anti-aircraft battery.

Table 1: Scheduled Monuments in the RCZAS project area

ID No.	NAME	EASTING	NORTHING	SMP PU
13811	MULTI-PERIOD SITE ON BREAN DOWN	328796	159035	7e01, 7d46
22827	BOWL AND DISC BARROWS 600M NNW OF SANDPOINT FARM	332713	166050	KIN2
22828	MOTTE AND BAILEY CASTLE 650M NNW OF SANDPOINT FARM	332639	166039	KIN2
22835	BELL BARROW 650M SOUTH-WEST OF UPHILL FARM	331612	157914	7e04
22841	WORLEBURY CAMP: LARGE MULTIVALLATE HILLFORT	331323	162499	KIN4
22847	WOODSPRING PRIORY, ASSOC. PONDS AND FIELD SYSTEM	334314	166111	KIN2
22852	SLIGHT UNIVALLATE HILLFORT AT WAIN'S HILL	339104	170667	PORT4
22863	SLIGHT UNIVALLATE HILLFORT, TWO AVENUES, SAUCER BARROW, REGULAR AGGREGATE FIELD SYSTEM AND ASSOCIATED EARTHWORKS ON WALTON COMMON	343071	173951	PORT3
24031	IRON AGE DEFENDED SETTLEMENT, FURZEBURY BRAKE	293588	148299	7d18
28520	SOCKET OF A WAYSIDE CROSS AT THE CROSSROADS NEAR SIX BELLS FARM, WESTBURY ON SEVERN	372197	213808	GLO5
28811	CHURCHYARD CROSS IN ST GILES CHURCHYARD, MAISEMORE	381379	221640	MAI2
28842	OVER BRIDGE	381608	219578	MAI2
28885	HEAVY ANTI-AIRCRAFT BATTERY 520M EAST OF HOLES MOUTH, AVONMOUTH	352422	180828	BRIS3
33712	DAW'S CASTLE, WATCHET	306184	143219	7d24
33714	MOTTE WITH TWO BAILEYS IMMEDIATELY EAST OF BRISTOL ROAD, DOWN END	330899	141364	7d42
33715	WAYSIDE CROSS 100M SOUTH EAST OF DONIFORD FARM	308838	142897	7d26
33730	FOUR MEDIEVAL FISH WEIRS EAST OF MINEHEAD HARBOUR	297645	147056	7d19
35328	CAIRN ON BOSSINGTON HILL	290839	148625	7d18
34859	OFFA’S DYKE, SEDBURY	354832	193041	TID1
35586	CROSS IN THE CHURCHYARD OF ST DECUMAN, WATCHET	306493	142684	7d24
GC102	ROMAN VILLA 600YDS (550M) SW OF WOOLASTON STATION	359721	198682	TID1
GC337	LLANTHONY SECUNDA PRIORY, GLOUCESTER	382403	217974	MAI4
GC339	OVER EARTHWORK	381367	219779	MAI2
GC435	BROAD STONE, TIDENHAM	357763	197246	TID1
GC462	HEMPSTED VILLAGE CROSS	381466	216948	MAI6
GC463	LADY'S WELL	381447	217323	MAI6
GC474	LYDNEY HARBOUR	364936	201364	LYD1
NS1	TWO PALMERSTONIAN GUN BATTERIES ON STEEP HOLM	322658	160572	HOL2
NS12	CHURCHYARD CROSS, ST JOHN'S, WESTON-SUPER-MARE	331792	161933	7e06
SO28	WICK BARROW PIXIE'S MOUND	320908	145575	7d31
SO480	REMAINS OF 14TH CENTURY CHANTRY AT KILVE	314644	144024	7d28
SO503	DESERTED MEDIEVAL FARM, W OF BRAMBLE COMBE	294054	147915	7d18

8 Areas of high archaeological potential

8.1 Areas of greatest significance

8.1.1 This section of the report was re-written in 2009 after discussion with English Heritage and local authority curatorial archaeologists.

8.1.2 The geographical extent of the RCZAS project survey area and the number of archaeological sites and monuments it contains precluded detailed assessments of significance being carried out to English Heritage MPP standards as part of the project being reported on here. Further work would need to be carried out on all heritage assets not currently designated as such for full assessment of their significance in terms of local, regional and national importance. Detailed assessments of significance would also need to be undertaken as part of Environmental Impact Assessments or Strategic Environmental Assessments carried out in advance of infrastructure projects and other developments.

8.1.3 Previous work has identified archaeological deposits of possible national or greater significance (Figure 23) at:

- Tidenham to Woolaston (See 6.2 above, SMP2 TID1);
- Awre (See 6.3 above, SMP2 PU GLO2);
- Longney/Elmore (See 6.5 above, SMP2 PUs SHA1-SHA2);
- Arlingham (See 6.5 above, SMP2 PUs SHA3-SHA4);
- Hills Flats/Oldbury (See 6.6 above, SMP2 PUs SEV3-SEV5);
- Aust to Gravel Banks (See 6.7 above, SMP2 PUs SEV6, BRIS1-2);
- Brean Down (See 6.9 above, SMP NDAS PUs 7e01, 7d46);
- Bridgwater Bay (See 6.10 above, SMP NDAS PUs 7d45-7d42, 7d37-7d35);
- Combwich (See 7.3.3 above, SMP NDAS PU 7d38);
- St Audrie's Bay (See 6.11.2 above, SMP NDAS PU 7d27);
- Minehead Bay, Dunster and Blue Anchor Bay (See 6.11 above, SMP NDAS PU 7d19-22);
- Porlock (See 6.11 above, SMP NDAS PUs 7d17-7d16).

Important prehistoric and Romano-British deposits were also located during archaeological work in advance of the Second Severn Crossing in the Avonmouth Levels.

8.2 Areas of low record density

8.2.1 Areas with few SMR/HER records, and therefore of potential for future research, include:

- Bullo (SMP2 PU GLO3);
- Lower and Upper Dumball (Westbury-on-Severn parish) (SMP2 PU GLO5);
- Frampton Sand/New Grounds (SMP2 PUs SHA7-SHA8);
- Gravel Banks to Portishead (SMP2 PUs BRIS2-3, BRIS6, PORT1);
- Sand Bay (SMP2 PU KIN3).

8.2.2 It is not yet clear why such areas have a perceived lower density of known recorded historical and archaeological assets. In some instances this may reflect later urban development and/or alluvium destroying or masking some features and deposits, as seems likely around Avonmouth for example. The apparent lack of fishing structures in Sand Bay, if a genuine phenomenon, is puzzling. The tidal regimes, currents and sediment structure of the intertidal zone there, however, might not be as suitable for fixed engine fishing as might appear, or at least the long-term survival of structures associated with such fishing. The tidal force of the falling tide along the outer Severn Estuary's eastern shore is strongest between Avonmouth and Woodspring Bay (Kirby and Shaw 2004: 33; La Trobe-Bateman and Russett 1999: 25). In other instances, as at Bullo for example, this may merely reflect a lack of detailed research-led and developer-funded archaeological work in the area. Research into areas of apparent low density of archaeology should be targeted at those areas where the following are recommended in the second round of Shoreline Management Plans:

- No active intervention or managed realignment, especially where this will result in the greatest changes to the coastline;

- Where hold the line will require considerable active intervention in the form of new defences or other works. Hold the line is also likely to result in erosion of intertidal areas in front of defences because of sea level rises, or the development of salt marsh that will also affect archaeological deposits and features.

8.3 Research themes

Themes which have been identified as requiring more archaeological work include:

- Submerged landscapes, especially the potential for structures of prehistoric date to survive in areas such as peat shelves;
- The chronology and typology of fishing structures in the intertidal zone;
- Watercraft and wrecks;
- Waterfront archaeology (including landing stages, quays and ferries);
- Trade;
- The evolution and absolute dating of sea defences;
- The chronology of land reclamation;
- The nature of the prehistoric wetland economy and the relative importance of fishing and dairying;
- Aerial reconnaissance in areas where ridge and furrow is being ploughed-down and revealing underlying archaeological sites and monuments;
- Past human social practices and lifeways such as fishing activities, salt production and seasonal livestock herding.

9 Threats to the archaeological resource

9.1 Threats to the archaeological resource identified in the RCZAS project area can be characterised in two ways:

- 'natural' threats such as coastal change and rising sea-levels;

- anthropogenic threats such as coastal defence schemes; infrastructure works (tidal barrage, road schemes); compensatory measures for habitat loss as a result of natural or anthropogenic change and increased visitor pressure and vandalism due to improved coastal access.

9.2 Natural threats to the coastline of the Severn Estuary were assessed as part of the national FutureCoast survey undertaken by DEFRA and the results are presented in section 13 of this report. In order to understand how the coast has changed in the past, the following synthesis was undertaken (by Richard Brunning of Somerset County Council) of all the previously published studies of sea-level change in the estuary. This was coupled with an analysis of historic Ordnance Survey mapping which were subsequently mapped into the project GIS. A further aspect of the analysis of coastal change was to map the locations of boreholes undertaken for geological and archaeological research as a way of assessing which parts of the coast have been well studied and those which may require further work.

9.3 The Tidal Severn Flood Risk Management Strategy and the CHAMP and SMPs for the Severn Estuary outline the anthropogenic responses to these threats, and this information is summarised in section 14. Other anthropogenic threats include the possible construction of a Severn barrage. As the location and form of a barrage (not to mention economic and environmental factors) is currently being considered alongside other tidal power options, it is not possible to assess the potential threat to the archaeological resource through this study (see section 14.3 below). Other infrastructure works, such as proposed expansion of port facilities at Avonmouth, the renewal of the 'old' Severn Crossing, the construction of new roads and other coastal development work, are mitigated by the planning process and potential areas of threat will not be identified here.

10 Coastal change on the English side of the Severn Estuary from the Palaeolithic to the present day by Richard Brunning

10.1 Introduction

10.1.1 This report was produced by Dr Richard Brunning, Somerset Levels and Moors Archaeologist for Somerset County Council. It has benefited from comments by Vanessa Straker, English Heritage Regional Science Advisor.

10.1.2 In order to understand the archaeological record of the present day coast a thorough understanding of past coastal change is essential. Some previous syntheses of coastal change and the influence of sea level fluctuations have been published, most notably by Kidson and Heyworth (1976), Allen (2001a and 2006) and Haslett *et al.* (2001a). A large number of palaeoenvironmental investigations have taken place in recent years, especially through the development control system. These have added considerably to our knowledge of costal change. In addition there is an increasing understanding of past climatic fluctuations in Europe (e.g. Magny 2004).

10.2 Pre-Anglian and lower and middle Palaeolithic sea level changes (Oxygen Isotope Stages 17-6)

10.2.1 The Pleistocene landscape of the Severn Estuary area is now largely submerged and covered by deep deposits of clay, silt or peat. The solid rock base of this landscape was shaped by river action and fluctuating sea levels during the Pleistocene. The morphology of the Pleistocene Severn valley has been well mapped by a combination of hydrographic, geophysical and borehole evidence from Gloucester to the central Bristol Channel (Andersen 1968, BGS 1983, 1986).

10.2.2 The main Severn valley is known to have a network of subsidiary valleys feeding into it from the English and Welsh side of the present estuary, all now drowned under present day valley systems. These have been studied in most detail on the Welsh side of the estuary but some work has been carried out in North Somerset Bristol (Leese and Vernon 1960, Hawkins 1962, 1990, Gilbertson and Hawkins 1978, Evans and Thompson 1979). The area with the least information is the Somerset Levels area where few studies of the submerged Pleistocene landscape have been carried out, with the exception of limited published work by Kidson and Heyworth (1976) and the crude evidence of a series of boreholes taken in advance of construction of the M5. Modern revision of the Glastonbury sheet by the British Geological Survey, that covers the southern part of the project area, is only now beginning. The work required to bring the sheet up to the modern standard should produce a much greater understanding of the tributary valleys.

10.2.3 Allen's summary map of the estuary during the later Quaternary (Allen 2001a fig. 2) has a series of question marks along the Somerset and North Somerset coastline reflecting a continuing lack of information for this area. Inland of the question marks the line of the former valleys is also largely hypothetical due to a lack of published data. Heyworth and Kidson published a contour map of the pre-Holocene land surface in the Somerset Levels (1976 fig. 9), based largely on unpublished data. This is now known to be a significant over-simplification of the submerged landscape which means that it is hard to know how far it can be trusted.

10.2.4 Sea levels and therefore coastlines were constantly changing during pre-Anglian periods and the Lower and Middle Palaeolithic (*c.* 787-135ka BP) as the climate fluctuated between warm and cold stages, glacial and interglacial periods. It is not possible to map the

infinite variety of coastline forms that occurred in the study area during this time and precise local data about sea level is very sparse, largely because it has been destroyed by later erosion events. The shape of the estuary would have had a considerable effect on the tidal range within the survey area. This means that it is not possible to directly apply sea level information derived from elsewhere to create a coastal model for the survey area.

10.2.5 During the earlier Pleistocene glaciations, sea levels were lowered by up to 120m. At these times there was considerable downcutting of the Tertiary geology by the River Severn and its tributaries. The Hoxnian (OIS 11) and Purfleet (OIS 9) interglacial periods were as warm as the later Ipswichian warm stage and sea levels could be expected to have reached similar heights. The four Cromerian (OIS 19, 17, 15, 13) and Aveley interglacials were almost as warm and would probably have produced mean sea levels only slightly less high (OIS 7). The evidence from the survey area for the Ipswichian interglacial, discussed in the next section, demonstrates that even where there is local evidence the exact form of the coastline is hard to determine.

10.2.6 Greylake sand quarry 2 in Somerset contains beds of the Greylake Member (Campbell *et al.* 1999) that are thought to date to OIS 7 and beds 7-9 at Woodside, near Weston in Gordano, may also be of similar date or even of OIS 9 (Hunt 2006). The latter beds reach to 13.6m OD and are thought to represent intertidal flats, suggesting mean Sea Levels not lower than 14m OD (ApSimon and Donovan 1956).

10.3 Ipswichian warm stage (*c.* 135-110ka BP) OIS 5e

10.3.1 During this warm stage the global sea level rose rapidly with evidence from coral reefs and the Greenland ice cap implying a high stand of *c.* 6m OD (Cuffey and Marshall 2000 and Allen 2001a) although local evidence suggests a higher possibility (see below). There is evidence of rock platforms and raised beaches formed at this time at Weston-super-Mare, Woodspring and Weston in Gordano (Gilbertson and Hawkins 1977, Whittaker and Green 1983, Bowen *et al.* 1985, Briggs *et al.* 1991, Hunt 2006).

10.3.2 The Burtle sand beds of the Somerset Levels are extensive formations created as estuarine shoals and sand flats (Bulleid and Jackson 1937, 1941, Kidson 1970, Andrews *et al.* 1979, Hunt and Clark 1983, Hunt 2006). The known outcrops represent the uppermost deposits of the formation resting on rock outcrops. More extensive deposits of the same formation are likely to exist at much lower altitude on top of the rock head in the drowned valleys (e.g. Heyworth and Kidson 1976, Hill *et al.* 2006).

10.3.3 Greylake sand quarry 2 in Somerset contains beds of the Middlezoy Member (Campbell *et al.* 1999) that have been equated to OIS 5e. The mollusc, foraminifera and ostracod evidence form these levels suggest deposition around Low Water Neap Tides. This has been used to suggest a Mean Sea Level of 12m above modern MSL and a high tide level of around 18m OD (Kidson *et al.* 1987, Hunt 2006)

10.3.4 Current thinking suggests that human occupation of Britain ceased during oxygen isotope stage 6, the Ipswichian interglacial (OIS5e) and the early stages of the Devensian glaciation (up to OIS4) from *c.* 135ka BP to 60ka BP (Knight and Howard 2004, 17). During this time there would have been no land bridge to the continent.

10.4 Devensian glaciation (*c.* 110-10.5ka BP)

10.4.1 During this cold stage sea levels dropped considerably as water was taken up in ice cap formation. This probably reached the greatest extent *c.* 19-23ka BP when sea level would have been tens of metres below the present day.

10.4.2 During the Devensian glaciation there were interstadial periods when sea level was much higher. Within the survey area the Low Ham Member of the Parrett Formation (Campbell *et al.* 1999) is a complex of sands, silts and peats east of High Ham island that are consistent with a back estuarine environment. Amino-acid ratios suggest a date of late OIS 5 or early OIS 3 and definitely postdate the Ipswichian Burtle Formation (Hunt and Bowen 2006). Indicators of marine influence were recorded at 13.8m OD which, allowing for tidal funnelling suggest a mean sea level of *c.* 2-5m OD (ibid., 189).

10.4.3 The Gordano valley contains peat deposits at 1.51m OD that have been dated to 15,060-14,840 or 14,260-14,220 or 14,130-13,820 cal. BP (Beta-189680) suggesting formation during the Bølling sub-interstadial (Hill *et al.* 2006) when temperatures in north-west England reached 13.4º C (Bedford *et al.* 2004). This suggests that sea level must have been similar to or lower than present levels at that time.

10.5 The Holocene (*c.* 10.5ka BP – present)

10.5.1 There is a wealth of information concerning coastal change in the Holocene from both sides of the Severn Estuary with many detailed and well dated palaeoenvironmental sequences. This evidence has revealed an extremely complicated picture of coastal change, underpinned by fluctuations in sea level rise (and fall) but also influenced by a host of other factors such as climate change (and tracks of depressions) and the formation and destruction of natural coastal barriers. Allen (2006, 17) acknowledged that such factors and agencies, particularly local factors over-riding wider trends, combined 'to create a seemingly haphazard range of lithostratigraphic responses as expressed in the estuarine/coastal Holocene of southern Britain'.

10.5.2 The same paper used palaeoenvironmental evidence and 138 associated radiocarbon dates from the Severn Estuary to demonstrate that the Holocene sequence in the area had a broad tripartite lithostratigraphic division that corresponded to similar evidence from southern Britain and elsewhere in north-western Europe. The division distinguished early Holocene silt dominated sequences, formed in mudflats and salt marshes, from mid Holocene intercalated silts and peats (formed in high-intertidal to supra-tidal marshes) and then a return to silt dominance in the late Holocene (Allen 2006). In the survey area this division has been formalised into the Lower, Middle and Upper Somerset Levels Formation (Haslett *et al.* 2001b) corresponding to the Wentlooge Formation on the Welsh coast.

10.5.3 The evidence summarised below demonstrates that the variations within this broad tripartite division could be considerable and heavily influenced by local topographic factors. The availability of numerous scientific dates for coastal changes on the English side of the estuary demonstrates the continuous nature of such changes and the short timescale over which many of them took place. The tripartite division is also brought into question by the existence of intercalated peat deposits in the earlier Holocene sequence (e.g. Heyworth and Kidson 1976, Hill *et al.* 2006, Wilkinson 2007). The early Holocene is less often studied because it is more deeply buried behind the present coast. The peat layers from this epoch have also suffered more compaction than later similar deposits because of the substantially greater overburden.

10.5.4 The rate of relative sea level rise is constantly being recalculated at a national level (e.g. Shennan *et al.* 2000) but more importantly has been revised within the Severn Estuary area in recent years (e.g. Allen 1990b, Long *et al.* 2001, Haslett *et al.* 2001a).

Phase	cal. BC	MSL rise (m)	Av. rate (mm yr^{-1})
1	7,500-5,500	-25 to -10	7.5
2	5,500-4,000	-10 to -5	3.3
3	4,000-0	-5 to -2.5	0.6

Table 2: Rates of relative sea level rise in Bridgwater Bay (after Long et al. 2001)

10.6 Early Holocene *c.* 8,500-5,000 cal. BC

10.6.1 Climatic amelioration at the end of the Devensian glaciation appears to have occurred rapidly with temperatures broadly comparable to those of today being reached within a few hundred years between *c.* 7,850 and *c.* 7,550 BC (Figure 24, Atkinson *et al.* 1987, Coope and Lemdahl 1995). The retreat of the glaciers led to eustatic global sea level rise from around –55m OD at the beginning of the Holocene to present day levels by *c.* 4,900 cal. BC (Tooley and Shennan 1987). This led to the submergence of the present Severn Estuary, the Somerset Levels and Moors, and the North Somerset and Avon Levels by *c.* 4,500 BC.

10.6.2 Thin peat layers are known from deep cores along the Somerset coastline and the M5 route (Kidson and Heyworth 1976, Long *et al.* 2001). These represent possible fluctuations in sea level rise giving rise to the formation of upper salt marsh or supra-tidal marsh conditions. They exist between –21.3m OD up to *c.* -2m OD just below the beginning of the peat dominated Middle Somerset Levels Formation. It may be possible to separate them out into a group between –20m OD and –12m OD and an upper group between –8m OD and –2m OD (Long *et al.* 2001) but such a division seems unproductive because of the lack of dating information for most of the layers. Their existence suggests that the difference between the Lower and Middle Somerset Formations are not as strong as has previously been suggested.

10.6.3 Scientific dates for the Lower Somerset Levels (Severn) Formation, dated to before *c.* 5,000 Cal BC, have been very limited but have been increased by recent work at Minehead (Jones *et al.* 2005) Woolaston (Brown *et al.* 2006) Burnham-on-Sea (Druce 1998) and Porlock (Jennings *et al.* 1998). They are presented in Table 3. The dates available before 1998 were used as sea level index points to suggest Mean Sea Levels although palaeoenvironmental analysis had not been carried out on most of the earliest samples. This suggested that the Highbridge cores represent a MSL of –25 to-26m OD at *c.* 7,500 cal. BC (Jennings *et al.* 1998). By *c.* 5,900 to 6,200 cal. BC MSL had risen rapidly to between *c.*-12.5 to –14m OD and by *c.* 5,000 cal. BC MSL was *c.* -8mOD (Jennings *et al.* 1998, table 1, 166).

10.6.4 The implications of this rapid sea level rise on the changing coastline have been modelled in detail for the central Axe valley (Haslett *et al.* 2001b) where the marine sediments of the Lower Somerset Levels Formation were studied in detail. Between *c.* 8,000 and 5,000 cal. BC the sea level rise was *c.* 5-6mm yr^{-1} (Haslett *et al.* 2001a, or 7.5 according to Long *et al.* 2001). During this time the estuarine surface, which penetrated far inland of the modern coastline, would have been dominated by mudflats/low marsh environments. Mid to high marsh would only occupy a narrow, relatively steeply inclined, fringe along the coastline

(Haslett *et al.* 2001a). There would be a need to transfer a large amount of tidal water off the surface of the low marsh during flood and ebb tides. This high hydraulic duty (Allen 1997d, 2001a) would require a relatively dense network of wide and deep tidal creeks.

10.7 Transition from lower to middle Somerset Formation *c.* 5,000-1,500 cal. BC

10.7.1 From *c.* 5,000 cal. BC (Figure 25) the rate of sea level rise began to decrease from the previous very rapid rate of *c.* 5-6mm y yr^{-1} to *c.* 2mm yr^{-1} between *c.* 5,000 and 3,000 cal BC (Haslett *et al.* 2001a). This had major effects on the development of the coastline as organic sedimentation began to outpace sea level rise. This allowed the development of the Middle Somerset Levels Formation and Middle Wentlooge peat dominated environments over the survey area. It seems unlikely that an increased sediment load in rivers due to deforestation played a role in this change, as extensive permanent clearance over most of the catchment did not occur until the late Bronze Age, continuing through the 1st millennium BC (Wilkinson and Straker 2008, Straker *et al*. 2008)

10.7.2 The deceleration in sea level rise would have allowed the mid marsh environments to expand and dominate a larger part of the estuary with a decrease in hydraulic duty and a corresponding decrease in tidal creek size. Eventually the higher marsh environments would squeeze out the middle marsh and would dominate the estuarine environment with small tidal creeks and a reduction in tidal flooding frequency (Haslett *et al.* 2001a).

10.7.3 The timing of the change from silt to peat environments and the character of the peat environments varied from place to place along the estuary (see table 3 for the different radiocarbon dates). In general the peat deposits are thicker inland while towards the coast they become increasingly intercalated with silt layers at Minehead, Stolford, Burnham-on-Sea, Huntspill and East Brent. The available evidence can be summarised form SW to NE along the survey area as follows;

10.7.4 Porlock Bay: The main peat layer at Porlock formed between *c.* 4,500 cal. BC and *c.* 3,540 Cal BC after which it was overlain by deposits of sand, grit, silt and clay (Jennings *et al.* 1998). The cessation of the organic formation in this area partly reflects the increased vulnerability of the coastal gravel barrier to storm events as the deceleration of sea level rise decreased longshore sediment supply. In addition anthropogenic disturbances within the catchment may have increased the supply of inorganic material into the area (Jennings *et al.* 1998).

10.7.5 Minehead Bay: Three periods of peat deposition were identified on the present foreshore at Minehead (Jones *et al.* 2005). The earliest deposits were created in marginal salt marsh conditions around 5,000 cal. BC and an alder carr peat sometime between 5,400 and 5,000 cal. BC. There was then another gap of several hundred years until peats laid down in a mixture of upper salt marsh, freshwater reed swamp and alder carr environments were created sometime between *c.* 4,800-4,500 cal. BC.

10.7.6 Parrett Valley: Very little dating and analysis has been carried out in this area. Around the mouth of the Parrett between Stolford and the Poldens, Heyworth and Kidson (1982) recorded the Middle Somerset Levels Formation as intercalated peat and clay along the coast and as a thick peat layer further inland, deposited from around 4,000 cal. BC. The Middle Somerset Levels Formation exists as a thick peat layer in the central Parrett valley. It has been briefly characterised by Alderton (1983), and was dated on its base at Sutton Hams to *c.* 3,900 Cal BC (Coles and Dobson 1989). Further inland near Langport, recent evidence has dated the base of the Formation to 4840-4520 cal. BC (Wilkinson 2006 see table 3 for

details). This limited evidence suggests that the organic deposits of the Formation developed seawards over a period of several hundred years in the 5th millennium BC.

10.7.7 Brue/Axe Valley: Intercalated peat and silt deposits are known from Burnham-on-Sea (Druce 1999), the Huntspill River (Brunning and Farr Cox 2006), Walpole (Hollinrake and Hollinrake 2002) and East Brent (Haslett *et al.* 2001a). The M5 boreholes also show similar deposits (Long *et al.* 2001) although the accuracy of the interpretation may be open to question and they are undated. The intercalated peat deposits have been dated between 5,440 and 3,370 cal. BC at Burnham-on-Sea (Druce 1999) and between *c.* 4,780 and 1,320 cal. BC at Walpole (Hollinrake and Hollinrake 2002). Godwin (1960) recorded intercalated peat and silt on the River Huntspill between Puriton Bridge and Withy Bridge. At Withy Bridge two peat layers (not noted by Godwin) formed in higher salt marsh conditions in the later Bronze Age (1523 to 1311 cal. BC) and early Iron Age (895 to 674 cal. BC; Vickery 1999). The transect between Brean and Wedmore (Haslett *et al.* 2001a) showed the main peat deposit dividing into intercalated peat and clays at Brean and to the south in the area north of Brent Knoll. The beginning of the peat formation is dated to 4,200-3,200 cal. BC and its surviving end to between *c.* 2,000 and 1,500 cal. BC (Haslett *et al.* 2001a).

10.7.8 In the Axe valley the beginning of the main peat layer has been dated to between 4,905 and 4,540 cal. BC, continuing until sometime between 1,775 and 1,425 cal. BC (Haslett *et al.* 2001b). In the central Brue valley peat formation began between 4,500 and 4,000 cal. BC (Coles and Dobson 1989) with an earlier thin peat in places forming possibly as early as *c.* 4,700 cal. BC (Wilkinson 1999). This sequence carried on forming into the later prehistoric period and beyond (see below).

10.7.9 N. Somerset and Avon Levels: The Gordano valley provides an unusual example of a long peat sequence, protected from the coast by a sand 'barrier', that begins at 13,110-11,870 cal. BC and resumes after a short hiatus of clayey-silt around 7,630-7,570 Cal BC (Hill *et al.* 2006). Peat kept forming until at least 4,580-4,440 cal. BC after which another 1.47m of peat formed (ibid.). On the other side of the barrier three peat bands formed between 5,370-5,270 cal. BC and 1,890-1,650 cal. BC, intercalated with sand and silt deposits. This resembles the coastal pattern of intercalated deposits further south in Somerset (see above). A similar situation occurs on the Berkeley Level (e.g. Lucy 1877, Allen 2001a). At Avonmouth, a series of recent detailed palaeoenvironmental investigations have revealed that fully marine conditions in the early Holocene changed to intertidal mudflats and salt marsh and terrestrial fen environments by the middle Neolithic (Barnett *et al.* 2009). A reversion to predominantly estuarine and salt marsh conditions may then have occurred in some areas during the middle Neolithic, in response to upward eustatic movement. From the late Neolithic, some parts of the Avonmouth salt marsh were drying out, and oak, lime and hazel woodland was developing, together with a substantive increase in Heathland. Comminuted charcoal of hazel, willow or aspen and grass stems suggests the clearance landscape for pastoral farming during the early and middle Bronze Age (Barnett and Armour-Chelu 2008, Barnett *et al*. 2009, Locock *et al*. 1998, Ritchie *et al*. 2008).

10.7.10 Inner Severn Estuary: The equivalent of the Middle Wentlooge/Somerset Levels Formation exists in the Lydney, Elmore, Rodley, Arlingham, Awre and Slimbridge Levels as a thick, mainly woody peat (Lucy 1877, Prevost *et al.* 1901, Hewlett and Birnie 1996, Allen 2001a, 22). The date of the initiation of peat growth is not known at these locations.

10.8 Transgressions and regressions of later prehistory *c.* 1,500 cal. BC- 0 cal. BC

10.8.1 In the second millennium BC there is a significant shift from the Middle to the Upper Somerset Levels Formation and their equivalents over most of the survey area. This

represents a shift from upper salt marsh and supratidal environments to lower to mid marsh environments. In the North Somerset Levels, recent studies showed evidence of positive sea level tendency until the proposed Roman reclamation (Haslett *et al.* 2000) and analysis of sediments in the Axe valley showed a positive sea level tendency throughout all the Upper Somerset Levels Formation (Haslett *et al.* 1998a). This suggests that throughout the later prehistoric period sea level continued to rise at a significant rate and faster than the sea level curves suggest (Haslett *et al.* 2001a, 48).

10.8.2 At several locations along the coast, peat formation ceases at similar dates in the second millennium BC. At Walpole, in Somerset the last peat was formed sometime between 1,603 and 1,320 cal. BC after which silts and clays dominated (Hollinrake and Hollinrake 2002). Further north at the lower end of the Axe valley silt deposition dominates from sometime around 2,000-1600 cal. BC (Haslett *et al.* 2001a). Further up the Axe valley near Nyland the change from peat to silt occurs sometime between 1,775 and 1,510 cal. BC (Haslett *et al.* 1998a).

10.8.3 Clay of the Upper Somerset Levels Formation also extends from the head of the Axe valley through the Panborough Gap into the Brue valley around Godney Moor and southwards through the Godney Gap into East Backwear (Godwin 1955, Housley *et al.* 2000). The transgressive change has been dated to between 1120 and 950 cal. BC at Long Run farm south of Godney. This represents the furthest extent of the transgression in Somerset and appears to have occurred at least several hundred years after the change in the Axe valley and at Walpole.

10.8.4 Rising sea level increased base levels further inland and led to flooding of the raised bog in the central Brue valley with calcareous water and the establishment of sedge fen (Godwin 1960) associated with the Meare Heath (Bulleid 1933, Godwin 1960, Coles and Orme 1976, Coles and Orme 1978a, Coles *et al.* 1988) and Tinney's Tracks (Coles and Orme 1978b, Beckett 1978, Girling 1978, Coles and Orme 1980). These two trackways have dated tree-ring chronologies, tying down their construction to sometime between 1550 and 1450 BC (Tyers 2004). As they appear to have been built in response to the increasing wetness on the bog surface, they provide probably the most precise date for the transgression and associated rise in base levels.

10.8.5 In the Parrett valley near Langport the transition form the Middle Somerset Formation peat to a silt-depositing environment has been dated to 1130-840 cal. BC (Wilkinson 2006). This corresponds well to the dates for a similar change south of Godney (above) suggesting that the transgression lasted for several hundred years and penetrated inland gradually.

10.8.6 In the North Somerset and Avon Levels change seems to have occurred at a similar date. In the Gordano valley outside the sand 'barrier', peat formation ceased around 1,890-1,650 cal. BC to be replaced by silty clay (Hill *et al.* 2006).

10.8.7 Further up the estuary at Avonmouth, peat deposits continued to form until a later date of between about 1210 to 920 cal. BC (Moore *et al.* 2003). This is almost exactly the same date as that obtained for the changes from peat to estuarine clay south of Godney Island in the upper Brue valley (Housley *et al.* 2000). The English side of the Severn Estuary appears to have been subject to a creeping transgression between *c.* 1,600 and 900 cal. BC.

10.8.8 In the inner Severn Estuary peat growth ceases on all the small Levels. The top of the peat deposits have been dated to between 800 and 200 cal. BC at Elmore and Longney and 1500-1200 cal. BC at Slimbridge (Allen 2002, Hewlett and Birnie 1996).

10.8.9 It is difficult to identify the exact position of the coastline during this period (Figure 26) because of the absence of peat forming upper salt marsh/brackish environments. This may be because such deposits were largely eroded by the coastal transgression, and/or because they were of very limited spatial extent. The inland extent of the upper salt marsh is limited by

the presence of the main central Somerset Levels peat formation that still dominated the central Brue and Parrett valleys during these periods, although the boundaries of salt marsh fringing the River Parrett are uncertain. In the Brue valley the raised bog was forming at least as far seawards as Woolavington Bridge on the River Huntspill, representing the unbroken continuation of peat formation since the early Neolithic (Jones 2003, Smith 2003, Tinsley 2003).

10.8.10 Further up the estuary the possible inland extent of coastal influence is limited by the natural topography restricting the area of the potential floodplain as is also the case at Porlock and Minehead. In the inner Severn Estuary peat deposits were still growing until sometime between 800 and 200 cal. BC (Hewlett and Birnie 1996). These demonstrate that upper salt marsh and supra-tidal environments continued to dominate that area until the late Iron Age.

10.8.11 Fluctuations in sea level rise and coastal change in the later Bronze Age and early Iron Age are evident at a limited number of places in the survey area. At Withy Bridge on the Huntspill River in Somerset inter-digitated peat and clay deposits have been dated to the late Bronze Age and early Iron Age (Vickery 1999). On the Avon Levels there have been numerous records of localised patches of soil formation, sometimes associated with human activity. These demonstrate that in localised areas the salt marsh environments were replaced by terrestrial soils for short periods between *c.* 1500 and 800 BC at Cabot Park, Rockingham Farm and Katherine Farm, Avonmouth (Locock *et al.* 1999, Moore *et al.* 2003, Allen *et al.* 2003).

10.8.12 By the middle of the first millennium BC there is evidence of regressive tendencies in some places, most notably on Godney Moor and the area south of Godney in the Brue valley where freshwater environments began forming peat on top of the estuarine clays between *c.* 840-450 cal. BC (Housley *et al.* 2000). Elsewhere on the English side of the Severn Estuary there is a general lack of dated deposits informing coastal change between 800-0 cal. BC, reflecting the absence of peat forming deposits over most of the survey area, except for the central Brue and Parrett valleys.

10.8.13 In the last few centuries of the first millennium BC the evidence from Goldcliff, on the Welsh side of the estuary, suggests that transgressive influences were still dominant (Bell *et al.* 2000). Rising sea level may have helped to cause the rising base levels that may have been responsible for the clay filled channel that cut the raised bog at Skinner's Wood in the Brue valley (Horner 1996) and the freshwater conditions in which the nearby Shapwick canoe was deposited (Godwin 1967). Late Iron Age salterns are also known from the Axe valley and the area immediately west of Wedmore (Leech 1997). There is evidence for transgressive events on the English side of the estuary at Avonmouth in later prehistory (Barnett et al. 2009, Ritchie et al. 2008), with associated expansions in estuarine and salt marsh conditions in low-lying areas. Analyses of forams and diatoms from clays in the Axe valley and North Somerset Levels also suggests that the positive sea-level tendency continued throughout the Late Bronze Age and Iron Age (Haslett *et al.* 1998a, 2000) as noted at the beginning of this section. Around the end of the 1st millennium BC the raised bog at Woolavington Bridge on the River Huntspill stopped growing and began to be eroded by salt marsh creeks (Brunning and Farr-Cox 2006).

10.9 Roman coastlines

10.9.1 Extensive reclamation of much of the coastal wetlands in the survey area appears to have taken place during the Romano-British period (Figure 27). In a few places the coast was seaward of the present coastline, while in others extensive salt marshes still penetrated far inland. In general it is evidence of reclaimed freshwater landscapes that is most indicative

of the coastline for this period rather than direct evidence for the coastal environments themselves.

10.9.2 There is a general lack of information regarding the position of the coastline in the section of the survey area west of the Polden Hills in Somerset. To the north of the Poldens settlement is known along the finger of hard geology from Pawlett to Highbridge, around Brent Knoll and the area northwards to Brean Down and the Axe and within the Axe valley itself (Rippon 1997a, Grove 2003). This settlement seems to have taken place from the 1st or 2nd centuries AD but environmental analysis of deposits of this period are very rare in the area. Most of the evidence takes the form of artefact scatters or poorly recorded excavations. In the Axe valley extensive remains of a reclaimed landscape are visible as slight earthworks, representing fields, settlements, droveways and a possible canal (Grove 2003). Reclamation in the Axe valley has been dated chemostratigraphically to AD 130-221 (Haslett *et al.* 1988a). This date is supported by the limited artefactual evidence from the settlements in the area. Recent work to the south of Brean Down shows a marginal salt marsh/terrestrial environmental environment in the present intertidal area that was cut by a ditch indicating freshwater grassland environment seasonally subject to coastal flooding (Allen and Ritchie 2000).

10.9.3 In the North Somerset Levels there is also a mixture of landscapes suggested by archaeological data. It had been proposed that natural sand dune defences protected the coast between Brean Down and Middlehope (Rippon 1997a). The recent (unpublished) discovery of a major Romano-British saltern site at Weston-super-Mare suggests that salt marsh environments may have penetrated further inland than the present coast at this time. On Banwell Moor and Kenn Moor there is extensive evidence for Romano-British rural settlement in the form of artefact scatters, relic field systems and excavated settlements (Rippon 1997a, 81-87). The latter include the Wemberham villa on the Congresbury Yeo (Reade 1885, 64-73), where occupation is dated to the 3rd to 4th centuries AD. That date range is also replicated in the relic landscape features on Kenn Moor at Yatton where excavation showed occupation in a freshwater environment with a well preserved corn drier complex suggesting arable farming on the wetland (Rippon 1995b, 1996 and 1997a, 82-7).

10.9.4 On the Avon Levels Romano-British occupation was identified at Northwick, Ellinghurst Farm, Rookery Farm and Crooks Marsh Farm (Barnes *et al*. 1993, 7-11 and Lawler *et al*. 1992) suggesting that these areas were also subject to reclamation at this time. These settlements varied significantly in date from the 1st to 2nd centuries AD at Northwick and Rookery Farm, 1st to late 3rd centuries AD at Ellinghurst Farm, and 4th century date at Crooks Marsh (Barnes *et al*. 1993, 7-11, Rippon 1997a, 91-2, Everton and Everton 1980, Lawler *et al*. 1992).

10.9.5 In the inner estuary, 2nd to 4th century AD occupation is indicated between Severn House Farm and Oldbury Pill (Allen and Fulford 1987, 249-253). This includes Romano-British artefact scatters over *c.* 3km of foreshore, suggesting the coastline of that period was seawards of the present one. At Oldbury excavations inside the sea wall demonstrated the presence of a settlement from the 2nd to the 4th centuries AD (Hume 1992). This limited evidence suggests that the Oldbury and Berkeley Levels were reclaimed during the Romano-British period. Suggested reclamation evidence has been found as far north as Elmore, just 7km south of Gloucester (Allen and Fulford 1990, 17-32). Allen and Fulford (1990, 315) suggested that 80% of the floodplain was reclaimed in the Roman period and 16% on the west with a big expansion in the 3rd century AD (Allen and Fulford 1990, 307).

10.10 Late Roman transgression

10.10.1 There is widespread evidence for a transgressive Phase 1n the survey area beginning in the Late Roman period (Figure 27). The most southerly evidence comes from the Huntspill Cut where a saltern site of 3rd to 4th century AD date was covered by silt deposited in an intertidal environment. The base of the silt has been dated by Optically Stimulated Luminescence to 110 AD ± 290 (Oxl-1268: Rhodes 2003).

10.10.2 In the Axe valley the date of the end of the reclamation and the return of marine influence is hard to determine. The only available estimate is a date between AD 207 and AD 411 (Haslett *et al*. 2001b). The villa at Lakehouse Farm continued in use into the 4th century AD (Rippon 1997a, 74), suggesting a similar date of transgression to that evidenced from the salterns south of Brent Knoll. The evidence from the North Somerset Levels, Avon Levels, Oldbury and Berkeley Levels and the inner estuary indicates extensive settlement along the coast until the mid- 4th century AD (Rippon 1997a, 84-97).

10.11 Early medieval reclamation

10.11.1 The gradual reclamation of the English side of the Severn Estuary coastline in the early medieval period has mainly been studied through landscape characterisation and place name analysis (e.g. Rippon 1997a and 2001b), with a few detailed excavations (e.g. Rippon 1997b, 1998, 1999, 2000 and 2007). Saxon habitation place names suggest occupation along the Severn Levels was very extensive by the late Saxon period although the back fen areas were only colonised much later. By the time of Domesday this zone was definitely reclaimed, and possibly farmed intensively.

10.11.2 The irregular field patterns noted along the coastal clay levels suggest that this reclamation took place in a gradual piecemeal fashion. This is supported by the most detailed local study of this process at Puxton (Rippon 2007). The date of reclamation of the coastal marsh is therefore not likely to be consistent across the survey area although Saxon charters suggest that it could have started by the end of the 7th century AD (Sawyer 1968 and Edwards 1998) and was largely complete by Domesday.

10.11.3 The present coastline of Somerset and North Somerset is protected by a chain of barrier beaches of sand and gravel topped by aeolian dune systems. Such barriers were present from at least the Bronze Age (Bell 1990). Very little is known about the shifting extent and location of such barriers, except at Porlock and Brean. By the medieval period the dune system seems to have been largely in place, and aeolian dunes buried part of a medieval settlement at Berrow (Somerset HER 10104).

10.11.4 In the area south of Brent Knoll in Somerset an extensive area of marshland is shown as Brent Marsh on 17th and mid-18th century maps of the county. This area contains evidence of ridge and furrow agriculture. This suggests that the area was reclaimed in the medieval or immediate post-medieval period and then subsequently became marshland again (Brunning and Farr-Cox 2006). Such shifts in the coastline are only likely to be identified by detailed landscape characterisation and investigative fieldwork including palaeoenvironmental analysis and scientific dating.

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Table 3. Scientific dates relevant to coastal change on the English shore of the Severn Estuary

Interpretation	Age cal. BC	RC years BP	Lab. code	Site and Reference
Base lower woody peat	5775-5635	6819+/-33	OxA-13699	**Woolaston**. Brown *et al.* 2006
Thin reed peat above lower peat	4335-4245	5420+/-40	OxA-14003	
Base upper woody peat	4320-3970	5256+/-35	OxA-13878	
Top upper woody peat	3770-3640	4910+/-40	OxA-13879	
Oak tree growth upper peat	4096-3699 tree-ring chronology			
Base reed swamp/salt marsh peat 1	5670-5380	6600+/-70	Wk- 5311	**Minehead Sites 75-77**. Jones *et al.* 2005
Base reed swamp/salt marsh peat 2	5640-5370	6570+/-70	Wk- 5310	
Top reed swamp/salt marsh peat 2	5620-5310	6490+/-80	Wk-5309	
Base brackish/freshwater reed peat 3	5540-5290	6440+/-70	Wk- 5308	
Base alder carr/reed peat	5630-5380	6560+/-60	Wk- 5302	**Minehead Site 27**. Jones *et al.* 2005
Base alder carr/reed swamp peat	4830-4490	5810+/-70	Wk- 5304	**Minehead Site 44-5**. Jones *et al.* 2005
Top alder carr/reed swamp peat	4830-4520	5820+/-60	Wk- 5303	
Base alder carr peat site 45	4780-4460	5770+/-70	Wk- 5305	
Base reed swamp site 46	4710-4360	5700+/-70	Wk- 5306	**Minehead Sites 46-7**. Jones *et al.* 2005
Base reed swamp site 47	4830-4520	5820+/-60	Wk- 5303	
Base of peat (eroded top)	4720-4250	5620+/-100	HAR-8546	**Brean Down** Bell 1990
Forest bed	6609-6425	7730+/-50	Beta-81655	**Porlock Bay**. Jennings *et al.* 1998
Peat	6380-5970	7280+/-90	OxA-6570	
Top second peat	5941-5540	6870+/-90	Beta-61544	
Top second peat	5987-5777	6707+/-50	Beta-86775	
Base fourth peat	4340-3970	5290+/-75	OxA-6572	
Base fourth peat	4460-4040	5450+/-70	OxA-6569	
Base fourth peat	4500-4240	5515+/-65	OxA-6571	
Base fourth peat	4458-3662	5250+/-180	Beta-61542	
Top fourth peat	3940-3540	4925+/-60	OxA-6402	
Top fourth peat	4040-3780	5120+/-55	OxA-6399	
Top fourth peat	4240-3700	5160+/-100	OxA-6401	
Top fourth peat	4225-3705	5140+/-100	Beta-61543	

Interpretation	Age cal. BC	RC years BP	Lab. code	Site and Reference
Base of Middle Somerset Levels Formation peat	3625-3195	4640+/-60	Beta-142351	**Brean-Wedmore Transect**. Haslett *et al.* 2001a
	4335-4050	5370+/-50	Beta-142353	
	4235-3800	5210+/-80	Beta-112355	
	4235-3800	5210+/-80	Beta-142355	
Transition from Middle to Upper Somerset Levels Formation	2010-1650	3500+/-70	Beta-142354	**Brean-Wedmore Transect.** Haslett *et al.* 2001a
	2140-1750	3600+/-70	Beta-142350	
	1620-1275	3190+/-70	Beta-142352	
Transition from Middle to Upper Somerset Levels Formation	1775-1515	3380+/-60	Beta-101741	**Rookery Farm, Axe valley**. Haslett *et al.* 1998a
	1765-1510	3370+/-60	Beta-101740	
	1690-1380	3250+/-80	Beta 101742	
Base of reed peat overlying estuarine clay	840-530	2590+/-50	GU-3246	**Godney Moor, Brue**, Housley *et al.* 2000
	810-450	2560+/-50	GU-3247	
Bottom of peat above estuarine clay	810-440	2550+/-50	Q-2458	**Long Run Farm, Brue** Housley *et al.* 2000
Top of peat before estuarine clay	1210-900	2860+/-50	Q-2459	
Bulk sample, reed peat ©	5440-5080	6340+/-70	Wk-5298	**Burnham-on-Sea.** Druce 1998
Base of peat (B)	4660-4340	5590+/-70	Wk-5297	
Base of peat (A)	4360-4000	5299+/-70	Wk-5299	
Top of peat (A)	3780-3370	4790+/-70	Wk-5300	
Peat	1682-1320	3220+/-70	Wk-9017	**Walpole, Somerset**. Hollinrake and Hollinrake 2002
Peat top	2296-1888	3710+/-70	Wk-9018	
Peat base	3503-3094	4570+/-60	Wk-9019	
Peat top	4672-4245	5580+/-100	Wk-9020	
Peat base	4781-4370	5750+/-80	Wk-9021	
Base of peat below main peat layer	4770-4460	5745+/-45	OxA-11233	**Shapwick Burtle.** Wilkinson 1999
Peat base Sutton Hams	3970-3660	5020+/-80	HAR-5354	**Central Brue valley**. Coles and Dobson 1989
Peat base Shapwick Heath	4611-4046	5510+/-120	Q-423	
Peat base Eclipse track	4448-4055	5440+/-70	HAR-4865	
Peat base Meare Village East	4315-3964	5270+/-70	HAR-7064	
Peat base Walton Heath	4680-4350	5650+/-70	HAR-1831	

Interpretation	Age cal. BC	RC years BP	Lab. code	Site and Reference
Base upper leaf fourth peat	1449-1100	3040+/-60	Beta-118378	**Rockingham Farm, Avonmouth** Moore *et al.* 2003
Top upper leaf fourth peat	1210-820	2810+/-70	Beta-118379	
Base lower leaf fourth peat	2880-2490	4073+/-55	NZA-15616	
Top lower leaf fourth peat	2900-2300	3966+/-60	NZA-15589	
Base upper leaf fourth peat	1880-1510	3352+/-60	NZA-15588	
Top upper leaf fourth peat	1320-920	2900+/-60	NZA-15587	
Base fourth peat	2580-2570	3917+/-55	NZA-15880	
Top fourth peat	1530-1370	3151+/-45	NZA-15879	
Base fourth peat	2860-2450	4045+/-50	AA-30868	**Pucklechurch to Seabank, Avonmouth**. Carter *et al.* 2004
Top fourth peat	2470-2450	3850+/-50	AA-30865	
Buried soil	1950-1050	3240+/-160	Wk-6234	
Buried soil	2130-1740	3670+/-60	Wk-6232	
Bottom of buried soil + occupation	5790-5590	6866+/-50	NZA-12479	**Katherine Farm, Avonmouth**. Allen *et al.* 2003
Top of buried soil with occupation	4910-4550	5879+/-70	NZA-12478	
Buried soil with occupation	1070-810	2778+/-55	NZA-12725	
	1380-1010	2957+/-55	NZA-12726	
Base of lower peat	2470-2290	3895+/-30	NZA-29002	**Plot 4000, Western Approaches Distribution Park, Avonmouth**. Ritchie *et al.* 2008
Top of lower peat	1900-1730	3489+/-30	NZA-23639	
Base of upper peat	2210-2020	3733+/-35	NZA-29001	
Top of upper peat	540-370	2357+/-35	NZA-29071	
Organic lenses in alluvium	930-800	2717+/-35	NZA-23638	
Thin horizon of inwashed charcoal and organic matter near top of middle Wentlooge deposits	2570-2340	3952+/-29	KIA-24862	**Former Enron Works, Severnside, South Glos.** Barnett and Armour Chelu 2008.
Base of black clay peat	2570-2230	3917+/45	NZA-29690	**Plot 8000, Western Approaches Distribution Park, Avonmouth**. Barnett *et al.* 2009
Black clay fen edge peat with inundations	3020-2890	4334+/25	NZA-29691	
Base of humified peat	2930-2875	4290+/25	NZA-29689	
Base of humified peat	2200-2160	3711+/25	NZA-29693	
Top of humidified peat	1430-1300	3097+/25	NZA-29692	
Lower buried soil	2905-2500	4170+/-70	Beta-125794	**Cabot Park, Avonmouth**. Locock *et al.* 1999
Lower buried soil	2585-2280	3970+/-60	Beta-125795	
Upper buried soil	1760-1505	3350+/-60	Beta-134901	

Upper buried soil	1390-1100	2970+/-60	Beta-134900	
Top woody peat	1520-1220	3100+/-50	Beta-80696	**Slimbridge**. Hewlett and Birnie 1996
Top woody peat	800-200	2340+/-60	Beta-80693	**Longney**. Hewlett and Birnie 1996
Top woody peat	800-200	2360+/-60	Beta-81686	**Elmore.** Allen 2001a
Upper peat (upper salt marsh)	895-674	2630+/-50	Not quoted	**Withy Bridge, Huntspill**. Vickery 1999
Lower peat (upper salt marsh)	1523-1311	3160+/-50		

11 Mapping of borehole data

11.1 Borehole and auger surveys have been undertaken in the Severn Estuary for both engineering and archaeological purposes and these can provide data about buried deposits and their potential to answer archaeological questions. In particular buried peat layers may yield palaeoenvironmental data which relate not only to past environments, but also to former sea-level (Kidson and Heyworth 1973, Heyworth and Kidson 1982, Hewlett 1997, Druce 2001).

11.2 The presence of boreholes is poorly recorded in the HER/SMRs for the RCZAS study area but those for Somerset were provided by Richard Brunning. The British Geological Survey holds a record of boreholes undertaken for geological purposes, which is available on-line via their GeoIndex :

http://www.bgs.ac.uk/geoindex/index.htm

11.3 However, this was not available in a format which allowed integration within the RCZAS database/GIS framework. For this reason boreholes were not mapped within the project GIS, but relevant locations are noted below.

11.4 The majority of BGS data relates to engineering work at Oldbury, Berkeley and Hinkley Point Power Stations and around the Second Severn Crossing, though of particular interest to the RCZAS are a series of boreholes taken at Frampton on Severn, Arlingham and Newnham and along the coast at Sand Bay. The sea defences at Burnham and Watchet were also surveyed, although the utility of engineering boreholes, and their associated logs, to archaeological work is questionable. An assessment of the quality of the borehole logs was beyond the scope of Phase 1 RCZAS work and an audit, targeted at pilot Phase 2 fieldwork sites should be undertaken to assess the usefulness of the data for the main fieldwork phase.

12 Digitising of cartographic data from historic OS mapping

12.1 In order to understand recent change to the coast of the Severn Estuary, the coastline as shown on historic Ordnance Survey maps was digitised into a GIS (Figures 28 to 31). A complete coverage of 1: 10,000 scale digital maps for the RCZAS study area was supplied by Landmark. The 1880 and 1925 Editions were initially chosen as being suitable for digitising, but the 1925 mapping was found to be incomplete. The only coverage which was complete was that from the 1900 Second Edition, which was digitised instead of the 1925 Third Edition.

12.2 High Water and Low Water were digitised at 1: 3500, the scale being chosen because the quality of the scans was poor below this resolution. The scale also avoids spurious accuracy. Inlets were digitised up to the 1km limit from High Water which defines the RCZAS study area.

12.3 The problems encountered during the digitisation process were generally associated with the ways in which the historic mapping had been scanned and tiled by Landmark. In particular, edges of individual sheets did not always match and, in some cases, the coastline was displaced by as much as 20m. In this situation, the digitisation took a middle line through any edge discontinuities.

12.4 A further problem with the survey area generally was the coincidence of High and Low Water above Bollow. The river above Sharpness is not charted and the tidal range here is very narrow, as a result it was not possible to accurately digitise both High and Low Water. As a compromise, Low Water was digitised accurately and High Water digitised inland of this at an arbitrary distance of 3-5m.

12.5 It was not possible to be certain if minor changes in the line of High and Low Water were due to cartographic errors and slight differences in the way in which the maps have been georeferenced/digitised. As a result, very minor change was ignored in the resulting analysis of coastal change.

12.6 The FutureCoast survey undertaken by Halcrow (see below) had already looked at this data in more detail and produced models of shoreline change as a result. These models should be accurate and are assessed below. It is important to note, however, that some elements of FutureCoast such as projected changes to shorelines will be affected by the recommendations of additional studies including the final North Devon and Somerset Coast Shoreline Management Plan (Halcrow 2009) and the final Severn Estuary Shoreline Management Plan 2, draft consultation versions of which have been recently released (Atkins Ltd 2009; Halcrow Group Ltd 2009).

13 The modern and projected coastlines: summary of FutureCoast data

13.1 The FutureCoast survey was carried out by Halcrow Group Ltd on behalf of DEFRA, and the CD of the results of the survey contains 51 pages of detailed information about projected coastal change within the Severn Estuary (as far north as the Old Severn Crossing) over the next 100 years. The document also deals with the morphology and historic change of the coast. A series of Shoreline Behaviour Statements have been complied for the estuary, which take into account the evolution, physical controls and linkages and human intervention along the coast, which are used to compile an assessment of the characteristics and behaviour of stretches of the coast classified as Coastal Behaviour Systems. These reports are summarised below.

13.2 The FutureCoast study identified two coastal behaviour systems within the RCZAS project area. These consist of the Bristol Channel South (Morte Point to Brean Down) and the Outer Severn Estuary (Brean Down to Penarth). The southern shore of the Channel was considered as three main units: Morte Point to Minehead, Minehead to Hinkley Point and Hinkley Point to Brean Down, whereas the estuary was considered to consist of four units: Brean Down to the River Yeo, Clevedon to Portishead Dock, Portishead to Old Severn Bridge and Old Severn Bridge (Beachley Point) to Penarth. It is important to note that these units are *not* the same as the Policy Units for the Shoreline Management Plans for North Devon and Somerset and the Severn Estuary (Atkins Ltd 2009, Halcrow Group Ltd 2009)

13.3 The section of coast between Porlock and Minehead (Figure 13) is described an east-west trending hard rock coast composed primarily of sandstones, slates and shales, the indentation of which is controlled by lithological and structural variation of the rocks. Porlock Bay is underlain by relatively soft mudstones and breccia (broken, angular rock fragments), with harder sandstones forming the surrounding higher ground. Porlock Ridge has had a complex history of build-up and breakdown, largely controlled by the rate of sea level rise and availability of sediment from the west. A large proportion of the gravel contained in the Porlock barrier system is thought to have been derived from head deposits that covered Porlock Bay following the last glacial episode.

13.4 Much of the open-cliffed coastline in this section of coast is undefended, with defences being restricted to individual embayments. Where defences are present, principally in the form of seawalls, they protect localised areas from flooding and erosion. The gravel barrier in Porlock Bay has been subjected to extensive human intervention to try to maintain its coherence and protect the back-barrier zone from flooding. This has involved groyning to retard longshore sediment flux, and artificial build-up of the barrier crest. Despite this, the shingle ridge breached in 1996 has not been repaired and there is now extensive tidal flooding. Whilst this has obvious implications for future shoreline development within Porlock Bay, little impact is anticipated for the behaviour of the wider coastline.

13.5 The cliffs between Porlock and Minehead are anticipated to display regionally low rates of erosion, with little change over the next century.

13.6 The section between Minehead and Hinkley Point (Figures 11 and 12) is described as predominantly cliffed and being essentially erosional, having retreated throughout the Holocene, leaving a wide intertidal platform. Landward movement of the MLW line of over 300m has been reported at Ker Moor during the last century, decreasing to 100m in the eastern side of Blue Anchor Bay. An extensive low-lying area of former salt marsh and river terrace deposits has developed between Minehead and Blue Anchor (Figure 12) following enclosure by a gravel storm ridge, the source of the gravel being erosion of the cliffs to the west of Minehead. Between Warren Point and Dunster, the ridge is backed by dunes which formed prior to the development of the ridge.

13.7 Although the majority of the cliffed coastline is undefended, management practices in Blue Anchor Bay have constrained the natural tendency for landward migration of the gravel storm ridge, artificially holding the shoreline seaward of its natural position. Defences at Warren Point and the adjacent frontage at Minehead to the west, also hold the shoreline as an artificial seaward protuberance. The resulting projected large-scale evolution of this stretch of coast is that it will continue to erode as it has done throughout the Holocene, with rates varying depending upon the differences in the underlying geology. Blue Anchor Bay would develop into a wider and deeper embayment, constrained to the northwest by the cliffs at Minehead Harbour and to the east at Blue Anchor. The gravel ridge between Minehead and Blue Anchor would display a natural tendency to migrate landward and to redistribute itself eastwards along the shoreline. The ridge would be subject to breakdown and there would be subsequent flooding of the low-lying area, extending west to Minehead. Where dunes back the ridge, they would afford a natural defence that could temporarily halt retreat of the ridge and supply sand to the foreshore. However, the dunes would eventually be lost due to longshore drift and a lack of fresh sediment supply.

13.8 The mudstone cliffs between Blue Anchor and St Audrie's Bay (Figure 12) would be expected to experience continued erosion but the cliffs between St Audrie's Bay and Hinkley Point would be expected to show lower rates of cliff recession, with little change over the next century.

13.9 Between Minehead and St Audrie's Bay, the coastline is described as cliffed and incised into Triassic shales and limestones and Jurassic mudstones, fronted by a wide intertidal rock platform. Variable spreads of mud, sand and gravel cover this platform. Cliff falls have been a recurrent problem along this stretch of coast, with the undefended cliffs to the east of Blue Anchor displaying a moderate rate of retreat, with low rates at Watchet and moderate rates in Helwell Bay. Unprotected mudstone cliffs in St Audrie's Bay are retreating by large-scale debris sliding and the cliffs incised into head deposits between Watchet and Doniford have been subject to rapid recession by debris flow and rotational sliding. To the west and east of Watchet harbour, defences have restricted erosion of the cliff, although MHW line has moved landward. St Audrie's Bay has seen a seaward shift of the MLW line, suggesting a widening and flattening of the foreshore due to a significant input of sediment from the cliffs.

13.10 The potential rates of cliff recession vary according to the bedrock geology, with higher relative erosion expected at Watchet, Doniford and St Audrie's Bay over the next century under an unconstrained scenario. Cliff recession at Watchet could initially be more rapid than for the adjacent coastline but is only likely to be significant in the short term. The remaining cliffed coastline to St Audrie's Bay would expect to see continued retreat, possibly leading to the development of a more pronounced embayment.

13.11 Between St Audrie's Bay and Hinkley Point the coast is characterised as a low cliffed coastline comprising predominantly Triassic shales and limestones, fronted by a wide intertidal rock platform. Extensive intertidal mud and sand flats occur from Lilstock to Hinkley Point and small, potentially floodable areas exist between the low cliffs at Kilve Pill and Lilstock. The cliffs between Quantoxhead and Lilstock have shown little historical change in cliff top position and the cliffs between Lilstock and Hinkley Point show equally low rates of recession. These low rates would be expected to continue between St Audrie's Bay and Lilstock and between Lilstock and Hinkley Point. The foreshore throughout this frontage would be expected to show an overall stability, with fresh sediment inputs balancing the retreat which will be driven by ongoing sea-level rise. The extensive rock platforms will also assist in maintenance of foreshore protection for the backing cliffs.

13.12 From Hinkley Point to the River Parrett (Figure 11) the coast is composed of Holocene estuarine and marine sediments. Analysis of historical maps as part of the FutureCoast project indicated that during the past century the MHW line has retreated at

Stolford, although only by a few metres, whereas for the rest of the shoreline to Stert Point there has been advance, of about 60m at Catsford Common and 200m at Steart, associated with salt marsh colonisation since 1928. Despite seaward movement of the MHW line, there has been retreat of the MLW line and foreshore steepening along this frontage. The MHW line at Stert Point has been subject to movement of hundreds of metres during the past few centuries. Until the late 18th century, the peninsula extended to Stert Island, becoming breached sometime prior to 1802. The predicted changes to the coast here are complex, but could result in the formation of a new tidal inlet or the breaking through of the River Parrett and the movement of this part of the coast to the west.

13.13 Between the River Parrett and Brean Down (Figures 10 and 11), the coast is characterised by a system of dunes, up to *c.* 800m wide and reaching heights of over 10m. Analysis of historic maps indicates that two islands existed in the mouth of the River Parrett Estuary until the late 18th century, one of which remains as East Dunball Point (west of Huntspill). Stert Island was formed by the breaching of the Stert peninsula prior to 1802. During the 1980s, the outer River Parrett channel developed a northerly course than previously. The mechanism for the switch in channel position is unknown and future patterns of movement are difficult to predict. The frontage from Burnham-on-Sea to Brean has experienced a complex pattern of shoreline change during the past century, but overall has been subject to shoreline retreat with the dunes actively eroding, their seaward faces retreating landward due to wave attack. At Berrow, however, the pattern of shoreline change is accretional, and an elongated area of salt marsh has developed since *c.* 1910, which has moved the shoreline seaward by *c.* 275m. During the 1960s the marsh was frequently tidally inundated, but subsequently a narrow series of foredunes formed to almost entirely isolate the marsh from the sea. These recent dunes are now subjected to erosion, and the width of the marsh is being reduced as the dunes migrate landwards. Severe erosion of the southern end of these dunes has been reported in recent years.

13.14 Historical map analysis indicates a seaward shift in the MHW position at Burnham-on-Sea during the past century (although this could be related to the replacement of defences), with a fluctuation in the position of the MLW line indicating possible foreshore steepening. The trend of seaward accretion is evident at Berrow, with seaward movement of the MHW line of up to 300m associated with salt marsh development. Continued erosion of the dunes at Berrow is likely, although they are not likely to be breached during the next 100 years. Without management intervention, the frontage of Burnham-on-Sea could be subject to erosion and inundation of the low-lying hinterland. The probability of this occurring will depend, to some extent, upon future evolution of the River Parrett channel, but is considered unlikely over the next century.

13.15 The coast between Brean Down and Worlebury Hill (Figure 9) is a dune-backed embayment, flanked by Carboniferous limestone headlands. Landward of the dunes is a low-lying area of predominantly estuarine and marine alluvium, forming part of the Severn Levels and linked to the Levels south of Brean Down by the floodplain of the River Axe. The foreshore comprises a wide sandy beach, grading to mud on the extensive tidal flats, which extend up to 2km offshore. Salt marsh has developed to the east of Brean Down, at the mouth of the River Axe. The northern side of Brean Down shows evidence of foreshore lowering during the past century, with increasing exposure of the intertidal rock platform which measured up to 40m wide at Fiddlers Point by the 1980s. The position of MHW has, however, remained stable due to the resistant nature of the bedrock. In the central bay, historic mapping indicates a seaward movement of the MHW mark of *c.* 50m since the 1880s. Over the long term, erosion and landward migration of the dune ridge would be expected to occur, with the northern end of the bay, in particular, having the potential to experience accelerated erosion if there was an increase in westerly storm wave activity. With breakdown of the dune ridge, low-lying areas would be subjected to extensive marine flooding, potentially extending south across the mouth of the River Axe to the Levels, south of Brean Down. Under such a scenario, Brean Down would be likely to become an island

seaward of the new shoreline. The headland cliffs along this shoreline would be expected to continue to display low recession rates over the next hundred years, however.

13.16 The area of Sand Bay, between Worlebury Hill and Sand Point (Figure 9), is an embayment similar in morphology to that of Weston Bay to the south, lying between the resistant Carboniferous limestone headlands of Swallow Cliff in the north and Worlebury Hill in the south. A narrow dune belt backs the embayment. The foreshore comprises a wide sandy beach, grading to extensive muddy intertidal flats. Salt marsh has developed at the northern end of the embayment, immediately to the south of Swallow Cliff, with an intertidal rock platform extending west along the headland to Sand Point. The cliff headlands are fronted by rocky intertidal platforms, with gravel and boulders covering the platform on the northern side of Worlebury Hill. At Worlebury Hill, local cliff failures and rock falls have resulted in a seaward movement of MHW due to eroded coarse-grained sediment remaining on the rock platform. In the central bay, however, MHW and MLW marks have remained similar to their positions in the 1880s. At the extreme northern end of the bay, MHW has moved seaward by *c.* 450m since the 1880s due to the accumulation of intertidal mud and salt marsh. This section of shoreline would be expected to experience erosion under westerly storm wave activity, leading to lowering of the foreshore level. Erosion and landward migration of the dune ridge would also be expected to occur, leading to breakdown due to a continued low sediment supply. A breach of the natural defence would lead to extensive marine flooding of the low-lying areas, potentially extending eastward to the Levels backing Woodspring Bay. Under such a scenario, Middle Hope would be likely to become an island. The headland cliffs would be expected to continue to display low recession rates over the next hundred years.

13.17 Between Sand Point and St Thomas's Head (Figure 9), the cliffed coastline is composed of resistant Carboniferous limestone, forming a headland separating Sand Bay to the south from Woodspring Bay to the east. The foreshore comprises an intertidal rock platform, with a mud covering on the eastern part. There is no evidence for significant production of sediment from the cliff erosion along this section of the coast at the present time. The resistant cliffs and rock platform would be expected to show continued low rates of recession over the next hundred years. With inundation of the low-lying Levels to the south and east, Middle Hope would be likely to become an island, although it would still exert control over the leeward shoreline by providing protection from direct wave activity from the north-west.

13.18 The stretch of coast between St Thomas's Head to the Blind Yeo and Clevedon (Figure 9) is a low-lying embayment between resistant Carboniferous limestone outcrops. An extensive low-lying hinterland of marine and estuarine alluvium backs the embayment, forming part of the Severn Levels and extending westward across the mouth of the Rivers Yeo and Banwell to Sand Bay. The backshore comprises salt marsh, fronted by wide intertidal mudflats. There has been a general erosional trend within the bay since the 1880s, with a 40m to 100m reduction in foreshore width. To the south of Wain's Hill at the mouth of the Blind Yeo, variable salt marsh progradation of up to 200m has occurred during the past century. Over the long term, landward recession of the shoreline and the creation of a wider intertidal zone could be expected with inundation potentially extending westward to the lowland behind Sand Bay.

13.19 From Clevedon to Portishead Dock (Figure 8), the cliffed coastline is composed of resistant Carboniferous limestones and mudstones with Devonian sandstone. A patchy cover of dolomitic conglomerate extends from below sea level to the top of the cliff. Between Walton in Gordano and Portishead, the ridge fronts a broad low-lying area of head and estuarine alluvium and peat, which has formed on weaker mudstones in a fault-controlled depression. Rates of cliff retreat along the foreshore have been low. Fragments of raised beach exist along the coastline, representing former Pleistocene positions of higher relative sea level at *c.* 3m and 15m levels. The coastline here would be expected to display low rates of recession with little change over the next hundred years. Localised rock falls could

continue to supply small quantities of gravel to the foreshore predominantly between Clevedon Pier and Ladye Bay, although limited redistribution would be expected, with rock platform dominating the foreshore along much of the frontage. The salt marsh in Woodhill Bay could erode along the marsh with inundation of a small area of lowland. Shoreline recession could lead to salt marsh squeeze, with landward migration constrained by the backing cliffs.

13.20 Between Portishead Dock and the Old Severn Bridge (Figures 7 and 8), the coastline is predominantly low lying, having developed between resistant dolomite and sandstone cliffs, to the south-west at Portishead Dock, and mudstone cliffs to the north-east of Old Passage. As with the estuarine margins throughout the rest of the estuary, the lowland sediments were deposited as marine and estuarine alluvium during the Holocene, as sea level rose to its present position. An earlier Pleistocene course of the River Severn flowed to the east of Severn Beach, with a westerly stream excavating the deep channel of The Shoots. Later interglacial obstruction diverted the river westward toward the present channel position, further eroding The Shoots. The resistant bedrock outcrops at English Stones and Lady Bench remained as mid-estuary constrictions to the main channel. Similar control points exist further upstream at Aust Rock and Beachley Head. English Stones has acted as a control over shoreline recession at New Passage, leading to its development as a promontory. Human modification due to land reclamation and sea defences has significantly altered the extent, elevation and form of the defended lowlands and historic trends on this frontage indicate relative stability of the lowland shoreline, with considerable accretion in some areas. When considering recent changes, however, it is important to recognise that trends identified may not necessarily reflect the longer-term erosional and depositional phases that the shoreline experiences. Extensive marine flooding of the lowland Levels between Portishead Dock and Old Passage is predicted by FutureCoast, with accompanying landward recession of the shoreline, creating wider intertidal areas. The cliffs such as Aust Cliff would, however, be expected to continue to display low rates of cliff recession during the next century. Sea level rise and increased local wave energy could lead to potentially higher rates of erosion, but the cliffs would be expected to remain largely unchanged.

13.21 As mentioned above in section 12.6, however, it is important to note that some of the projected coastline changes predicted by the FutureCoast survey will be superseded by the recommendations of the Shoreline Management Policies (SMPs), second draft consultation versions of which are now available for the North Devon and Somerset Coast (Halcrow Group Ltd 2009) and for the Severn Estuary Shoreline (Atkins Ltd 2009). Decisions on whether to ‘Hold the line’, ‘Advance the line’, to have ‘Managed realignment’ or ‘No active intervention’ will inevitably affect some of the physical landforms and geomorphological and geofluvial processes outlined above. These possible changes are outlined in the relevant SMP documents.

14 Coastal management

14.1 Management Principles

14.1.1 A number of current Statutes, Bills and Conventions apply to the archaeology of the coastal zone. These include:

- European Convention on the Protection of the Archaeological Heritage Convention (revised) 1992;
- UNESCO Convention on the Protection of Underwater Cultural Heritage 2001;
- Ancient Monuments and Archaeological Areas Act 1979;
- National Heritage Act 2002;
- Marine and Coastal Access Bill 2009 (Defra 2009a).

14.1.2 The protection of archaeology in the coastal zone is complicated by its physical location between terrestrial and maritime regulatory areas. The system of regulation is currently in a state of considerable flux, due to proposed legislative changes and the fact that many policy and guidance documents are under revision or consultation. Some of these problems were outlined in a recent study covering current and future practices of planning at the coast in England and Wales – *Planning at the Coast* (Entec UK Ltd 2009). This noted, for example, that coverage of flood and coastal erosion varied despite there being a requirement for development plans to take into account coastal management plans such as Shoreline Management Plans (SMPs). It recognised that future planning policy and any future legislation must be more compatible with marine plans, but recognised that there were problems in integrating SMPs with both land and marine planning. There is a danger that landside processes such as cliff erosion that are affected by both terrestrial and marine activities may not be fully considered in the development of marine and terrestrial planning policies (ibid.: 12). Several studies and strategies have, however, been produced to address these issues (e.g. Defra 2005, 2009b).

14.1.3 In the future, it is proposed that a Marine Management Organisation will have responsibility for preparing Marine Plans in English inshore and offshore marine areas. Based on a draft consultation document (Defra 2009c), there is currently a public consultation process underway with relevant stakeholders to divide regions into plan areas and identify the appropriate boundaries between them.

14.1.4 Although a new Heritage Protection Bill was issued in 2008, it is unlikely that time will be found to bring it before parliament in the foreseeable future. This bill proposed a new unified system of designated heritage assets to replace Scheduled Ancient Monuments, Listed Buildings, Registered Parks and Gardens and Registered Battlefields. A recent document setting out revised English Heritage principles and policies in managing the historic environment has also been produced (English Heritage 2008), one in which a more consolidated consistent and holistic approach is advocated. It is intended that this will be supported by additional, more detailed guidance in due course (ibid.: 13).

14.1.5 The Department for Communities and Local Government is currently consulting on a new 'Planning Policy Statement 15: Planning and the Historic Environment' to replace PPGs 15 and 16. DCLG are also consulting on a draft planning policy on development and coastal change (DCLG 2009), which will result in a supplement to PPS25 (Development and flood risk), requiring local authorities to designate areas at most risk as 'Coastal Change Management Areas'. In addition, the English Heritage policy document covering maritime archaeology (Roberts and Trow 2002) is now out of date and it is planned to issue a new policy document for consultation soon (P. Murphy pers. comm.). Any new policy will comply

with the general principles of integrated coastal zone management (ICZM) and adaptive management in particular (ibid.).

14.1.6 Current advice on management of the historic environment in the coastal zone can be found in Defra policy and strategy documents and more specifically in the following English Heritage documents:

- *Coastal Defence and the Historic Environment* (English Heritage 2003);
- *Ports: The impact of Development on the Historic Environment* (EH 2006a);
- *Shoreline Management Plan Review and the Historic Environment* (EH 2006b).

14.1.7 This current advice stresses the need for consultation with English Heritage and the HERs/SMRs of relevant local authorities regarding management of the historic environment and on the implications of specific developments or other actions. It is vital that regional and local advice is taken and that all heritage assets are considered, not just designated monuments, buildings and areas. It is likely that the new English Heritage policy will move away from an automatic onus on preservation *in situ* to one of adaptation, where following regional and local advice archaeological mitigation will focus on those areas, features, monuments or buildings considered to be most important.

14.1.8 The English Heritage Commission agreed at its meeting on 12 May, 2009 "…*that the scale of the impact of coastal change on the historic environment needed to be assessed, that losses of heritage assets were inevitable and that prioritisation was needed in areas most at risk."* (Public minutes of meeting).

14.2 Shoreline Management Plans and the Tidal Severn Flood Risk Management Strategy

14.2.1 The existing Shoreline Management Plan (SMP1) for the Severn Estuary was compiled by the Severn Estuary Coastal Group and Gifford Associated Consultants in 2000. Updated Shoreline Management Plans (SMPs) are now being drafted for the RCZAS area, by consultants acting on behalf of the Environment Agency (North Devon and Somerset) and the lead local authority (Monmouthshire for the Severn). These are the North Devon and Somerset SMP2, and the Severn Estuary SMP2, the boundary between the two being at Anchor Head, Weston-super-Mare. Draft consultation versions of these two revised SMPs are now available (Halcrow Group Ltd 2009, Atkins Ltd 2009). These SMPs divide the coastline into a series of Policy Units (PUs), each characterised by similarities in natural processes, the character of the coast, and/or flood or erosion risk.

14.2.2 Once the final revised SMPs are issued, heritage assets at risk from coastal change will need to be reassessed. The plans will provide the evidence base for the identification of 'Coastal Change Management Areas' in regional and local plans, and they will also inform decisions (taken by the Environment Agency) on which defence schemes to fund. The revised SMPs only provide the policy for management approaches to such defences, however, and will not detail how policies will actually be implemented. The plans for future management will aim to reduce the impact of coastal processes on people and the developed, historical and natural environment. The SMPs will provide detailed information on the extent of coastal erosion, as well as consideration of the range of feasible coastal management scenarios for each coastal area and their impact in shaping the coastline for short term (0-20 years), medium term (20-50 years) and long term (50-100 years) periods. The relevant Coastal Group acts as a steering committee. English Heritage is one of the bodies that advise and comment on progress.

14.2.3 The shoreline management policies that will be considered in future have been defined by Defra (2006). In terms of the management of coastal defences, they consist of:

- Hold the line: Maintain or upgrade the level of protection provided by defences;
- Advance the line: Build new defences seaward of the existing defence line;
- Managed realignment: Allowing retreat of the shoreline, with management to control or limit movement;
- No active intervention: A decision not to invest in providing or maintaining defences.

14.2.4 The upstream limit of the FutureCoast survey was the Severn Crossing, but the area between Avonmouth and Maisemore Weir was covered by the Environment Agency's *Tidal Severn Flood Risk Management Strategy* (TSFRMS). This Strategy aimed to provide a 50 year framework for managing flood risk in this area. As such, the survey was intimately tied-up with both the Severn Estuary Shoreline Management Plan (SMP) and the Coastal Habitat Management Plan (CHaMP). SMP1 and CHaMP will now be superseded by the Severn Estuary SMP2 (Atkins Ltd 2009), whose upstream boundary is now at Haw Bridge, north of both Gloucester and Maisemore Weir, the upstream limit of the RCZAS project area.

14.2.5 The Environment Agency's *Tidal Severn Flood Risk Management Strategy* (TSFRMS) will itself be superseded by an updated study, the Severn Estuary Flood Risk Management Strategy (SEFRMS), which was begun in February 2008 (Atkins Ltd 2009: 3). The SEFRMS is intended to be an engineering-focused study complementary to the Shoreline Management Plan 2, and will examine SMP2 policy decisions in more detail and develop these into practical management options. It is the SEFRMS that will provide information as to how the policies of the SMP2 will be implemented, and it will analyse the most appropriate standards and methods of protection, and determine where defences can be positioned. It has not yet been completed.

14.3 The Severn Estuary Shoreline Management Plan 2 (SMP2)

14.3.1 In the Severn Estuary SMP2 (which also covers Wales), the relevant SMP area for the RCZAS extends from Beachley Head to Anchor Head, Weston-super-Mare. There are 42 separate Policy Units (PUs) that fall within the area of the Severn Estuary RCZAS – PUs WYE2, TID1-TID2, LYD1, GLO1-GLO8, MAI1-MAI2, MAI4-MAI6, SHA1-SHA8, SEV1-SEV6, BRIS1-BRIS3, BRIS6, PORT1-PORT4, KIN1-KIN4 and HOL2 (Atkins Ltd 2009: 23-26, part B, section 5.1). PUs BRIS4 and BRIS5 fall outside of the RCZAS study area.

14.3.2 These 42 Policy Units (PUs) are shown in Figures 4-9, and their physical characteristics and proposed future management policies (Atkins Ltd 2009) are summarised as follows:

- **TID1** – Beachley Point to Guscar Rocks. Largely low-lying agricultural grazing land, with cliffs at Sedbury, some residential areas and buildings, the Army Apprentices College, Nature Conservation sites and the Gloucester-Chepstow GWR railway.

  Short term, medium term and long term preferred policy – No Active Intervention. Within 50-100 years, increasingly dominant erosion will result in realignment of the shoreline, whilst sea level rises will increase isolated flooding incidents on agricultural land and the railway line.

The SMP2 consultation document notes that the flood risk will increase in the long term to Broad Stone and the remains of Woolaston chapel (Atkins Ltd 2009). What is not stated, however, is that the remains of several early modern putcher ranks, other undated wooden structures, the Scheduled Roman villa complex at Chesters, part of the Scheduled Offa's Dyke, medieval structures at Grange Pill, prehistoric and Roman artefact scatters plus important prehistoric peat deposits and prehistoric wooden structures will also all be at much greater risk from erosion and 'coastal squeeze'. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion as part of any future management plans.

- **TID2** – Guscar Rocks to Lydney Harbour. Largely low-lying agricultural grazing land, with some residential areas and buildings, Nature Conservation sites and the line of the Gloucester-Chepstow GWR railway.

  Short term preferred policy – No Active Intervention. Medium and long term preferred policy – Managed Realignment. The likely flood risk to residential areas will be limited wherever possible, but there will be increased flood risk to agricultural land.

  Managed Realignment would most likely involve the construction of set back defences or other actions to regulate tidal exchange, and may include the expansion of existing wetland areas. The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). However, early modern jetties at Cone Pill and Warth Brook, post-medieval deposits, medieval ridge and furrow and various phases of bank defences, potentially dating back to the medieval or Romano-British periods, would all be at much greater risk from erosion and 'coastal squeeze', as would the early modern hulks and wooden revetment and/or fishing structures on the Lydney foreshore. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion as part of any future management plans.

- **LYD1** – Lydney Harbour basin. Modern industrial area and historic harbour structures and other associated features.

  Short term, medium term and long term preferred policy – Hold the Line. The existing defences of the harbour and the harbour gates will be maintained to prevent flooding.

  The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009), and the policy of hold the line may mean that there are minimum risks to historical and archaeological assets. There will need to be an archaeological assessment, however, of the impact of hold the line on inter-tidal features in front of defences due to foreshore erosion and 'coastal squeeze'. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion as part of any future management plans.

- **GLO1** – Lydney Harbour to Brims Pill. This area is mostly rocky shoreline and steeply sloping wooded riverbank or grazing land, with some residential areas at Purton and Gatcombe in narrow inlets, and low-lying agricultural grazing land around Poulton Court and Brims Pill. Lydney Cliff is a SSSI.

  Short term, medium term and long term preferred policy – No Active Intervention. The high ground should prevent flooding, although the railway line runs close to the shore near Wellhouse Bay and Purton, and some protection may be required in future to limit erosion.

The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). The remains of several post-medieval or early modern putcher ranks along the foreshore would be at greater risk of erosion, however, and it is possible that any previously unrecorded medieval and post-medieval remains at Purton Pill might be exposed and eroded. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion as part of any future management plans.

- **GLO2** – Brims Pill to Northington Farm. This area mostly consists of low-lying agricultural grazing land.

  Short term preferred policy – No Active Intervention. Medium and long term preferred policy – Managed Realignment. In the medium and longer term a new defence line will be created on higher ground further inland, and this will probably result in the creation of additional intertidal and/or salt marsh habitat in front of it. Much of the low-lying land east of Awre will thus be affected.

  The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009), but two early modern fish houses and the earthworks of medieval ridge and furrow and post-medieval early modern rhynes would all be destroyed by greater erosion and flooding, along with several putcher ranks, different phases of flood defence banks and other traces of land reclamation of medieval date, perhaps with origins in the Romano-British period. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion as part of any future management plans.

- **GLO3** – Northington Farm to Newnham Church. This area mostly consists of agricultural grazing land, some residential areas, Nature Conservation sites and the line of the Gloucester-Chepstow GWR railway.

  Short term, medium term and long term preferred policy – No Active Intervention. The higher ground and harder geology in this zone should limit flooding and erosion, although in the long term the rate of shoreline erosion will increase as a result of sea level rises. In the long term monitoring and control of this erosion may become necessary.

  The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Ridge and furrow recorded near The Priory possibly associated with the medieval settlement of Boxcliff situated near Box Rock might be at risk from flooding, however. Possible boat building features at Bullo Pill might also be at risk from erosion, and Listed Buildings on low-lying land immediately south of Newnham at Callow Pill may be at greater risk from flooding and ‘coastal squeeze’. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion as part of any future management plans.

- **GLO4** – Newnham Church to Pound Farm north of Broadoak. This area consists of the residential areas of Newnham, low-lying agricultural grazing land, the line of the Gloucester-Chepstow GWR railway and the A48 (T) road.

  Short term, medium term and long term preferred policy – Hold the Line. Existing defences will be maintained to protect the A48 road and residential properties, particularly those in the low-lying part of Newnham. In the medium to long term, as sea level rises, erosion and flood risk may increase, and more active management of

the existing defences may be required, and/or replacement of the existing defence line.

Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009), but this will depend on the active maintenance of defences. Many of the residences in the lower part of Newnham are Listed Buildings, and there are surviving remains of the post-medieval and early modern quay. In addition, some ridge and furrow earthworks on low-lying land east of Broadoak may be at greater risk from flooding, erosion and 'coastal squeeze'. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion as part of any future management plans.

- **GLO5** – Pound Farm to Hill Farm, Rodley. This area consists mainly of low-lying agricultural grazing land, the Garden Cliff SSSI Nature Conservation site and isolated residential properties, along with the moated manor and gardens at Westbury Court.

  Short term, medium term and long term preferred policy – Hold the Line. Existing defences will be maintained to protect the low-lying hinterland behind the Garden Cliff face, but the current earth embankments will probably have to be replaced in 20-50 years time.

  Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009), but this will depend on the active maintenance of defences. The SMP2 consultation document does note that consideration should be given to Westbury Court Gardens, which currently experiences flood risk from tide locked flap valves. Medieval ridge and furrow, a Scheduled wayside cross socket, post-medieval rhynes and several historical phases of flood defence bank south-east of Rodley would also be at risk if defences were not maintained. The land reclamation and river defences at Rodley are medieval or earlier in origin. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **GLO6** – Hill Farm, Rodley to Goose Lane Farm, north of Bollow. This area consists mainly of low-lying agricultural grazing land, with some orchards and woods on steeper ground, Nature Conservation sites and isolated farms and residential properties.

  Short term, medium term and long term preferred policy – No Active Intervention. The higher ground and harder geology in this zone should limit flooding and erosion, although in the long term the rate of shoreline erosion will increase as a result of sea level rises. In the long term monitoring and control of this erosion may become necessary to protect residential properties in and around Bollow.

  The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Some ridge and furrow and the possible 19th century gamekeeper or fish keeper's cottage on the riverbank south-east of Bollow might be at greater risk from erosion and flooding though. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **GLO7** – Goose Lane Farm, north of Bollow to Ley Road south of Denny Hill. This area consists mainly of low-lying grazing land and orchards, with the Walmore

Common RAMSAR Nature Conservation site, isolated residential properties, and the A48 (T) road.

Short term, medium term and long term preferred policy – Hold the Line. Existing defences will be maintained, but the current earth embankments will probably have to be replaced in 20-50 years time, and in the long term monitoring and control of erosion may become necessary.

Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). The remains of medieval ridge and furrow, different phases of historic flood defence banks and a Listed Building at The Noards would be under threat if there was increased flooding, erosion and 'coastal squeeze'. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **GLO8** – Ley Road south of Denny Hill to the drain from Long Brook, between Clay Hill and Minsterworth. This area mostly consists of low-lying grazing land and orchards, with some higher ground such as Denny Hill and Clay Hill, Nature Conservation sites, isolated residential properties, and the A48 (T) road and the Gloucester-Chepstow railway.

  Short term, medium term and long term preferred policy – Hold the Line. Existing defences will have to be maintained to prevent flooding of the road and railway. In the long term some monitoring and control of erosion may become necessary.

  Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). The remains of medieval ridge and furrow and a Listed fish house would be under threat if there was increased flooding. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **MAI1** – Drain from Long Brook, between Clay Hill and Minsterworth, to the A40 road bridge. This area consists of low-lying grazing land and orchards, Nature Conservation sites, residential areas such as Minsterworth as well as isolated residential properties, and the A48 (T) road and the Gloucester-Chepstow railway.

  Short term preferred policy – No Active Intervention. Medium and long term preferred policy – Managed Realignment. The current flood defences are expected to fail in the next 20 years, threatening agricultural land, some isolated residential properties, some local infrastructure and the electricity distribution network. The maintenance of some existing defences may take place if funds are available, although it is not intended to construct new defences. Much of the Minsterworth Ham area would be left to evolve naturally, probably into wetlands, and this offers a potential site for habitat creation. Subject to further studies, in the medium term a new defence line may be constructed, to expand existing wetland areas or replace areas lost by sea level rise, and also to increase flood conveyance to reduce the overall impact of flooding. Once created, these new defences would be maintained over the long term.

  The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009), but any increase in flooding would threaten Listed Buildings in Minsterworth and Calcott's Green, and the Scheduled Telford Bridge and the line of the Roman road. Any expansion of wetlands would also affect many areas of ridge and furrow and earlier phases of flood defence. There will need to be an archaeological

assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **MAI2** – The A40 road bridge to Haw Bridge, north of Bishop's Norton. This Severn Estuary SMP2 Policy Unit extends further north than Maisemore weir, the northernmost boundary of the RCZAS study area. The area consists of the confluence with the River Leadon, generally low-lying agricultural grazing land but also higher ground such as Spring Hill, residential areas such as Maisemore and isolated farms and residential properties, Nature Conservation sites, and the A417 road.

  Short term, medium term and long term preferred policy – Hold the Line. Existing defences will be maintained to prevent flooding, although some may need to be reconstructed and enhanced. In the long term some monitoring and control of erosion may become necessary.

  The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009), but any increase in flooding would threaten Listed Buildings in Maisemore and Maisemore Court, a Scheduled churchyard cross, the remains of Civil War fortifications at Over, Over Bridge, and two ring ditches between Over and Over Farm. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **MAI4** – Upper Parting to Lower Parting. This area consists of low-lying grazing land, infrastructure, public and government buildings, residential areas, the A417 and A430 roads, the Gloucester-Chepstow railway, and the Scheduled remains of Llanthony Priory.

  Short term, medium term and long term preferred policy – Hold the Line. Existing defences will be maintained to prevent flooding, although where no current defences exist further assessment will be necessary on the future requirement of defences as sea level rises, and some may need to be reconstructed and enhanced. In the long term maintenance of new and existing defences should continue.

  Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009), but the site of Llanthony Priory will require careful assessment in any future flood defence schemes, as will the many Listed Buildings and buried archaeological remains in this part of Gloucester. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans. The location of the Roman and medieval port facilities at Gloucester is still unknown, which would be a crucial condition of the assessment of construction of any future flood defences.

- **MAI5** – Alney Island. This area consists of low-lying grazing land, infrastructure such as the electricity transforming station, residential areas, the A417 and A430 roads, the Gloucester-Chepstow railway, and Alney Island Nature Reserve.

  Short term, medium term and long term preferred policy – Hold the Line. Existing defences will be maintained to prevent flooding, although some may need to be reconstructed and enhanced. Where no current defences exist, further assessment will be necessary on the future requirement of defences as sea level rises. In the long term maintenance of new and existing defences should continue.

Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009), but the cross by Maisemore Bridge and post-medieval drainage features at Port Ham would be at risk from any flooding. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **MAI6** – Lower Parting to Severn Farm, near Stonebench. This area consists of low-lying agricultural land, a landfill site, infrastructure such as a sewage works, industrial and residential areas, the A430 road and the Gloucester-Sharpness Canal.

  Short term, medium term and long term preferred policy – Hold the Line. Existing defences will be maintained to prevent flooding, although some may need to be reconstructed and enhanced. Where no current defences exist, further assessment will be necessary on the future requirement of defences as sea level rises. In the long term maintenance of new and existing defences should continue.

  Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Areas of medieval ridge and furrow, post-medieval drainage channels, undated early phases of river bank defences, Listed Buildings in Newark and Hempsted, a village cross in Hempsted and the Scheduled earthworks at Lady's Well would all be at risk from any flooding. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **SHA1** – Severn Farm, near Stonebench to Wicks Green. This area consists of low-lying agricultural land and orchards, a small higher area (Windmill Hill), isolated farms and residential properties.

  Short term preferred policy – No Active Intervention. Medium and long term preferred policy – Managed Realignment. The current flood defences are expected to fail in the next 20 years, although the maintenance of existing short lengths of defence will continue to allow the implementation of a new defence line, if funds are available. In the medium and long term, much of the Elmore area would be left to evolve naturally, probably into wetlands, and this offers a site for habitat creation. In the medium term a new defence line will be constructed further inland along higher ground. Once created, these new defences would then be maintained over the long term.

  The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009), but notes that 156ha of land will be subject to frequent flooding. Extensive areas of medieval ridge and furrow and post-medieval land drainage, early phases of land reclamation, the undated 'Great Wall' of Elmore and other river bank defences that are probably medieval in origin would therefore all be at much greater risk from flooding and an expansion of wetlands or intertidal areas, as would Listed Buildings in Elmore and Elmore Back, and a possible moated site at Wicks Green. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **SHA2** – Wicks Green to Longney Green. This area consists of low-lying agricultural land and orchards, residential areas and isolated farms.

  Short term preferred policy – No Active Intervention. Medium and long term preferred policy – Managed Realignment. The current flood defences are expected to fail in the next 20 years. In the medium and long term, the lowest-lying land in the area would

be left to evolve naturally, probably into wetlands, and this offers habitat creation. In the medium term a new defence line of earthwork embankments will be constructed along higher ground to try and minimise the impact to people, property and infrastructure, and also to increase flood conveyance. This might leave Downend, Castle End Farm or Longney as islands or peninsulas surrounded by wetlands. Once created, these new defences would then be maintained over the long term.

The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009), but notes that 352ha of land will be subject to frequent flooding. Areas of medieval ridge and furrow and post-medieval land drainage, early phases of land reclamation and river bank defences that are probably medieval in origin would thus all be at much greater risk from flooding and an expansion of wetlands or intertidal areas, as would Listed Buildings at Yew Tree Farm, Downend, Bowlane, Longney and Manor Farm. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **SHA3** – Longney Green to Overton Lane. This area consists of low-lying agricultural land and orchards, a small higher area (Barrow Hill), residential areas and isolated farms, and infrastructure such as electricity pylons.

  Short term, medium term and long term preferred policy – Hold the Line. The existing flood defences are expected to fail in the next 20-50 years. If this was allowed, a large flood cell would develop and would impact on agricultural land, residential properties, local infrastructure and the electricity, effectively creating an island around Arlingham. To prevent this, existing defences will be reconstructed and enhanced. Where no current defences exist, further assessment will be necessary on the future requirement of defences as sea level rises. In the long term maintenance of new and existing defences will continue.

  Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Areas of medieval ridge and furrow, post-medieval land drainage and early phases of land reclamation and river bank defences that are probably medieval in origin would all be at risk from any flooding, as would Listed Buildings at Epney, Lea Court Farm, Upper Framilode, Framilode, Priding and the moated manor at Wick Court. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **SHA4** – Overton Lane to upstream of Hock Cliff. This area consists of low-lying agricultural land and orchards, small higher areas (Barrow Hill), residential areas and isolated farms, Nature Conservation sites and infrastructure such as electricity pylons.

  Short term preferred policy – No Active Intervention. Medium and long term preferred policy – Managed Realignment. The current flood defences are expected to fail in the next 20 years. In the medium and long term, the lowest-lying land in the area would be left to evolve naturally, probably into wetlands, and this offers habitat creation. In the medium term a new defence line of earth embankments will be constructed, the location to be determined by future studies, and to increase flood conveyance. Once created, these new defences would then be maintained over the long term.

  The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009), but notes that 409ha of land will be subject to frequent flooding. Some of the

most well-preserved areas of medieval ridge and furrow in the inner Severn Estuary would thus be threatened by flooding. Post-medieval land drainage and early phases of land reclamation and river bank defences would also be at much greater risk from flooding and an expansion of wetlands or intertidal areas, as would Listed Buildings at Arlingham, Passage Farm, Church Farm, rectory Farm and West End Farm. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **SHA5** – Hock Cliff. This area consists of agricultural land, orchards and isolated residential properties behind an elevated cliff of hard geology which is a Nature Conservation site.

  Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the hard geology will limit this, although the area will be monitored and if in the long term erosion should threaten cliff top assets, erosion protection measures will be considered.

  Due to the nature of the geology and the landscape, the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). The Listed Building at The Reddings and a series of stratigraphic units within the section at Hock Cliff might be threatened if erosion accelerated greatly, and prehistoric flint and medieval pottery finds from below the cliff might increase. The medieval settlement site and earthworks immediately west of Fretherne, however, should be safe.

- **SHA6** – Downstream of Hock Cliff to Frampton Pill. This area consists of low-lying agricultural land and orchards, isolated farms and residences, the Gloucester and Sharpness Canal, and infrastructure such as a sewage works.

  Short term, medium term and long term preferred policy – Hold the Line. The existing flood defences are expected to fail in the next 20-50 years. If this was allowed, a large flood cell would develop and would impact on agricultural land, residential properties, local infrastructure and the electricity, effectively creating an island around Arlingham, and threatening Frampton on Severn. To prevent this, existing defences will be reconstructed and enhanced. Where no current defences exist, further assessment will be necessary on the future requirement of defences as sea level rises. In the long term maintenance of new and existing defences will continue.

  Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Areas of medieval ridge and furrow, post-medieval land drainage and earlier phases of land reclamation and river bank defences would all be at risk from any flooding, as would Listed Buildings at Saul Lodge, Manor Farm, Church End and in Frampton on Severn itself. The Fretherne and Splatt swing bridges across the canal are also Listed structures. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **SHA7** – Frampton Pill to Royal Drift outfall. This area consists of low-lying agricultural land, isolated farms and residences, the Gloucester and Sharpness Canal, and the Conservation Site of the Wildfowl and Wetlands Trust at Slimbridge.

  Short term preferred policy – No Active Intervention. Medium and long term preferred policy – Managed Realignment. The current flood defences are expected to fail in the

next 20 years. In the medium and long term, the lowest-lying land in the area would be left to evolve naturally, probably into wetlands, and this offers habitat creation. In the medium term a new defence line of earth embankments will be constructed. Once created, these new defences would then be maintained over the long term.

The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009), but notes that 187ha of land will be subject to frequent flooding. Ridge and furrow, post-medieval land drainage and earlier phases of land reclamation and river bank defences would all be at much greater risk from flooding and an expansion of wetlands or intertidal areas, as would an undated brushwood and timber structure that may have been a trackway or a wharf (Price and Spry 2004). There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **SHA8** – Royal Drift outfall to Sharpness Docks. This area consists of a mixture of low-lying and more elevated agricultural land, isolated farms and residences, the Gloucester and Sharpness Canal, infrastructure including a water treatment works and reservoirs at Purton, the industrial area and docks at Sharpness, and Nature Conservation sites.

  Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology and higher ground will limit this, although the area will be monitored and erosion protection measures will be considered if necessary.

  Due to the nature of the geology and the landscape, the SMP2 consultation document states that limited erosion and flood risk will not impact on the historic environment, but that erosion protection may be required to protect the Purton Hulks and the canal (Atkins Ltd 2009). In addition, however, areas of medieval ridge and furrow, post-medieval land drainage, earlier phases of land reclamation and river bank defences would be at risk from any flooding or erosion, as would an early modern wildfowl decoy, and Listed Buildings in Sharpness and Purton. The latter include one of the swing bridges at Purton and a towing horse stable and lock house at Sharpness Docks. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **SEV1** – Sharpness Docks to Bull Rock. This area consists of a mixture of low-lying agricultural land, isolated farms and residences, infrastructure including a sewage treatment works and a depot near Newtown, and Nature Conservation sites.

  Short term, medium term and long term preferred policy – Hold the Line. The existing flood defences are expected to fail in the next 20-50 years. If this was allowed, a large flood cell would develop and would threaten Berkeley and Berkeley Power Station. To prevent this, existing defences will be reconstructed and enhanced. Where no current defences exist, further assessment will be necessary on the future requirement of defences as sea level rises. In the long term maintenance of new and existing defences will continue.

  Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Areas of medieval ridge and furrow, post-medieval land drainage and earlier phases of land reclamation and river bank defences would all be at risk from any flooding, as would Listed Buildings at Saniger

Farm and Oakhunger Farm. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **SEV2** – Bull Rock to the southern boundary of Berkeley Power Station. This area consists of a mixture of low-lying agricultural land, and the infrastructure and buildings associated with Berkeley nuclear power station.

  Short term, medium term and long term preferred policy – Hold the Line. Although the power station itself is situated on higher ground, the existing flood defences in this area are expected to fail in the next 20-50 years. To prevent flooding as sea level rises, existing defences will be reconstructed and enhanced. In the long term maintenance of new and existing defences will continue.

  Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Small areas of medieval ridge and furrow, post-medieval land drainage and earlier phases of river bank defences would all be at risk from any flooding, as would a Grade II Listed former summerhouse. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **SEV3** – The southern boundary of Berkeley Power Station to Oldbury Power Station. This area consists of a mixture of low-lying agricultural land, isolated farms and residences, and Nature Conservation sites.

  Short term, medium term and long term preferred policy – Hold the Line. Although the power station itself is situated on higher ground, the existing flood defences in this area are expected to fail in the next 20-50 years. To prevent flooding as sea level rises, existing defences will be reconstructed and enhanced. In the long term maintenance of new and existing defences will continue.

  Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). However, important prehistoric worked flint scatters, stone axes and peat deposits have been found at this locale. An extremely significant Romano-British port site at Hill Pill would also be badly affected by any increased erosion, flooding or 'coastal squeeze', or indeed by any new flood defence works. The Romano-British site includes the remains of stone buildings and substantial surviving archaeological deposits that have produced pottery and other artefacts, and evidence for iron working. It is already eroding out of the existing riverbank. Further Romano-British artefacts were discovered during groundwork at a pub in Shepperdine. Large areas of ridge and furrow, post-medieval land drainage and earlier phases of river bank defences would also all be at risk from any erosion or flooding, as would post-medieval or early modern fishing structures in the intertidal zone, and Listed Buildings at Shepperdine Farm, Dairy Farmhouse, Manor Farm, Jobsgreen Farm and Worthy Farm. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **SEV4** – Oldbury Power Station. This area consists of a mixture of low-lying agricultural land, and the infrastructure and buildings associated with the Oldbury on Severn nuclear power station.

Short term, medium term and long term preferred policy – Hold the Line. Although the power station itself is situated on higher ground, the existing flood defences in this area are expected to fail in the next 20-50 years. To prevent flooding as sea level rises, existing defences will be reconstructed and enhanced. Oldbury has been selected as a possible site for a new nuclear power station, to be constructed next to the decommissioned old facilities. In the long term maintenance of new and existing defences will continue.

Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). However, unpublished salvage excavations at the site of the silt lagoon at Oldbury Power Station revealed prehistoric features including ditches and structural remains, worked timbers and flint. Romano-British pottery, slag animal bone and other finds were found at the southern end of the tidal reservoir for the power station, whilst the intertidal zone there has a series of post-medieval or early modern fish traps, possibly of a unique form. All of these features would be affected by any increased erosion, and potentially by any future flood defence schemes or infrastructure work associated with a new power station. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **SEV5** – Oldbury Power Station to Littleton Warth. This area consists of a mixture of low-lying agricultural land, with some elevated areas such as Oldbury Camp and Cowhill Wood, an industrial estate with residential areas such as Oldbury on Severn and Cowhill, isolated farms and residences, and Nature Conservation sites.

  Short term, medium term and long term preferred policy – Hold the Line. The existing flood defences are expected to fail in the next 20-50 years. If this was allowed, a large flood cell would develop and would threaten Oldbury Power Station, Oldbury on Severn, Little upon Severn or even Thornbury. To prevent this, existing defences will be reconstructed and enhanced. Where no current defences exist, further assessment will be necessary on the future requirement of defences as sea level rises. In the long term maintenance of new and existing defences will continue.

  Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Any changes caused by increased flooding, erosion and/or the construction of new flood defences, however, could impact upon a series of extremely significant archaeological remains in this locale including prehistoric peat deposits and flint scatters, and nationally important human footprints and animal tracks of Neolithic date. Romano-British finds from Oldbury Pill include a stone shaft, flue tile fragments and tegulae, suggesting the presence of a villa or another form of high-status site. Romano-British pottery, other artefacts and evidence for iron working has also been found at Cowhill, Home Farm and Dayhouse Farm, and at Cowhill part of a minor Roman road has also been found. Medieval artefacts have been recovered from Home Farm, Dayhouse Farm and Nupdown Farm. The reclamation of this area may have occurred in the Romano-British or medieval periods, and other historical assets potentially at risk in this area include areas of ridge and furrow, post-medieval land drainage and earlier phases of river bank defences. In addition, post-medieval or early modern fishing structures are present in the intertidal zone, Oldbury Sands contains the remains of at least 17 known shipwrecks, and there is a Listed Building at Lower Farm. The hill at Oldbury on Severn also features the Scheduled Ancient Monument of an Iron Age Hillfort, whose landscape setting might also be at threat, and Listed Buildings in Thornbury itself could be at risk from any flooding. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **SEV6** – Littleton Warth to Aust Ferry. This area consists of a mixture of low-lying agricultural land, with some elevated areas behind a hard geology cliff, a geological SSSI. There is also the M48 Severn Bridge road crossing and associated services, a power line crossing with its pier and an electricity substation, residential areas such as Aust, isolated farms and residences, and Nature Conservation sites.

  Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology and higher ground will limit this, although the area will be monitored and erosion protection measures will be considered if necessary in the future if the M48 and other infrastructure is threatened.

  Due to the nature of the geology and the landscape, the SMP2 consultation document states that limited erosion and flood risk will not impact on the historic environment (Atkins Ltd 2009). Nevertheless, it would seem that any erosion, flooding and 'coastal squeeze' between Littleton Warth and the higher ground by the M48, and between the southern end of Aust Cliff and Old Passage, could still threaten a variety of archaeological and historical assets. Iron Age and Romano-British finds have been recovered from in and around Aust, including possible votive objects, and Aust was probably a Romano-British settlement or small port. There are remains of medieval ridge and furrow and post-medieval drainage and flood defences, Second World War structures, and Aust and Old Passage contain several Listed Buildings. The intertidal zone in this locale includes post-medieval or early modern fish traps and ship wrecks, and the remains of several piers and slipways, including the old ferry crossing at Old Passage. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **BRIS1** – Aust Ferry to New Passage. This area consists mostly of low-lying agricultural land, the A403, M4 and M48 roads and motorways, isolated farms and residences, and Nature Conservation sites.

  Short term, medium term and long term preferred policy – Hold the Line. Existing flood defences will be maintained for the long-term although there may be some erosion of the coastal salt marsh.

  Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Nevertheless, a Romano-British field system near Northwick, areas of ridge and furrow, post-medieval land drainage and earlier phases of river bank defences would all be at risk from any erosion, flooding and 'coastal squeeze', as would Listed Buildings at Northwick. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **BRIS2** – New Passage to northern extent of Severnside Works. This area consists of low-lying agricultural land and industrial areas, the A403, M4, M48 and M49 roads and motorways, the Second Severn crossing road bridge, the Severn Tunnel railway and associated infrastructure, residential areas such as Severn Beach, Redwick and Pilning, isolated farms and residences, and Nature Conservation sites.

  Short term, medium term and long term preferred policy – Hold the Line. Existing flood defences will be maintained for the long-term although there may be some

erosion of the coastal salt marsh. The existing flood defences are expected to fail in the next 20-50 years, but will be reconstructed and enhanced.

Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Any increased flooding, erosion and/or the construction of new flood defences, however, could impact upon prehistoric peat and alluvium deposits, important Iron Age inhabitation sites at Hallen, a Romano-British field system at Crook's Marsh, areas of ridge and furrow, post-medieval land drainage and river bank defences. The intertidal zone in this area contains prehistoric peat deposits, submerged forest and post-medieval or early modern fish traps. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **BRIS3** – The northern extent of Severnside Works to Avonmouth Pier. Much of this Policy Unit lies outside the Severn Estuary RCZAS, as it falls within the area covered by the Environmental Impact Assessment for the proposed Bristol Deep Sea Container Terminal (Maritime Archaeology 2007; see section 14.5 below). Nevertheless, there is a narrow strip approximately 1.5km wide between the north-west to south-east railway and the fuel depot and the A403, and extending to the south-east where the railway line crosses the M49 and M5, which is within the Severn Estuary RCZAS area, along with a narrow strip by Shirehampton and the east bank of the River Avon. This area consists mostly of low-lying industrial areas and infrastructure such as the M49 and M5.

  Short term, medium term and long term preferred policy – Hold the Line. Existing flood defences will be maintained for the long-term although there may be some erosion of the coastal salt marsh. The existing flood defences are expected to fail in the next 20-50 years, but existing defences will be reconstructed and enhanced.

  Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Any changes caused by increased flooding, erosion, 'coastal squeeze' and/or the construction of new flood defences, however, could impact upon prehistoric peat and alluvium deposits, prehistoric occupation deposits, areas of ridge and furrow, post-medieval land drainage and phases of river bank defences, and Second World war features. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **BRIS6** – Avon Road (Easton-in-Gordano) to Portishead Pier. This area consists of low-lying salt marsh, dock-related industry and infrastructure at the Royal Portbury Docks, electricity power lines and infrastructure, the M5 motorway, residential areas at Pill, Lodway and Easton-in-Gordano, and Nature Conservation sites.

  Short term, medium term and long term preferred policy – Hold the Line. Existing flood defences will be maintained for the long-term although there may be some erosion of the coastal salt marsh. Existing flood defences will be reconstructed and maintained.

  Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Little archaeological work has been undertaken in the Portishead dockland and intertidal areas, but any changes caused by increased flooding, erosion and/or the construction of new flood defences, however, could impact upon known early modern pier structures and Second World War features.

There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **PORT1** – Portishead Pier to Battery Point swimming pool. This area consists of hard geology cliffs and a wave-cut platform, with residential and industrial areas on the steep slopes above, and the East Wood Nature Conservation site.

  Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology and higher ground will limit this, although the area will be monitored and erosion protection measures will be considered if necessary in the future.

  Due to the nature of the geology and the landscape, the SMP2 consultation document states that limited erosion and flood risk will not impact on the historic environment (Atkins Ltd 2009). Little archaeological work has been undertaken in this area, but any changes caused by increased flooding, erosion and 'coastal squeeze' could impact upon the early modern pier structure itself and nearby slipways, the early modern lighthouse, post-medieval to Second World War structures and fortifications and several other Listed Buildings. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **PORT2** – Battery Point swimming pool to southern extent of Esplanade Road. This area consists of low-lying, rocky shoreline and salt marsh, a boating lake and residential areas, and Nature Conservation sites.

  Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology will limit this, although the area will be monitored and erosion protection measures will be considered if necessary in the future.

  Due to the nature of the geology and the landscape, the SMP2 consultation document states that limited erosion and flood risk will not impact on the historic environment (Atkins Ltd 2009). Little archaeological work has been undertaken in the intertidal and foreshore areas of Woodhill Bay and these may have to be targeted in Phase 2 fieldwork, but there will also need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **PORT3** – Southern extent of Esplanade Road to Ladye Point. This area consists of some low-lying salt marsh but is mostly hard cliff geology with sloping agricultural land, residential areas, a golf course and Nature Conservation sites.

  Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology will limit this, although the area will be monitored and erosion protection measures will be considered if necessary in the future.

  Due to the nature of the geology and the landscape, the SMP2 consultation document states that limited erosion and flood risk will not impact on the historic

environment (Atkins Ltd 2009). Little archaeological work has been undertaken in the intertidal and foreshore areas of Kilkenny Bay, Sugar Loaf Beach, Black Nore, Hang Rock, Redcliff Bay, Charlcombe Bay, Walton Bay, Pigeon House Bay, Margaret's Bay and Backhill Sands, and these may have to be targeted in Phase 2 fieldwork. Scheduled Ancient Monuments such as the Bronze Age barrow, Iron Age 'banjo' enclosure and associated prehistoric field system earthworks at Walton Common, Welton Castle and medieval ridge and furrow at Walton Down may all be at risk from greater degrees of runoff and slope erosion. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **PORT4** – Ladye Point to Old Church Road. This area consists of hard cliff geology with wave-cut platform and low-lying rocky shoreline, residential areas, recreation grounds and Nature Conservation sites.

  Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology will limit this, although the area will be monitored and erosion protection measures will be considered if necessary in the future.

  Due to the nature of the geology and the landscape, the SMP2 consultation document states that limited erosion and flood risk will not impact on the historic environment (Atkins Ltd 2009). Little archaeological work has been undertaken in the area, and this may have to be targeted in Phase 2 fieldwork. Nevertheless, any changes caused by increased flooding, erosion and 'coastal squeeze' could impact upon the univallate hillfort and early modern fort at Wain's Hill and medieval pillow mounds, the earthworks and Listed Building on Church Hill, and the early modern pier and many Listed Buildings in Clevedon itself. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **KIN1** – Old Church Road to St Thomas' Head. This area consists mostly of low-lying salt marsh and agricultural grazing land, with some isolated farms and residences, infrastructure such as the M5 motorway and sewage works, and Nature Conservation sites.

  Short term, medium term and long term preferred policy – Managed Realignment. The existing defences are expected to fail within the next 20-50 years, resulting in frequent, extensive flooding. The long term plan in this area is, subject to further studies, to encourage the natural development of the estuary as salt marsh and wetlands, whilst reducing the impacts of flooding to people, property and infrastructure. There would thus be opportunities for habitat creation, and managed realignment would most likely involve the construction of set back defences or other actions to regulate tidal exchange. The precise location and type of defence would be determined by more detailed studies.

  The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Any expansion of wetlands, increased flooding, erosion and/or the construction of new flood defences, however, could impact upon important prehistoric peat and alluvium deposits in the Gordano valley, prehistoric flint scatters south of Blackstone Rocks, and medieval and post-medieval land drainage and flood defences along the Severn shoreline and the banks of the River Banwell, some associated with the medieval Woodspring Priory (see KIN2 below). The intertidal

zone in this area contains post-medieval or early modern fish traps, wooden structures of unknown date and function, and piers and target wrecks associated with the firing range at Langford Grounds off Kingston Seymour. There is also a Listed Building at Dowlais Farm. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **KIN2** – St. Thomas' Head to Middle Hope car park, Sand Point. This area consists of hard cliff geology with sloping agricultural grazing and open heathland, isolated residences and a Nature Conservation site (the Middle Hope SSSI).

  Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology will limit this, although the area will be monitored and erosion protection measures will be considered if necessary in the future.

  Due to the nature of the geology and the landscape, the SMP2 consultation document states that limited erosion and flood risk will not impact on the historic environment (Atkins Ltd 2009). Nevertheless, the Scheduled Ancient Monuments in the area include Bronze Age barrows, a later prehistoric field system, a medieval motte and bailey castle and the remains of the medieval Woodspring Augustinian Priory. These extremely important heritage sites may all be at risk from greater degrees of surface runoff, and slope and cliff erosion. There will need to be an archaeological assessment of the impact of foreshore and cliff erosion and 'coastal squeeze' as part of any future management plans.

- **KIN3** – Middle Hope car park, Sand Point to southern extent of Beach Road. This area consists mostly of low-lying salt marsh and sand dunes, agricultural grazing land, isolated farms and residences, holiday and caravan parks, the residential areas of Kewstoke, Norton and Worlebury, and a Nature Conservation site.

  Short term, medium term and long term preferred policy – Hold the Line. The existing sand dune defences may be breached in the next 20-50 years. To avoid this, the sand dunes will continue to be managed to provide flood protection, but as sea level rise increases, there will be some realignment in the area to the north of the Policy Unit as erosion increases.

  The SMP2 consultation document records little threat to historical assets (Atkins Ltd 2009). Any increased flooding, erosion and/or the construction of new flood defences, however, would impact upon post-medieval or early modern fish traps in the intertidal zone, which has not been extensively surveyed. Listed Buildings on the northern edge of Worlebury might also be at risk. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion and 'coastal squeeze' as part of any future management plans.

- **KIN4** – Southern extent of Beach Road to Birnbeck Island, Anchor Head, Weston-super-Mare. This area consists mostly of hard rock headland cliffs, and steeply sloping, open ground with some residential areas, infrastructure such as a water tower and reservoir, a pier and an IRB Lifeboat station, and Nature Conservation sites.

Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology will limit this, although the area will be monitored and erosion protection measures will be considered if necessary in the future.

Due to the nature of the geology and the landscape, the SMP2 consultation document states that limited erosion and flood risk will not impact on the historic environment (Atkins Ltd 2009). Nevertheless, the Scheduled Ancient Monument of Worlebury Camp, a multivallate Iron Age hillfort, may be at risk from greater degrees of runoff, and slope and cliff erosion. Any increased flooding or erosion could, however, impact upon Listed Buildings including the pier and lifeboat station at Birnbeck Island, and in the northern part of Weston-super-Mare. There will need to be an archaeological assessment of the impact of foreshore and headland erosion as part of any future management plans.

- **HOL2** – The island of Steep Holm. This area consists of hard rock steep cliffs, with open heathland above, including Nature Conservation sites, and abandoned military installations.

  Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology will limit this, although the area will be monitored and erosion protection measures will be considered if necessary in the future.

  Due to the nature of the geology and the landscape, the SMP2 consultation document states that limited erosion and flood risk will not impact on the historic environment (Atkins Ltd 2009). Nevertheless, Scheduled Ancient Monuments including a medieval priory, a possible medieval field system and early modern and Second World War defence installations may be at risk from greater degrees of runoff, and slope and cliff erosion. These may all be at risk from greater degrees of surface runoff, and slope and cliff erosion. There will need to be an archaeological assessment of the impact of foreshore and cliff erosion as part of any future management plans.

14.4 The North Devon and Somerset Shoreline Management Plan 2 (NDAS)

14.4.1 In the North Devon and Somerset SMP, the SMP area extends from Hartland Point to Anchor Head, Weston-super-Mare. There are 32 separate Policy Units (PUs) that fall within the area of the Severn Estuary RCZAS – PUs 7d145-7d39, 7d42-7d46, and 7e01-7e06 (Halcrow Group Ltd 2009: 4-5, fig. 1, overview maps 2 of 3, 3 of 3). PUs 7d40 and 7d41 lie outside of the RCZAS study area, as they are more than 1km south of Dunball, the southernmost limit of the RCZAS along the River Parrett.

14.4.2 These 32 Policy Units (PUs) are shown in Figures 9-13, and their physical characteristics and proposed future management policies (Halcrow Ltd 2009) are summarised as follows:

- **7e06** – Birnbeck Island, Anchor Head, Weston-super-Mare to the Club House, Weston-super-Mare. This area consists of some hard rock headland cliffs, but mostly low-lying residential areas with sea front, a pier and infrastructure.

Short term, medium term and long term preferred policy – Hold the Line. The existing beach and sea front seawall defences (themselves rebuilt and strengthened after the floods of 1981) will continue to be maintained in the short and medium term. Although the rate of erosion will accelerate in the future as a result of sea level changes, the area will be monitored and additional erosion protection measures will be considered if necessary in the future. This may include beach recharge and the construction of additional shoreline control structures such as groynes.

Due to this policy of hold the line the SMP2 consultation document records little threat to historical assets (Halcrow Group Ltd 2009: Appendix I), although it notes that Listed Buildings in Weston-super-Mare will be protected as a result. Little archaeological work has been undertaken in the area, and this may have to be targeted in Phase 2 fieldwork. Any increased flooding, erosion or 'coastal squeeze' could, however, impact upon known ship wrecks and any unknown wooden structures surviving in Weston Bay, and the remains of Second World War structures at Knightstone and the early modern Grand Pier would also be vulnerable to erosion, or might be affected by the construction of any new flood or beach defences. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion, and 'coastal squeeze', as part of any future management plans.

- **7e05** – The Club House, Weston-super-Mare to Links Road, Uphill. This area consists mostly of low-lying coastal dunes, residential areas, a golf course, infrastructure further inland such as the A38 road and M5 motorway, and the Uphill SSSI Nature Conservation site.

  Short term, medium term and long term preferred policy – No Active Intervention. Natural coastal evolution will be permitted, but with continued monitoring of the sands dunes. In the long term, if the dunes are at risk from being eroded and breached, then a secondary defence embankment will be constructed as part of managed realignment.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) notes that Listed Buildings in Uphill will remain protected. Little archaeological work has been undertaken in the area, and this may have to be targeted in Phase 2 fieldwork. Any increased flooding, erosion or 'coastal squeeze' could, however, impact upon the remains of Second World War structures, or these might be affected by the construction of any future flood defences. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion, and 'coastal squeeze', as part of any future management plans.

- **7e04** – Links Road, Uphill to River Axe estuary mouth. This area consists mostly of low-lying coastal dunes, salt marsh and agricultural land, with some isolated farms and residences, infrastructure, and the Walborough SSSI Nature Conservation site.

  Short term preferred policy – Hold the Line. Medium term preferred policy – Managed Realignment. Long term preferred policy – Hold the Line. Short term hold the line will allow time for studies to investigate options for managed realignment and the maintenance or rebuilding of flood defences, which will then be maintained in the long term. There will be habitat creation through an expansion of salt marsh and/or intertidal areas.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) notes that Listed Buildings in Uphill will remain protected. Little archaeological work has been undertaken in the area, and this may have to be targeted in Phase 2 fieldwork. Any

increased flooding, erosion or 'coastal squeeze' could, however, impact upon the remains of Second World War features, or these might be affected by the construction of any future flood defences. The Scheduled Ancient Monument of Walbrough Bronze Age round barrow and a probable later prehistoric or Romano-British enclosure at Uphill Farm may be at risk from greater degrees of surface runoff and slope erosion. There will need to be an archaeological assessment of the impact of intertidal, foreshore and slope erosion, and 'coastal squeeze', as part of any future management plans.

- **7e03** – River Axe river mouth southwards along east bank southwards to just north of Diamond Farm. This area consists mostly of low-lying salt marsh and agricultural land, with infrastructure such as a marina and further inland such as the A38 road, M5 motorway and a railway line, and Nature Conservation sites.

  Short term preferred policy – Hold the Line. Medium term preferred policy – Managed Realignment. Long term preferred policy – Hold the Line. Short term hold the line will allow time for studies to investigate options for managed realignment and the maintenance or rebuilding of flood defences, which will then be maintained in the long term. There will be habitat creation through an expansion of salt marsh and/or intertidal areas.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records little threat to historical assets. Little archaeological work has been undertaken in the area though, and this may have to be targeted in Phase 2 fieldwork. Any increased flooding, erosion or 'coastal squeeze' could, however, impact upon areas of medieval ridge and furrow, post-medieval drainage, reclamation and early phases of flood defences, several examples of stack stands or refuge mounds on Bleadon Level, and remains of artificial oyster beds or brine pits. There will need to be an archaeological assessment of the impact of intertidal, foreshore and slope erosion, and 'coastal squeeze', as part of any future management plans.

- **7e02** – Just north of Diamond Farm northwards along the west bank of the River Axe to the river mouth and Brean Down Farm. This area consists mostly of low-lying salt marsh and agricultural land, with some isolated farms and residences, infrastructure, and Nature Conservation sites.

  Short term preferred policy – Hold the Line. Medium term preferred policy – Hold the Line. Long term preferred policy – Hold the Line, or, No Active Intervention. A short term hold the line policy could cause 'coastal squeeze' and loss of intertidal areas, but in the longer term, if this looked likely then a shift in policy to no active intervention could occur. There would then be habitat creation through an expansion of salt marsh and/or intertidal areas, but a concomitant significant loss of agricultural land. In the very long term future (*c*. 100 years+), the River Axe might even be allowed to alter its course significantly to discharge *south* of Brean Down.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records little threat to historical assets. Little archaeological work has been undertaken in the area though, and this may have to be targeted in Phase 2 fieldwork. Any increased flooding, erosion or 'coastal squeeze' could, however, impact upon areas of medieval ridge and furrow, post-medieval drainage, reclamation and early phases of flood defences, and several examples of stack stands or refuge mounds. A ditched enclosure south-east of Brean Farm could also be threatened, especially by any long term realignment of the River Axe, which would also threaten peat deposits and features in Bridgwater Bay on Berrow Flats. There will need to be an archaeological

assessment of the impact of intertidal and foreshore erosion, 'coastal squeeze' and river realignment as part of any future management plans.

- **7e01** – Brean Down Farm to Howe Rock. This area consists mostly of hard rock headland cliffs with a wave-cut platform and rocky foreshore, open heathland uplands, and the Brean Down SSSI Nature Conservation site.

  Short term, medium term and long term preferred policy – No Active Intervention. Natural coastal evolution will be permitted.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Any increased erosion could, however, impact upon nationally important archaeological remains including Bronze Age round barrows, a later prehistoric field system, and a known ship wreck site off Fiddler's Point. The upland remains may also be at risk from greater degrees of surface runoff and slope erosion. There will need to be an archaeological assessment of the impact of intertidal, foreshore and slope erosion, as part of any future management plans.

- **7d46** – Howe Rock to Brean Down Bird Garden. This area consists mostly of hard rock headland cliffs with a wave-cut platform, some sand dunes on the southern side, open heathland uplands, and the Brean Down SSSI Nature Conservation site.

  Short term, medium term and long term preferred policy – No Active Intervention. Natural coastal evolution will be permitted.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Any increased erosion could, however, impact upon nationally important archaeological remains including Bronze Age round barrows and settlement remains, prehistoric burials, a later prehistoric field system, an Iron Age hillfort and Romano-Celtic temple, early modern and Second World War fortifications, and a known ship wreck site. The upland remains may also be at risk from greater degrees of surface runoff and slope erosion, and prehistoric peat deposits and post-medieval and early modern fish trap structures in the intertidal zone off Black Point would be extremely vulnerable to any increased erosion, as would the prehistoric features eroding out of the sand cliff on the southern side of Brean Down. Any long term realignment of the River Axe so that it discharges south of Brean Down would also have serious archaeological implications. There will need to be an archaeological assessment of the impact of intertidal, foreshore and slope erosion, and river realignment, as part of any future management plans.

- **7d45** – Brean Down Bird Garden to the northern extent of Brean. This area consists mostly of sand dunes, low-lying agricultural land, isolated farms and residences, and a caravan park.

  Short term preferred policy – Hold the Line. Medium term preferred policy – Hold the Line. Long term preferred policy – Hold the Line, or, No Active Intervention. In the long term, rising sea levels would mean that a hold the line policy would require the replacement and enlargement of the existing coastal defences, and this may not be economically viable (Halcrow Group Ltd 2009: App. I). In the very long term future (*c*. 100 years+), the River Axe might even be allowed to alter its course significantly to discharge *south* of Brean Down, and this would also mean a significant loss of agricultural land, and would threaten access to Brean Down. The constriction of

setback defences north of Brean itself may be required to minimise the flood risk to this settlement, but also to the wider Somerset Levels and Moors.

The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Little archaeological work has been undertaken in the area though, and this locale may have to be targeted in Phase 2 fieldwork. Any increased erosion could, however, impact upon prehistoric peat deposits and faunal remains in the intertidal zone on Berrow Flats, as well as medieval, post-medieval and early modern fish trap structures. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion, and river realignment, as part of any future management plans.

- **7d44** – The northern extent of Brean to northern extent of Berrow. This area consists mostly of sand dunes, low-lying agricultural land, farms and residential areas, camping, caravan and leisure parks, and Nature Conservation sites.

  Short term preferred policy – Hold the Line. Medium term preferred policy – Managed Realignment. Long term preferred policy – Managed Realignment. Short term hold the line will allow time for studies to investigate options for managed realignment and the building of a new line of set-back flood defences, which will then be maintained in the long term. There will be habitat creation through an expansion of intertidal areas and sand dunes, but a concomitant loss of agricultural land and residential and leisure areas.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) notes that Listed Buildings in Brean will remain protected. Little archaeological work has been undertaken in the intertidal zone, and this may have to be targeted in Phase 2 fieldwork. Any increased flooding, erosion or 'coastal squeeze' up against new hard defences could impact upon the remains of medieval ridge and furrow, post-medieval drainage features, Second World War structures and Listed Buildings, and/or these might be affected by the construction of any future set-back flood defences. Increased erosion and 'coastal squeeze' could also severely impact upon important prehistoric peat deposits and faunal remains in the intertidal zone on Berrow Flats, as well as medieval, post-medieval and early modern fish trap structures, and early modern ship wrecks. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion, and 'coastal squeeze', as part of any future management plans.

- **7d43** – The northern extent of Berrow to the mouth of the River Brue. This area consists of sand dunes, low-lying agricultural land, residential areas, caravan and leisure parks, infrastructure including an electricity substation, a pier, the BARB Lifeboat and hovercraft station, and Nature Conservation sites including Stert Island.

  Short term preferred policy – Hold the Line. Medium term preferred policy – Hold the Line. Long term preferred policy – Hold the Line. The existing beach and sea front seawall defences (themselves rebuilt and strengthened after the floods of 1981) will continue to be maintained in the short and medium term. The rate of erosion will accelerate in the future as a result of sea level changes, and the frontal dunes at Berrow may experience overtopping and breaching as a result. There may also be 'coastal squeeze'. The area will be monitored and additional erosion protection measures will be considered if necessary in the future, in order to protect Berrow, Burnham-on-Sea and Highbridge. This work may include dune management at Berrow. The course of the River Parrett may change.

The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) notes that Conservation Areas (and Listed Buildings) in Berrow, Burnham-on-Sea and Highbridge will remain protected. Little archaeological work has been undertaken in the intertidal zone, and this may have to be targeted in Phase 2 fieldwork. Increased erosion and 'coastal squeeze' could severely impact upon important prehistoric peat deposits in the intertidal zone off Burnham-on-Sea, as well as medieval, post-medieval and early modern fish trap structures, and ship wrecks. Any changes to the mouth of the rivers Parrett and Brue and the course of the Gutterway could also affect intertidal archaeological features. Areas of medieval ridge and furrow, early phases of flood defences, the remains of Second World War structures and Listed Buildings in Berrow and Burnham-on-Sea could also be threatened by any erosion, flooding or the construction of new coastal defences. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion, 'coastal squeeze' and possible long-term river realignments as part of any future management plans.

- **7d42** – The mouth of the River Brue southwards along the east bank of the River Parrett to Dunball. This area consists of low-lying salt marsh and agricultural salt grazing land, isolated farms and residences, residential areas including Stretcholt, Pawlett, Walpole and Dunball, industrial areas, a landfill site, infrastructure including a sewage works, power lines and the M5 motorway, and Nature Conservation sites.

  Short term preferred policy – Hold the Line. Medium term preferred policy – Managed Realignment. Long term preferred policy – Managed Realignment. Short term hold the line will allow time for studies to investigate options for managed realignment and the building of a new line of set-back flood defences, including the construction of a surge barrier to protect Bridgwater. These new defences would then be maintained in the long term. There would be habitat creation through an expansion of salt marsh and/or intertidal areas, but also a significant loss of agricultural land, especially on Pawlett Hams and Huntspill Levels.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Little archaeological work has been undertaken in the area though, and this locale may have to be targeted in Phase 2 fieldwork. Increased erosion, flooding and 'coastal squeeze' could severely impact upon important medieval, post-medieval and early modern fish trap structures, and several known ship wrecks in the intertidal zone and along the banks of the River Parrett. Any changes to the mouth of the Parrett could also severely affect intertidal archaeological features. Areas of possible late prehistoric or Romano-British salt production, the remains of a possible Roman road, a Scheduled medieval motte and bailey castle at Walpole, medieval ridge and furrow, post-medieval drainage features and river bank revetments, early phases of flood defence banks, stack stands or refuge mounds, artificial oyster beds, the remains of Second World War structures and Listed Buildings at Dodd's Farm, Pawlett and Huntspill could also be threatened by any erosion or flooding. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion, 'coastal squeeze' and possible long-term river realignment as part of any future management plans.

- **7d39** – Bridgwater northwards along the west bank of the River Parrett to the southern edge of Combwich. Part of this Policy Unit (south of Dunball) lies outside of the RCZAS study area. This area consists of low-lying salt marsh and agricultural salt grazing land, isolated farms and residences, residential areas including Rodway and Combwich, and Nature Conservation sites.

Short term preferred policy – Hold the Line. Medium term preferred policy – Hold the Line. Long term preferred policy – Managed Realignment. In the short term, hold the line will allow time for existing defences to be enlarged and rebuilt, and will also include the construction of a surge barrier to protect Bridgwater. In the long term, these defences will have to be rebuilt in a setback position, and can then be maintained. There would be habitat creation through an expansion of salt marsh and/or intertidal areas, but also a loss of agricultural land.

The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Little archaeological work has been undertaken in the area though, and it may have to be targeted in Phase 2 fieldwork. Increased erosion, flooding and 'coastal squeeze' could impact upon post-medieval and early modern fish trap structures and known ship wrecks in the intertidal zone and/or along the banks of the River Parrett. Any changes to the mouth of the Parrett could also affect intertidal archaeological features. Areas of possible late prehistoric or Romano-British occupation and salt production, medieval ridge and furrow, post-medieval drainage features and river bank revetments and early phases of flood defence banks could also be threatened by any erosion or flooding. There will need to be an archaeological assessment of the impact of river bank erosion, 'coastal squeeze' and possible long-term river realignment as part of any future management plans.

- **7d38** – The southern edge of Combwich to Riverside Farm, north of Combwich. This area consists of low-lying residential areas and agricultural land, and some infrastructure such as a water treatment plant and sluice gates.

  Short term, medium term and long term preferred policy – Hold the Line. The existing flood defences will be upgraded and maintained in the short to medium term, but may need to be rebuilt and improved in the long term.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) notes that Listed Buildings in Combwich will remain protected. There was probably an important Romano-British settlement and port at Combwich, although its exact extent is unknown, so any increase in erosion, flooding or the construction of new flood defences could impact upon such deposits, as well as early phases of river bank revetments and flood defence banks. The Listed Buildings in Combwich should, however, be protected under the hold the line policy. There will need to be an archaeological assessment of the impact of river bank erosion and flood defence construction as part of any future management plans.

- **7d37** – Riverside Farm, north of Combwich along the west bank of the River Parrett to Fenning Island, Stert Point. This area consists of low-lying salt marsh and agricultural land, isolated farms and residences, and some infrastructure (power lines).

  Short term preferred policy – Hold the Line. Medium term preferred policy – No Active Intervention. Long term preferred policy – No Active Intervention. Short term hold the line will allow time for studies to investigate options for no active intervention. Erosion and flooding will accelerate in the future as a result of sea level changes. Natural coastal evolution of the Steart peninsula will be permitted in the medium term (20-50 years), and this is likely to lead to the loss of Steart village and outlying farms, which will become uneconomic to defend. There will be habitat creation through an expansion of intertidal areas and salt marsh, but a concomitant loss of agricultural land, farms and residential areas. The existing power lines may be offered some

protection, but will probably need to be relocated in the long term. In the long term future (*c*. 100 years+), the River Parrett may alter its course significantly.

The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Little archaeological work has been undertaken in the area though, and it may have to be targeted in Phase 2 fieldwork. Increased erosion, flooding and river realignment could impact upon known ship wrecks along the banks of the River Parrett, along with areas of possible late prehistoric or Romano-British salt production, medieval ridge and furrow, a possible ditched enclosure, a known causeway or river crossing just north of Combwich, post-medieval drainage features, stack stands or refuge mounds, river bank revetments and early phases of flood defence banks. There will need to be an archaeological assessment of the impact of river bank erosion, flooding and possible long-term river realignment as part of any future management plans.

- **7d36** – Fenning Island, Stert Point to Manor Farm, Stert Point. This area consists of low-lying salt marsh and agricultural land, isolated farms and residences, some infrastructure (power lines), and Nature Conservation sites (Stert Point and Bridgwater Bay nature reserves).

  Short term preferred policy – Hold the Line. Medium term preferred policy – No Active Intervention. Long term preferred policy – No Active Intervention. Short term hold the line will allow time for studies to investigate options for no active intervention. Erosion and flooding will accelerate in the future as a result of sea level changes. Natural coastal evolution of the Steart Peninsula will be permitted in the medium term (20-50 years), and this is likely to lead to the loss of Steart village and outlying farms, which will become uneconomic to defend. There will be habitat creation through an expansion of intertidal areas and salt marsh, but a concomitant loss of agricultural land, farms and residential areas. The existing power lines may be offered some protection, but will probably need to be relocated in the long term. In the long term future (*c*. 100 years+), the River Parrett may alter its course significantly.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets, but the area may have to be targeted in Phase 2 fieldwork. Increased erosion, flooding and river realignment will impact upon nationally important groups of medieval, post-medieval and early modern fish weirs and other timber structures, post-medieval drainage features, early phases of sea defences, a wildfowling decoy pond, and some Second World War structures. There will need to be an archaeological assessment of the impact of erosion, flooding and possible long-term river realignment as part of any future management plans.

- **7d35** – Manor Farm, Stert Point to Wall Common car park, Steart Peninsula. This area consists of low-lying salt marsh and agricultural land, Steart village and outlying farms and residences, some infrastructure (power lines), and a Nature Conservation site (Wall Common).

  Short term preferred policy – Hold the Line. Medium term preferred policy – No Active Intervention. Long term preferred policy – No Active Intervention. Short term hold the line will allow time for studies to investigate options for no active intervention. Erosion and flooding will accelerate in the future as a result of sea level changes. Natural coastal evolution of the Steart Peninsula will be permitted in the medium term (20-50 years), and this is likely to lead to the loss of Steart village and outlying farms, which will become uneconomic to defend. There will be habitat creation through an expansion of intertidal areas and salt marsh, but a concomitant loss of agricultural

land, farms and residential areas. The existing power lines may be offered some protection, but will probably need to be relocated in the long term. In the long term future (*c*. 100 years+), the River Parrett may alter its course significantly, possibly cutting through the Steart Peninsula.

The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Increased erosion, flooding and river realignment will, however, impact upon the remains of the possible Deserted Medieval Village site south of modern Steart village, medieval ridge and furrow, nationally important groups of medieval, post-medieval and early modern fish weirs and other timber structures, post-medieval drainage features, artificial oyster beds, early phases of sea defence banks and groynes, and historic buildings in and around Steart village, including St Andrew's Church and a chapel. There will need to be an archaeological assessment of the impact of erosion, flooding and possible long-term river realignment as part of any future management plans.

- **7d34** – Wall Common car park, Steart Peninsula to Stolford Farm. This area consists of low-lying shingle/gravel ridges, sand dunes, salt marsh and agricultural grazing land, isolated farms and residences, and Nature Conservation sites.

  Short term preferred policy – Managed Realignment. Medium term preferred policy – Hold the Line. Long term preferred policy – Hold the Line, or, No Active Intervention. Erosion and flooding will accelerate in the future as a result of sea level changes. In the short term (0-20 years), the existing sea defences which are in a poor condition will be rebuilt in a realigned setback position, and the previous defence line will then be deliberately breached. There will then be habitat creation through a proposed expansion of intertidal areas and salt marsh (Hamel and Bryant 2008), but a concomitant loss of agricultural land. It is possible that the policy of No Active Intervention on the Steart Peninsula further east may mean that in the long term even the realigned Stolford to Wall Common defences become technically and economically difficult to sustain, and guided by further studies there may then be a move to no active intervention in this area too.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Increased erosion and flooding could, however, impact upon important prehistoric submerged forest and peat deposits in Stolford Bay, prehistoric flint scatters, and nationally important groups of medieval, post-medieval and early modern fish weirs and other timber structures. In addition, medieval ridge and furrow, possible Deserted Medieval Village earthworks east of Whitewick Farm, post-medieval drainage features, windmill mounds, early phases of sea defence banks and groynes, and Second World War structures could also all be affected by any increased erosion or flooding inland, or by groundwork associated with the creation of ecological habitation. Historic and Listed Buildings in Stockland Bristol, Chalcott Farm and Otterhampton might also be at risk from future flooding. The archaeological assessment of the impact of proposed ecological habitation creation (Hamel and Bryant 2008) has outlined the considerable historic and archaeological potential of this area. Any proposed erosion, flooding or groundwork in the area may require further archaeological evaluation and mitigation.

- **7d33** – Stolford Farm to Great Arch. This area consists of low-lying shingle/gravel ridges, salt marsh and agricultural grazing land, farms and residences, and part of the village of Stolford.

Short term preferred policy – Hold the Line. Medium term preferred policy – Managed Realignment. Long term preferred policy – Hold the Line. Erosion and flooding will accelerate in the future as a result of sea level changes, and the existing sea defences will be maintained in the short term, but in the medium term (20-50 years) these will be rebuilt in a realigned setback position, and this new defence line will then be maintained.

The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) notes that Listed Buildings at Stolford Farm will remain protected, but this ignores additional historic and Listed Buildings in Stolford village itself, including a medieval chapel and an early modern Primitive Methodist chapel. Increased erosion, flooding and 'coastal squeeze' could also impact upon important prehistoric submerged forest and peat deposits in Stolford Bay, nationally important groups of medieval, post-medieval and early modern fish weirs, medieval ridge and furrow, post-medieval drainage features, and early phases of sea defence banks and groynes. The archaeological assessment of the impact of proposed ecological habitation creation (Hamel and Bryant 2008) has outlined the considerable historic and archaeological potential of this area. There will need to be an archaeological assessment of erosion, flooding and flood defence construction as part of any future management plans.

- **7d32** – Great Arch to Hinkley Point. This area consists of low-lying shingle/gravel ridges and agricultural grazing land, rocky foreshore, isolated farms and residences, and part of the village of Stolford.

  Short term preferred policy – Hold the Line. Medium term preferred policy – Managed Realignment. Long term preferred policy – Hold the Line. Erosion and flooding will accelerate in the future as a result of sea level changes, and the existing sea defences will be maintained in the short term, but in the medium term (20-50 years) these will be rebuilt in a realigned setback position, and this new defence line will then be maintained.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Increased erosion and flooding could, however, impact upon important prehistoric submerged forest and peat deposits in Stolford Bay, a probable Romano-British settlement north of Idson Farm, nationally important groups of medieval, post-medieval and early modern fish weirs, medieval ridge and furrow, post-medieval drainage features, early phases of sea defence banks and groynes, and historic and Listed Buildings in Stolford village and at Little Dowden's Farm. The archaeological assessment of the impact of proposed ecological habitation creation (Hamel and Bryant 2008) has outlined the considerable historic and archaeological potential of part of this area. Any proposed erosion, flooding or groundwork in the area may require further archaeological evaluation and mitigation.

- **7d31** – Hinkley Point to north of Knighton. This area consists of low-lying shingle/gravel ridges and agricultural grazing land, low cliffs and rocky foreshore, isolated farms and residences, and infrastructure including Hinkley Point nuclear power station, power lines and sewage works.

  Short term, medium term and long term preferred policy – Hold the Line. The existing flood defences will be upgraded and maintained in the short to medium term, but may need to be rebuilt and improved in the long term. The future expansion of the nuclear power station may mean that upgraded sea defences are also westwards.

The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) notes that the Scheduled Ancient Monument of Wick round barrow/Pixies' Mound will remain protected due to the hold the line policy. Increased erosion and flooding could, however, also impact upon a possible Romano-British settlement at Hinkley Point, medieval ridge and furrow, St Sidwell's Well, post-medieval water meadow and drainage features, early phases of sea defence banks and groynes, the remains of a lime kiln and a Second World War pillbox, and further inland, historic buildings in Wick and Shurton. There will need to be an archaeological assessment of erosion, flooding and flood defence construction as part of any future management plans. It is likely that the expansion of the Hinkley Point nuclear power station will require detailed Environmental Impact Assessments incorporating historical and archaeological information.

- **7d30** – North of Knighton to Lilstock harbour and Lilstock Farm. This area consists of coastal cliffs, wave-cut platforms and rocky foreshore, with a shingle ridge, sloping agricultural land and isolated farms, and small isolated wooded copses.

  Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology, wave-cut platform and shingle ridge will limit this. In the next 100 years, coastal erosion of 10-50m is predicted (Halcrow Group Ltd 2009: App. G), but any small bays along this section of coast will only be reinforcing the naturally indented nature of this coastline.

  Due to the nature of the geology and the landscape, the SMP2 consultation document indicates that limited erosion and flood risk will not impact on the historic environment (Halcrow Group Ltd 2009: App. I). Nevertheless, a deserted farm and field system north of Knighton may be at risk from increased runoff and/or slope erosion, along with catch-water meadow systems, a possible windmill mound and a Listed barn building. More importantly, along the current coastline the post-medieval and early modern breakwater and harbour remains at Lilstock Harbour would be under serious threat from any future erosion and flooding, along with the remains of associated harbour structures, buildings and lime kilns, and later Second World War structures. Another early modern wharf or quay north of Knighton would also be at risk. There will need to be an archaeological assessment of the impact of foreshore and cliff erosion and flooding as part of any future management plans.

- **7d29** – Lilstock Farm. This area consists of low coastal cliffs, wave-cut platforms and rocky foreshore, with a shingle ridge, sloping agricultural land and an isolated farm.

  Short term preferred policy – Hold the Line. Medium and long term preferred policy – No Active Intervention. Short term hold the line will allow time for studies to investigate options for no active intervention. Erosion and flooding will accelerate in the future as a result of sea level changes, but it is thought that the geology and topography will limit this.

  Due to the nature of the geology and the landscape, the SMP2 consultation document indicates that limited erosion and flood risk will not impact on the historic environment (Halcrow Group Ltd 2009: App. I). Nevertheless, catch-water meadow systems and field system features north of Lilstock Farm may be at risk from increased runoff and/or slope erosion, and on the existing coast a series of post-medieval or early modern fish weirs and a Second World War marker could be at risk from erosion. Any overbank flooding may threaten the valley floor water meadow systems immediately east of Lilstock Farm. There will need to be an archaeological

assessment of the impact of foreshore and cliff erosion and flooding as part of any future management plans.

- **7d28** – Lilstock Farm to St Audrie's Bay holiday village. This area consists mostly of coastal cliffs, wave-cut platforms and rocky foreshore, sloping agricultural land and isolated farms and residences, residential areas such as East Quantoxhead and Kilve, small isolated wooded copses, and Nature Conservation sites.

  Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology, wave-cut platform and shingle ridge will limit this. In the next 100 years, coastal erosion of 10-50m is predicted (Halcrow Group Ltd 2009: App. G), but it is proposed that any small bays along this section of coast will only be reinforcing the naturally indented nature of this coastline. There is a risk of localised flooding at Kilve Point.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Nevertheless, there are significant historical assets in this area including finds of Palaeolithic and Mesolithic flint tools from the cliffs and foreshore, several other flint scatters, Scheduled Bronze Age round barrows, catch-water meadow systems and field system features associated with the Shrunken Medieval Village north of Kilton that may be at risk from increased runoff and/or slope erosion. Other historical and archaeological features at East Quantoxhead include a medieval manor house, deserted farm, fish ponds and a churchyard cross, and nearby slopes preserve windmill mounds, the remains of other medieval field systems and lynchets, and the remains of a Second World War camp and firing range (Riley 2006: 88, 153). Any possible threat to the medieval St Andrew's Church at Lilstock and the medieval chantry chapel north of Kilve needs to be more carefully assessed. The latter in particular lies in a low-lying valley, and is associated with other Listed Buildings and historical remains including a medieval manor house and medieval tombs. On the existing coast a series of little studied post-medieval or early modern fish weirs in the intertidal zone north of Lilstock and East Quantoxhead, several lime kilns and Second World War structures could all be at serious risk from cliff erosion or flooding. Clearly, there will need to be a detailed archaeological assessment of the impact of foreshore, cliff and slope erosion and flooding as part of any future management plans.

- **7d27** – St Audrie's Bay holiday village to Doniford Holiday Park. This area consists mostly of coastal cliffs, wave-cut platforms and rocky foreshore, sloping agricultural land and isolated farms and residences, small isolated wooded copses, and a large camping and caravan park.

  Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology, wave-cut platform and shingle ridge will limit this. In the next 100 years, coastal erosion of 10-50m is predicted (Halcrow Group Ltd 2009: App. G), but it is proposed that any small bays along this section of coast will only be reinforcing the naturally indented nature of this coastline.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets, other than a potential for the St Audrie's Registered Historic Park and Garden to be flooded. Nevertheless, there are significant historical assets in this area including prehistoric peat deposits in St Audrie's Bay that have produced nationally important Pleistocene faunal remains, but which have not been

recorded or surveyed in detail, and an equally little studied but also potentially important group of medieval, post-medieval and early modern fish weirs in the intertidal zone. Medieval field system features, a windmill mound, lime kilns, an early modern slipway, Second World War remains (including the large camp the holiday village is built on) and several Listed Buildings at The Home Farm could all be at risk from future increased cliff erosion or flooding. There will need to be a detailed archaeological assessment of the impact of foreshore and slope erosion and flooding as part of any future management plans.

- **7d26** – Doniford Holiday Park to Doniford Beach Halt. This area consists mostly of low, soft mudstone and shale cliffs and rocky foreshore, low-lying agricultural land alongside The Swill, sloping agricultural land and isolated farms and residences, low-lying residential areas at Doniford itself, small isolated wooded copses, a large holiday park and static caravan site, and infrastructure such as Doniford Beach Halt railway station and the West Somerset Railway.

  Short term preferred policy – Hold the Line. Medium and long term preferred policy – No Active Intervention. Short term hold the line of the rock revetment in front of the holiday park will allow time for studies to investigate options for no active intervention. Erosion and flooding will accelerate in the future as a result of sea level changes, and in the medium to long term coastal erosion of at least 10-50m is predicted (Halcrow Group Ltd 2009: App. G). Given the soft nature of the geology, however, it is possible that a larger embayment might form.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. On exposed slopes, however, a cropmark enclosure on Rydon Hill might be vulnerable to future erosion, whilst finds of Palaeolithic artefacts and faunal remains have come from the cliffs and Doniford river gravels (Norman 1978; Riley 2006: 16). In the low-lying valley of The Swill, prehistoric flint and pottery scatters, a lime kiln, the remains of a Second World War camp and historic and Listed Buildings and a Scheduled wayside cross in Doniford would all potentially be at risk from increased erosion and flooding. There will need to be an archaeological assessment of the impact of foreshore, slope and cliff erosion and flooding as part of any future management plans.

- **7d25** – Doniford Beach Halt to the western edge of Watchet. This area consists mostly of low, soft mudstone and shale cliffs at Helwell Bay and rocky foreshore, with harder cliffs west of Watchet, sloping agricultural land, residential areas at Watchet and St Decumans, and infrastructure such as the B3190 road, Watchet Harbour and the West Somerset Railway.

  Short term, medium term and long term preferred policy – Hold the Line. Existing flood defences will be upgraded and maintained in the short to medium term, but may need to be rebuilt and improved in the long term to prevent outflanking, especially on the eastern part of the area at Helwell Bay where the cliffs are eroding more rapidly.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets, presumably because of the hold the line policy. Nevertheless, finds of Palaeolithic artefacts and faunal remains have come from the cliffs and harbour (Riley 2006: 16), and any increased erosion or flooding could threaten the low-lying areas of historic Watchet. In addition to being an Anglo-Saxon port and coin mint (Riley 2006: 82), the town also, this town also contains a number of historic and Listed Buildings, along with lime kilns, the lighthouse and other structures and buildings associated with the harbour, and Second World War

structures, several of which are already in grave danger from cliff erosion. There will need to be an archaeological assessment of the impact of foreshore and cliff erosion and flooding as part of any future management plans.

- **7d24** – The western edge of Watchet to Gray Rock, Blue Anchor Bay. This area consists mostly of cliffs and rocky foreshore, sloping agricultural land, residential areas at St Decumans, isolated farms and residences, wooded copses, a camping and caravan site, and infrastructure such as the B3191 road.

  Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology, wave-cut platform and shingle ridge will limit this. In the next 100 years, coastal erosion of 10-50m is predicted (Halcrow Group Ltd 2009: App. G), but it is proposed that any small bays along this section of coast will only be reinforcing the naturally indented nature of this coastline.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Although the intertidal zone in this area has not been subject to much study, other historical assets potentially at risk from future flooding or cliff and/or slope erosion include prehistoric flint scatters, cropmark enclosures north-east of Robinson's Copse, the remains of St Mary's Chapel north of Cridland's Copse, lime kilns, the Scheduled Ancient Monument of Daw's Castle (an Anglo-Saxon *burh*) (McAvoy 1986), and historic and Listed Buildings along the valley of the River Washford at Snailholm Farm and Kentford Farm. There will need to be an archaeological assessment of the impact of foreshore, slope and cliff erosion and flooding as part of any future management plans.

- **7d23** – Gray Rock, Blue Anchor Bay to Blue Anchor. This area consists of low cliffs and rocky foreshore, low-lying sand and shingle beach, gently sloping agricultural land, low-lying residential areas at Home Farm, Chapel Cleeve and Blue Anchor, isolated farms and residences, wooded copses, a caravan site, and infrastructure such as the B3191 road and the West Somerset Railway.

  Short term and medium term preferred policy – Hold the Line. Long term preferred policy – No Active Intervention. The existing sea defences will be upgraded and extended in the short to medium term, but at the eastern end of this area, larger and more expensive defences would be required in the long term, and so here the defences will be allowed to deteriorate and fail. The coastal road and the West Somerset Railway would probably require continued protection.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. The intertidal zone contains important groups of medieval, post-medieval and early modern fish weirs. Other historical assets potentially at risk from future erosion or flooding include post-medieval drainage features, lime kilns and brick kilns, and a brickyard; a coastguard station, historic and Listed Buildings in Blue Anchor, Chapel Cleeve and at Marshwood Farm, and Second World War structures including many pillboxes. There will need to be an archaeological assessment of the impact of foreshore and cliff erosion and flooding as part of any future management plans.

- **7d22** – Blue Anchor to Sea Lane End, Dunster Beach. This area consists of low-lying rocky foreshore and shingle beach, low-lying or gently sloping agricultural land,

isolated farms and residences, wooded copses, and infrastructure such as the West Somerset Railway.

Short term preferred policy – Managed Realignment. Medium and long term preferred policy – Hold the Line. In order to reduce flooding to the low-lying hinterland of Ker Moor, a secondary defence embankment will be constructed seawards (north of) the railway line. In the medium to long term this new defence line would be maintained, and reinforced and extended if necessary. This could, however, cause 'coastal squeeze' up against the new hard defences.

The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. The intertidal zone at Dunster Beach contains important groups of medieval, post-medieval and early modern fish weirs, and other fishing related features at risk from erosion. There are coastal Second World War structures, mostly pillboxes; that would also be at serious risk from any future erosion or flooding, and on Ker Moor there are also post-medieval drainage features. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion, 'coastal squeeze' and flooding as part of any future management plans.

- **7d21** – Sea Lane End, Dunster Beach to Lower Marsh Farm. This area consists of low-lying shingle beach and agricultural grazing land, isolated farms and residences, residential areas further inland such as Marsh Street and Dunster, infrastructure such as the A396 road, Dunster railway station and the West Somerset Railway, and a Nature Conservation site (Dunster Beaches Estate Nature Reserve).

  Short and medium term preferred policy – Managed Realignment. Long term preferred policy – Hold the Line. The existing groynes and other defences at Dunster Beach are privately owned and maintained, and will become increasingly difficult to maintain and uneconomical. The rate of erosion and flooding will accelerate in the future as a result of sea level changes, possibly breaching the shingle beach. In order to reduce flooding to the low-lying hinterland and the risk of 'back-door' flooding to Minehead, a secondary defence embankment will be constructed, possibly seawards (north of) the railway line. In the long term this new defence line would be maintained. This could, however, cause 'coastal squeeze' up against the new embanked defences. The outflow of the River Advill at the eastern end of this area might also need to be adapted and altered.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets, other than a need for Dunster Castle and Conservation Areas at Dunster to be protected. In fact, although the low-lying residential areas of Dunster and Marsh Street with their historic and Listed Buildings might be at risk from increased flooding, this would not affect the hilltop castle. The intertidal zone at Dunster Beach contains important groups of medieval, post-medieval and early modern fish weirs, and other fishing related features at risk from erosion. Other historical assets at serious risk from future flooding, erosion and 'coastal squeeze' include prehistoric artefact scatters, post-medieval drainage features, Second World War structures, including many vulnerable pillboxes; and additional Listed Buildings at The Old Manor and Dunster Station. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion, 'coastal squeeze' and flooding as part of any future management plans.

- **7d20** – Lower Marsh Farm to Warren Point. This area consists of low-lying shingle beach and agricultural grazing land, residential areas of Minehead, a golf course and

part of a holiday village, and infrastructure such as a sewage works, the A396 road and the West Somerset Railway.

Short term preferred policy – Hold the Line. Medium term preferred policy – Managed Realignment. Long term preferred policy – Hold the Line. Existing beach management and flood defence maintenance will continue in the short term, allowing time for managed realignment options to be studied. The rate of erosion and flooding will accelerate in the future as a result of sea level changes, possibly causing 'back-door' flooding to Minehead. A secondary defence embankment will thus be constructed, and in the long term this will be maintained as the primary defence line. There could, however, be 'coastal squeeze' up against the new embanked defences.

The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets, other than a need for Conservation Areas in Minehead to be protected. Nevertheless, any increased erosion or flooding could seriously affect important prehistoric peat deposits and submerged forest in the intertidal zone, associated with finds of early prehistoric flints; nationally important groups of medieval, post-medieval and early modern fish weirs, and other fishing related features; a possible medieval harbour site north of The Old Manor, post-medieval drainage features and older phases of flood defence banks, and Second World War structures. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion, 'coastal squeeze' and flooding as part of any future management plans.

- **7d19** – Warren Point to near Culver Cliff. This area consists of low-lying sea front and residential areas of Minehead, with high hard geology cliffs to the west of the area; wooded slopes and a coastal leisure park, a holiday village, and urban infrastructure such as roads, Minehead railway station and the West Somerset Railway, Minehead Harbour and an IRB lifeboat station.

  Short term, medium term and long term preferred policy – Hold the Line. Existing flood defences will be upgraded and maintained, but may need to be rebuilt and improved in the long term.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets, other than a need for Conservation Areas in Minehead to be protected. Nevertheless, any increased erosion or flooding could seriously affect nationally important groups of medieval, post-medieval and early modern fish weirs in the intertidal zone of Minehead Bay and also north of the harbour (four of these fish traps are Scheduled Ancient Monuments), and other fishing features such as conger eel traps. Other features vulnerable to any erosion or flooding include the remains of medieval timber piles from a medieval quay in Minehead Bay, a possible platform above the cliff near Beacon, the historic structures and buildings associated with Minehead harbour, historic and Listed Buildings in Minehead, and also many Second World War structures along the seafront. There will need to be an archaeological assessment of the impact of intertidal and foreshore erosion, 'coastal squeeze' and flooding as part of any future management plans.

- **7d18** – Near Culver Cliff to Hurlstone Point. This extensive Policy Unit consists mostly of hard geology cliffs and steep headlands separated by steeply sloping combes, with occasional narrow gravel beaches below the cliffs (Selworthy Sand and Greenaleigh Sand), open upland heath or steeply sloping agricultural land, isolated farms and residences, the South West Coastal Path and Nature Conservation sites.

Short term, medium term and long term preferred policy – No Active Intervention. Although the rate of erosion will accelerate in the future as a result of sea level changes, it is thought that the harder geology will limit this. In the next 100 years, coastal erosion of *c*. 10m is predicted, although in one area at Minehead Bluff this could be up to 50m (Halcrow Group Ltd 2009: App. G).

The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Few intertidal features are known from this Policy Unit area, although at Culver Cliff there is a small and little studied group of fish weir structures. Most of the archaeological and historical assets are on upland areas, and consist of prehistoric lithic scatters, Scheduled Bronze Age cairns, round barrows and later prehistoric field system features, the Scheduled Iron Age hillfort of Furzebury Brake, deserted medieval farms and medieval field system features, the remains of the medieval clifftop Burgundy chapel, the early modern coastguard tower at Hurlstone Point, and a series of Second World War remains including pillboxes and gun emplacements, observation posts, radio antennae bases, and an extensive tank training area. Some of these features are already threatened by cliff erosion, including important sites such as Furzebury Brake and Burgundy chapel, and any increases in rainfall and erosion might exacerbate slope erosion too. There will need to be an archaeological assessment of the impact of slope and cliff erosion as part of any future management plans.

- **7d17** – Hurlstone Point to Porlock Beach. This area consists of some hard cliffs at the eastern end but mostly of low-lying shingle ridge, salt marsh and agricultural grazing land, backed by sloping agricultural land, with isolated farms and residences, residential areas at Bossington, Porlock and West Porlock, and SSSIs and Nature Conservation sites.

  Short term, medium term and long term preferred policy – No Active Intervention. The shingle ridge was breached after a large storm in 1996, and the low-lying Porlock Marsh floodplain area behind (between Porlock and Porlock Weir) is reverting to salt marsh, leading to habitat creation, but with a loss of agricultural land. The rate of erosion and flooding will accelerate in the future as a result of sea level changes, and this will also cause 'coastal squeeze'.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets, other than a need for a Conservation Zone in Bossington to be protected. Any increase in erosion or flooding could, however, seriously affect nationally important prehistoric submerged forest deposits in the intertidal zone, associated with finds of early prehistoric flints, along with several post-medieval or early modern fish weirs. The intertidal zone has also produced evidence of palaeochannels and Bronze Age faunal remains. Further to the east behind the breached shingle ridge, medieval and post-medieval timbers and drainage features have been recently excavated, which were once buried by the shingle ridge and alluvial deposits. Prehistoric flint scatters at Hurlstone Point, an oyster bank, lime kilns, a wildfowl decoy pond, historic and Listed Buildings in Bossington, and Second World War structures could also all be at serious risk in the future. Given the no active intervention policy and the likelihood of coastal rollback, there will need to be a detailed archaeological assessment of the impact of intertidal, foreshore and cliff erosion, and flooding and 'coastal squeeze', as part of any future management plans.

- **7d16** – Porlock Beach to western edge of Porlock Weir. This area consists mostly of low-lying shingle ridge, salt marsh and agricultural grazing land, backed by soft cliffs inland at Porlockford as well as steeply sloping wooded and agricultural land, with

some isolated residences, residential areas at Porlock Weir, infrastructure such as the B3225 road and Porlock Harbour, and Nature Conservation sites.

Short term preferred policy – Hold the Line. Medium term and long term preferred policy – No Active Intervention. Existing flood defences will be maintained in the short term (0-20 years), allowing time for measures to be developed to adapt this area to a policy of no active intervention. In the medium to long term, however, maintaining the defences will prove uneconomic, and they will not be replaced or upgraded, unless there is private funding for this. Properties at Porlock Weir will then be at increased risk from erosion and flooding as a result of sea level changes. It is also likely that the soft cliffs inland at Porlockford at the eastern end of this area will also experience some erosion too, probably at less than 0.50m per year.

The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets, other than a need for Conservation Areas in Porlock to be protected, and tourist and local infrastructure in Porlock Weir. The latter would, however, appear to be threatened and potentially undermined by the medium and long term no active intervention policy. Any increase in erosion or flooding could seriously affect nationally important prehistoric submerged forest deposits in the intertidal zone, associated with finds of early prehistoric flints, along with medieval, post-medieval or early modern fish weirs, lime kilns, historic and Listed Buildings in Porlock Weir, and Second World War structures. Given the no active intervention policy and the likelihood of coastal rollback, there will need to be a detailed archaeological assessment of the impact of intertidal, foreshore and cliff erosion, and flooding and 'coastal squeeze', as part of any future management plans.

- **7d15** – Western edge of Porlock Weir to Gore Point. This area consists mostly of low-lying shingle ridge, salt marsh and agricultural grazing land, backed steeply sloping wooded and agricultural land, some isolated residences at Worthy, and Nature Conservation sites.

  Short term, medium term and long term preferred policy – No Active Intervention. The shingle beach will not be maintained any further, and is likely to widen and flatten, increasing the risk of overbank flooding. The rate of erosion and flooding will accelerate in the future as a result of sea level changes, and the shingle beach will probably suffer 'coastal squeeze', rolling back to the steeper ground further inland.

  The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Any increase in erosion or flooding could, however, threaten the Listed Buildings of Worthy Manor and its associated outbuildings. There will need to be a detailed archaeological assessment of the impact of foreshore erosion, flooding and 'coastal squeeze', as part of any future management plans.

- **7d14** – Gore Point to Yellow Rocks. Much of the central and western extent of this Policy Unit area lies outside of the RCZAS study area, but there is a small eastern section within it that forms the westernmost end of the RCZAS. This area consists mostly of low-lying shingle ridge and rock-cut platform backed by steep hard geology cliffs, with steep wooded slopes behind.

  Short term, medium term and long term preferred policy – No Active Intervention. Erosion and flooding will accelerate in the future as a result of sea level changes, and the shingle beach will probably suffer overbank flooding and 'coastal squeeze', rolling back to the cliffs behind. The cliffs are thought likely to erode at a relatively slow rate.

The SMP2 consultation document (Halcrow Group Ltd 2009: App. I) records no implications for historical assets. Any increase in erosion or 'coastal squeeze' could seriously affect a little studied group of medieval, post-medieval or early modern fish weirs off Gore Point, however, along with an early modern slipway; whilst erosion and flooding could threaten a group of historic estate cottage buildings. There will need to be a detailed archaeological assessment of the impact of intertidal, foreshore and cliff erosion, and flooding and 'coastal squeeze', as part of any future management plans.

14.5 The impact of major infrastructure projects

14.5.1 There are several major infrastructure projects currently proposed within the area covered by the Severn Estuary RCZAS study that will significant implications for future management plans. As part of the planning process these will have to be the subject of individual, detailed Environment Impact Assessments (EIAs), and this work will necessarily need to assess the potential impact of these developments upon maritime, intertidal and terrestrial historical and archaeological assets. Follow-up assessment and/or mitigation work may also be necessary.

14.5.2 In order to save duplication of effort, it is proposed that in most instances the areas directly affected by the proposed developments should not be studied in detail during the Stage 2 fieldwork phase of the RCZAS project. If undertaken within the RCZAS project timetable, the results of any EIAs and other archaeological studies can nevertheless be incorporated within the final RCZAS results.

14.5.3 One major potential development within the RCZAS area is a proposed dock expansion at Avonmouth Docks, immediately west of St Andrews Road railway station, and the northern part of the Royal Albert Dock, as part of the Bristol Deep Sea Container Terminal. This development has already been the subject of an archaeological study forming part of a wider EIA. The study examined all known historical and archaeological assets within the 'footprint' of the proposed construction and dredging operations (Maritime Archaeology 2007), and included prospection such as marine geophysical survey. The proposed development includes the reclamation of 33 hectares of intertidal land.

14.5.4 Amongst the findings of the archaeological assessment of the Bristol Deep Sea Container Terminal site was the potential for earlier prehistoric deposits to survive within the area proposed for reclamation, whilst the intertidal zone within the footprint of the proposed scheme includes the remains of a 19th century steel-built ship, possibly the *Stormcock* (Maritime Archaeology 2007: 40, section 6.1.1). If a decision is made to go ahead with the scheme, it is likely that additional archaeological and historical investigation will be necessary.

14.5.5 An even greater potential impact upon archaeological and historical assets within the Severn Estuary RCZAS area might be caused by one or more of the tidal power schemes currently being considered for the Severn Estuary. The basic proposals as such are not exactly new – indeed, it was an earlier proposal by the Severn Tidal Power Group for a tidal power scheme that resulted in the first rapid assessment of the archaeological potential of the Severn Estuary (SELRC 1988, see section 1.5 above), produced by the Severn Estuary Levels Research Committee that was itself formed in 1985 as a response to such proposed developments (Nayling 2002, 110). In recent years, however, the political and economic impetus for a tidal power scheme seems to have been growing.

14.5.6 In January 2008 the Government launched a two-year feasibility study to investigate tidal power options for the Severn. It was carried out by a cross-governmental team led by the Department of Energy and Climate Change (DECC) and also including the Cabinet

Office, Department for Environment, Food and Rural Affairs (Defra), Department for Transport, Department for Communities and Local Government, Her Majesty's Treasury, Wales Office, the Welsh Assembly Government and the South West Regional Development Agency. Parsons Brinckerhoff Ltd was commissioned to undertake evidence gathering and prepare financial and economic assessments of the various schemes. This preliminary work included the production of a Scoping Topic Paper on the historic environment in association with Black and Veatch Ltd and Wessex Archaeology (Parsons Brinckerhoff Ltd 2008).

14.5.7 The Scoping Topic Paper recommended that the following further reports should be commissioned (Parsons Brinckerhoff Ltd 2008: 5-6):

- A detailed historic environment characterisation study should be undertaken for the entire Severn Estuary to synthesise new and previously available data, in order to develop a regional framework and strategy to examine the significance of the resource;

- An archaeological desk-based assessment to evaluate the archaeological potential of the area that will be affected, taking into account the terrestrial, intertidal and submerged evidence which will determine further work required;

- A high-level desk-based assessment of the historic landscape to define regional areas to assess the potential effects of the development on the historic character of the surrounding landscape;

- An assessment of the available geophysical and geotechnical data to identify submerged historic environment potential;

- A review of the models for erosion and sedimentation to assess implications for the historic environment, to be examined against previous studies for past developments in order to determine the level of confidence in the proposed modelling schemes.

14.5.8 In January 2009 a short-list of five possible Severn tidal power schemes was announced by the Secretary of State for the DECC. The recommended short-list was:

- Shoots Barrage – located near the Severn road crossings;

- Beachley Barrage – slightly smaller and further upstream than the Shoots Barrage (and upstream of the Wye);

- Fleming Lagoon – an impoundment on the Welsh shore of the Severn Estuary between Newport and the Severn road crossings;

- Bridgwater Bay Lagoon – an impoundment on the English shore of the Estuary between Hinkley Point and Weston-super-Mare;

- Cardiff-Weston Barrage – the largest proposed scheme, located between Brean Down in Somerset, and Lavernock Point near Penarth, west of Cardiff, Wales.

14.5.9 Detailed Strategic Environmental Assessment (SEA) work will be carried out by DECC on the short-listed options to predict their environmental and social effects (e.g. Austin 2009), and this will include the potential impact of the various schemes upon historical and archaeological assets. This will need to examine not just the direct footprints of the construction, however, but also any expansion of quarrying to meet the need for materials for the schemes, and the potential impact of extra compensatory ecological habitat creation as a response to any loss of habitat within the proposed schemes.

14.5.10 A similar ecological habitat creation scheme has been mooted by the Environment Agency as part of a programme of managed coastal defence realignment between Catsford Common and Wall Common on the Steart Peninsula in Somerset. The proposed breaching of the existing coastal defences would result in the inundation of low-lying pasture farmland and eventually the development of salt marsh and coastal grazing marsh. A project-specific initial heritage assessment of the proposal has been produced by Wessex Archaeology on behalf of the Environment Agency (Hamel and Bryant 2008).

14.5.11 Owing to changes in national energy policy, new nuclear power stations are being considered for the first time in many years. Two of the sites nominated for new build reactors lie within the Severn RCZAS study area, located at the existing nuclear power plants at Oldbury on Severn, South Gloucestershire, and Hinkley Point in Somerset (Hutton 2009). Due to the existing power plants and the lengthy period required for decommissioning, any new builds will have to expand upon the existing areas of the power stations, and will consequently affect additional areas of the intertidal and terrestrial RCZAS zones. At Hinkley Point this construction is proposed to the west and south-west of the existing power station (ibid.), and at Oldbury this will be in an area to the north of the existing structures, along with a haul road to Sharpness. Separate EIAs incorporating historical and archaeological studies will therefore be required for the footprints of the proposed new schemes.

15 Identification of areas of deposition and erosion within the Severn Estuary

15.1 The data collated by the FutureCoast survey gives a very good indication of where the coast will move in the next 100 years, if unconstrained, and identifies the level of impact this will have. A further major study by Posford-Duvier (2000) was more concerned with large scale sediment movement, and does not have a high degree of relevance to this study.

15.2 FutureCoast identified the potential magnitude of change in shoreline position in the next 100 years, which is presented in five bands:

- *Extreme*: greater than 200m change;
- *Very High*: 100 to 200m change;
- *High*: 50 to 100m change;
- *Moderate*: 10 to 50m change;
- *Negligible/ no change*: less than 10m change.

15.3 For the purposes of the RCZAS, Very High and High were considered together, Moderate was mapped, but areas of negligible/ no change were not mapped (Figure 33). Although there are some substantial areas of little or no change mapped by FutureCoast, there are no areas identified where the coast is moving seawards, net coastal change is thought to be inland during the next 100 years.

Areas of high potential change were identified as:

- Porlock Bay;
- Blue Anchor Bay;
- the coast east from Hinkley Point to Weston-super-Mare (excluding Brean Down);
- Sand Bay.

15.4 The only area of Moderate potential change was identified as the stretch of coast from the east of Blue Anchor Bay to St Audrie's Bay.

15.5 Areas mapped as 'major change in landform' occurred in Woodspring Bay (between Woodspring Priory and Clevedon) and along the North Somerset coast between Portishead and Aust. These areas are also identified as 'Hotspots', where there is potential for a major change in morphological form or a breakdown of an existing morphological form.

15.6 Low to Medium Hotspots were identified in Porlock Bay and from Sand Point to St Thomas' Head. Medium to High Hotspots were identified between Minehead and Blue Anchor, Hinkley Point to Sand Point, St Thomas' Head to Blind Yeo and Clevedon to Old Passage.

15.7 In many ways it is easier to identify those areas of the coast which are not affected by some sort of coastal process (either natural or anthropogenic), as the areas which are affected by change are so extensive. Areas not potentially affected by change are:

- The hard rock coast between Selworthy Beacon and Minehead;

- The low cliffs between Watchet and Hinkley Point (but see section 15.8 below, and Blue Anchor to St Audrie's Bay has been identified as under moderate potential change);
- Brean Down (but see section 15.8 below) and Worlebury;
- Sand Point to St Thomas' Head;
- Clevedon to Portishead;
- Sharpness to Purton;
- Broadoak to Northington;
- Hagloe to Beachley.

15.8 There are some obvious omissions within the overall FutureCoast-inspired framework, based on localised contexts and conditions. For example, at Brean Down there are nationally important Bronze Age and earlier archaeological deposits below the undercliff that will be at grave risk from future erosion, and this part of Brean Down is especially vulnerable to coastal change. The elevated headland area of Brean Down, however, is much less susceptible and consequently at a lower risk. Similarly, the low cliffs immediately east of Watchet Harbour and in Helwell Bay consist primarily of clays and soft shales, and these are regularly undermined by high tides and storms. This leads to frequent collapses and the progressive erosion of the cliff face and shoreline, and is thus at moderate to high risk.

15.9 Although these areas have been identified as not potentially under threat, ongoing processes in the intertidal area do, potentially, threaten all sites in this location throughout the estuary. Similarly, such processes constantly reveal new sites in these locations.

16 Identification of specific sites and areas which would benefit from further research or fieldwork

16.1 All of the areas of known deposits and of high archaeological potential identified in Section 8 lie in areas which are potentially affected by coastal change. They are outlined here in relation to some of the issues raised by the South West Archaeological Research Framework or SWARF (Webster 2008), and in line with the preferred policy options being proposed within the second revised versions of the Shoreline Management Plans (SMPs) for North Devon and Somerset, and the Severn Estuary (Halcrow Group Ltd 2009, Atkins Ltd 2009). The following recommendations include research beyond the scope of RCZAS fieldwork.

16.2 The NMP and the Stage 2a pilot fieldwork have identified large numbers of previously unrecorded or little investigated fishing weir structures and associated features in Bridgwater Bay, especially at Berrow Flats and Steart Point, Stolford Bay, St. Audrie's Bay, Blue Anchor Bay/Dunster Beach, Minehead Bay and Porlock Bay (Catchpole and Chadwick 2009b, Crowther and Dickson 2008). There are relatively few HER/SMR records for these areas, and extensive further fieldwork is required to assess their survival, condition, dating and possible preservation. Although some are post-medieval or early modern, a few of the very small number that have been scientifically dated have proved to be Anglo-Saxon in origin (Brunning 2008). There may have been considerable similarities in construction techniques and fishing practices, both in terms of wider geographical area, but also through time. The earliest dateable origins of these fish weirs and fish traps needs to be established, as well as potential typologies and chronologies for their form, construction techniques and materials. As the SWARF research agenda identified, it is also important to try and identify which individuals or groups might have had tenure or control over them, such as royal estates for example (Webster 2008: 175).

16.3 These areas of fish traps vary in terms of their preferred Shoreline Management Policy options, from no active intervention at Stert Flats, Berrow Flats, Blue Anchor Bay and Porlock Bay to managed realignment at Dunster Beach, and Stolford Bay, and hold the line at Minehead Bay. In most of these areas, however, as sea levels rise tidal scouring and erosion in the intertidal zone is likely to increase, and the timber-built features in particular will be increasingly vulnerable. In a few locales, In some places such as Minehead Bay, managed realignment or hold the line will probably cause 'coastal squeeze' up against new or existing hard defences, and this will exacerbate erosion in the intertidal zone. These fishing structures are therefore a threatened and diminishing historical asset, and time is rapidly running out for their recording and study.

16.4 The area between Stert Flats and Berrow Flats is under high potential threat due to long term policies of no active intervention and managed realignment, and possible long term river realignment. The area of Berrow Flats in particular is poorly understood, although the NMP recorded numerous fishing structures and at least two wrecked vessels in the intertidal zone here. This is also an area previously identified as having high archaeological potential. Weston Bay and Sand Bay are similarly poorly understood (but were not covered by the initial NMP survey undertaken for RCZAS Phase 1). Stert Flats, Berrow Flats, Sand Bay and Weston Bay merit targeting for further survey and fieldwork, although health and safety considerations may have many implications for walking and working long hours in the hazardous intertidal areas at these locales.

16.5 The nationally important peat deposits, Pleistocene artefacts and faunal remains discovered in St Audrie's Bay need additional work to assess the extent and state of preservation of these deposits, and to obtain samples and dating material where possible. The juxtaposition of key faunal remains and potentially highly informative palaeo-environmental deposits is a relatively rare occurrence in south-west England (Hosfield *et al*. 2008: 27), and this area has considerable archaeological potential.

16.6 All along the RCZAS project area in fact, accessible peat deposits should be targeted for further fieldwork to record their extent, character, likely age and state of preservation. In particular, they need to be assessed to see if they have the potential to preserve prehistoric wooden structures such as buildings and trackways, as is the case on the Welsh coast of the Severn in areas such as the Gwent Levels (e.g. Bell *et al*. 2000). Along the English Severn shoreline, the peat deposits at Woolaston and Stroat, and on Oldbury Level/Hills Flats are particularly important in this context, and are worthy of further survey and study. It would seem unlikely that such structures were confined to the modern Welsh shoreline alone, and the Welsh evidence was often discovered through chance or by the dedicated and exhaustive fieldwork of 'amateurs' such as the late Derek Upton. Such extensive survey has been missing along the English Severn shoreline, but several sites such as Hallen slightly further inland in the Somerset Levels (Fitzpatrick *et al*. 2008: 133) suggest this potential exists. The exceptionally rare earlier prehistoric (Mesolithic and Neolithic) human footprint and animal track evidence found on the Gwent Levels also occurs at Oldbury/Hills Flats (Brown 2007a, 2007b), and is of national and international significance. This evidence can produce invaluable insights into the daily lives of past people. Such remains are extremely vulnerable, for although they are usually exposed by erosion they do not survive long after this. Although Lydney Level has been discussed at length by Allen (2001b) this section of the coast has also been identified as having exceptionally rapid coastal erosion (Allen 2000) and should be targeted for further survey.

16.7 The area to the north and south of Avonmouth is likely to undergo major changes, some as a result of large infrastructure projects, and this includes locales where previous work has identified important archaeological deposits in both the intertidal and terrestrial parts of the estuary. The area around English Stones/Second Severn Crossing has a high number of fish traps identified by Allen (2005), and work here would compliment proposed work on fish traps in Blue Anchor/Minehead Bays and Bridgwater Bay. The fish traps identified by Allen (2005) at Horse Pool, Oldbury Flats as being unique to the Severn also require further work. These areas will mostly be hold the line in terms of their preferred SMP policies, but erosion and 'coastal squeeze' are likely to increase there in the future. Work in the intertidal zone in these areas (see 16.11 below) might also contribute to the understanding of the prehistoric and Roman sites in the northern Levels.

16.8 The area around Woodspring Bay, Blackstone Rocks and Wains Hill is under particularly high threat due to coastal change and is an area which has produced evidence for Mesolithic occupation. Although the peat deposits here have been sampled, the context of the lithics recovered by Sykes (1938) is poorly understood. Work in Woodspring Bay may also complement proposed work in Sand Bay and Rippon's work at Kingston Seymour (Rippon 2004), as well as potentially helping to understand the landscape setting and exploitation of Woodspring Priory. Woodspring Bay is also an area previously identified as having high archaeological potential.

16.9 Nearly all the coast between Purton and Gloucester and Gloucester to Minsterworth has been identified as being under high potential threat, and this is also an area which has produced much archaeological evidence. The sequence of reclamation here needs further work, as does the nature and date of the 'Great Wall' of Elmore. The area of Frampton Sand/New Grounds has few HER/SMR records and that around Minsterworth Ham is also poorly understood. The section of coast from Rodley to Broadoak is an area of poorly understood reclamation and was also a focus for medieval and post-medieval fisheries. Fish traps are present in the intertidal zone at Broadoak, but this is an area with low numbers of SMR/HER records. Similarly, the area around Awre requires further work in understanding the reclamation sequence and the nature and date of the archaeological deposits recovered by Allen and Fulford (1987) require clarification. Large areas of reclaimed low-lying farmland at these locales will all ultimately be abandoned in the next 20-50 years and allowed to revert to intertidal or salt marsh areas, under policies of no active intervention and/or managed

realignment. There is thus a steadily shrinking window of opportunity for archaeological work to obtain reliable scientific dates for the sequences of land reclamation in these areas.

16.10 Several areas of land reclamation in Somerset also require similar further investigation. The sequences of land reclamation between Clevedon and Wick St Lawrence, Hinkley Point and Brean Down, at Pawlett Hams and Huntspill Level, Ker Moor near Dunster and Porlock Marsh are all poorly understood and need further investigative work. Porlock Marsh for example is within an area of proposed no active intervention and is already flooding and rescinding back into salt marsh, whilst at Dunster Beach, any proposed managed realignment is liable to result in 'coastal squeeze' and parts of Ker Moor also reverting to intertidal or salt marsh conditions. Once again, in 20-50 years time these areas will have reverted to salt marsh and/or intertidal zones, destroying any evidence for the date and sequences of land reclamation. Any surviving late prehistoric or Romano-British salterns in areas such as the Huntspill Level (Holbrook *et al*. 2008: 147) will also disappear.

16.11 Late prehistoric and Romano-British remains at Hill Flats and Oldbury Level may represent an unknown port side or at least a settlement of not inconsiderable social status, and although this area should in theory be protected by a preferred policy of hold the line, in practice this archaeology is already eroding rapidly and material is regularly falling out of the low sea cliff. Urgent survey and potentially future rescue excavation work is required to record and interpret this evidence. The construction of any new flood defences at Oldbury and Combwich and a new nuclear power station at Oldbury would also potentially have serious impacts upon important Romano-British settlement or port sites. The nature of Romano-British coastal trade and shipping along the Severn Estuary is poorly understood (Holbrook *et al*. 2008: 154, Rippon 2008).

16.12 The area of Tidenham and Sedbury has few SMR/HER records, but is located close to an area which has produced valuable environmental sequences, alongside *in situ* archaeological deposits at Woolaston. A survey of this area for similar deposits would be of value.

16.13 The wrecked vessels in the estuary could benefit from further survey work. Paul Barnett (pers. comm.) suggests that there are at least 81 vessels in the Purton area and a further 21 at Lydney, only some of which have had detailed surveys carried out. The vessels at Purton and Sharpness have now been the subject of an aerial photographic progression study (Dickson 2009). The wrecked vessels in Minehead Bay, on Oldbury Sands, Berrow Flats and along the River Parrett would also benefit from further work.

16.14 Digitising the historic charts of high potential should be considered as an appropriate early task within the main Phase 2 survey stage. These historic charts include the 1832 survey of the Severn by Commander Denham, the subsequent resurvey of 1849 by Captain Beechly and the 1853 survey by Commander Alldridge. These are located in the National Hydrographic Office in Taunton, although a duplicate of the Beechly chart is held by Gloucester Record Office.

16.15 Several specific survey targets also need to be investigated during the main Phase 2 RCZAS fieldwork. These include the possible round barrow or windmill mound indicated by Lidar during the NMP survey, south-east of Bays Court near Westbury-on-Severn (Catchpole and Chadwick 2009a: 7; Truscoe 2007), which could not be reached during the Stage 2a pilot fieldwork due to access difficulties. In addition, there is a curious feature adjacent to Beacon Sand south-west of Waldings Pill and south-east of Wibdon, at ST 5740 9660. It is visible from the train, and also on aerial photographs on Windows Live and Google Earth. It appears as a sub-circular area of reeds on salt grazing land, with a raised earthwork bank around it, but a gently concave, water-retaining centre. The field is called The Wharf on historic OS maps, and this might be a feature connected with a small landing stage or jetty.

16.16 No trace of the possible fish house near Hawkins Pill was found during the Stage 2a pilot fieldwork, although the survey team were not able to gain access to Hawkins Pill itself. Additional survey work here may be able to find some traces of this structure.

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19 Abbreviations

CHAMP	Coastal Habitat Management Plan
DEFRA	Department for Environment, Food and Rural Affairs
EH	English Heritage
GCC	Gloucestershire County Council
HER	Historic Environment Record
NMP	National Mapping Programme
NMR	National Monuments Record
OD	(Above) Ordnance Datum
OIS	Oxygen Isotope Stage
RCZAS	Rapid Coastal Zone Assessment Survey
SCC	Somerset County Council
SMP	Shoreline Management Plan
SMR	Sites and Monuments Record
UKHO	United Kingdom Hydrographic Office

Figure 1: Severn Estuary RCZA - Extent of coastline

Figure 2: Severn Estuary RCZA Survey Area

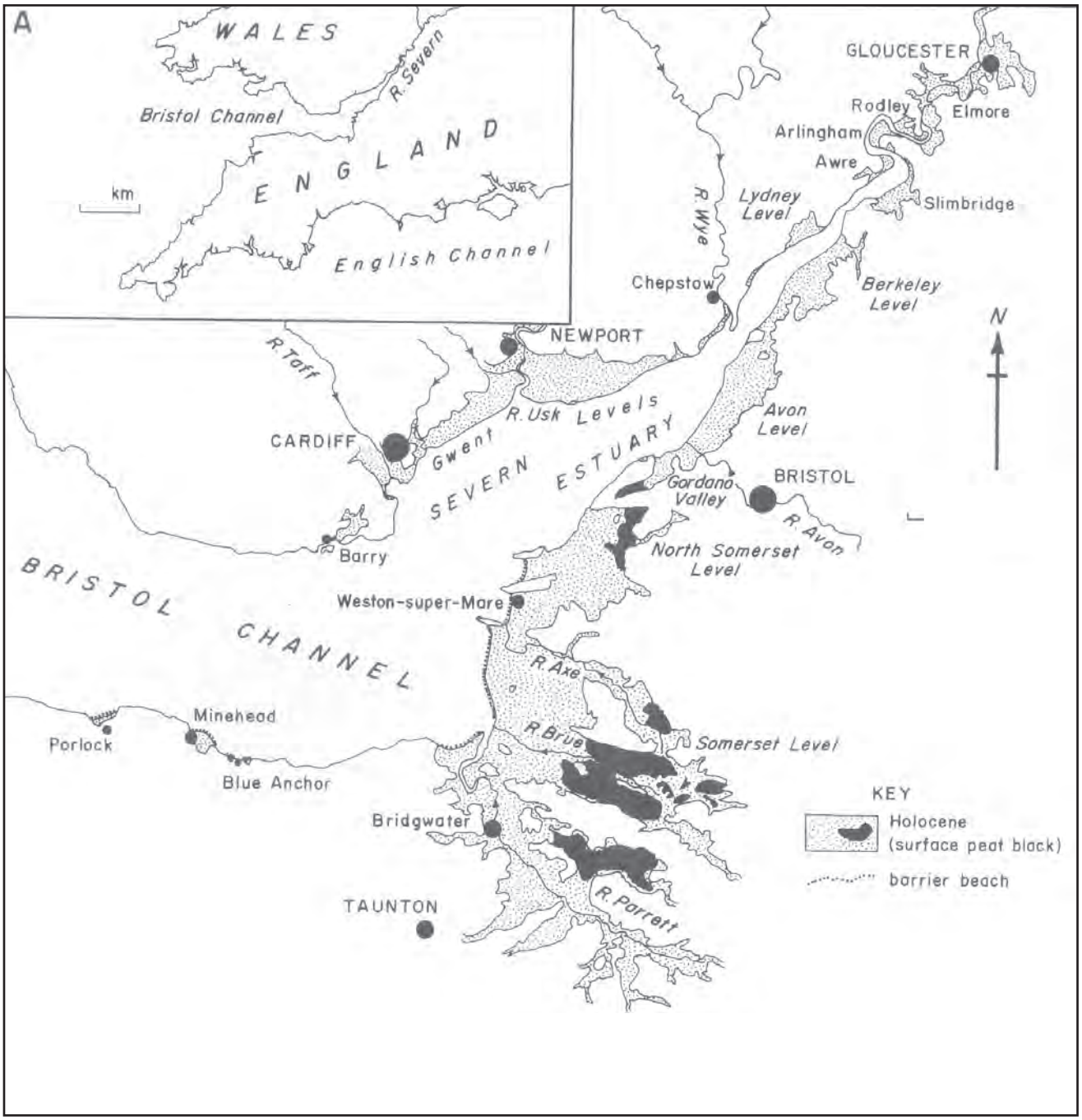

Figure 3: Sediments within the RCZA survey area (taken from Allen 2001a)

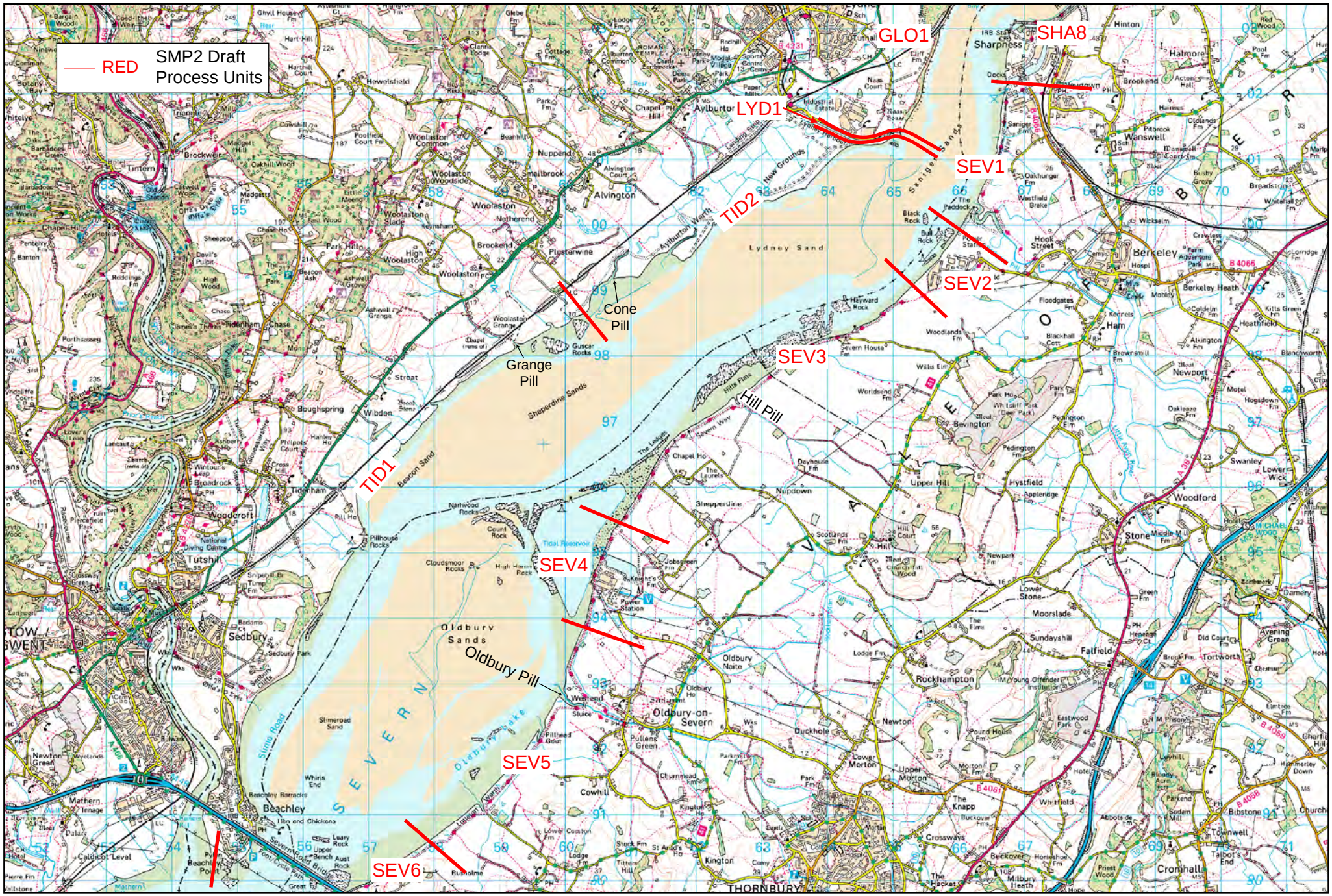

Figure 4: Beachley to Lydney and Sharpness to Severn Bridge

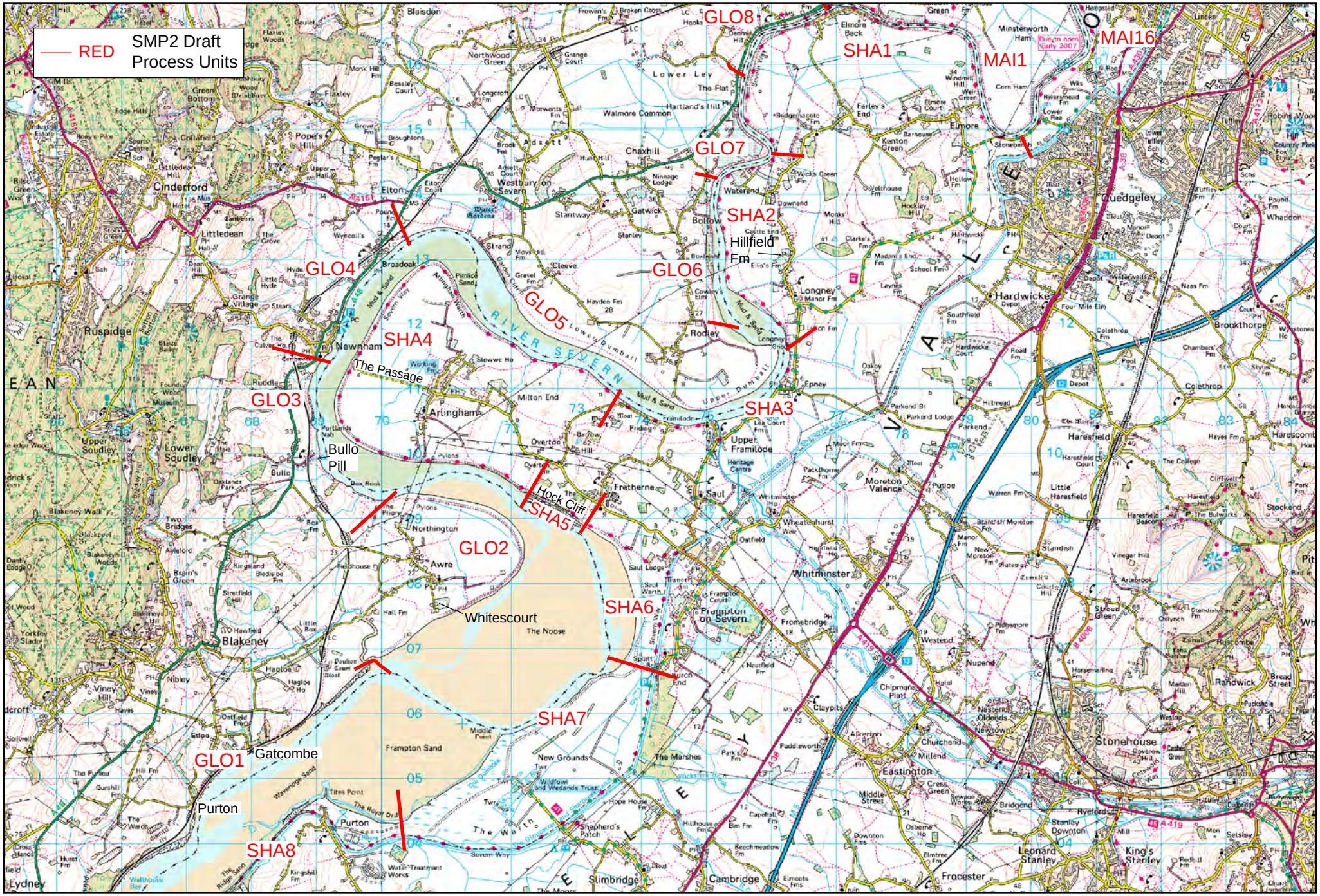

Figure 5: Lydney to Gloucester and Gloucester to Purton

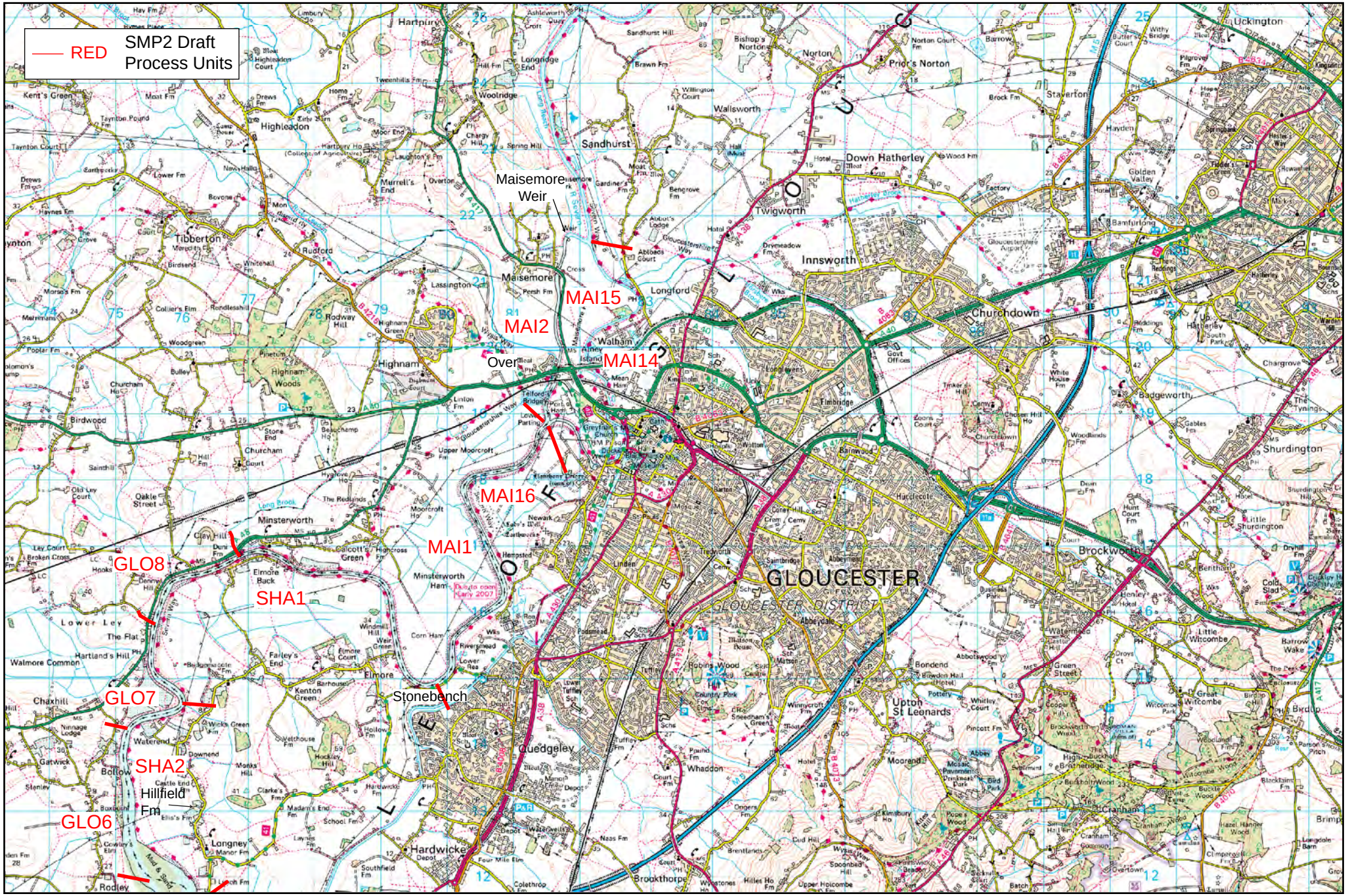

Figure 6: Gloucester to Maisemore

Figure 7: Severn Crossings to Avonmouth

Figure 8: Avonmouth to Clevedon

Figure 9: Clevedon to Brean Down

Figure 10: Brean Down to Burnham-on-Sea

Figure 11: Burnham-on-Sea to Kilve

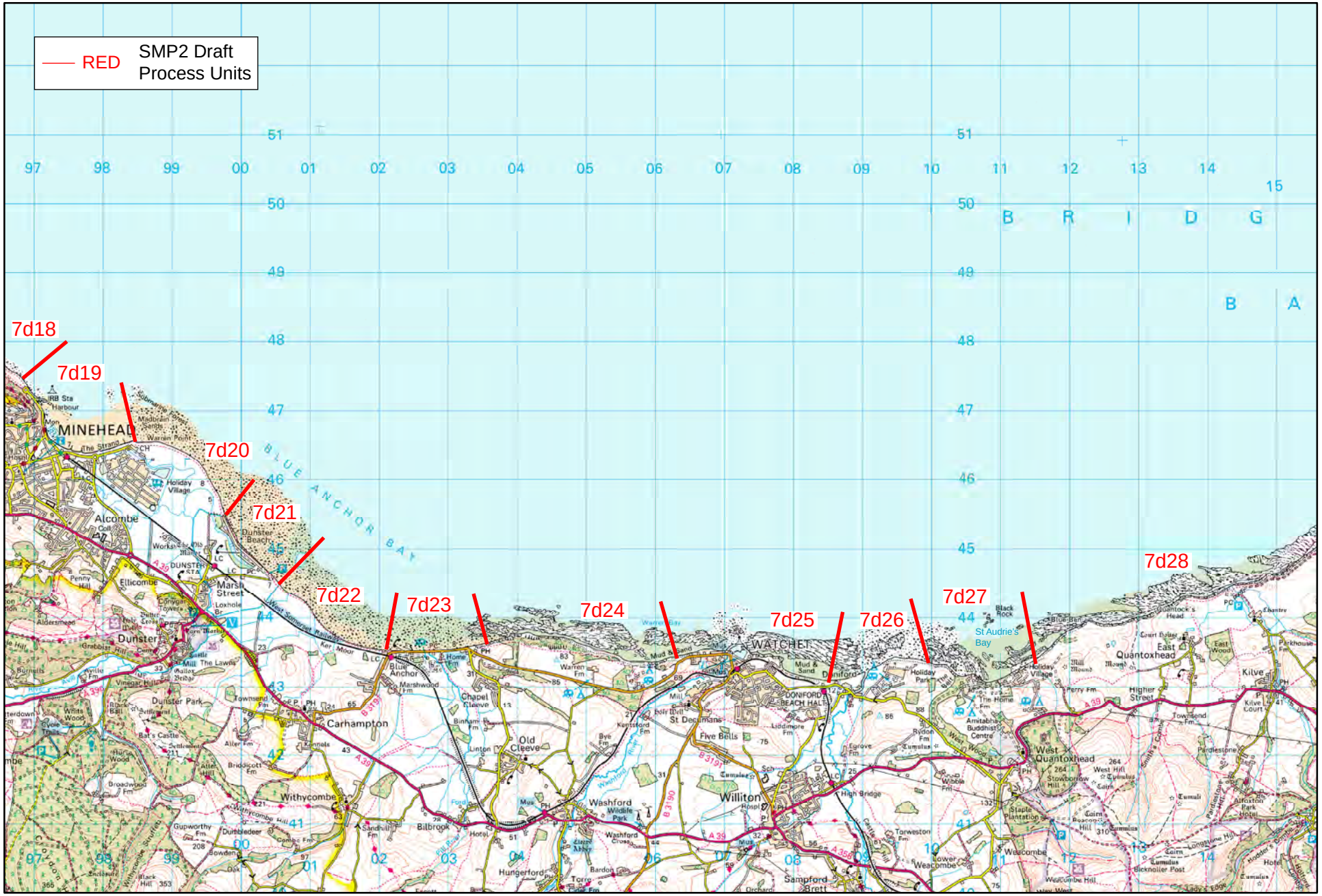

Figure 12: Kilve to Minehead

Figure 13: Minehead to Gore Point

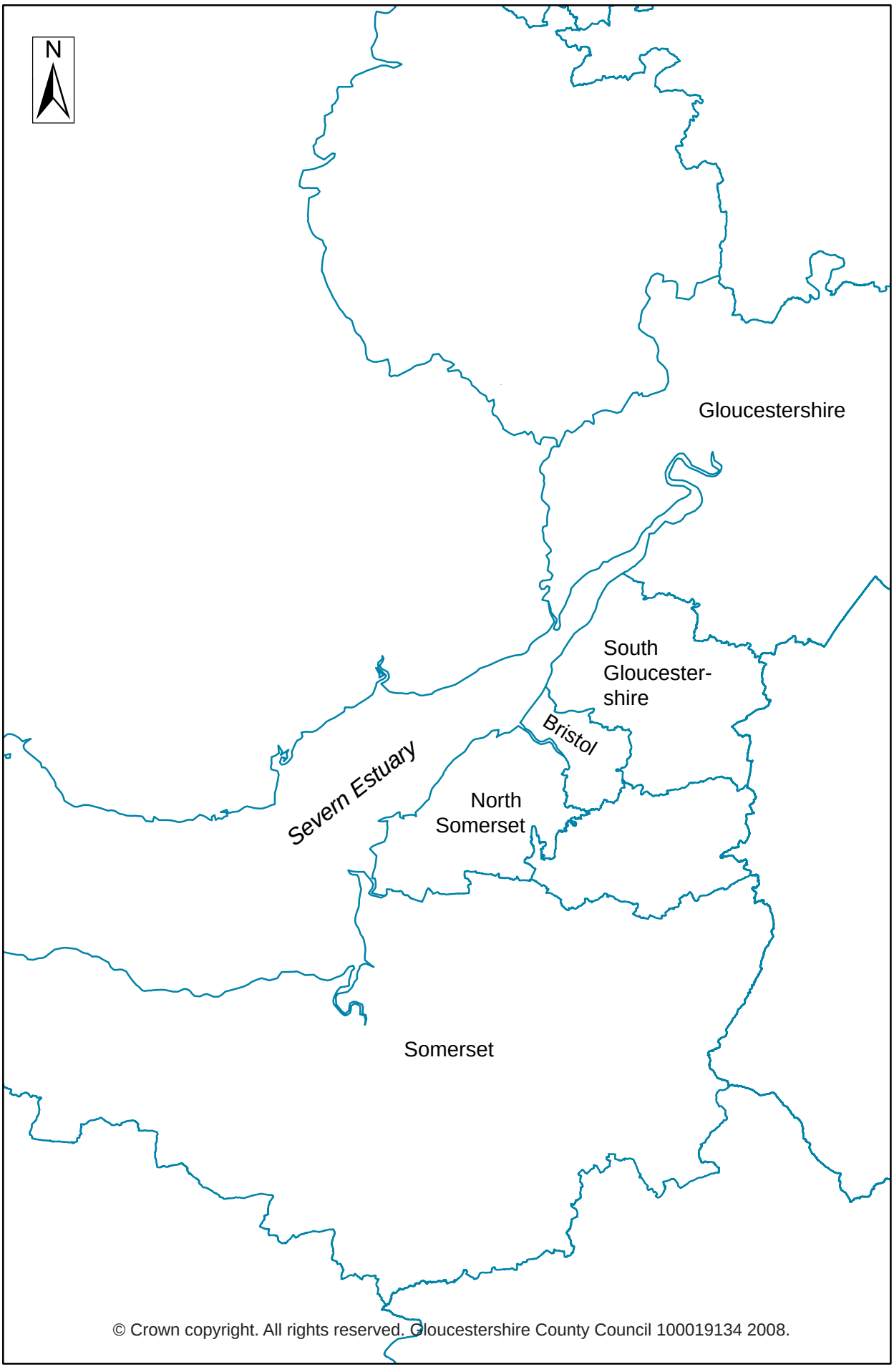

Figure 14: County and Unitary Authorities which provided HER or SMR data for the RCZA.

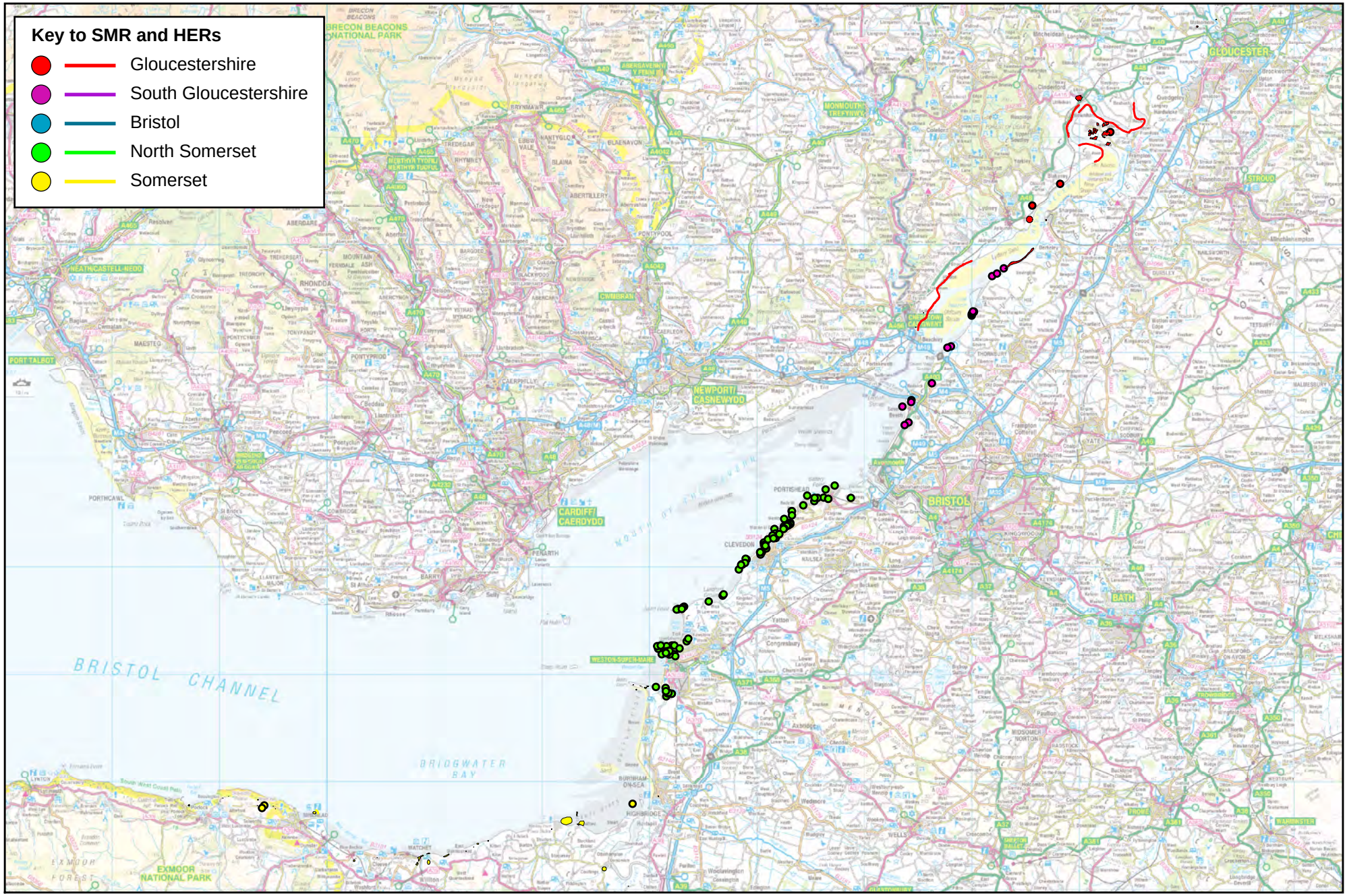

Figure 15: HER/SMR Data at beginning of project. Prehistoric Period

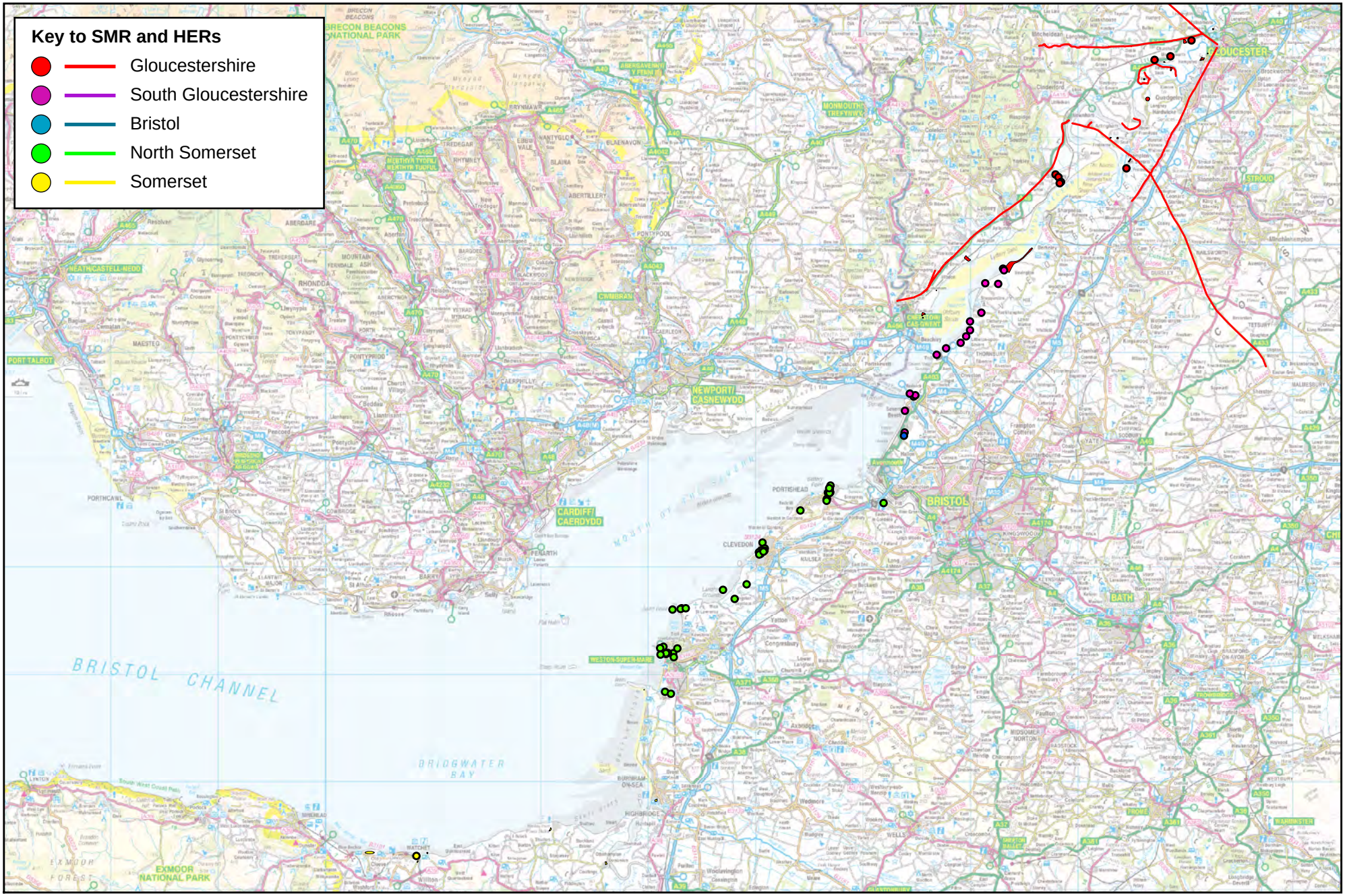

Figure 16: HER/SMR Data at beginning of project. Roman Period

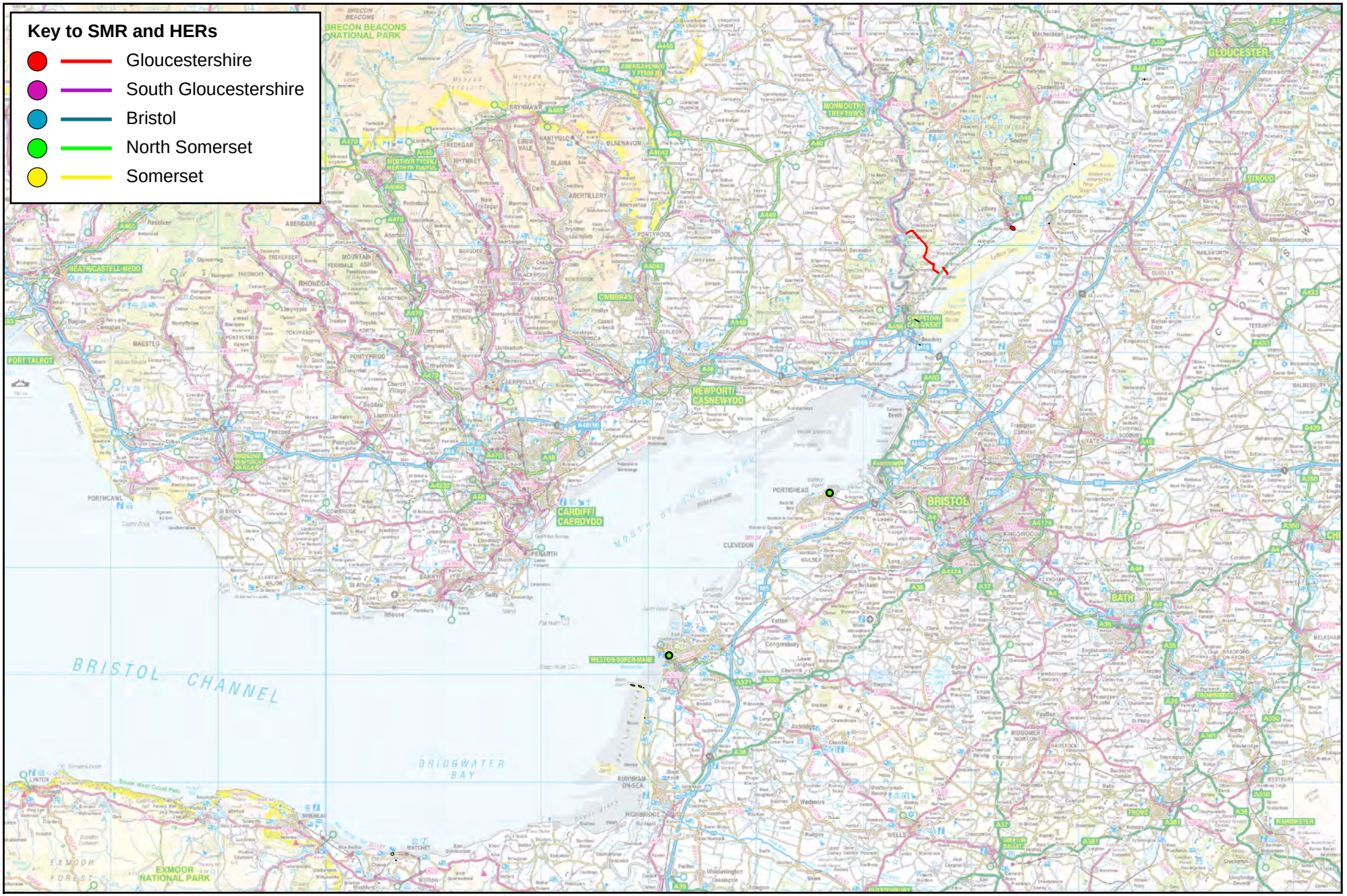

Figure 17: HER/SMR Data at beginning of project. Early Medieval Period

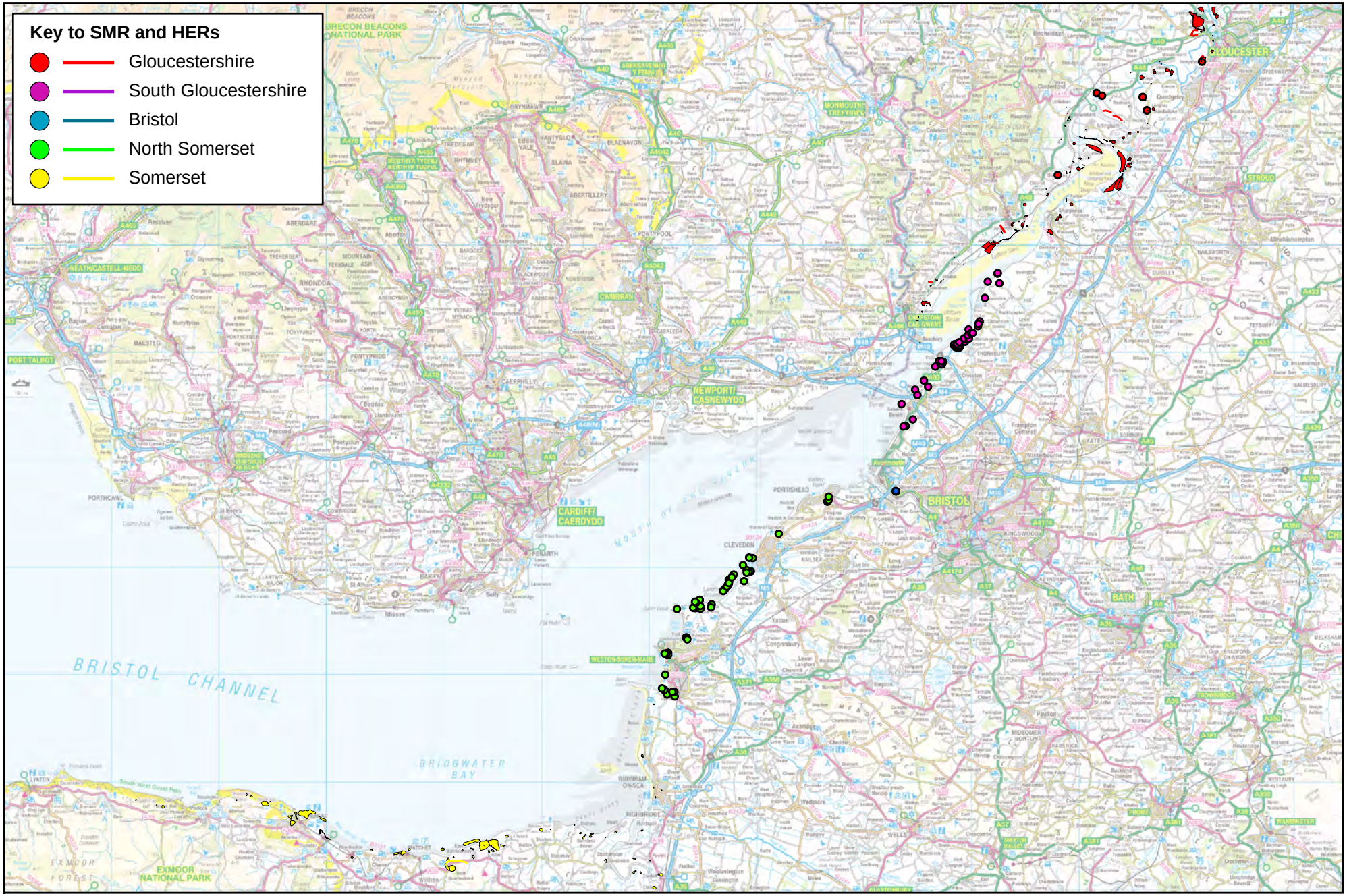

Figure 18: HER/SMR Data at beginning of project. Medieval Period

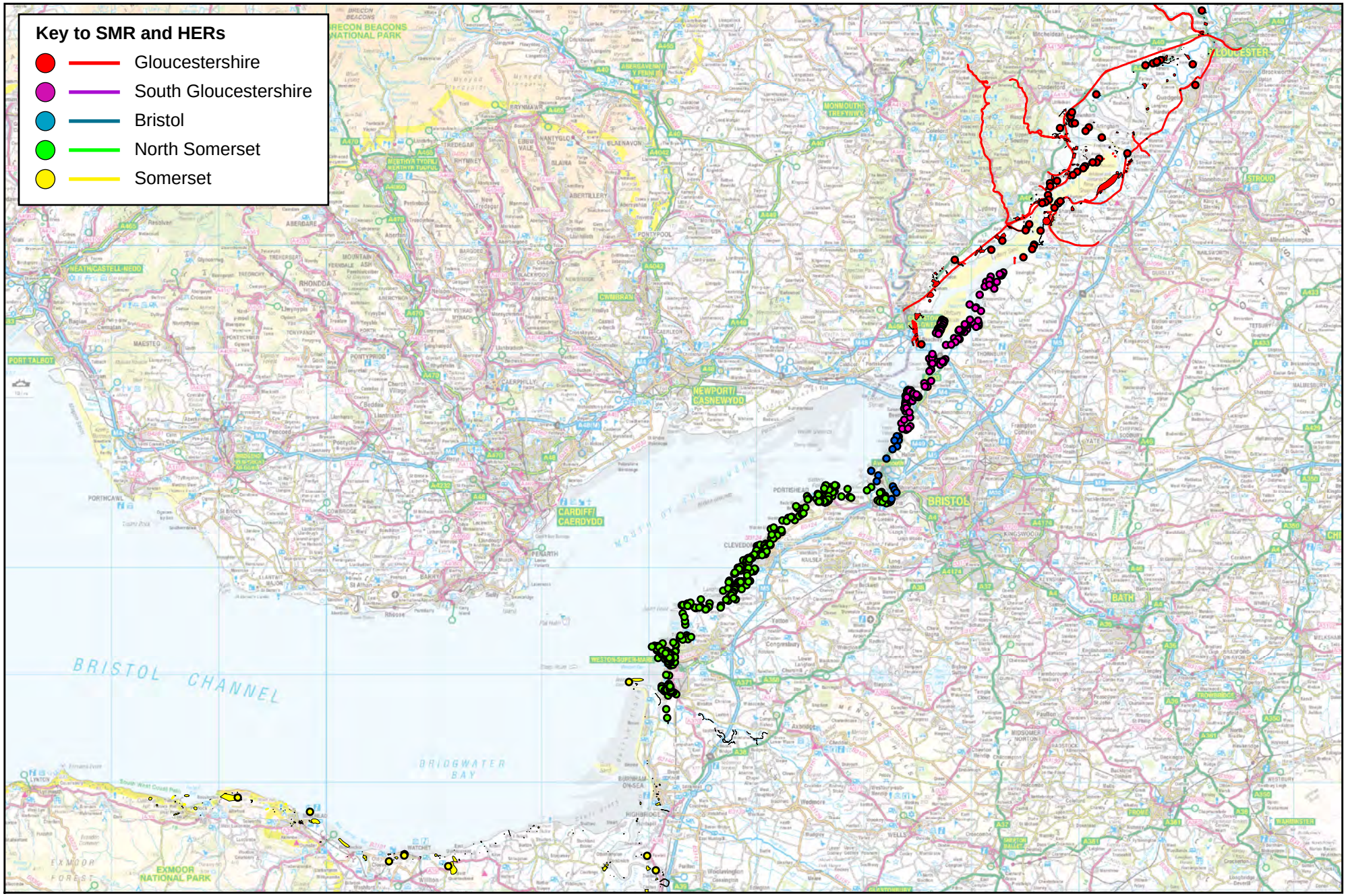

Figure 19: HER/SMR Data at beginning of project. Post-Medieval Period

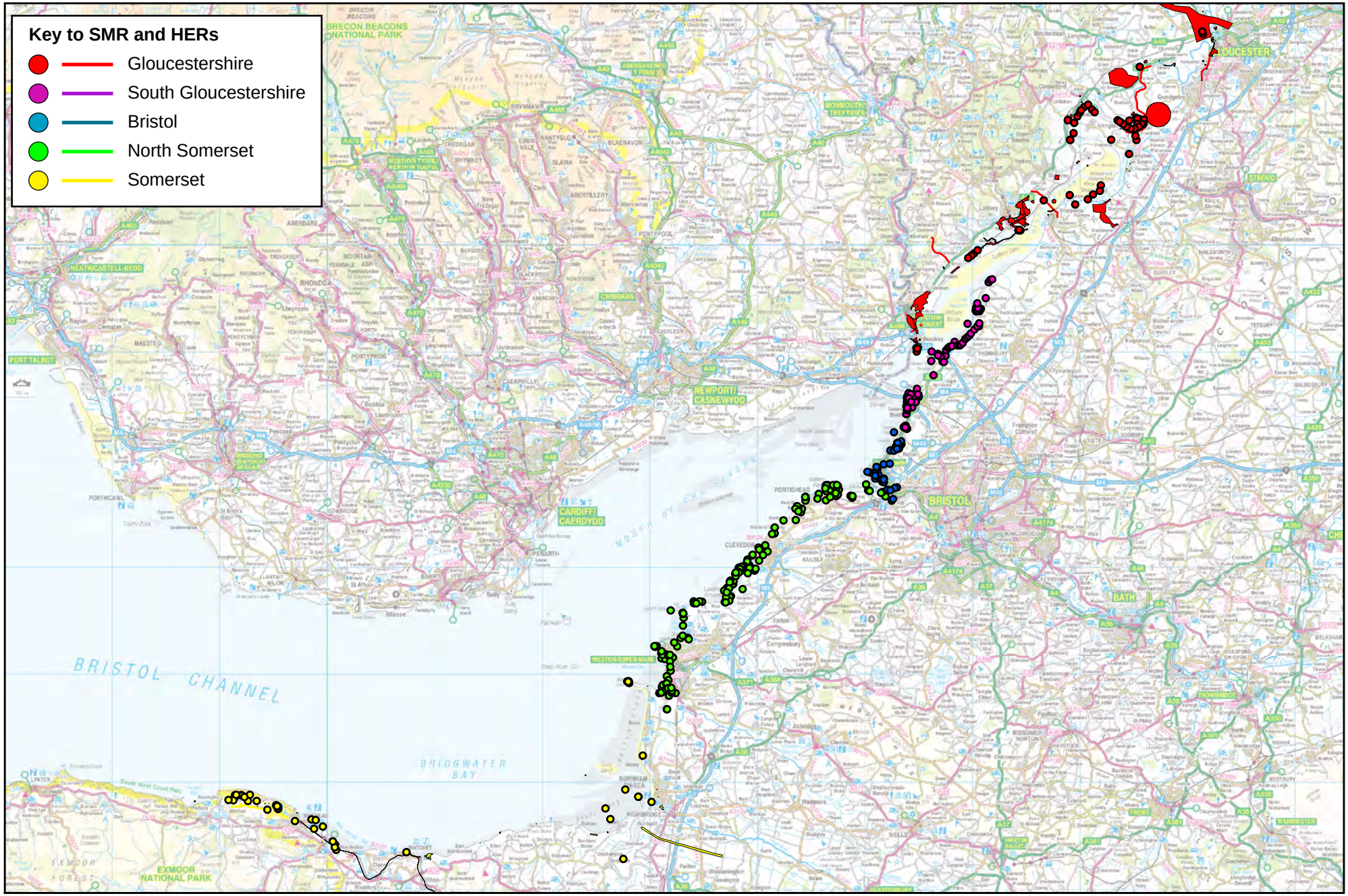

Figure 20: HER/SMR Data at beginning of project. Modern Period

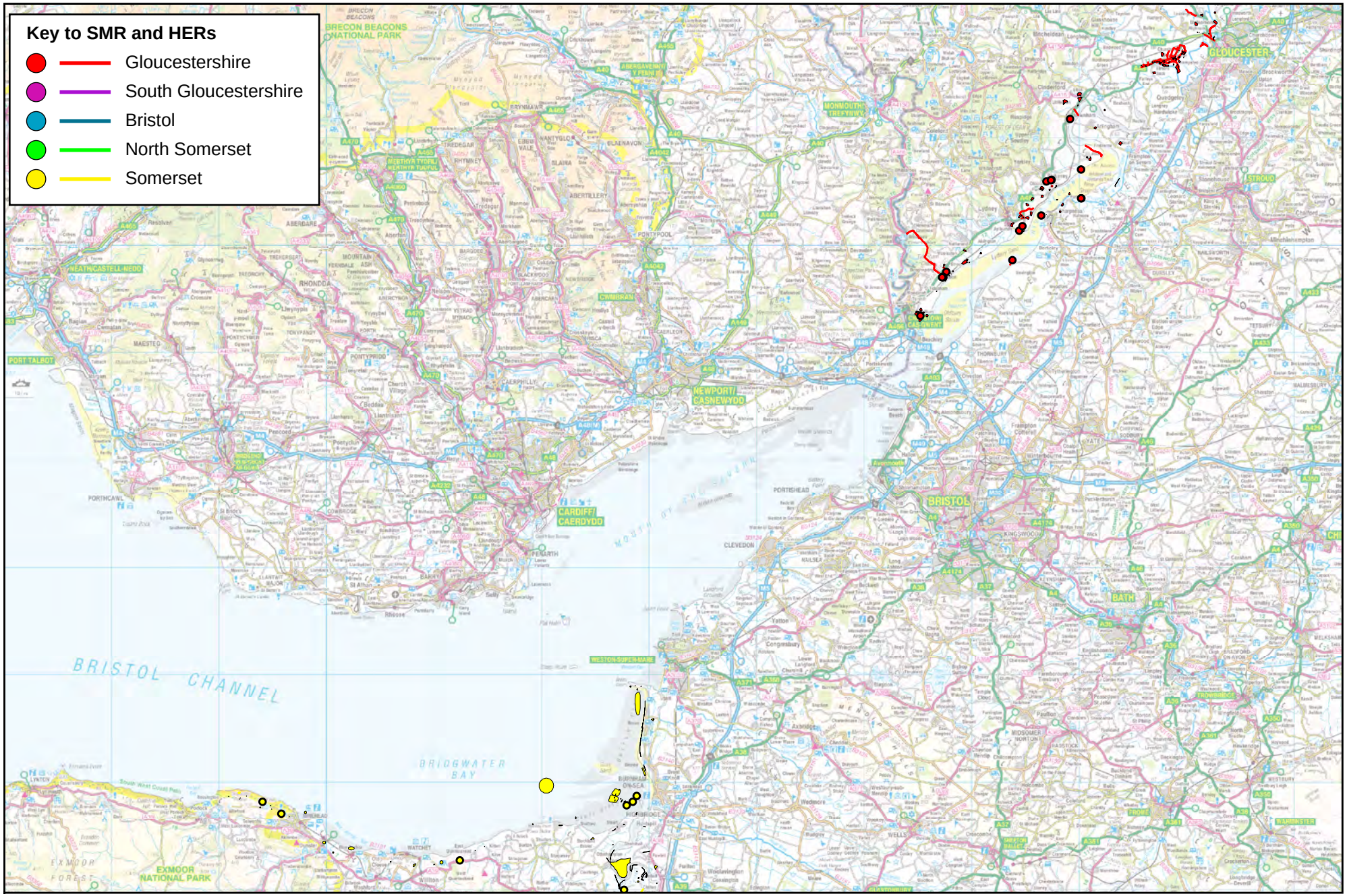

Figure 21: HER/SMR Data at beginning of project. Unknown Period

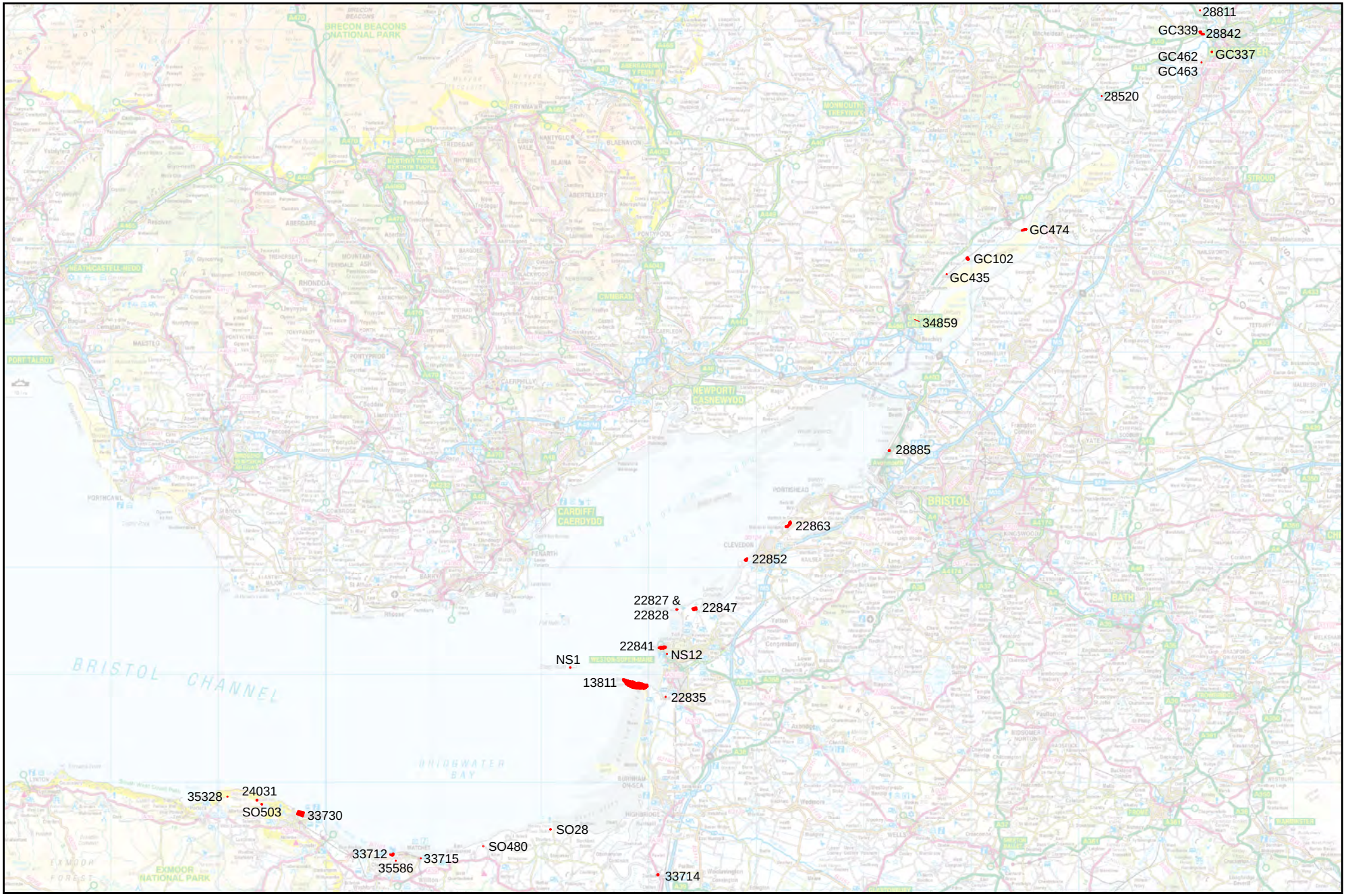

Figure 22: Scheduled Monuments within the RCZA survey area

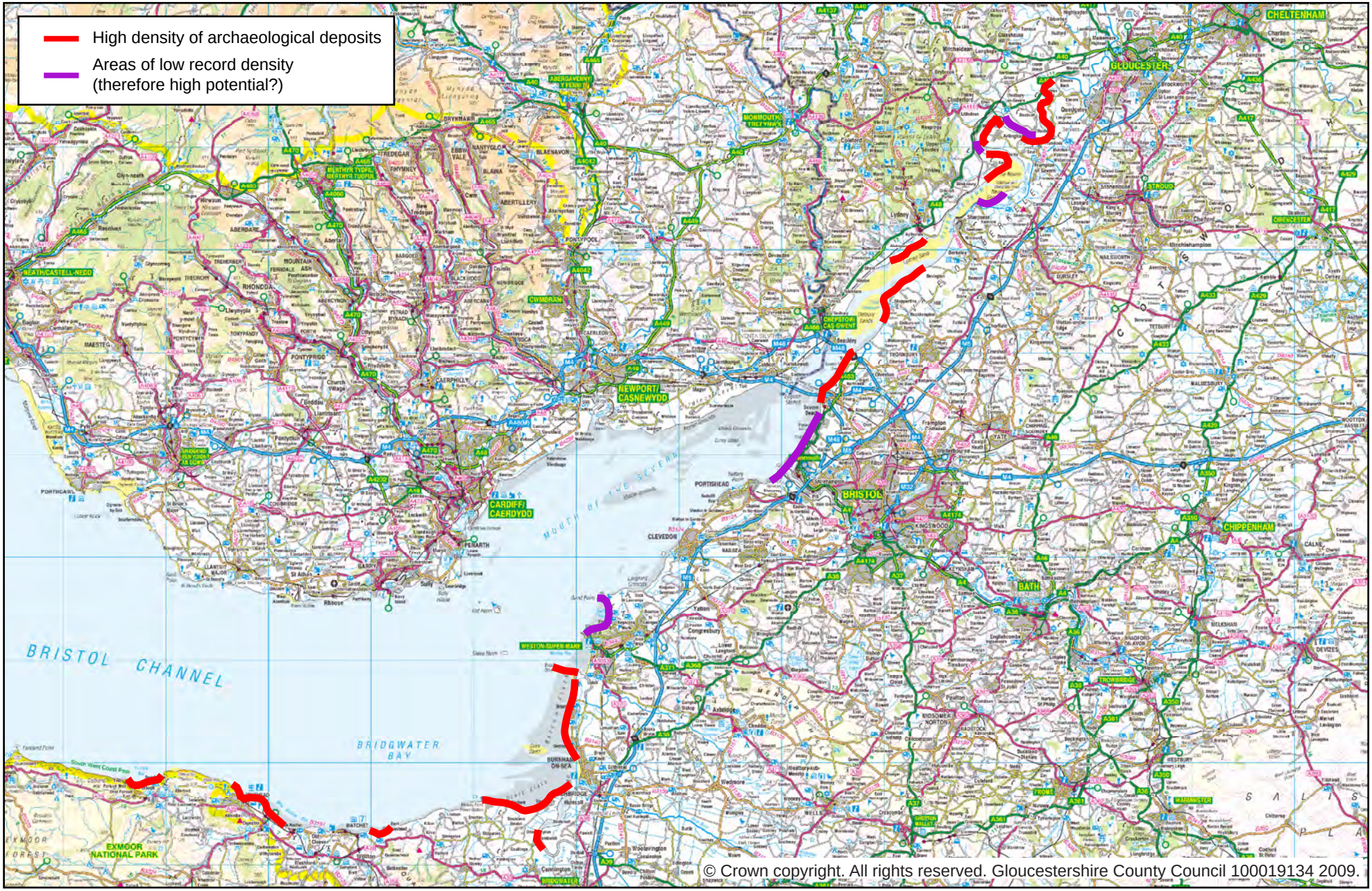

Figure 23: Areas with high and low densities of known archaeological deposits

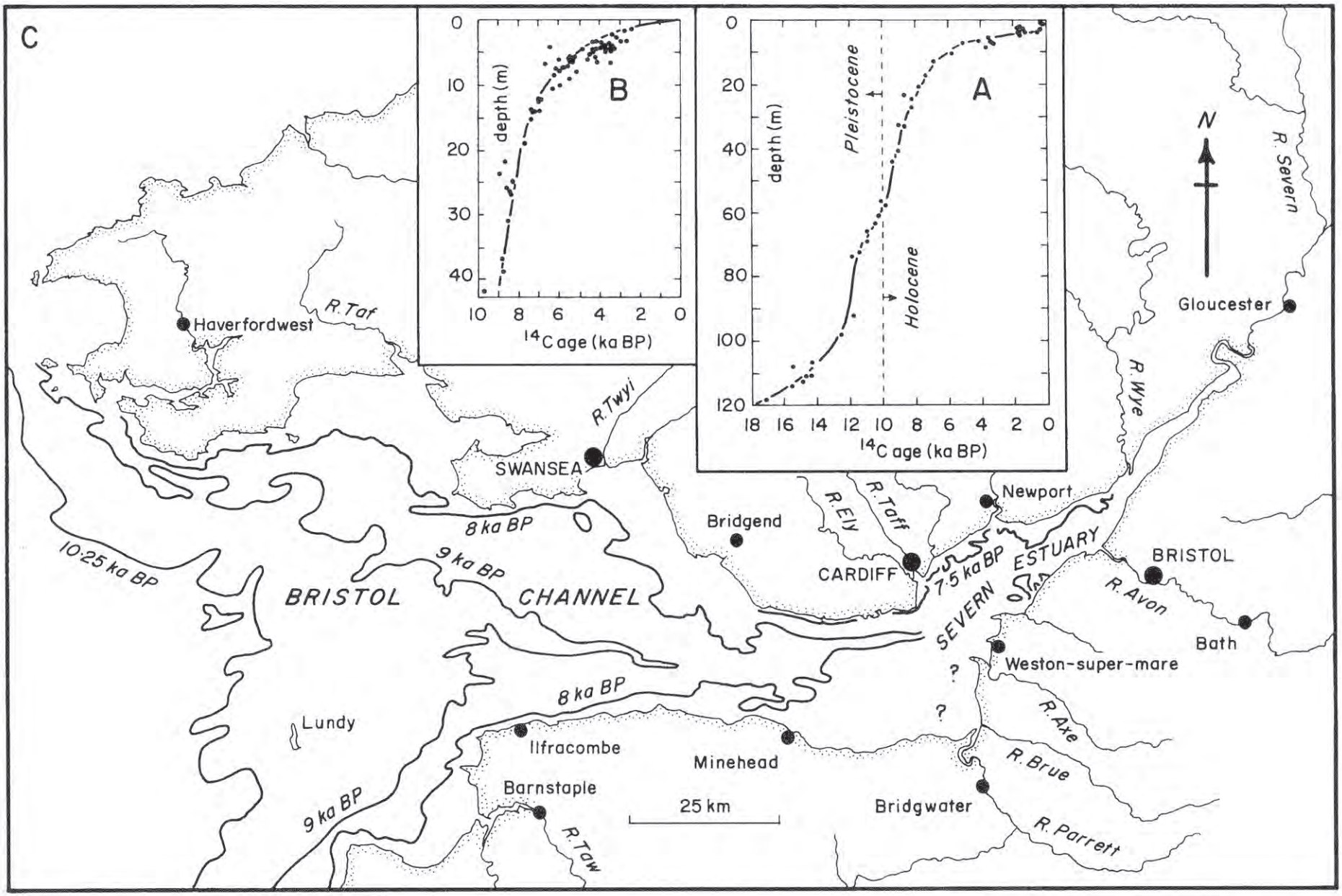

Figure 24: Post-glacial sea level rise (Allen 2001a, Fig. 4). A - Global rise from Devensian maximum. B - SW England from dated peats. C - Approximate shorelines.

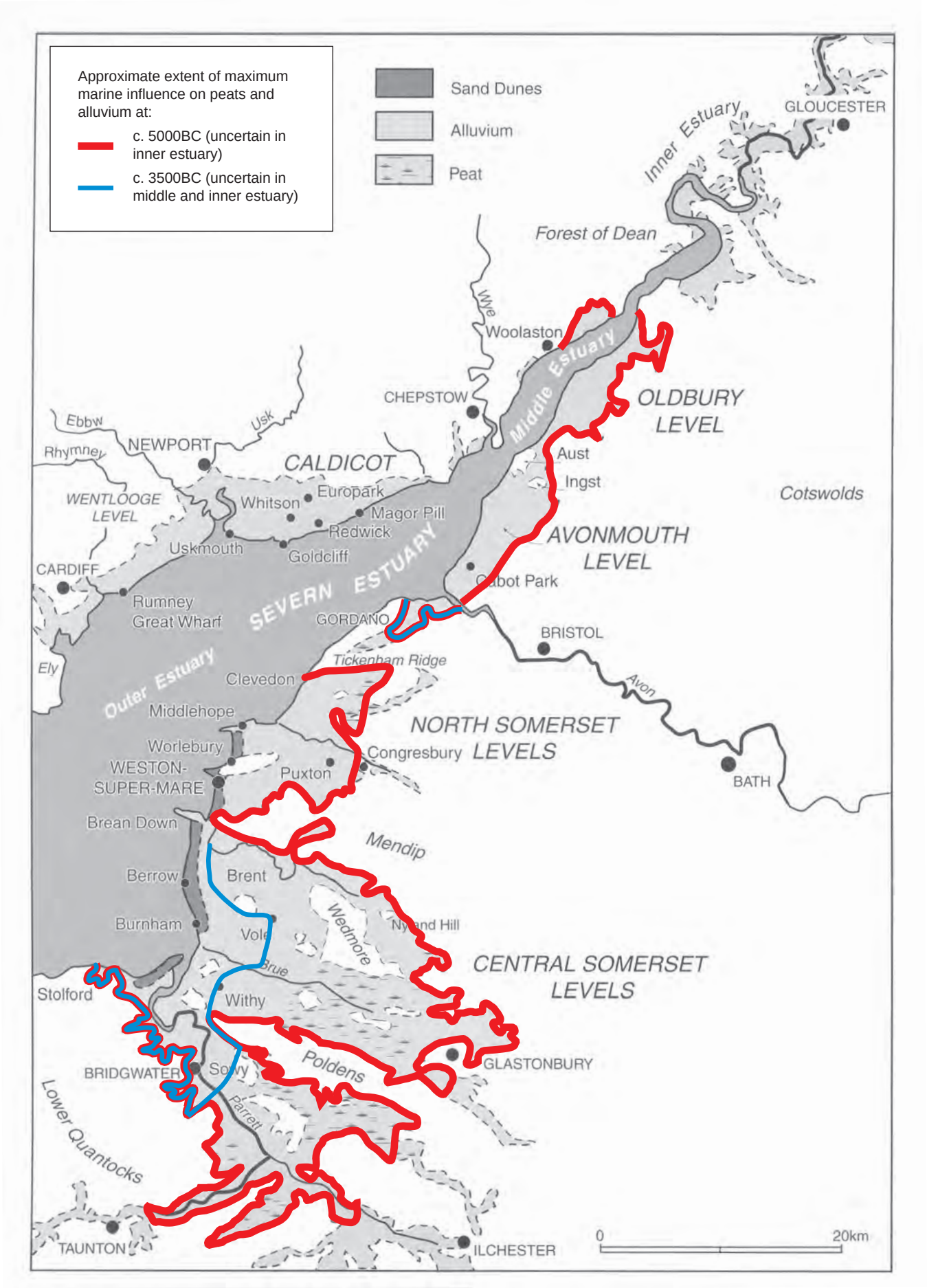

Figure 25: Late Mesolithic and Neolithic extents of marine influence
(Base map Turner *et al* 2001, Fig. 1)

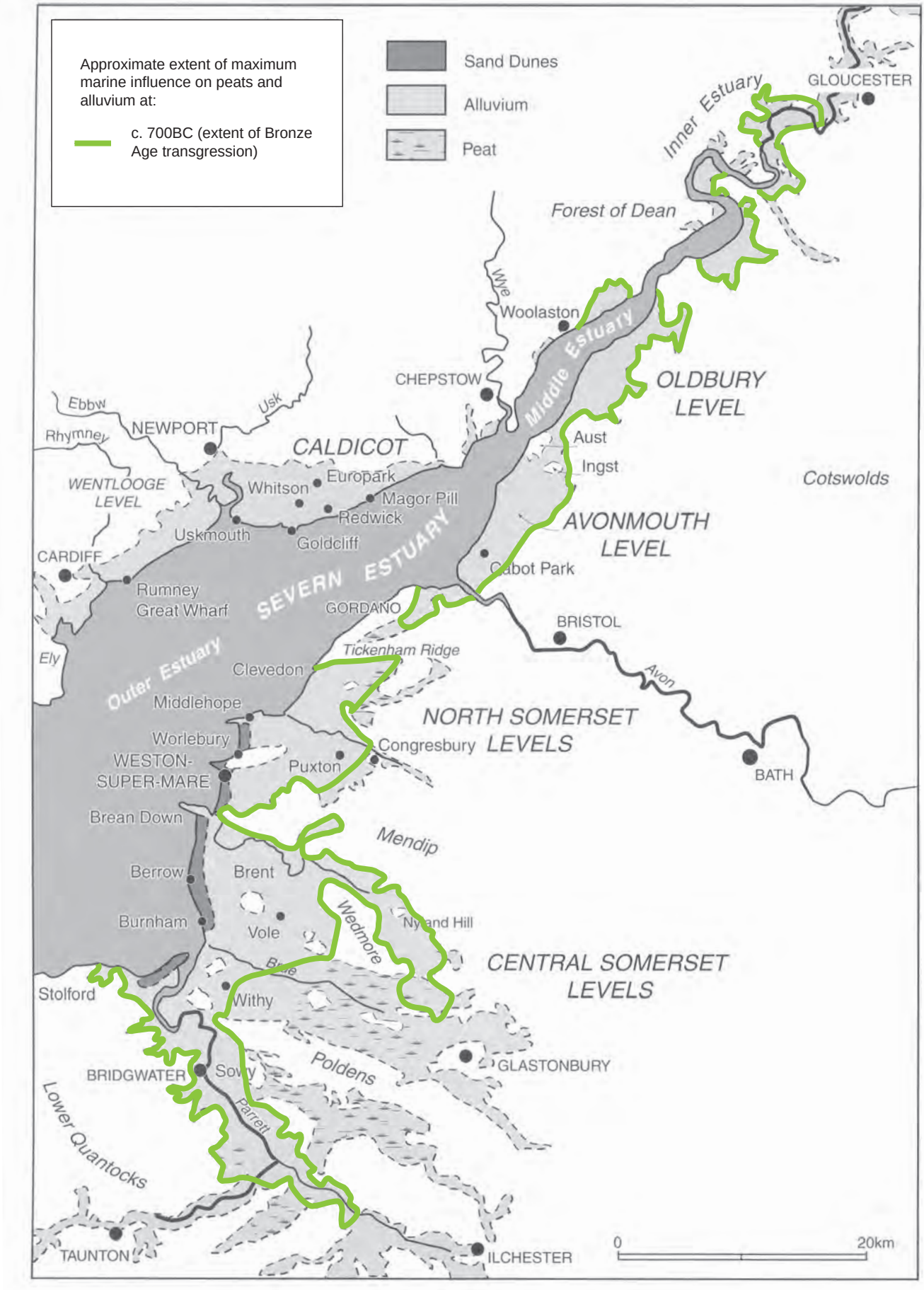

Figure 26: Extent of Bronze Age trangression
(Base map Turner *et al* 2001, Fig. 1)

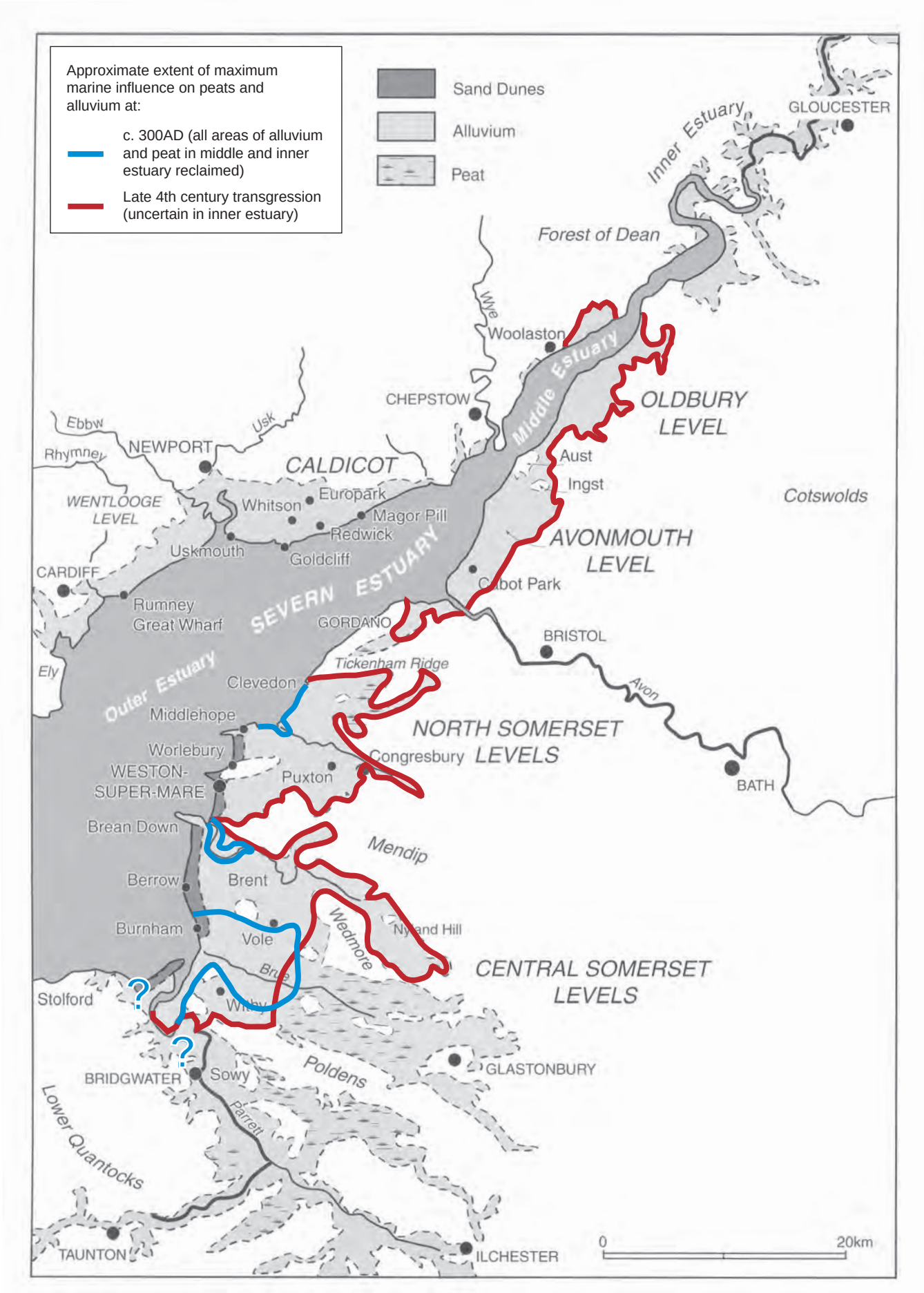

Figure 27: Roman period extents of marine influence
(Base map Turner *et al* 2001, Fig. 1)

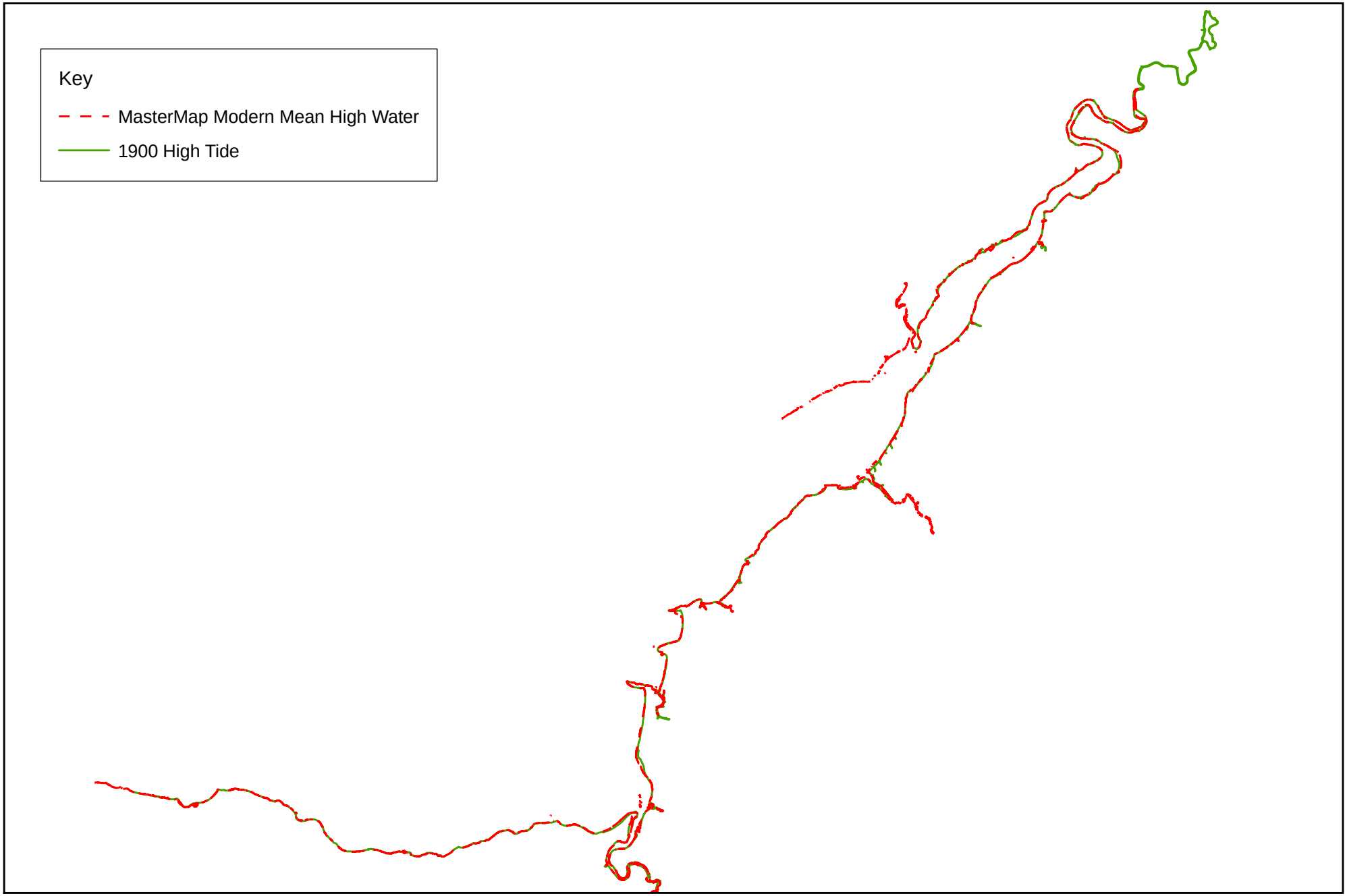

Figure 28: Modern and 1900 mapping of high tide

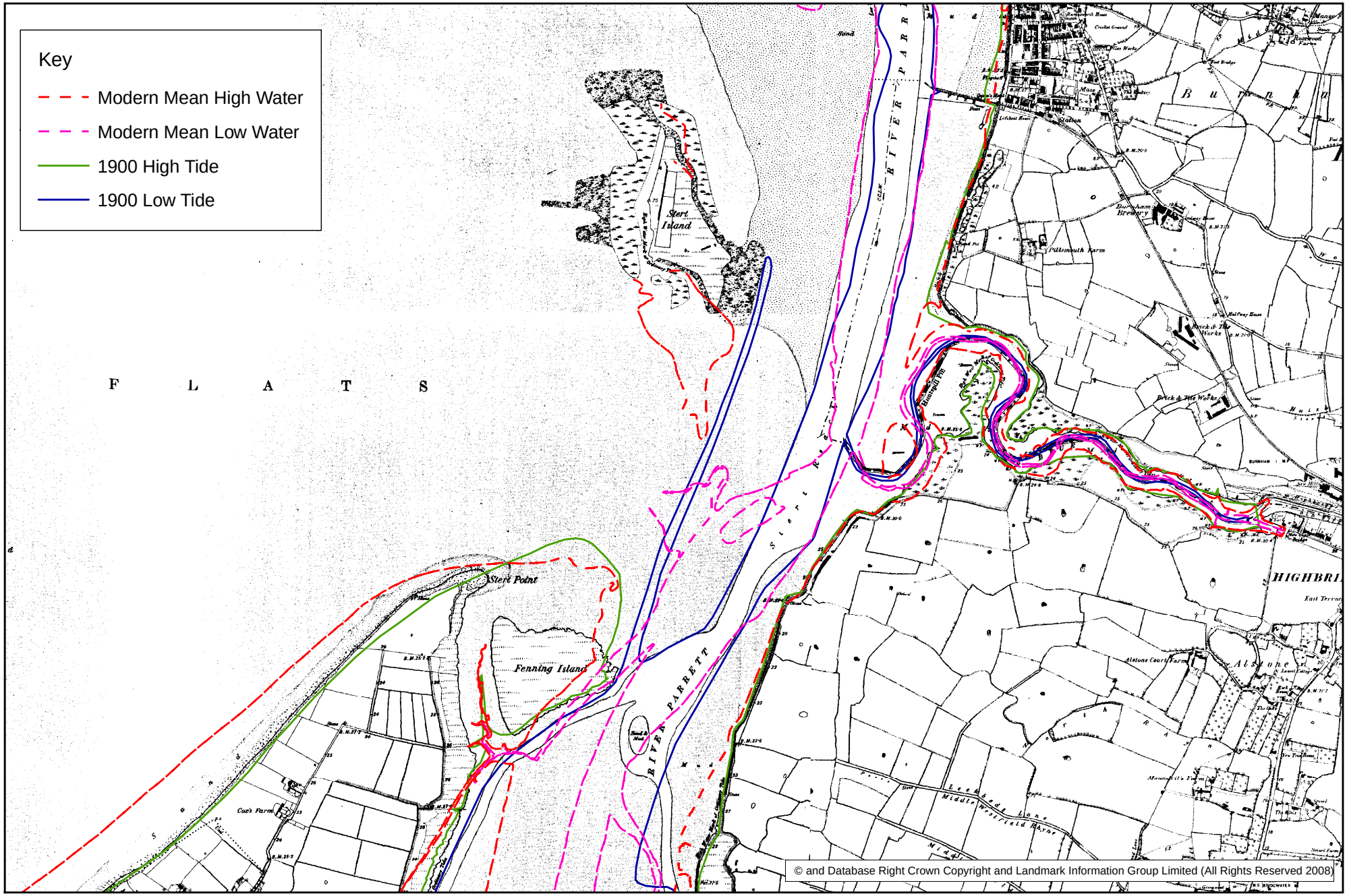

Figure 29: Changes to tidal range around Stert Point (base map 1880)

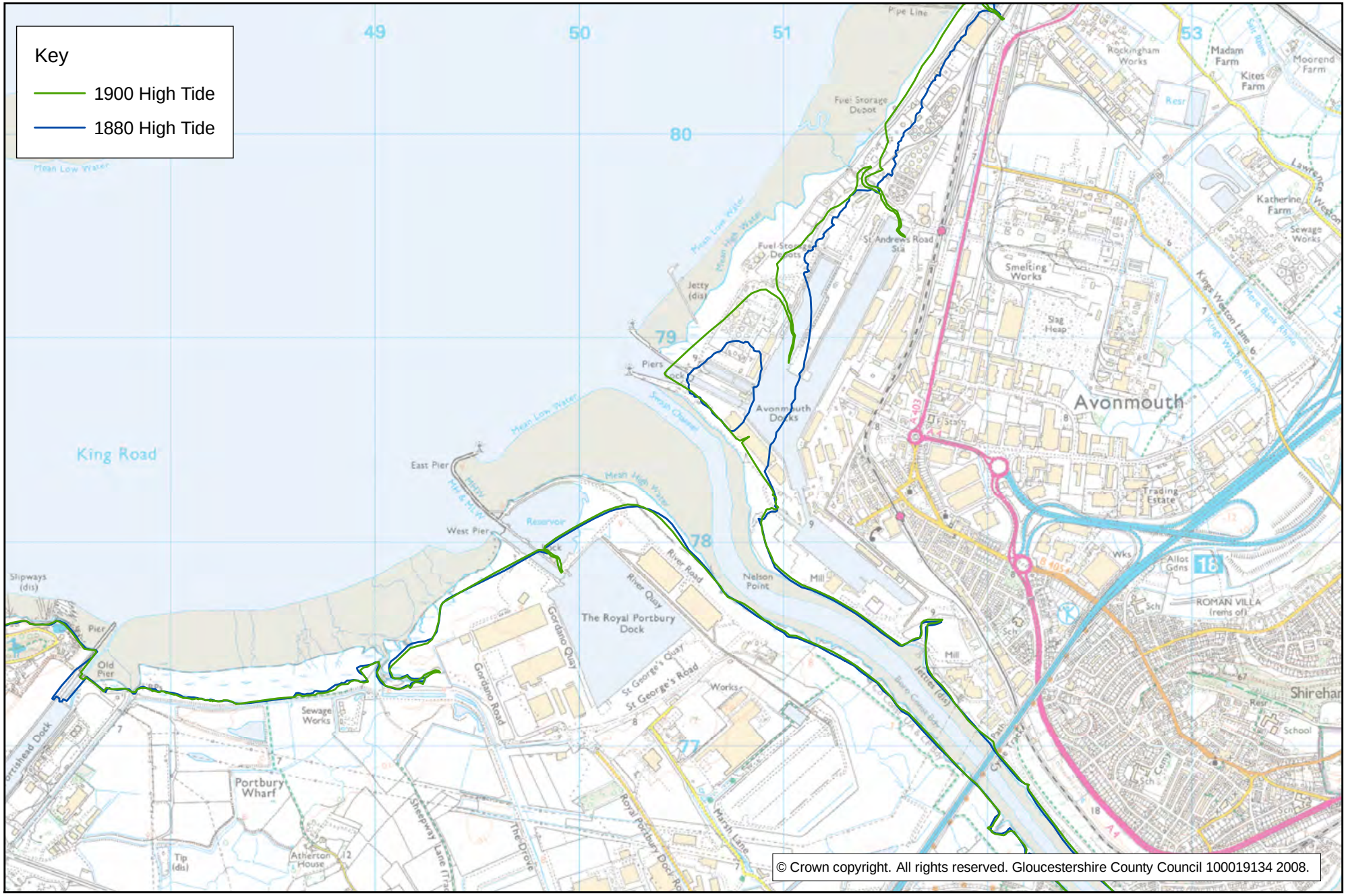

Figure 30: Changes to high water level caused by 20th century development at Avonmouth

0 500 m

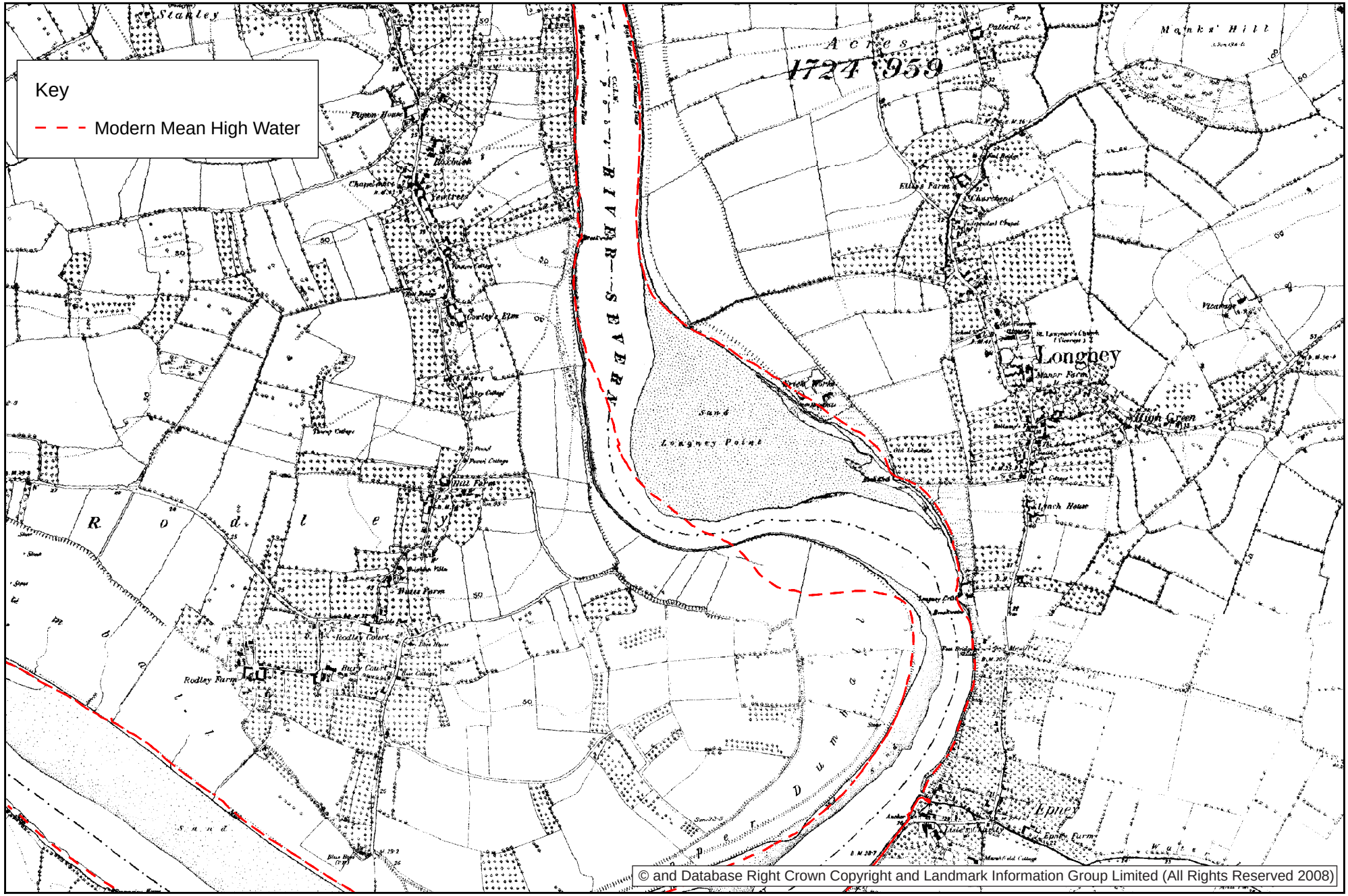

Figure 31: Changes to the course of the river between Rodley and Longney since 1880

0 500 m

Figure 32: FutureCoast: Areas of predicted coastal change (undefended)

Appendix A: Historic maps and charts consulted in Records Offices

Reference	Date	Title	Description	Notes	Assessment
Gloucester					
D149/T1004	1225	Grant of land in Frampton Marsh for 6 salmon putchers near Bukepul	documents only		low
D421 L8	1682	Map of the New Ground at Lydney described in 1682 by Richard Croft	document bundle relating to legal case between Bathurst and Jones over ownership		low
D6/E4	1700	Survey of Certain Estates belonging to Benjamin Hyett in the County of Gloucester	bound book of surveys showing boats, sandbanks and river walls		low
D326/L2	1721	Map of fisheries at Elmore and Framilode	shows Elmore and Epney weirs		low
D3398 1/1/33	1721	Fisheries in Elmore and Framilode	shows names of owners		low
D2998/1	1725	A Map of the Manor of Arlingham in the County of Gloucester	shows Arlingham peninsular	Boats shown on river	low
P152/IN 1/2	1738-9	Note about building Hock-Crib sea wall	documents only		low
P298 MI 10	1752	Agreement about land cast-up by the river at Slimbridge	documents only		low
D2426/P1	1757	Plan of the Estate of William Jones and John Guise	similar to D2426/P2 but less detail		low
P218a/MI1	1757	Plan of the Estates of Charles Barrow in the Parish of Minsterworth			low
Photocopy 283	1772	Map of the Estate at Dinny in the Parish of Minsterworth and Doodlings Farm in the Parish of Longney	shows sea wall on S bank of river and boats and fishermen		low
D326 E2	1774	Terrier of Lands Owned by William Jones and John Guise in Highnam, Over and Linton in the Parish of Churcham	inserted sketch map of lands adjoining River Severn		low
D149/P11	1800	Plan of New Grounds, Slimbridge	shows Frampton Pill and Slimbridge Warth		low
D134/P10	1825	Plan of the Hay-Hill Estate in the Parishes of Newnham and Awre	shows wharf at Bullo Pill but no detail of buildings etc		low

D272/9/2	1835	Map of the Lower Level of the County of Gloucester. The Lower Division	shows Avon Battery, Dundall Island and sea defences		medium
D272/9/3	1835	Map of the Lower Level of the County of Gloucester. The Upper Division	shows Bull Inn/Bullow Passage, New Grounds at Slimbridge and decoy pool at Hamfallow		medium
D2426/P2	1841	Map of the Highnam Court Estate in the parish of Churcham	shows Over Bridge, River Leadon and Hereford and Gloucester Canal		medium
MA19/41	1843	Chart of the Severn below Gloucester	navigation chart shows brick kilns at Longney, "ground newly warped up" at Slimbridge, East Point Fort at Avonmouth		medium
MA19/42	1850	Survey of the Severn by Capt. Beechly, RN, FRS	very detailed chart with fish weirs, piers, stakes shown	difficult to use as rolled	high
D1501	1860	Map of the Parish of Minsterworth in the County of Gloucester	shows fishery boundaries		low
D650/15	1861	Plan of the Parish of Slimbridge	shows "land in the course of being reclaimed from the Severn. Decoy Pool, breakwaters and old sea wall		medium
D18/406-425	1882	Arlingham Shores, showing situations of breakwaters immediately required	document bundle relating to Arlingham Shores	other documents relate to 18th and 19th century flood defence	low
D4170 1/1	1904	New Sea Wall at Bollow	document bundle with maps, specifications etc for the new wall		low
D421 E38	n.d.	Map of land adjoining River Severn	from Cone Pill to beyond Purton Pill	no scale	low
Bristol					
Bristol Plan/Arranged/245	1693	The River Avon from the Severn to the City of Bristol	shows vessels on the Severn, anchorages in the Avon and the place at which King William landed in 1690		low
38035 (BP244)	1794	New Improved Chart of the Bristol Channel			low
07787 (1) a.2	1832	England West Coast. Bristol Channel Inner Part	chart showing sandbanks etc	poor detail	low
31965 STG/14	1841	Plan of Parish of Burnham	shows Brue/Parrett confluence and "baths"		low

38035 (BP244)	1847	Chart from Dunball Island to Woodhill Bay			low
35192/x/12	1866	Certificate for Privileged Engines	documents and map of putchers at Chapel House		high
07787 (1) c.2	1868	Chart of part of the Bristol Channel	covers large area in little detail		low
31965 STG/81	1877	Somerset Drainage Act 1877. River Parrett Division	shows Steart Point, sea wall and pebble bank		low
07787 (1) b	1880	England West Coast. Bristol Channel King Road	shows Avonmouth and Portishead docks. Battery at Portishead Point and rifle range N of Avonmouth Hotel		low
07787/1d	1886	Charts of Bristol Channel		unfit for production	
7790/53	1895	Plan and Section of Portishead Pier			low
DocksPlans/Arranged/54	1905	Chart of Nash Point to New Passage		unfit for production	
41545/1	1933	England West Coast. Newport and Western Super Mare to Chepstow and Bristol		poor detail	low
41545/2	1934	England West Coast. Bristol Channel King Road	shows enlarged Avonmouth Docks		low
07783 (18) c/23	19th century	Sanitary districts in Somerset	drainage board map	poor detail	low
07783 (18) c/23	19th century	Sanitary districts in Gloucestershire	drainage board map		
248 (4)	19th century	Petition against act for erecting locks on the Severn		documents only	
40762/8	19th century	Nass Sands Lighthouse	engraving only		low
07787/1e	n.d.	Plans, charts etc of Bristol Channel		unfit for production	
07787/11	n.d.	Ordnance Survey showing tides in river		missing	
32835	n.d.	Aust Ferry	documents from 1631, 1656 and 1732	documents only	
00546 (62)	n.d.	Plan No.3 Portishead Docks	low detail		low
39290/FW/LN/17	n.d.	Chart of Bristol Channel from Arrowsmiths Tide Table		poor detail	low

40145/ph/9 (l)	n.d.	Map of Port of Bristol	limits of Port and Harbour of Bristol		low
5139 (29B)	n.d.	Indenture	mentions fisheries	documents only	
4480	1736 - 1743	Maps and Plans "Surveys of the several City Lands belonging to the Chamber of Bristol"	fiche of maps including Redwick, Northwick and Portbury, also some Gloucestershire property.	shows seabanks on River Banwell	medium
Taunton					
D/RA		Somerset Rivers Authority	records from 18th century onwards: 135 boxes, 100 volumes, 101 rolls and 30 glass negatives in collection		
T/PH/gc 11	1714	Porlock Manor Court Book 1705-1717	agreement for the erection of sea walls 1714	documents only	low
D/RA/5/1	1867-1925	Avon, Brue and Parrett Fisheries District Acts and Orders	description of numbers of putchers on the Severn and Parrett	documents only	low
D/RA/2/9/34	1907	Royal Commission on Coastal Erosion 1906-8	describes sea defence work at Steart 1927, Burnham sea walls and RAF bombing range at Stert	documents only	low
D/RA/1/2/59	1907	List of works in Sand Bay	commissioned by the Coastal Erosion Committee, 1907	documents only	low
D/RA/9/24	18th century	bundle of copies of maps	includes copy of 16th century map and other 18th century maps		medium
D/RA/1/1/19	19th century	Tide Basin in the River Parrett	detailed plan of locks, docks etc on Bridgwater and Taunton Canal Navigation	not in study area	low
D/RA/1/2/124	19th century	Survey of the Yatton Jury of Sewerers	list of people responsible for maintenance of sea wall in Yatton, Brockley, Chelvey, Backwell, Kingston Seymour and Kenn	documents only	low
DD/WO	1802	Map of St Decuman's	Bristol Channel at N of map		low
DD/X/LTR1	1687	East Quantoxhead	Copy of map. Shows boat on river	poor quality reproduction	low
DD/X/WBB	1815	Uphill	Shows public wharf at end of "The Pill"		low

D/RA/2/9/10	early 20th century	bundle of maps, plans and surveys	erosion at Steart 1902, 1922 and 1928	good quality drawings	medium
DD/PT	1780	Kenn and area	shows feature labelled "west wharfe wall to keep back the spring tides"	good , early drawings	medium
DD/SAS H/528/1	19th century	Sea defences at Dunster	plan and section of wooden pile sea defences		medium
UKHO					
804	1815		survey of channel to Gloucester	no archaeological detail	low
Sailing directions	1839	Sailing Directions for the Bristol Channel	descriptions of charts surveyed by Commander Denham and Captain Beechly		
L4505	1845		re-survey of the Severn by Beechly	no archaeological detail	low
L7314	1847	Rough of the Bristol Channel	Clevedon to Aust surveyed by Beechly		low
L7315	1849	Survey of the Bristol Channel by Beechly	see MA19/42 in GRO		high
L7316	1849	Severn to Tewkesbury	surveyed by Beechly		low
L9785	1853	Original Rough of the Port of Bridgwater	survey by Alldridge. Shows submerged forest off Stolford, fishing weirs etc		medium
E9629	1953	Flatholm to Portishead		no archaeological detail	low
K3647	1962	Avonmouth to Sharpness	soundings only	no archaeological detail	low
H1430/72	1971	Portishead foreshore	soundings off Portishead	no archaeological detail	low

E143/2	19th century		shows warren house at Steart and Steart Point as 3 islands	otherwise poor on archaeological detail	low
E143/3	19th century				low
B4435			soundings in the middle of the channel	no archaeological detail	low
L7313			surveyed by Beechly	no archaeological detail	low