



# Survey of the Remains of Elements of a Mulberry Harbour

DIBDEN BAY  
SOUTHAMPTON  
MAY 2012

Anthony Burgess – Masters student in Maritime Archaeology, University of Southampton

# Survey of the Remains of Elements of a Mulberry Harbour

List of Figures	3
Summary	5
Copyright Statement and Disclaimer	5
Abbreviations	6
<b>1. INTRODUCTION</b>	<b>7</b>
1.1 Background	7
1.2 Study Area	7
1.3 Aims and Objectives	7
<b>2. HISTORICAL BACKGROUND</b>	<b>8</b>
2.1 Operation Neptune and the construction of the Mulberry Harbours	8
2.1.1 Historical context	8
2.1.2 The Harbours	8
2.1.3 Construction	9
2.2 History of the site and deposition of the Beetles	10
2.2.1 Site formation and composition	10
2.2.2 Origin and Deposition of the Beetles	12
<b>3. METHODOLOGY</b>	<b>14</b>
3.1 Pre-survey methodology	14
3.1.1 Desk-based assessment	14
3.1.2 Pre-survey visit	15
3.2 Survey methodology and data analysis	16
3.2.1 Survey methodology	16
3.2.2 Data analysis	16
3.2.3 Problems & caveats	17
<b>4. RESULTS</b>	<b>18</b>
4.1 Previous reports and studies	18
4.2 Results of survey and research	18
4.2.1 The Beetles	18

4.2.2	The Beach	23
<b>5.</b>	<b>RISKS TO THE SITE</b>	<b>24</b>
5.1	Developmental pressures	24
5.2	Natural Processes	24
<b>6.</b>	<b>RECOMMENDATIONS AND CONCLUSIONS</b>	<b>25</b>
6.1	Future Management	25
6.2	Archaeological Significance	26
<b>7.</b>	<b>REFERENCES</b>	<b>28</b>
<b>8.</b>	<b>APPENDICES</b>	<b>30</b>
8.1	Site maps	30
8.2	Historic maps and photos – site development and construction	35
8.2.1	Site development	35
8.2.2	Construction and deployment	46
8.3	Site Photos	50
8.4	Photo glossary	57
8.5	Survey spreadsheet	60
8.6	Sources	61
8.7	Risk Assessment	63
8.8	Health & Safety Risk Form and Guidance	64
8.9	NMR entry	66
8.10	RAF photo index	67

# Survey of the Remains of Elements of a Mulberry Harbour

## List of Figures

FIGURE 1 - PLAN VIEW OF THE MULBERRY HARBOUR AT ARROMANCHES .....	9
FIGURE 2 - PLAN OF BEETLE .....	11
FIGURE 3 - PHOTO SHOWING LOCAL FAILURE OF THE COASTAL DEFENCES.....	11
FIGURE 4 - SIGN ON THE PATH FROM HYPHE MARINA VILLAGE TO THE RECLAIM MAKING CLEAR ITS STATUS.....	12
FIGURE 5 - AUTOCAD DEPICTION OF SECTION A AND THE LOWER HALF OF SECTION B .....	20
FIGURE 6 - BEETLE 12 .....	21
FIGURE 7 - AUTOCAD DEPICTION OF BEETLE NO. 12 RTK POINTS, COMBINED WITH CCO LIDAR DATA.....	21
FIGURE 8 - AUTOCAD DEPICTION OF BEETLE NO. 12 BASED UPON RTK DATA, COMBINED WITH CCO LIDAR DATA.....	22
FIGURE 9 - POINT CLOUD OF BEETLE NO.12 .....	22
FIGURE 10 - AUTOCAD DEPICTION OF SECTIONS C & D RTK POINTS COMBINED WITH CCO LIDAR DATA .....	23
FIGURE 11 - OVERVIEW OF DIBDEN BAY.....	30
FIGURE 12 - AERIAL PHOTO DISPLAYING THE SOUTHERN END OF THE SITE.. ..	30
FIGURE 13 - AERIAL PHOTO DISPLAYING THE NORTHERN END OF THE SITE.....	31
FIGURE 14 - RTK SMARTNET POINTS TAKEN OF BEETLE NO.12. ....	31
FIGURE 15 - SOUTH COAST OF ENGLAND SHOWING MULBERRY HARBOUR SITES.. ..	32
FIGURE 16 - MAP DEPICTING SSSIS IMPACTING UPON SITE. ....	32
FIGURE 17 - SUPERIMPOSED RAF AERIAL PHOTO (EH90) ON PRESENT DAY AERIAL PHOTO HIGHLIGHTING THE FOUR BURIED BEETLES.....	33
FIGURE 18 - MAP SHOWING THE RTK SMARTNET POINTS TAKEN IN THE COURSE OF THE SURVEY.....	33
FIGURE 19 - GENERAL BEACH PROFILE BASED UPON RTK DATA .....	34
FIGURE 20 – OS MAP DIBDEN BAY 1871.....	35
FIGURE 21 – OS MAP DIBDEN BAY 1910.....	36
FIGURE 22 – OS MAP DIBDEN BAY 1945.....	36
FIGURE 23 - EH10: MARCHWOOD MILITARY PORT SEPT 1946 SHOWING THE RECLAIMED LAND BEHIND MARCHWOOD MILITARY PORT.....	37
FIGURE 24 - EH12: MARCHWOOD MILITARY PORT MAY 1947. ....	37
FIGURE 25 - EH1:RAF OBLIQUE LOOKING WEST ACROSS THE TEST TO THE NORTHERN BOUNDARY OF DIBDEN BAY AUGUST 1947.....	38
FIGURE 26 - EH65: MAY 1950 SHOWING STAGE 1 OF RECLAMATION.....	38
FIGURE 27 - EH73: APRIL 1954 – CLEARANCE OF MARCHWOOD OF MULBERRY HARBOUR ELEMENTS.....	39
FIGURE 28 – EH75: JUNE 1955. THE BEGINNINGS OF THE BREAKWATER ON WHICH THE BEETLES ARE NOW DEPOSITED CAN BE SEEN.....	39
FIGURE 29 - EH76: JULY 1955 CONTINUATION OF CREATION OF BREAKWATER.....	40
FIGURE 30 - CLOSE UP OF EH76 SHOWING THE BEETLES AND THE BREAKWATER ON WHICH THEY NOW REST ..	40
FIGURE 31 - OS MAP DIBDEN BAY 1962 .....	41
FIGURE 32 - EH77: JAN 1962, SHOWING A COMPLETED SEAWALL WITH A PIER .....	41
FIGURE 33 - CLOSE UP OF EH77 SHOWING BEETLES AND PIER .....	42
FIGURE 34 - EH88: SEPT 1964 OUTLINING THE EXTENT OF STAGE 2 OF THE RECLAMATION. ....	42

## Survey of the Remains of Elements of a Mulberry Harbour

FIGURE 35 - 1967 RAF AERIAL PHOTO EH82 SUPERIMPOSED UPON A PRESENT DAY AERIAL PHOTO, ILLUSTRATING THE LOCATION OF THE DREDGING PIERS AND THE EXISTENCE OF FURTHER BEETLES .....	43
FIGURE 36 - EH90: SEPT 1967. THE BEETLES.....	43
FIGURE 37 - EH91: SEPT 1967 SHOWING THE SECOND LINE OF BEETLES, .....	44
FIGURE 38 – OS MAP DIBDEN BAY 1973 .....	44
FIGURE 39 – OS MAP DIBDEN BAY 1990.....	45
FIGURE 40 –THE PROGRESSIVE RECLAMATION OF DIBDEN BAY .....	45
FIGURE 41 - PRE-FABRICATED CONCRETE SECTIONS AWAITING ASSEMBLY AT MARCHWOOD .....	46
FIGURE 42 - BEETLE MID-ASSEMBLY SHOWING THE INTERNAL FRAMING. ....	46
FIGURE 43 - BEETLES BEING ASSEMBLED IN THEIR FRAMES READY FOR CASTING .....	47
FIGURE 44 - A NEAR-COMPLETE BEETLE.....	47
FIGURE 45 - A COMPLETED BEETLE AWAITS LAUNCH. ....	48
FIGURE 46 - BEETLE BEING LAUNCHED AT MARCHWOOD. ....	48
FIGURE 47 - WHALE UNIT BEING TOWED TO FRANCE. ....	49
FIGURE 48 - WHALE UNIT IN SITU IN FRANCE, .....	49
FIGURE 49 – PHOTO OF THE NORTHERN SECTION OF THE SITE, TAKEN FROM THE RED FUNNEL ISLE OF WIGHT FERRY.....	50
FIGURE 50 - LOOKING SOUTHEAST FROM SECTION D, HIGHLIGHTING THE SHINGLE RIDGE CAUSED BY THE CONCRETE LIGHTER .....	50
FIGURE 51 - EXPOSED DORSAL COUPLING BRACKET OF BEETLE NO.32 .....	51
FIGURE 52 - ALTERNATING PROFILES OF THE BEETLES .....	51
FIGURE 53 - UNDAMAGED MOSS-FREE AREA AT THE BASE OF THE BEETLES INDICATING BEACH MOTILITY.....	52
FIGURE 54 - FEATURE USED TO SECURE THE WOODEN BUFFERS .....	52
FIGURE 55 - WOOD REMNANT .....	53
FIGURE 56 - CORROSION STAINS.....	53
FIGURE 57 - INTERIOR OF BEETLE SHOWING THE DURABILITY OF THE INTERNAL BULWARKS.....	54
FIGURE 58 - COLLAPSED SECTION OF A BEETLE, CLEARLY SHOWING THE ERODED METAL REINFORCEMENTS .....	54
FIGURE 59 - BEETLE NO.4.....	55
FIGURE 60 - BEETLE NO.3.....	55
FIGURE 61 - BEETLE NO.1 WITH THE WOODEN POST PROTRUDING IN THE CENTRE BOTTOM OF PICTURE.....	56
FIGURE 62 - SITE PHOTO SHOWING THE PREDOMINANCE OF DORSAL ALGAL GROWTH AT THE SOUTHERN END OF THE SITE.....	56
FIGURE 63 – FRONT/REAR BOLLARDS .....	57
FIGURE 64 – SIDE BOLLARDS.....	57
FIGURE 65 – DORSAL COUPLING BRACKET (WITH WOOD REMNANTS).....	58
FIGURE 66 – INSPECTION HATCH .....	58
FIGURE 67 – METAL BRACKET.....	59
FIGURE 68 – CENTRAL EXTERNAL FEATURE.....	59

## **Summary**

This report is the result of a four-month project into the remains of elements of a Mulberry Harbour that line the foreshore of Dibden Bay in Southampton. These have lain on this site for approximately 50 years, used firstly as a breakwater and then as part of the coastal defence strategy of 'hold the line'. It is a unique site, a largely overlooked testimony to a crucial yet underappreciated part of the liberation of Europe - the construction of floating harbours to expedite the landing of personnel and supplies in France.

This report aims to build upon previous studies and aims to provide a reference point for future work on the site. It is also hoped that by doing so, this report will bring to wider view these remnants of a remarkable chapter in British history.

## **Copyright Statement and Disclaimer**

No part of this report may be reproduced, republished or disseminated without prior consultation with the University of Southampton (Archaeology Department). All views herein are the author's own and should not be taken to be necessarily indicative of the views of the University of Southampton. All images are the property of the author unless otherwise stated.

This report is an amended version of that submitted by the author in part-fulfilment for the requirements of the MA/MSc in Maritime Archaeology at the University of Southampton.

## Abbreviations

ABP	Associated British Ports
ADS	Archaeology Data Service
AHBR	(Hampshire) Archaeology & Historic Buildings Record
AIA	Archaeology Impact Assessment
CCO	Channel Coastal Observatory
EH	English Heritage
GIS	Geographical Information Systems
HER	Historic Environment Record
H&WTMA	Hampshire & Wight Trust for Maritime Archaeology
IWM	Imperial War Museum
LiDAR	Light Detection and Ranging
NFDC	New Forest District Council
NFRDC	New Forest Rural District Council (predecessor to the NFDC)
NFNPA	New Forest National Park Authority
NMR	National Monument Record
RAF	Royal Air Force
RCZA	Rapid Coastal Zone Assessment
RTK	Real Time Kinematic
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
WA	Wessex Archaeology

## 1. Introduction

### 1.1 Background

This survey report has been carried out by postgraduate students from the University of Southampton (UoS) into the remains of elements of a Mulberry Harbour on the foreshore of Dibden Bay, Southampton.

### 1.2 Study Area

The study area encloses 39 concrete pontoons ('Beetles') located on the foreshore of Dibden Bay, facing Southampton Docks from the south bank of the River Test. With the exception of Beetle no.1, they are laid nose-to-tail in an unbroken line, stretching northwest from 441586E 109361N to 441291E 109759N<sup>1</sup> for approximately 450 metres, bookended by Marchwood Military Port to the northwest and Hythe Marina Village to the southeast (Figure 11). To the landward side is approximately 770 acres of reclaimed land, created from the dredging of Southampton Water between the 1940s and 1960s (NFDC 2004), which in turn borders the New Forest National Park, founded in 2005.

### 1.3 Aims and Objectives

The primary aims and objectives of this report are:

- a) to accurately survey the remaining Beetles, using methods deemed most appropriate for the environment, time and personnel constraints and the subject material, whilst maintaining awareness of Health and Safety issues;
- b) to place the Beetles in their historical, local and temporal context (including site formation) in order to better assess their archaeological significance, and make recommendations for future monitoring where appropriate;
- c) to ensure that the work undertaken builds upon previous studies, compliments existing projects and leaves a durable, accessible and worthwhile record for the future and;
- d) to identify any risks to the site and when possible assess its stability.

---

<sup>1</sup> All co-ordinates provided in this assessment use the British National Grid, projected via OSGB 1936



## **2. Historical Background**

### **2.1 Operation Neptune and the construction of the Mulberry Harbours**

#### **2.1.1 Historical context**

During the planning for the assault phase of the invasion of Europe (Operation Neptune), it became clear that the early use of a major port (or preferably ports) would be crucial to ensure the reliable supply of troops and materiel critical to making the invasion a success. This presented a number of challenges, among which were the likely heavy casualty rates in attacking a port directly (as demonstrated at Dieppe in 1942), and the risk that the port would be rendered inoperable before capture by enemy action or the attack itself. It was therefore decided that two artificial harbours (codenamed 'Mulberry') would be constructed and then towed across the English Channel to Normandy, almost literally in the wake of the invading forces, to be assembled at beaches Omaha and Gold (at Vierville-sur-Mer and Arromanches respectively). Whilst 'Mulberry A' at Omaha was wrecked by storms shortly after construction, 'Mulberry B' ('Port Winston') remained operational until the capture of Antwerp in November 1944, during which time 25% of stores and 20% of personnel landed had come via Mulberry B (Hartcup 2006 : 140). Whilst the concept of a floating harbour was simple and by no means new (MacDermott 1957), due to the constraints placed on the enterprise owing to scale, time, shortages of skilled labour and material and the need for absolute secrecy, its execution proved to be an engineering and logistical challenge of considerable proportions.

#### **2.1.2 The Harbours**

The Mulberry Harbours consisted of a number of elements, each of which was crucial to the functioning of the whole. These can be broadly categorised into two groups:

- Breakwaters used to create a sheltered area in which ships could load and offload. These consisted of blockships ('Corncob'), concrete caissons ('Phoenix') and floating steel barriers ('Bombardons');
- Floating pierheads and roadways ('Whales'), which by falling and rising with the tide facilitated the two-way movement of troops and materiel from the ships to

the shore. The roadways were supported by floating pontoons made of steel or reinforced concrete ('Beetles').

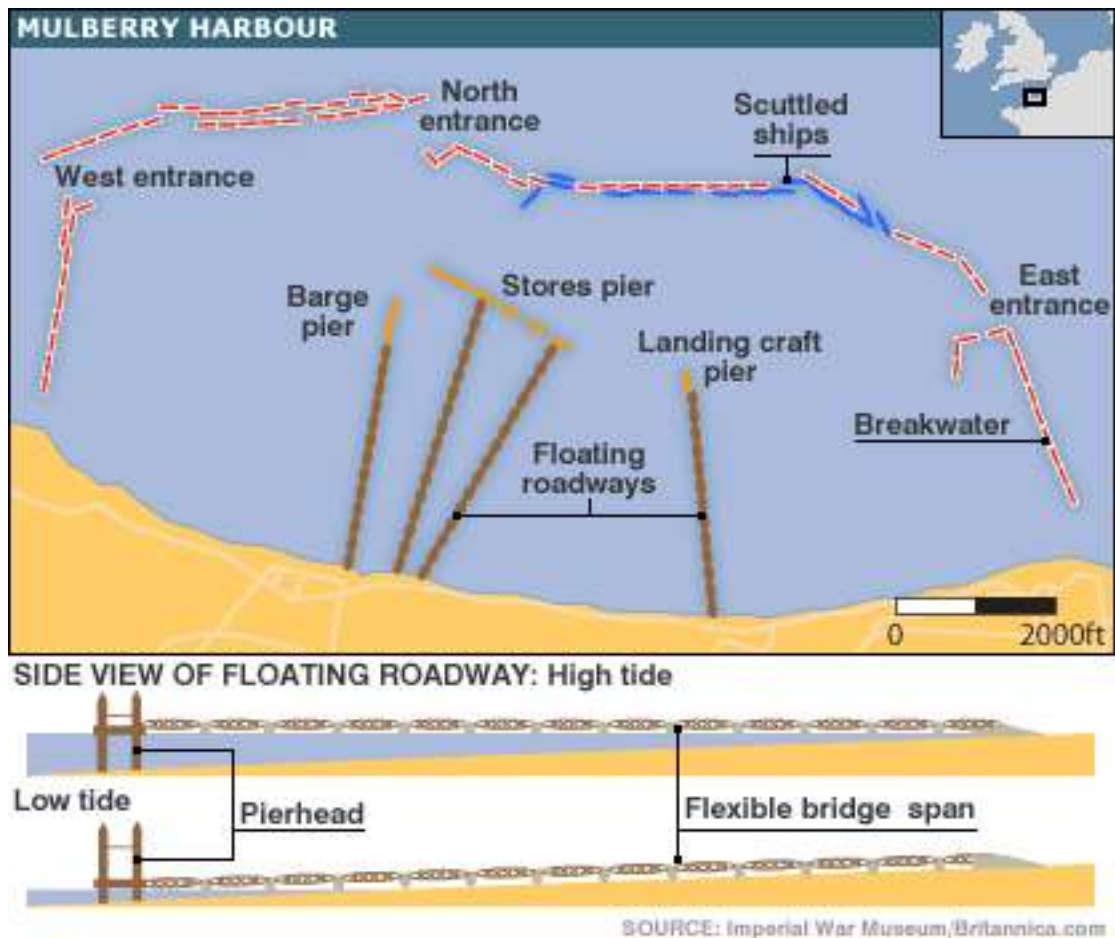


Figure 1 - Plan view of the Mulberry Harbour at Arromanches, with a side view demonstrating the rise and fall of the roadway and pierhead due to the tide, which amounted to approximately 6 metres. Concrete Beetles were used only where the water was deep enough that they would always be afloat, otherwise steel Beetles were used. Imperial War Museum website

### 2.1.3 Construction

After experiments with various combinations of shape, thickness and material, the final design shown in Figure 2 was agreed upon, and at least 470 concrete Beetles were produced (Hartcup 2006 : 77). Each Beetle measured approximately 12.8m x 4.5m x 2.1m (NMR Section 8.9), weighed just over 46 tonnes (Hartcup : 81) and was divided into six watertight compartments, each of which had an inspection hatch (Hartcup 2006 : 37) (Figure 66). Production involved the transportation of pre-fabricated concrete sections to a number of assembly points (Figure 41); these were then cast together (Figure 42), launched (Figure 46) and attached to their steel roadways in sections approximately 150m in length for towing across the Channel (Figure 47). Of the three assembly points on the south coast (floats were also constructed in London – Hartcup

2006), Marchwood was the principal one due to its excellent transportation links and proximity to Southampton Docks, which was the primary embarkation point for France (Hartcup 2006).

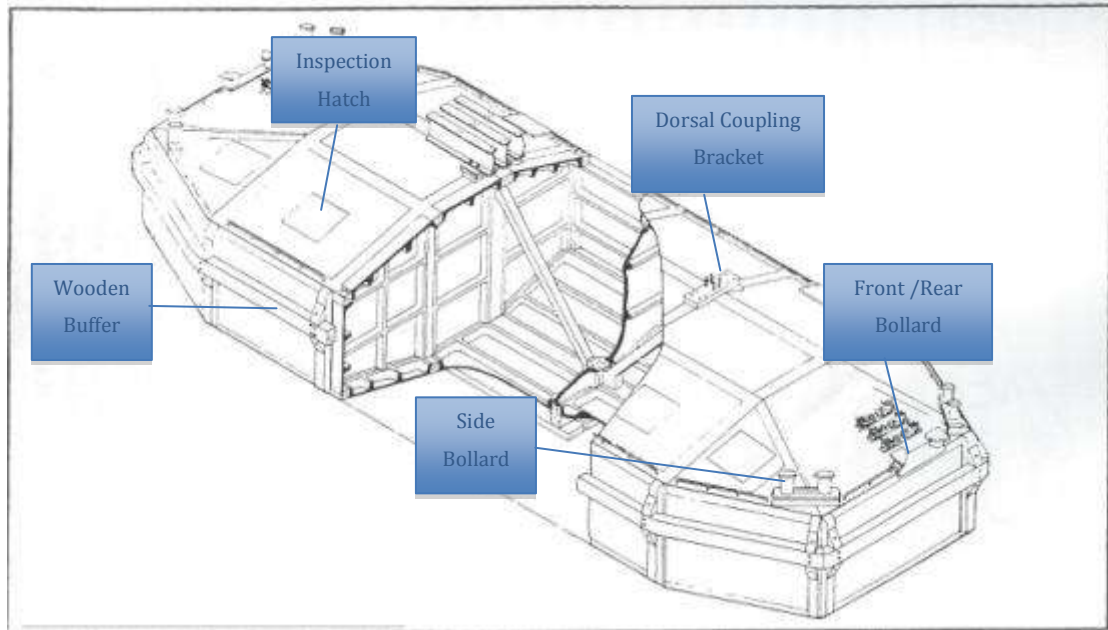


Figure 2 - Plan of Beetle with some of the key features highlighted, photographs of which can be found in the Photo Glossary. Hartcup 2006 (feature boxes and nomenclature author's own)

## 2.2 History of the site and deposition of the Beetles

### 2.2.1 Site formation and composition

The land upon which the Beetles now rest has historically been marshland and mudflats, veined with navigation channels (Figure 20 to 22) and remained so until the Dredging and Construction Company (DCC) began to use dredgings from Southampton Water to reclaim the land. This had been initiated as early as 1933 in the area behind what is now Marchwood Military Port (Graham Parkes pers. com.)<sup>2</sup>; the earliest record of consent for the land south of this initial reclaim is dated 17<sup>th</sup> May 1950 (AH 2000 Section 2.2), with evidence of a breakwater being in existence from 1947 (Figure 25). From then until 1966 (Graham Parkes pers. com.), this pattern of creating breakwaters and then infilling the delineated area was replicated across Dibden Bay three times, starting from just south of Marchwood down to what is now Hythe Marina Village (Figure 40). Stage 1 was completed by 1955, at which point Stage 2 was initiated

---

<sup>2</sup> Historic reclamation of the area may extend to as far back as the early Medieval period (Saxon) – WA 2000

(Figure 28); the breakwater for this is where the Beetles now rest. Piers were built from these breakwaters out to the Test, possibly to enable boats to unload dredgings – as the land was reclaimed, these piers were dismantled and rebuilt further down the breakwater (Figure 35). Whilst the shape of the current shoreline was complete by 1966, final infilling did not cease until 1985 (Graham Parkes pers. com.). The demarcated land<sup>3</sup> was then acquired by the British Transport Docks Board (the nationalised predecessor of ABP) in 1968 as a strategic land bank for expansion of Southampton Docks. No reference to the Beetles was found in the planning history of Dibden Bay (AH 2000).

The site itself consists of a beach composed of shingle and seashells, bordering reclaimed land, all of which in turn has been lain upon Holocene-era deposits (WA 2000). The coastal defence strategy for this region is 'hold the line' (WA 2010), a task for which the Beetles have proven themselves to be admirably suited, as can be seen through the lack of erosion when contrasted with other parts of the reclaim (Figure 3).



**Figure 3 - Photo looking back towards Hythe from south of the site, showing local failure of the coastal defences**

---

<sup>3</sup> with the exception of the land where Hythe Marina Village now lies, which was acquired by the NFRDC in a land swap deal with the DCC in 1951 (AH 2000)

With the land being privately owned by ABP and newly created, no historic right to public access exists (Figure 4), although a footpath does lead from Hythe to the beach. Whilst there were plans to build a cycle path here (NFDC 2004), these have not been progressed.



Figure 4 - Sign on the path from Hythe Marina Village to the reclaim making clear its status

## 2.2.2 Origin and Deposition of the Beetles

### 2.2.2.1 Origin

Whilst it cannot be stated conclusively that the Beetles of Dibden Bay originated at Marchwood, it would seem reasonable to assume that the siting of the largest known collection of Beetles within one mile of their chief assembly point is not a co-incidence. It is possible that they were never used; the envisaged difficulties of transporting floating roadways across a passage of water notorious for its fickleness necessitated the production of a large number of spare parts<sup>4</sup>. Interestingly, a completed floating roadway was also used at Marchwood itself as late as 1947 (Figure 24, WA 2000 site

---

<sup>4</sup> This caution proved well founded – 40% of ‘Whale’ units were lost in transit to France (Hartcup 2006 : 118)

feature #1310), demonstrating both the utility and durability of the design<sup>5</sup>. However, it has been stated that following the dismantling of the Mulberry Harbour at Arromanches in November 1944, 'Whale' units were returned to Marchwood for dismantling and storage (WA 2000 : 33, Graham Parkes pers. com.). There are therefore four possibilities for the origin of the Beetles, namely that they were:

- unused spares produced at Marchwood;
- used in France and then returned for dismantling (origin unknown);
- the remains of the floating roadway in Marchwood (Figure 24) or;
- a combination of the above

#### **2.2.2.2 Deposition**

Whilst there is extensive evidence of Beetles from 1945 onwards both at Marchwood and at Dibden Bay (see Appendix 8.2), the earliest known date for the Beetles at this site is 1962 (Figure 32) when they were used as consolidation material for a breakwater. Figure 26 to Figure 29 show how between 1950 and 1955, Marchwood Military Port was cleared of all Mulberry Harbour elements, and the remaining Beetles consolidated into one area. Evidence of this breakwater dates to 1955 however (Figure 29), and so it is likely that the Beetles were placed there soon after this. The Beetles then had holes broken through them and the interior filled with gravel to destroy their buoyancy (Graham Parkes pers. com.). A further line of Beetles, running near perpendicular to these into what was Dibden Bay and is now reclaimed land, can also be seen from 1964 (Figure 34 & Figure 37). It is likely that Beetle no.1, which also lies near perpendicular to the rest of the Beetles, is in fact the top most Beetle of this line (Figure 35). Whilst the RAF photography for 1962 is not entirely clear or complete, those from 1964 and 1967 are both (Figure 34 & Figure 36), with 38 Beetles visible. Superimposition of RAF photographs onto modern day aerial photography indicates that there are four Beetles submerged beneath the shingle (Figure 17), with visual evidence found of one of these (Beetle no.32) during survey (Figure 51).

---

<sup>5</sup> The fact that they are in an inter-tidal area suggests they were made of steel, although the soft mud may have made the use of concrete Beetles possible.

### **3. Methodology**

#### **3.1 Pre-survey methodology**

##### **3.1.1 Desk-based assessment**

Before surveying the site, a thorough search for relevant existing material was made, a full list of which can be found in Appendix 8.6. In addition, correspondence was entered into with the following individuals and organisations, both in order to gather more material and to ensure that (wherever possible) the findings of this report would feed into relevant projects:

Associated British Ports - ABP forwarded the Archaeological Impact Assessment (AIA) conducted on their behalf by Wessex Archaeology in 2000, which remains the only AIA known to have been carried out specifically at Dibden Bay. At their request a project report will be deposited in the archive of ABP, subject to caveats.

New Forest National Park Authority – a meeting between project members and NFNPA was arranged to ensure that the survey findings of this assignment fed into the NFNPA ‘New Forest Remembers’ project, and that any previous fieldwork undertaken by them was consulted. NFNPA also forwarded research conducted at the National Archives to project members. In exchange, research data and a project report will be shared with NFNPA.

English Heritage – as custodians of the RAF aerial photo archive, EH were contacted with a request for relevant photographic material; the archive was then accessed directly by a member of the group at Swindon. Due to the high cost of scanning at English Heritage, a digital camera was used to record the images; these were then enhanced (Apple iPhoto) and when used in GIS, georeferenced.

Wates Group Ltd – as the original builders of the Beetles (Hartcup 2000 & Wates Group website<sup>6</sup>), Wates were contacted (both by e-mail and telephone) with a view to

---

<sup>6</sup> “During the Second World War, the company built aerodromes, army camps, factories and most notably, developed a speciality in constructing pre-cast and in situ reinforced concrete barges and floating docks. The company supplied major parts of the Mulberry Harbours that were towed across the Channel after D-Day.” Source – Wates Group website

obtaining blueprints and to help establish if possible the provenance of the Beetles in Dibden Bay. Unfortunately, no response was forthcoming.

National Archives – as the Beetles would have been the property of the British Government, the National Archives were contacted to try and establish when the Beetles were placed in their present position. Whilst no member of the team went to Kew, as stated above, the NFNPA forwarded research of interest to this project.

H&WTMA – Stephen Fisher and Julian Whitewright were contacted to ascertain the level of previous work and for assistance in attempting to establish the provenance of the Beetles.

Waterfront Heritage – Graham Parkes (Chairman) was contacted to establish if there was any local knowledge of the Beetles in the Hythe area.

The author would like to take this opportunity to thank the above for their time and assistance for this survey. A full list of documents and publications consulted can be found in the References section (Section 7).

### **3.1.2 Pre-survey visit**

A pre-survey visit to the site was made on 29<sup>th</sup> February 2012 with the following aims:

- a) Assess the site for Health & Safety issues;
- b) Look for any manufacturers marks on the Beetles;
- c) Take photos of structures and the varying states of deposition for use in photogrammetry software and GIS;
- d) Assess accessibility of the site;
- e) Assess sample size and content of site and narrow down survey targets and;
- f) Ascertain the state of decay of site.



## **3.2 Survey methodology and data analysis**

### **3.2.1 Survey methodology**

Project team members returned to the site on 28<sup>th</sup> April 2012 and 12<sup>th</sup> May 2012. The site was surveyed in the following ways:

Each Beetle was assessed via a number of criteria (see 8.5 Survey spreadsheet) in order to ascertain patterns and identify anomalies. Leica Viva GS10 RTK Smartnet was used to profile the Beetles prominence above the beach, which also served to geolocate every Beetle.

The beach was profiled (again with RTK Smartnet) both longitudinally (from behind the Beetles), and double transversely across Beetles 2, 12, 24 and 36 from the furthest landward side of each Beetle down the beach at approximately 2 metre intervals (Figure 18), until the level tidal plain was reached. This also ensured some overlap with the Beetles beach profile stated above, thus enabling data verification. In addition, the gap between Beetle 32 (the first of the buried Beetles) and Beetle 36, was also similarly profiled to compare to the rest of the site.

Beetle 12 was profiled in detail (Figure 14), both with RTK Smartnet and with photos. Beetle 15 was also extensively photographed; these Beetles were selected due to their good condition and their prominent profile above the beach.

All the Beetles were photographed from the beachside, from on top, and (where the path permitted) from the landward side. Features of note were also photographed. This enabled further analysis and verifying of data from off-site. All photos are available on request (via UoS Archaeology Department).

### **3.2.2 Data analysis**

Photographs of the riverside profiles of the Beetles were added to the free online Microsoft photo package 'Photosynth'. Photographs of Beetles 12 and 15 were also added. These can be found at the following web addresses: <http://photosynth.net/view.aspx?cid=87e9ed7e-1fe9-4145-bbbc-dbd916b55e5d> and <http://photosynth.net/userprofilepage.aspx?user=Dibden Bay 2012>.

The GIS software suite ArcGIS 10 was utilised to incorporate and then analyse the numerous data sources. Autocad and Microsoft Excel were used to manage the data, map the site and enable detailed analysis.

### **3.2.3 Problems & caveats**

The foremost problem lay with the primary equipment used to survey the site, the RTK Smartnet. On the first survey, the spirit level was loose in the housing on the main staff, thus rendering it useless as a means of obtaining truly accurate X & Y co-ordinates. Additionally, a precise signal was lost for a small part of the Beetle profile survey (including unfortunately where it crossed with the beach profile), which affected both X,Y and Z co-ordinates. Conversely, on the second survey, the spirit level was secure but the equipment proved unable to obtain an accurate fix, thus unfortunately invalidating the height measurements for the beach profile. This was spotted due to the large disparity with the previous data collected and with the comprehensive photo coverage; unfortunately the disparity was both too wide and too irregular to compensate for. Combined with the encroachment of the bank onto many of the Beetles and the lack of an historic reference point (the measurements coming from the NMR entry for the site), this had a negative impact upon the quality of the survey. As such, this report has been forced to rely rather more on desk-based data e.g. photographs, LiDAR etc. than was originally envisaged, although site visits still proved invaluable, for example in ground-truthing the data.

The use of Agisoft Photoscan to build up a detailed composite photo cloud of Beetles 12 & 15 was considered - however a number of factors mitigated against the usefulness of the software in this context, namely; the large size of the objects; the amount of 'noise' in the background, the inability to gain complete coverage due to the close proximity of other Beetles and the overlapping bank, the porous nature of the subjects and the fact that only one (heavily utilised) PC had the requisite software.

## **4. Results**

### **4.1 Previous reports and studies**

Whilst no report was found that focused exclusively on this site (with the exception of a previous UoS survey – see below), the AIA undertaken by Wessex Archaeology on behalf of ABP in 2000 acted as a useful baseline, providing background details of the Beetles construction, geographical coordinates and a snapshot of how the archaeological significance was assessed at the time. Postgraduate students from the University of Southampton surveyed this site in 2009; however, after consultation with members of UoS Archaeology staff, it was decided that the material gathered would be of limited use, and this report was therefore not consulted. Wessex Archaeology were commissioned by NFDC to complete a Rapid Coastal Zone Assessment, and as part of this a walkover of the site was completed in one day in 2010 (WA 2010: 62).

Dibden Bay was the focus of a large number of reports in the wake of ABP's announcement of its intention to build a container port there in 1997. A collection of these, although not the Wessex Archaeology AIA, can be found in the Cope Library at the University of Southampton. Dibden Bay has also featured in various regional assessments and plans e.g. RCZAs; a selection of these can be found in the References section.

### **4.2 Results of survey and research**

#### **4.2.1 The Beetles**

Research of a wide number of databases indicates that this site is unique both in the number and composition of Mulberry Harbour components (Figure 15). There are a number of 'Unknowns' in the NMR database for Mulberry Harbour elements, which could be Beetles – open source research indicating other isolated Beetles corroborates this (including in Scotland where prototypes were tested – Hartcup 2006). Approximately 12 Beetles can also be found on the beach at Arromanches (Google Earth).

Levels of deterioration vary widely on the site (see Section 8.5), although the overall site condition can be summarised as declining. The three principal components of concrete, metal and wood have predictably survived at differing rates. The presence of wood is restricted to small quantities attached to metal protuberances (Figure 55), whilst all that remains of some of the metal are corrosion stains (Figure 56). In some

sections, the metal has been weakened to the point where it is unable to support the weight of the concrete it previously reinforced (Figure 58). The concrete has generally fared better, although this has perhaps more to do with the quantity – if the concrete had been more resistant, then the reinforced metal within would have avoided exposure and deterioration. Again, conditions vary widely from Beetle to Beetle, with some appearing to be in almost pristine condition (Figure 59 - Beetle no.4) whilst others have suffered a great deal of deterioration (Figure 60 - Beetle no.3).

Analysis of the extant data combined with fieldwork enabled confirmation of the number of Beetles on site as 39, which can be divided into four sections:

- Section A consists of Beetle no.1, which lies on a NNE/SSW axis and is half buried by the reclaim.
- Section B consists of 30 Beetles (numbers 2-31) in varying degrees of completeness and preservation, and forms the bulk of the site.
- Section C consists of four Beetles (numbers 32-35) concealed by the build-up of shingle caused by the placement of a concrete barge on the foreshore.
- Section D consists of four Beetles with an especially high profile above the beach. This is due to localised conditions caused by a scour pit, formed by the same concrete barge and the corrugated metal fence that marks the border between Stage 1 and Stage 2 of the reclaim.

#### **4.2.1.1 Section A**

Analysis of the RAF aerial photos taken in the 1960s offer a possible explanation for the anomalous positioning of this Beetle. When the breakwaters were formed for Stage 2 in the reclamation process, Beetles were used as consolidation material for both edges of this reclaim (Figure 34 & Figure 37). The alignment of this Beetle matches a projected line from this second (now wholly buried) group of Beetles. It is therefore conceivable that Beetle no.1 is the last of this previously unknown chain as opposed to the first of the known Beetles. Further analysis of these photos shows that a pier was anchored at this point during the process of reclaim. This may account for the presence of what appears to be a wooden pile, which has been driven through the Beetle (Figure 61), and large sections of abandoned concrete (Figure 62).

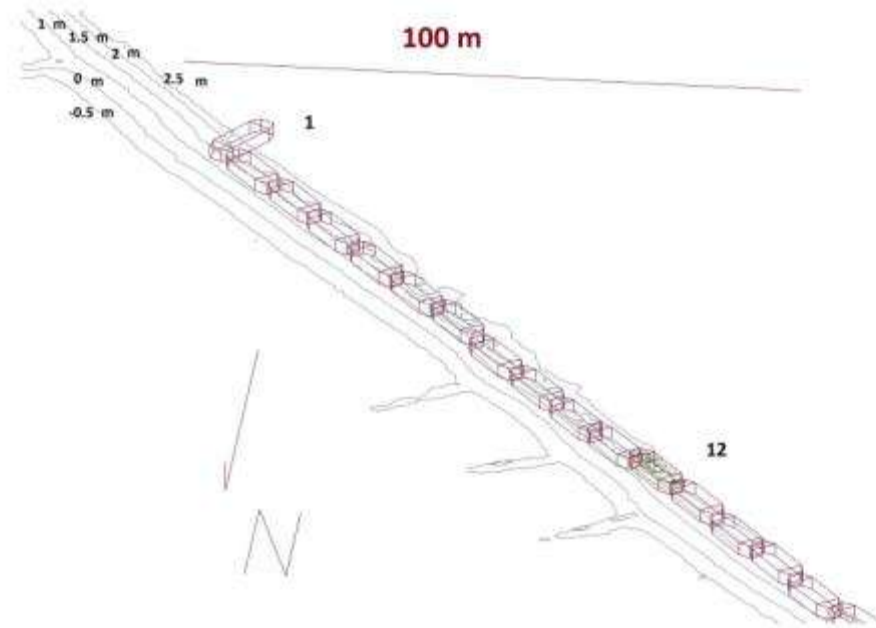


Figure 5 - Autocad depiction of Section A and the lower half of Section B, making clear the contra-orientation of Beetle no.1. The contour lines depict the beach slope at 50cm intervals, commencing at -0.5m below sea level (OD Newlyn)

#### 4.2.1.2 Section B (including Beetle no.12)

As the largest collection of Beetles, this offered the greatest scope for analysis and brought forth a number of interesting observations. Beetle no.2 is the only Beetle still with a side bollard (Figure 64); a possible explanation is that those on the others were removed pre-deposition for scrap, but this one left intact to facilitate towing to the site. This may also account for the presence of a coil of metal cable in Beetle no.3. The presence of front and rear bollards is concentrated from Beetles nos. 21-29, once again possibly to facilitate towing. A possible explanation for Beetle no. 20 being upside down is that it was the last of that towed line, with the second section (of 19 Beetles with the prevalence of front and rear bollards) being towed to site separately.

Interestingly, there appears to be no correlation between rate of deterioration, beach location, algal growth level and beach profile, with examples of heavily deteriorated and well preserved Beetles in all categories and in some cases even side by side (e.g. Beetles 3 & 4). However, algal growth does appear to be concentrated at either end of the site (and predictably at the northern parts of the individual Beetles) and has a greater coverage in the southern part (Figure 62), though once again examples of heavily affected and less affected Beetles exist side by side (e.g. Beetles 5 & 6).

**4.2.1.3 Beetle 12**

A total of 286 RTK points were specifically taken of Beetle no. 12 with a further 10 taken in the course of measuring the profile above the beach and of the beach profile itself (see section 3.2.1); the results of this can be seen in Figure 7. Length was 12.4m by 3.63m (the full width was obscured by the overhanging bank), with a profile height of 1.73m and 1.23 m (southern/northern end). Due to problems already discussed (see section 3.2.3) the data was to some extent compromised, but nevertheless, combining the RTK points with CCO LiDAR data allowed for a certain amount of rectification.



**Figure 6 - Beetle 12. Northwest is to the right**



**Figure 7 - Autocad depiction of Beetle no. 12 RTK points, combined with CCO LiDAR data. The degree of entrenchment in the bank is clear. The contour lines depict the beach slope at 50cm intervals, commencing at -0.5m below sea level (OD Newlyn)**

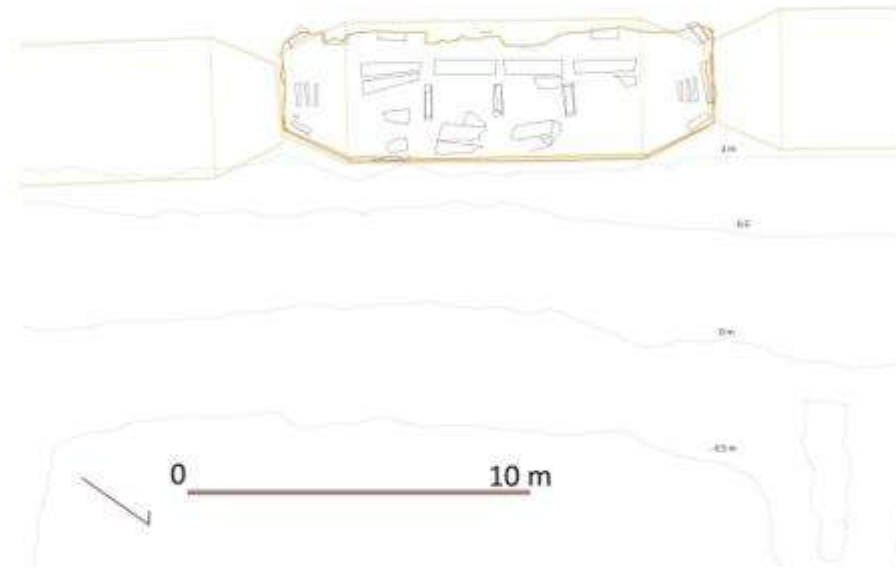


Figure 8 - Autocad depiction of Beetle 12 based upon RTK data, combined with CCO LiDAR data, displaying the encroachment of the bank. The contour lines depict the beach slope at 50cm intervals, commencing at -0.5m below sea level (OD Newlyn)

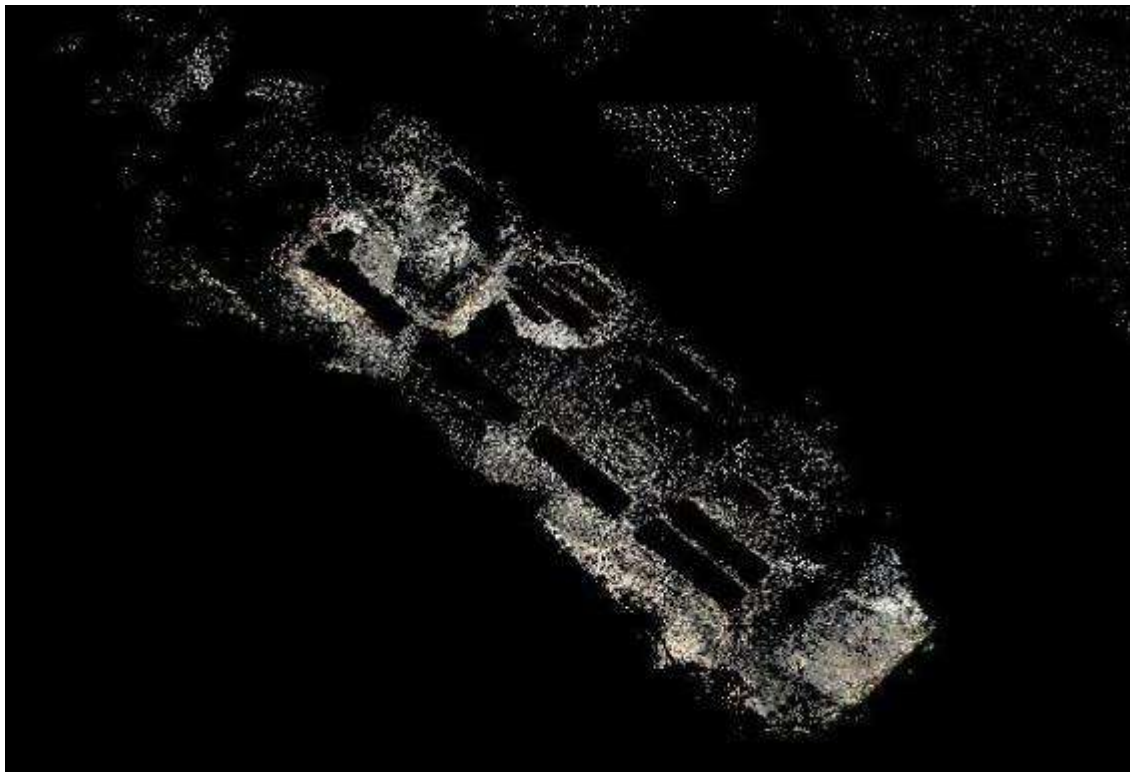


Figure 9 - Point cloud of Beetle no.12, generated by Microsoft Photosynth. Orientation of Beetle SE-NW (top left to bottom right)

#### 4.2.1.4 Sections C and D

The submergence and exposure of Sections C and D respectively has been caused by the placement of a concrete lighter further into the inter-tidal area adjacent to Beetles nos 35 & 36 (Figure 10, Figure 13 & Figure 50) and the outer edge of the fence of Stage 1 of the reclaim. It is not known when this vessel was placed on site, only that it appeared between 1967 and 1999 (RAF photos and Google Historic Imagery).

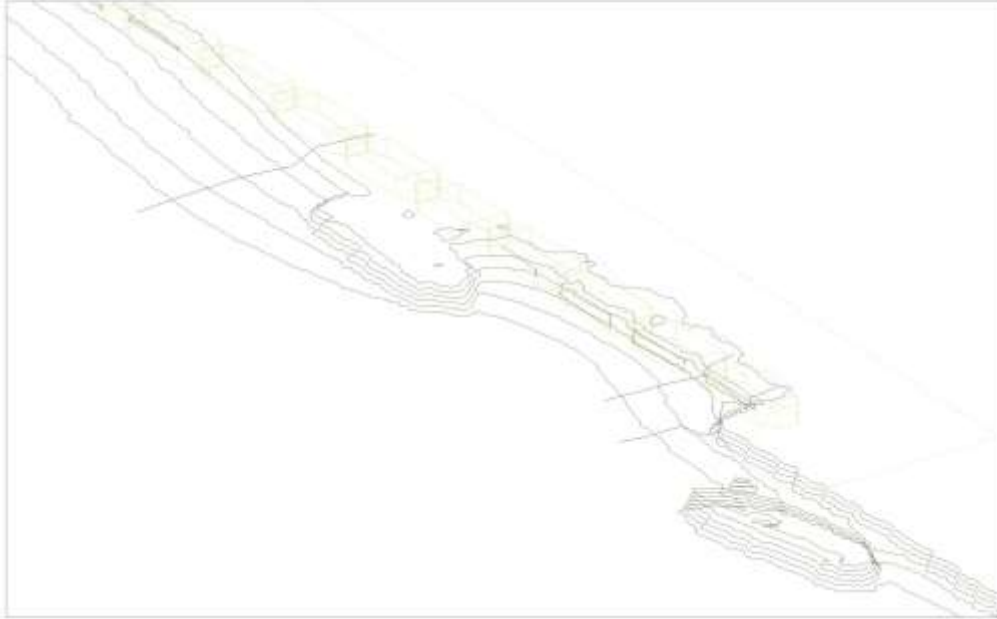


Figure 10 - Autocad depiction of Sections C & D RTK points combined with CCO LiDAR data, depicting the distortion of the beach profile. The contour lines depict the beach slope at 50cm intervals, commencing at -0.5m below sea level (OD Newlyn).

#### 4.2.2 The Beach

The foreshore of Dibden Bay lies on the border of two SSSIs – Dibden Bay SSSI and Hythe to Calshot Marshes SSSI (Figure 16). Dibden Bay is designated as such '*for its nationally important assemblage of invertebrates...and is one of the richest sites around the Solent for nationally-rare and nationally scarce species. It is also notified for breeding lapwing *Vanellus vanellus**' (SSSI citation report – Natural England website). The Hythe and Calshot Marshes SSSI forms part of the Solent and Southampton Water SPA (Natural England 2012).

The beach, consisting of shingle and seashells, has a high motility factor, as can be seen in Figure 19 and Figure 53. The clear demarcation between unaffected concrete and concrete which has breaches and complete algal coverage, indicates that this has not been a gradual process. A possible explanation for this is that it is due to the impact of one or more severe storms.



## 5. Risks to the site

### 5.1 Developmental pressures

The single greatest threat to the site is the prospect of development by the landowners ABP. Whilst a previous ABP proposal to build a container terminal on the site was rejected by the Secretary of State for Transport in 2004, it was primarily on the grounds of unacceptable disruption to marine habitats and the local environment (Carey 2004, NFDC 2004), and explicitly not due to unacceptable impact on the archaeological record (Carey 2004 para.18). In their 2009 Master Plan Shadow Strategic Environmental Assessment, ABP clearly state their intention to develop the reclaimed land between 2020 and 2030 (ABP 2009 para. 3.21), warning of dire economic and social costs if this does not proceed.

Regarding impact upon the archaeological record however, the report could be regarded as ambivalent. On the one hand, echoing the initial rejection letter, the report states that the proposed developments are considered to have no significant effect on features of historic, archaeological and cultural interest (ABP 2009 para. 7.20) and no mention of the Beetles is made under the sites likely to be impacted under PPG16 (now PP5) (ABP 2009 Appendix A). However, when the report considers how the development will adversely affect the landscape and townscape it states that there is potential *'for new port facilities [i.e. Dibden Bay] to have major significant adverse effects on landscape and townscape including archaeology'* (ABP 2009 Appendix B : 59).

Any future development will require a new AIA, and this site will naturally fall under its purview. Of relevance to this is the HLF-funded NFNPA 'New Forest Remembers' project, whose aims (amongst others) include surveying WWII sites in and around the New Forest NP. Further details of this project can be accessed from the NFNPA website (<http://www.newforestnpa.gov.uk>).

### 5.2 Natural Processes

Whilst the site is suffering decline, the overall level of deterioration can be categorised as low. As stated in the New Forest RCZA (Appendix A):

*"The threats to this Coastal Stretch from natural processes can be considered to be Low. Therefore impacts associated with development pressure can be considered to be the most*

*significant threat to archaeological features within this area. It can be seen that the risk from coastal erosion in this coastal stretch is significantly lower than that observed in any of the other coastal stretches. There is no predicted erosion of the coastal fringe in the short or medium term*". The scour pit created by the concrete lighter in the north of the site does not appear to have had an adverse effect upon the condition of the affected Beetles when compared to the rest of the site, though this will require future monitoring.

## **6. Recommendations and Conclusions**

### **6.1 Future Management**

The remoteness of the site has been a mixed blessing, conversely both largely protecting it from anthropological interference whilst exposing it to developmental pressures. The WA 2010 RCZA states that "*volunteer participation allowed for a greater understanding of the historic landscape through first-hand experience of change*", and future volunteer participation can be expected to build upon this. The visibility of the site from both the Hythe-Southampton ferry and the Southampton-Isle of Wight ferry (Figure 49) permits the possibility of using these as platforms for wider public knowledge, for example through the use of information panels. The NFNPA "New Forest Remembers" project also has the potential to more widely disseminate knowledge of this site. The interactive presence of concrete, metal and wood also makes this an excellent case study for the survival of these components in the inter-tidal zone. As such, it is recommended that this site continue to be the subject of future surveys by the University of Southampton (at three year intervals), both in order to monitor the site and to expand knowledge of it. These should include (but not be restricted to) RTK beach and Beetle profiling, surveying of surviving features of note (as per Appendix 8.5) and comparison to the latest LiDAR and aerial photography as this becomes available.

As stated in section 5.1, the site has been afforded robust (albeit default) protection through its location bordering two SSSIs situated in the Solent and Southampton Water SPA. This has proven to be sufficient thus far and could therefore preclude it's specific scheduling under the 1979 Ancient Monuments and Archaeological Areas Act. This notwithstanding, as this report has made clear, this site has unique archaeological significance (see below), and thus consideration should be given to scheduling this site under the 1979 Act.

## 6.2 Archaeological Significance

As World War II recedes further into the past and the living record diminishes, the cultural value of the remnants left behind by its participants increases. This 'growing awareness of the importance and vulnerability of the country's wartime remains' (Dobinson 1996) is evidenced by such programmes as the Defence of Britain project and more locally with the response to the NFNPA 'New Forest Remembers' initiative:

*'Consultation carried out with local communities for this project application, has created a huge interest and much correspondence, proving that the desire within local communities to get involved and contribute is very strong.'* (NFNPA 2012).

As shown in Section 4.2.1 and Figure 15, this site forms a unique part of the Mulberry Harbour diaspora of the south coast, which in turn contributes to the World War II archaeological record of the UK. Thus, as the largest accessible grouping of Beetles in the UK, and the largest collection of them anywhere, this site has undoubted national archaeological significance, and particular significance locally. Dobinson states in relation to estimating the value of World War II relics:

*'Completeness, condition and rarity will be obvious factors, as will the grouping of monuments in strategic locations, such as around ports and cities, along stretches of coastline and areas with a long history of defence provision'* (Dobinson et al. 1997 from WA 2000).

The fact that they are not *in situ* (i.e. France) must therefore be balanced with the site fulfilling every one of the criteria stated above, its strong local links and the large number of Beetles, which in themselves are a testament to the size of the undertaking (WA 2000 : 51). The significance of this site is highlighted by that of a parallel one in Scotland, when the survival of the prototype Beetles in Loch Ryan was threatened by the proposal by Stena Lines to build a new port at Cairnryan; the Medway Maritime Trust then stepped in, offering to use a WWII-era tug to transport a Beetle to the Medway (<http://www.medwaymaritimetrust.org.uk/mmtnews/index.htm>).

Today, the Mulberry Harbours are regarded as one of the great engineering feats of the Second World War (Hartcup 2006). Furthermore, the technological innovations they brought forth have found subsequent uses in a number of fields; for example in the oil industry the hydraulic jacks aka 'Spuds' have been utilised on oil platforms (Hartcup

## Survey of the Remains of Elements of a Mulberry Harbour

2006), whilst Wates Group used the advances in concrete to literally lay the foundations for the post war construction boom (Wates website 2012). As “*the greatest World War II military remains found anywhere during the survey [of the New Forest]*” (NF RCZA Appendix A) and “*an iconic monument to Britain’s resilience and invention*” (NF RCZA Fieldwork 2011), this irreplaceable site is worthy of wider public knowledge and access.

## 7. References

- Adams Hendry (2000) *Planning History of Dibden Bay TS/H1* Adams Hendry/ABP
- Associated British Ports. (2009) *Port of Southampton Master Plan - Shadow Strategic Environmental Assessment*. ABP
- Asteris, M. and Collins, A. (2007). *Developing Britain's port infrastructure: markets, policy, and location* Environment and Planning, University of Portsmouth.
- Benatchez J & Moran C (2011) *Total Station and the use of digital photography* SAA Archaeological Record 11(3):16-21
- Carey, P (2004) *Decision re the declining of planning permission for Dibden Terminal* Department of Transport London
- DCMS (2010) *Scheduled Monuments*. Department for Culture, Media and Sport, London.
- Dobinson, C. S. (1996) *Operation Overlord: Embarkation works for the invasion of occupied Europe 1942-44*. Twentieth Century Fortifications in England, Volume V. Council for British Archaeology, York
- Dobinson, C.S. Lake, J. & Schofield, A.J. (1997) *Monuments of War : Defining England's 20<sup>th</sup>-century Defence Heritage* *Antiquity* (71) 272:288-299
- Dunkley, M. (2008). *Protected Wreck Sites at Risk. A Risk Management Handbook*. English Heritage.
- Hampshire Archives and Local Studies  
<http://www3.hants.gov.uk/archives/catalog.htm> Accessed 9th April 2012 Hampshire County Council
- Hartcup, G. (2006) *Code Name Mulberry* (2<sup>nd</sup> ed.) Pen & Sword Military Barnsley
- Imperial War Museum <http://www.iwm.org.uk/> Accessed 7<sup>th</sup> April 2012 *Imperial War Museum*

## Survey of the Remains of Elements of a Mulberry Harbour

MacDermott, A (1957). *Before Mulberry - floating harbours and breakwaters*. *Mariners Mirror* Vol. 43 p70-72

Mulberry Survey Project (Arromanches) <http://www.mulberrysurvey.co.uk> Accessed 9th April 2010

New Forest District Council (2004) - *New Forest District Coastal Management Plan Zone 11, Dibden Bay to Marchwood* NFDC

New Forest National Park Authority (2012) *New Forest Remembers* NFNPA

Parkes, Graham – Chairman of Waterside Heritage; personal communication

Taylor, A. et al. (2001) *Health Impact Assessment -Proposed Extension To The Port Of Southampton At Dibden Bay*. Southampton and South West Hampshire Health Authority.

Trevarthen, E. (2010). *Hampshire Aggregate Resource Assessment: Aerial Photography Enhancement. Results of NMP Mapping*. Historic Environment Projects, Environment, Planning and Economy, Cornwall Country Council.

Wates Group Ltd. website <http://www.wates.co.uk/about/history> Accessed 7th April 2012

Wessex Archaeology (2010) *New Forest Rapid Coastal Zone Assessment* Wessex Archaeology

Wessex Archaeology. (2000). *Dibden Terminal. Archaeology Impact Assessment TS/A1*. Wessex Archaeology/ABP.

Whitewright, J. (2011) *LCT(A) 2428: An Assessment for Scheduling in the Maritime Zone* HWTMA/English Heritage

Young, A. (2008). *The Aggregate Landscape of Hampshire. Results of NMP Mapping*. Historic Environment Service, Environment and Heritage, Cornwall County Council.

## 8. Appendices

### 8.1 Site maps



Figure 11 - Overview of Dibden Bay.

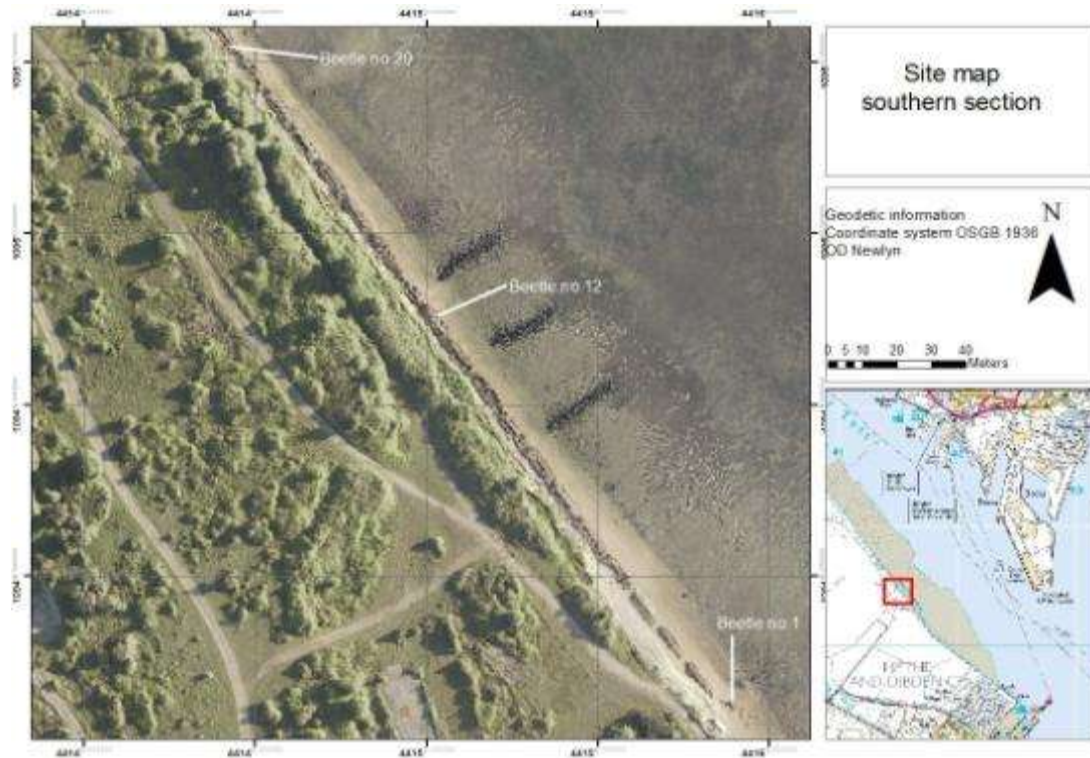


Figure 12 - Aerial photo displaying the southern end of the site. Aerial photo courtesy of CCO.

## Survey of the Remains of Elements of a Mulberry Harbour



Figure 13 - Aerial photo displaying the northern end of the site. Aerial photo courtesy of CCO.



Figure 14 - RTK Smartnet points taken of Beetle no.12. Aerial photo courtesy of CCO.



Survey of the Remains of Elements of a Mulberry Harbour

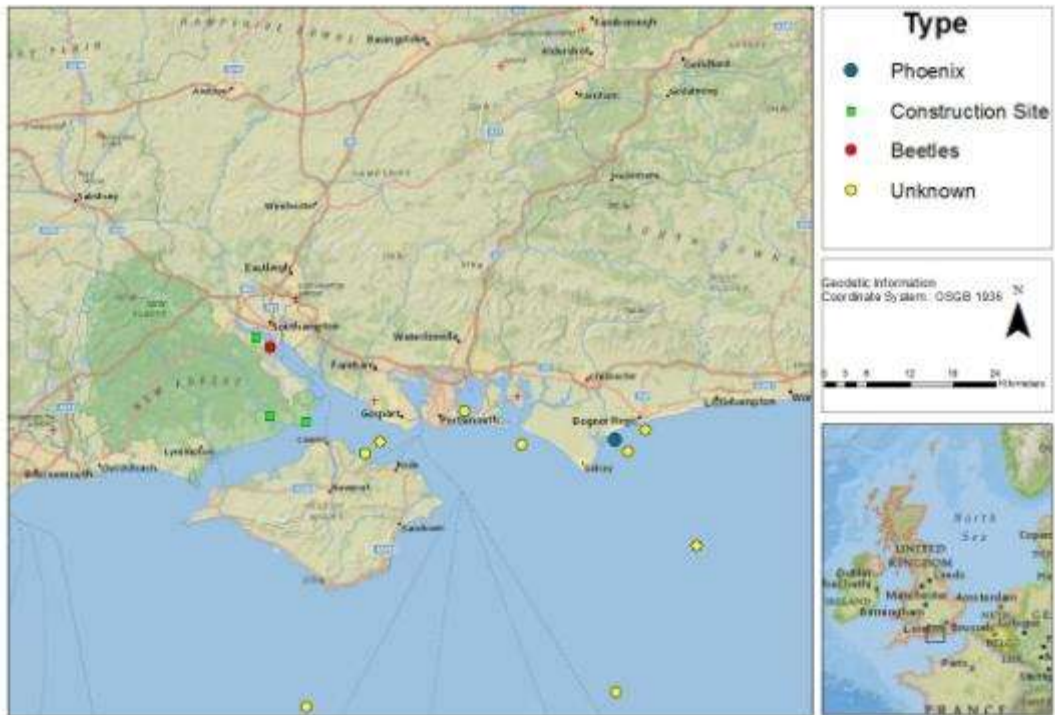


Figure 15 - South coast of England showing Mulberry Harbour sites from the NMR.



Figure 16 - Map depicting SSSIs impacting upon site.

## Survey of the Remains of Elements of a Mulberry Harbour



Figure 17 - Superimposed RAF aerial photo (EH90) on present day aerial photo highlighting the four buried Beetles. Aerial photo courtesy of the CCO.



Figure 18 - Map showing the RTK Smartnet points taken in the course of the survey. Aerial photo courtesy of the CCO.

Survey of the Remains of Elements of a Mulberry Harbour

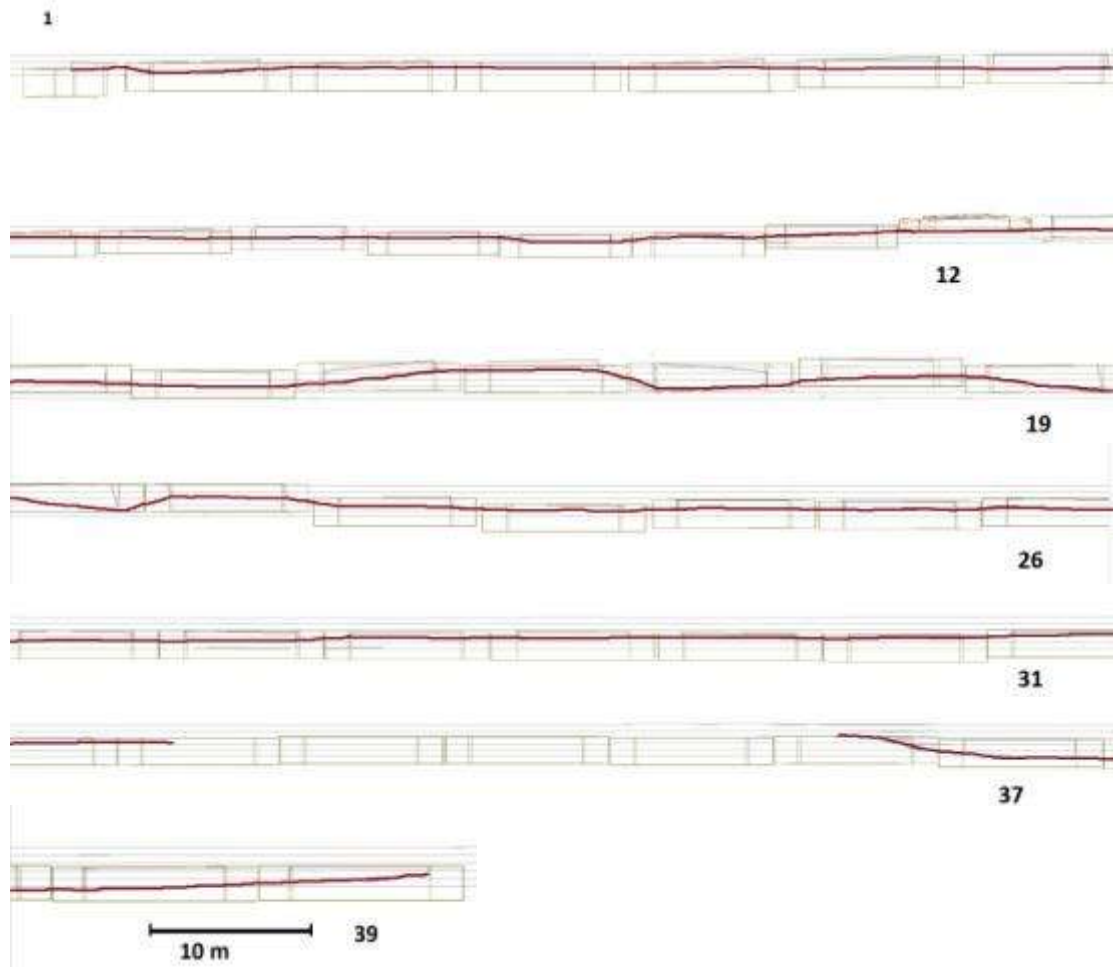


Figure 19 - General beach profile based upon RTK data

## 8.2 Historic maps and photos - site development and construction

### 8.2.1 Site development

All maps are sourced from Ordnance Survey, either via Edina Digimap or scanned directly from a paper copy. Photographs are sourced from the RAF Aerial Photographic Archive, stored in the NMR Offices of English Heritage in Swindon. Specific reference details for individual photographs can be found by matching the EH number with its entry in the RAF photo index in section 8.10.



Figure 20 - Dibden Bay in 1871. Southampton Docks has yet to built (likewise on reclaimed land)

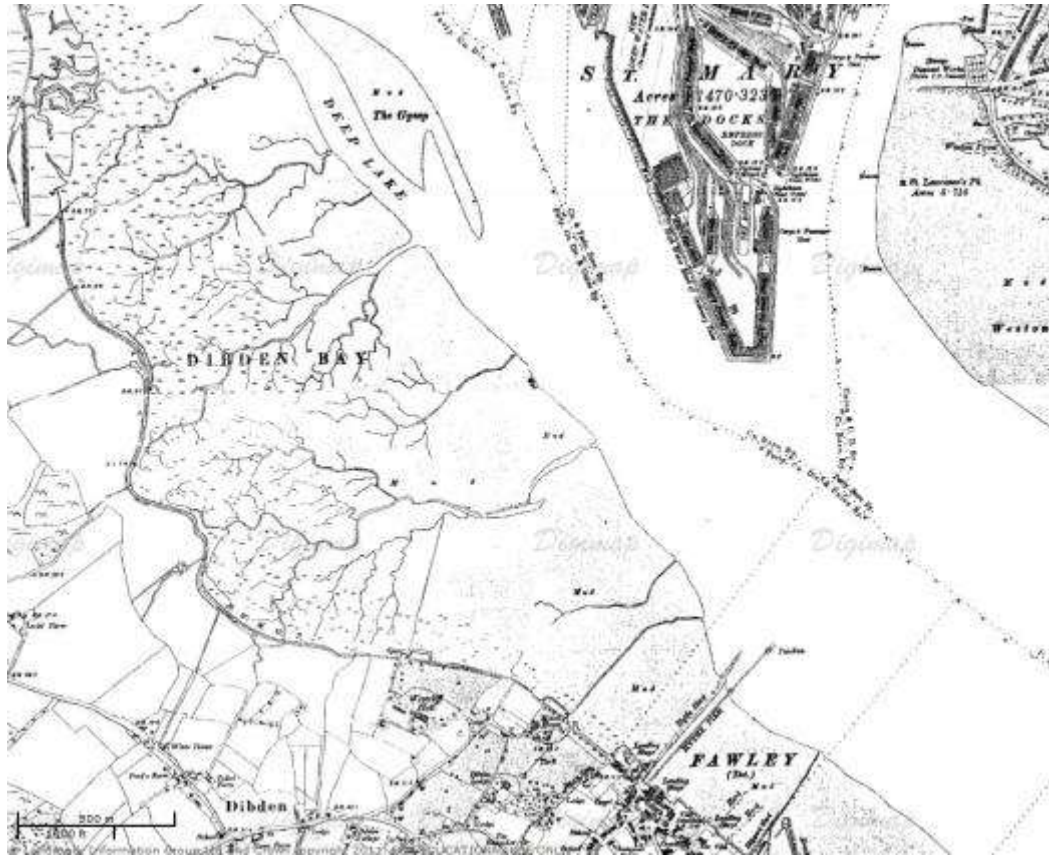


Figure 21 - Dibden Bay in 1910



Figure 22 - Dibden Bay in 1945. The first signs of reclamation can be found in the top left sector.

Survey of the Remains of Elements of a Mulberry Harbour



Figure 23 - EH10 Marchwood Military Port Sept 1946 showing the reclaimed land behind Marchwood Military Port. Scale 1:9800



Figure 24 - EH12 Marchwood May 1947. Note the large number of Beetles at the end of the floating pier and other Mulberry Harbour remnants. Scale 1:5800



Figure 25 - EH1 RAF oblique looking west across the Test to the northern boundary of Dibden Bay in August 1947, with the breakwater laid for the next stage of the reclamation. Beetles (centre left and bottom right), concrete barges (centre right) and buffer pontoons (bottom left) are scattered throughout the area



Figure 26 - EH65 May 1950 showing stage 1 of reclamation. Scale 1:9950



Figure 27 - EH73 April 1954. Clearance of Mulberry Harbour elements and the consolidation of Beetles in one sector to the right of the reclaim. Scale 1:9000



Figure 28 - EH75 June 1955. The beginnings of the breakwater on which the Beetles are now deposited can be seen.



Survey of the Remains of Elements of a Mulberry Harbour



Figure 29 - EH76 July 1955. Continuation of creation of breakwater. Scale 1:10300



Figure 30 - Close up of EH76 showing the Beetles and the breakwater on which they now rest

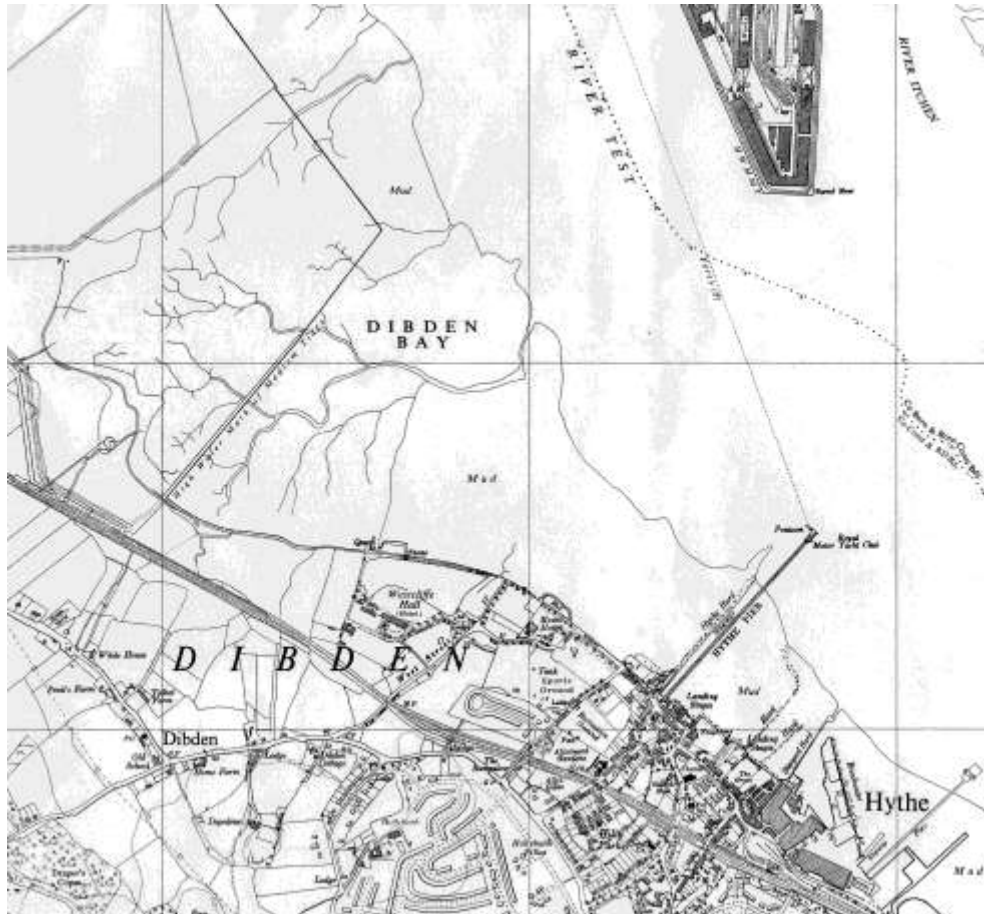


Figure 31 - 1962 OS Map showing Stage 2 of the reclaim as complete. Scale 1:10560



Figure 32 - EH77 Jan 1962, showing a completed seawall with a pier. Scale 1:10000



Figure 33 – Close up of EH77 showing Beetles and pier



Figure 34 – EH88 Sept 1964 outlining the extent of Stage 2 of the reclamation. Note how the pier has now moved. Scale 1:7500.

## Survey of the Remains of Elements of a Mulberry Harbour

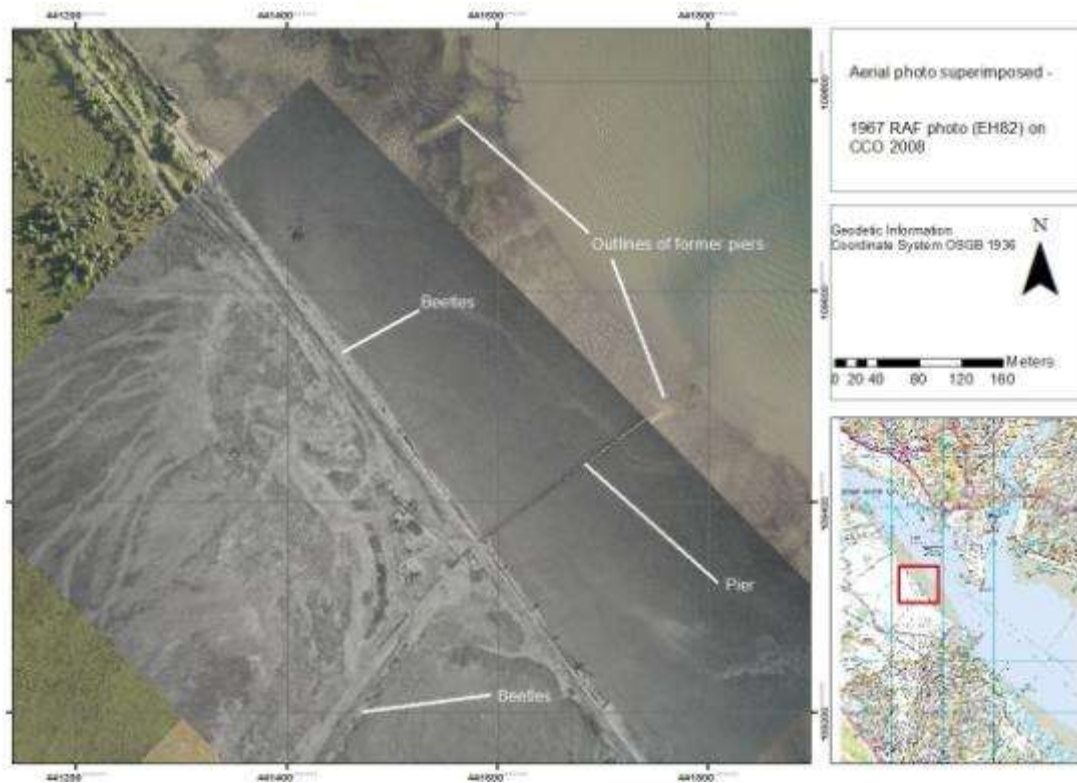


Figure 35 - 1967 RAF aerial photo EH82 superimposed upon a present day aerial photo, illustrating the location of the dredging piers and the existence of further Beetles in what is now the reclaim. Aerial photo courtesy of the CCO.



Figure 36 - EH90 Sept 1967. The Beetles. Scale 1:3000

Survey of the Remains of Elements of a Mulberry Harbour



Figure 37 - EH91 Sept 1967 showing the second line of Beetles, now completely covered by the reclaim. Scale 1:3000



Figure 38 - 1973 OS map showing the reclaim as complete. Scale 1:10000



Figure 39 - 1990 OS Map showing the creation of Hythe Marina Village. Scale 1:10000



Figure 40 - Modern aerial photo showing the progressive reclamation of Dibden Bay (based upon RAF aerial photos and historic maps)

### 8.2.2 Construction and deployment

These photographs depict the construction of Beetles at Marchwood Military Port in 1943/44, and their subsequent deployment in France. The construction photographs were located by Richard Reeves (consultant on the NFNPA 'New Forest Remembers' project) from the National Archives at Kew (Crown copyright). The deployment photographs are sourced from the Imperial War Museum website.



Figure 41 - Pre-fabricated concrete sections awaiting assembly at Marchwood. National Archives ref. WO 240/1159

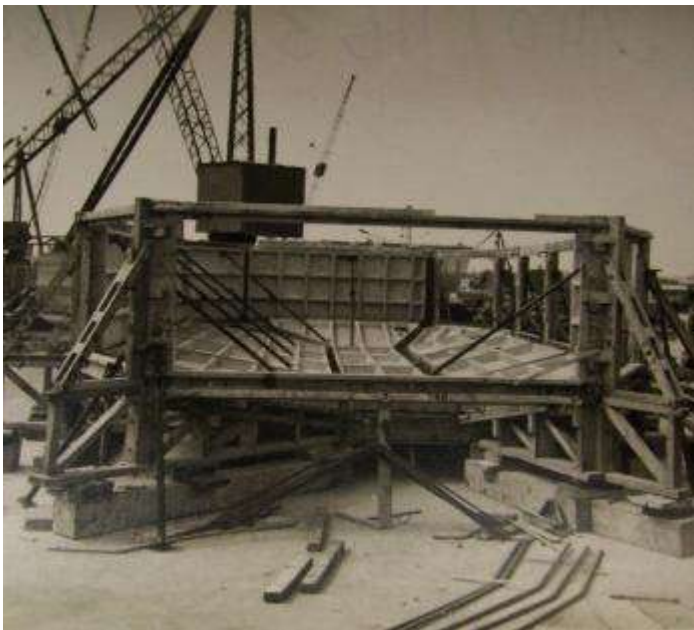


Figure 42 - Beetle mid-assembly showing the internal framing. National Archives ref. WO 240/1163



Figure 43 - Beetles being assembled in their frames ready for casting. National Archives ref. WO 240/1165



Figure 44 - A near-complete Beetle. National Archives ref. WO 240/1157





Figure 45 - A completed Beetle awaits launch. The function of the grill on the starboard side has not been established. National Archives ref. WO 240/1148



Figure 46 - Beetle being launched at Marchwood. Picture ref. A-25810 IWM.



**Figure 47 - Whale unit being towed to France. Note the hydraulic jacks on the Beetles indicating that these are made of steel not concrete. Picture ref B-005689 IWM**



**Figure 48 - Whale unit in situ in France, showing the floating roadways, the piers with hydraulic jacks and in the background, the blockships. Picture ref A-024362 IWM.**

### 8.3 Site Photos



Figure 49 - Photo of the northern section of the site, taken from the Red Funnel Isle of Wight ferry. The ridge concealing four of the 39 Beetles can clearly be seen extending left from the concrete lighter (centre of photo).



Figure 50 - Looking southeast from Section D, highlighting the shingle ridge caused by the concrete lighter to the left of picture



Figure 51 - Exposed dorsal coupling bracket of Beetle no.32 (not 31 as stated on slate). Trowel points to north



Figure 52 - Looking southeast, this photo clearly shows the alternating profiles of the Beetles



Figure 53 - Looking northwest up the line of Beetles - note the undamaged moss-free area at the base of the Beetles indicating beach motility and how the breaches in the side correspond to this level



Figure 54 - Looking southeast down the line, these features were used to secure the wooden buffers and also appear in the construction photos in Section 8.2.2



Figure 55 - Wood remnant



Figure 56 - Corrosion stains



**Figure 57 - Interior of Beetle showing the durability of the internal bulwarks used to create the watertight compartments**



**Figure 58 - Collapsed section of a Beetle, clearly showing the eroded metal reinforcements**



Figure 59 - Beetle no.4. Northwest is to the right.



Figure 60 - Beetle no.3. Northwest is to the right.





Figure 61 - Beetle no.1 with the wooden post protruding in the centre bottom of picture. Northwest is to the left.



Figure 62 - Site photo looking northwest showing the predominance of dorsal algal growth at the southern end of the site, indicating that the tidal effect here is not uniform. The wooden post in Beetle no.1 and concrete remnants (possibly of a pier) can be seen in the foreground.

## 8.4 Photo glossary



Figure 63 – Front/Rear Bollards



Figure 64 – Side Bollards



Figure 65 - Dorsal coupling bracket (with wood remnants)



Figure 66 - Inspection hatch



Figure 67 – Metal bracket



Figure 68 – Central external feature

## 8.5 Survey spreadsheet

Key for spreadsheet:

**Condition:** 1 – Very well preserved; 2 – Good; 3 – Fair; 4 – Deteriorated

**Burial Depth:** 1 – ¼ buried; 2 – ½ buried; 3 – ¾ buried; 4 – buried to top edge; 5 – buried

**Bollards:** SB – Side Bollard; FS – Front/rear bollard (south end of Beetle); FN – Front/rear bollard (north end of Beetle); BE – Front/rear bollard (both ends)

**CEF:** Central External Feature (see Photo Glossary)

**OEF:** Other External Feature (see Photo Glossary)

**Drums NE:** Drums (north end of Beetle)

Beetle #	Condition	Burial Depth	Wood	Bollards	CEF	OEF	Moss Level	Drums NE	RTK Profile
1	4	2	Some	Y			High		
2	3	2	Little	SB		x	Medium		Y
3	4	3					High		
4	1	4				x	Medium		
5	3	2	Some				High		
6	2	2				x	Low		
7	2	1				x	Medium		
8	2	2			x	x	High		
9	3	2			x	x	Low		
10	4	2			x		Medium		
11	3	2				x	Medium		
12	2	1	Little			x	Medium		Y
13	3	2				x	Low		
14	3	1				x	Low		
15	2	1				x	Low		
16	2	2	Some	NE		x	Medium		
17	2	2	Little	SE		x	Medium	x	
18	2	2				x	Low	x	
19	3	2					Medium		
20	3	2					Medium		

## Survey of the Remains of Elements of a Mulberry Harbour

21	3	2		SE		x	Low		
22	3	3		SE		x	Medium		
23	2	2		BE		x	Low		
24	2	2		BE		x	Medium		Y
25	2	2		BE		x	Low		
26	3	2		BE		x	Low		
27	3	3		BE		x	Low		
28	3	3		SE		x	Low	x	
29	2	4	Some	BE		x	Low		
30	2	4	Little			x	None		
31	3	4		SE		x	None		
32	Unknown	5					None		
33	Unknown	5							
34	Unknown	5							
35	Unknown	5							
36	2	2		NE		x	Medium		
37	2	1		BE		x	Medium		
38	1	1	Some		x	x	High		
39	3	2				x	Medium		Y

### 8.6 Sources


See below for the full list of sources utilised. Those marked '(X)' were not visited by members of the project team, but by correspondents who kindly agreed to search on behalf of the project team in the course of their own research.

Name	Accessed online	Contacted direct	Visited
Associated British Ports	X	X	
Channel Coastal Observatory (CCO)	X		
CUCAP	X		
Defence of Britain online archive	X		
EDINA Digimap	X		
English Heritage	X	X	X

Survey of the Remains of Elements of a Mulberry Harbour

Google Maps	X		
Hampshire & Wight Trust for Maritime Archaeology	X	X	
Hampshire Archaeology and Historic Buildings Record (AHBR)	X		
Hampshire County Council Archive	X	X	(X)
Hampshire Environment Department	X	X	
Imperial War Museum photographic archive	X		
Mulberry Survey Project (Arromanches)	X		
National Archive at Kew	X	X	(X)
National Monuments Record (NMR)	X		
National Oceanography Centre			X
Natural England (custodians of SSSIs)	X		
New Forest National Park Authority	X	X	X
Southampton City Libraries	X	X	X
UoS Libraries and journals (via Webcat, TDNet and Web of Knowledge)	X	X	X
Vision of Britain website	X		
Waterside Heritage	X	X	
Wates Group Ltd	X	X	

## 8.7 Risk Assessment



ENGLISH HERITAGE

**Historic Wreck Site Risk Assessment**

Wreck/Site Name				Mulberry Harbour Remants - Dibden Bay											
NMR / UKHO No.		EH Region		Restricted Area		Principal Land Use									
1394527		South East		Unknown		Coastland 2									
Latitude (WGS84)		50 53' 7" N													
Longitude		1 24' 49" W													
Class Listing		Period		Status											
Maritime Craft		Modern - II World		E - Unknown											
Licensee		Nominated Archaeologist		Principal Ownership Category											
Nil		No		Private											
Seabed Owner		Navigational Administrative Responsibility													
B - other		Not applicable													
Environmental Designations															
D - SSSI Dibden Bay & SSSI Hythe to Calshot Marshes															
Seabed Sediment				Energy											
OT - Shingle beach				Low											
Survival															
Very good															
Overall Condition		Condition Trend		Principal Vulnerability											
C - Gen. satisfactory		B - Declining		DEV, C, ERO											
Amenity Value: visibility															
A - substantial above ground structural remains															
Amenity Value: physical accessibility				Amenity Value: intellectual accessibility											
A - Full				C - no interpretation											
Management Action															
Management Prescription		A	B	C	D	E	F	G	H	I	J	K	L	M	N
													X		
Notes:															
Remains of at least 36 concrete pontoons ('Beetles'), built to support the floating roadways of the Mulberry Harbours, line the foreshore of Dibden Bay on the boundary between two SSSIs															
Environmental Designations - Also borders the New Forest National Park															
Survival - levels of deterioration vary from Beetle to Beetle															
Amenity Value : physical accessibility - no right of public access, but no explicit restrictions given															
Management prescription - recommended that site is monitored on a regular basis to measure deterioration															
Risk is assessed as: <b>High / Medium / Low</b>															
Data Source		GEO		Date & Initials		12th May 2012									
Date of previous assessment:				Has an ecological survey been undertaken? <input checked="" type="checkbox"/> / N											

www.english-heritage.org.uk



## 8.8 Health & Safety Risk Form and Guidance

### RISK ASSESSMENT FORM

#### Risk Assessment Form and Guidance

<b>Activity being Assessed:</b>	Surveying of remains of a Mulberry Harbour
<b>Location:</b>	Dibden Bay, Hampshire
<b>Who is exposed to the hazard:</b>	Project members - Alicia Mejias, Tony Burgess, Paolo Croce, Marina Orts, Paolo Pecci

<b>Assessor's name:</b>	Alicia Mejias	<b>Assessor's job title:</b>	Masters Student
<b>Assessor's signature:</b>		<b>Date of assessment:</b>	29 <sup>th</sup> February 2012

<b>Review (by) date:</b>	As Appropriate
--------------------------	----------------

<b>Legislation applicable:</b>	
--------------------------------	--

Survey of the Remains of Elements of a Mulberry Harbour

No.	Hazard <i>List the hazards associated with the activity</i>	Control Measures <i>already in place to control the risk</i> <i>List any safety measures that are already in place to control the risks</i>	Risk rating <i>score with existing controls</i> <b>L x S</b> <i>Refer to matrix below</i>	Additional controls required <i>List in this column any extra safety controls or precautions that are required but are not currently in place</i>	Risk rating <i>score with new controls</i> <b>(Residual Risk)</b> <b>L x S</b> <i>Refer to matrix below</i>	Completed <i>(Control measures met)</i> <i>Where additional control measures are required, fill this column in with the date that they were put in place</i>
1	Slippage upon moss	None	3	Care to be taken when walking	3	
2	Iron fastenings	None	6	Stay aware and avoid	6	
3	Falling into Beetle	None	4	Stay aware and avoid walking on Beetle when possible	4	
4	Stuck in mud	None	2	None	2	
5	Slip on slope	None	1	None	1	
6	Drowning in Beetle	None	5	Stay aware and keep an eye on fellow project team members	5	
7	Iron debris	None	3	Avoid when possible	3	
8	Beetle gives way underfoot	None	4	Avoid walking on Beetles except when necessary	4	

Continue on separate sheet if necessary.

## 8.9 NMR entry

### NMR MONUMENT REPORT

Unique Identifier: 1394527

NMR Number: SU 40 NW 30

#### Location

Hythe And Dibden (Civil Parish)  
New Forest (District)  
Hampshire

OSGB Grid Reference SU 415 094 (area)

#### Summary

Remains of about 30 World War II Mulberry Harbour pontoons or Beetles line the riverbank of Southampton Water at Dibden Bay. Built on the Beaulieu River in 1943-4 the Beetles were towed across the English Channel to form part of the D-Day Mulberry Harbour installation.

#### Status

#### Other Identifiers

#### Notes

[SU 415094] The remains of 30 World War II Beetles line the riverbank of Southampton Water at Dibden Bay between Hythe marina and Husbards shipyard. Constructed of concrete, the Beetles were floats or pontoons to support the floating roadway of the D-Day Mulberry Harbour. They are 42 ft long, 15 ft wide and about 7 ft deep. Some 470 Beetles were required to support the roadway of which about 50 were constructed at Clobb Copse, Beaulieu. (1)

#### Sources

#### Related Events and Archives

Any event and or archive records linked to this monument are outlined below. For further details please contact the NMR (see covering letter) quoting the Unique Identifier and NMR Number of this monument record and the identifying numbers and titles of items of interest.

**Related Event Records**      There are no related event records for this monument

**Related Archive**              There are no related archives for this monument.

## 8.10 RAF photo index

### Obliques

<b>EH#</b>	<b>Library and frame number</b>	<b>Photo reference (NGR and Index number)</b>	<b>Original number</b>	<b>Date</b>	<b>Map Reference</b>
EH1	RAF 30094	SU 4110 / 3	CAL/UK/8	22 AUG 1947	SU 410100
EH2	RAF 30094	SU 4010 / 2	CAL/UK/8	22 AUG 1947	SU 409101
EH3	RAF 30094	SU 4010 / 3	CAL/UK/8	22 AUG 1947	SU 408104
EH4	RAF 30059	SU 3910 / 3	540/382	24 JUL 1950	SU 393105

**Verticals.** Those in bold are close-up photographs taken of previously listed entries

<b>EH#</b>	<b>Date</b>	<b>Sortie number</b>	<b>Lib. #</b>	<b>Frame number</b>	<b>Centre point</b>	<b>Scale 1:</b>
EH5	02 AUG 1945	RAF/106G/UK/585	25	6259	SU 409 103	2500
EH6	02 AUG 1945	RAF/106G/UK/585	25	6311	SU 410 104	2500
EH7	02 AUG 1945	RAF/106G/UK/585	25	6311	SU 410 104	2500
EH8	12 AUG 1945	RAF/106G/UK/650	27	5133	SU 405 098	2500
EH9	12 AUG 1945	RAF/106G/UK/650	27	5246	SU 407 100	2500
EH10	21 SEP 1946	RAF/CPE/UK/1749	468	3079	SU 405 105	9800
EH11	11 APR 1947	RAF/CPE/UK/1977	584	5170	SU 409 102	4800
EH12	11 MAY 1947	RAF/CPE/UK/2060	626	6039	SU 408 104	5800
EH13	20 APR 1953	RAF/82/765	1421	40	SU 408 104	5000
EH14	31 AUG 1954	RAF/82/1006	1520	378	SU 412 096	15000
EH15	06 JUN 1955	RAF/58/1779	1649	11	SU 405 100	10000
EH16	06 JUL 1955	RAF/82/1229	1666	60	SU 404 099	10300
EH17	18 JAN 1962	RAF/58/4878	2238	41	SU 411 105	10000

Survey of the Remains of Elements of a Mulberry Harbour

EH18	07 MAR 1962	RAF/58/4973	2504	21	SU 405 106	10500
EH19	08 AUG 1955	RAF/542/222	2554	4	SU 406 108	10000
EH20	25 MAY 1955	RAF/540/1627	2812	2	SU 404 101	10000
EH21	08 JUL 1945	RAF/106G/UK/492	4957	5102	SU 407 106	4000
EH22	08 JUL 1945	RAF/106G/UK/492	4957	5103	SU 410 106	4000
EH23	12 OCT 1950	RAF/541/T/51	5063	3068	SU 408 109	10333
EH24	02 SEP 1964	OS/64171	1110 1	67	SU 406 107	7500
EH25	12 AUG 1945	RAF/106G/UK/650	27	5048	SU 407 092	2500
EH26	12 AUG 1945	RAF/106G/UK/650	27	5049	SU 408 091	2500
EH27	12 AUG 1945	RAF/106G/UK/650	27	5050	SU 410 091	2500
EH28	12 AUG 1945	RAF/106G/UK/650	27	5127	SU 418 097	2500
EH29	12 AUG 1945	RAF/106G/UK/650	27	5128	SU 416 097	2500
EH30	12 AUG 1945	RAF/106G/UK/650	27	5129	SU 414 097	2500
EH31	12 AUG 1945	RAF/106G/UK/650	27	5130	SU 412 098	2500
EH32	12 AUG 1945	RAF/106G/UK/650	27	5131	SU 409 098	2500
EH33	12 AUG 1945	RAF/106G/UK/650	27	5132	SU 407 098	2500
EH34	12 AUG 1945	RAF/106G/UK/650	27	5247	SU 408 100	2500
EH35	12 AUG 1945	RAF/106G/UK/650	27	5248	SU 410 100	2500
EH36	12 AUG 1945	RAF/106G/UK/650	27	5249	SU 412 100	2500
EH37	12 AUG 1945	RAF/106G/UK/650	27	5250	SU 414 100	2500
EH38	12 AUG 1945	RAF/106G/UK/650	27	5369	SU 409 101	2500
EH39	12 AUG 1945	RAF/106G/UK/650	27	5371	SU 412 101	2500
EH40	26 AUG 1945	RAF/106G/UK/725	53	6072	SU 411 095	2500
EH41	26 AUG 1945	RAF/106G/UK/725	53	6073	SU 408 095	2500
EH42	26 AUG 1945	RAF/106G/UK/725	53	6074	SU 406 095	2500
EH43	28 MAR 1946	RAF/106G/UK/132 2	313	5077	SU 422 092	4800

Survey of the Remains of Elements of a Mulberry Harbour

EH44	28 MAR 1946	RAF/106G/UK/132 2	313	5078	SU 419 092	4800
EH45	28 MAR 1946	RAF/106G/UK/132 2	313	5079	SU 416 092	4800
EH46	28 MAR 1946	RAF/106G/UK/132 2	313	5080	SU 413 091	4800
EH47	28 MAR 1946	RAF/106G/UK/132 2	313	5081	SU 409 091	4800
EH48	28 MAR 1946	RAF/106G/UK/132 2	313	5081	SU 409 091	4800
EH49	21 SEP 1946	RAF/CPE/UK/1749	468	3080	SU 412 105	9800
EH50	21 SEP 1946	RAF/CPE/UK/1749	468	4079	SU 411 090	9800
EH51	21 SEP 1946	RAF/CPE/UK/1749	468	4080	SU 418 089	9800
EH52	11 APR 1947	RAF/CPE/UK/1977	584	5175	SU 416 102	4800
EH53	11 APR 1947	RAF/CPE/UK/1977	584	5176	SU 412 101	4800
EH54	11 APR 1947	RAF/CPE/UK/1977	584	5177	SU 408 100	4800
EH55	11 MAY 1947	RAF/CPE/UK/2060	626	6014	SU 408 090	5800
EH56	11 MAY 1947	RAF/CPE/UK/2060	626	6015	SU 412 090	5800
EH57	11 MAY 1947	RAF/CPE/UK/2060	626	6016	SU 416 091	5800
EH58	11 MAY 1947	RAF/CPE/UK/2060	626	6017	SU 420 091	5800
EH59	14 MAY 1947	RAF/CPE/UK/2064	634	5108	SU 407 097	4800
EH60	14 MAY 1947	RAF/CPE/UK/2064	634	5109	SU 409 099	4800
EH61	14 MAY 1947	RAF/CPE/UK/2064	634	5110	SU 412 101	4800
EH62	14 MAY 1947	RAF/CPE/UK/2064	634	5111	SU 415 103	4800
EH63	23 MAY 1950	RAF/541/533	1081	3014	SU 412 087	9950
EH64	23 MAY 1950	RAF/541/533	1081	3018	SU 419 108	9950
EH65	23 MAY 1950	RAF/541/533	1081	4018	SU 405 093	9950
EH66	23 MAY 1950	RAF/541/533	1081	4019	SU 409 089	9950
EH67	20 APR 1953	RAF/82/765	1421	4	SU 408 095	5000

Survey of the Remains of Elements of a Mulberry Harbour

EH68	20 APR 1953	RAF/82/765	1421	5	SU 413 095	5000
EH69	20 APR 1953	RAF/82/765	1421	41	SU 413 104	5000
EH70	15 APR 1953	RAF/58/1087	1442	42	SU 415 095	4400
EH71	15 APR 1953	RAF/58/1087	1442	43	SU 410 095	4400
EH72	08 APR 1954	RAF/82/895	1522	89	SU 402 101	9000
EH73	08 APR 1954	RAF/82/895	1522	90	SU 405 097	9000
EH74	08 APR 1954	RAF/82/895	1522	93	SU 415 085	9000
EH75	06 JUN 1955	RAF/58/1779	1649	10	SU 410 102	10000
EH76	06 JUL 1955	RAF/82/1229	1666	59	SU 412 099	10300
EH77	18 JAN 1962	RAF/58/4878	2238	40	SU 417 105	10000
EH78	07 MAR 1962	RAF/58/4973	2504	20	SU 415 106	10500
EH79	25 MAY 1955	RAF/540/1627	2812	1	SU 409 101	10000
EH80	07 SEP 1967	MAL/67083	4775	33	SU 419 088	3000
EH81	07 SEP 1967	MAL/67083	4775	34	SU 416 090	3000
EH82	07 SEP 1967	MAL/67083	4775	35	SU 414 092	3000
EH83	07 SEP 1967	MAL/67083	4775	36	SU 411 094	3000
EH84	12 OCT 1950	RAF/541/T/51	5063	3082	SU 410 092	10333
EH85	04 JAN 1945	RAF/106G/LA/90	8334	4063	SU 419 086	10000
EH86	04 JAN 1945	RAF/106G/LA/90	8334	4064	SU 412 084	10000
EH87	02 SEP 1964	OS/64171	1110 1	43	SU 418 095	7500
EH88	02 SEP 1964	OS/64171	1110 1	44	SU 413 095	7500
<b>EH89</b>	<b>02 SEP 1964</b>	<b>OS/64171</b>	<b>111 01</b>	<b>44</b>	<b>SU 413 095</b>	<b>7500</b>
<b>EH90</b>	<b>07 SEP 1967</b>	<b>MAL/67083</b>	<b>477 5</b>	<b>36</b>	<b>SU 411 094</b>	<b>3000</b>
<b>EH91</b>	<b>07 SEP 1967</b>	<b>MAL/67083</b>	<b>477 5</b>	<b>34</b>	<b>SU 416 090</b>	<b>3000</b>

Survey of the Remains of Elements of a Mulberry Harbour

<b>EH92</b>	<b>25 MAY 1955</b>	<b>RAF/540/1627</b>	<b>281</b> <b>2</b>	<b>1</b>	<b>SU 409 101</b>	<b>10000</b>
<b>EH93</b>	<b>07 MAR</b> <b>1962</b>	<b>RAF/58/4973</b>	<b>250</b> <b>4</b>	<b>20</b>	<b>SU 415 106</b>	<b>10500</b>
<b>EH94</b>	<b>18 JAN 1962</b>	<b>RAF/58/4878</b>	<b>223</b> <b>8</b>	<b>40</b>	<b>SU 417 105</b>	<b>10000</b>
<b>EH95</b>	<b>06 JUL 1955</b>	<b>RAF/82/1229</b>	<b>166</b> <b>6</b>	<b>59</b>	<b>SU 412 099</b>	<b>10300</b>