

KIDWELLY and PEMBREY MARSHES

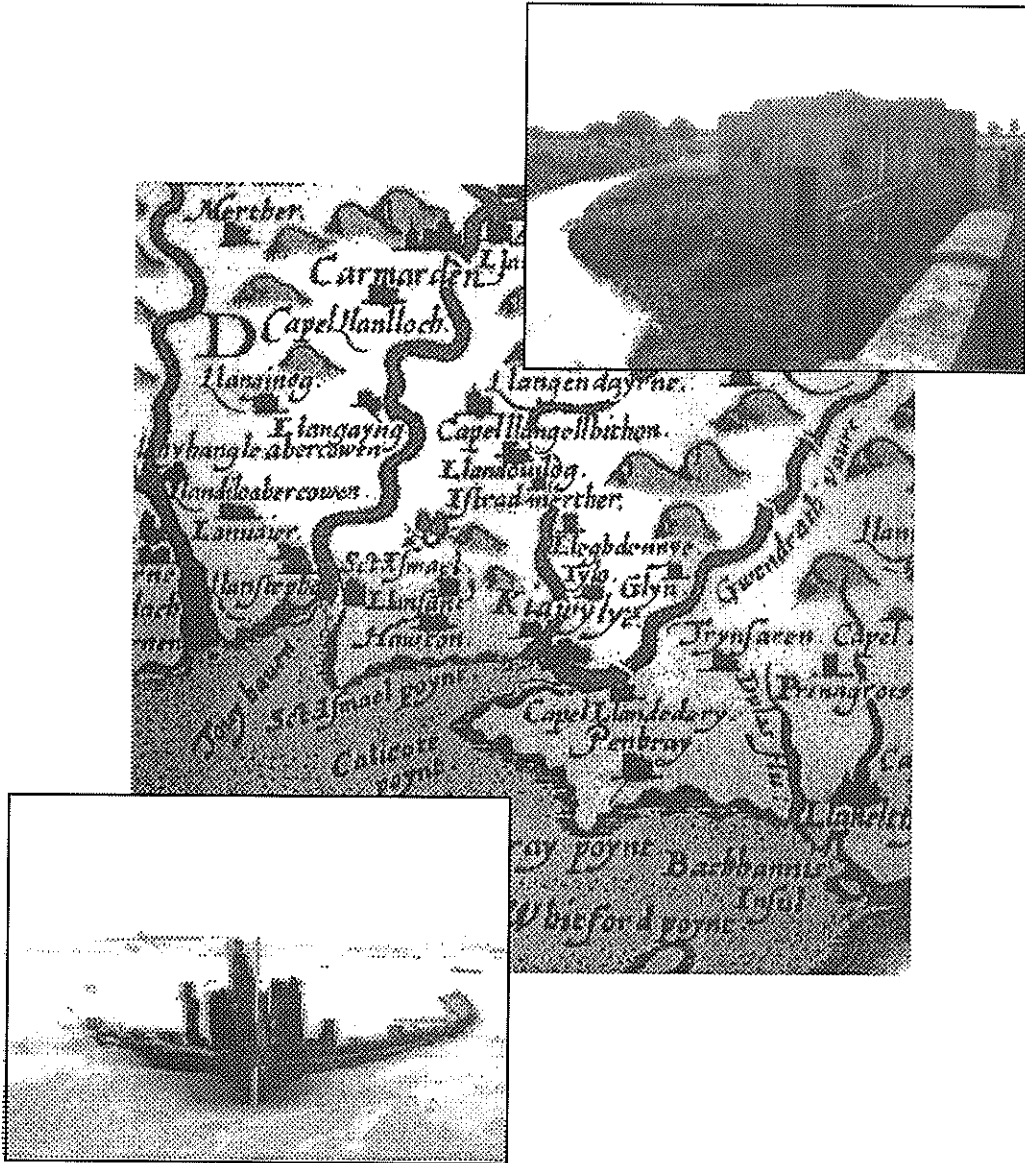
ARCHAEOLOGICAL ASSESSMENT of a WETLAND LANDSCAPE

by

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March 1996



DYFED ARCHAEOLOGICAL TRUST

Dyfed Wetlands Survey Part 1

grant-aided by

Cadw: Welsh Historic Monuments

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KIDWELLY - PEMBREY

MARSHES

ARCHAEOLOGICAL ASSESSMENT OF A WETLAND LANDSCAPE

Much of the survey area is relatively recent in both geological and historical terms. Coastal change in Carmarthen Bay has been dramatic, and rapid change continues. The Laugharne, Kidwelly and Pembrey Marshes and the estuaries of the Taf, Tywi and Gwendraeths Fawr and Fach have been proposed as a Grade I landscape of exceptional and great historic interest. An important feature of the area's present day landscape is its legacy of early industrial transport systems - canals, railways, shipping places - products of the export demands of the inland coal industry. It is appropriate now, in the closing years of the 20th century, to recognise, as this report demonstrates, the modern changes - military, afforestation and leisure. The Pembrey and Kidwelly Marshes contain remarkable archaeological evidence of this period which has overlain, but not removed, earlier traces of land use. The special landscape of the Pembrey and Kidwelly Marshes deserves better recognition, enhancement and protection.

INTRODUCTION

The importance of wetlands as areas of high archaeological potential has been recognised since the discovery of the Swiss lake villages in the mid 19th century. Early wetland investigation in this country was started with the intention of discovering similar sites in Britain. The early investigators did discover waterlogged settlement sites like the one at Glastonbury Lake Village, discovered by Arthur Bulleid in 1870 (Coles and Minnitt 1995, 5-9) in the Somerset Levels and the crannogs or lake-side villages in Holderness, Humberside, (Davies and Van de Noort 1993, 46) during the later 19th century. These discoveries confirmed the potential of the wetlands for producing exciting archaeological finds. Since then continued work in wetland areas of Britain has produced many important archaeological finds, including the Neolithic Sweet track, Somerset; Bronze Age boats from North Ferriby, Humberside; Iron Age huts from Goldcliff, Gwent, and the Roman and medieval boats from the Severn Estuary, Gwent.

IMPORTANCE OF WETLAND ARCHAEOLOGY

Undoubtedly the principal importance of the wetlands is the survival of forms of evidence not recoverable from dry sites, namely organic materials, such as wood, cloth, leather and in some cases human bodies. The matrix in which such material is found is itself of archaeological significance as it contains contemporary palaeoenvironmental evidence, such as pollen, macroscopic plant and insect remains, preserved by the anaerobic conditions present in the wetland deposits (Coles 1995, 1; Van de Noort and Ellis 1995, 1). The recovery of this type of

evidence means that a wider study base is possible for investigation of wetland sites than it is for most dry sites, giving a more integrated and fuller understanding of past activity on the site. Wetlands are, by definition, areas of waterlogged ground, and can occur anywhere, for example they can be river floodplains, small areas of localised bog, old mill ponds, leats and moats. All have the potential to produce waterlogged artefacts and palaeoenvironmental evidence, and they should be borne in mind during archaeological investigations away from the more obvious coastal wetland areas of intertidal zones and reclaimed marsh land.

The significance and potential of wetland archaeology has long been recognised in England where a systematic investigation of the four major wetland areas began in 1973 with the Somerset Levels. In 1976 the Fenland Project was started to investigate the wetland areas of, Cambridgeshire, Lincolnshire and Norfolk; this was followed in 1989 by the North West Wetlands Survey. The final area was the Humber basin; work began in 1992 and is due to continue until the turn of the century (Van de Noort and Davies 1993, 1-2; Wainwright cited in Coles 1995, vii).

IMPORTANCE OF WETLAND LANDSCAPES

There has been a tendency for archaeologists to concentrate on buried sites, finds and landscapes of the wetlands to the detriment of the study of their surviving present day landforms and landscape components. This bias is understandable in terms of the richness of the buried archaeological resource and threats to its survival.

The present day landscape is in many cases no less fragile or vulnerable to piecemeal changes and development, and often wholesale obliteration, than the buried resource. This report could not attempt a total landscape study, on the lines of the Gwent Levels Project (Rippon 1996), but many of the archaeological sites and features are in themselves major "components" of the present day landscape.

This report also attempts to address the question of how this very particular landscape is perceived by those who own and manage it. In the full flush of enthusiasm for "improvement" in agriculture, Charles Hassall, writing in 1794, could calculate the expense of embanking "these valuable tracts of land" at a mere 2/8 per yard. In more recent times such enclosed and drained land has been seen as low value flatlands suitable for light industrial type development. It is also a matter of concern for archaeologists and landscape historians that they have failed to match the wildlife bodies in raising the conservation profile of wetland landscapes. The success of Pembrey Country Park will, it hoped, offer opportunities for sympathetic uses and management of the wider Kidwelly and Pembrey Marshes landscape that recognises the interest and value of its history and archaeology.

PROJECT COMMISSION

This archaeological assessment and rapid survey project was grant-aided by Cadw: Welsh Historic Monuments as part of their funding arrangements for rescue archaeology in Wales. It is hoped that it will be the first of a series of similar projects to study the archaeological potential of the wetlands of west Wales. In southeast Wales tremendous advances have been made in the last decade in demonstrating the archaeological richness and potential of the intertidal areas of the Severn Estuary. Such studies are inextricably linked to the coastal mudflats, saltmarshes and reclaimed land of the Severn Estuary shores. In the support of the preparation of a register of Historic Landscapes in Wales Cadw and the Countryside Council for Wales commissioned a detailed characterisation and assessment survey of the Gwent Levels (Rippon 1996). Concern has been expressed that a lack of comparable studies of other areas of wetland in Wales might lead to an imbalance in our recognition of the importance of such historic landscape types and their particular archaeological potential across Wales as a whole.

Dyfed Archaeological Trust therefore submitted a proposal for an assessment and rapid survey project of the Pembrey and Kidwelly Marshes as an initial "wetlands survey" for west Wales. The Pembrey and Kidwelly Marshes were chosen because they comprise as distinctive and particular a landscape type as the Gwent Levels. Although some work has been done on their history and archaeology, there had been no systematic identification and mapping of sites and landscape

features. Without this type of assessment pressures on the archaeological resource and proposals for protection, management and enhancement cannot be fully determined. This project constitutes a more preliminary assessment than that carried out on the Gwent Levels, but it is hoped that the results will be comparable.

PROJECT OBJECTIVES

The main aims of the project were:

To identify, record and evaluate the archaeological resource.

To characterise the principal landscape types in historic landscape terms.

To identify the pressures, current and potential, that may have an adverse affect on the archaeological resource.

To make recommendations for the protection of individual sites and features, and on ways of developing overall archaeological protection and management strategies.

To produce a report on the completion of the project summarising the above.

The enhancement of the Sites and Monuments Record (SMR) with detailed site information.

[The SMR is a regional archaeological record forming part of ENDEX (the extended national archaeological database) supported by the Royal Commission on the Ancient and Historic Monuments of Wales]

METHODS EMPLOYED DURING THE PROJECT

These are described in some detail in order to indicate the limitations as well as the extent of research and fieldwork. A significant aim of this project was to develop working methods and techniques for future wetland surveys. Although not included in this report, the time taken and the productivity of different project tasks have been recorded and analysed, and will result in more efficient working for future surveys. Equally, time taken in making initial contacts with the relevant agencies - in this case Llanelli Borough Council, the National Rivers Authority and the Ministry of Defence - will not have to be totally replicated in the future.

PROJECT LOGISTICS

The principal problems were those of access and position fixing. Access to the foreshore and intertidal areas were naturally determined by the tides; advantage was taken of low water spring tides. Saltmarshes crossed by large, deep creeks and numerous channels are difficult to

deep creeks and numerous channels are difficult to survey systematically. For safety reasons it was essential that there were always two fieldworkers present during visits to the saltmarshes. The reclaimed marshlands are still characterised by open drains, albeit in a state of decay, which can present difficulties, even when permission to survey farmland has been obtained. A considerable part of the survey area lies within an active RAF bombing range so has very restricted access. In areas with few, or no, identifiable reference points such as, Pembrey Forest, the dunes and foreshore of Cefn Sidan Sands, there were problems of accurately plotting the position of sites and features. Some of these problems are specific to the survey area whilst some apply to coastal and wetland surveys in general. Vehicular access was sought wherever possible and practicable to minimise on time taken walking to a survey site.

LIMITATIONS AND BIASES

The use of the term assessment makes it clear that no exhaustive search for and study of historic documentary and cartographic sources, aerial photography and secondary sources could be undertaken within the constraints of the project. However, sufficient assessment of the totality of the available source material has been made to indicate where further work might best be directed.

A non-intrusive study of a wetland environment has the limitations of a desk-top study with its inbuilt biases towards the written record of the historic period, especially the later historic period, as well as the added effect of alluvium masking earlier features. Whilst the bias towards the written records of the later historic period can be partially offset by extensive fieldwalking there is no way of overcoming the masking effect of the sediment without sub-surface sampling.

Dyfed Archaeological Trust has also benefited in terms of developing methodologies for coastal and wetland recording through a recent pilot project in maritime recording in Carmarthen Bay organised by the Trust for RCAHMW (Gale 1995).

All wetlands are, as Bryony Coles notes, dynamic ecosystems (Coles 1995, 12) and this is clearly shown within the survey area where it can be seen to be continuously evolving. The movement of sediment within the study area is a rapid process. For example, the wreck of a ship, the *Jessie*, carrying bricks from Cornwall to Llanelli was exposed in Carmarthen Bay during 1993, but in a matter of days it had been re-covered by sand (James 1993, 94). An indication of the continued movement of sediment within the area is the northwesterly growth of Towyn Point by nearly 4km since the middle ages (James 1991, 160), and the continued growth of the salt marsh north of the airfield and around the old harbour at Pembrey.

Rapid sedimentation in the area is not new. The port of Kidwelly declined during the late 15th century and early 16th century due to the choking of the Gwendraeth channel (Williams 1978, 63; Morris 1990, 14). Similarly, the owners of Pembrey Harbour (opened in 1819) had recurring problems with silting only 5 years after opening. Scouring reservoirs had to be constructed to sluice silt from the harbour at low tide (Nicholson 1991, 124, 135). Today the scouring reservoirs are silted up and grassed over, and the harbour itself is salt marsh. All this means that the "free sections" or cuttings available in the sides of tidal creeks and pills and in marshland drains may not represent a very great time span in the sedimentary history of the area.

PROJECT BREAKDOWN

The project broke down into four main phases which are summarised below.

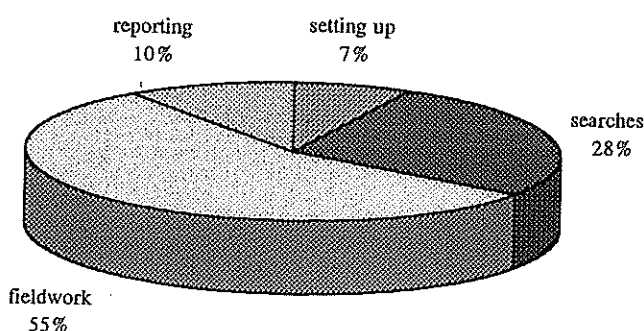


Fig. 1 breakdown of project tasks

Pre-fieldwork

This comprised the extraction of existing records from the Sites and Monuments Record. It was known before the project commenced that the archaeological resource of the survey area was poorly recorded and underrepresented in the SMR. It was therefore essential to augment this information at an early stage by analysis of those first and second edition Ordnance Survey 1:2500 and 1:10560 maps which form part of the SMR. This enabled possible sites and features to be assigned Primary Record Numbers (PRN). All other SMR information was summarised on the project's working maps prepared for use during the fieldwork.

Fieldwork

Efficiency in the pre-fieldwork phase enabled the fieldwork phase to comprise the largest element of the project, as intended from the outset. The field work can be described as rapid survey aimed at identification, classification and description of sites and features. Primary recording of all new sites and features was directly onto SMR record forms. Selected sites and

features were photographed in both monochrome and colour slide, 35mm. Site notes were kept during all visits, and all sites were plotted onto the working maps.

Documentary searches

Documentary searches were carried out to provide further information on known sites, identify and provide contemporary and secondary information on new sites and to provide an overall framework for study of the development of the area. Throughout the project, the fieldwork and documentary searches were intended to complement each other; both constantly provided information which opened new avenues of research in the other. This led to a fairly flexible approach to data collection allowing constant reappraisal of the collected data.

Reporting

This report aims to describe and summarise the objectives, structure, methods, limitations and results of the project. It is intended to circulate this report to all agencies and institutions active in the area. As many of these will not be primarily concerned with archaeological interests it is hoped that enough introductory and background information has been included for the nature and significance of the archaeological resource to be appreciated. Equally the report endeavours to evaluate the archaeological resource of the area in national, regional and local terms. However, this can only be on a provisional basis in the absence of more detailed work within the area and within the region to provide valid comparisons.

COMPLEMENTARY STUDIES

The project was designed to complement other studies carried out by DAT in SE Dyfed which concentrated on the historic industrial utilisation of the mineral resources - limestone, gritstone, silica, coal - (Murphy and Sambrook 1994; Sambrook 1995) and the current threat posed by continued extraction (Sambrook and James 1995).

ACKNOWLEDGEMENTS

The Trust gratefully acknowledges Cadw's support for this project, and the interest and advice of Rick Turner, Inspector of Ancient Monuments with responsibility for Dyfed, provided at its inception and during site visits. Grateful thanks also go to a number of institutions and individuals who provided valuable help and assistance throughout the course of the project: Staff at the Central Register of Air Photography for Wales, Cardiff, for guiding us through the vast coverage of the area; Mike Scott of Forest Enterprise for arranging unlimited access to Pembrey Forest and for showing us around; the interest in the project shown by the Head Ranger and staff of Pembrey Country Park, both in general and in regard to conservation of monuments during felling and

planting was of great encouragement; Flight Lieutenant J S Tayler, Officer Commanding, Royal Air Force Pembrey Sands, for organising access to the live air weapons range, and his range workers for their on-site advice "don't kick the blue ones". As usual other Trust staff gave freely of their time and knowledge to discuss issues and new sources of information.

THE SURVEY AREA

THE SURVEY AREA: EXTENT AND LIMITS

The survey area covers c.3,700 hectares (c.9,143 acres) of low-lying land (generally below 10m OD) between Pembrey and St Ishmael, Dyfed. The limits of the survey area were Pembrey Harbour in the southeast, mean low water mark on the south, west and northwest, St Ishmael's church in the north and Spudder's Bridge to the northeast (Fig 2). Within the survey area there are five distinct land-type zones, saltmarsh; reclaimed marsh; intertidal; forested dunes and un-forested dunes (Fig 2).

THE LANDSCAPE OF KIDWELLY AND PEMBREY MARSHES: NATURAL PROCESSES AND HUMAN ACTIONS

GEOLOGICAL BACKGROUND

The geological and sedimentary development of the survey area has been discussed elsewhere (Archer 1968; Kahn 1968; Jones 1977; James 1991) and this discussion relies heavily on those works. There is no intention to duplicate what has already been covered in these publications but it is important to summarise from existing information the coastal development since the later prehistoric period. For clarity the survey area will be split into two areas, north and south of the Gwendraeth Estuary.

South of the Gwendraeth Estuary

Borehole data has shown that south of the Gwendraeth channel the survey area comprises a great depth of blown sand deposits (up to 30m) overlying preglacial layers, bedrock or pleistocene clays (James 1991, 144). This blown sand has, over time, been formed into the vast Towyn Burrows and Pembrey Burrows dune systems which form the seaward protection for Pembrey Marsh. The dunes are generally aligned parallel to the present coastline in a sequence of regressive shore faces (Archer 1968, 164; Jones 1977, 9; James 1991, 144) typical of sand dune system development (Coastal Defence and the Environment: a guide to good practice, 1995, 37-fig 3.16 - issued by the Ministry of Agriculture, Fisheries and Food, 1993, reprinted 1995).

Inland the dunes gradually flatten and sand gives way to

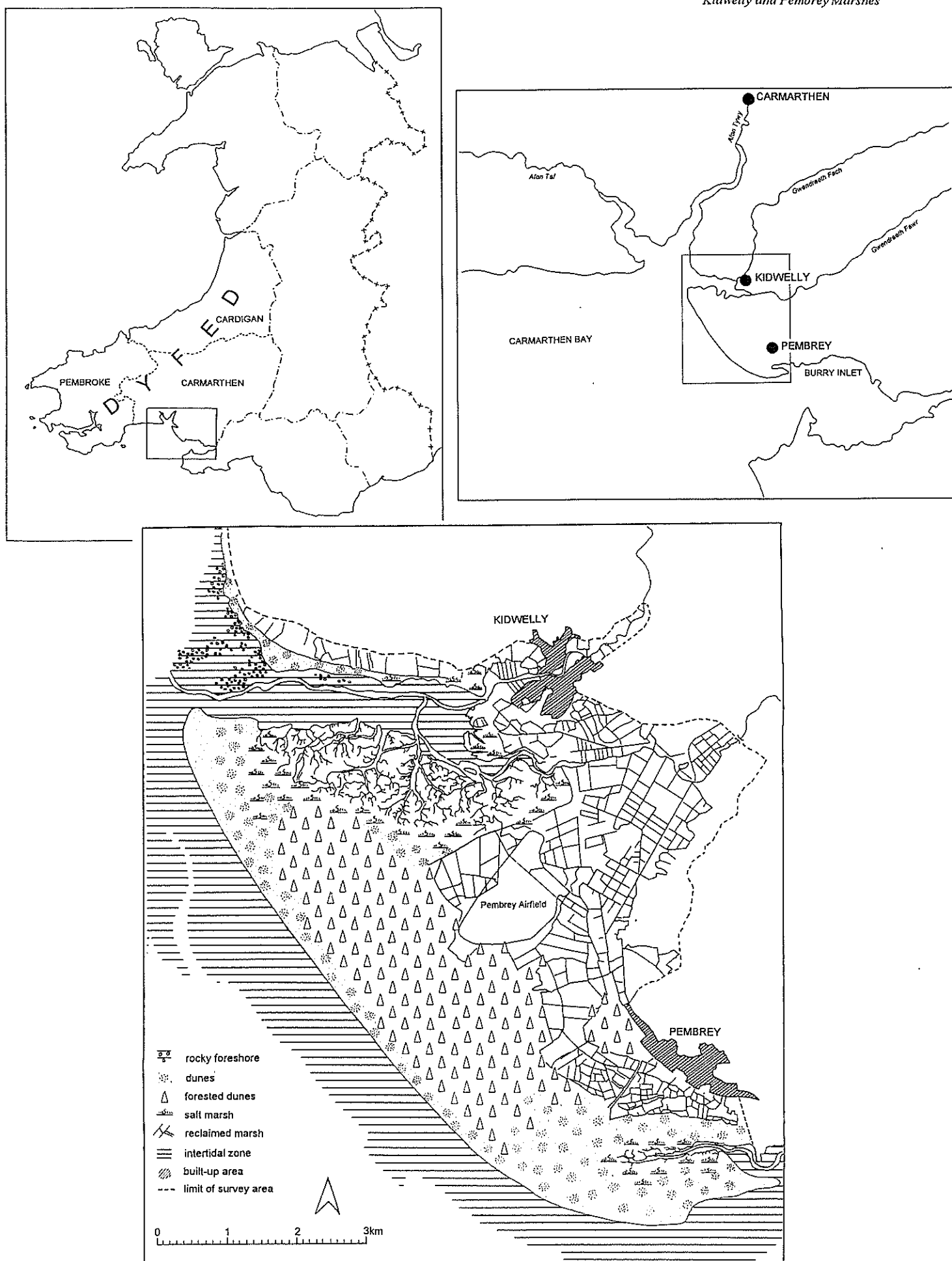


Fig. 2 Location plan

the alluvial plains of Pembrey and Pinged Marshes which are large areas of enclosed and drained former saltmarsh. Much of the enclosed land, especially that in the area around Pen-y-Bedd and Ty Mawr, is freshwater marsh and includes the Ffrwd freshwater nature reserve (managed by the Dyfed Wildlife Trust) which is designated a Site of Special Scientific Interest (SSSI). Further north the salinity of the marsh increases as many of the creeks are still tidally influenced.

The drift deposits overlie a solid geological sequence comprising sandstone and boulder clay along the Gwendraeth channel, and beneath the salt marsh to the north of the airfield. South of this are the undivided Lower and Middle Coal Measures which are bounded to the south by further deposits of sandstone.

North of the Gwendraeth Estuary

A thin fringe of alluvium and sand surrounds the coastline from Kidwelly to St Ishmael's church, much of this has been claimed and is now utilised in part in the Carmarthen Bay Holiday Village. Some sand dunes survive, and even though in places they are suffering heavy erosion there is some continued deposition of wind blown sand carried across the Gwendraeth channel from Towyn Point. Underlying the dunes is a stiff red clay, which is also being eroded where it has been exposed. Seaward of the dunes is extensive strew of rocks and stones, including St Ishmael's Scar, Salmon Point Scar and Pastoun Scar, exposed at low tide. Peat deposits, including the remnants of a submerged forest which was inundated c.5000 years BP (James 1991, 144), have been uncovered on Pastoun Scar and Salmon Point Scar.

Underlying the drift is sandstone and boulder clay which gives way to the Millstone Grits of the hills to the north of Kidwelly.

The differences between the stratigraphy north and south of the Gwendraeth Estuary is marked and not readily explained, for example the lack of any substantial deposits of peat south of the channel, even though peat was recorded in trial pits in Burry Port and Llanelli (Archer 1968, 164). It has been suggested that the submerged forest level originally extended across the survey area but was subsequently eroded away by the northward movement of the Gwendraeth Estuary (Kahn, 1968 498-501; James 1991, 160-161). Further work is required in this area to fully understand the stratigraphic differences.

Islands in the alluvial plain

Within the survey area are a number of islands of higher ground in the alluvium, most notably at Ty-gwyn (NGR SN 4195 0358), near Morfa Mawr (NGR SN 4266 0524) and near Kidwelly Quay (NGR SN 3974 0620). Only the one near Morfa Mawr has had any definite occupa-

tion on it; a small farmstead (PRN 31418; NGR SN 4270 0526) and a limekiln (PRN 8342; NGR SN 4269 0515). The farmstead was lived in until the late 1970s/early 1980s, since when it has been stripped and is now derelict, although the walls survive to full height. The limekiln was shown on the Ordnance Survey 6" sheets of 1871, but there is no evidence of it now. The island near Kidwelly Quay is clearly shown on the tithe plan (1839), and for a time during the 1960s was apparently used as a caravan park. The island near Ty-gwyn is more of a promontory extending into the wetlands than a true island. It is roughly in the position of Pinged on Rees' *Map of South Wales and the Borders in the Fourteenth Century* (1932).

The islands near Morfa Mawr and Kidwelly Quay are too small to have supported anything other than a single farmstead, but there is no evidence that the one at Kidwelly ever did. They would have given refuge for grazing animals during particularly wet periods.

SEA-LEVEL CHANGE IN THE SURVEY AREA

Even though no work has been carried out on the post-glacial rise in sea-level for the survey area it can be assessed and estimated via work in other areas. Estimated sea-level changes in Cardigan Bay and Bridgewater Bay (Heyworth and Kidson 1982, 91-111) and Milford Haven and Swansea Bay (Toft 1992, 249-254) are similar enough to use them as a very rough guide to the survey area. These figures suggest a rise of c.25m since 9000 BP radiocarbon years (Heyworth and Kidson 1982, 110), with a suggested rise of 2.5m-3.7m since the Roman period (Waddelove and Waddelove 1990; Toft 1992, 251).

THE PRESENT LANDSCAPE: HUMAN ACTIONS

The landscape is predominantly the product of human action. Without human intervention, landscape development within the survey area would be a more cyclical process, with alternating episodes of accretion and erosion. This cyclical process is illustrated by some of the shipwrecks on Cefn Sidan Sands which are periodically covered and uncovered; at present they are in a cycle of erosion with up to 0.3m of sand loss during the short time-span of this survey. Human intervention interrupted the cycle and was designed to first stabilise and then utilise former marginal land to its full production potential because the dynamism of the sedimentation and erosion of the unprotected marsh could dramatically affect the amount of land available at any given time.

LAND-CLAIM

The fundamentals of land-claim were, and still are, the construction of sea defences to protect the area from

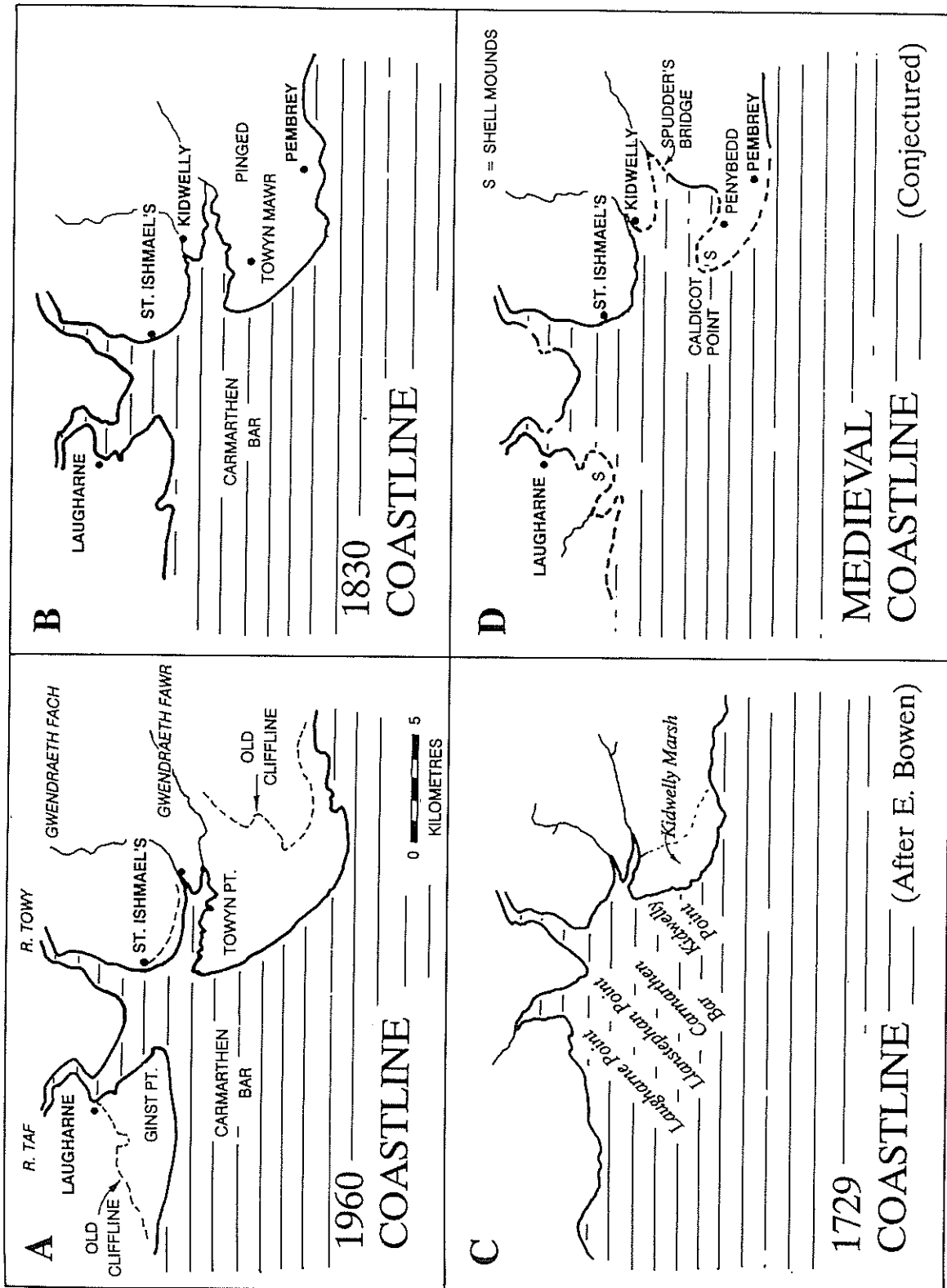


Fig. 3 changing coastline of Carmarthen Bay
A, B and D represent the coast line at mean high water, whereas C is a tracing of part of Emmanuel Bowen's map of 1729. Note that in A, the broken line represents a fossilized cliffline; D, the broken line represents the conjectural coastline. Note also the position of the shell middens. Reproduced by kind permission of T A James and the Carmarthenshire Antiquarian Society.

inundation, and a system of drainage ditches to drain the newly enclosed land. There is comprehensive and extensive evidence of land-claim within the survey area.

Sea defences

Currently the sea defence system is a combination of purpose-built sea walls and the embankments of the main railway and road across the marshes. The north end of Pembrey Marsh and much of the area around Kidwelly are still protected by early 19th century sea-walls. Even though the surviving sea walls are probably early 19th century in date, the ones around Kidwelly would almost certainly have had early, possibly medieval, origins.

The earliest reference to sea defences comes from the early 17th century when three gentlemen were granted rights by the Crown for proprietary rights over certain (unstated) marshes in the county "on condition they undertook to drain them and protect them from the sea" (Lloyd 1938, 259 cited in James 1991, 152). It is likely that the sea defence they constructed was a sea wall

called The Bulwarke shown on a c.1681 map of Caldicot (the earliest cartographic evidence of sea defences in Carmarthenshire; NLW ref Ashburnham 2122. fig. 5). There are slight hints of earlier coastlines, and possible defences, such as a boundary shown on the c.1681 map as the divide between "Caldicot Out Ground" and "Caldicot Inclosed Grounds". The boundary roughly follows the line of The Bulwarke, but some 0.8km to landward. Interestingly on this map there are three farms called Caldicot Farme, one of which is in the area of Out Ground. Could this divide have been a former sea defence line, and the farm in the Out Ground the Caldicot Farm held by one John Butler in 1443-4? Subsequently two further sea walls were constructed to the northwest of The Bulwarke enclosing more of the salt marsh. The first is not precisely datable, although it was constructed pre-1796, when the excavation for Ashburnham Canal had cut through a bulwark on the edge of the marshland (Morris 1970, 57; James 1991, 154). Several field names with bank as an element are shown on a map of the Pembrey marsh dating from 1762 (ref. NLW PG 2096 RM A188) in the vicinity of this sea wall suggesting that it was in existence by the mid 18th century. The

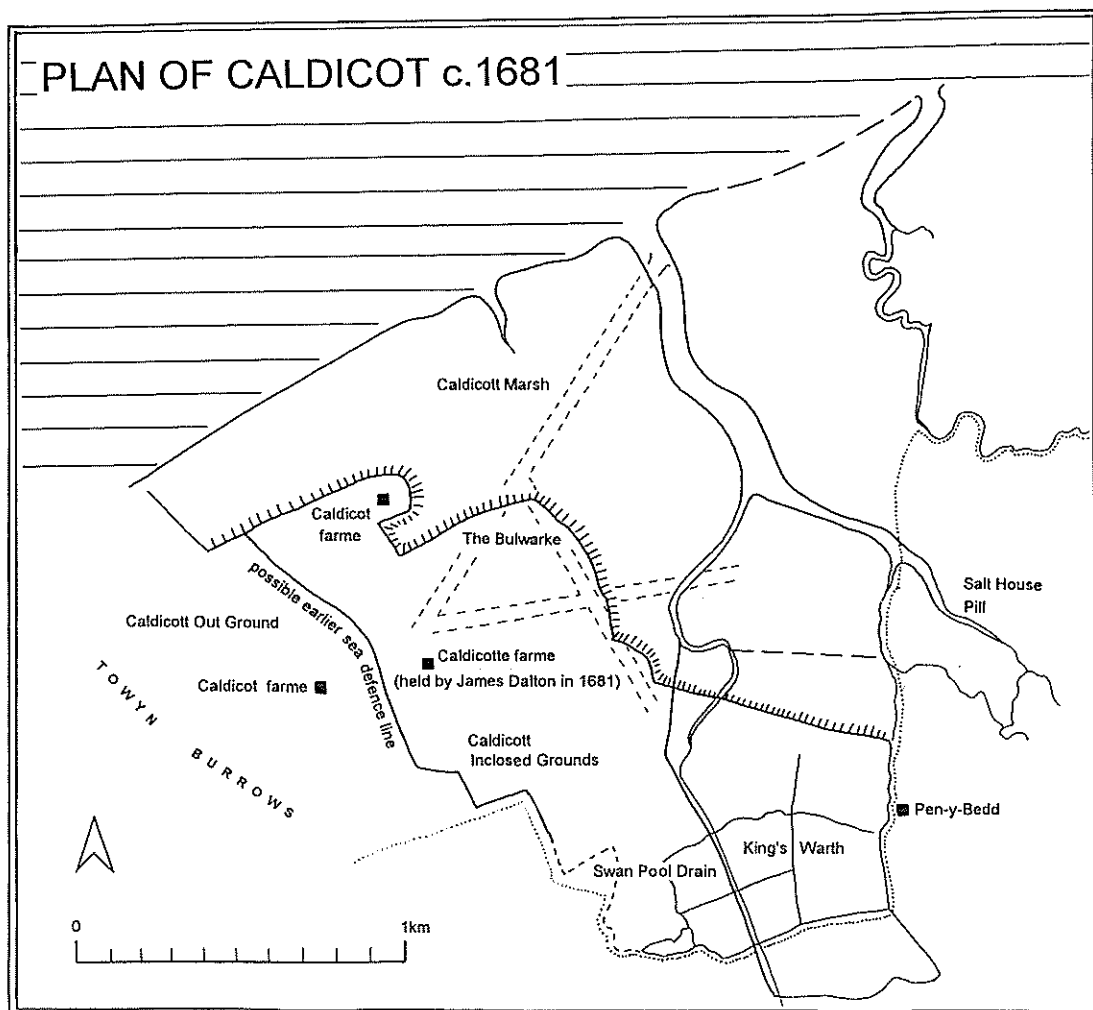


Fig. 5 Plan of Caldicot showing the late 17th century landscape
the runways of Pembrey Airfield have been added to show
its relationship to the present landscape.

(after James 1991)

other sea wall was Bank-y-Lord (PRN 29994; NGR SN 3907 0425; SN 3942 0436; SN 4000 0463) constructed in the early 19th century which still protects much of the marsh today, particularly in the area around the airfield.

Bank-y-Lord was commissioned by Lord Ashburnham and constructed during 1817-1818. It was 4km long, c.3.5m high and up to 26m across its base and enclosed approximately 500 acres of salt marsh. During a survey carried out in 1884 to investigate the possibilities of enclosing more of the salt marsh, it was said that Bank-y-Lord took 400 labourers 2 years to build (ref: Ashburnham group II 62/1). Whether those figures are totally accurate or not (they appear to have been based on local hearsay) they do give an idea of the scale of resource outlay required for successful land-claim, especially when one takes the necessary drainage system into consideration as well.

The last area of marsh to be brought totally under management was Pinged Marsh, today the area between the railway line, the Gwendraeth Fawr, Spudder's Bridge and Mynydd Pembrey (fig 2). It was only after the new road (the A484) and railway were built and opened in the mid 19th century that the protection of Pinged Marsh was complete. The railway embankment (PRN 30078) and Bank-y-Lord are still the major sea defence for the marsh.

Sea wall construction has a number of knock-on effects outside the enclosed area. Restriction of the channel by sea walls reduces the space available for sediment deposition which potentially leads to the choking of river channels. This process was blamed for the choking of Kidwelly Quay (PRN 7808; NGR SN 3976 0640) during an early 19th century survey of the Gwendraeth Fawr and Kidwelly Quay (Morris 1988, 76). Sea walls also upset the natural cyclical process of deposition and erosion and leave the salt marsh vulnerable to erosion by increasing sea-level rise. It has been suggested that salt marsh can keep pace with a sea-level rise of less than 5mm per year, but anything above that will lead to erosion.

Drainage

The study area is crisscrossed by numerous drainage channels. The channels can be divided into three main types: a) natural drainage, b) enhanced natural drainage, c) artificial drainage (includes underground elements, culverts etc.).

- a) Natural drainage channels are generally serpentine and dendritic in character giving the landscape an irregular appearance. Natural drainage allows episodic access to the wetlands.
- b) Enhanced natural drainage channels are modified in some way, i.e. recutting and minor redirection, but still retain some natural characteristics. The enhancement of some of the drains would have

helped to stabilise some areas of the wetlands possibly even allowing more frequent and better controlled access to the wetlands.

- c) Artificial channels are, in general, straight, uniform and result in a regular, almost always rectilinear, land pattern. Artificial drainage would have fully stabilised the enclosed wetlands allowing constant access and utilisation of the wetlands.

The study area contains evidence of all three categories of drainage (Fig. 2). The area between the Country Park and the railway shows clear evidence of natural drainage, the area east of the airfield shows enhanced natural drainage and the drainage of Pinged Marsh, the area east of the railway, is totally artificial. This last point is clearly shown on recent aerial photographic coverage of the area (see for example the colour coverage from 1992, Geonex 149267), with the artificial drainage imposed on a natural system of palaeochannels.

Swan Pool Drain is the major drain in the system and runs from near Pembrey Old Harbour in the south and drains into the salt marsh north of the airfield. It used to flow, and takes its name, from two large ponds known as the Swan Pool (now the site of the Ashburnham Golf Course). The drain is clearly shown on all cartographic evidence of the area, the earliest being the plan of Caldicot in c.1681. The northern end of the drain was incorporated into Ashburnham's Canal (see below page 10) when construction work started in 1769. Further alterations to its route were necessary when Pembrey Airfield was built in 1940. During WWII Swan Pool Drain was heavily protected by a line of pill-boxes constructed along its length, suggesting that it was considered a potential stop-line.

The extensive system of tidal creeks in the salt marsh north of the airfield are an integral part of the drainage matrix, making it important they are kept open and free flowing, although, little or no direct action is taken to keep them open (E G Petty, National Rivers Authority, in litt). The principal saltmarsh creek, Pill Towyn, still flows through Bank-y-Lord, where it was formerly controlled by sluice gates, now broken and partially removed. Another important channel was Salt House Pill, which survives in part, and at one time may have been navigable almost as far as Ty Mawr and Clôs. Salthouse Pill, named in the Duchy of Lancaster surveys of 1609 (Rees 1953, 209), indicates the former presence of a salt house, perhaps now recalled by the derelict Saltrock Farm (James 1991, 151).

Inland the drains are becoming less important to the overall drainage of the marsh as more farmers lay systems of field drains on their land. Field drains are a more efficient and, after initial laying, labour-free system of drainage, whereas open drainage channels require periodic cleaning, although, the periods between each

cleaning can be quite long. One of the farmers spoken to during the survey said that the major open drain through his land was last cleaned more than 15 years ago, and that it will be another 1 or 2 years before it is next cleaned.

One area where some of the drains and water courses may be cleaned and reopened is in the Ffrwd Nature Reserve (NGR SN 4200 0350). The reserve is a designated Site of Special Scientific Interest (SSSI), managed by the Dyfed Wildlife Trust, and contains many plants absent or rare in other parts of Carmarthenshire (*Y Naturiaethwr*, No 30, 1993). Their water management policy for the reserve is currently under review and may lead to the cleaning of the drains (S Lucas, Dyfed Wildlife Trust pers. comm.). The reserve is one of the last areas of freshwater marsh in Carmarthenshire, and contains the southern terminal of Ashburnham's Canal, and is bounded on its western edge by the Pembrey Canal and Gwendraeth and Burry Port Railway Line. So the cleaning and reopening of drains and water courses may have archaeological implications, but, the improved monitoring of ground water levels would provide useful information for archaeological management of wetland sites.

Even when some of the salt marsh had been enclosed and brought under management the remaining unenclosed salt marsh would still have had an important role to play, as it provided excellent grazing land. The regular covering of the salt marsh by water means a regular supply of water-borne nutrients to continuously rejuvenate the grass throughout the year. A flat calm tide will leave a film of inedible silt on the grass, so a roughish tide is best, as it will deposit the nutrients and wash the silt from the grass as the waters recede (Harris 1995, 60). The unenclosed salt marsh north of the airfield is still much sought after grazing land.

STABILISATION OF THE SAND DUNES

Another example of human intervention to stop the natural cycle of erosion and deposition is the stabilisation of the sand dune systems of Towyn Burrows and Pembrey Burrows. The Burrows are today covered, and rendered stable, by the vast Forest Enterprise plantations of Pembrey Forest and Pen-y-Bedd Woods, a total of c.950 hectares (c.222.87 acres). Pembrey Forest has been designated a Forest Nature Reserve by the Forestry Commission.

Prior to forestry planting, which occurred between 1929 and 1954, the dunes were sparsely covered with Marram Grass and scrub and were vulnerable to erosion by strong winds. Therefore it was imperative that the dunes were stabilised if they were to be successfully planted. The unstable dunes were also something of a threat to the reclaimed marsh behind them because sand blown out of the dunes could quickly inundate the land behind. Stabilisation and repair of damaged dunes was achieved by the construction of brushwork fences against which

wind blown sand was trapped eventually forming a new dune (information from various unaccredited Forestry Commission papers and Sand Dunes - issued by the Nature Conservancy Council for Wales, 1978). New dunes were then planted with plants such as Marram Grass to further stabilise them before the trees themselves, mostly Corsican Pine (*Pinus nigra maritima*), were planted.

Whilst this process of stabilisation and planting was successful, and the plantations are now well established and productive, there are many areas along the seaward edge of the dunes that are suffering significant erosion. Up to 25m of dunes have been lost from the seaward edge of the active Pembrey Sands Air Weapons Range bombing range in the last 18 months (information from the RAF range warden), leaving only approximately 25m between the control tower and the approaching sea. Extensive erosion is also occurring on the St Ishmael coast, particularly at Salmon Point Scar where the remains of a number of buildings from the deserted medieval village (DMV) of St. Ishmael (PRN 2113; NGR SN 3630 0775) are being exposed from beneath the retreating dunes. There have been attempts at dune consolidation on the St Ishmael coast where the remains of a wooden sea wall (PRN 30104; NGR SN 3635 0775) survive, along with vast amounts of slag which was brought in and dumped behind the wall. And on Cefn Sidan beach a large stone groyne built by Llanelli District Council to encourage sand accumulation and dune growth is now c.20m seaward of the eroding dune face.

At the same time as erosion is occurring in some places there is active deposition in others. Towyn Point for example has extended to the northwest by over 2km since 1830. The surveyor for the 1884 survey (see above, page 8) noted that a "considerable gain both in area and elevation has taken place.... since the Ordnance Survey was made" (NLW ref: Ashburnham group II 62/1) and deposition is still taking place today. Deposition is also occurring at the Pembrey end of the survey area where the Pembrey Burrows extend almost to the mouth of the old Pembrey Harbour.

DATING THE LANDSCAPE

IDENTIFYING LANDSCAPE INDICATORS

The present landscape is a palimpsest of features of varying form and date. To understand the present landscape and its development it is necessary to deconstruct it in order to extract the remains of earlier landscapes. Although these remains are fragmentary, and often documentary, they do survive and show a landscape with a long history. Some features and events are precisely datable. The list below outlines the most significant from youngest to oldest:

- 1976 creation of Pembrey Country Park
- 1941 construction of Pembrey Airfield.

- 1928 planting of Pembrey Forest begins.
- 1914 construction of the Royal Ordnance factory.
- 1890 construction of dynamite factory
- 1869 construction of railway along the Kidwelly & Llanelli Canal.
- 1852 construction of GWR railway.
- 1851 construction of Pembrey-Kidwelly road.
- 1823 start of construction of Pembrey canal.
- 1818 construction of Bank-y-Lord.
- 1817 Bowser's canals.
- 1814 start of construction of Kidwelly & Llanelli Canal.
- 1801 construction of Ashburnham's Quay.
- 1769 start of construction of Ashburnham's Canal.
- 1767 start of construction of Kymer's Canal.

Besides these known and precisely datable events there is much documentary and archaeological evidence of the earlier landscape, and landscape use. For example, a number of early 17th century descriptions of the marshes of Pembrey and Kidwelly and cartographic evidence of the mid to late 17th century (NLW ref: Ashburnham 2122) reveal a stable landscape with large areas of claimed and managed marsh supporting several farmsteads. Therefore it is possible to project back to at least the beginning of the 17th century. There are indicators on the plan of Caldicote that hint at former landscapes such as the possibility of a sea defence, on roughly the same alignment as the one shown, but c.0.8km to the southwest. The line follows a boundary shown on the plan between the "Caldicot Inclosed Grounds" and "Caldicot Out Ground" (Fig. 5).

Archaeological evidence recovered from shell middens (PRN 2131; NGR SN 38 03) amongst the dunes (now in Pembrey Forest) and from St. Ishmael DMV (PRN 2113;

NGR SN 3630 0775) indicates settlement and activity from the 13th century. There is no archaeological evidence of settlement on the southern side of the Gwendraeth channel at present. However, a settlement at Pinged is known to have existed during the medieval period and there is a documentary reference to Caldicote dating back to the 13th century. Investigation of the shell middens on Towyn Burrows, now within Pembrey Forest, revealed layers of shells separated by layers of sand indicating periodic, probably seasonal use. The pottery recovered from the middens was of late 13th century to early 14th century date (James 1991, 159). Searches made during this study failed to relocate the middens, although, the Forest Enterprise ranger reported a possible midden (PRN 31396; NGR SN 3870 0200) in the centre of the forest (Mike Scott, Forest Enterprise, pers. comm.).

A few stray finds of prehistoric and Roman date have been recovered from within the survey area. The prehistoric finds consist of: a stone axe hammer (PRN 1395; NGR SN 40 05) supposedly from the Gwendraeth channel; worked flint (PRN 2121; NGR SN 362 093 and PRN 2130; NGR SN 38 03) from the intertidal zone on the St. Ishmael coast and Towyn Burrows; a bronze age palstave (PRN1626; NGR SN 40 07) from near Kidwelly Castle, and a Roman coin (PRN 11304; NGR SN 3608 0729) from Salmon Point Scar. Some of the supposed find spots are difficult to corroborate, so it is unwise to make too much of this evidence.

Development of the cultural landscape

PREHISTORIC AND ROMAN (FIG. 6)

The only evidence of prehistoric activity from within the survey area has been described above. Just outside the area are the site of a Bronze Age round barrow (PRN 3057; NGR SN 4195 0205); the site of a Bronze Age standing stone (PRN 11498; NGR SN 4257 0255); two Iron Age hillforts, Moat Farm Camp (PRN 1624; NGR SN 4340 0535) and Cwrt Wood Camp (PRN 1638; NGR SN 4298 0410) and a field system (PRN 9638; NGR SN 423 020) associated with the latter. The hillfort at Cwrt Wood (PRN 1638) was expanded and its defences much strengthened during its lifetime which was a common

feature of defended coastal sites. It has been suggested that this may hint at exploitation and control of marine and wetland resources (Williams 1981, 24). There is no evidence to indicate the extent of the wetlands during the prehistoric period, but if there is any surviving evidence of prehistoric activity one of the most likely places would be in the Pen-y-Bedd and Ty Mawr area at the foot of Mynydd Pembrey.

The one coin (PRN 11304; NGR SN 3608 0729) of the Roman period discovered from a cockle bed on Salmon Point Scar may offer support to the assertion that the Romans were exploiting the cockle beds around the Tywi, Taf and Gwendraeth Estuaries (Jenkins 1976, 173; Coates 1995, 6).

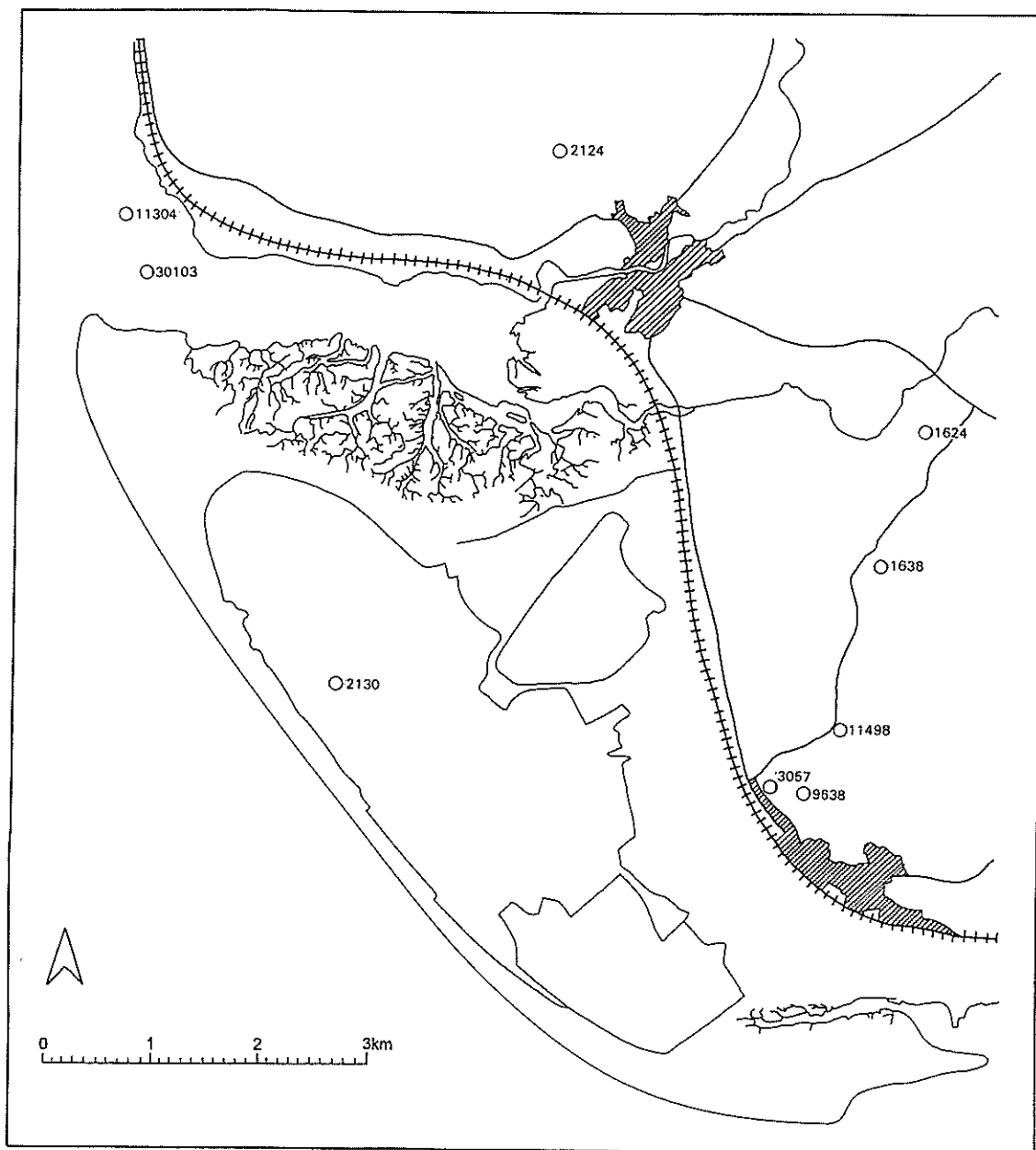


Fig. 6 known Roman and prehistoric sites in the vicinity of the survey area

There is a 13th century reference to a Caldicot, which John Leland in his Itinerary (c.1535-45) places on the spit of land between the Gwendraeth Fawr and Gwendraeth Fach. However the first cartographic

The position of the shell middens is a good indicator of the late 13th century coastline. Cockles are generally collected from shallow water in the lee of the dunes, therefore the middens are probably close to the medieval position of Towyn Point. If that assumption is correct then the medieval coastline may well have been roughly on the alignment of the boundary shown on the map of Caldicot in c.1681 (Fig. 5). The map shows three farms called Caldicot Farm, the northern most has been equated with Towyn Mawr (James 1991, 152). One of the others is shown in the so-called "Caldicot Out Ground" behind the boundary that may have been a sea wall: could this be the original Caldicot Farm? with the later farms being built on claimed land following the early 17th century enclosure of some of the salt marsh.

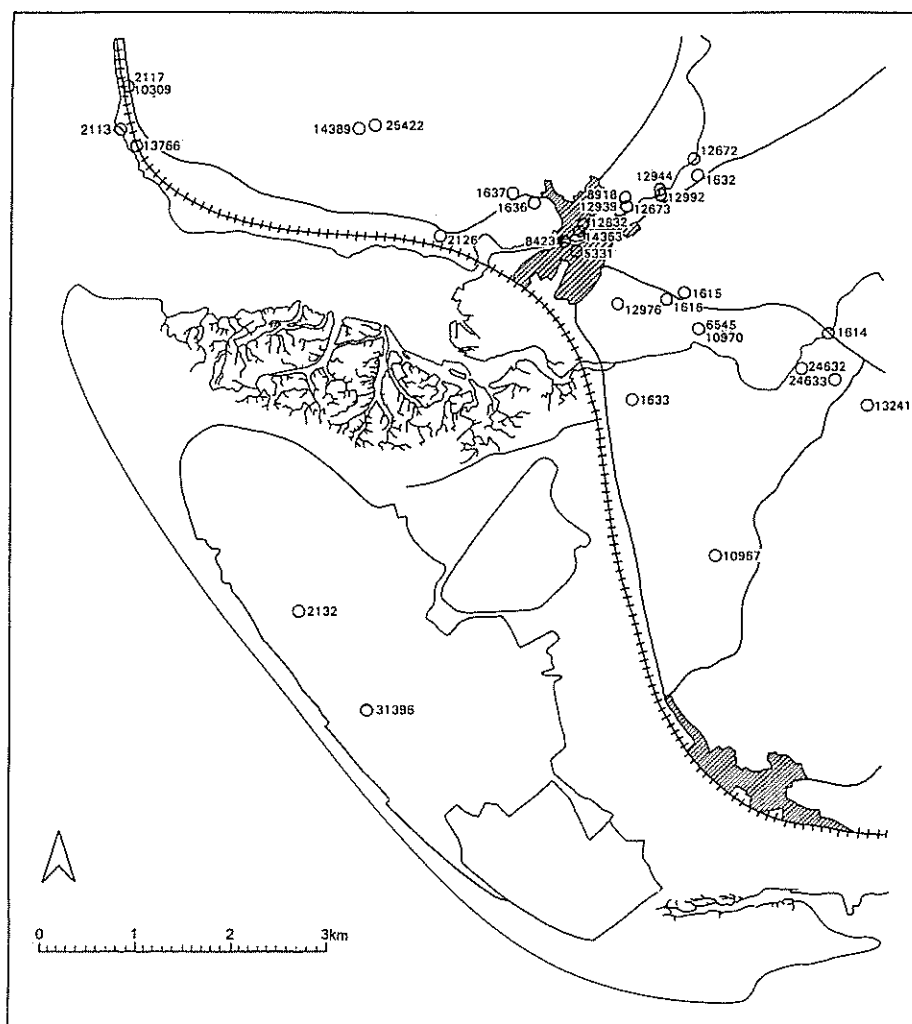


Fig. 7 Known early medieval and medieval sites in the vicinity of the survey area
Note the encroachment onto the eastern edge of the marsh and the positions
of the shell middens (PRNs 2132 and 31396)

POST-MEDIEVAL - MODERN (FIG. 8)

The post-medieval and modern periods have seen the increasing industrialisation of the Pembrey area. Increasing industrialisation led to increasing development of the area; a population increase of over 75% occurred in Pembrey between 1801 and 1833 (Lewis 1833; Thomas 1927, 40). The attraction was the burgeoning coal and metal processing industries of the Llanelli and Pembrey area (for discussion see Sambrook and James 1995). The coal industry was one of the major factors in the shaping of the landscape, and with proposals for opencasting currently under consideration it may again become a significant influence on the region.

Crossing the survey area is a network of canals, tram-

roads and railways which connected the many collieries that sprang up along the Gwendraeth Valley with the landing and loading places at Kidwelly and other smaller quays on the Gwendraeth Fawr, Pembrey and later Burry Port. The development and history of the individual elements of the transport system have been written about extensively (see for example Morris 1970; Morris and Jones 1972; Jones and Morris 1974; Bowen 1976; Sambrook and James 1995) as has their impact on the wetlands (James 1991). For the colliery owners and canal builders the marshes were simply an engineering problem to overcome. There appears to have been little attempt to use the canal embankments to enclose marsh land ready for drainage, although the 1842 Land Enclosure Act covered the area of land between the Kidwelly and Llanelli Canal and Pinged.

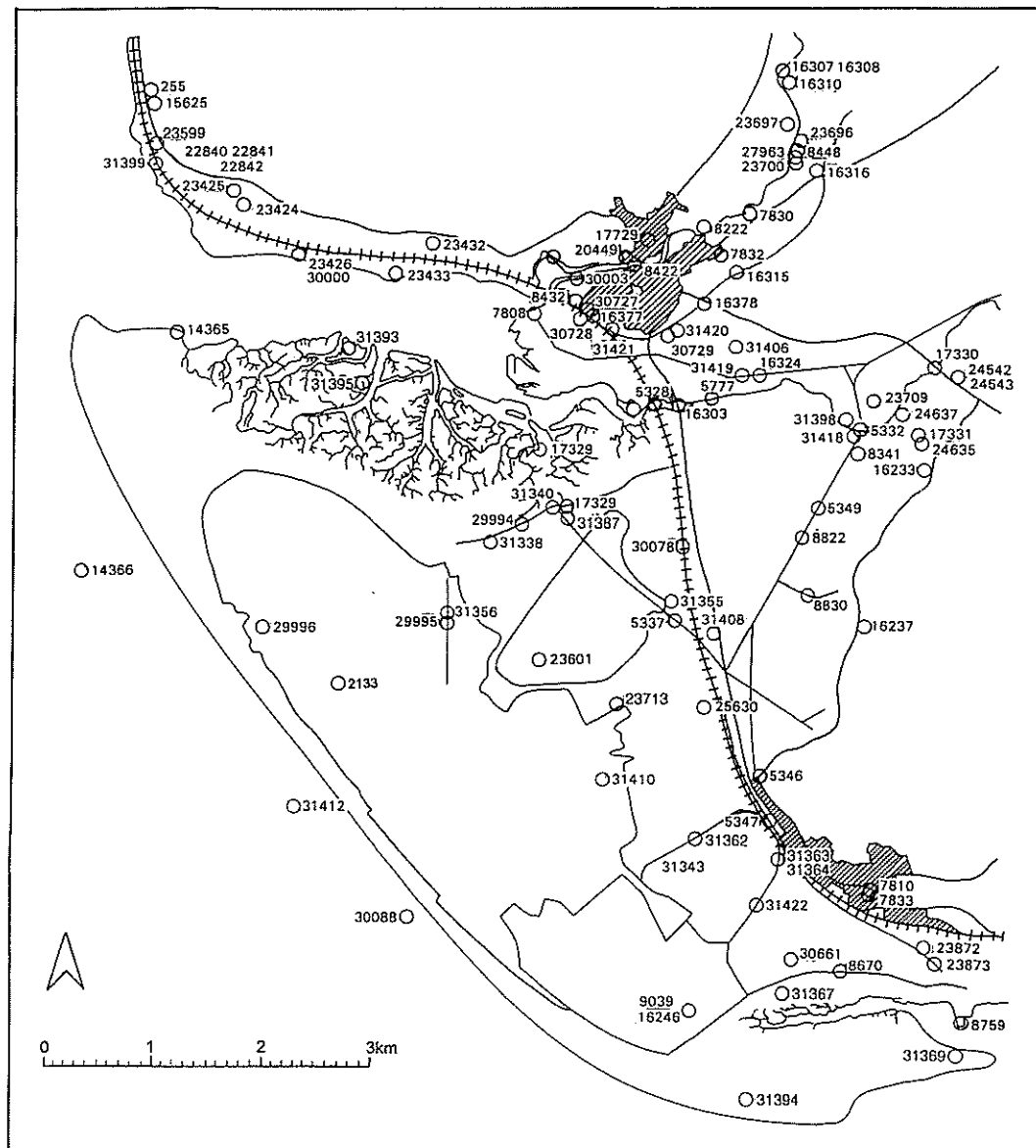


Fig. 8 known post-medieval sites in the vicinity of the survey area
Note the position of shipwreck (PRN 31394) now well inland
of the saltmarsh edge

MODERN (FIG. 9)

The modern history of the landscape has been one of marginal and anti-social activities such as, the manufacture of explosives, military activity and large-scale tree plantations. Explosives were first manufactured in the area during the late 19th century when the Nobel Dynamite Company set up a factory (PRN 9039; NGR SN 4120 0010) in Pembrey Burrows. The Nobel Company works later became the Royal Ordnance Factory (PRN 16246; NGR SN 4130 0010). The site of the Royal Ordnance Factory is now occupied by Pembrey Country Park (PRN 31393; NGR SN4080 0050), Wales' leading tourist attraction.

Military activity in the area is said to date back to at least the Civil War. In 1940 Pembrey Airfield (PRN 31405; NGR SN 4030 0350) was opened for the first time. Originally it consisted of grass runways, which, given the nature of the area, frequently became inoperable. The present airfield layout dates from 1941-1944; although many buildings have been demolished much of the layout remains. A major WWII defensive line runs across the

survey area. It consists of a number of pillboxes and lines of anti-tank cubes. Military activity continues in the area with the Pembrey Sands Air Weapons Range (PRN 30076).

Dominating the modern landscape is the vast Forest Enterprise plantation of Pembrey Forest which covers the dunes between the claimed and managed marsh and Cefn Sidan Sands. Planting began during the 1920s and continued until the 1950s. The forest, which is a popular place for walking and horse riding, contains a wide and diverse range of archaeological sites and features.

Pembrey Country Park was created on the site of the Royal Ordnance Factory in the mid 1970s and has since become the leading tourist attraction in Wales. Together with the Welsh Motor Sport Centre, established on the old airfield, the country park is rapidly changing the character of the region. The emphasis of the regional economy has shifted from industry to leisure. As tourism increases there is great potential for presentation of the cultural history of the region.

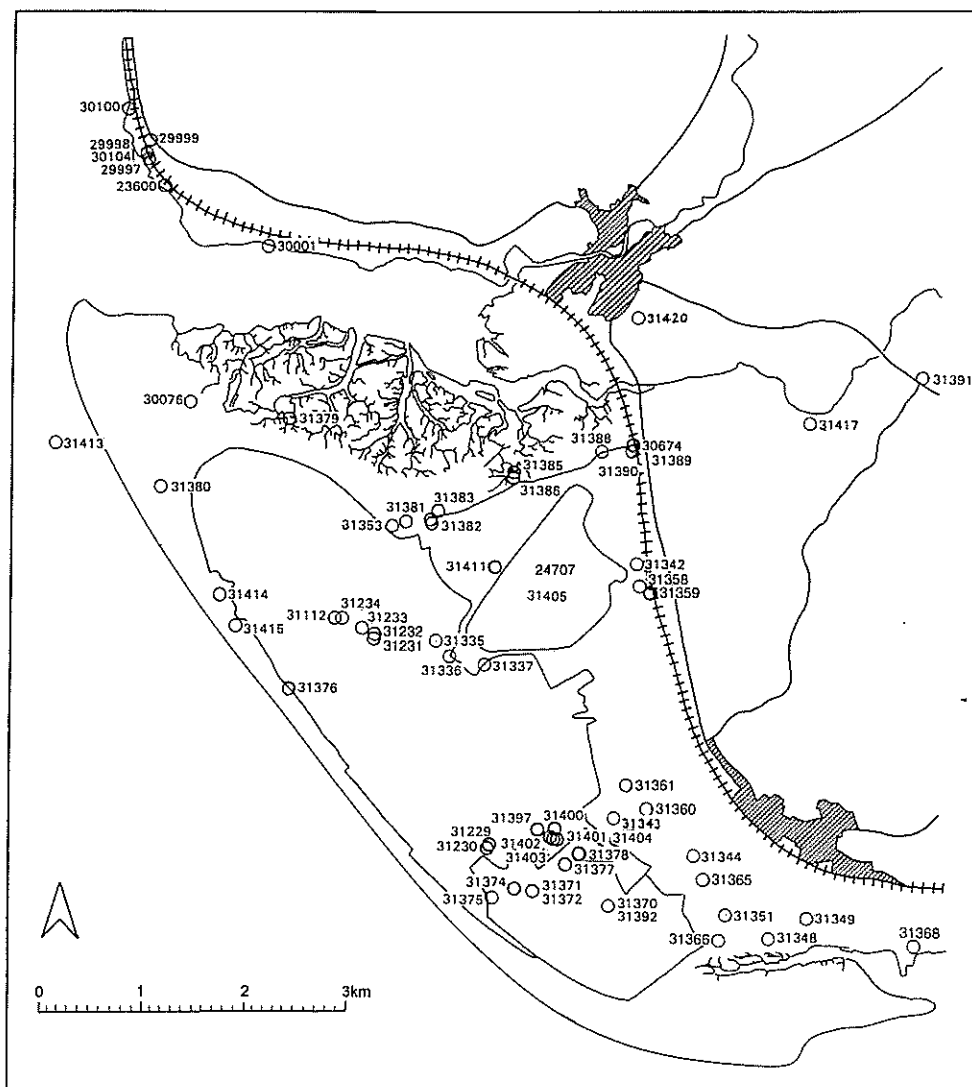


Fig. 9 known modern (i.e. very late 19th century/ 20th century) sites in the vicinity of the survey area

THE ARCHAEOLOGY OF THE SURVEY AREA

Since being claimed from the sea the marshes have been used for four distinct purposes, food collection and production, anti-social industrial manufacture, military action and leisure. The unclaimed landscape would have been used for food collection because wetlands are rich in the range and diversity of natural food resources as well as providing good grazing on the salt marshes between tides.

FOOD COLLECTION

Little evidence of food collection was recorded during this survey, it being confined to a possible fish weir (PRN 31369; NGR SS 4365 9955) and several shell middens at St. Ishmael DMV (PRN 2113; NGR SN 3630). Known shell middens now within Pembrey Forest (PRN 2131; NGR SN 38 03) were not located during the survey. The middens at St. Ishmael DMV contain abundant shells and animal bone fragments; it is hoped to investigate some of these middens during 1996. A post-medieval shell midden (PRN 31399; NGR SN 3634 0874) visible in the dunes near St. Ishmael gives a clear indication of how they were formed, with layers of shells interbedded with layers of blown sand. This midden was almost certainly used seasonally, with the sand layers being 2-3 times thicker than the shell layers.

The possible fish weir comprised of three parallel rows of wooden uprights, which are now partially besanded, near the entrance to the old harbour at Pembrey.

FOOD PRODUCTION

In nearly all cases of land-claim the primary motive was to produce additional managed agricultural land, and therefore income, from what was otherwise an unrealised asset. This was certainly the case in the survey area, with at least three episodes of sea wall construction. The managed marsh provides excellent grazing; even during the driest summer the grass stays lush and green. Salt marsh was and is much sought after grazing land because it is renourished by every tide: it has been said that there is a recognisable taste to salt-grazed animals (Harris 1995, 60). In the 14th century one John ap Owen rented the salt marsh at Caldicot for grazing sheep; he was exporting as many as 50 sacks of wool a year to London (Morris 1990, 14).

A number of post-medieval farmsteads, including Towyn Mawr (PRN 31419; NGR SN 3972 0363) which was incorporated into the temporary Towyn Camp (PRN 31411; NGR SN 3973 0374) constructed to house military personnel during WWII, shown on the c.1681 plan of Caldicot have been demolished. Some were cleared when the airfield was constructed. The major surviving farm west of the railway line is Pen-y-Bedd (PRN 25630; NGR SN 4132 0274), which translates

literally as "head of the grave" or, as a less likely translation "grave of a chief". Either way the Bedd element is quite specific as meaning a grave. Unfortunately it is not clear how or why this name came about. Prior to 1642 Pen-y-Bedd formed part of the Cwrt Penbre Estate when it was owned by the Vaughan family; it later passed by marriage to the Lords Ashburnham (Jones 1987, 157). Some of the buildings are now in a dilapidated condition.

INDUSTRY

Agricultural-based industry

There are a wide range of industries recorded within the survey area, and many of them have left behind an extensive archaeological and documentary record. Probably the earliest industry in the area was the medieval woollen trade. It has already been seen above how in the 14th century John ap Owen was shipping up to 50 sacks of wool per year from his flocks grazing on the local salt marsh (Morris 1990, 14). A century and a half later (c.1535-43) Leland wrote his oft-quoted line that the Kidwelly area was producing what he regarded as the "best wool in hye Wallys" (cited in Morris 1990 and James 1991). Nearly all of the farms in the area now graze cattle rather than sheep.

Small-scale industry

Many farms would have had secondary, small-scale industrial interests to augment their agricultural income. Towyn Canol (PRN 31410; NGR SN 4044 0213), a farmstead to the south of Towyn Mawr, had a field called smoking house meadow indicating the presence of a smoking house. It is likely that this smoking house would have provided additional income for its operator. Salt production was also carried out during the medieval and post-medieval periods on Salthouse Pill (PRN 31407; NGR SN 4134 0368). Another of the small farmsteads on the claimed land behind Towyn Burrows, Tai Uchaf, (PRN 23601; NGR SN 3980 0325) was supposed to have brewed beer. The fact that this information, however anecdotal, survives suggests that beer production was at a level greater than for home consumption.

The growth of the coal industry

By the late 16th century mineral extraction appears to have replaced the wool trade as the largest industry in the region; in 1585 Pembrey was the chief Carmarthenshire port for the export of coal (Sambrook and James 1995, 7). The coal industry has been one of the major dynamics responsible for the shaping of the present landscape. Coal was first extracted from the Gwendraeth Valley during the medieval period, but its boom years were undoubtedly from the late 18th century to the late 19th century. Within the survey area there were no collieries, but there are very extensive surviving

remains of the transport infrastructure needed to support the collieries (fig. 10), mostly in very good condition.

THE CANALS, RAILWAYS AND QUAYS

The chronology of canal and railway building is:

- 1767 start of construction of Kymer's Canal (PRN 5777; NGR SN 3976 0640 - SN 4464 0681).
- 1769 start of construction of Ashburnham's Canal (PRN 5337; NGR SN 4228 0261 - SN 4000 0464).
- 1801 construction of Ashburnham's Quay (PRN 17329; NGR SN 3997 0464).
- 1814 start of construction of Kidwelly and Llanelli Canal (PRN 8822; NGR SN 4152 0313 - SN 4260 0590).
- 1817 construction of Bowser's canal (PRN 8830; NGR SN 4200 0395 - SN 4232 0380).
- 1823 start of construction of Pembrey canal (PRN 5437; NGR c.SN 4300 0090 - SN 4177 0341).
- 1852 construction of GWR railway.
- 1865 abandonment of Kidwelly and Llanelli Canal and creation of Kidwelly and Burry Port Railway.
- 1866 amalgamation of Kidwelly and Burry Port Railway and the Burry Port Harbour Company to form Burry Port and Gwendraeth Valley Railway.

Probably the best survival of this infrastructure is the stretch of canal (and the later railway which ran along the tow path) from the Butcher's Arms public house to the Coed Bach washery. This stretch incorporates some of the surviving length of the Pembrey Canal (PRN 5347; NGR SN 4152 0313 - SN 4260 0590) much of the Kidwelly and Llanelli Canal (PRN 8822; NGR SN 4152 0313 - SN 4260 0590), part of Ashburnham's Canal (PRN 5337; NGR SN 4228 0261 - SN 4000 0464) as well as some of the tracks and sleepers from the Burry Port and Gwendraeth Valley Railway which used the tow paths of the canals. As well as the canals and railway line there are many surviving associated structures, bridges, an aqueduct and a reservoir (see below). The survival and condition of this section meets several of the criteria (as outlined in Planning Policy Guidance 16, issued by the Welsh Office 1991) used when assessing the potential of a site for scheduling.

The point where Pembrey Canal crosses Ashburnham's Canal at NGR SN 4176 0272 is perhaps the most interesting section as the junction of the canals survive intact. The canals are now very overgrown so it was not possible to see if there were any sluice gates or other water management features surviving. This is also the point where the road from Pen-y-Bedd to Pinged crosses the canals. Some of the tracks from the Burry Port and Gwendraeth Valley Railway survive in the road surface.

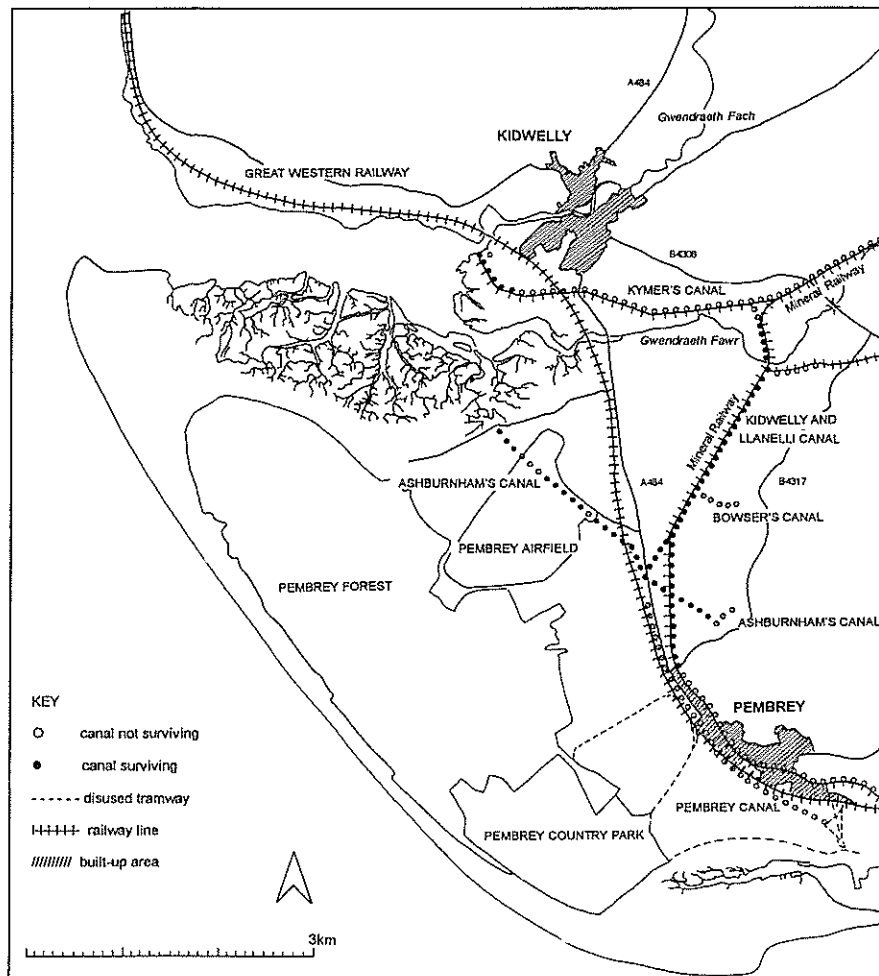


Fig. 10 the canals, railway, roads and major tramways

Further north the Kidwelly and Llanelli Canal crosses the Gwendraeth Fawr on an aqueduct (PRN 17330; NGR SN 4276 0530) which was constructed in 1815. Next to the aqueduct stands a red-brick lined reservoir (PRN 31417; NGR SN 4278 0517) which was presumably used to rewater the trains on the Burry Port and Gwendraeth valley Railway.

During high tides the aqueduct backs up the Gwendraeth Fawr causing regular flooding of Morfa Mawr Farm a short distance to the southeast. Just below the aqueduct a small quay, Franklands Quay (PRN 31398; NGR SN 4260 0540), was established some time during the 18th century. The quay survived into the 19th century and was shown on a map of the Gwendraeth Fawr in 1814 (James 1991, 156). Nothing is now visible on the quay. Other quays constructed to serve the coal industry were established at Bertwyn (PRN 23433; NGR SN 3850 0670) and Muddlescwm (PRN 31419; NGR SN 4140 0560). There is no trace now of these quays, and it is not clear how formal they were. They may simply have been flat areas of mud, or they may have had some associated structures.

Kidwelly Quay (PRN 7808; NGR SN 3976 0640) and the canal (PRN 5777; NGR SN 3976 0640 - SN 4464 0681) constructed by Thomas Kymer in the 18th century survive in good condition. The quay has been consolidated and renovated recently to provide a public amenity area, and the canal leading from the quay is in good condition.

Brick making

Kidwelly became famous during the later 19th century for its silica bricks. A number of brickworks making the world famous Dinas firebrick were constructed in Kidwelly from the mid 19th century onwards (Murphy and Sambrook 1994, 12; Sambrook and James 1995, 19). Quality silica stone was readily available on Mynydd -y-garreg, just northeast of Kidwelly. In 1852 there were three firebrick factories operating in Kidwelly (PRN 30727; NGR SN 4030 0630; PRN 30729; NGR SN 4038 0635; PRN 30728; NGR SN 4100 0622). One of them (PRN 30728) was connected via a tramway (PRN 31420; NGR SN 4110 0622) to the Gwendraeth Valleys Railway; a small trace of this tramway may be visible as an earthwork (PRN 31406; SN 4115 0612) running across a field near the new Kidwelly by-pass.

Brick making also took place on a much smaller scale. A brick kiln (PRN 31421; NGR SN 4049 0626) was shown on the 1st edition Ordnance Survey maps just south of the main Dinas firebrick works and another brick kiln (PRN 23713; NGR SN 4050 0280) was operating on the marsh just behind Towyn Burrows. Both were small-scale and must have been exploiting local pockets of suitable clay. Little or nothing now remains of the brick making industries around Kidwelly.

Shipping

Access to the sea, or more importantly access to places and markets across the sea, were vital to the development of Pembrey and Kidwelly. Without these sea links neither place would have developed, and may even have declined. The earliest reference to shipping in the area is an early 13th century grant of a licence to a certain Robert of Kidwelly, shipmaster, to trade with Gascony (Morris 1990, 13). It is likely that the original Norman incursion into the area was by sea. Likewise it is probable that a millennium earlier the first Roman penetration of the area was also by boat, and the sea would have been vital for continuing communication with, and supplying the Roman forts established at Loughor and Carmarthen. There is no evidence of prehistoric maritime activity within the survey area. Discoveries in other parts of Britain, most notable Ferriby, Humberside, and Dover, Kent, have shown that coastal communities, from at least the Bronze Age, had craft capable of sea travel (Heal 1993, 63). Therefore the prehistoric communities in the southeast Dyfed region had the potential to exploit not only the Carmarthen Bay and Burry Inlet waters but much further afield.

Throughout the medieval period Kidwelly was an important port, and vast amounts of sea traffic passed through Carmarthen Bay on its way to and from the town of Carmarthen. With the volume of medieval traffic passing through the bay it is no surprise that there were wrecks on the notorious Cefn Sidan Sands. In the 15th century the holder of Caldicot farm was given rights to wreck found on the shore (James 1991, 151). The rights of wreck was a important issue and one which formed part of a dispute between the manors of Pembrey and Kidwelly during the later 18th century concerning the boundaries of their properties. One particular ship was mentioned a number of times during the dispute, The Prince of Wales, which was wrecked on 29th October 1794 (NLW ref: Ashburnham group II, 19/1-21). Although there were those with official rights to wreck found on the shore the area is most famous, or infamous, for its unofficial wreckers, the so-called "Gwyr y bwyelli bach" (the men of the little axes). They were reputed to have lured hundreds of ships into the shallow waters of the bay by going out in bad weather and lighting fires on the hills to fool the crews into thinking they were harbour lights. Once into the shallow water ships would normally founder on Cefn Sidan Sands where they would be looted by the local inhabitants.

Once on the sands it was almost impossible to get off again, but it did happen; in December 1863 a fully laden ship bound for Liverpool was successfully refloated with the assistance of the Carmarthen Bay lifeboat (Dyfed Archives Service Quarterly Newsletter, winter 1995-96). One of the wrecks now visible on Cefn Sidan Sands (PRN 31412; NGR SN 3760 0185) appears to be stern on to the beach indicating that it too may have been the subject of an attempt to refloat it, albeit an unsuccessful one.

The links between Pembrey and Kidwelly and the sea have been severed by a range of contributory factors: the decline of the coal industry, the rise of the port of Llanelli and the silting up of the harbours and quays. Wrecks visible at low tide all along Cefn Sidan Sands and the disused harbour at Pembrey and the old quay at Kidwelly are stark reminders of the problems and dangers facing shipping in this part of Carmarthen Bay.

MILITARY ACTIVITY

Military activity is still a considerable factor in the area with the Pembrey Sands Air Weapons Range. A vast quantity of other military monuments survive ranging from airfield buildings to anti-tank blocks. It has been suggested that there was military occupation of one of the fields during the Civil War of 1648 (Lyne 1987), although the evidence as presented for this would need verifying, and it is not known which field it was. Photographs held in Llanelli Reference Library show army units stationed on the flat land below Mynydd Pembrey during 1913 (ref. 41.ILL204; 124.ILL5385) and a gun crew from 1914 (ref. 135.ILL5386). During WWII

the area was considered important enough to construct considerable defences and an airfield (PRN 31405; NGR SN 4030 0350). Much of its strategic importance was due to the presence of the Royal Ordnance Factory (PRN 16246; NGR SN 4130 0010) which during its peak wartime years was producing 700 tons of T.N.T every week (The History of the Pembrey Royal Ordnance Factory. Pem-brey Country Park Booklet).

Coastal defences

The wide flat beach of Cefn Sidan was a potential landing point so a series of beach defences were constructed which included rows of barbed wire fences. After the war the barbed wire was removed and the posts cut down to beach level. However, erosion of the beach at the west end of the air weapons range over the last 12 months has exposed many rows of the posts (PRN 31413; NGR SN 3500 0500) to a height of 1m. A construction of metal and wooden posts (PRN 31409; NGR c. SN 3790 0060), was spotted once at extreme low tide. The metal posts were larger and thicker than those used for the barbed wire field, and this structure may have been

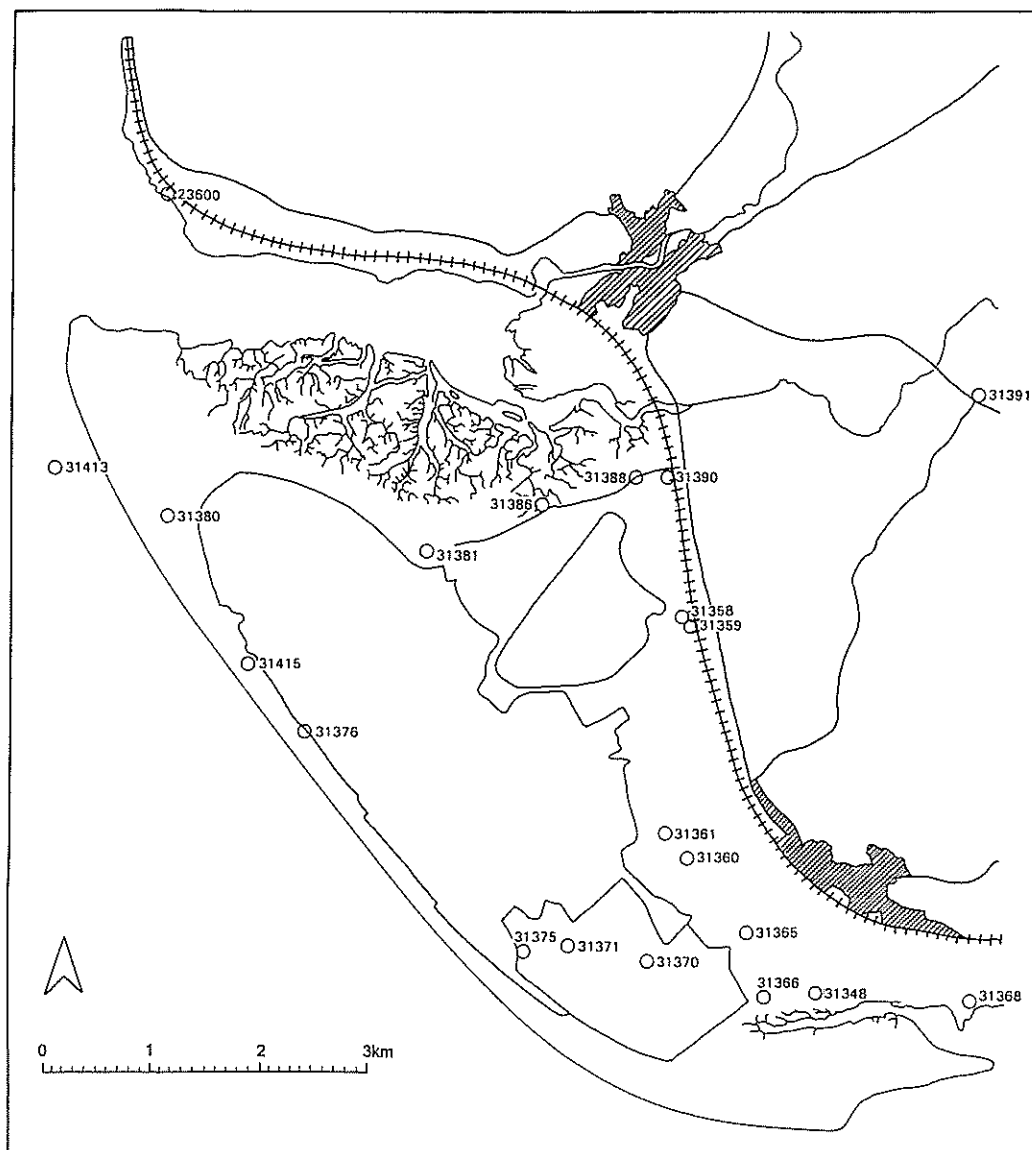


Fig. 11 WWII defences

part of the first line of shoreline defences.

Covering the beach defences were a series of gun emplacements (PRN 31376; NGR SN 3774 0260; PRN 31380; NGR SN 3650 0454; PRN 31414; NGR SN 3707 0352; PRN 31415; NGR SN 3724 0326) positioned on the dunes. Within the dunes were two firewatchers huts (PRN 31371; NGR SN 4017 0064 - plate 5; PRN 31375; NGR SN 3970 0062). Pillboxes were constructed on the dunes; it has been said that some of those on the south-eastern end of the beach have collapsed as the dunes have eroded (Archer 1968, 164-165). Some of the pillboxes such as the "type 23" (PRN 31370; NGR SN 4088 0052) overlooking the main road through the country park (formerly the main railway line through the ordnance factory) were for the defence of specific installations rather than part of the coastal defence.

The Command Stop Line

During WWII Britain was divided into strategic defence zones separated by a series of defensive lines: General Headquarters Stop Line, Command Stop Lines, Corps Stop Lines and Divisional Stop Lines. These lines determined the level of military response to incursion into any of the zones. Behind the dunes a line of defences marks the course of a Command Stop Line which extends from Pembrey Burrows in the south to New Quay, Cardigan Bay, in the north (Saunders 1989, 216; Glover 1990, 82-83). This would have acted as a second line of defence should the beach defences be breached.

For much of its route across the survey area the Command Stop Line follows the line of Swan Pool Drain; three pillboxes (PRN 31365; NGR SN 4167 0078; PRN 31360; NGR SN 4122 0141; PRN 31361; NGR SN 4095 0165) were positioned on its west bank. Other elements of this line within the survey area are: a line of anti-tank cubes (PRN 31359; NGR SN 4120 0396 - SN 4137 0312) protecting the railway at the point where it is crossed by the road from Pembrey Airfield; a line of anti-tank cubes (PRN 31390; NGR SN 4110 0494) and a pillbox (PRN 31389; NGR SN 4106 0500) alongside the railway where it crosses Bank-y-Lord; a pillbox (PRN 31366; NGR SN 4189 0013) in Pembrey Burrows at the southeast corner of the ordnance factory; a pillbox (PRN 31358; NGR SN 4114 0365) alongside the road leading from Pembrey Airfield.

Other defensive lines

There are other identifiable defence lines within the survey area, namely one along Bank-y-Lord and one along Pembrey Burrows from the ordnance factory to Pembrey Harbour. The line along Bank-y-Lord consisted of four pillboxes (PRN 31381; NGR SN 3886 0428; PRN 31386; NGR SN 3996 0464; PRN 31388; NGR SN 4070 0490; PRN 31389; NGR SN 4106 0500). The westernmost pillbox (PRN 31381) has been demolished but not removed, and the easternmost pillbox (PRN 31389) also forms part of the Command Stop Line. Along the

southern coastline of the survey area a defensive line consisted of at least two pillboxes (PRN 31366; NGR SN 4189 0013; PRN 31368; NGR SN 4365 9990) and a possible command post (PRN 31348; NGR SN 4245 0020). Pillbox (PRN 31389) forms part of the Command Stop Line; Pillbox (PRN 31368) was positioned on the end of Pembrey Harbour pier, but the platform it sat on has eroded and collapsed. The possible command post was first identified from aerial photographs (Ordnance Survey OS 165/246, 1965 frames 092-093; Geonex, 1992 frames 109-110) and comprised of a number of connecting slit trenches with the remains of a concrete structure in the middle. The trenches were arranged to give good visibility along the coastline.

Pembrey Airfield

The airfield (PRN 31405; NGR SN 4030 0350 - plate 1) was opened in May 1940 as a fighter station, but by June of 1941 it had become home to 1 Air Gunnery School (Action Stations, vol. 3). An Astrodome Trainer (PRN 24707; NGR SN 4070 0470) which survives on the airfield is a Scheduled Ancient Monument (SAM CM 248), but is degrading badly and is, along with most of the other surviving airfield buildings, being used as a farm shed, housing cattle and machinery. In all there are 15 surviving buildings on the airfield (for descriptions see below), some in good condition.

The southwest end of the airfield has now been turned into the Welsh Motor Sports Centre racing circuit; many de-commissioned wartime airfields around Britain have become racing circuits, the most notable being Silverstone, Northamptonshire, home of the British Formula 1 Grand Prix. Recent local press reports suggest that there may be an attempt to reopen one of the runways for commercial flights in an effort to boost the local economy (South Wales Evening Post (Ammanford edition) 31/1/96). It is unclear how this could operate given the scale of military flying over the air weapons range immediately north of the airfield.

A vivid reminder of the active airfield has recently been uncovered in the saltmarsh to the north of the airfield. The wreckage of a Wellington Bomber (PRN 31379; NGR SN 3778 0528) which crashed in 1945 has been disturbed by local residents in order to remove the engines. It is not clear at present where the engines are destined for. There are unsubstantiated reports of a second crashed aeroplane in the saltmarsh, this time a Spitfire, or Hurricane, nearer to Kidwelly.

LEISURE

Pembrey Country Park (PRN 31292; NGR SN 4080 0050) occupies the site of the former Royal Ordnance factory and is Wales' leading tourist attraction. In creating the park much of the former factory site was levelled as part of the preparatory works. Some of the factory buildings survive. The Welsh Motor Sports Centre on Pembrey Airfield is rapidly becoming a motor racing circuit of national importance.

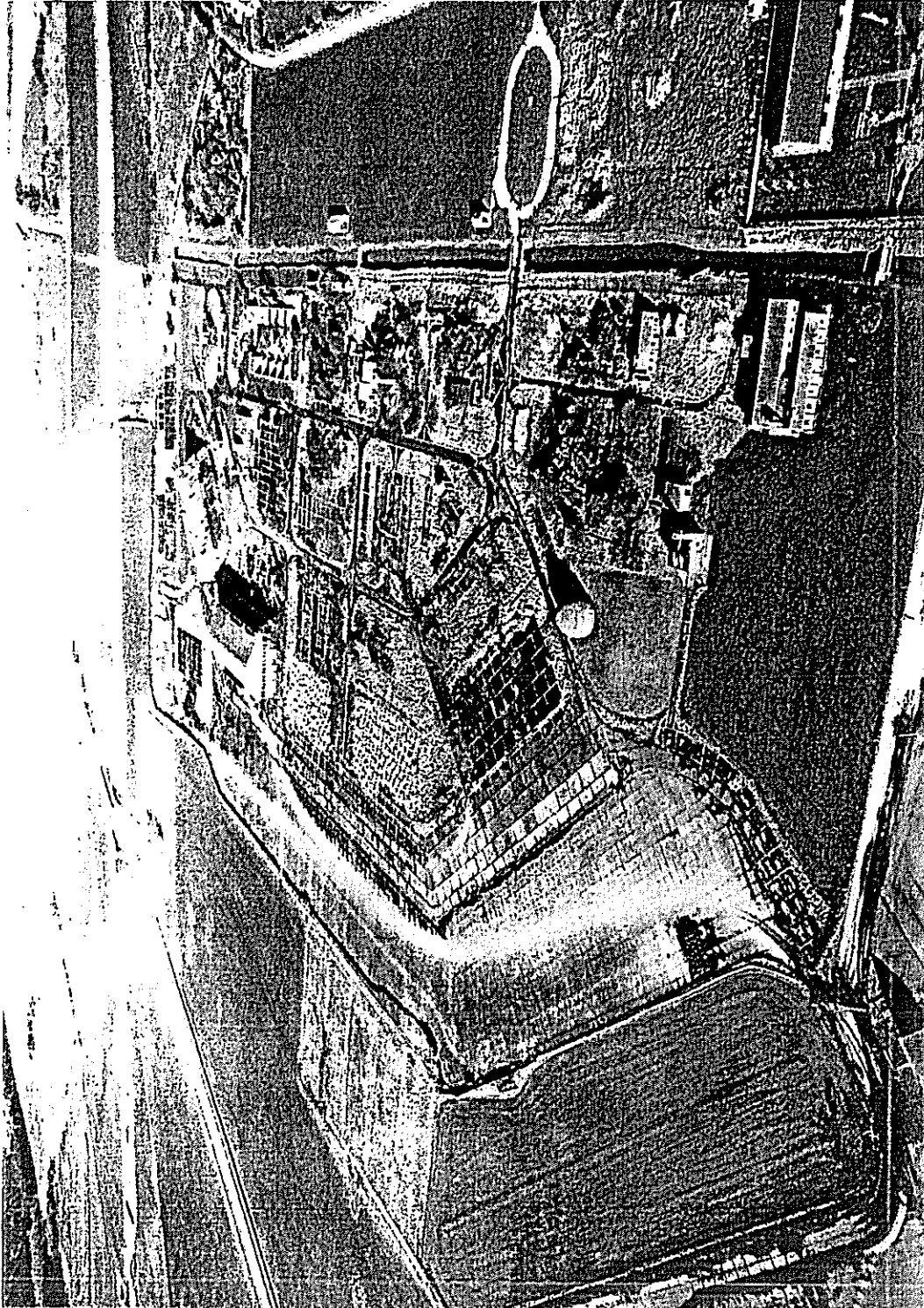


Plate 1 Pembrey Airfield showing layout of buildings
Note the Astrodome Trainer in the foreground

photo DAT

Summary list of new archaeological sites

This list contains a summary of all new archaeological sites and features discovered during the survey. It shows the range and diversity of previously unrecorded archaeological interests.

PRN 31405 NGR SN 4030 0350 (plate 1)

Pembrey Airfield. When it first opened in 1939 the airfield had no permanent structures and grass runways which became inoperable after the slightest rainfall. The present layout was constructed in 1941, and the layout and all the buildings were clearly shown and named on an Air Ministry Record Plan of 1944. The PRN for the airfield includes PRNs 31078-31228. Descriptions of standing structures and their individual PRNs are given below, information concerning the use of the buildings has been taken from the 1944 Air Ministry plan. PRNs not discussed below had either been demolished down to ground level, surviving for the most part as concrete bases, or completely demolished and removed.

PRN 31080 NGR SN 4020 0380

Large rectangular, metal-framed building covered by corrugated asbestos panels. On the Air Ministry plan it was shown as a synthetic trainer in 1944, and described as an F-type shed. Along the back of the shed is a lean-to type extension. This was one of four identical buildings which fronted onto the airfield and was possibly originally constructed as a hangar. It survives almost intact, although the majority of the asbestos panels are broken or missing and the lean-to extension was too overgrown to enter, so it is not certain what function it had. There has been some post-war repair to the roof which appears to have been reroofed at some time. Today it is used as a farm store and filled with farm machinery.

PRN 31081 NGR SN 4020 0380

Another F-Type shed identical to PRN 31080, and in identical condition. There is no indication on the Air Ministry plan as to the function of this shed. It too is now used as a farm store and filled with farm machinery.

PRN 31095 NGR SN 4020 0380

This small rectangular building was the ration store. The concrete panelled building survives, although the doors and windows are missing.

PRN 31116 NGR SN 4020 0380

Large rectangular brick-built fuel compound. The compound survives and is currently used as a cattle pen. A number of store rooms/sheds inside the compound

have their doors missing, but other than that it is in good condition.

PRN 31131 NGR SN 4020 0380

Red brick-built bulk petrol installation building. The building survives, as does a lot of the internal gear, such as pipe work and valve gear. There is likely to be an associated storage tank under the building. The doors of the building had been removed and it is now very overgrown.

PRN 31145 & PRN 31146 NGR SN 4020 0380 (PLATE 2)

A range of buildings which supplied power to the airfield. PRN 31145 was the works services building, and boiler house and PRN 31146 was a pumphouse and substation. Of the buildings, PRN 31145 only survives as a concrete base, but PRN 31146 survives fairly well intact, even its doors survive. All the buildings were built from red brick, including the tall square chimney stack, which survives to its full height, although it does have a large crack down its SW side.



Plate 2 power generation plant Pembrey airfield

PRN 31153 NGR SN 4020 0380

A machine gun range and test butt. Consisted of a red brick-built building surrounded by an earth bank. The bank has been levelled, but the building survives.

PRN 31185 NGR SN 4020 0380

Former shoemaker, tailor and barber shop, survives intact except for its door which is missing and broken windows.

PRN 31193 NGR SN 4020 0380

The disinfectant house, a corrugated tin shed surviving except for its doors and windows. Some machinery survives in situ inside the shed.

PRN 31197 NGR SN 4020 0380 (plate 3)

Large red brick-built decontamination centre survives intact except for its doors. Much of the internal fittings survive, including shower cubicles, toilets and wash basins. Outside the NW end of the building a series of rails still stand, which would have guided people into two decontamination suites. The building layout is symmetrical about its long axis.

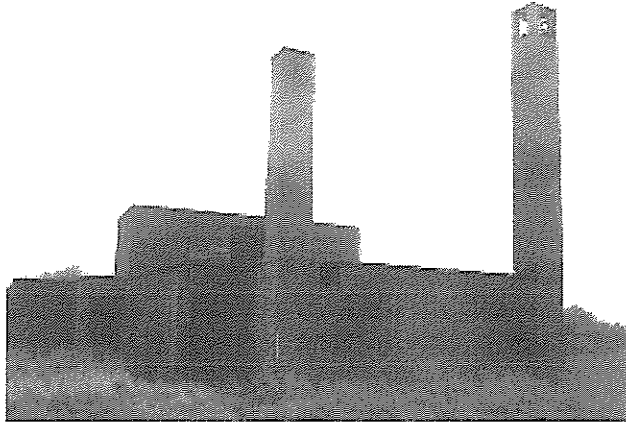


Plate 3 decontamination centre

PRN 31203 NGR SN 4020 0380

Concrete building used as the WAAF laundry, survives in good condition.

PRN 31204 NGR SN 4020 0380

Small, square concrete-built WAAF hairdresser's shop surviving in good condition.

PRN 31211 NGR SN 4020 0380

Rectangular, red-brick sleeping shelter, designed to accommodate 23 men and located at the NW perimeter of the airfield. The building is now very overgrown.

PRN 31216 NGR SN 4020 0380

Irregularly-shaped concrete-built building which was formerly the WAAF Institute. The building has been boarded-up in recent times, and so may survive quite well internally.

PRN 31231 NGR SN 3845 0307

Remains of a rectangular red brick-built structure 5m x 3m x 1.5m high, in Pembrey Forest. The structure comprised of two bays, one of which had been partially demolished. Its function is not certain, although it may have been the base for some form of storage tank.

PRN 31232 NGR SN 3855 0311

Small rectangular red brick-built building in Pembrey Forest with a NW facing entrance, and only one window opening, NE facing (no frame or glass survived). Internally there were 4 ceramic drains in the floor, so there must have been water supplied to the building at some time. There was nothing to indicate a former use.

PRN 31233 NGR SN 3850

A compound of 9 buildings constructed in the dunes at the SW end of the airfield, now in Pembrey Forest. The buildings were visible on 1944 aerial photographs of the airfield, and appeared to be Nissen-shaped huts. All that remains today are the concrete bases for 7 of buildings, 2 of which have been damaged by Forest Enterprise groundworks. The site is almost totally overgrown with little of the bases visible. It is not known what the compound was used for, but its location away from the main airfield suggests that it may have been some form of ammunition storage.

PRN 31234 NGR SN 3875 0330

The concrete base of one of c.15 buildings which formed a compound (PRN 31112 see above) at the southwest end of the airfield now part of Pembrey Forest. As well as the base part of the corrugated metal sheeting of the superstructure was visible. Sticking up through the base was a metal pipe, either a water pipe, or an electrical conduit. The site is heavily overgrown, but because of its concrete base the building is poorly drained compared to the surrounding dunes, and has therefore developed its own micro-bog environment. These micro environments should make it possible to locate the other buildings, should the concrete bases survive.

PRN 31335 NGR SN 3918 0308

A bank surrounding a small pond which was visible on aerial photographs taken in 1982, but is now within Pembrey Forest. The pond was not found during the survey.

PRN 31336 NGR SN 3932 0298

A small rectangular grey building visible on aerial photographs but not found during the survey. It was most likely a small tin farm shed or animal shelter.

PRN 31337 NGR SN 3960 0280

Very large metallic-looking mound seen on aerial photographs, which was either a domed building associated with the airfield, or more likely a large silage stack covered in black polythene sheeting. Well weathered sheeting would look metallic from the air.

PRN 31340 NGR SN 3995 0468

Bank extending from Bank-y-Lord onto the saltmarsh. The bank was shown on early Ordnance Survey maps, and so may have been a part of the original construction of Bank-y-Lord. It now has two modern metal water pipes and sluices running through it.

PRN 31342 NGR SN 4110 0375

A broad bank alongside a concrete road that leads to a new factory unit. The bank is probably constructed from the spoil generated during construction of the new factory.

PRN 31343 NGR SN 4077 0139

Siding on disused tramway (PRN 31362). On aerial photographs taken in 1992 there were two buildings clearly shown, these are almost certainly modern farm buildings and not associated with the workings of the tramway.

PRN 31344 NGR SN 4170 0107

Two brick-built rectangular enclosures, now part of Meusydd Farm, but which appear to have originally been associated with the Royal Ordnance Factory. This assumption is supported by the disused tramways (PRN 31345) which connected the enclosures with the main tramway (PRN 31422) to the Royal Ordnance Factory. There is no evidence as to their former function, although they were likely to have been two outlying storage yards.

PRN 31345 NGR SN 4170 0107

Two short lengths of disused tramway connecting the enclosures (PRN 31344) with the main Royal Ordnance Factory tramway (PRN 31422). Both lengths now survive as earthworks extending from the southern corner of the enclosures and curving southwest to join the main tramway.

PRN 31348 NGR SN 4245 0020

A complex of slit-trenches in Pembrey Burrows overlooking the Burry Inlet. There is a concrete base in the centre of the complex. The position and layout of the complex suggest that it may have been a command post for the WWII defensive line from the Royal Ordnance Factory to Pembrey Harbour. Most of the trenches survive in good condition.

PRN 31349 NGR SN 4270 0036 - SN 4310 0038

Bank flanking a path along the southern edge of Ashburnham's Golf Course. The bank was visible on 1992 aerial photographs (Geonex 1992, frames 109-110) and probably derived from clearance of the path.

PRN 31350 NGR SN 4230 0063

A nexus of four low banks visible on aerial photographs of the golf course. Three banks fan out roughly north-east-southwest from a northwest-southeast bank. It is unclear what they are, but they may have been tramways.

PRN 31351 NGR SN 4195 0044

Small concrete? building sitting in a what appears to be a fairly deep bunker on the golf course. The bunker is not a "golf course type" of bunker, but more like a defensive bunker. Perhaps this building was part of the WWII defences. It was not visited during the survey.

PRN 31353 NGR SN 3870 0420

An irregular enclosure and building on the northern end of Towyn Burrows visible on 1944 aerial photographic coverage of Pembrey Airfield. There was no trace of either the enclosure or building on later aerial photographs or on the ground. Therefore it is assumed that it was associated with the airfield and removed at the end of WWII.

PRN 31355 NGR SN 4110 0370

A small farmstead shown on the 1944 aerial photographic coverage as being close to the road leading to Pembrey Airfield. On later cartographic evidence the farmstead had moved further away from the road. There is no trace of the farmstead surviving.

PRN 31356 NGR SN 3900 0360

Farmstead shown on tithe plan and early Ordnance Survey maps and 1944 aerial photographic coverage. The farmstead was not named on either map, and there is now no trace of it.

PRN 31358 NGR SN 4114 0365

Brick-faced pill-box, type 24, positioned on the southern side of the road from the airfield, just before the bridge over the railway. Part of the Command Stop Line.

PRN 31359 **NGR SN 4120 0396 to SN 4137 0312 (plate 4)**

A row of anti-tank cubes placed along the side of the main railway line stretching for a total of over 0.75km either side of the road from the airfield. Along with the pill-box (PRN 31358) they formed an effective defensive line at this point. Part of the Command Stop Line.



Plate 4 anti-tank cubes and railway looking south

PRN 31360 & PRN 31361 **NGR SN 4122 0141 & SN 4095 0165**

Two type 24 pill-boxes positioned to defend a line which followed Swan Pool Drain. Part of the Command Stop Line.

PRN 31362 **NGR SN 4075 0120; SN 4078 0130; SN 4170 0189; SN 4177 0383**

A raised flat-topped causeway which curves NE away from a point near to the main railway line suggesting that it may once have been a branch line, or tramway associated with the railway. From the railway it curves into Pen-y-Bedd Wood before running W across the flat pasture land between Pen-y-Bedd and Pembrey Forest. At one point the line widens into what looks from aerial photographs to be a siding (PRN 31343), from here it curves S and enters the NE corner of the Royal Ordnance Factory site.

PRN 31363 & PRN 31364 **NGR SN 4200 0145 & SN 4205 0144**

Two curvilinear platforms and old railway lines positioned at the point where the line of the tramway (31422) curves north to join the main railway. The

platforms which were concrete topped and brick-faced appear to be in fairly good condition, although very overgrown.

PRN 31365 **NGR SN 4167 0078**

Type 24 pill-box alongside the road leading from Pembrey to the Pembrey Country Park at the point where Swan Pool Drain passes beneath the road. Part of the Command Stop Line.

PRN 31366 **NGR SN 4189 0013**

A type 24 pill-box in Pembrey Burrows at the southeast corner of the Royal Ordnance Factory just S of the Ashburnham Golf Course. One of a number of pill-boxes along the S coastline of the survey area. Part of the Command Stop Line.

PRN 31367 **NGR SN 4202 0034**

Possible shell midden damaged by the construction, or repair, of a path along the S edge of the Ashburnham Golf Course. An oval spread of cockle shells extended from a low mound, c.0.3m high, N across the path and beyond. The interpretation of this feature as a shell midden is tentative because at various other points along the S edge of the golf course there were piles of cockle shells which were being used to resurface some of the course paths.

PRN 31368 **NGR SS 4365 9990**

Remains of a type 24 pill-box which formerly stood on the tip of the pier at the entrance to the silted up old harbour at Pembrey. Erosion around the pier had undermined the pill-box foundations and it had collapsed towards the sea. All around the end of the pier there were a lot of obviously structural concrete pieces which appeared to have come from other pill-boxes, which were probably dumped to attempt to stop the erosion. There was a concrete base on the end of the pier for an anti-aircraft gun, so it may be that there was a look out post associated with the gun. If so then some of the concrete pieces may have been from the look out post.

PRN 31369 **NGR SS 4365 9955**

A long structure comprising 3 parallel rows of upright wooden posts, positioned at the mouth of the large creek in Pembrey Burrows. The most likely interpretation of the structure is that it was a fish weir. Its mid channel location meant that it was not visited, but it is thought that the structure was up to 250m long, and may have been truncated slightly at its N end. Only c.0.5m of the uprights was visible, and it is not clear at present whether the structure is being exposed or covered by the shifting of the sediment in the area.

PRN 31370 **NGR SN 4088 0052**

Rectangular pill-box, type 23, positioned on a tall dune overlooking what was the main road and railway line through the Royal Ordnance Factory, now the main road through Pembrey Country Park.

PRN 31371 NGR SN 4017 0062 (plate 5)

Square, red brick-built structure with a protected entrance on its SW corner constructed on a flattened and made up dune. The layout of the structure is unusual for a pill-box, in this area, so it may have been something like a firewatchers' post. This is suggested by some writing on the interior of the W wall where a letter S with an arrow and a letter W have been painted in white paint either side of the window slot. This was to ensure that accurate directions were given by the watchers.



Plate 5 firewatchers hut in Pembrey Country Park. *Note the protected entrance*

PRN 31372 NGR SN 4017 0062

A few metres north of, and obviously associated with, structure PRN 31371 was a small red brick-built structure of unknown function, possibly a latrine or store shed?

PRN 31373 NGR SN 4000 0070

A length of a concrete tramway base. In this area of Pembrey Country Park there appears to be a substantial amount of the tramway network surviving, at least as a concrete base. The more exposed tramway bases still have the rails in the concrete.

PRN 31374 NGR SN 3993 0066

An area thought to contain two buildings, although now all that is visible is a small rectangular hollow in the sand. Surrounding the area is a very large amount of building debris and rubble, but this is likely to have been laid when the country park was being created in the mid 1970s when nearly all of the Royal Ordnance Factory buildings were demolished and much of the rubble spread around the park to provide pathways etc..

PRN 31375 NGR SN 3970 0062

A square, red brick-built structure with protected entrance, which may have been a pill-box. Similar in size, and with its protected entrance similar in layout to the firewatchers' hut (PRN 31371) it is possible that this structure formed a similar function. The only major difference between the two are the windows, in this structure they are much smaller than those in PRN 31371 making it similar to a pill-box. Maybe this structure had a dual function being a defensive position used as a firewatchers' (or similar) post.

PRN 31376 NGR SN 3774 0262

Two 1m x 1m square concrete pads in the dunes, probably the remains of a gun emplacement, of which there are many along the seaward edge of the dunes behind Cefn Sidan Sands.

PRN 31377 NGR SN 4046 0098

The remains of a small red brick-built structure in the N of Pembrey Country Park. Only a concrete base and a small section of one wall survives (to a height of 0.4m) intact, much of the debris from the rest of the building is where it fell. So it seems that the building was knocked down during creation of the country park but the remains never removed.

PRN 31378 NGR SN 4054 0102

A short length of brick foundations, now very overgrown and mostly buried. There were two buildings shown in this area on modern Ordnance Survey maps, but only this length of wall was found. The remains of the other building are probably buried, but surviving to some extent.

PRN 31379 NGR SN 3778 0528

Wreckage of a Wellington Bomber that crashed during a training flight in 1945. The wreckage lies on the edge of a creek in the saltmarsh to the north of the airfield, with the starboard side buried in the bank. Extensive damage to the wreck has occurred recently during the removal of the engines and engine mountings. This site lies within the active air weapons range, so it is only accessible at weekends and with prior permission from the RAF.

PRN 31380 NGR SN 3650 0454

The concrete base of a WWII gun emplacement. Seen only from the control tower on the air weapons range. This site was not visited as it lay just behind the active bombing drop zones, and is therefore full of unexploded ordnance.

PRN 31381 NGR SN 3886 0428

Demolished remains of a type 23 pill-box. Formerly part of a defensive system that included a number of type 23 pill-boxes positioned along Bank-y-Lord to protect the S edge of the Gwendraeth Estuary.

PRN 31382 NGR SN 3918 0424

A pond at the N end of one of the drainage channels which drained the land around Towyn Mawr. The pond was originally formed by a rising water level in the ditch which had become filled at its N end. Once formed the pond was used as a drinking point for the cattle which graze on the saltmarsh, and their continued use of the pond is causing substantial erosion around the edges, leading to an increase in the size of the pond.

PRN 31383 NGR SN 3924 0430

Small, square, shallow, 0.3m deep, hollow in the top of the W end of Bank-y-Lord surrounded by a low, 0.1m high, ridge. It is quite small, only 2m x 2m, and even though it appears to be the site of a former structure there was no evidence of there having been one.

PRN 31384 NGR SN 3870 0424

An earthwork enclosure made up of two clearly defined parallel banks and a slightly less defined cross bank at its N end. The S end runs to the edge of Pembrey Forest; it is not visible inside the forest, but that maybe because the forest is very overgrown at this point.

PRN 31385 NGR SN 3990 0466

A concrete chute, and ?hopper building. The building was positioned just inside Bank-y-Lord in Pembrey Airfield and the hopper led N from there before emptying into Pill Towyn, the major creek in the saltmarsh. The chute was constructed from concrete, with a ceramic insert and was supported on concrete piers every 2m-3m. Angled metal struts were positioned over the chute along its entire length; each had a ring at the top, which possibly carried a cable (electric lighting?). There is no evidence to suggest what the chute carried.

PRN 31386 NGR SN 3996 0464

Rectangular, brick-faced, Type 23 pill-box positioned on top of Bank-y-Lord just east of the concrete and ceramic chute (PRN 31385). The pill-box is part of a defensive system along the S edge of the Gwendraeth Estuary.

PRN 31387 NGR SN 4006 0444

A row of four wooden uprights and one cross-piece exposed in the alluvium at the point where Swan Pool Drain/Ashburnham's Canal meets Pill Towyn just inside Bank-y-Lord. Only the top 0.1m of the posts were

exposed at a depth of 0.5m-0.6m below the present ground surface, and 0.3m below the level of the cross-piece which was stuck in the eroding channel bank. The difference in height between the cross-piece and uprights means that no direct association was determined, although there is a good chance that it was a hurdle-like structure, possibly to strengthen and protect the side of the channel.

The site is used by cattle every day because it is a sheltered spot off of the saltmarsh during high tides. Cattle drinking from the pill and the drain/canal are eroding the site, and are likely to continue to expose more of the structure.

PRN 31388 NGR SN 4070 0490

Rectangular, type 23 pill-box on top of Bank-y-Lord. This pill-box was part of the defensive line along the S edge of the Gwendraeth Estuary. All the pill-boxes, except for the one at the extreme E end (see PRN 31389 below) are type 23 and brick-faced. All except the one (PRN 31381) at the W end of Bank-y-Lord survive in good condition.

PRN 31389 NGR SN 4106 0500

An hexagonal, type 24 pill-box located on Bank-y-Lord at the point where the bank is crossed by the main railway line. This pill-box is the E end of the defensive line along the S edge of the Gwendraeth Estuary. Quite why this type of pill-box was chosen for this location is not clear, although its all-round vision would have given a good view back along the line as well as out into the estuary and along the railway line. Part of the Command Stop Line.

PRN 31390 NGR SN 4110 0494

A short line of anti-tank cubes that runs S from pill-box (PRN 31389) alongside the main railway line. Part of the Command Stop Line.

PRN 31391 NGR SN 4380 0532

Pill-box, type 24 at the junction of the B 4317 and the B 4308. This pill-box is the most inland one discovered in the survey area, but its position indicates that this junction was considered a good defensive position. Its apparent isolation from the other pill-boxes recorded during the survey suggests that there may be other inland boxes covering other strategic points.

PRN 31392 NGR SN 4080 0050

Pembrey Country Park was created on the site of the former Royal Ordnance Factory site during the mid 1970s. Creation of the park depended on the demolition of most of the Royal Ordnance Factory buildings,

although this survey has shown that many of the buildings away from the centre of the site survive in some form. The park is the leading tourist attraction in Wales.

PRN 31393 NGR 3813 0606

A shipwreck on the southern side of the Gwendraeth channel recorded on 1965 aerial photographs of the site (OS 65 125, 009-010). It is now covered by the expanding saltmarsh, and its site now lies well inland of the saltmarsh edge.

PRN 31394 NGR SS 4174 9024

Another possible shipwreck site recorded from aerial photography (RAF 876, 1954: 0019-0018). A crescent-shaped feature was clearly visible within the saltmarsh near Pembrey Burrows. In 1954, when this coverage was taken, the position of the wreck was well inland in the saltmarsh.

PRN 31395 NGR SN 3824 0587

A group of seven wooden uprights visible on the 1965 aerial photographic coverage (OS 65 125: 009-010) forming two distinct lines, one of four and one of three in the saltmarsh just southeast of shipwreck (PRN 31393). The line of four uprights is roughly parallel with the edge of a creek and the line of three heads towards it from the southeast at a slightly oblique angle. It is not certain what the posts were, they may have been something to do with shipping, or, more likely, they were part of a fish trap.

PRN 31396 NGR SN 3870 0200

A possible shell midden in the centre of Pembrey Forest. It was reported by foresters to the Forest Ranger as a shell mound. The mound was c.6m diameter and 1.5m high. No shells were recovered to support this.

PRN 31397 NGR SN 4016 0126 (plate 6)

A complex of large, oval bunkers (the largest is c.30m x 25m). Each bunker consists of a sand bank, c.4m-5m high, and cut through by two opposing brick-built entrances. Both entrances curve along their length. One entrance was wider and carried a tramway (the sleepers survive in some bunkers) and the other was for pedestrian access. Both entrances were built from red brick, including the floors, and capped by a thick concrete roof. Originally the complex was served by a tramway; no evidence of this remains. A total of 14 bunkers were noted during the survey, although it is likely that there are others in the forest. There are a number of similar bunkers inside Pembrey Country Park.

Although not certain it is probable that they were safe bunkers for munitions assembly. If there was an accident and an explosion occurred it would be confined to a

single bunker thereby minimising the loss of materials and personnel.

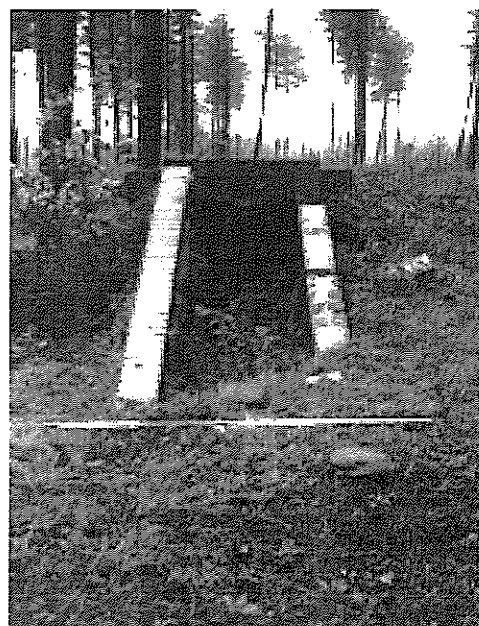


Plate 6 curved entrance into one of the bunkers

PRN 31398 NGR SN 4260 0540

The site of the former Frankland's Quay on the Gwendraeth Fawr just below the aqueduct. Nothing is visible on the site anymore, although both times it was visited was during high tide so some evidence may remain at a lower level. Of course the quay may have simply been a flat area of mud where craft beached rather than a formal quay with wooden or other structures.

PRN 31399 NGR SN 3634 0874

A shell midden in the dunes on the St Ishmael coast. The midden has been cut through by a path down to the foreshore and also truncated on its seaward side by high tide. There are three major shell layers separated by layers of clean sand indicating periodic, probably seasonal use. Pottery is present in all three shell layers, and even though no pottery has been removed it appears to date from the post-medieval period.

PRN 31400 NGR SN 4039 0126

Remains of a large rectangular, red-brick building protected by a horseshoe-shaped sand bank suggesting it was used for explosives, possibly storage. This building is shown on Ordnance Survey maps. The building was demolished deliberately, although the rubble has not been removed. The site is now within Pembrey Forest, and whilst it is not planted it is very overgrown.

PRN 31401 NGR SN 4034 0122

Small red-brick building with a staggered entrance. The walls have been partially demolished down to a height of

1.5m. The interior was too overgrown to see if there were any internal fixtures or fittings. This building was part of a small complex of surviving structures (includes PRNs 31400, 31402, 31403, 31404), all of unknown function but certainly part of the Royal Ordnance Factory.

PRN 31402 NGR SN 4030 0120

A small, rectangular brick-built pit, 2m x 1m. It is now water-filled so it was not possible to find its depth. There is no clue as to its former use.

PRN 31403 NGR SN 4032 0123

A 20m long, north-south, sand bank with a red brick-built, vaulted tunnel through it which must formerly have been part of a larger structure, although there was no evidence of it.

PRN 31404 NGR SN 4038 0120

A red brick-built building which survives to a height of 2m and comprises an open lobby and two stalls which appear to have formerly been roofed. Although it was not possible to check the interior of the stalls it is possible that the building was a latrine for personnel working in that area of the Royal Ordnance Factory.

PRN 31406 NGR SN 4115 0612

Slight earthwork visible running northwest-southeast across pasture land just south of the new Kidwelly Bypass. The earthwork comprises a low central ridge flanked on either side by very shallow ditches. It is possible that it is the remains of a tramroad (PRN 31420) connecting with the Burry Port and Gwendraeth Valley railway.

PRN 31407 NGR SN 4134 0368

Salt House Pill, formerly a large creek through the Towyn salt marsh. First mentioned in early 17th century descriptions of the area, it is clearly shown on cartographic evidence from the 17th and 18th centuries. Now only some sections survive incorporated into the drainage system, the rest having silted up. On the 18th century map it appears to have been wide enough for small craft access as far as Clôds and Ty Mawr.

PRN 31408 NGR SN 4144 0344

Saltrock Farm. An abandoned farmstead alongside the A484. Only two derelict buildings now stand on the site. The name of the farm and Salt House Pill suggest the presence of a salt works on the site during the post-medieval period.

PRN 31409 NGR SN c.SN 3790 0060

Remains of a structure of wooden and metal posts. Possibly part of the first line of WWII beach defences. It was only visible once during the survey during an extremely low tide.

PRN 31410 NGR SN 4044 0213

Towyn Canol. Former farmstead shown on 1762 plan of Pembrey Marsh. In 1762 one of the fields was called smoking house meadow, indicating that there was a smoking house nearby. Census returns from the 19th century show there to have been four cottages at Towyn Canol. Nothing now survives.

PRN 31411 NGR SN 3973 0374

Towyn Camp. A temporary encampment constructed to house airfield personnel during WWII. Some of the buildings survived until the 1960s. The site later became a chicken farm. Except for some of the concrete roads and one short length of brick wall nothing now survives of the camp and the site is currently pasture land.

PRN 31412 NGR SN 3760 0185

Shipwreck on Cefn Sidan Sands. It appears to be "stern-on" to the beach suggesting that there may have been an attempt to refloat it. Probably a late 19th century coastal trader.

PRN 31413 NGR SN 3500 0500

WWII beach defences, lines of metal posts and barbed wire. Following the end of the war the barbed wire was removed and the posts cut down to beach level, but subsequent erosion has exposed up to 1m in height of the posts. Most are at the western end of the Pembrey Sands Air Weapons Range.

PRN 31414 & PRN 31415 NGR SN 3707 0345 & SN 3724 0326

Two disused gun emplacements shown on post-war Ordnance Survey maps but not visited during the survey.

PRN 31416

Command Stop Line. A tactical defence line that stretches from New Quay in the north to Pembrey in the south, comprising a number of individual installations, including pillboxes and anti-tank cubes.

PRN 31417 NGR SN 4278 0517

Large red brick reservoir alongside the aqueduct (PRN 8822; NGR SN 4276 0530) carrying the Kidwelly and Llanelli Canal across the Gwendraeth Fawr near Morfa

Mawr Farm. The reservoir building is square and unroofed, and has a external reservoir on its north side. It was presumably constructed to supply water for the trains of the Burry Port and Gwendraeth Valley Railway which replaced the canal.

PRN 31418 NGR SN 4270 0526

Small farmstead sitting on a small knoll of higher ground in the alluvium. Lived in until the 1980s it is now derelict, although, all the walls stand to full height.

PRN 31419 NGR SN 4140 0560

Quay on the Gwendraeth Fawr at Muddlescwm. The quay was shown on John Wedge's plan of Kidwelly Bar and Harbour in Carmarthen Bay of 1814. It was probably established towards the end of the 18th century for the coal industry.

PRN 31420 NGR SN 4110 0622

Tramway connecting the Dinas Silica Works with the Burry Port and Gwendraeth Valley Railway. It is possible that part of the tramway now survives as an earthwork (PRN 31406) crossing a field below the new Kidwelly by-pass.

PRN 31421 NGR SN 4049 0626

An old brick kiln shown on the 1st edition Ordnance Survey maps, just south of the main Dinas firebrick works at Kidwelly. This old kiln is evidence of earlier much more small-scale brick manufacture in the area.

PRN 31422 NGR SN 4200 0130 - SN 4154 0065

Main tramway from Royal Ordnance Factory joining with the mainline railway. The bed of the tramway survives alongside the present road from Pembrey to Pembrey Country Park.

THE ARCHAEOLOGICAL RESPONSE: OPPORTUNITIES AND CONSTRAINTS

There is a growing, and welcomed, trend towards more conciliatory terms than "threats to the archaeological resource" in the development of archaeological management and conservation strategies. This is particularly welcomed with regard to wetland archaeology where an integrated approach to archaeological and environmental conservation and protection offers the best management potential. But it must be stressed that any development has the potential to impact on the archaeological resource, and so does pose a threat. In a wetlands environment the potential impacts are perhaps greater and more varied than that facing dry sites. Often on wetland sites the impact may not be immediate, and often invisible, but ultimately destructive such as, long term water level changes and changes in water condition.

It is hoped that this assessment will initiate a series of processes aimed at providing effective management of archaeological sites and features in a wider environmental conservation framework. The processes can be defined as in Fig 12.

THE PROCESSES OF CHANGE: PRESSURES ON THE ARCHAEOLOGICAL RESOURCE

Although archaeology is now a material consideration in developments requiring planning permission, it is a fact that many operations in wetland areas potentially damaging to archaeological features and deposits do not fall within the Town and Country Planning legislation. Changes in methods of land management, such as the change from "soft" to "hard" drainage fall into this category. Archaeologists study change in both the recent and distant past. But equally archaeologists are concerned that all past traces of human activity are given due attention and are not destroyed through ignorance, indifference or needlessly. The pressures affecting the archaeological resource may be divided into:

Environmental pressures

Water management operations

Land management operations

Development proposals

Both general factors and specific actions, current and/or proposed are outlined below, together with an indication of the conservation controls and guidelines which may or may not be in place. This section then leads on to specific recommendations for future action.

ENVIRONMENTAL PRESSURES

In this case environmental pressures are anything not directly initiated by human action, such as erosion, long-term sea level rises, terrestrialisation and acid rain.

Within the survey area the biggest threat is from erosion with long stretches of sand dunes being eroded at very high tide. In some places the threat of erosion is getting to the stage where human intervention will become necessary, particularly on the St Ishmael coast where the railway line is close to the dunes and on the Towyn Burrows where the RAF control tower is in imminent danger of inundation. This erosion is having a direct and devastating effect on the archaeological resource, pillboxes have been lost from the dunes behind Cefn Sidan Sands, and St. Ishmael DMV and the shipwrecks on Cefn Sidan Sands are suffering constant erosion. Accretion in sand dune systems is the reverse of the coin to erosion and this is very marked on the south eastern edge of the study area towards Burry Port. Here the present day land surfaces and any historic traces within them are being buried.

It is expected that the new unitary authority for the area, Carmarthenshire County Council, will continue the preparation of a Shoreline Management Plan for Carmarthen Bay. A scoping document has already been produced (1995) by Shoreline Management Partnership, acting for Llanelli Borough Council as lead body, Carmarthen District Council, the Countryside Council for Wales, Swansea City Council, the National Rivers Authority and the Ministry of Defence. A preliminary archaeological appraisal has been prepared and submitted for the whole area by Dyfed Archaeological Trust, Heritage Management Section; the appraisal did not include detailed site information. The principal purpose of the plans is to formulate a sustainable coastal defence policy and options of "managed retreat" may be considered. An understanding of the past coastal processes is necessary to predict future change. Archaeological data are relevant here as are archaeological and historical features in management policies, particularly with reference to tourism, recreation and education.

WATER MANAGEMENT OPERATIONS

Maintenance of existing coastal defences may have archaeological implications since existing defences are made up of older elements of different dates. Repair and remodelling might destroy evidence of the origin and development of the defences and their sea outfalls. Earlier redundant sea defences are no longer anyone's responsibility to maintain. The NRA controls land drainage through the issue of Land Drainage Consents. This report has highlighted the accelerating pace of change from "soft drainage" (the present system of creeks, channels and open drains) to "hard drainage" (land drains). The older system, which has evolved over

Processes	Project action	Future action
IDENTIFICATION of the archaeological resource.	SMR interrogation. Desk-Based Assessment. Rapid field survey.	Detailed documentary research Analysis and mapping of APs Measured surveys. Trial trenching, test pitting and palaeoenvironmental sampling.
EVALUATION of the archaeological resource.	Support data for Historic landscape Register in terms of Scheduling criteria. Provisional assessment of local and regional importance.	More detailed landscape assessment using Register criteria. On-going evaluation as local and regional studies are carried out.
DISSEMINATION of information on the archaeological resource.	Production and circulation of report. Addition of new data to the SMR	Archaeological input into all the area's management bodies by reports, information or representation. Archaeological advice to statutory consultees.
RECOGNITION of the importance and relevance of the archaeological resource.		Archaeological information and conservation guidelines in all Management Plans and procedures (Pembrey Country Park, Forest Enterprise, MoD NRA, GWR).
PROTECTION of the archaeological resource.	Recommendations for Scheduling/Listing enhancement. Enhancement of the SMR for DC and other advices. Raising the archaeological and landscape profile of the area via the project and report.	Scheduling/Listing Area designations in future LA Plans. Promotion of good practice in conservation guidelines in all Management Plans and guidelines and liaison. Ensuring preservation by record in cases of unavoi dable destruction
ENHANCEMENT of the archaeological resource	Outline methods and guidelines in report	Consolidation of monuments. Clearance of site environs Prevention of erosion and damage
UTILISATION of the archaeological resource	Outline proposals in report	On-site interpretation (boards, leaflets, trails booklets, talks, events). Incorporation of archaeological interests into general and other promotional material.

Figure 12: table showing suggested management procedures

time, constitutes the principal evidence for the processes and dates of land-claim, and the sides of the ditches can expose earlier levels, structures and objects. Their decay and eventual abandonment has archaeological implications, just as much as any major recutting and remodelling. It is generally recognised that a general lowering of the water table and water abstraction can adversely affect wetland ecology. It is perhaps less generally appreciated that it can damage buried archaeological features and deposits.

The lead body here is the NRA, through their flood defence revenue programme and the issue of Land Drainage Consents. The NRA has recently reviewed its responsibilities towards archaeology (Evans et al 1994, 289). Consultation with archaeological curators is directed through an annual Conservation Liaison group meeting, where forthcoming works programmes are circulated. Changes underway in reorganisation of the NRA into an Environment Agency reinforce the need to identify archaeological constraints in advance and to indicate options for archaeological mitigation measures, since work programmes will now be out to open tender. Consultation on land drainage consents may need to be selective due to limited archaeological development control resources.

LAND MANAGEMENT OPERATIONS

Historically two main factors have influenced the winning of land from the sea and the uses of it: the desire to gain good agricultural land, and the need to construct transport systems to shipping places and quays. But what was highly valued farming land to one generation and set of economic circumstances, might seem worthless to others. Nowhere are such oscillations in perception as marked as on marshlands. In more modern times they have been seen as ideal locations for "anti-social" industries (such as the Royal Ordnance Factory), for large-scale military installations and for leisure activities such as the Carmarthen Bay Holiday Village, motor sports, beaches woodland walks, water sports and fishing. Commercial forestry was seen as an ideal way of stabilising land and providing an income from otherwise valueless sand dunes. Individual actions or operations in every day use and management of farms, forest and woodland, MoD operations and leisure facilities can have adverse impacts on the archaeological resource, often unwittingly.

Pembrey Country Park is the biggest tourist attraction in Wales. It is additionally distinctive in that many of the visitors and users are local people. It is fair to say that it has principally been promoted for the very high quality of Cefn Sidan Beach and for woodland walks. Park officers are well aware of the 20th century heritage of military buildings and the maritime heritage, but less so of traces of an earlier past. No longer are these structures seen simply as dangerous eyesores to be demolished and cleared or buried. Equally it is important for conservationists to recognise concerns and

responsibilities for public safety. However, there are as yet no clear ideas on how best these features can be managed and indeed promoted to give added interest and attraction to the park. A new Management Plan for the park will be prepared in the near future in which these issues should be addressed.

Forest Enterprise, Llandovery District, is in charge of Pembrey Forest, which has been designated by them a Forest Nature Reserve. Archaeological sites and concerns have been highlighted by Dyfed Archaeological Trust in consultations for the Pembrey Forest Design Plan. General guidelines have most recently been issued in the Forest Authority's "Forestry and Archaeology".

No detailed information has been gathered for this report on the future prospects for farming on the marshes. A number of horses and ponies are grazed on the marsh as well as sheep and cattle. In general there is move towards diversification where possible - an outline proposal for a golf course and clubhouse at Pen-y-Bedd Farm has been made. Within the areas designated as SSSIs and for a number of marshland habitats in general there is little doubt that "traditional" methods of farming, most especially of drainage with open channels, are best for environmental conservation. They are valuable archaeologically in that they preserve buried traces better and maintain historic elements in the landscape of the area as working components, thus giving it time-depth and diversity.

Equally wildlife conservation initiatives - the construction of new habitats, the management of features like canals - may be detrimental to archaeological features and deposits. Ecologists could argue with some justification that archaeological/historical conservation can be detrimental to wildlife. For example, recent consolidation and repair of Spudder's Bridge on the lower Gwendraeth Fawr destroyed rare lichen living on the bridge.

DEVELOPMENT PROPOSALS

The principal development proposals affecting the area are opencast coaling and associated infrastructure developments. Celtic Energy, as successors to British Coal Opencast own a very large interest area, now termed the Glanston Site, where prospecting operations were carried out in 1993. A preliminary archaeological appraisal was forwarded to British Coal Opencast in 1993, highlighting the known and potential archaeological interests.

A new Gwendraeth Valley Link Road, which would run along the towpaths of the Kidwelly and Llanelli and Pembrey Canals, has been proposed by the Amman/Gwendraeth Partnership; a feasibility study and public exhibition has taken place. No archaeological appraisal of the scheme has yet taken place. As it stands, the route lines threaten the best preserved sections of the canals

and a number of associated features.

RECOMMENDATIONS

These recommendations follow the order laid out in the order of Processes in Fig. 12 and are therefore a mixture of both general and specific. In accordance with standard practice any sites and/or features recommended for consideration by the Secretary of State for Wales for Scheduling or Listing are not individually listed whilst the recommendations are being considered. In other instances suggestions are made for possible provision for further work and actions to be carried out. These are made simply for the relevant bodies to consider and are for further discussion.

IDENTIFICATION

Detailed documentary research

It is recommended that all existing bodies use every opportunity to promote further research and that consideration be given to the most appropriate means by which all interested parties can be made aware of past, current and future work. Occasional seminars held at Pembrey Country Park might be one possibility. Such events would promote the safeguarding of the modern material record and the value of oral testimony.

Analysis and mapping of aerial photographs

It is recommended that funding be sought for the mapping of all traces of past activity visible on historic and recent air photographs on a GIS base. The project has shown the sheer quantity of information available and the lack of accurate, detailed maps. An accurate and comprehensive map base of all historic features of interest is seen as an absolute necessity and pre-condition for detailed management proposals.

EVALUATION

Trial trenching and test pitting

It is recommended that all opportunities be sought for sampling of deposits to rectify the imbalances in evidence available, particularly of former shorelines and past environments. It is further recommended that a research design be developed in order to better specify assessment and evaluation in advance of, and recording during development of archaeological features and palaeoenvironmental deposits.

EVALUATION

Landscape assessment

It is recommended that in any detailed landscape assessments of the area the archaeological and historical dimension should be included: the methods of assessment and characterisation employed in the Gwent Levels

Project (Rippon 1996) could be used as a model. A more detailed assessment might be required in support of the Historic Landscape Register (Cadw: CCW). A preliminary and provisional characterisation has already been made in the Landscapes Working for Wales: South East Carmarthenshire Assessment, cultural heritage element, carried out by DAT for Chris Blandford Associates acting for a group of local authorities, the WDA and Forest Authority.

On-going evaluation

It is recommended that recognition is made at all levels that the archaeological and historical resource is a dynamic and changing one, both in terms of sites and features revealed by natural and human actions, changes in their condition and the discovery of new material through fieldwork and research. This recognition carries with it the need to maintain and enhance site records, principally the Sites and Monuments Record and to monitor and re-evaluate sites. Scheduling provides for a 5 year inspection cycle.

DISSEMINATION

It is recognised that the best way of dissemination of archaeological information initially is through personal contacts. It is therefore recommended that there should be archaeological representation on all relevant management/conservation committees or groups. This includes the Pembrey Range Environmental Liaison Committee, which could have the same kind of archaeological representation as Castlemartin Range Advisory. Failing that, it is recommended that information, or a report be made to such committees on archaeological aspects within their areas and affected by their operations.

RECOGNITION

It is recommended that where not already in place, archaeological information and guidelines specific to the area be included in Management Plans and Work Programmes. Help and advice can be provided by Cadw and the Heritage Management Section of DAT.

PROTECTION

It is recommended that there be an extension of Scheduling and Listing of archaeological sites and buildings under the 1979 Ancient Monuments Act. Individual recommendations have been made separately to Cadw, principally regarding WWII structures and elements of the early transport systems.

It is recommended that measures available to Local Authorities to protect the cultural heritage be considered in future LA Plans in specific relation to Pembrey and Kidwelly Marshes.

It is recommended that measured and photographic records be made of the following structures, features and

deposits which are subject to active erosion and destruction to preserve them by record:

PRN	NAME	NGR
2113	St Ishmael DMV	SN 3630 0775
14365	shipwreck (Paul)	SN 3520 0650
14366	shipwreck (Teviotdale)	SN 3530 0420
30086	shipwreck	SN 3800 0290
30088	shipwreck	SN 3865 0088
31412	shipwreck	SN 3760 0185

ENHANCEMENT

It is recommended that consideration be given to the best practical methods of consolidating monuments and making them accessible, also preventing further erosion, initially in the context of existing works programmes and operations (e.g. within the Country Park).

UTILISATION

It is recommended that archaeological information generated by this survey be incorporated into the existing interpretation of this area. Other conservation bodies and those involved with the presentation of this special landscape should recognise its historic importance. The legacy of early canals and railways provide an existing framework of footpaths which could be developed into industrial heritage trails. The recent history of Pembrey and its role in WWII should be recognised and not needlessly swept away.

Appendix one: sources consulted

CARTOGRAPHIC SOURCES

Plan of Caldicot. c.1681 (ref: NLW Ashburnham 2122).

A map of the Lordship and Estate of the Right Hon. John Earl of Ashburnham situate in the Parish of Pembrey. Surveyed and delineated by John Davies. 1762 (ref: NLW PG 2096 RM A188).

Kidwelly Bar and Harbour in Carmarthenshire, surveyed by John Wedge. 1814.

Tithe map and apportionment for the parish of Kidwelly, 1847.

Tithe map and apportionment for the parish of Pembrey, 1841

Plan of proposed new road from Pinged via Bryn Dias. 19th century (ref: Ashburnham 309 - held in MSS department, NLW).

Plan of Morfa Isaf and Pant Teg farms. 19th century. (ref: Ashburnham 984 - held in MSS department, NLW).

Copy of the Record site plan of Pembrey Airfield issued by the Works Directory of the Air Ministry. 1944.

All editions of the Ordnance Survey, and the original surveyors drawings which were drawn in 1811.

DOCUMENTARY SOURCES

Deeds relating to Pembrey. 1481-1637 (ref: Ashburnham group II 1/1-4, held in the MSS department, NLW).

A lease of Warren in Pembrey parish. 1662 (ref: Ashburnham group II 2/12, held in the MSS department, NLW).

Will of Roger Hoskins of Pembrey parish. 1685 (ref: Ashburnham group II 4/37, held in the MSS department, NLW).

Papers concerning a cause in Chancery between Lady Bridget Ashburnham et al. and John Roberts about disputed rights on Pinged Marsh. 1712-14 (ref: Ashburnham group II 7/1-8, held in the MSS department, NLW).

Papers relating to boundaries of the manor of Pembrey. Based mainly on the right to wreck on Cefn Sidan - dispute between the estates of Pembrey and Golden Grove. 1782-1872 (ref: Ashburnham group II 19/1-21, held in the MSS department, NLW).

Papers relating to Pinged Marsh. 1883 (ref: Ashburnham group II 61/1-5, held in the MSS department, NLW).

Papers relating to proposed reclamation of Towyn Marsh. 1884-8 (ref: Ashburnham group II 62/1-5, held in the MSS department, NLW).

Journals or diaries probably kept by A Tatlow... of visits to the Welsh Estates. 1796-1801 (ref: Ashburnham 189-192, held in the MSS department, NLW).

Aerial photographs

Coverage held by the Central Registry of Air Photography for Wales, Cardiff.

Sortie	Scale	Date
RAF		
39RAF5697	1:50000	27/08/81
36TUDUK120	1:10700	03/04/46
106UK1629	1:10000	08/07/46
82RAF876	1:10000	24/03/54
543RAF1475	1:10000	31/10/61
1PRU1227	1:20000	03/07/87

Ordnance Survey

OS65109	1:7500	13/06/65
OS62014	1:24000	14/04/62
OS65246	1:7500	09/10/65
OS78009	1:24600	07/04/78
OS65125	1:7500	23/06/65
OS6230	1:24000	28/04/62

Commercial

Geonex 149267	1:10000	10/10/92
Medmenham Loe	1:90000	5/03/44
Fairey Surveys	1:3k;10k;16k	1969/67

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