

**PEMBREY BURROWS DUNE GRASSLAND  
RESTORATION:  
HISTORIC ENVIRONMENT DESK-BASED  
ASSESSMENT:  
SN 38260 01859**



*Cover Photo: Cropped WW2 RAF Medmenham Oblique photographs: WG APU Ref: MW017-D8 Sortie RAF unknown: 01/07/40*



Prepared by  
Dyfed Archaeological Trust  
For: Natural Resources Wales



**DYFED ARCHAEOLOGICAL TRUST**

REPORT NO. 2020/33  
EVENT RECORD NO. 121883

August 2020

**PEMBREY BURROWS DUNE  
GRASSLAND RESTORATION:  
HISTORIC ENVIRONMENT DESK-  
BASED ASSESSMENT:  
SN 38260 01859**

**By**

**Menna Bell**

*Paratowyd yr adroddiad yma at ddefnydd y cwsmer yn unig. Ni dderbynnir cyfrifoldeb gan Ymddiriedolaeth Archaeolegol Dyfed Cyf am ei ddefnyddio gan unrhyw berson na phersonau eraill a fydd yn ei ddarllen neu ddibynnu ar y gwybodaeth y mae'n ei gynnwys*

*The report has been prepared for the specific use of the client. Dyfed Archaeological Trust Limited can accept no responsibility for its use by any other person or persons who may read it or rely on the information it contains.*

Ymddiriedolaeth Archaeolegol Dyfed Cyf  
Ty Cornel, Stryd 6 Caerfyrddin, Llandeilo, Sir  
Gaerfyrddin SA19 6AE  
Ffon: Ymholiadau Cyffredinol 01558 823121  
Adran Rheoli Treftadaeth 01558 823131  
Epost: [info@dyfedarchaeology.org.uk](mailto:info@dyfedarchaeology.org.uk)  
Gwefan: [www.archaeolegdyfed.org.uk](http://www.archaeolegdyfed.org.uk)

*Dyfed Archaeological Trust Limited*  
*The Corner House, 6 Carmarthen Street, Llandeilo,*  
*Carmarthenshire SA19 6AE*  
*Tel: General Enquiries 01558 823121*  
*Heritage Management Section 01558 823131*  
*Email: [info@dyfedarchaeology.org.uk](mailto:info@dyfedarchaeology.org.uk)*  
*Website: [www.dyfedarchaeology.org.uk](http://www.dyfedarchaeology.org.uk)*

*Cwmni cyfyngedig (1198990) ynghyd ag elusen gofrestredig (504616) yw'r Ymddiriedolaeth.*  
*The Trust is both a Limited Company (No. 1198990) and a Registered Charity (No. 504616)*  
*CADEIRYDD CHAIR: J Protheroe-Jones CYFARWYDDWR DIRECTOR: K MURPHY BA MCIfA*

**PEMBREY BURROWS DUNE GRASSLAND RESTORATION:  
HISTORIC ENVIRONMENT DESK-BASED ASSESSMENT:  
SN 38260 01859**

<b>Client</b>	Natural Resources Wales
---------------	-------------------------

**Event Record No** 121883

<b>Report No</b>	2020/33
------------------	---------

**Project Code** FS20-010

<b>Report Prepared By</b>	Menna Bell
---------------------------	------------

**Fieldwork Undertaken By** Menna Bell

<b>Illustrated By</b>	Menna Bell
-----------------------	------------

**Report Approved By** Fran Murphy

---

Rev Number	Description	Undertaken	Approved	Date
1	Draft_V1	MB	FM	15/09/2020

**PEMBREY BURROWS DUNE GRASSLAND RESTORATION:  
HISTORIC ENVIRONMENT DESK-BASED ASSESSMENT:  
SN 38260 01859**

**TABLE OF CONTENTS**

<b>EXECUTIVE SUMMARY</b>	<b>1</b>
<b>1. INTRODUCTION</b>	<b>2</b>
1.1 Project Proposals and Commission	2
1.2 Scope of the Project	2
1.3 Abbreviations	4
1.4 Illustrations	4
1.5 Timeline	4
<b>2. LOCATION AND TOPOGRAPHY</b>	<b>5</b>
<b>3. METHODOLOGY</b>	<b>9</b>
3.2 Site Walkover Survey	9
<b>4. ARCHAEOLOGICAL AND HISTORICAL BACKGROUND</b>	<b>10</b>
4.1 Historic Mapping	10
4.2 Historical Background	11
4.3 Known Archaeological Remains	13
4.4 Newly Identified Sites	21
4.5 Site Walkover Survey	27
<b>5. ASSESSMENT OF ARCHAEOLOGICAL POTENTIAL &amp; IMPORTANCE</b>	<b>44</b>
5.1 Calculating areas of Archaeological Potential	44
5.2 Area of Extant/known archaeology	49
5.3 Area of High archaeological potential	49
5.4 Area of Medium archaeological potential	49
5.5 Area of Low archaeological potential	49
<b>6. POTENTIAL IMPACTS</b>	<b>56</b>
6.1 Short term	56
6.2 Long term	56
<b>7. CONCLUSIONS AND MITIGATION PROPOSALS</b>	<b>57</b>
7.1 Archaeological Constraints	57
7.2 Mitigation proposals	58
<b>8. SOURCES</b>	<b>59</b>
<b>9. PROJECT ARCHIVE</b>	<b>61</b>
<b>APPENDIX 1</b>	<b>62</b>
<b>APPENDIX 2</b>	<b>63</b>
<b>APPENDIX 3</b>	<b>70</b>

## FIGURES

<b>Figure 1:</b>	Location map showing study area at Pembrey Burrows in the Gwendraeth Estuary	3
<b>Figure 2:</b>	The study area encompassing the sea buckthorn which has colonised the dune system at Pembrey Burrows	5
<b>Figure 3:</b>	LIDAR imagery showing the topography of study area.	8
<b>Figure 4:</b>	The 1:10560 (6 inch) map of 1953 showing 3 structures located at the end of a track leading to Cefn Sidan Sands	10
<b>Figure 5:</b>	The distribution of sites within and in the vicinity of the study area (outlined in red) identified in Jon Berry's PhD thesis	14
<b>Figure 6:</b>	Map showing the location of PRNs and NPRNs within the study area and the 100m search buffer	15
<b>Figure 7:</b>	Map showing the location of J Berry sites within the study area and the 100m search buffer	20
<b>Figure 8:</b>	The RAF vertical photograph of Pembrey area (ref 106G UK 1400) dated 11th April 1946 and the study area outlined in pink	22
<b>Figure 9:</b>	The RAF vertical photograph of Pembrey area (ref 106G UK 1400) dated 11th April 1946 and the study area outlined in pink	23
<b>Figure 10:</b>	An extract of the 1946 RAF vertical aerial photograph showing the density of sites and features associated with the bombing range and anti-invasion defences	25
<b>Figure 11:</b>	A composite of two photos of the 1940 RAF oblique aerial photographs of Pembrey Burrows showing the buildings and structures comprising the former hub of the bombing range	26
<b>Figure 12:</b>	Thematic map showing the distribution of the confidence values of sites recorded from the sources within the study area and 100m buffer. (Map data ©2020 Google; Maxar Technologies)	46
<b>Figure 13:</b>	An extract of the heatmap featuring those sites centred on the main hub area of former bombing range. (Map data ©2020 Google; Maxar Technologies)	47
<b>Figure 14:</b>	Map showing the areas of "Extant/known archaeology", "High archaeological potential", "Medium archaeological potential" and "Low archaeological potential" in the study area and 100m buffer. (Map data ©2020 Google, Maxar Technologies)	48
<b>Figure 15:</b>	Map showing the distribution of sites from all sources and their confidence classes at the north-western end of the study area and 100m buffer. (Map data ©2020 Google, Maxar Technologies)	50
<b>Figure 16:</b>	Map showing the distribution of sites from all sources and their confidence classes near the centre of the study area and 100m buffer. (Map data ©2020 Google, Maxar Technologies)	51
<b>Figure 17:</b>	Map showing the distribution of sites from all sources and their confidence classes at the hub area of the former bombing range control within the study area and 100m buffer. (Map data ©2020 Google, Maxar Technologies)	52
<b>Figure 18:</b>	Map showing the distribution of sites from all sources and their confidence classes in the area immediately south-east of the centre of the study area and 100m buffer. (Map data ©2020 Google, Maxar Technologies)	53

**Figure 19:** Map showing the distribution of sites from all sources and their confidence classes in towards the south-eastern end of the study area and 100m buffer. (Map data ©2020 Google, Maxar Technologies) 54

**Figure 20:** Map showing the distribution of sites from all sources and their confidence classes at the south-eastern end of the study area and 100m buffer. (Map data ©2020 Google, Maxar Technologies) 55

## **TABLES**

<b>Table 1:</b>	Archaeological and Historical Timeline for Wales	4
<b>Table 2:</b>	Table of PRN and NPRN records for sites within the study area and 100m search buffer currently held with the Dyfed Historic Environment Record	16
<b>Table 3:</b>	Sites within the study area and 100m search buffer, recorded in J Berry's unpublished, 2016 PhD thesis	19
<b>Table 4:</b>	Newly identified sites seen identified from the photographic evidence	24
<b>Table 5:</b>	Sites recorded during the site walkover survey	29

## **PHOTOGRAPHS**

<b>Photo 1:</b>	Overview of the area cleared of sea buckthorn immediately north-west of the concrete track and in the vicinity of the former bombing range hub	28
<b>Photo 2:</b>	Overview of the dense sea buckthorn and scrub on the south-eastern side of the concrete track	28
<b>Photo 3:</b>	A mature Cypress tree occupies a large hollow at the approximate location of the likely Ambulance Station	25
<b>Photo 4:</b>	The south-eastern end of the concrete platform discovered immediately north of the approximate location of the Ambulance Station	32
<b>Photo 5:</b>	The west facing opening of the concrete platform discovered immediately north of the approximate location of the Ambulance Station	32
<b>Photo 6:</b>	Overview of the area encompassing the former Ambulance Station, Motor Generator House and Bombing Range Control Tower	33
<b>Photo 7:</b>	A mature, dying cypress tree occupies the approximate location of the Bombing Range Control Tower	34
<b>Photo 8:</b>	A southeast facing overview of the dune-scape northwest of the approximate location of the Bombing Range Control Tower	34
<b>Photo 9:</b>	The concrete block embedded with the wooden post (PRN118046) found in the location of Jon Berry's grid reference for a searchlight emplacement	36
<b>Photo 10:</b>	The 2m ranging pole indicates the edge of a deep, bramble chocked hollow in the alternative location for the searchlight platform	37
<b>Photo 11:</b>	Wing Marker Shelter No. 1 (PRN 105937)	38
<b>Photo 12:</b>	Main Markers Shelter (PRN 31415, NPRN 270659)	38
<b>Photo 13:</b>	Pillbox PRN118045 (NPRN 270657)	39

<b>Photo 14:</b>	Wing Markers Shelter No. 2 (PRN31414) with Gun House PRN 112367 just visible amongst the thicket behind	40
<b>Photo 15:</b>	Tywyn Burrows 4-inch Beach Defence Gun House (PRN 112367)	40
<b>Photo 16:</b>	Overview of the dense sea buckthorn on the south-eastern side of the concrete track towards the centre of the Burrows	41
<b>Photo 17:</b>	General view of Alice Pyper walking along the seaward, south eastern perimeter of the study area, at Cefn Sidan Sands	4
<b>Photo 18:</b>	A section of the dune cliff showing the depths of the vegetation and buried plastic netting	42
<b>Photo 19:</b>	Gun emplacement PRN112368	43

**PEMBREY SANDS AIR WEAPONS RANGE:  
ARCHAEOLOGICAL ASSESSMENT IN ADVANCE OF SEA BUCKTHORN  
REMOVAL**

**EXECUTIVE SUMMARY**

*DAT Archaeological Services were commissioned to prepare a Historic Environment (Archaeological) Desk-Based Assessment of an area comprising approximately 37.5 ha of the non-native invasive shrub sea buckthorn at Pembrey Burrows & Tywyn Burrows (centred on SN38260 01859) which forms the southwestern fringe of Pembrey Country Park in Carmarthenshire. The study was requested ahead of the proposed removal of the sea buckthorn as part of the Heritage Lottery Fund scheme of dune rejuvenation.*

*Pembrey Burrows encompasses an area of archaeological and historically significant Second World War anti-invasion defences along with later infrastructure relating to the RAF air weapons range located at the northern most extent of the burrows at Tywyn Point.*

*The desk-based study has attempted to identify the presence and character of the known and potential surviving anti-invasion defences within the dune area and to assess the likely impacts of the removal of the sea buckthorn.*

**CRYNODEB GWEITHREDOL**

*Comisiynwyd Gwasanaethau Archeolegol YAD i baratoi Asesiad Ddesg yr Amgylchedd Hanesyddol o ardal yn cynnwys tua 37.5 ha o bwkthorn môr llwyni goresgynnol anfrodorol ym Mhorth Tywyn a Mornant Porth Tywyn (sy'n canolbwyntio ar SN38260 01859) sy'n ffurfio ymyl de-orllewin Pharc Gwledig Pen-bre yn Sir Gaerfyrddin.*

*Gofynnwyd am yr astudiaeth cyn y bwriad i gael gwared ar y bwkthorn môr fel rhan o gynllun Adnewyddu twyni Cronfa Dreftadaeth y Loteri.*

*Mae Burrows Pen-bre yn cwmpasu ardal o amddiffynfeydd gwrth-ymosodiad archeolegol a hanesyddol arwyddocaol yn yr Ail Ryfel Byd ynghyd â seilwaith diweddarach sy'n ymwneud ag ystod arfau awyr yr RAF sydd wedi'i lleoli ar y rhan fwyaf o'r burresi yn Nhywyn Point.*

*Mae'r astudiaeth ddesg wedi ceisio nodi presenoldeb a chymeriad yr amddiffynfeydd gwrth-ymosodiad hysbys a photensial sydd wedi goroesi yn yr ardal dwyt ac asesu effeithiau tebygol tynnu'r bwkthorn môr.*



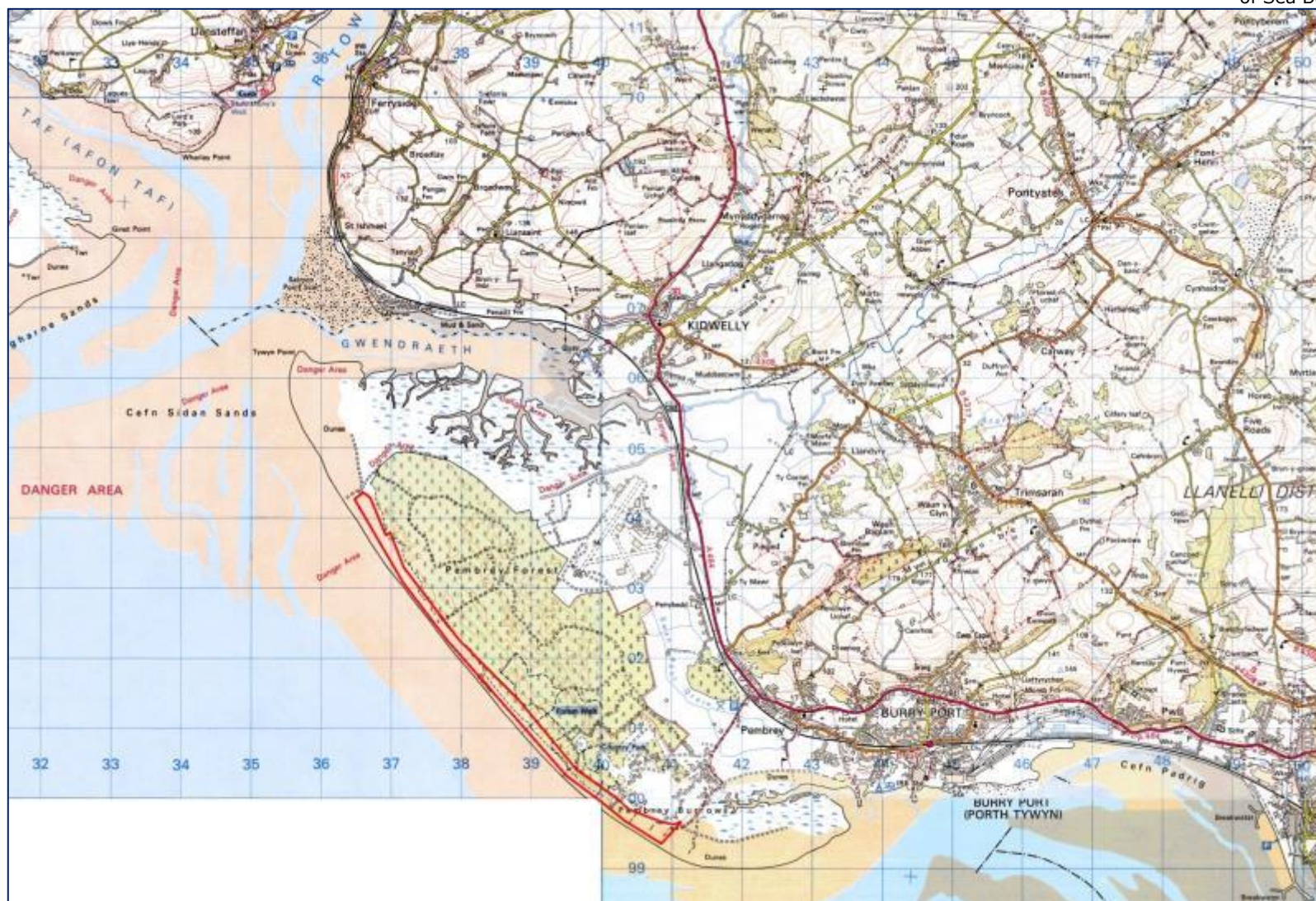
## **1. INTRODUCTION**

### **1.1 Project Proposals and Commission**

- 1.1.1 DAT Archaeological Services were commissioned by Natural Resources Wales to undertake an archaeological assessment of an area comprising approximately 37.5 ha of the non-native invasive shrub sea buckthorn (*Hippophae rhamnoides*) at Pembrey Burrows (centred on SN38260 01859) which forms the southwestern fringe of Pembrey Country Park in Carmarthenshire. The assessment was requested ahead of the proposed removal of the sea buckthorn as part of the Heritage Lottery Fund (HLF) scheme of dune rejuvenation. The objective at Pembrey Burrows is to restore the dunes to grassland.
- 1.1.2 Pembrey Burrows encompasses an area of archaeological and historically significant Second World War anti-invasion defences along with later infrastructure relating to the RAF air weapons range located at the northern most extent of the burrows at Tywyn Point. This programme of removal has been highlighted by Jonathan Berry of Cadw as potentially damaging these archaeological remains the significance of which are highlighted by Berry's recent, unpublished PhD thesis (Berry 2016) and an archaeological assessment of the air weapons range undertaken by the author in 2016 (Bell 2016). Furthermore Berry's thesis (*ibid*) has demonstrated that the dune system at Pembrey was densely defended and constituted an integral part of the Carmarthen Stop Line. This stop line was one of a number established throughout the Western Command and comprised co-ordinated anti-invasion defences stretching between the Ceredigion and Carmarthenshire coastlines.
- 1.1.3 At present the remains highlighted by Berry are not yet recorded on the Dyfed Historic Environment Record (HER) or the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) National Monument Record. A scheduling assessment of these remains was suspended owing to site access difficulties and the on-going COVID-19 pandemic. However, Berry has previously stressed that the scheduling assessment ought to be completed with the aim of scheduling the remains as monuments of national importance (Berry, 2016 *pers comm*).
- 1.1.4 Furthermore, Berry has expressed concern that the removal of the sea buckthorn could cause the remobilisation of the sand dunes and may lead to undermining, rotation, inundation and eventual damage to the remains of the beach defences.

### **1.2 Scope of the Project**

- 1.2.1 This archaeological assessment is presented as a fulfilment of a Written Scheme of Investigation (Appendix 3). The report follows the Standard and Guidance for Historic Environment Desk-Based Assessment as defined by the Chartered Institute for Archaeologists (CIfA 2014).
- 1.2.2 The results are intended to identify the presence and character of the known and potential surviving anti-invasion defences within the dune area and to assess the likely impacts of the removal of the sea buckthorn.
- 1.2.3 Pembrey Burrows lies within the planning jurisdiction of Carmarthenshire County Council.
- 1.2.4 This assessment comprised a desk-based assessment followed by a walkover survey of the accessible areas of the study area. The results of this assessment encompass the area of sea buckthorn comprising around 37.5 hectares in total.



**Figure 1:** Location map showing study area (outlined in red) at Pembrey Burrows in the Gwendraeth Estuary.

Reproduced from the Ordnance Survey 1:50,000 scale Explorer Map with the permission of The Controller of Her Majesty's Stationery Office,  
© Crown Copyright Dyfed Archaeological Trust. The Corner House, 6 Carmarthen Street, Llandeilo, Carmarthenshire SA19 6AE. Licence No 100020930

### 1.3 Abbreviations

- 1.3.1 All sites recorded on the regional Historic Environment Record (HER) are identified by their Primary Record Number (PRN) and located by their National Grid Reference (NGR). Sites recorded on the National Monument Record (NMR) held by the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW) are identified by their National Primary Record Number (NPRN). Altitude is expressed to Ordnance Datum (OD). References to cartographic and documentary evidence and published sources will be given in brackets throughout the text, with full details listed in the sources section at the rear of the report.

### 1.4 Illustrations

- 1.4.1 Printed map extracts are not necessarily reproduced to their original scale.

### 1.5 Timeline

- 1.5.1 The following timeline (Table 1) is used within this report to give date ranges for the various archaeological periods that may be mentioned within the text.

**Table 1:** Archaeological and Historical Timeline for Wales

Period	Approximate date	
Palaeolithic –	c.450,000 – 10,000 BC	Prehistoric
Mesolithic –	c. 10,000 – 4400 BC	
Neolithic –	c.4400 – 2300 BC	
Bronze Age –	c.2300 – 700 BC	
Iron Age –	c.700 BC – AD 43	
Roman (Romano-British) Period –	AD 43 – c. AD 410	Historic
Post-Roman / Early Medieval Period –	c. AD 410 – AD 1086	
Medieval Period –	1086 – 1536	
Post-Medieval Period <sup>1</sup> –	1536 – 1750	
Industrial Period –	1750 – 1899	
Modern –	20th century onwards	

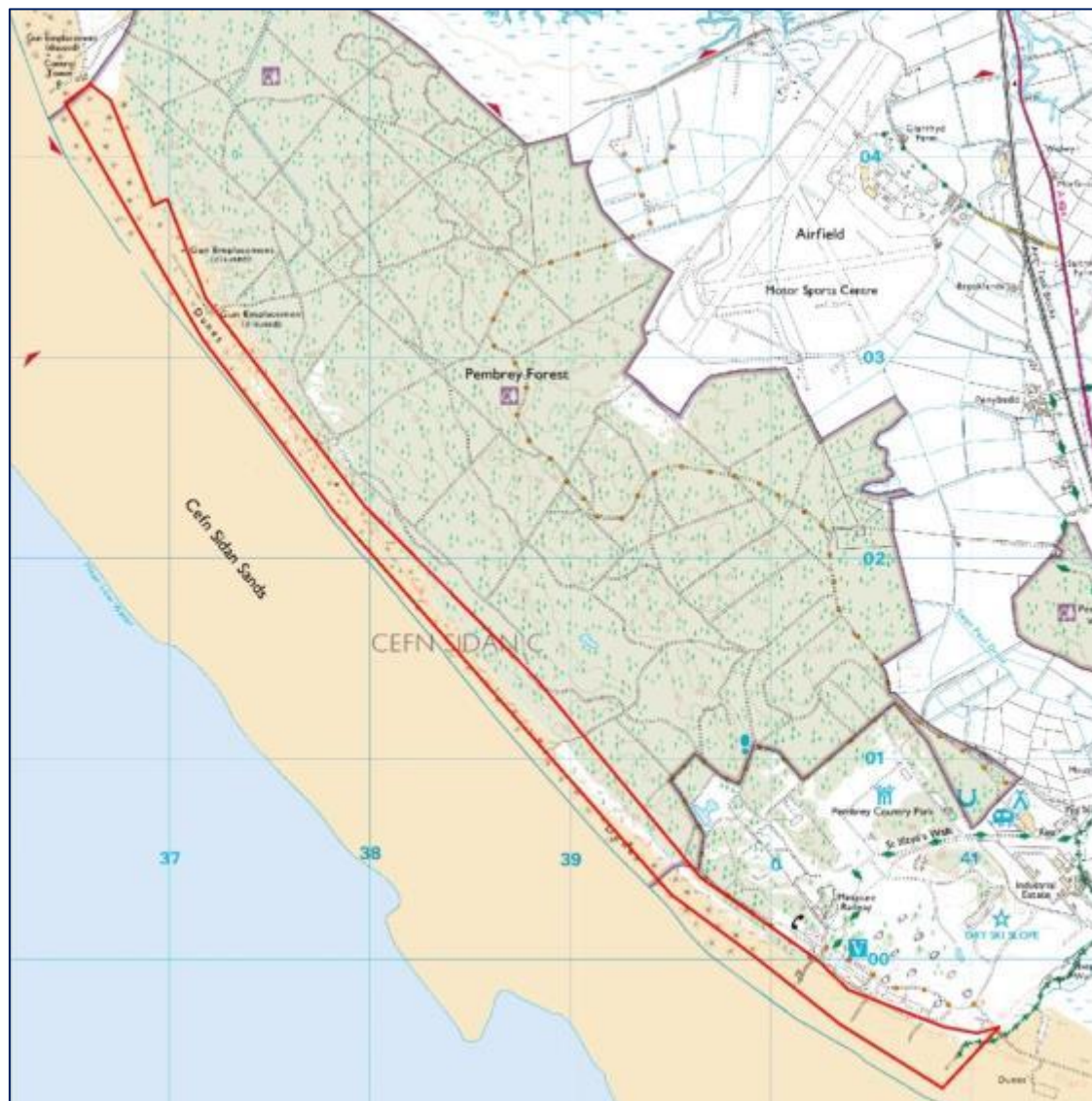
---

<sup>1</sup> The post-medieval and Industrial periods are combined as the post-medieval period on the Regional Historic Environment Record as held by Dyfed Archaeological Trust



## 2. LOCATION AND TOPOGRAPHY

- 2.1 Pembrey Burrows are located at the southern side of the Gwendraeth Estuary in the eastern part of Carmarthen Bay. The Pembrey Burrows dune system commences in the north at Tywyn Point and extends southwards along the coast before terminating at the town of Burry Port. Pembrey Airfield is located around 2km to the east of the Burrows with Pembrey Forest located immediately adjacent and Pembrey Country Park located at the southern end of the dunes (Figure 1). The assessment area comprises a swathe of sea buckthorn which has colonised the entire dune system running parallel with Cefn Sidan Sands (Figure 2). Pembrey forest is owned and managed by Natural Resources Wales and is bordered by the MOD Pembrey Sands Firing Range in the northwest and the Country Park at its southern end. The sand dunes at this end fall within the ownership of Carmarthenshire County Council.



**Figure 2:** The study area (outlined in red) encompassing the sea buckthorn which has colonised the dune system at Pembrey Burrows.

Reproduced from the Ordnance Survey 1:25,000 scale Explorer Map with the permission of The Controller of Her Majesty's Stationery Office, © Crown Copyright Dyfed Archaeological Trust. The Corner House, 6 Carmarthen Street, Llandeilo, Carmarthenshire SA19 6AE. Licence No 100020930

- 2.2 The northern and southern most ends of Pembrey Burrows dune system fall within the Carmarthen Bay Dunes Special Area of Conservation (SAC) and the entire system is encompassed by the Pembrey Coast SSSI (ref 509). Pembrey Burrows has been subject to a recent geomorphological appraisal undertaken on behalf of Natural Resources Wales (Pye and Blott 2014) and its characterisation of the dunes is reproduced here:

*"Pembrey Burrows forms one of a number of dune systems which fringe the eastern part of Carmarthen Bay. It represents a double barrier spit system which is connected to the mainland shore by a relatively narrow sandy ridge. Behind the barrier are extensive tidal flats and marshes, now partly embanked and reclaimed. At its widest point the central part of dune system is more than 2 km wide. The central part of the dune system lies within Pembrey Forest and Pembrey Country Park, but the northern end (Tywyn Burrows) forms part of the Pembrey Sands Air Weapons Range and the southern end is designated as the Pembrey Burrows and Saltings Local Nature Reserve. The main part of the high dune system is relatively young, having formed since the Middle Ages. In the past 120 years, dune-capped spit systems have developed at the northern and southern ends of the system, near Tywyn Point and 'the Nose', respectively. A separate belt of dunes extends westwards from Burry Port towards Ashburnham and is now separated from the sea by a seawall, Burry Saltings and younger dune ridges further seaward.*

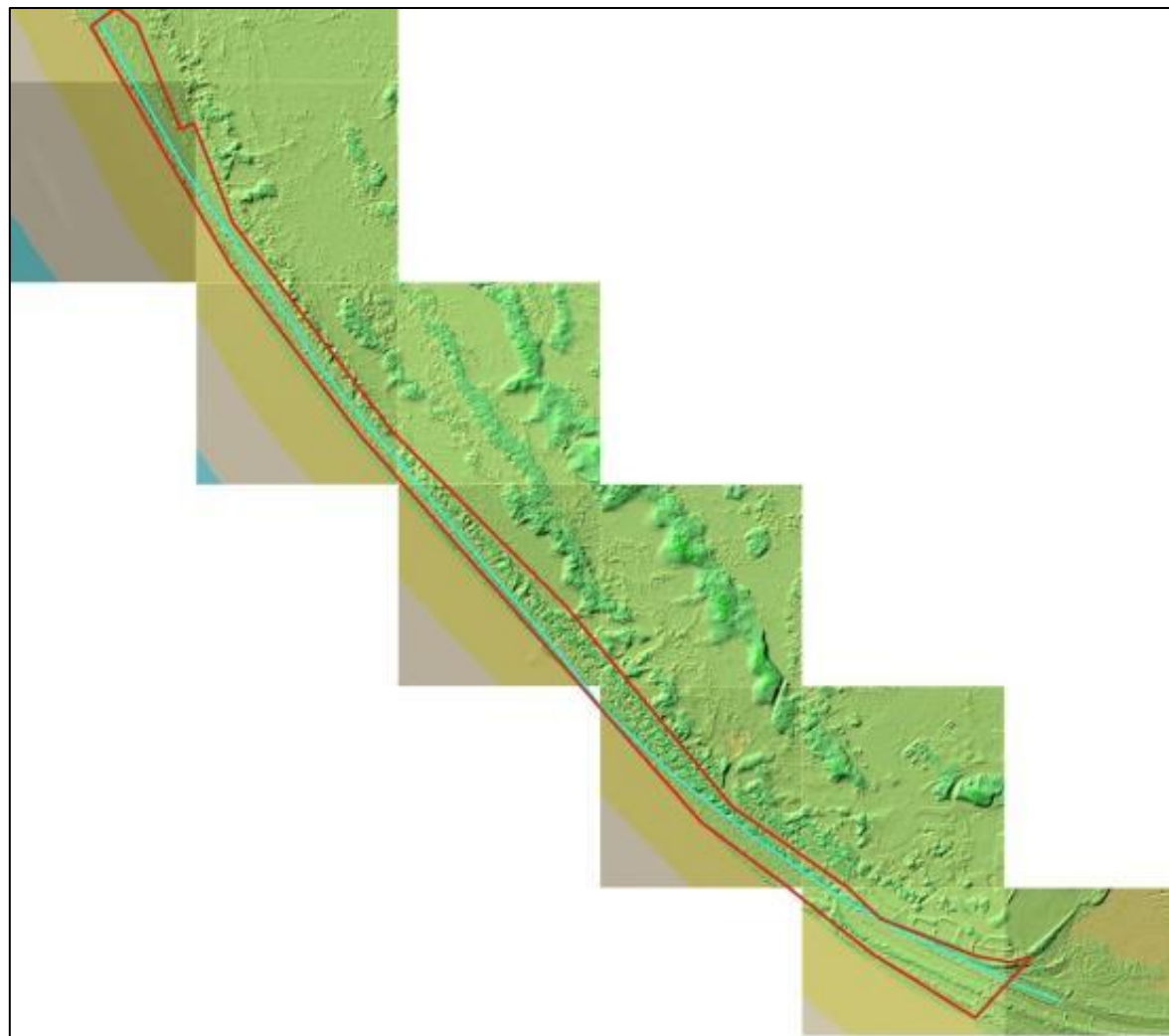
*"The Pembrey dune system forms the seaward end of an area of windblown sand which has a general 'hammer-head' plan shape. The high dunes partially overlie intertidal sands and older windblown sands with lower relief. Stabilized dunes also occur around the base of the higher ground between Burry Port and Kidwelly. It is likely that these shore dunes formed after the maximum of the post-glacial marine transgression, around 4000 to 5000 years ago. Subsequent coastal sediment accumulation has led to westward progradation of the shoreline and the formation of the Pembrey barrier feature. LiDAR data show an E-W ridge of slightly higher ground extending westwards from the foot of Pen-bre Mountain. This probably represents a sandy spit system which developed in the later Holocene before the main high dune ridges at Pembrey were formed. These consist of a series of ridges, sub-parallel to the modern shoreline, which become younger towards the sea. They represent phases of vertical dune growth and slight eastwards dune migration since the Middle Ages. Over the past 500 years the shoreline at Pembrey has shown an overall trend to move seawards."*

*"The age of the oldest blown sand deposits in the eastern part of the system has not been determined, but the main body of the sand dune system is only a few hundred years old."*

- 2.3 The morphology of the beach at Tywyn Point and at the south-eastern end of the Pembrey dunes has been closely monitored since 1998. The monitoring data shows that there has been up to 170m of frontal dune erosion at Tywyn Point and no net change near the control tower between the years 1998 and 2013. However, the study states that there has been around 40m of dune erosion immediately south of the rock armour at the control tower since 1998. Furthermore the study notes the vulnerability of the dunes to storm erosion citing between 5m and 15m of erosion of the dune frontage and consequent dune cliffing following the winter storms of 2013/14. The impact of more recent storm events is not known.
- 2.4 Overall however, it seems that " *for the most of the past 400 years the rate of onshore sand transport has been sufficient to allow progradation of the central part of the shoreline as well as alongshore extension and seaward growth of the spit systems at Tywyn Point and The Nose. In the past 120 years the supply of*

*sand from offshore appears to have reduced although not ceased, and there has been only limited seaward movement of the dune toe along the central part of the shoreline since 1906, A point of no net change occurs approximately 2km north of the Pembrey Country Park beach access point” ” (Pye and Blott 2014;8).*

- 2.5 Through a combination of historical mapping, aerial photography and recent GPS survey data Pye and Blott have been able to reconstruct the limit of terrestrial vegetation from the years 1820 to 2014. Using this information, complementary use of LIDAR data (2m dsm) and 1946 RAF vertical photography, it has been possible to plot the approximate wartime coastline and its relevance to the proposed area of sea buckthorn removal for the purpose of this assessment (Figure 3). Whilst this is an approximation it does provide a useful indication of the extent of accretion of the sand dunes in the intervening years.
- 2.6 The underlying solid geology of this area is the Bishopstone Mudstone Formation- comprised of mudstone, siltstone and sandstone; sedimentary bedrock formed approximately 313 to 326 million years ago during the Carboniferous period. The superficial geology is one of windblown sand. Geological information has been obtained through the British Geological Survey mapping portal. The geomorphological assessment undertaken by Pye and Blott (2014), states that the Pembrey Dune system formed over the last 12,000 years during the Late Flandrian (Post-glacial) period. Furthermore, the main part of the dune system is less than 500 years old whilst the major dune-capped barrier spits at either end of the system have developed within the past 130 years.
- 2.7 Following late nineteenth-century efforts to control blowing sand and dune migration, large scale planting of conifers on the dunes was initiated by the Forestry Commission during the middle twentieth-century. This planting began in 1929 and continued until 1954. The conifers largely occupy the centre of the dune system, namely Pembrey Forest, whilst the northern and southern ends of the dune system have largely experienced succession by scrub, grasses and sea buckthorn. Where active sand accretion is confined largely to the terminal ends of the dune system it is possible to find areas of bare sand and mobile dunes (Pye and Blott *ibid*).



Contains Natural Resources Wales information © Natural Resources Wales and Database Right. All rights Reserved.

**Figure 3:** LIDAR imagery showing the topography of study area (outlined in red and the approximate 1946 coastline (turquoise line) based on information extracted from the Pye and Blott 2014 report and comparison with 2m DSM LiDAR data and rectified 1946 RAF vertical aerial photography.

### **3. METHODOLOGY**

#### **3.1 Desk Top Study**

- 3.1.1 Data held within the Dyfed HER and a wealth of other resources were consulted in the preparation of this report. Owing to the restrictions imposed by the ongoing COVID-19 pandemic it was not possible to consult sources in the national archives. Instead, digital copies of aerial photographic collections held by the RCAHMS and Welsh Government were viewed in conjunction with historic RAF plans to identify the presence of anti-invasion defences within the study area. Despite Pembrey's importance during the Second World War there are relatively few contemporary documents to consult. A few recent studies have begun to document and map the archaeological remains of this area. A key resource in this study was an extract of Jon Berry's PhD thesis data acquired from the author for the 2016 archaeological assessment (Bell, 2016) which was used to provide a baseline dataset for this assessment.
- 3.1.2 Additionally, an invaluable source of information was gained from the ongoing Cadw pan Wales assessment of military camps and ranges currently being undertaken by Alice Pyper of Dyfed Archaeological Trust. This project builds on the Cadw threat-related assessment of twentieth-century military sites; airfields, dispersed sites and defences also undertaken by Pyper (Pyper and Page, 2014). Pyper's familiarity and specialist knowledge of Pembrey has provided critical understanding and insight into what remains a fairly ambiguous study area. Recent, high resolution LIDAR data was also reviewed. A complete list of resources consulted is included at the end of this report.
- 3.1.3 Sufficient information was consulted to inform and comment on the goals of the assessment. GIS layers were created and used to assess and illustrate the likely impacts on any identified remains (or potential remains) from the removal of the sea buckthorn.

#### **3.2 Site Walkover Survey**

- 3.2.1 A site visit was undertaken on 11th August 2020 by the author accompanied by Alice Pyper, also of Dyfed Archaeological Trust. Owing to the size of the survey area and limitations on time and access, the survey comprised a targeted visit and assessment of the known and accessible archaeological sites identified during the desk-based assessment. Areas of high archaeological potential were also visited (access permitting) and previously unrecorded features were discovered. Identified sites and features were located using a handheld GPS and a brief description was recorded. All sites were photographed along with general photographs of the study area demonstrating the extent and nature of the sea buckthorn.



## 4. ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

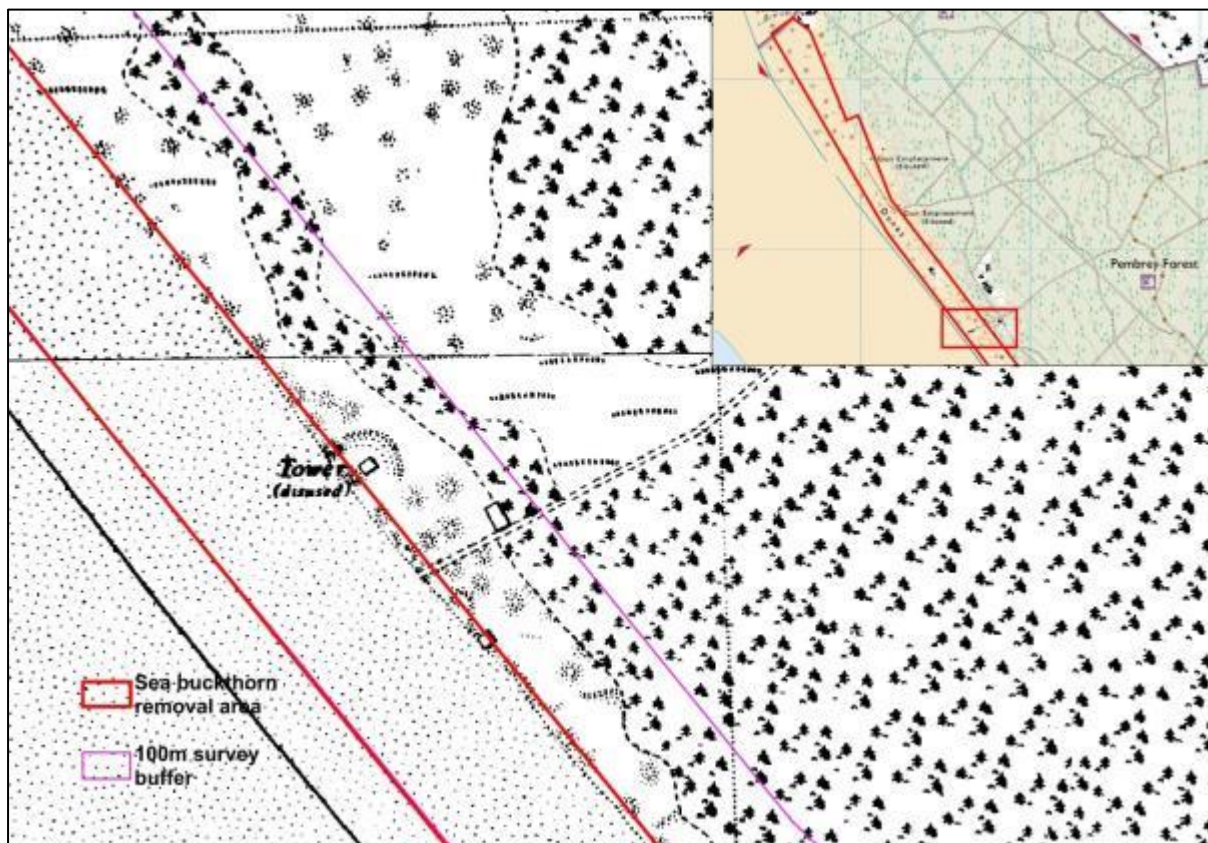
### 4.1 Historic Mapping

#### ***1st edition 1891 county series Ordnance Survey Map, 1:10,560 (6")***

- 4.1.1 The 6 inch OS map published in 1891 attests to the amount of accretion and development of the dune system since the late nineteenth-century. The study area roughly corresponds with the line of high watermark and the remainder of Tywyn Point (or "Towyn" point as it appears on the map) beyond the northwestern extent of the survey area is depicted as being an area of mudflats and salt marsh. There does appear to be a subtle variation of the terrain immediately south of Tywyn point which is suggestive of being an area of sand dunes.

#### ***1953 National Grid series Ordnance Survey Map, 1:10,560 (6")***

- 4.1.2 The 6 inch OS map published in 1953 shows three rectangular structures located at the end of the track which provides access to the beach at the northwestern extent of Pembrey Burrows. The structures are drawn with bold, continuous lines but their plans are not infilled meaning that these were extant structures greater than 1ft in height but no longer in use or devoid of a roof. The northwestern structure is annotated as "Tower (disused)" (Figure 4). What is also interesting is the differentiation and extent of the dune areas and the scrub.



**Figure 4:** The 1:10560 (6 inch) map of 1953 showing 3 structures located at the end of a track leading to Cefn Sidan Sands. Insert map shows the location of these features within the study area as indicated by the red rectangle.

Reproduced from the Ordnance Survey 1:25,000 scale Explorer Map with the permission of The Controller of Her Majesty's Stationery Office, © Crown Copyright Dyfed Archaeological Trust. The Corner House, 6 Carmarthen Street, Llandeilo, Carmarthenshire SA19 6AE. Licence No 100020930

## **4.2 Historical Background**

- 4.2.1 The following general historic background is based on the descriptions of the Historic Landscape Character area of Carmarthen Bay Estuary and specifically the regions of Pembrey and Burry Port, Pembrey Burrows (in which the sea buckthorn sits) and Penbre Saltmarsh. The following descriptions are paraphrased from the Dyfed Archaeological Trust Historic Landscape Characterisations (Murphy and Ludlow, 2000) also available on the Trust's website<sup>2</sup>.

### ***Pembrey and Burry Port***

- 4.2.2 Pembrey in its present form, is a product of the burgeoning coal industry of South-east Carmarthenshire during the 18th and early 19th century, although Pembrey has much earlier origins; the parish church is dedicated to St Illtud, and as a coastal church with early post-Conquest documentary references, maybe a pre-Conquest foundation. It was granted to the Benedictines of Sherborne Abbey, Dorset, by Roger of Salisbury, Lord of Kidwelly, in 1120 (Ludlow 1998).
- 4.2.3 During the later Medieval period Pembrey, with Maenor Penrhyn to the north, was at least initially held of the Lordship of Kidwelly, as both a Welshry and a foreignry (Rees 1953, 200). It enjoyed manorial status at least as early as 1361 under the Butlers, who possibly held it as a demesne manor, but by 1630 under the Vaughans it had become independent of Kidwelly Lordship (Jones 1983, 18), and was in 1896 described as a private manor with regular court leets (Jones 1983, 29). It was acquired by the Ashburnham family in 1677. ....The coastal strip, 'Tywyn Bach', remained common pasture until the 19th century (Ludlow 1999, 23), and there is little further evidence of human activity until the 18th century when the lime trade with the Gower led to the establishment of several lime kilns.

### ***Pembrey Burrows***

- 4.2.4 The area of Pembrey Burrows occupies that part of Pembrey (or 'Towyn') Burrows which is not planted with coniferous forest, ie. a narrow strip averaging some 150 m wide on the seaward side of Pembrey Forest. The Burrows developed at the mouth of the River Gwendraeth Fawr over a long period, alongside a series of reclamations around an initial nucleus formed by a tongue of dry land at the foot of Mynydd Penbre. The Burrows have developed since the 17th century at least but, according to James, are no earlier than the Medieval period. Their seaward development continues, and that part occupied by this area has only developed since 1830 (James 1991, 155). The area was incorporated into the system of Second World War defences around Pembrey Airfield and Ordnance Factory.

### ***Penbre Saltmarsh***

- 4.2.5 The character area of Penbre Saltmarsh lies around that of Pembrey Burrows to the west, north but mostly to the east and comprises an area of saltmarsh on both sides of the Gwendraeth estuary. The southern side has mainly developed since the construction of Banc-y-lord, the great sea-wall which forms the southern edge of the area, in 1817-18 (James 1991, 156-7). The northward side of the estuary has been subject to erosion rather than deposition, but this area featured a quay, Berwyn (or 'Ballast') Quay, until the mid 19th century (Morris 1988, 77). A quay was established at Pill Tywyn at the end of Ashburnham's Canal, in c.1801 apparently before the construction of Banc-y-lord (James 1991, 156-7). Nearby lay the outlet of Swan Pool Drain, which drained the former marshland to the east.

---

<sup>2</sup> <http://www.dyfedarchaeology.org.uk/HLC/CarmarthenBayMap.htm>

- 4.2.6 Further information is also included in the 'Human Intervention and Management' section of the NRW report background of the geomorphological appraisal (Pye and Blott 2014, 9-13). The following sections are taken directly from this report to provide information on recent changes and alterations to the specific area of the sea buckthorn within Pembrey Burrows. *'The tithe map of 1841 shows most of the Pembrey dune area (the 'Great Outlet') as common land with only one farm (Towyn Canol) located on the eastern margin of the dunes. This farm is also shown on the OS Six Inch First Edition map Sheet LVII NW, surveyed in 1879. Virtually no information is available concerning the usage of the dunes in this period but, like many other Welsh dune systems, they are likely to have been grazed and parts managed as a warren.*

*'Construction of an airfield and gunnery school (RAF Station Pembrey) began in 1937 and the facility opened in March 1939. The airport is still used to support the nearby RAF Pembrey Sands Air Weapons Range, opened in 1966. The main control tower, including the weather station, is located at the southwest corner of the Range, adjacent to the beach. The main aerial target area is located behind the main dune ridges in the middle part of the range. A 7000 foot long Tactical Landing Zone is located on the adjacent beach and used by C-130 Hercules crews to practice natural surface landings and take-offs. Conservation management of the Range is managed by Defence Training Estates (DTE).*

*'The morphology of parts of the dune system has been substantially modified over the years by excavations for buildings and infrastructure, creation of drains and water storage features. Significant areas were flattened for roads and buildings during construction and operation of the munitions factories and the WWII military training facilities. ...When buckthorn was cleared from parts of the Pembrey site in 1998 two ponds were created at SS 413996 and SS 425994.*

*'Large parts of the Pembrey system were grazed before the two World Wars but grazing effectively ceased after 1939. Grazing was reintroduced for conservation purposes to the southern part of the Pembrey Burrows dunes in 2006/07 when 77 ha were fenced off. Since then additional areas have been fenced and are now being grazed following sea buckthorn clearance.*

*'The Pembrey dune system has not been greatly affected by coastal defence works except near the Air Weapons Range control tower, south of Tywyn Point... In the 1980s rock armour was placed along the dune toe and on the upper beach opposite the access ramp to provide erosion protection near the Air Weapons Range control tower. Between 1998 and 2006 additional rock structures were built and these have fixed the local shoreline position, although erosion has continued to the north and south.'* (Pye and Blott 2014, 9-13)

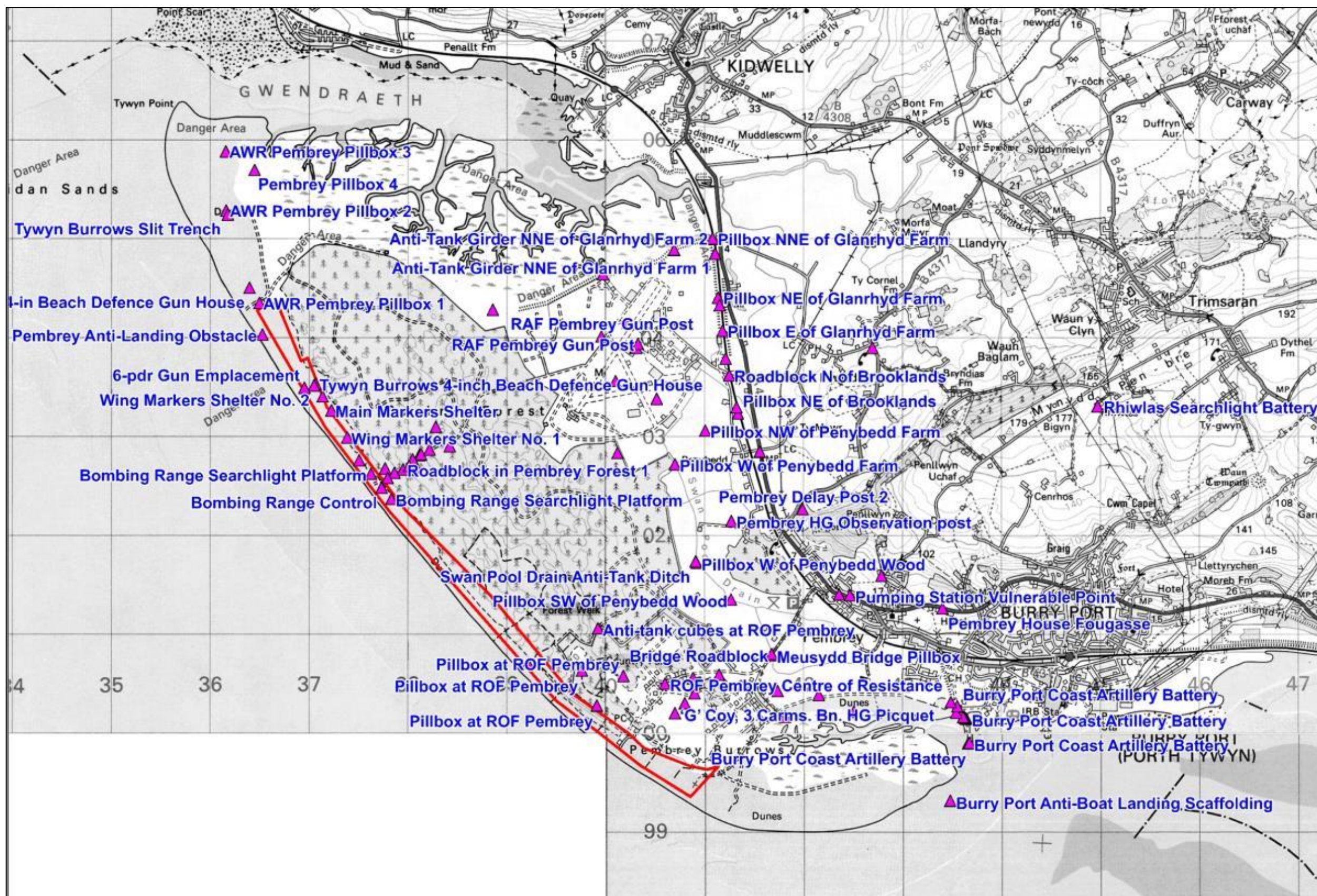
- 4.2.7 Work began on the construction of the RAF Pembrey Airfield and Pembrey Sands Air Weapons Range in 1937. The Range opened as the "No. 1 Bombing and Gunnery School" in 1939 before being succeeded in 1941 by the "No.1 Air Gunnery School". During the outbreak of the Second World War the Range became integrated into the Carmarthen Stop Line and several anti-invasion defences were constructed along the coastline and further inland in defence of the airfield. The wartime boundary of the range extended from the north at Tywyn Point to approximately 2.5km south of the present southern border, and accommodated numerous structures and targets along the length of the coast. These included Wing Marker Shelters, Searchlight platforms and the location of the Original Bombing Range Control Tower (Pyper and Page 2014).
- 4.2.8 Following the Second World War, operations at RAF Pembrey ceased in 1957. In 1966 the Pembrey Sands Air Weapons Range was established and operated by the RAF. The RAF continued operations until 2006 when the Range was taken

over by the Defence Training Estate (*ibid.*). It is currently owned by the Ministry of Defence and managed by the Defence Infrastructure Organization and is used as a training estate for air-to-ground bombing, strafing practice and Temporary Landing Zones in a beach environment.

### **4.3 Known Archaeological Remains**

- 4.3.1 Pembrey Burrows encompasses an area of archaeological and historically significant Second World War anti-invasion defences, along with later infrastructure relating to the RAF air weapons range located at the northern most extent of the burrows at Tywyn Point. The dune system at Pembrey was densely defended and constituted an integral part of the Carmarthen Stop Line. This stop line was one of a number established throughout the Western Command and comprised co-ordinated anti-invasion defences stretching between the Ceredigion and Carmarthenshire coastlines. Whilst the archaeological significance of this area has long been acknowledged, the true extent and nature of the archaeology remains somewhat ambiguous and underrepresented in the Dyfed HER and the RCAHMW National Monument Record (NMR).
- 4.3.2 Jonathan Berry's (Cadw Senior Inspector) 2016 unpublished thesis on the study of Second World War anti-invasion defences in south and southwest Wales revealed a significant number of sites within the Pembrey area, the majority of which were previously unrecorded sites (Berry, 2016, see Figure 5). At present the remains highlighted by Berry are not yet recorded on the Dyfed HER or the RCAHMW NMR.
- 4.3.3 It is understood that Jon Berry's thesis will be deposited in the HER at a later date and subsequently the individual sites and features identified will be recorded appropriately and assigned individual PRN numbers. Meanwhile, for the purpose of this assessment, data relevant to sites and features within and around the Pembrey Burrows have been extracted to form a baseline dataset.
- 4.3.4 A 100m search buffer of the study area was used to capture all designated and non-designated recorded sites recorded within the Dyfed HER, RCAHMW's NMR and indeed, sites recorded by Berry. No designated assets were located within these parameters. The Dyfed HER returned six records within the study area and four records within the 100m search buffer. The NMR returned only two records within the study area and four within the 100m search buffer. These sites are presented in Figure 6 and Table 2.





**Figure 5:** The distribution of sites within and in the vicinity of the study area (outlined in red) identified in Jon Berry's PhD thesis. Only those sites located within the study area and 100m search buffer have been considered for this assessment.

Reproduced from the Ordnance Survey 1:50,000 scale Explorer Map with the permission of The Controller of Her Majesty's Stationery Office, © Crown Copyright Dyfed Archaeological Trust. The Corner House, 6 Carmarthen Street, Llandeilo, Carmarthenshire SA19 6AE. Licence No 100020930



Reproduced from the Ordnance Survey 1:50,000 scale Explorer Map with the permission of The Controller of Her Majesty's Stationery Office, © Crown Copyright Dyfed Archaeological Trust. The Corner House, 6 Carmarthen Street, Llandeilo, Carmarthenshire SA19 6AE. Licence No 100020930

**Table 2:** Table of PRN and NPRN records for sites within the study area and 100m search buffer currently held with the Dyfed Historic Environment Record. See Figure 7

PRN	NPRN	NAME	TYPE	SUMMARY	PERIOD	NGR
31376		Pembrey Forest	GUN EMPLACEMENT	Two concrete pads, 1m x 1m, no other features visible. Pads in the sand in between two hollows. The hollow to the west has the appearance of having had modifications, although it is too overgrown to investigate.	Modern	SN37740262
31414		Wing Marker Shelter No 2	GUN EMPLACEMENT	A small concrete rectangular plan shelter with a turf covered concrete roof.	Modern	SN3705303516
31415		Main Marker Shelter.	GUN EMPLACEMENT	A concrete rectangular plan shelter with a turf covered concrete roof.	Modern	SN37240326
105937		Wing Marker Shelter No 1.	SHELTER	A gun emplacement built of reinforced concrete with turf on the flat roof. Identical in form to PRN 31414. A Pyper 2014 Rectangular in plan 3.05 x 2.4 m with openings facing southwest. One wide rectangular opening in southwest wall with doorway to side. Internally the walls are painted cream and a small concrete pad on the northeastern corner may form the base of stove. Other fixings and fixtures are traceable in the paintwork of the interior.	Modern	SN37380298
107878		ROF PEMBREY	LOOKOUT	Brick built lookout, characteristically a ROF design lookout, although this one has narrow embrasures. Its position doesn't quite tie into a lookout shown on the ROF plan, though it is clearly of the right date. A Pyper 2015	Modern	SN3991100280
109252		NATIONAL FILLING FACTORY NO 18 PEMBREY	MUNITIONS FACTORY	Adjacent to the HM Factory Pembrey, which was producing high explosives and propellants, a loading plant was constructed for filling shells, mines and torpedoes. This factory was built and managed by the Explosives Loading	Modern	SS40769977

				Company, working as agents for the Ministry of Munitions from 1917. This factory was cleared for the construction of the Royal Ordnance Factory Pembrey in 1938-9.		
112367	270658		GUN EMPLACEMENT	Mass concrete gun emplacement facing onto the beach, set on In elevated position. Large horizontal embrasure facing forward and smaller gun embrasures to rear and sides. Protected entrance at rear.	Modern	SN3706903532
112368			GUN EMPLACEMENT	A gun emplacement overlooking Cefn Sidan beach. Built in shuttered concrete with a wide horizontal opening to the front (southwest) and overhanging roof. Gun embrasures to the sides, looking northwest and southeast, plus one in the rear wall to the left of the protected entrance. Almost completely engulfed by sea buckthorn and starting to break up due to the mobile sand dunes. A Pyper 2019.	Modern	SN3921900709
112369	91230		SEARCHLIGHT EMPLACEMENT	Unknown military structure recorded on OS mapping, but access in 2019 impossible due to thick sea buckthorn. Visited, A Pyper 2019 Visible on satellite imagery. Identified as searchlight platform by Jon Berry (2016). M Bell 2020 Likely NPRN 91230 visited and identified by T and H James in 1999 as a gun emplacement.	Modern	SN3783402366
112369	91230	UNKNOWN (PEMBREY BURROWS)	GUN EMPLACEMENT	A WWII reinforced concrete defence post protecting part of Pembrey Air Field. Long axis 340 degrees, open front facing sea with enfilading openings off N and S sides, 6.5 paces wide internally, one entry point. Interesting surviving contemporary instructions painted on walls, including a semi-circular pelorus recording bearings of landmarks (including two shipwrecks) and information on case-shot and	Modern	SN37830238



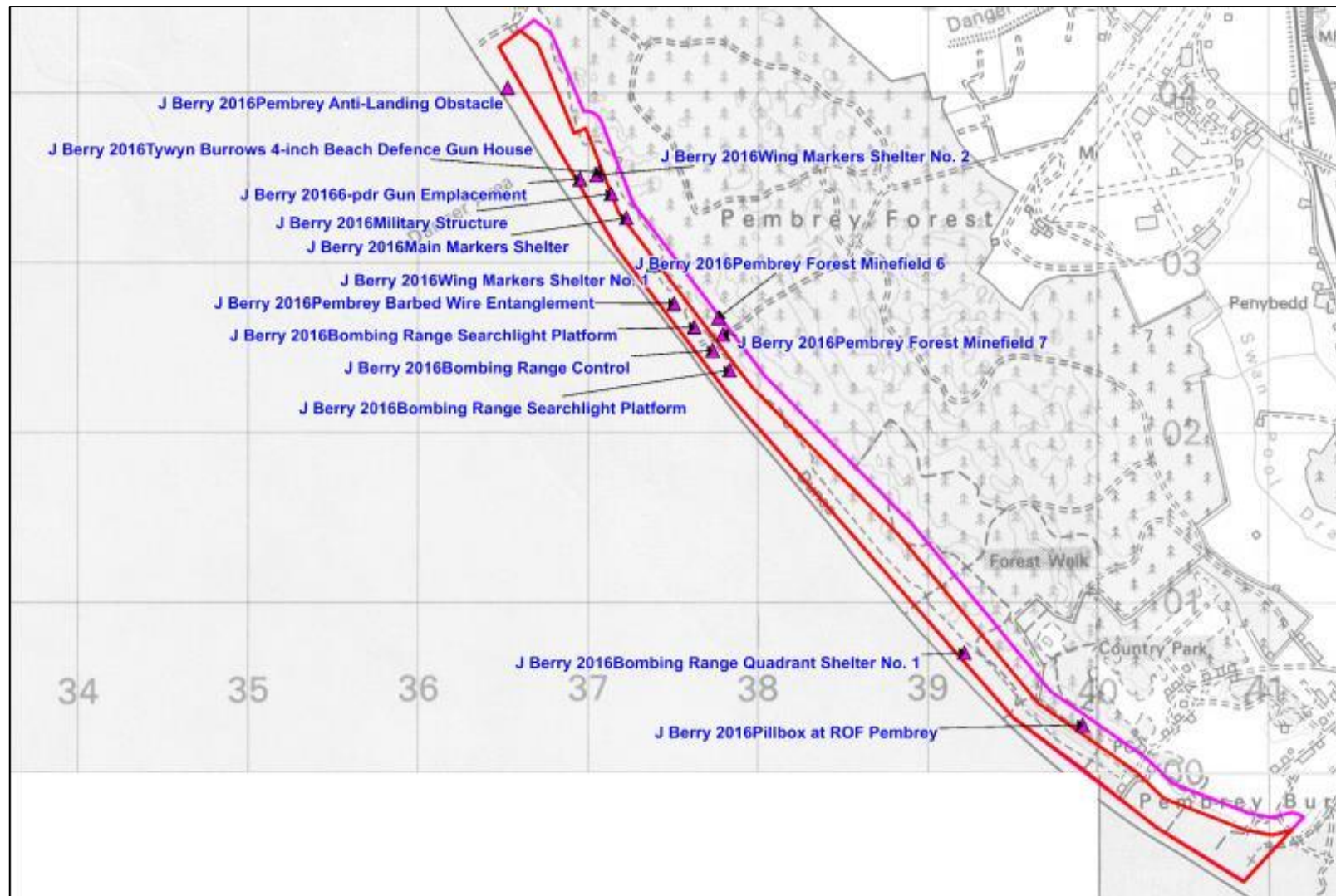
				half charges. Site now difficult to approach. Visited TA & HJ James 18.1.99 (TAJ 18.1.1999). See PRN 112369 Identified as J Berry (2016) as a searchlight platform.		
--	--	--	--	---	--	--

	270657	EMERGENCY COAST DEFENCE BATTERY, PEMBREY	EMERGENCY COAST DEFENCE BATTERY	Two 4-inch QF beach defence gun houses set 310 metres apart. Located on the dune front overlooking Cefn Sidan Sands and Carmarthen Bay. Record derived from Defence of Britain Project (Record Number 11553)	Modern	SN37150340
	270658	GUN EMPLACEMENT, PEMBREY	GUN EMPLACEMENT	No.1, 4-inch QF gun house. Located on the dune front overlooking Cefn Sidan Sands and Carmarthen Bay, set some 210 metres back from the mean high water mark. Record derived from Defence of Britain Project (Record Number 11554)	Modern	SN37060353
	270659	GUN EMPLACEMENT, PEMBREY	GUN EMPLACEMENT	No.2, 4-inch QF gun house. Located on the dune front overlooking Cefn Sidan Sands and Carmarthen Bay, set some 210 metres back from the mean high water mark. Record derived from Defence of Britain Project (Record Number 11555)	Modern	SN37230326
	270661	MINEFIELD, PEMBREY	MINEFIELD	Plotted off aerial photographs. Record derived from Defence of Britain Project (Record Number 11556)	Modern	SN37780265
	270664	MINEFIELD, PEMBREY	MINEFIELD	Plotted off aerial photographs. Record derived from Defence of Britain Project (Record Number 11556)	Modern	SN37860255

4.3.5 Of Berry's sites, twelve fall within the study and three within the 100m search buffer (Table 3, Figure 7). The majority of the sites are located towards the northern end of the study area and comprise structures and infrastructure associated with the bombing range. Closely associated with this cluster of sites and within the 100m buffer are two of 6 minefields located in Pembrey Forest (Figure 7). Of these fifteen sites only Berry's "Pillbox at ROF Pembrey" is recorded in the Dyfed HER (PRN 107878).

**Table 3: Sites within the study area and 100m search buffer, recorded in J Berry's unpublished, 2016 PhD thesis. See Figure 7**

REF	NAME	TYPE	SUMMARY	NGR
J Berry 2016	Pillbox at ROF Pembrey	Pillbox	None available	SN3991100277
J Berry 2016	Pembrey Forest Minefield 6	Minefield	""	SN3777102675
J Berry 2016	Pembrey Forest Minefield 7	Minefield	""	SN3779702577
J Berry 2016	Pembrey Anti-Landing Obstacle	Anti-Landing Obstacle	""	SN3653104028
J Berry 2016	Tywyn Burrows 4-inch Beach Defence Gun House	Gun Emplacement	""	SN3706803531
J Berry 2016	Wing Markers Shelter No. 2	Observation Post	""	SN3705303515
J Berry 2016	Main Markers Shelter	Observation Post	""	SN3722903262
J Berry 2016	Wing Markers Shelter No. 1	Observation Post	""	SN3738802988
J Berry 2016	Bombing Range Searchlight Platform	Searchlight Emplacement	""	SN3762802620
J Berry 2016	Bombing Range Control	Observation Post	""	SN3773502482
J Berry 2016	Bombing Range Searchlight Platform	Searchlight Emplacement	""	SN3783402366
J Berry 2016	Bombing Range Quadrant Shelter No. 1	Quadrant Shelter	""	SN3921500703
J Berry 2016	6-pdr Gun Emplacement	Gun Emplacement	""	SN3695503492
J Berry 2016	Military Structure	Coastal Defences	""	SN3713903404
J Berry 2016	Pembrey Barbed Wire Entanglement	Barbed Wire Entanglement	""	SN3750902758



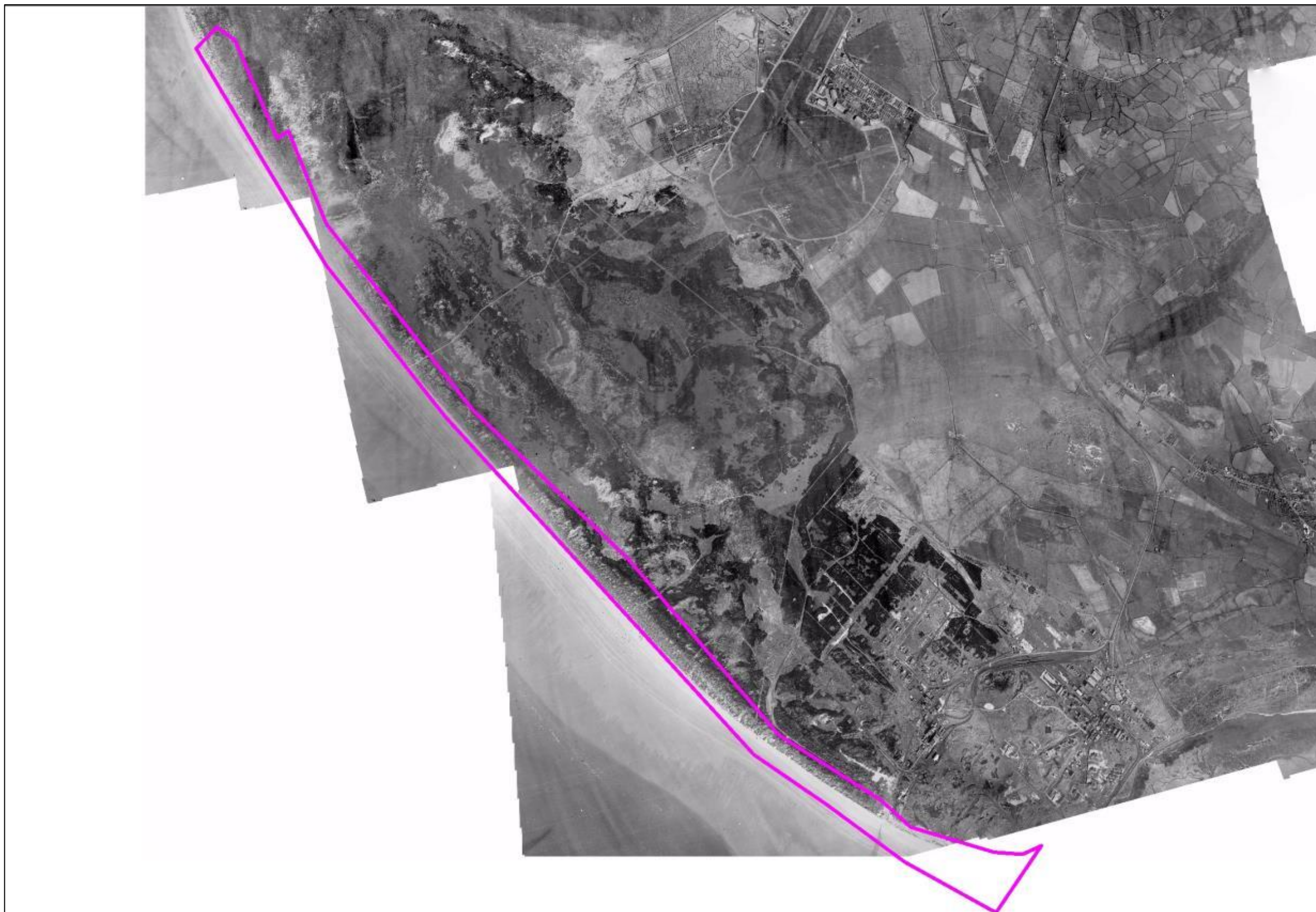
**Figure 7:** Map showing the location of J Berry sites (pink triangles) within the study area (outlined in red) and the 100m search buffer (outlined in pink).

Reproduced from the Ordnance Survey 1:50,000 scale Explorer Map with the permission of The Controller of Her Majesty's Stationery Office, © Crown Copyright Dyfed Archaeological Trust. The Corner House, 6 Carmarthen Street, Llandeilo, Carmarthenshire SA19 6AE. Licence No 100020930

#### **4.4 Newly Identified Sites**

- 4.4.1 Further to the dataset provided by Jon Berry, cartographic and photographic evidence were consulted to verify and identify the remains of as yet unrecorded anti-invasion defences. Sources included the 1940 RAF Medmenham Collection oblique aerial photography and 1946 RAF Operation Revue vertical aerial photography (Figure 8). These were examined in conjunction with an abbreviated copy of a 1940 armament training manual for Air Firing & Bombing Ranges and a historic RAF plan of the Air Firing and Bombing Range. This plan is undated but it is most likely to depict the range, its features and infrastructure during wartime and immediately after (Figure 9). The anti-invasion defences are not recorded but it is possible to correlate features on this map to sites and features identified on the aerial photography and it serves as a useful datum.
- 4.4.2 The Medmenham Collection oblique aerial photography was a key source, and a sortie of Cefn Sidan Sands dated 1<sup>st</sup> July 1940 was carefully examined. The sortie begins at Twywn Point and covers the full length of the Burrows before ending at the present day Country Park. The photographs capture a number of buildings and structures along the fringe of the dunes and it has been possible to identify these features as being extant on the 1946 vertical photography. Furthermore, there is reasonable agreement between the layout and nature of these features with the schema presented in the armament training manual and RAF range plan.
- 4.4.3 All of these features correspond with those sites identified by Berry although there is some discrepancy in their layout and precise location. In order to reduce this conflict the RAF 1946 vertical photograph was converted into a GIS raster image and geo-referenced against the modern 1:10,000 Ordnance Survey mapping using well defined, common topographical points. A number of control points were established to ensure minimal error margins during the registration process. However, given the discrepancy in scaling and the vastness of the aerial coverage it is not a perfect registration, but a very close match. The identified features were plotted and their locations recorded although the accuracy varied from approximate to confident in the instance where a feature remains extant on the modern mapping and satellite imagery.
- 4.4.4 A total of nine features were identified within the study area and two within the 100m search buffer. The photographic sources reveal the density of structures associated with the former bombing range centered on SN3774002560. These comprise a likely bombing range control tower, ambulance station, motor generator house, two searchlight platforms, two quadrant shelters and at least one practice bombing signal. Also plainly discernible are the six, decommissioned minefields located both side of and intersecting, the still extant concrete track in Pembrey Forest which is connected to the southwestern extent of Pembrey Airfield. Two of these minefields are situated within the 100m search buffer. These minefields have been allocated PRNs and recorded in the HER as polygonal sites for they are expansive, linear features located within immediate proximity to an extant topographic feature and therefore the ambiguity of their location is suitably reduced (Figure 10). Lastly, a possible quadrant shelter was identified in isolation some 1.5km south east along the dunes from the central cluster. These sites are presented in Table 4 and a composite image of the oblique aerial photographs identifying the bombing range structures and features is shown in Figure 11.





**Figure 8:** The RAF vertical photograph of Pembrey area (ref 106G UK 1400) dated 11<sup>th</sup> April 1946 and the study area outlined in pink.

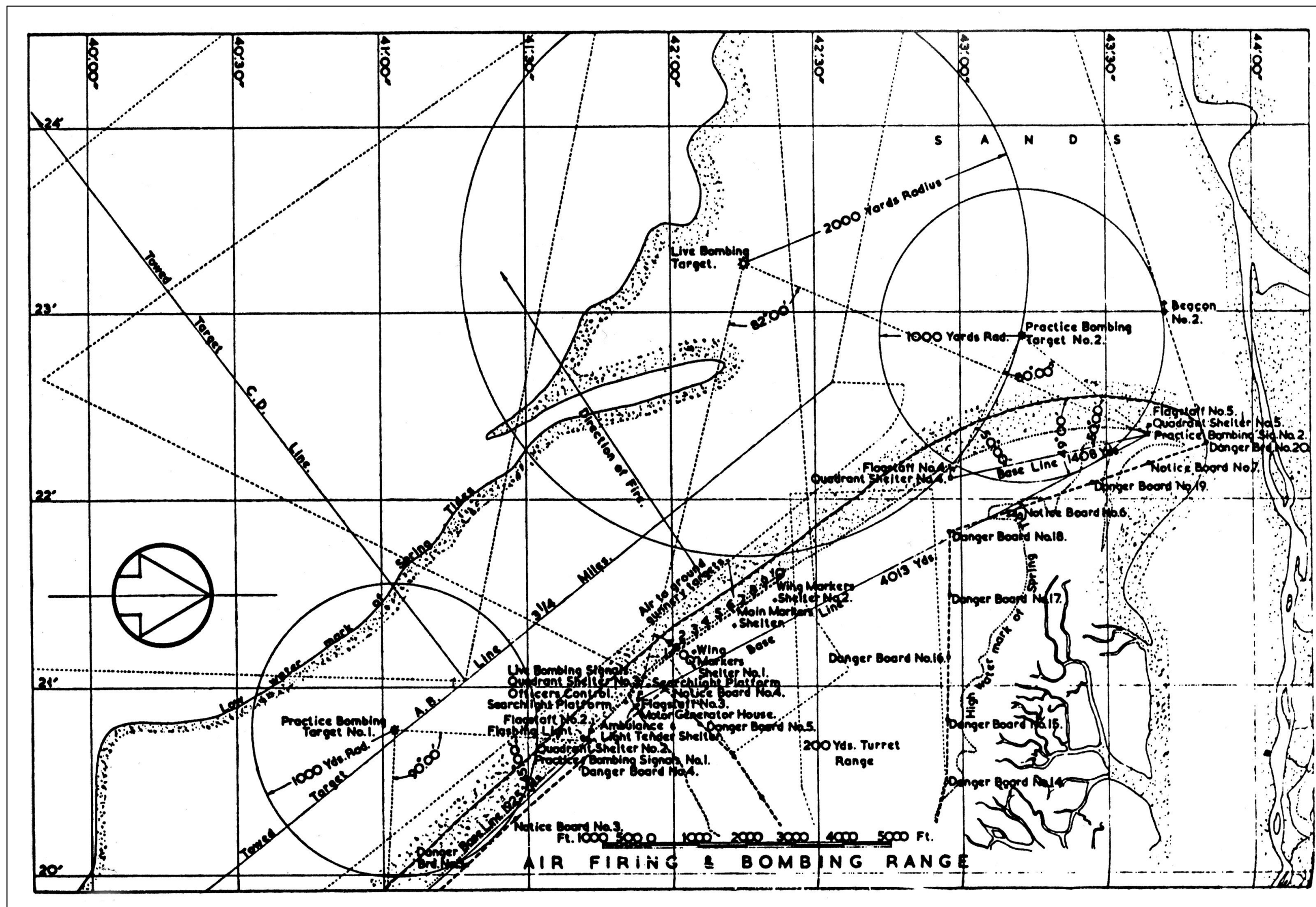
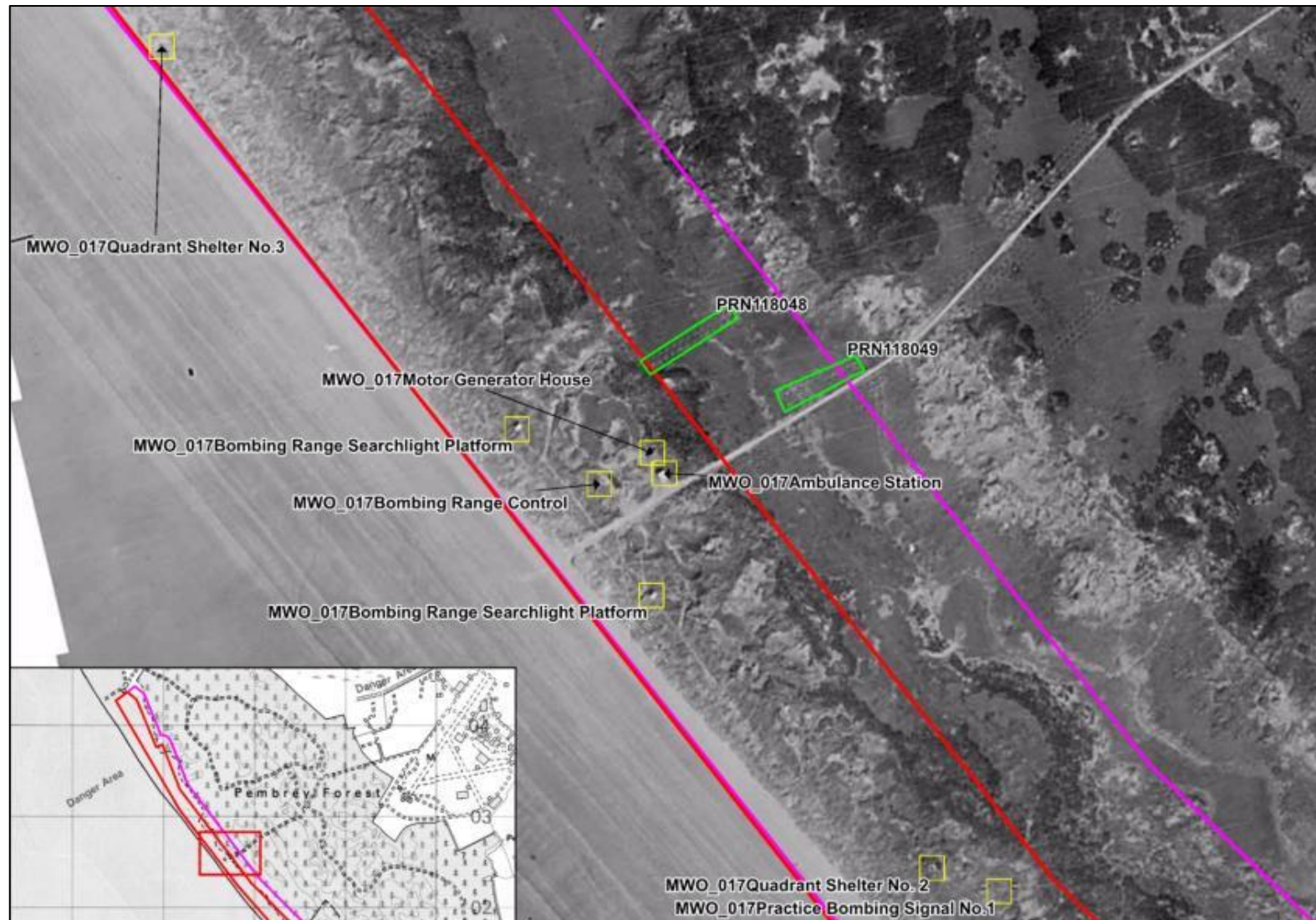


Figure 9: The undated but most likely 1940s RAF survey of Pembrey Air Firing and Bombing Range



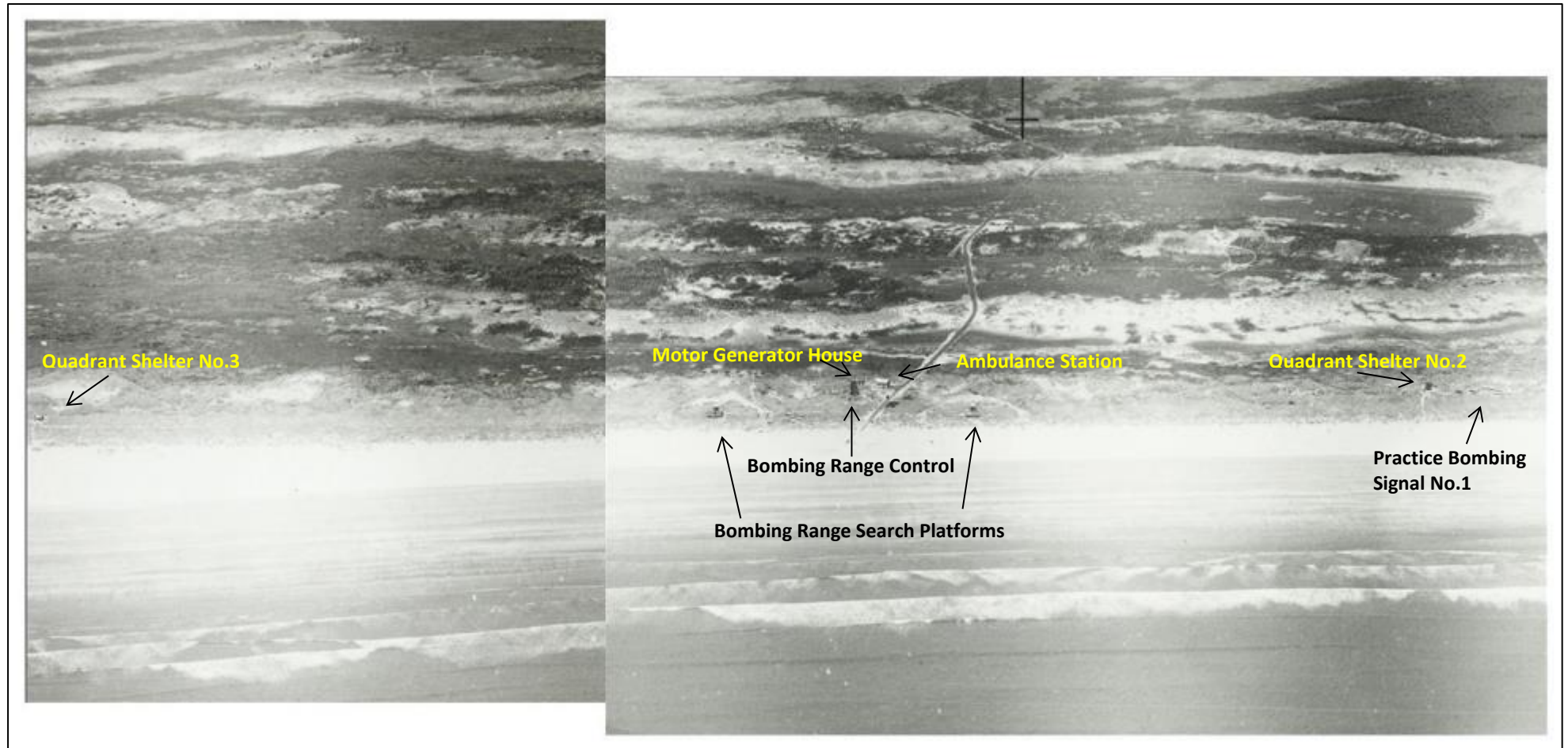
**Table 4:** Newly identified sites seen identified from the photographic evidence.

PRN	Ref	Name	Type	Summary	NGR
118048	MWO_017	Pembrey Forest Minefield 6	Minefield	Decommissioned minefield identified on 1946 RAF vertical photographs	SN3771902643
118049	MWO_017	Pembrey Forest Minefield 7	Minefield	Decommissioned minefield identified on 1946 RAF vertical photographs	SN3781602602
	MWO_017	Motor Generator House	Motor Generator House	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo and "Air Firing & Bombing Range" plan. Possible earthwork visible on LANDSTAT 2009.	SN3768902573
	MWO_017	Bombing Range Control	Observation Post	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photos D6 to D9 and "Air Firing & Bombing Range" plan. Also J Berry site	SN3764802557
	MWO_017	Ambulance Station	Ambulance Station	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo and "Air Firing & Bombing Range" plan	SN3769702558
	MWO_017	Quadrant Shelter No.3	Quadrant Shelter	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo D7 and "Air Firing & Bombing Range" plan	SN3733902881
	MWO_017	Bombing Range Searchlight Platform	Searchlight Emplacement	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo D7 and "Air Firing & Bombing Range" plan. Also J Berry site	SN3758902601
	MWO_017	Bombing Range Searchlight Platform	Searchlight Emplacement	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo and "Air Firing & Bombing Range" plan. Also J Berry site	SN3783402366
	MWO_017	Quadrant Shelter No.2	Quadrant Shelter	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photos D6 to D9 and "Air Firing & Bombing Range" plan	SN3788202279
	MWO_017	Practice Bombing Signal No.1	Practice Bombing Signal	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo D8 & D9 and "Air Firing & Bombing Range" plan	SN3793102258
	MWO_017	Bombing Range Quadrant Shelter No.1	Quadrant Shelter	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo D18 & D19. Not visible on "Air Firing & Bombing Range" plan. Also J Berry site	SN3890301038



**Figure 10:** An extract of the 1946 RAF vertical aerial photograph showing the density of sites and features associated with the bombing range and anti-invasion defences within the study area (outlined in red) and 100m buffer (outlined in pink). The green polygons map the extent of the minefields within the search area. Note the additional north-eastern minefields aligned parallel to the track.





**Figure 11:** A composite of two photos of the 1940 RAF oblique aerial photographs of Pembrey Burrows showing the buildings and structures comprising the former hub of the bombing range.

## 4.5 Site Walkover Survey

- 4.5.1 The purpose of a walkover survey is to empirically verify the information gained during the desk-based assessment. It is also designed to record previously unrecorded sites which may or may not be impacted upon by the proposed sea buckthorn removal.
- 4.5.2 The site walkover survey was undertaken by Alice Pyper and Menna Bell on the 11th August 2020 during pleasant weather conditions. Given the size of the study area and limitations on time and access owing to the density of the sea buckthorn, the walkover survey comprised a targeted visit and assessment of the areas identified during the desk-based assessment as having the greatest archaeological potential. The walkover survey began at the hub of the former bombing range centred on SN3774002560 which presently provides access onto the beach via the aforementioned concrete track in Pembrey Forest. The concrete track remains in good condition and is perfectly serviceable for vehicular access. There is presently a large area of hardstanding immediately at the end of this track providing a convenient area for parking. Sites at the northern and southern extents of the study area were not accessed although a number had recently been visited by Pyper as part of the on-going Cadw pan Wales assessment of military camps and ranges and previous threat related assessment of twentieth century military sites (Pyper and Page, 2014), the results of which are included in this report.
- 4.5.3 Where accessible, each of the target sites were visited, recorded and photographed. The current extent of the sea buckthorn was assessed and the impact of its removal considered. The potential for further associated and more ephemeral sites was also considered. The walkover survey began on the north-western side of the concrete track, in the vicinity of the former bombing range control tower and then progressed to the south-eastern side and southwards along the dune cliffs and perimeter of the sea buckthorn before culminating at the approximate location of the southernmost searchlight platform. The results of the survey are presented in Table 5 and are discussed here.
- 4.5.4 On arrival at the target area it was apparent that a substantial swathe of sea buckthorn had already been removed on the northern side of the concrete track and clearance was visible throughout the north-western extent of the study area (Photo 1). Subsequent correspondence with NRW revealed that this was undertaken in 2015 and mulching was used to remove the sea buckthorn (Ruth Harding, *pers comm*, August 2020). Conversely, the density of the sea buckthorn on the south-eastern side was such that it was impenetrable (Photo 2). Despite the clearance on the north-western side, pockets of young sea buckthorn survived within a thicket of bramble and coarse scrub made all the more formidable by the undulating topography of the dunes. Additionally, tall grasses and other innocuous yet expansive vegetation made for difficult terrain underfoot and severely impaired access to the target grid references. Nevertheless, forays were made where safe to do so.
- 4.5.5 It was expected that any extant remains would comprise robust, concrete or brick-built structures, although not likely to be intact given the scarce representation in the archaeological record. Even less likely to survive would be the remains of the electrical services which would have provided power to the infrastructure of buildings and structures throughout the bombing range. There was little expectation of any temporary features such as the bombing signals surviving but the site walkover was vigilant for these possibilities.



**Photo 1:** Overview of the area cleared of sea buckthorn immediately north-west of the concrete track and in the vicinity of the former bombing range hub (DAT Photo121883\_152336).



**Photo 2:** Overview of the dense sea buckthorn and scrub on the south-eastern side of the concrete track (DAT photo 121883\_17475)

**Table 5:** Sites recorded during the site walkover survey

PRN	NAME	TYPE	NGR	CONDITION	DESCRIPTION	PHOTO
118046		STRUCTURE	SN3762802617	Damaged; not in situ	<p>Possible quadrant shelter like structure identified on 1946 vertical photo and D8 MWO_017 oblique photographs. Berry "Bombing Range Searchlight Platform".</p> <p>Mature Cypress tree in large hollow in which two concrete block (not insitu) were found. The largest of the two measured 0.59m2 and 0.34m deep and was embedded with the remains of a wooden post of approx. 0.13m2.</p> <p>Very dense thickets of brambles, bind weed and other vegetation along with pockets of young sea buckthorn.</p>	121883_170802
118047		STRUCTURE	SN3770302573	Damaged	<p>Partially exposed shutter concrete platform; possibly triangular in shape although northeastern side is completely buried by dune and vegetation. Surrounded by dense bramble thicket. West facing opening c.3.9m wide and similar void exposed facing east but inaccessible. Two square ends (like a gear cog) measuring 0.65m x 0.75m were exposed. The southeastern end had a rectangular slot measuring 0.20m x 0.12m.</p> <p>Feature located immediately north of where possible Ambulance station identified on aerial vertical and oblique photographs.</p>	<p>121883_162942</p> <p>121883_162918</p>
N/A	Bombing Range Searchlight Platform	SEARCHLIGHT PLATFORM	SN3758902601	Unknown	<p>Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo D7 and "Air Firing &amp; Bombing Range" plan. Also J Berry site.</p> <p>Large hollow filled with thicket of bramble and bind weed in this location: not accessible.</p>	121883_173021
N/A	Motor Generator House	MOTOR GENERATOR HOUSE	SN3768902573	Unknown	<p>Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo D7 and "Air Firing &amp; Bombing Range" plan. Possible earthwork visible on LANDSTAT 2009.</p>	<p>121883_152322</p> <p>121833_19220</p>

					Area visited; mature Cypress tree in hollow and surrounded by thicket of bramble and young sea buckthorn. No remains visible	
N/A	Bombing Range Control Tower	OBSERVATION	SN3764802557	Unknown	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo D7 and "Air Firing & Bombing Range" plan. Possible earthwork visible on LANDSTAT 2009. Area visited; mature Cypress tree in hollow and surrounded by thicket of bramble and young sea buckthorn. No remains visible	121883_191847 121883_152322 121833_19220
N/A	Ambulance Station	AMBULANCE STATION	SN3769702558	Unknown	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo D7 and "Air Firing & Bombing Range" plan. Possible earthwork visible on LANDSTAT 2009. Area visited; mature Cypress tree in large hollow and surrounded by thicket of bramble and young sea buckthorn. No remains visible. Fragment of asbestos roof tile found in hollow.	121883_152322  121833_19220
N/A	Bombing Range Searchlight Platform	SEARCHLIGHT PLATFORM	SN3783402366	Unknown	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo D7 and "Air Firing & Bombing Range" plan. Possible earthwork visible on LANDSTAT 2009.  Despite sincere efforts, this area was completely inaccessible owing to dense, mature sea buckthorn.	121883_174745



- 4.5.6 The first target site visited was the Ambulance Station identified on the historic aerial photography. A mature Cypress tree, some 15m north of the beach track and enveloped by a thicket of bramble and young sea buckthorn, filled a significant hollow on the site of the approximate grid reference (Photo 3). The hollow and its vicinity were investigated but no structural remains were identified save for a single fragment of what appeared to be an asbestos roof tile. Whilst it is most likely that this fragment is residual it is a contemporary and appropriate roof material for this period.



**Photo 3:** A mature Cypress tree occupies a large hollow at the approximate location of the likely Ambulance Station (DAT Photo 121883\_152322).

- 4.5.7 Whilst no remains of the ambulance station were identified, an entirely undocumented concrete structure was discovered just beyond the northern reach of the Cypress' canopy. This partially exposed structure comprised a shutter concrete platform, possibly triangular in plan and appeared to be intact although its north-eastern extent was engulfed by a dune and blanketed with a bramble thicket. A little clearance revealed a wide, west facing opening measuring 3.9m in length and a similar opening was partially revealed on its east facing aspect. These openings were finished by jutting square ends, much like a gear cog in form, and measured 0.65m wide and 0.75m in length. The south-eastern end featured a rectangular slot measuring 0.2m x 0.12 and it was not possible to see a matching feature at the north-western end (Photos 4 & 5). This structure is not visible on the aerial sources, nor is it identified on the Air Firing and Bombing Range plan and is also not listed in Berry's thesis. It is likely that the structure dates from the latter part of the war years, perhaps as an auxiliary or additional feature beyond the original layout of the bombing range infrastructure. It is also possible that it is associated with the post war use of the bombing range up to the late 1950s. Without further clearance it is impossible to discern its true form (and function) or suitably access it for proper examination. Nevertheless, the structure has been recorded in the HER and allocated the PRN 118047.



**Photo 4:** The south-eastern end of the concrete platform discovered immediately north of the approximate location of the Ambulance Station. PRN 118047 (Photo DAT 121883\_162918).



**Photo 5:** The west facing opening of the concrete platform discovered immediately north of the approximate location of the Ambulance Station. PRN 118047 (DAT Photo 121883\_162942).



- 4.5.8 The survey progressed in search of the remains of the Motor Generator House which was approximately located some 16m north-east of the Ambulance station. However, it was noticed that a second and third mature Cypress trees were located in close proximity to the first target site, and appeared to match the triangular layout of the Ambulance Station, Motor Generator House and Bombing Range Control Tower as depicted on the bombing range plan and aerial photography (Figures 9 & 10). The approximate grid reference of the Motor Generator House was examined but no remains were identified. Roughly parallel transects were walked between the north-western cypress tree and the approximate grid reference but no remains were found. The cypress tree occupied a large hollow and the topography of the dunes undulated significantly. The density of the vegetation also increased in this area making it exceedingly difficult to traverse (Photo 6).
- 4.5.9 A similar approach was taken to investigate the vicinity of the approximate location of the Bombing Range Control Tower. Again, a mature cypress tree occupied a large hollow which has been in filled with dense thicket of bramble and other vegetation (Photo 7). The surrounding area was explored but no remains were found amongst this dune-scape where pockets of young sea buckthorn gave way to substantial expanses of bramble thicket (Photo 8).



**Photo 6:** Overview of the area encompassing the former Ambulance Station, Motor Generator House and Bombing Range Control Tower. Note the layout of the three mature cypress trees and undulating, vegetated terrain (DAT Photo 121883\_192200)





**Photo 7:** A mature, dying cypress tree occupies the approximate location of the Bombing Range Control Tower (DAT Photo 121883\_191847)



**Photo 8:** A southeast facing overview of the dune-scape northwest of the approximate location of the Bombing Range Control Tower (DAT Photo 121883\_173547).

- 4.5.10 There were two possible locations for the north-western searchlight platform. The first approximate grid reference visit was that recorded by Jon Berry and the second location was some 43m to the West and derived from plotting the features identified on the rasterized 1946 RAF aerial photograph. Berry's grid reference was investigated first. In an emerging pattern, a mature Cypress Tree was found to be occupying its location. Two concrete blocks were found beneath the canopy of the tree but were clearly not in situ. The largest of the two measured approximately 0.6m<sup>2</sup> and 0.34m deep and was embedded with the remains of a square wooden post, approximately 0.13m<sup>2</sup> (Photo 9). No other remains were found and nothing to indicate the source of this material although this area was again densely vegetated and difficult to navigate. The location of these blocks have been recorded in the HER and allocated the PRN 118046.
- 4.5.11 The location of the second grid reference was not accessible for it appeared to fall within the very centre of a substantial hollow which boiling over with dense bramble and vegetation (Photo 10). Needless to say, no remains were visible.





**Photo 9:** The concrete block embedded with the wooden post (PRN118046) found in the location of Jon Berry's grid reference for a searchlight emplacement. (DAT Photo 121883\_165811).





**Photo 10:** The 2m ranging pole indicates the edge of a deep, bramble choked hollow in the alternative location for the searchlight platform (DAT Photo 121883\_173021).

4.5.12 The survey did not progress further along the north western extent of the survey area for Pyper had recently visited the recorded structures in the area in Spring 2019. However, for the purpose of this report, these sites are included in the same fashion. From here, sites are included as they encountered moving northwards towards the north-western end of the study area. Located some 440m north-west of PRN 118046, Pyper identified PRN 105937 "Wing Marker Shelter No.1" as plotted on the bombing range plan (Figure 9) and comprising a reinforced concrete structure with a turf, flat roof as a gun emplacement. She describes it as rectangular in plan measuring roughly 3.05m x 2.4m with a wide rectangular opening and doorway facing south west (Photo 11). Jon Berry also records this structure as "Wing Marker Shelter No.1" but there is a slight discrepancy in the grid references. At the time of Pyper's visit, the shelter was largely unobstructed by vegetation and easily accessible although a wall of vegetation, most likely sea buckthorn, was visible in the background.



**Photo 11:** Wing Marker Shelter No. 1 (PRN 105937) (DAT Photo 105937\_17\_02\_2019\_02)

4.5.13 The Main Markers Shelter (PRN 31415, NPRN 270659) is located within the 100m search area, some 327m north-west of PRN105937 and remains extant, is rectangular in plan with a wide south-western facing opening (Photo 12). Jon Berry also records this structure as "Main Makers Shelter". At the time of Pyper's visit in Spring 2019, the structure is free from vegetation and whilst sea buckthorn is visible in the background, it does not appear to be encroaching of the structure at any urgency.



**Photo 12:** Main Markers Shelter (PRN 31415, NPRN 270659)31415\_17\_02\_2019\_02)



- 4.5.14 Pillbox PRN 118045 (NPRN 270657) is located roughly 173m north-west of PRN 31415 and is situated within the study area. Pyper describes this structure of being brick built with a shuttered concrete roof, a canted front with wide gun embrasures and small loop-holes in the side and rear walls. At the time of Pyper's visit in Spring 2019, the structure was inaccessible owing to its encasement in woody vegetation, likely sea buckthorn (Photo 13).



**Photo 13:** Pillbox PRN118045 (NPRN 270657)(DAT Photo 118043\_17\_02\_2019\_02)

- 4.5.15 Located approximately 140m north-west of PRN118045 and located within the study area is Wing Makers Shelter No.2 (PRN 31414). Pyper describes this rectangular, shutter concrete structure as being identical to PRN 31414 (Wing Markers Shelter No.1) in form (Photo 14). This shelter is also recorded by Berry and 1940s plan of the bombing range (Figure 9). At the time of Pyper's visit in Spring 2019 the front of the structure is free of vegetation although (and as identical to PRN 31415) sea buckthorn is closely advancing from the rear of the structure. Indeed, gun house PRN 112367 is just visible in the thicket behind.



**Photo 14:** Wing Markers Shelter No. 2 (PRN31414) with Gun House PRN 112367 just visible amongst the thicket behind (DAT Photo 31414\_17\_02\_2019\_2

4.5.16 The furthest archaeological feature in the north-western extent of the study area is the "Tywyn Burrows 4-inch Beach Defence Gun House". This feature does not appear on the bombing range plan but is recorded by Berry and the HER as PRN 112367 and NPRN270658. It comprises a large concrete gun emplacement with a wide embrasure facing the beach and smaller gun embrasures situation at the sides and rear (Photo 15). At the time of Pyper's visit, the structure was surrounded by woody vegetation, most likely sea buckthorn, and was just about accessible.



**Photo 15:** Tywyn Burrows 4 inch Beach Defence Gun House (PRN 112367)112367\_15\_02\_2019\_02



4.5.17 Returning to the concrete track in the location of the main hub of the bombing range, the site visit continued across the track and along the south-eastern extent of the study area (Photo 16). As previously noted, the density of the sea buckthorn in this area is extraordinary and whilst efforts were made to identify possible routes in, it proved to be impassable. As such, it was not possible to investigate the unrecorded sites in this area; namely Berry's grid references for the Bombing Range Control Tower and searchlight platform and the alternative searchlight platform location as identified from the aerial photography. Also in this area but not possible to investigate are the approximate locations for the Quadrant Shelter No.2 and Practice Bombing Signal also identified from the aerial photography (Figures 9 & 10). Whilst it was not possible to access on the ground, PRN 112369 is a concrete structure which is clearly visible on the satellite imagery and OS Mapping. It is located roughly 217m south-eastern of and is recorded as a gun emplacement in the HER whilst Berry has recorded it as a searchlight platform.



**Photo 16:** Overview of the dense sea buckthorn on the south-eastern side of the concrete track towards the centre of the Burrows (now beach access track) (DAT Photo 121883\_152345).

4.5.18 Not to be thwarted altogether, the survey continued along the perimeter of the study area, onto Cefn Sidan Sands (Photo 17). The dune cliffs were examined for any evidence of eroding archaeology and to gain some insight into the geomorphology of the dunes. No eroding archaeology was observed but it was interesting to note the depth of the sea buckthorn and at one instance, buried plastic netting eroding out below the depth of the vegetation (Photo 18).



**Photo 17:** General view of Alice Pyper walking along the seaward, south eastern perimeter of the study area, at Cefn Sidan Sands (DAT Photo121883\_175003)



**Photo 18:** A section of the dune cliff showing the depths of the vegetation and buried plastic netting (DAT Photo 121883\_175518)



4.5.19 Finally, located some 2.1km from the end of the south-eastern extent of the study area is a gun emplacement PRN 112368. Whilst not accessed during this site visit, Pyper was able to visit it during Spring 2019. Pyper describes the structure as being constructed of shuttered concrete with a wide, south-west facing, horizontal opening and an overhanging roof. It has gun embrasures on both sides and one to the left of the protected rear entrance. At the time of the visit, Pyper records it as being almost completely engulfed by sea buckthorn and beginning to break up owing to some mobility of the dunes in this area (Photo 19). Jon Berry has recorded this feature as Bombing Range Quadrant Shelter No. 1.



**Photo 19:** Gun emplacement PRN112368 (DAT Photo 112368\_17\_02\_2019\_04)

## **5. ASSESSMENT OF ARCHAEOLOGICAL POTENTIAL & IMPORTANCE**

### **5.1 Calculating areas of Archaeological Potential**

- 5.1.1 Owing to the density of the sea buckthorn within the study area, it was not possible to neither confidently ascertain the extent and nature of the archaeology nor quantitatively assess the potential impacts on this resource. Furthermore, the geomorphology and formation of sand dunes can create complex taphonomies for it is a dynamic environment creating undulating topographies. As demonstrated by the observation of the buried plastic netting in the dune cliff (Photo 18), it would be easy to assume that the World War 2 remains are buried by a depth of sand and yet some structures survive extant, at ground level and are even visible on satellite imagery. The absence of any remains within the vicinity of the former Bombing Range Control Tower and its supporting infrastructure is not evidence of its absence and the uncertainty regarding the confidence of precise locations only adds to the ambiguity.
- 5.1.2 In broad terms, one could consider Pembrey Burrows to be an area of high archaeological potential. Berry's thesis, the 2016 archaeological survey of the northernmost extent of the Burrows and indeed this audit and appraisal of archival and secondary sources attests to the density and significance of the twentieth century anti-invasion defences in the area. Indeed, the unexpected discovery of the previously undocumented concrete platform (PRN 118047) demonstrates the potential for further undocumented archaeology to survive and highlights a surprisingly scarce history of a modern defense infrastructure of national importance.
- 5.1.3 The inability to record the identified sites on the ground also impedes an assessment of the reliability of the sources particularly in regard to the locations of the sites and features. And yet, the variety of sources and their degree of concordance does enable a more refined and pragmatic assessment of archaeological potential. It has been possible to quantify the study area into areas of "Certain", "High", "Medium" and "Low" archaeological potential whilst considering the ambiguity of the sources. Consequently, it is then possible to better infer the significance of the impact of the removal of the sea buckthorn in these areas and inform a program of removal.
- 5.1.4 All of the sources used in this assessment were amalgamated into one dataset and assigned confidence values based on the level of ambiguity for each individual site i.e. is this point representative of a known, extant and accurately recorded feature or has it been tentatively plotted from a secondary source? A simple ranking system was created whereby those sites with the greatest confidence were given the highest value and those with the least confidence with the lowest value as follows:

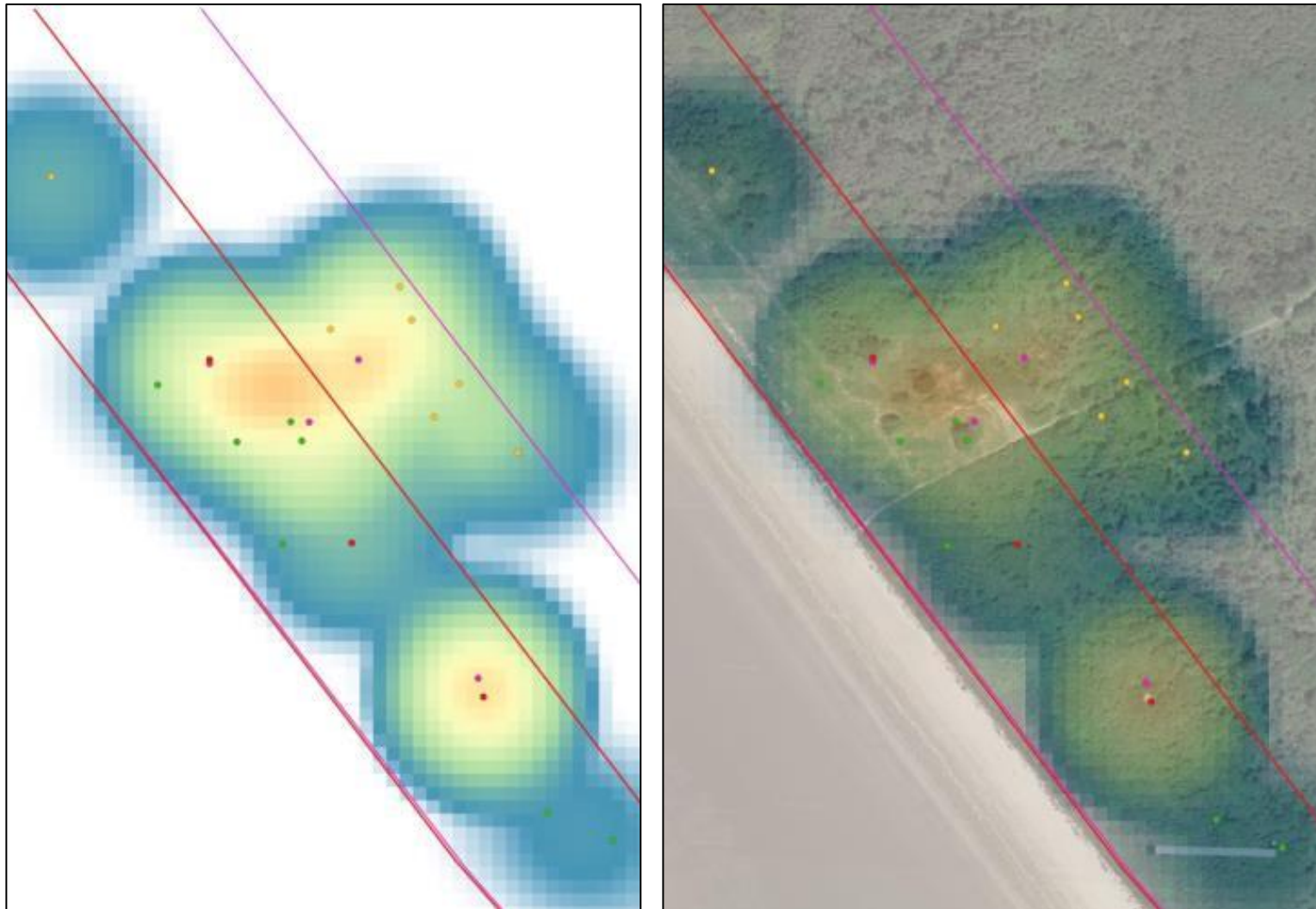
<b>Confidence value</b>	<b>Evidence</b>
6	Extant site, recently visited
5	Extant site (visible) but not recently visited
4	Jon Berry site where source is identified as "archaeology"
3	Plotted from reliably registered secondary source
2	Location of site visited but not visible
1	Plotted from dubiously registered secondary source

- 5.1.5 Once all of the values had been assigned, a vector point layer for all the sites was created and subjected to a statistical interpolation process known as Weighted Kernel Density Estimation to produce a heatmap visualization of the density of sites and their confidence levels. Unweighted density estimations treat all points as having equal weighting and it is a convenient way to visualize inferences made of a sample whereby hotspots can quickly be identified. The objective of this assessment, however, was not just to plot the density of sites but to consider their confidence value so that areas of archaeological potential/risk could be more appropriately defined.
- 5.1.6 The confidence values also enabled the production of thematic maps whereby the confidence values were classified into orders of certainty. A confidence value of 6 indicated certainty and corresponding points were coloured magenta and descended in a typical "traffic light" schema of "High certainty" (red), "Medium certainty" (amber) and "Low certainty" (green) (Figure 12).
- 5.1.7 For the purpose of the heatmap, each point was allocated an influence radius of 100m. The resultant heatmap is a raster layer in which each pixel within that dataset contains the interpolated weighted sum of the confidence values of all the sites. Pixels with the highest values indicated the greatest certainty and therefore the risk whilst pixels with the lowest values indicated the lowest risk (Figure 13). It was then possible to reclassify the range of highest to lowest pixel values into 3 categories; Certain, High and Medium and the remaining white space (or "no data values") within the study area and 100m buffer became the Low areas. These categories were then converted to polygonal areas and mapped into areas of known/extant archaeology, high archaeological potential, medium archaeological potential and low archaeological potential (Figure 14). A high-resolution version of this map using the 1:50,000 Ordnance Survey map at an A3 size is included in Appendix 1. The confidence value table for all sites is reproduced in Appendix 2. It is important to note that polygonised areas of risk are intended to be used as guidance to enable a pragmatic and informed approach to the removal of the sea buckthorn. Their parameters are not to be taken literally, rather they ought to indicate appropriate levels of mitigation and due caution.
- 5.1.8 The potential for surviving archaeology associated with the bombing range and anti-invasion defences (including those site types already identified) can comprise:
- Pillboxes
  - Gun Emplacements
  - Observation shelters
  - Searchlight emplacements
  - Concrete platforms
  - Partially demolished and dispersed building materials
  - Decommissioned minefields
  - Electrical services
  - Temporary structures (such as signals)
- 5.1.9 Thematic maps capturing all the sites and their confidence values are presented in Figures 15 – 20.

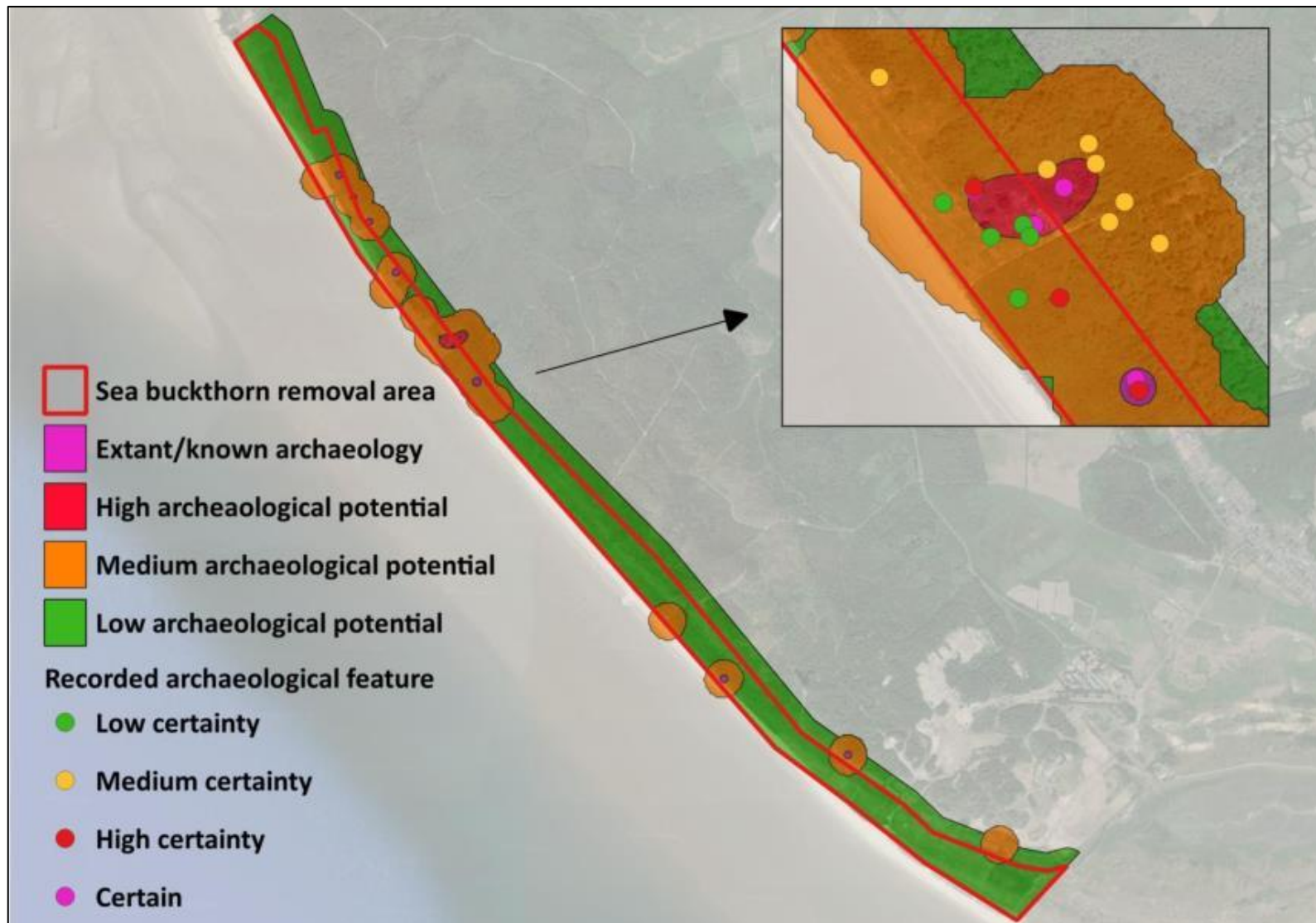


**Figure 12:** Thematic map showing the distribution of the confidence values of sites recorded from the sources within the study area and 100m buffer. Certain (magenta) High certainty (red), Medium certainty (amber) and Low certainty (green) for all archaeological sites. (Map data ©2020 Google, Maxar Technologies)





**Figure 13:** An extract of the heatmap featuring those sites centred on the main hub area of former bombing range. The warmest coloured areas indicate the highest risk and the blue areas indicate the lowest risk. (Map data ©2020 Google;Maxar Technologies)



**Figure 14:** Map showing the areas of “Extant/known archaeology”, “High archaeological potential”, “Medium archaeological potential” and “Low archaeological potential” in the study area and 100m buffer. (Map data ©2020 Google, Maxar Technologies)

## **5.2 Area of Extant/known archaeology**

*(Shaded magenta)*

- 5.2.1 These areas encompass the known, extant archaeological sites assessed in this survey and are recorded in the HER and/or NMR. They are sites which have either been visited during the walkover survey or have been recently surveyed as part of a pan Wales, Cadw threat related assessment. The polygons are centred on the point data within a reasonable margin but they do not necessarily reflect the exact extent on the ground. These polygons are intended to prioritise the presence of the known features whilst highlighting their vulnerability to any invasive programme of removal.

## **5.3 Area of High archaeological potential**

*(Shaded red)*

- 5.3.1 This is a localised area where the remains of the former Bombing Range Control Tower, Motor Generator House, Ambulance Station, the newly discovered concrete platform (PRN 118047) and concrete blocks (PRN 118046) are located, Figure 14. Whilst no evidence of the substantial structures were found during the walk over survey it doesn't negate the possibility of there being superficially buried remains, or remains that are obscured by the dense vegetation. Indeed the discovery of the platform and concrete blocks indicate that the possibility for further extant remains in this area is high.

## **5.4 Area of Medium archaeological potential**

*(Shaded amber)*

- 5.4.1 These areas encompass the extents of the calculated risk parameters generated by the heatmap. They are in effect, the sum of all the confidence values that are less than "high" but greater than "zero" where there is a known risk of archaeology. They also allow for the ambiguity of some of the grid references and highlight areas where removal of the sea buckthorn should be undertaken with due caution.

## **5.5 Area of Low archaeological potential**

*(Shaded green)*

- 5.5.1 The remainder of the study area and the 100m search buffer along Pembrey Burrows are considered to be of low archaeological potential. This potential is not to be interpreted as "negligible" for at a regional level the area is of significant archaeological and historical importance for twentieth century anti-invasion defences in south-west Wales. Whilst this survey has reviewed a reasonable selection of documentary and photographic sources, it is by no means an exhaustive study. There is a very real chance that undocumented archaeology survives within the study area and could be discovered during any invasive works. The difficult terrain and dense vegetation means that systematic walkover surveys are simply not possible and inroads into unexplored areas of the Burrows will likely be ad hoc opportunities. It is also pertinent to consider the morphology of the dune system; itself a moveable landscape and it is equally likely that negative features such as the trenches, weapon pits etc may have been in-filled by sand movement and substantial structures may have been buried. Nonetheless, any surviving remains of the anti-invasion defences are of high archaeological and historical importance and if the scheduling assessment is completed, it is likely that these remains will be scheduled as monuments of national importance.





**Figure 15:** Map showing the distribution of sites from all sources and their confidence classes at the north-western extent of the study area and 100m buffer. (Map data ©2020 Google, Maxar Technologies)





**Figure 16:** Map showing the distribution of sites from all sources and their confidence classes near the centre of the study area and 100m buffer. (Map data ©2020 Google, Maxar Technologies)



Report No. 2020/33





**Figure 18:** Map showing the distribution of sites from all sources and their confidence classes in the area immediately south-east of the centre of the study area and 100m buffer. (Map data ©2020 Google, Maxar Technologies)



**Figure 19:** Map showing the distribution of sites from all sources and their confidence classes towards the south-eastern end of the study area and 100m buffer. (Map data ©2020 Google, Maxar Technologies)





**Figure 20:** Map showing the distribution of sites from all sources and their confidence classes at the south-eastern end of the study area and 100m buffer. (Map data ©2020 Google, Maxar Technologies)

## **6. POTENTIAL IMPACTS**

### **6.1 Short term**

- 6.1.1 At the time of writing this report the proposed methodology of the sea buckthorn removal was not known. However, it is understood that the process requires the removal of the entire plant and root system. This can be done through a combination of hand digging and mechanical clearance. Mechanical clearance entails the use of heavy machinery such as tractors, tracked excavators fitted with "grabber" buckets or tracked forestry mulchers (Rooney *et al*, 2011). It is an invasive and nondiscriminatory process and is likely to destroy more ephemeral archaeological remains and will potentially damage the visible (and hidden) built structures. Therefore the short term potential impacts equate to the immediate destruction of the subtle, yet integral, components of the anti-invasion defences whilst isolating the more robust structures.
- 6.1.2 Conversely however, the clearance of the sea buckthorn and vegetation will reveal the built structures, improve accessibility and prevent the encroachment and exploitation of parietal vegetation.

### **6.2 Long term**

- 6.2.1 It is understood that the removal of the sea buckthorn and vegetation will lead to mobilisation of the sand dunes which in turn, could lead to erosion and undermining of the dunes and ultimately, the archaeological remains. Additionally, the improved accessibility and exposure of the built structures also increases their vulnerability to weathering and erosion, and may accelerate their deterioration.

## **7. CONCLUSIONS AND MITIGATION PROPOSALS**

### **7.1 Archaeological Constraints**

- 7.1.1 Following the results of the desk-based assessment and the completion of the walk-over survey, it has been possible to produce a baseline dataset indicating the known quantity of anti-invasion defences within the vicinity of the Pembrey Burrows and specifically the area of the sea buckthorn removal.
- 7.1.2 Dense vegetation and the undulating topography of the dune system prevented a systematic walkover survey of the study area, although it was possible to identify an area of high archaeological potential which resulted in the discovery of previously undocumented structures. Furthermore, consultation of the photographic and documentary evidence in conjunction with the new structure suggests that there is a more nuanced narrative of the bombing range in the later war years until its close in the late 1950s.
- 7.1.3 Whilst there has been a significant amount of accretion in the northern end of the Burrows at Tywyn Point and at the very southern extent of the study area, there has been little net change in the central dune system. Through a combination of information extracted from the geomorphological assessment of the sand dunes system, consultation of the LIDAR data and historic aerial and cartographic evidence, it has been possible to project an approximation of the wartime coastline over the current mapping.
- 7.1.4 The northern half of the study area has undergone some clearance of the invasive species in 2015. Whilst this area is significantly reduced in sea buckthorn, dense thickets of brambles and other coarse scrub now dominate. This in addition to the extremely undulating topography means that the area is very difficult to navigate by foot, and systematic walkover surveys are very difficult to complete. The southern half of the removal area is so densely colonised by sea buckthorn that it was impenetrable.
- 7.1.5 Consultation of various sources including contemporary aerial photography, archival material and Jon Berry's thesis revealed that the archaeology at Pembrey Burrows is underrepresented. Despite some general concordance between these sources there remained significant ambiguity regarding the distribution and nature of the archaeology, particularly regarding precise location. To reduce the level of ambiguity, all sites identified from the sources were allocated a confidence value to indicate the degree of certainty for the survival or presence of archaeological remains. These values were used to create a weighted heatmap which not only considered the density of the points, but also their confidence level so that the level of archaeological potential/risk could be appropriately defined. The resultant regions of risk were classified and polygonised into areas of "Extant/known archaeology" and areas of "High", "Medium" and "Low" archaeological potential.
- 7.1.6 The "Extant/known" areas encompass those sites that are recorded within the HER and/or NMR and have been recently visited. The area of "High" archaeological potential is localised to the area with formerly stood the Bombing Range Control Tower, Motor Generator House and Ambulance station. This area was visited during the survey and whilst no remains were observed, an entirely unexpected and undocumented concrete platform was found in the area. Two substantial concrete blocks, one embedded with the remains of a square wooden post were also discovered in an area of a potential site. The areas of "Medium" archaeological potential encompass the final extents of the area of risk as calculated by the heatmap. These in effect capture the risk values which are less than the "high" but are greater than "zero". They indicate the known extent of archaeological potential and indicate due caution. The remainder of the study area and the 100m search buffer comprise the area of "Low" archaeological

potential and should not be interpreted as being “negligible”. After all, there remains a reasonable amount of ambiguity in what is considered at a regional level to be an area of significant archaeological and historical importance for twentieth century anti-invasion defences in south-west Wales.

- 7.1.7 Although the methodology of the proposed removal program is unknown at this time, it is expected to be an invasive and destructive process. Ephemeral anti-invasion defences are particularly vulnerable and are likely to be destroyed whilst the more robust, built structures are also susceptible to damage. Beyond these immediate, short term impacts and loss of archaeology, the longer term impacts of the removal are likely to erode and accelerate the deterioration of the surviving built remains. However, vegetation clearance around these remains enables greater accessibility and alleviates the encroachment and exploitation of vegetation succession.

## **7.2 Mitigation proposals**

- 7.2.1 The map of archaeological potential (See Appendix 1) can be used to inform the program of sea buckthorn removal. It is intended to enable a pragmatic, phased approach and subsequently, the results of this survey can help to inform a targeted approach. If it is conducive for the program of removal to begin with the “Low” areas of potential, then it may be possible to tentatively approach the “Medium” and almost certainly, the “High” and “Certain” areas under the conditions of an archaeological watching brief or supervision. Whilst it may be impossible to prevent the loss of the ephemeral elements such as the interconnecting services or signals, it may well be possible to identify and record any newly revealed, more robust remains. Furthermore, it may be preferable to adopt less invasive clearance around the areas of “High” archaeological potential if at all possible.
- 7.2.2 Ultimately, decisions on the requirement and scope of any further programme of archaeological works lies with the Development Manager to the local Planning Authority (Dyfed Archaeological Trust-Development Management). Further consultation with Jon Berry at Cadw would also be advisable.



## 8. SOURCES

### Published

Chartered Institute of Archaeologists: *Standards and Guidance for Historic Environment Desk-Based Assessment* (2014)

James, H, 1991, 'The Roman Roads of Carmarthenshire', in H James (ed.), *Sir Gâr: Studies in Carmarthenshire History*, Carmarthen

Jones, F, 1983 'Pembrey Court: An Old Carmarthenshire Manor House', *Carmarthenshire Antiquary* , 19, 17-41

Morris, W H, 1988, 'Report on the Restoration of Kidwelly Harbour by John Rennie and Edward Bankes, 1820', *Carmarthenshire Antiquary* , 24, 75-81.

Pye K, Blott S J. 2014. *Pembrey Burrows – a geomorphological appraisal and options for dune rejuvenation*. NRW Evidence Report No: 42, 87pp. Natural Resources Wales, Bangor

Rooney, P.J., Houston, J.A. and Weaver, G. 2011. *The conservation and management of Sea Buckthorn (Hippophaë rhamnoides) in the UK: report of the workshop at Saltfleetby-Theddlethorpe Dunes and Gibraltar Point SAC, 17-18 September 2009*. Sand Dune and Shingle Network: Occasional Paper No. 3, Liverpool Hope University Press.

### Unpublished

Berry, J. 2016: Second World War anti-invasion defences in south and south-west wales: A comparative case study area based approach

Ludlow, N, 1998 'The Welsh Historic Churches Project: Carmarthenshire Churches, 1996-7', unpublished report by Archaeoleg Dyfed Archaeological Trust

Ludlow, N, 1999 'Burry Port Harbour: An Initial Archaeological Assessment', unpublished report by Archaeoleg Dyfed Archaeological Trust

Murphy K, and Ludlow, N 2000: Carmarthenshire Historic Landscape Characterization Volume 1. Dyfed Archaeological Trust Unpublished Report 40373

Pyper, A and Page, M. 2014: *Twentieth century military sites: Airfields – dispersed sites and defences Final report: A threat-related assessment 2013-2014* Dyfed Archaeological Trust Unpublished Report 2012/70

### Database

Dyfed Historic Environment Record, housed with Dyfed Archaeological Trust in The Corner House, 6 Carmarthen Street, Llandeilo, Carmarthenshire, SA19 6AE

### Websites

British Geological Survey mapping portal. Available at: <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

AeroResource: The home of the aviation enthusiast.

<http://www.aeroresource.co.uk/operational-reports/pembrey-sands-air-weapons-range/>

### Cartographic

1891 - 1<sup>st</sup> edition 1:10560 (6") map of Carmarthenshire

1908 - 2<sup>nd</sup> edition 1:10560 (6") map of Carmarthenshire  
c. 1940 RAF Pembrey Air Firing & Bombing Range survey  
1949 RAF Pembrey Sands Bombing & Gunnery Ranges  
1975 RAF Pembrey Air Weapons Range survey

**Photographic**

WW2 RAF Medmenham Oblique photographs: WG APU Ref: MW017- Sortie RAF  
4024: 01/07/40

RAF Operation Revue 1946 Vertical photographs: Sortie No. 106GUK/1400  
14.04.16

RAF Pembrey Air Weapons Range survey plan as August 1975

## **9. PROJECT ARCHIVE**

Project Number: FS20\_010

Project Name: Pembrey Burrows

Event Record Number: 121883

Site Visit forms x 1

Digital Photographs: x 16 JPEGS

Digital Photographs Film Number: 121883\_152322 to 121883\_191847

GIS MapInfo Tables (.TAB, .MAP, .ID, .DAT):

- FS16\_021\_Pembrey\_Sands\_Sea\_Buckthorn\_Layer
- FS16\_021\_MWO\_017\_Identified\_Sites
- FS16\_021\_Berry\_Sites
- FS16\_021\_Lines\_of\_vegetation
- FS16\_021\_Low\_risk
- FS16\_021\_Medium\_risk
- FS16\_021\_High\_risk

## APPENDIX 1



**Figure 1:** Map showing the area of low (green), medium (amber), high (red) and certain (magenta) archaeological potential within the study area (outlined in red) and 100m buffer.

Reproduced from the Ordnance Survey 1:50,000 scale Explorer Map with the permission of The Controller of Her Majesty's Stationery Office, © Crown Copyright Dyfed Archaeological Trust.

The Corner House, 6 Carmarthen Street, Llandeilo, Carmarthenshire SA19 6AE. Licence No 100020930



## APPENDIX 2

Table of archaeological confidence for all sites from amalgamated sources

PRN	NPRN	REF	NAME	TYPE	SUMMARY	EVIDENCE	CONFIDENCE	NGR	EASTING	NORTHING
31376			Pembrey Forest	GUN EMPLACEMENT	Two concrete pads, 1m x 1m, no other features visible. Pads in the sand in between two hollows. The hollow to the west has the appearance of having had modifications, although it is too overgrown to investigate.	Extant not visited	5	SN37740262	237740	202620
31414			Wing Marker Shelter No 2	GUN EMPLACEMENT	A small concrete rectangular plan shelter with a turf covered concrete roof.	Extant visited	6	SN3705303516	237053	203516
31415	270659		Main Marker Shelter.	GUN EMPLACEMENT	A concrete rectangular plan shelter with a turf covered concrete roof.	Extant visited	6	SN37240326	237240	203260
105937			Wing Marker Shelter No 1.	SHELTER	A gun emplacement built of reinforced concrete with turf on the flat roof. Identical in form to PRN 31414. A Pyper 2014 Rectangular in plan 3.05 x 2.4 m with openings facing southwest. One wide rectangular opening in southwest wall with doorway to side. Internally the walls are painted cream and a small concrete pad on the northeastern corner may form the base of stove. Other fixings and fixtures are traceable in the paintwork of the interior.	Extant visited	6	SN37380298	237380	202980
107878		J Berry 2016	Pillbox at ROF Pembrey	PILLBOX		J Berry Site; Arch	4	SN3991100277	239911	200277
107878			ROF PEMBREY	LOOKOUT	Brick built lookout, characteristically a ROF design lookout, although this one has narrow embrasures. Its position doesn't quite tie into a lookout shown on the ROF plan, though it is clearly of the right date.A Pyper 2015	Extant visited	6	SN3991100280	239911	200280

**APPENDIX 2** (Continued)

109252			NATIONAL FILLING FACTORY NO 18 PEMBREY	MUNITIONS FACTORY	Adjacent to the HM Factory Pembrey, which was producing high explosives and propellants, a loading plant was constructed for filling shells, mines and torpedoes. This factory was built and managed by the Explosives Loading Company, working as agents for the Ministry of Munitions from 1917. This factory was cleared for the construction of the Royal Ordnance Factory Pembrey in 1938-9.	Plotted from secondary source; confident	3	SS40769977	240760	199770
112367	270658			GUN EMPLACEMENT	Mass concrete gun emplacement facing onto the beach, set on an elevated position. Large horizontal embrasure facing forward and smaller gun embrasures to rear and sides. Protected entrance at rear.	Extant visited	6	SN3706903532	237069	203532
112368				GUN EMPLACEMENT	A gun emplacement overlooking Cefn Sidan beach. Built in shuttered concrete with a wide horizontal opening to the front (southwest) and overhanging roof. Gun embrasures to the sides, looking northwest and southeast, plus one in the rear wall to the left of the protected entrance.  Almost completely engulfed by seabuckthorn and starting to break up due to the mobile sanddunes. A Pyper 2019.	Extant visited	6	SN3921900709	239219	200709
112369	91230			SEARCHLIGHT EMPLACEMENT	Unknown military structure recorded on OS mapping, but access in 2019 impossible due to thick seabuckthorn. Visited, A Pyper 2019  Visible on satellite imagery. Identified as searchlight platform by Jon Berry (2016). M Bell 2020 Likely NPRN 91230 visited and identified by T and H James in 1999 as a gun emplacement.	Extant not visited	5	SN3783402366	237834	202366

**APPENDIX 2** (Continued)

112369	91230		UNKNOWN (PEMBREY BURROWS)	GUN EMPLACEMENT	A WWII reinforced concrete defence post protecting part of Pembrey Air Field. Long axis 340 degrees, open front facing sea with enfilading openings off N and S sides, 6.5 paces wide internally, one entry point. Interesting surviving contemporary instructions painted on walls, including a semi-circular pelorus recording bearings of landmarks (including two shipwrecks) and information on case-shot and half charges. Site now difficult to approach. Visited TA & HJ James 18.1.99 (TAJ 18.1.1999). See PRN 112369 Identified as J Berry (2016) as a searchlight platform.	Extant not visited	5	SN37830238	237830	202380
118045	270657			PILL BOX	A pillbox constructed in brick with a shuttered concrete roof. A canted front with wide gun embrasures and small loop-holes in the side and rear walls. Entered from the rear (northeast). Access impossible due to growth of scrub all over the structure. Same construction as pillbox PRN114747. A Pyper 2020	Extant visited	6	SN3713803408	237138	203408
118046				STRUCTURE	Possible quadrant shelter like structure identified on 1946 vertical photo and D8 MWO_017 oblique photographs. Berry "Bombing Range Searchlight Platform".  Mature Cypress tree in large hollow in which two concrete block (not insitu) were found. The largest of the two measured 0.59m2 and 0.34m deep and was embedded with the remains of a wooden post of approx. 0.13m2. Very dense thickets of brambles, bind weed and other vegetation along with pockets of young sea buckthorn. M Bell 2020	Extant visited	6	SN3762802617	237628	202617

**APPENDIX 2** (Continued)

118047				STRUCTURE	Partially exposed shutter concrete platform; possibly triangular in shape although northeastern side is completely buried by dune and vegetation. Surrounded by dense bramble thicket. West facing opening c.3.9m wide and similar void exposed facing east but inaccessible. Two square ends (like a gear cog) measuring 0.65m x 0.75m were exposed. The southeastern end had a rectangular slot measuring 0.20m x 0.12m. Feature located immediately north of where possible Ambulance station identified on aerial vertical and oblique photographs. M Bell 2020	Extant visited	6	SN3770302573	237703	202573
118048		J Berry 2016	Pembrey Forest Minefield 6	MINEFIELD		Plotted from secondary source; confident	3	SN3777102675	237771	202675
118048		MWO_017	Pembrey Forest Minefield 6	MINEFIELD	Decommissioned minefield identified on 1946 RAF vertical photographs	Plotted from secondary source; confident	3	SN3771902643	237719	202643
118049		J Berry 2016	Pembrey Forest Minefield 7	MINEFIELD		Plotted from secondary source; confident	3	SN3779702577	237797	202577
118049		MWO_017	Pembrey Forest Minefield 7	MINEFIELD	Decommissioned minefield identified on 1946 RAF vertical photographs	Plotted from secondary source; confident	3	SN3781602602	237816	202602
	270657		EMERGENCY COAST DEFENCE BATTERY, PEMBREY	EMERGENCY COAST DEFENCE BATTERY	Two 4-inch QF beach defence gun houses set 310 metres apart. Located on the dune front overlooking Cefn Sidan Sands and Carmarthen Bay. Record derived from Defence of Britain Project (Record Number 11553)	Extant not visited	5	SN37150340	237150	203400
	270658		GUN EMPLACEMENT, PEMBREY	GUN EMPLACEMENT	No.1, 4-inch QF gun house. Located on the dune front overlooking Cefn Sidan Sands and Carmarthen Bay, set some 210 metres back from the mean high water mark. Record derived from Defence of Britain Project (Record Number 11554)	Extant visited	6	SN37060353	237060	203530



**APPENDIX 2** (Continued)

	270659		GUN EMPLACEMENT, PEMBREY	GUN EMPLACEMENT	No.2, 4-inch QF gun house. Located on the dune front overlooking Cefn Sidan Sands and Carmarthen Bay, set some 210 metres back from the mean high water mark. Record derived from Defence of Britain Project (Record Number 11555)	Extant not visited	5	SN37230326	237230	203260
	270661		MINEFIELD, PEMBREY	MINEFIELD	Plotted off aerial photographs. Record derived from Defence of Britain Project (Record Number 11556)	Plotted from secondary source; confident	3	SN37780265	237780	202650
	270664		MINEFIELD, PEMBREY	MINEFIELD	Plotted off aerial photographs. Record derived from Defence of Britain Project (Record Number 11556)	Plotted from secondary source; confident	3	SN37860255	237860	202550
		J Berry 2016	Pembrey Anti-Landing Obstacle	ANTI-LANDING OBSTACLE		J Berry Site; Arch	4	SN3653104028	236531	204028
		J Berry 2016	Tywyn Burrows 4-inch Beach Defence Gun House	GUN EMPLACEMENT		J Berry Site; Arch	4	SN3706803531	237068	203531
		J Berry 2016	Wing Markers Shelter No. 2	OBSERVATION POST		J Berry Site; Arch	4	SN3705303515	237053	203515
		J Berry 2016	Main Markers Shelter	OBSERVATION POST		J Berry Site; Arch	4	SN3722903262	237229	203262
		J Berry 2016	Wing Markers Shelter No. 1	OBSERVATION POST		J Berry Site; Arch	4	SN3738802988	237388	202988
		J Berry 2016	Bombing Range Searchlight Platform	SEARCHLIGHT EMPLACEMENT		J Berry Site; Arch	4	SN3762802620	237628	202620
		J Berry 2016	Bombing Range Control	OBSERVATION POST		J Berry Site; Arch	4	SN3773502482	237735	202482
		J Berry 2016	Bombing Range Searchlight Platform	SEARCHLIGHT EMPLACEMENT		J Berry Site; Arch	4	SN3783402366	237834	202366
		J Berry 2016	Bombing Range Quadrant Shelter No. 1	QUADRANT SHELTER		J Berry Site; Arch	4	SN3921500703	239215	200703

**APPENDIX 2** (Continued)

		J Berry 2016	6-pdr Gun Emplacement	GUN EMPLACEMENT		Plotted from secondary source; confident	3	SN3695503492	236955	203492
		J Berry 2016	Military Structure	COASTAL DEFENCES		Plotted from secondary source; confident	3	SN3713903404	237139	203404
		J Berry 2016	Pembrey Barbed Wire Entanglement	BARBED WIRE ENTANGLEMENT		Plotted from secondary source; confident	3	SN3750902758	237509	202758
		MWO_017	Motor Generator House	MOTOR GENERATOR HOUSE	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo and "Air Firing & Bombing Range" plan. Possible earthwork visible on LANDSTAT 2009.	Visited not visible	2	SN3768902573	237689	202573
		MWO_017	Bombing Range Control	OBSERVATION POST	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photos D6 to D9 and "Air Firing & Bombing Range" plan. Also J Berry site	Visited not visible	2	SN3764802557	237648	202557
		MWO_017	Ambulance Station	AMBULANCE STATION	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo and "Air Firing & Bombing Range" plan	Visited not visible	2	SN3769702558	237697	202558
		MWO_017	Quadrant Shelter No.3	QUADRANT SHELTER	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo D7 and "Air Firing & Bombing Range" plan	Plotted from secondary source; not confident	1	SN3733902881	237339	202881
		MWO_017	Bombing Range Searchlight Platform	SEARCHLIGHT EMPLACEMENT	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo D7 and "Air Firing & Bombing Range" plan. Also J Berry site	Plotted from secondary source; not confident	1	SN3758902601	237589	202601
		MWO_017	Bombing Range Searchlight Platform	SEARCHLIGHT EMPLACEMENT	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo and "Air Firing & Bombing Range" plan. Also J Berry site	Plotted from secondary source; not confident	1	SN3783402366	237834	202366
		MWO_017	Quadrant Shelter No. 2	QUADRANT SHELTER	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photos D6 to D9 and "Air Firing & Bombing Range" plan	Plotted from secondary source; not confident	1	SN3788202279	237882	202279
		MWO_017	Practice Bombing Signal No.1	PRACTICE BOMBING SIGNAL	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo D8 & D9 and "Air Firing & Bombing Range" plan	Plotted from secondary source; not confident	1	SN3793102258	237931	202258

APPENDIX 2 (Continued)

		MWO_017	Bombing Range Quadrant Shelter No. 1	QUADRANT SHELTER	Visible on RAF Medmenham 01/07/1940 MWO17 aerial photo D18 &D19. Not visible on "Air Firing & Bombing Range" plan. Also J Berry site	Plotted from secondary source; not confident	1	SN3890301038	238903	201038
--	--	---------	---	---------------------	---	---	---	--------------	--------	--------

## APPENDIX 3

### PEMBREY BURROWS DUNE GRASSLAND RESTORATION: HISTORIC ENVIRONMENT DESK-BASED ASSESSMENT: WRITTEN SCHEME OF INVESTIGATION

#### 1. Introduction

- 1.1 This document has been prepared by DAT Archaeological Services on behalf of Natural Resources Wales (NRW) to provide a Written Scheme of Investigation (WSI) for a historic environment desk-based assessment in advance of sea buckthorn removal at Pembrey Burrows, Pembrey, Carmarthenshire (roughly centred on SN 3847 0151; Figures 1 and 2).
- 1.2 Pembrey Burrows is the site of archaeologically and historically significant Second World War anti-invasion defences along with later infrastructure relating to the air weapons range, highlighted in previous studies (Berry 2016, Bell 2016). There is the potential for the development work to damage these remains.
- 1.3 This document outlines the proposed methodology that DAT Archaeological Services will use to undertake this desk-based assessment.
- 1.4 The desk-based assessment will identify any known archaeological or historical sites within the development area and its environs, identify potential setting impacts on scheduled monuments or listed buildings in the vicinity, identify any historic landscape areas that may be affected by the proposals and assess the potential for hitherto unknown archaeological remains to be present within the proposed development area. An indication of what further archaeological works might be required in advance of or during the proposed development, if any, would also be prepared.
- 1.5 The scope of this assessment follows the *Standard And Guidance For Historic Environment Desk-Based Assessment* as laid down by the Chartered Institute for Archaeologists (CIfA 2014). The standard states that:  
*A desk-based assessment will determine, as far as is reasonably possible from existing records, the nature, extent and significance of the historic environment within a specified area. Desk-based assessment will be undertaken using appropriate methods and practices which satisfy the stated aims of the project, and which comply with the Code of conduct and other relevant regulations of CIfA. In a development context desk-based assessment will establish the impact of the proposed development on the significance of the historic environment (or will identify the need for further evaluation to do so), and will enable reasoned proposals and decisions to be made whether to mitigate, offset or accept without further intervention that impact.*
- 1.6 A desk-based assessment is defined by CIfA as:  
*A desk-based assessment is a programme of study of the historic environment within a specified area or site on land, the inter-tidal zone or underwater that addresses agreed research and/or conservation objectives. It consists of an analysis of existing written, graphic, photographic and electronic information in order to identify the likely heritage assets, their interests and significance and the character of the study area, including appropriate consideration of the settings of heritage assets....*
- 1.7 The Trust always operates to best professional practice. DAT Archaeological Services is the contractual arm of Dyfed Archaeological Trust that has its own Health and Safety Policy, and all works are covered by appropriate Employer's Liability and Public Liability Insurances. Copies of all are available on request.
- 1.8 ***Dyfed Archaeological Trust is a CIfA Registered Archaeological Organisation.***



- 1.9 ***All permanent staff members of DAT Archaeological Services are CSCS<sup>3</sup> registered.***

## **2. AIM AND OBJECTIVES OF THE PROJECT**

- 2.1 This document provides a scheme of works for:

The preparation of an Historic Environment Desk-Based Assessment of the planned Sea Buckthorn removal at Pembrey Burrows, Pembrey, Carmarthenshire. This report will assess the potential impact that the development might have on any archaeological remains, if present, within the area, and an assessment of the wider impact of the development on the historic environment.

- 2.2 Provision of a written scheme of investigation to outline the methodology by which DAT Archaeological Services will undertake desk-based assessment.
- 2.3 To identify any known historic environment features within the wider area that could be affected indirectly by the proposed works, including visual impact.

---

<sup>3</sup> *Construction Skills Certification Scheme (Health and Safety Tested)*



**Figure 1:** Map showing the area of study.

Reproduced from the Ordnance Survey 1:25,000 scale map with the permission of The Controller of Her Majesty's Stationery Office, © Crown Copyright Dyfed Archaeological Trust Ltd., Corner House, 6 Carmarthen Street, Llandeilo, Carmarthenshire SA19 6AE. Licence No 100020930

**Vehicle Access for Forest SN4152 0068**

- Countryparkgate
- Forestrygate
- Survey Boundary

0 0.2 0.4 0.8 1.2 1.6 Kilometers

© Hawlfraint a hawliau cronfa ddata'r Goron 2016.  
Rhif Trwydded yr Arolwg Ordnans 100019741.

© Crown Copyright and database right 2016.  
Ordnance Survey licence number 100019741.

Project No: FS20\_010



### **3. METHODOLOGY**

- 3.1 The archaeological survey will involve the preparation of a stand-alone report. The report will be prepared using relevant information from a number of sources, and will comprise a number of elements, including:
- Dyfed Archaeological Trust (DAT) Historic Environment Record (HER) data and other relevant information;
  - National Monuments Record of Wales information as held by the Royal Commission on Ancient and Historic Monuments of Wales in Aberystwyth (RCAHMW offices in Aberystwyth);
  - Bibliographic, cartographic and photographic information held at the National Library of Wales and potentially information held at the Local Studies Library. Cartographic information will be very important to get an understanding of the development of this area;
  - Identification of any Scheduled Monuments, Listed Buildings, Parks and Gardens, Historic Landscape Character Areas, or Conservation Areas within or in the vicinity of the site area;
  - Search of the RCAHMW and Welsh Government aerial photographic collections to identify the presence of anti-invasion defences across the area which were visible prior to the sea buckthorn becoming so dense;
  - Relevant web-based information;
  - Site visit and walkover survey;
  - Assessment of the archaeological potential of the area; and
  - Assessment of likely impacts on any identified remains (or potential remains) and likely requirements, if any, for further stages of archaeological work.
- 3.2 A search radius of 100m around the site of the works area is proposed to identify the presence of non-designated archaeological sites recorded on the Dyfed Archaeological Trust (DAT) Historic Environment Record (HER). A search radius of 500m is proposed to identify Scheduled Monuments, Historic Landscape Character Areas, Registered Parks and Gardens and Listed Buildings.
- 3.3 The proposed site visit would provide an assessment of the presence of any visible archaeological remains/surviving industrial remains and the extent of redevelopment within the area.
- 3.4 Maps, photographic evidence, service information and any available geotechnical information will be used to determine the extent of previous disturbance within the development area and the nature of its redevelopment. This will be essential information to determine if intrusive evaluation will be required.
- 3.5 The report will be fully representative of the information gained from the above methodology. The report will include the following:
- a) A concise non-technical summary of the appraisal results;
  - b) The report will contain plans showing the development area in respect to the local topography and surrounding archaeological sites;
  - c) The report will list all the sources consulted;
  - d) Where necessary, the report will also contain suitably selected plans and maps (including historic maps for map regression) of significant archaeological features;



- e) Short written descriptions of all archaeological features observed during the site visit;
  - f) Statement of the local and regional context of the historic assets identified. Consideration, where appropriate, of the National Archaeological Research Agenda;
  - g) An assessment of the relative value or significance of each recognised historic asset;
  - h) An impact assessment of the proposed development on the known and potential archaeological resource.
- 3.6 Once completed, a draft copy of the report will be submitted to NRW for comment. Once the comments of this draft have been addressed, a final version of the report will be prepared and submitted. A further copy of the report will be provided to the Dyfed Archaeological Trust for deposition within the Regional Historic Environment Record (HER). A hard copy will also be supplied to the NMR. Digital copies will be supplied to all parties on suitable media.
- 3.7 Where appropriate, a summary report on any new significant archaeological discoveries will be submitted for publication to a national journal (e.g. Archaeology in Wales) no later than one year after the completion of the work.
- 3.8 Although there may be a period during which client confidentiality should be maintained, the report and the archive should normally be deposited in the appropriate repository not later than six months after completion of the work.

#### **4. QUALITY ASSURANCE**

- 4.1 DAT Archaeological Services has considerable experience of undertaking historic environment desk-based assessments and always operates to best professional practice; adhering to CIfA guidelines where appropriate. The Trust is a Registered Organisation with CIfA and all staff abide by their code of conduct and adhere to their relevant standards and guidance.
- 4.2 DAT Archaeological Services operate robust internal monitoring procedures that ensure that the standard of each project is maintained from commencement to completion.

#### **5. STAFF**

- 5.1 The project will be managed by F Murphy, Head of DAT Archaeological Services.
- 5.2 The report will be prepared by experienced members of staff from DAT Archaeological Services.

## **6. HEALTH AND SAFETY**

- 6.1 All permanent members of DAT Archaeological Services staff are CSCS<sup>4</sup> registered.
- 6.2 DAT Archaeological Services will carry out a health and safety risk assessment before the site walkover survey to ensure that all potential risks are minimised.
- 6.3 All relevant health and safety regulations must be followed, including compliance with Welsh Government guidelines on working practices during the current Covid-19 Pandemic, and guidance issued by CIfA.
- 6.4 CIfA advise that Registered Organisations should ensure they are familiar with the latest *Site Operating Procedures*, published by the Construction Leadership Council (Version 4, updated 18<sup>th</sup> May 2020) and the latest *Covid-19 Working Advice Ver.1.1*, published by Prospect (5<sup>th</sup> May 2020), which addresses potential issues relating to archaeological site work. These procedures will be attached to the project risk assessment. If the site cannot operate in line with this guidance then the project archaeologist will not be allowed to attend.
- 6.5 The project risk assessment details the precautions put in place to reduce the spread of Covid-19 Coronavirus during fieldwork.
- 6.6 Safety helmets, high visibility vests and boots are to be used by all site personnel as necessary. The site contractors will make all archaeological staff aware of any other PPE<sup>5</sup> that may be required and provide them. Archaeological staff must not enter any area where there is a considered to be a health and safety risk that has not or is not being appropriately mitigated against.

---

<sup>4</sup> *Construction Skills Certification Scheme (Health and Safety Tested)*

<sup>5</sup> *Personal Protection Equipment*

