hayle harbour : : regeneration
South Quay

Development Proposal for South Quay/Foundry Yard Hayle Harbour

December 2010

Archaeological Report

REAL ESTATE DEVELOPMENT

ING

Northamptonshire Archaeology

Archaeological evaluation at South Quay Hayle Harbour, Cornwall August 2010

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Report 10/142

September 2010

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QUALITY CONTROL

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Approved by	Andy Chapman		

OASIS REPORT FORM

PROJECT DETAILS		
Project name	Archaeological evaluation at South Quay, Hayle Harbour, Cornwall	
Short description	In August 2010 Northamptonshire Archaeology undertook a trial trench evaluation on behalf of Prospect Archaeology and their client ING Red UK at South Quay, Hayle, Cornwall. The quay, which is designated along with the rest of the harbour as a World Heritage Site as part of the Cornwall and West Devon Mining Landscape, is the subject of proposals for commercial and residential development. Trenches successfully located buried quay walls, timber revetments and part of a buried slipway.	
Project type	Evaluation (HAY10)	
Site status	Brownfield	
Previous work	None	
Current Land use	Harbour/waste ground	
Future work	Unknown	
Monument type/ period	Industrial	
Significant finds	n/a	
PROJECT LOCATION		
County	Cornwall	
Site address	South Quay, Hayle Harbour, Hayle	
Study area	*c* 3.5ha	
OS Easting & Northing	NGR 155680 37467	
Height OD	0-5mOD	
PROJECT CREATORS		
Organisation	Northamptonshire Archaeology (NA)	
Project brief originator	Cornwall Council's Historic Environment Planning Advice Officer	
Project Design originator	Northamptonshire Archaeology (NA)	
Director/Supervisor	Paul Mason	
Project Manager	Ian Meadows	
Sponsor or funding body	ING Red UK (Hayle Harbour) Ltd	
PROJECT DATE		
Start date/end date	August 2010	
ARCHIVES	Location	Content (eg pottery, animal bone etc)
Paper	Northamptonshire Archaeology	Site records, photographic, drawings
Digital	Northamptonshire Archaeology	Mapinfo GIS data, photographs
BIBLIOGRAPHY	Unpublished client report (NA report)	
Title	Archaeological evaluation at South Quay, Hayle Harbour, Cornwall	
Serial title & volume	Northamptonshire Archaeology Report 10/142	
Author(s)	Paul Mason	
Page numbers	31	
Date	27th September 2010	

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ARCHAEOLOGICAL EVALUATION AT SOUTH QUAY

HAYLE HARBOUR, CORNWALL

AUGUST 2010

ABSTRACT

In August 2010 Northamptonshire Archaeology undertook a trial trench evaluation on behalf of Prospect Archaeology and their client ING Red UK at South Quay, Hayle, Cornwall. The quay, which is designated along with the rest of the harbour as a World Heritage Site as part of the Cornwall and West Devon Mining Landscape, is the subject of proposals for commercial and residential development. Trenches successfully located buried quay walls, timber revetments and part of a buried slipway.

1 INTRODUCTION

In August 2010 Northamptonshire Archaeology (NA) was commissioned by Prospect Archaeology on behalf of their client, ING Red UK (Hayle Harbour) Ltd, to undertake a trial trench evaluation at South Quay, Hayle Harbour, Cornwall (NGR 155680 37467, Fig 1). The work was undertaken at the recommendation of the Cornwall Council's Historic Environment Planning Advice Officer (HEPAO) in response to an application for outline planning permission for commercial and residential development of the site (Application no 09-1334-ORM).

The archaeological evaluation complied with the HEPAO brief (Pound 2010, appendix A) and an approved method statement prepared by Northamptonshire Archaeology (NA 2010). All work was conducted in accordance with methods of best practice defined by the Institute for Archaeologists (IfA 2008).

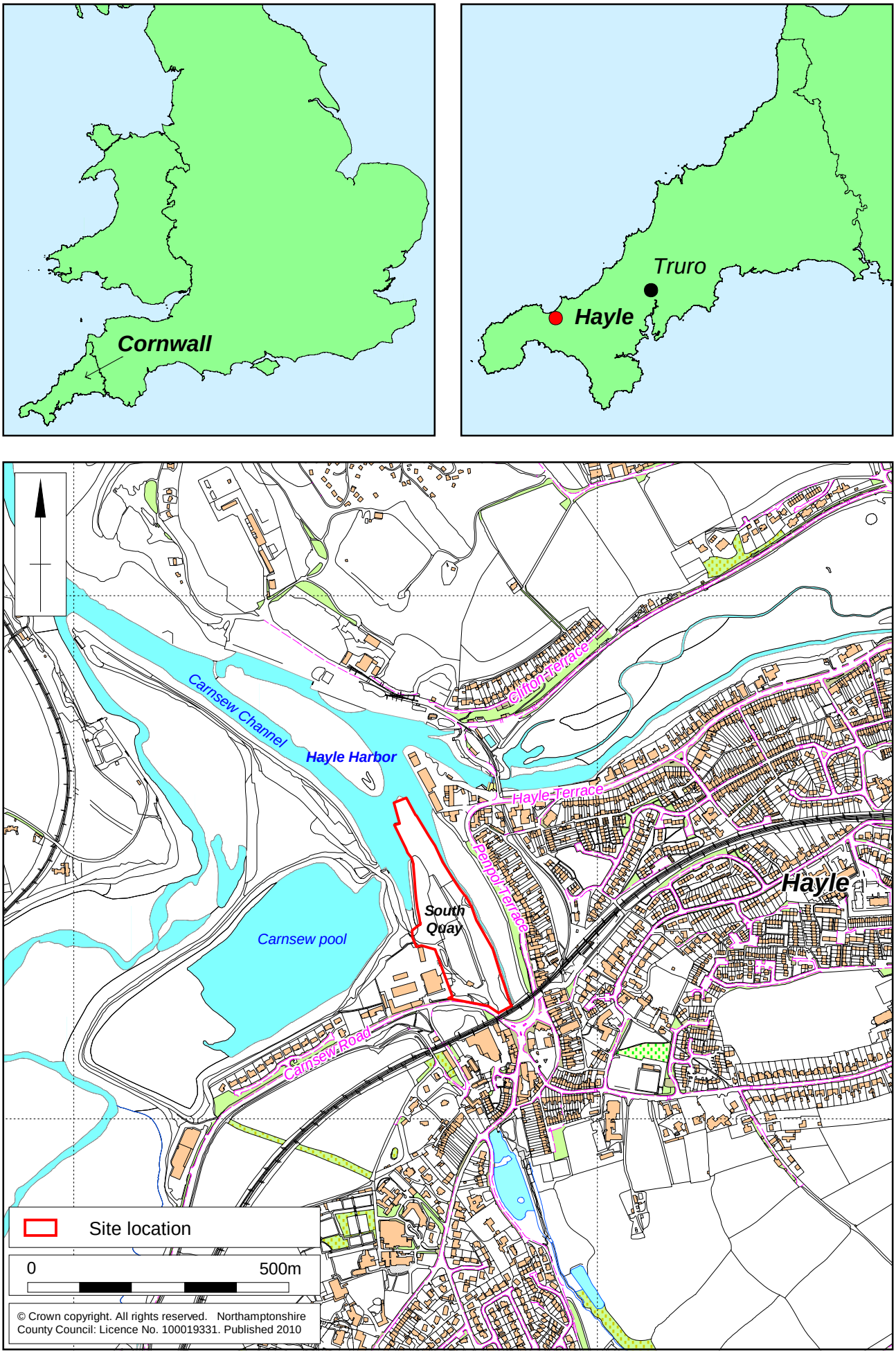
The fieldwork was undertaken between 5th and 13th August 2010. Seven trenches of varying length were excavated to locate an in-filled quayside and slip way (Fig 2). The site code HAY10 was allocated to the project and the site archive will be held at Northamptonshire Archaeology before being submitted to Cornwall Record Office.

2 BACKGROUND

2.1 Topography and geology

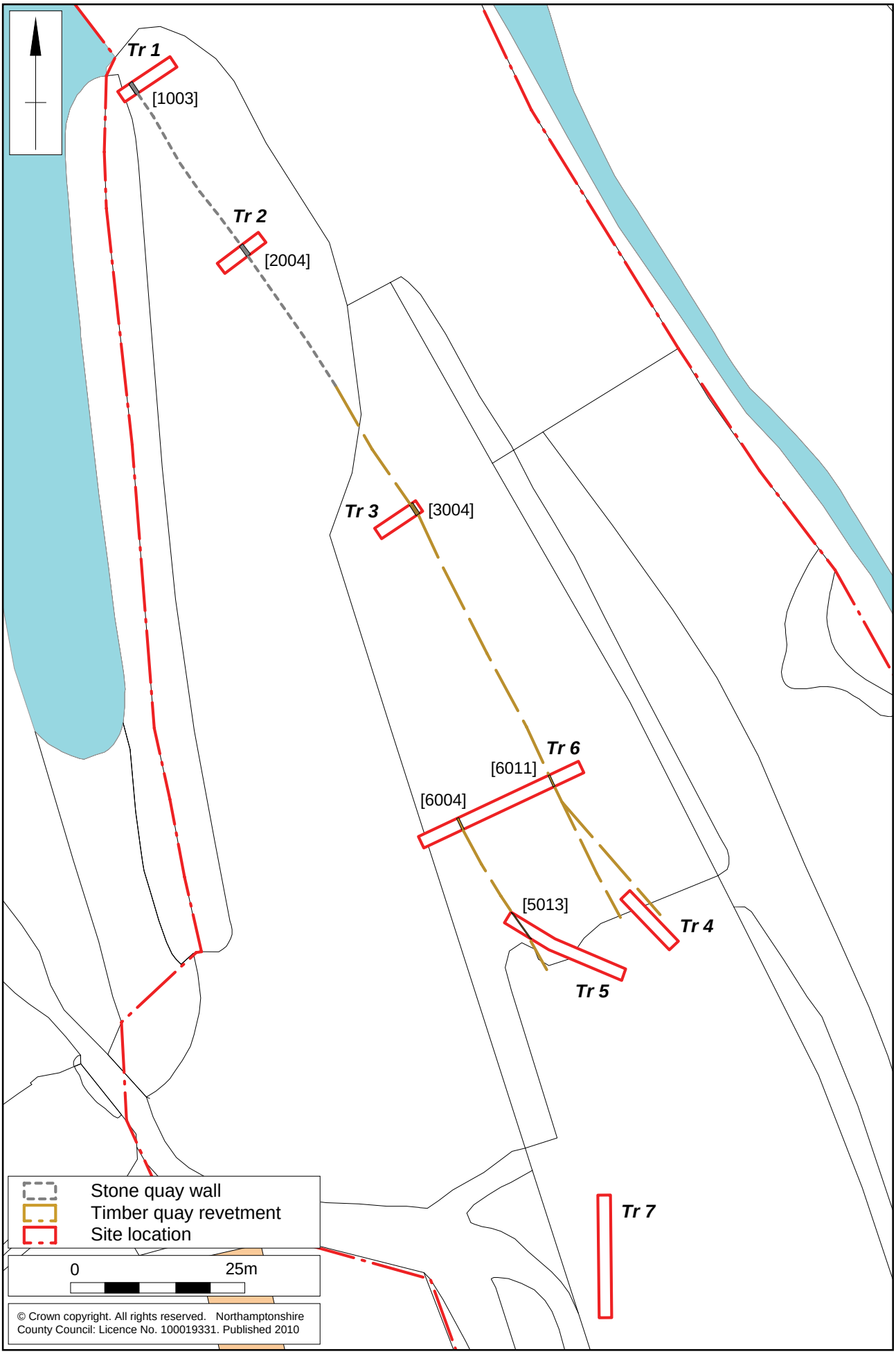
Hayle is located in north-west Cornwall on the eastern side of the Hayle Estuary which opens onto St Ives Bay, *c* 4km south-east of St Ives itself. The harbour lies on the western side of the town with South Quay (NGR 155680 37467) projecting northwards into the centre of the estuary. The quay is bounded to the south by the mainland, to the west by the Carnsew Channel and to the east by the Penpol River; the latter provide mooring for Hayle's small fleet of private fishing boats and leisure craft.

The site (*c* 3.4ha) is currently used as a makeshift car park by harbour users, although much of the area is covered in mounds of fly-tipped building debris and very overgrown



Scale 1:10,000

Site location Fig 1



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Trench location plan Fig 2

surface hereabouts lies at *c* 4-5m OD.

The geology is recorded as Middle Devonian (undifferentiated) mudstone, siltstone and sandstone overlain by clay, silt and sand alluvium (www.bgs.ac.uk/GeoIndex).

A view of the material in-filling South Quay and Carnsew Channel, looking south Fig 3

2.2 Historical background

The later history of Hayle, and more specifically for the purposes of this report, South Quay, is closely linked to Hayle Foundry and the rise to prominence of its founders, the Harvey family. The history of the site and its immediate environs has been well documented in works such as Edmund Vale's *The Harveys of Hayle* (2009, first published in 1966) and, more latterly in the *Hayle Historical Assessment* (Cahill *et al*, 2000). The following background information summarises the key events as set out in these publications.

Quays were first established at Hayle Harbour in 1740 by John 'Merchant' Curnow and expanded to include Carnsew Quay, under the auspices of the Cornish Copper Company following their relocation to Hayle from the Camborne area in 1758. The Harvey family's association with the town dates to 1779 when John Harvey, a blacksmith by trade, established a small iron foundry, the first in Cornwall, to supply machinery to the mining industry. Seafaring was the principal mode of transport for movement of fuel, raw materials and goods and one of Harvey's first actions was to deepen the channel of the Penpol River following the grant of a lease in 1780. By 1805 a fleet of three ships served *Harvey and Co*; there was, however, no foundry quay - the only way of accessing the river was via areas of levelled ground known as 'plots' or plats' (Vale 2009, 105).

The foundry's rapid expansion saw the manufacture and export of complete steam engines by the end of the 18th century. The company enjoyed a long association with the renowned engineer Richard Trevithick, supplying engines and parts for a number of

his inventions, including his 'fire-carriage' the first ever powered road vehicle (1801). These successes led to a bitter rivalry with the older-established Cornwall Copper Company; violent clashes over land ownership and rights characterised their relationship for much of the 19th century.

Following the death of John Harvey in 1803 his son Henry took over the management of the family business. It was during his tenure that the expansion of the Harbour complex, including the construction of South Quay, was triggered in 1817 when the Cornish Copper Company's lease of Carnsew Quay expired. Its owners, whose sympathies lay with Harvey and Co, duly granted it to them. Henry Harvey set about deepening the Carnsew Channel and building South Quay over a reef of Killas rock that outcropped to the west of Penpol River. The quay, which stretched northward into the estuary for a full quarter of mile, was finished late in 1818 and included in its design an archway which allowed a pre-existing fording point over the estuarine sands to pass underneath it. In addition, the quay walls incorporated a series of unusual arcs to allow ships to berth tightly to the dockside, although it has been suggested that this design was actually dictated by the shape of the reef upon which it was built (Vale 2009, 134).

By 1832 Harvey and Co had branched into shipbuilding; two years later a 72-ton schooner, *The John Harvey*, and a 52-ton smack, *The Nautilus*, were seaworthy. The problem of silting in the Carnsew Channel was overcome in the years 1833-4 when a large reservoir was dug to the west of Carnsew Quay and its waters used to flush the channel via a series of sluice gates.

Further prestige was conferred when Harvey and Co were commissioned by the Dutch government to supply the world's largest steam engine; construction took place between 1843-9. The 1840s also saw Harvey's shipyard building iron-hulled ships for the first time. In 1867 they acquired the waterside premises of their old rival, the Cornish Copper Company thus uniting much of the harbour under a single ownership.

By the end of the 19th century, however, lack of investment coupled with the absence of strong leadership saw the business go into decline. In 1903 the foundry was broken up and sold, but Harvey and Co continued to trade as merchants, importing coal, timber and building materials. Ship breaking also took place on the slips and quayside in the years following the First World War.

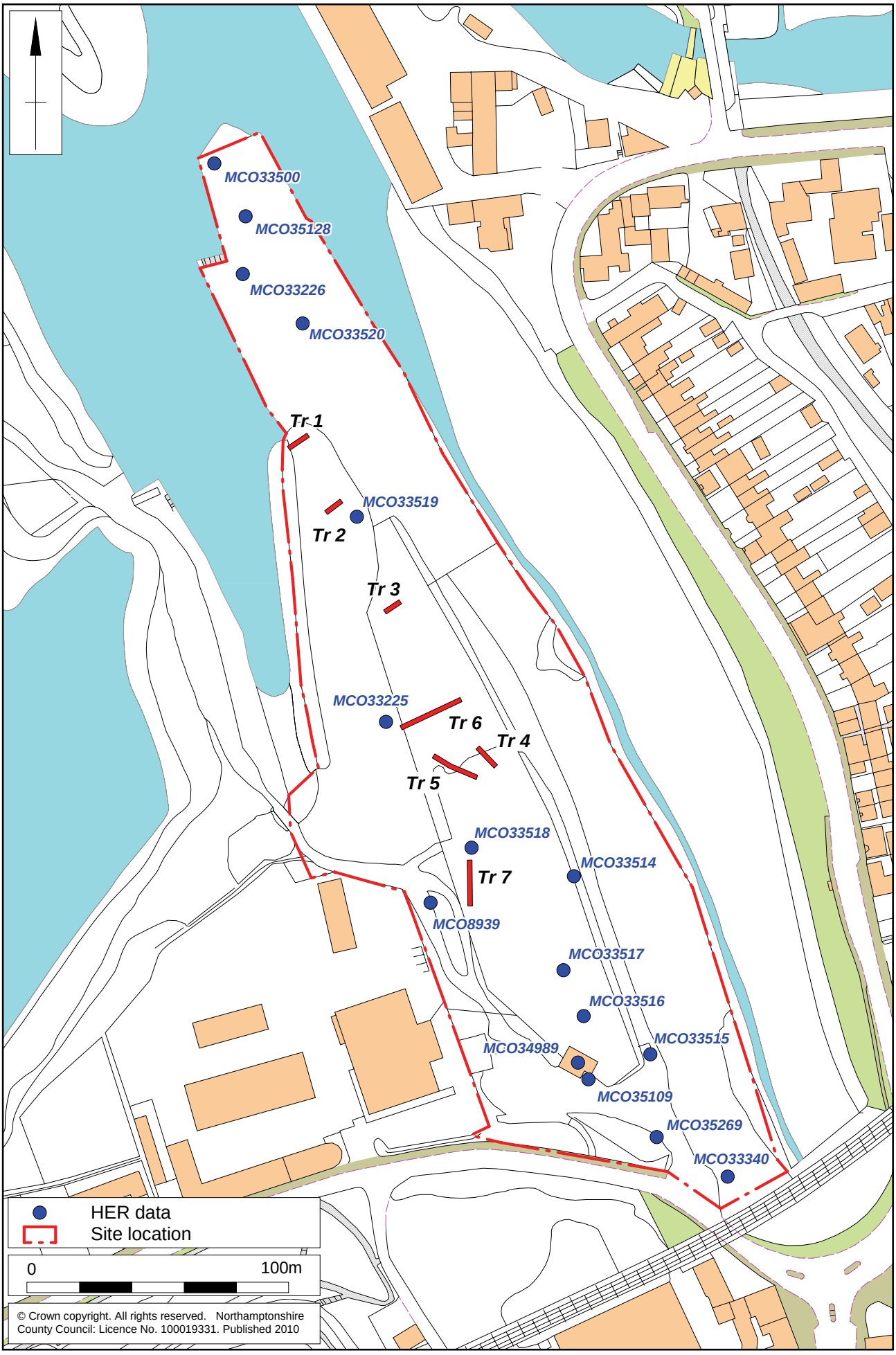
In 1966 the company, who still owned much of the harbour, were operating as a general building merchants; three years later they were bought out by United Builders Merchants Ltd. Sluicing of the harbour ceased in 1972 leading to the effective end of commercial traffic in 1977. In 1983 the harbour was put up for sale, South Quay being one of ten lots made available for purchase.

2.3 Designations and Historic Environment Records

In 2006 Hayle Harbour was designated as a World Heritage Site as part of the Cornwall and West Devon Mining Landscape (UNESCO Ref 1215). South Quay falls within the Hayle Conservation Area and its fabric is Grade II listed.

A search of Cornwall and Scilly Historic Environment Record produced a total of 73 sites and monuments within a 250m radius of the site, including fourteen listed buildings. Of these sites, sixteen fell inside the boundary of the proposed development area (Fig 4; Table 1). All but one relate to the 18th, 19th and earlier 20th century development of South Quay - the exception being a house, 'Blue Hayes' that was built in the 1960s and only recently demolished (MCO34989)

In close vicinity to the site are a large number of entries relating to Harvey's Foundry and



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Historic Environment Record information Fig 4

proposed development area. An inscribed grave stone of probable 5th-century date found in association is designated as a scheduled monument (MCO7140).

Table 1: Historic Environment Records within the proposed development area.

HER No	Grid ref (SW)	Description
MCO8939	5570 3732	Site of Harvey's shipyard, opened 1805
MCO33225	5568 3739	Buried quay, the site of Harvey's shipyard slips and docks
MCO33226	5563 3756	Extant quay walls, listed building 10/104
MCO33340	5582 3721	Location of iron and hemp loft mapped on 1864 plan of Hayle Foundry
MCO33500	5562 3760	Extant granite mooring posts, *c* 1818
MCO33514	5576 3733	Location of cart house mapped on 1864 plan of Hayle Foundry
MCO33515	5579 3726	Location of saw pit mapped on 1864 plan of Hayle Foundry
MCO33516	5576 3728	Location of timber shed mapped on 1864 plan of Hayle Foundry
MCO33517	5575 3730	Location of boiler shop mapped on 1864 plan of Hayle Foundry
MCO33518	5572 3734	Site of Harvey's shipwright's yard as mapped on 1864 plan of Hayle Foundry
MCO33519	5567 3747	Location of steamer's office mapped on 1864 plan of Hayle Foundry
MCO33520	5565 3755	Location of ore store mapped in 1842 and 1864
MCO34989	55757 37258	'Blue Hayes' house, 1960s
MCO35109	5576 3725	Drawing office, early/mid 19th century
MCO35128	5563 3758	Site of a former road tunnel under South Quay
MCO35269	5579 3723	Small area of mid 19th-century kerbing/cobbling

The Historic Environment Record also contains 23 event records within the search area. These include the World Heritage bid, historic surveys and management recommendations, small fieldwork projects focusing on elements of the Foundry and a building recording action undertaken on 'Blue Hayes' prior to its demolition (ECO1552). The latter is the only piece of archaeological work to have been undertaken within the proposed development area.

2.4 Cartographic evidence

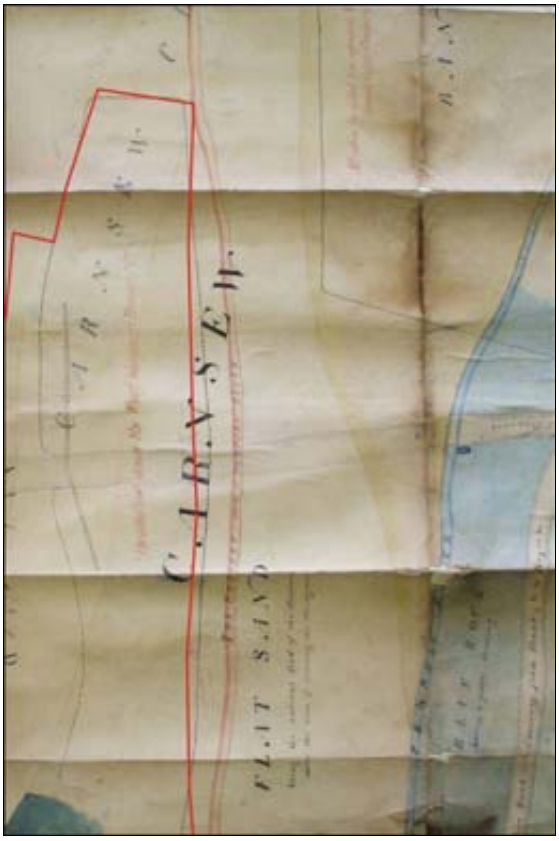
Historic maps have been selected from the extensive Harvey Archive held at Cornwall Record Office and combined with relevant Ordnance Survey maps, to demonstrate the development of South Quay. The proposed development area is outlined in red.

Plan of Hayle Harbour and Wharves at Hayle, c 1809-1819 (Fig 5; CRO H166/30)

A dotted line on this early plan of the harbour denotes the northern part of South Quay at the time of its construction and annotates it as, '... the Wharf belonging to Harvey & Co'. The line of the path between Penzance and St Ives, fordable at low tide and passing via a tunnel under the quay, is indicated on an east to west axis. The Cornwall Copper Company's new Copper House Quay is outlined to the north-west of Harvey's wharf.

A plan of Carnsew, 1828 (Fig 6; CRO DDH166/20)

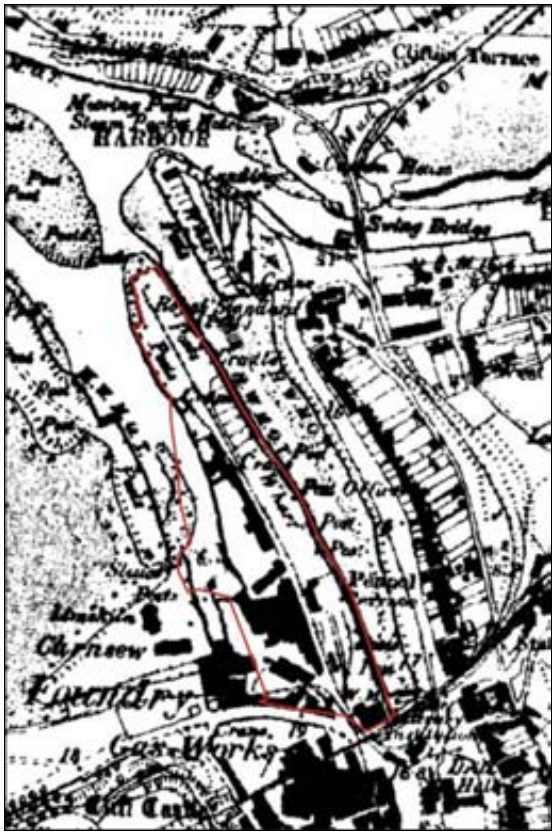
This map shows the quayside a decade after it was built, but includes a dotted line demarking the part that formerly belonged to the Cornwall Copper Company as part of their Carnsew holding prior to its transfer to Harvey and Co in 1817. A few small buildings are depicted in the south-eastern part of the quay and a 'timber pound' is annotated in the south-west. Further north, the location of the tunnel beneath the wharf is annotated 'arch'; either side are a series of lines spaced at regular intervals, presumably depicting light structures or 'pens' built on the quayside.



Plan of Hayle Harbour and wharves at Hayle, *c* 1809-1819 Fig 5

A plan of Carnsew, 1828 Fig 6

1st Edition Ordnance Survey map, 1879 Fig 7



Ordnance Survey map, 1888-1891 Fig 8

1st Edition Ordnance Survey map, 1879 (Fig 7)

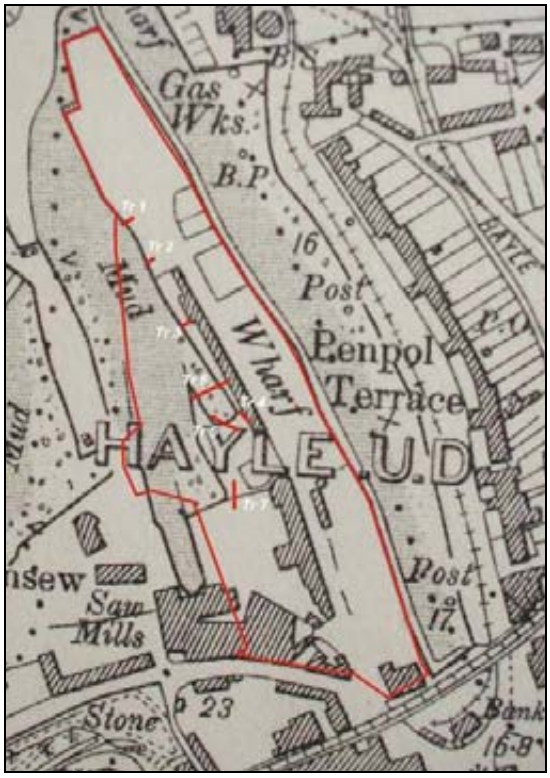
The earliest Ordnance Survey map shows much of the southern and western part of the quay built up with buildings together with tramlines running along its length and two cranes. At least one, perhaps two slipways give access to the southern end of the Carnsew Channel.

Ordnance Survey map, 1888-1891 (Fig 8)

The layout of the quay remains the same as that depicted on the earlier edition.

Ordnance Survey map, 1908 (Fig 9)

The most important development shown on this map (surveyed 1907) is the existence of a new slipway adjoining the south-eastern corner of the Carnsew Channel. A number of the quayside buildings appear to have been demolished, leaving a linear block aligned along the western side of the quay. The tramlines and cranes are no longer depicted.



Ordnance Survey map, 1908 Fig 9

Ordnance Survey map, 1936 (Fig 10)

This map appears to indicate that the 'new' slipway depicted on the 1908 edition has been in-filled. The angle of its western wall is just visible where a mooring post is indicated. A series of tramlines are once again depicted, one branch appearing to divide either side of the former slipway.

Ordnance Survey map, 1938 (Fig 11)

This map is a revision of the 1907 survey and clearly shows the outline of the 'new' slipway suggesting that if it was indeed in-filled at the time of the 1936 survey, it had been re-exposed by this date. Otherwise, the morphology of the site is little changed.

Ordnance Survey map, 1936 Fig 10

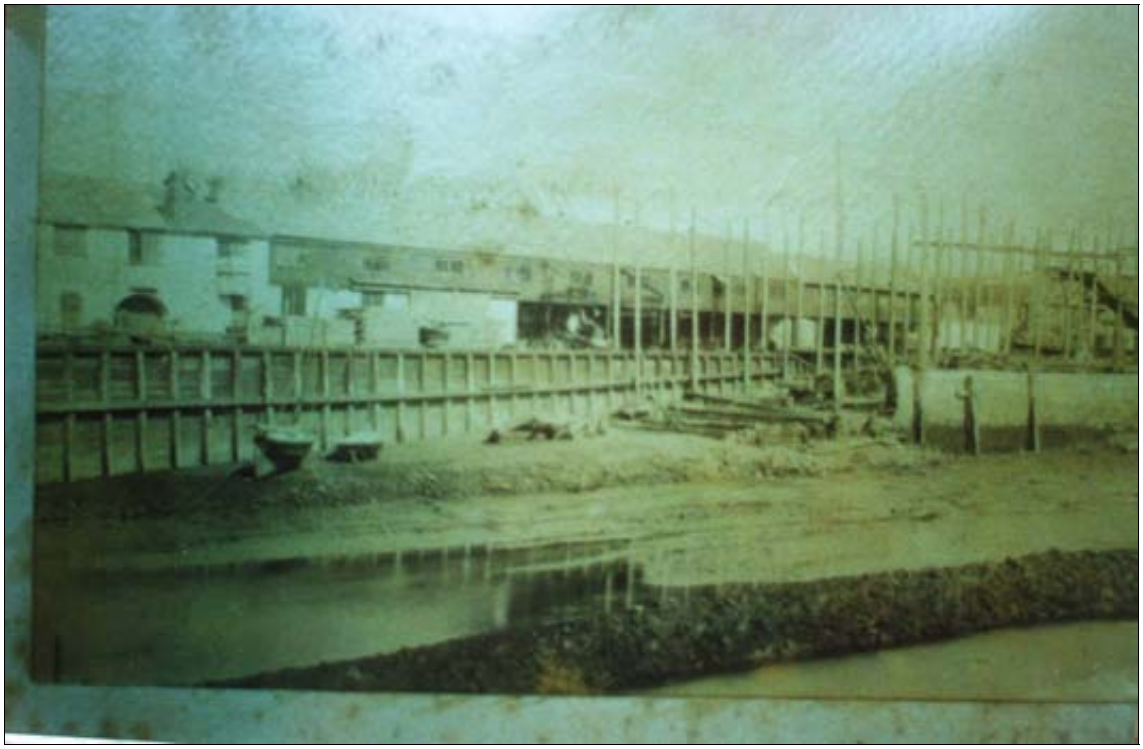
Ordnance Survey map, 1936 Fig 11

2.5 Photographic evidence

The 20th-century development of the site is well documented by a series of photographs, including aerial photographs, which serve to augment and sometimes clarify the cartographic evidence. The following sequence of images, spanning the period *c* 1910-1968, is considered the most instructive of those available.

South Quay and slipway, c 1900-1910 (Fig 12)

This undated photograph (provided by and reproduced with the permission of John Browne, former Harbour Master) was probably taken during the first decade of the 20th century from a vantage point on Carnsew Quay at low tide. It shows a timber revetment along the south-western side of South Quay and a slipway (first depicted on the 1908 Ordnance Survey map; Fig 9). Timber beams lie across the base of the slipway and tall upright scaffolding posts are present suggesting shipbuilding. A linear block of buildings line the edge of the quay and slipway. The stone-built edge of a second slipway, the middle of three, appears on the right hand side of the photograph.

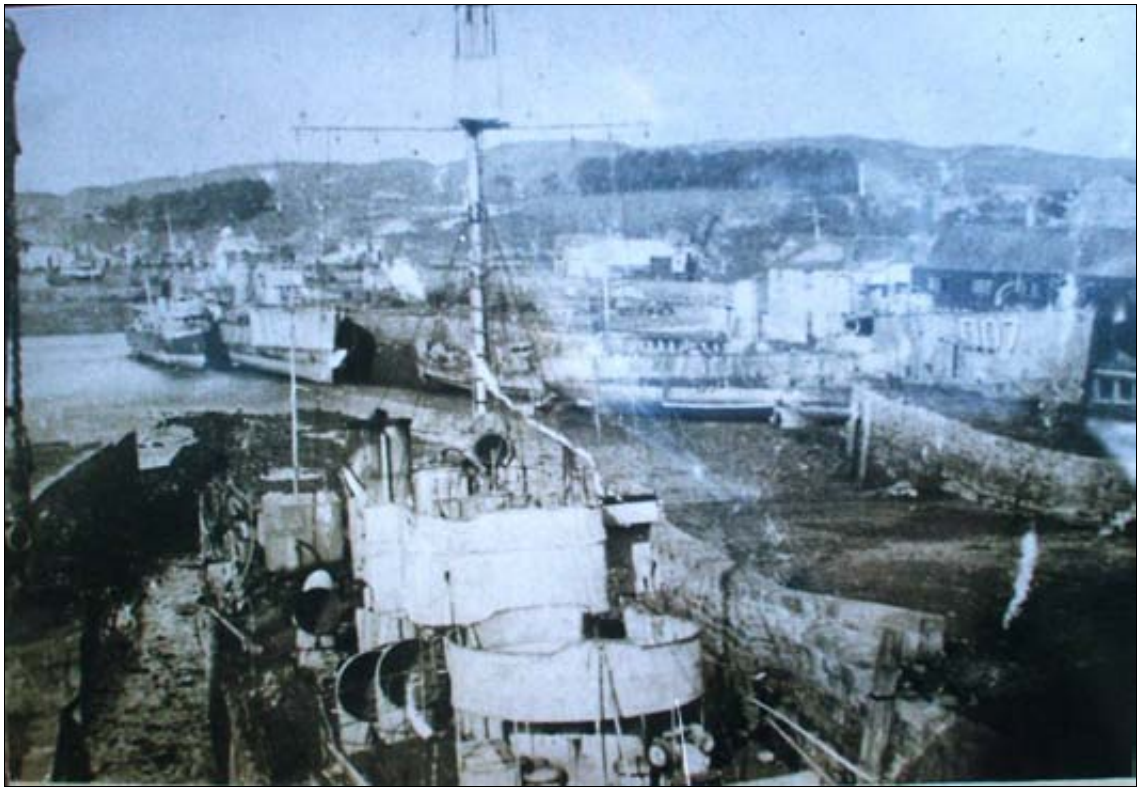


South Quay and slipway, *c* 1900-1910, showing timber revetment

(photograph reproduced courtesy of John Browne) Fig 12

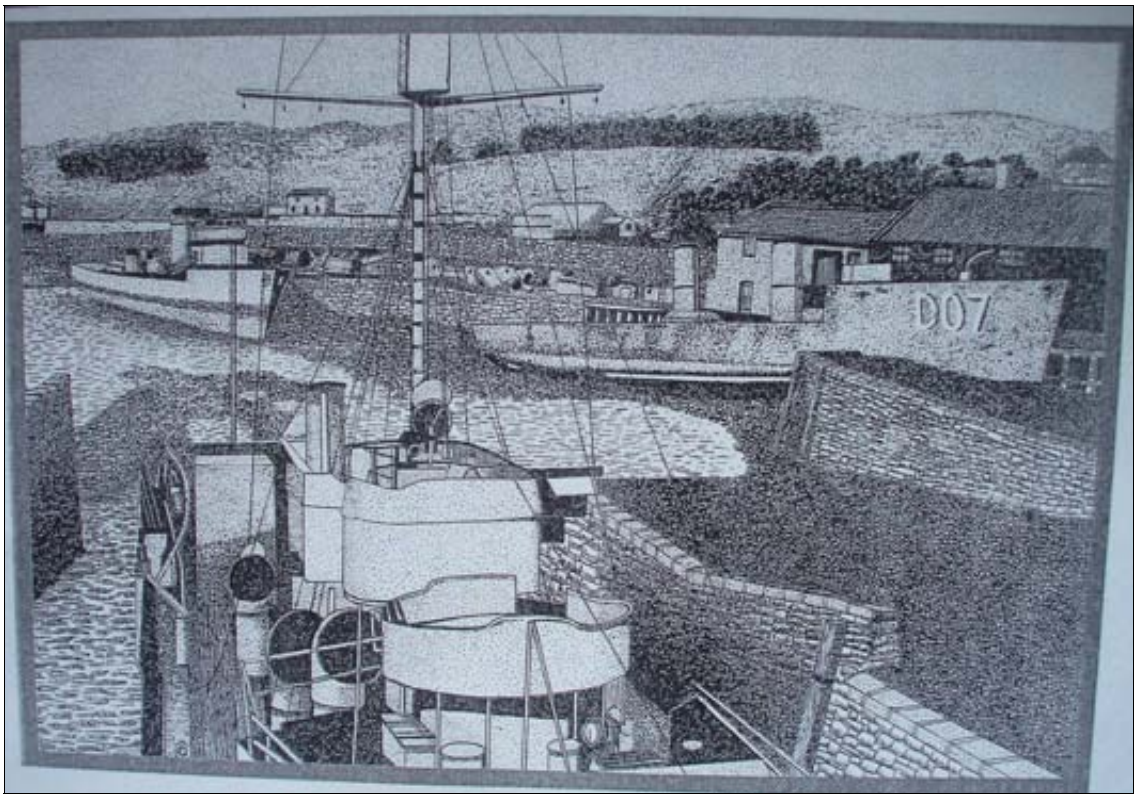
South Quay and Carnsew Channel, c 1920 (Figs 13 and 14)

Taken from the head of the most westerly of three slipways accessing the Carnsew Channel, this photograph (also courtesy of John Browne) shows a number of ships berthed along the quayside together with a large naval vessel with the number D07 pulled up on the slipway closest to South Quay. A cursory search of available naval records suggest that this was the River, or E-class Destroyer HMS Arun which was launched at Birkenhead in 1903 and sold for breaking up in 1920 (www.battleships-cruisers.co.uk/river_class.htm). The interface between stone and timber quayside construction can be seen close to the stern of the ship – it is more clearly visible on a drawing made from the photograph (Fig 14).



South Quay and Carnsew Channel, *c* 1920

(photograph reproduced courtesy of John Browne) Fig 13



South Quay and Carnsew Channel, *c* 1920

(drawing reproduced courtesy of John Browne) Fig 14

A smaller ship lies on the slipway in the foreground of the photograph, and to the right of this an open slip, the middle of the three, is flanked by stone walls.

Hayle Harbour, 1931 (Fig 15)

This oblique aerial shot is taken from the north and shows a large vessel moored at South Quay together with smaller ships pulled up on the three slipways at the head of the Carnsew Channel. The linear block of buildings lines the south-western part of the quayside and goods, or perhaps piles of fuel, occupy the northern end of the wharf. Ships, including what appear to be barges, are also moored on the eastern (Penpol) side of South Quay.

Hayle Harbour, 1931 Fig 15

Hayle Harbour, 1942 (Fig 16)

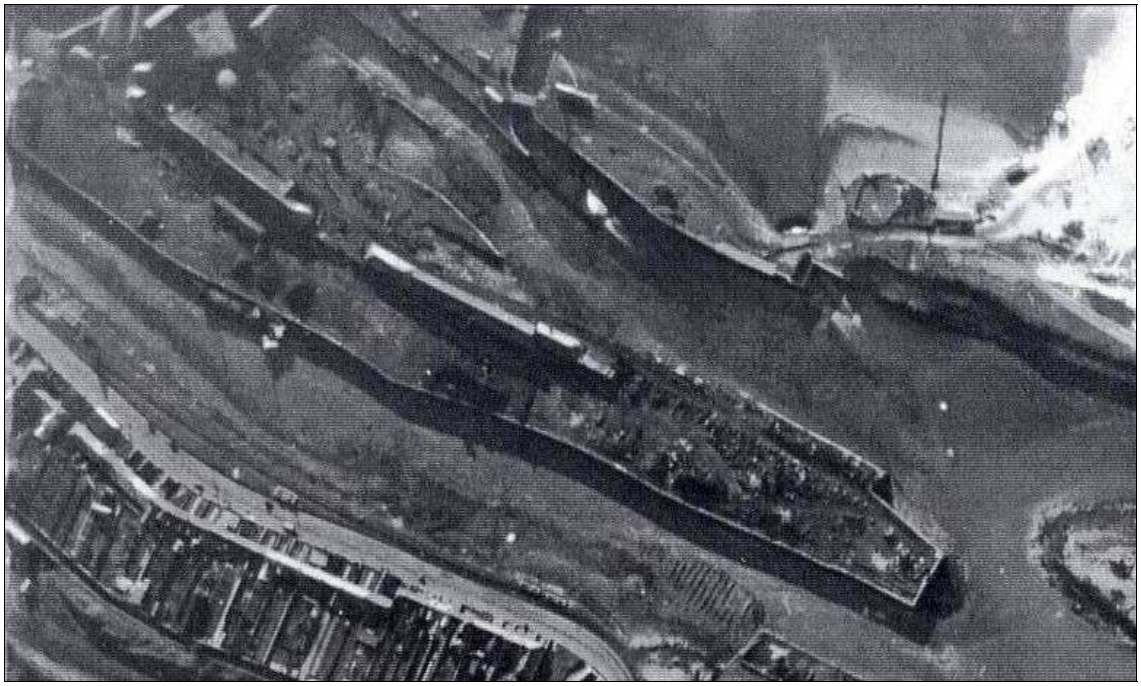
All three slipways are visible on this wartime aerial photograph which was taken at low tide. The harbour is conspicuously free of shipping.

Hayle Harbour, 1946 (Fig 17)

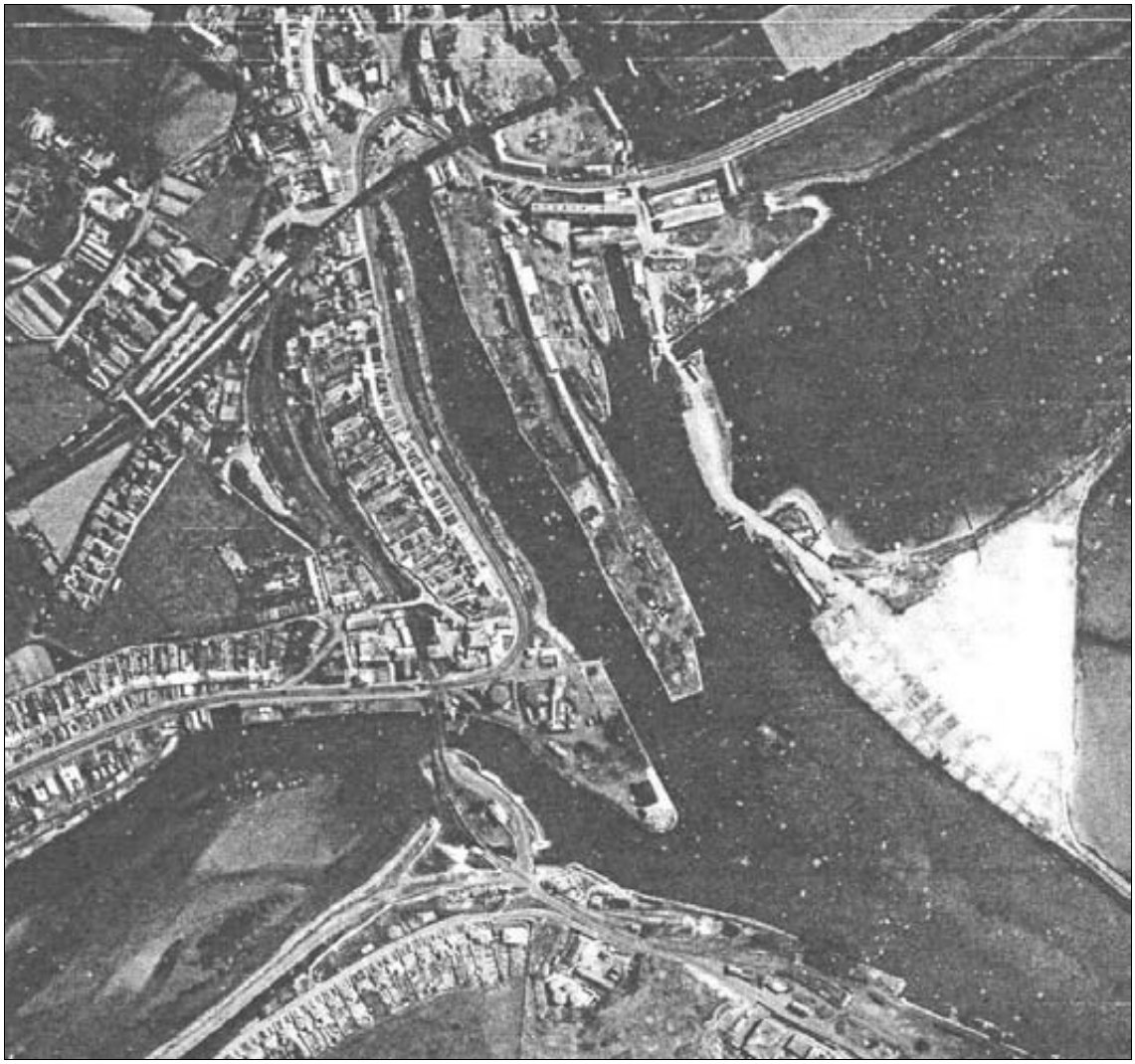
The morphology of South Quay and the neighbouring slipways remain the same on this early post-war aerial photograph. Ships are pulled up on the South Quay slipway and the central slipway.

Hayle Harbour, 1960 (Fig 18)

The South Quay and Carnsew slipways are visible on this aerial photograph taken from an obliquely from the south-east.

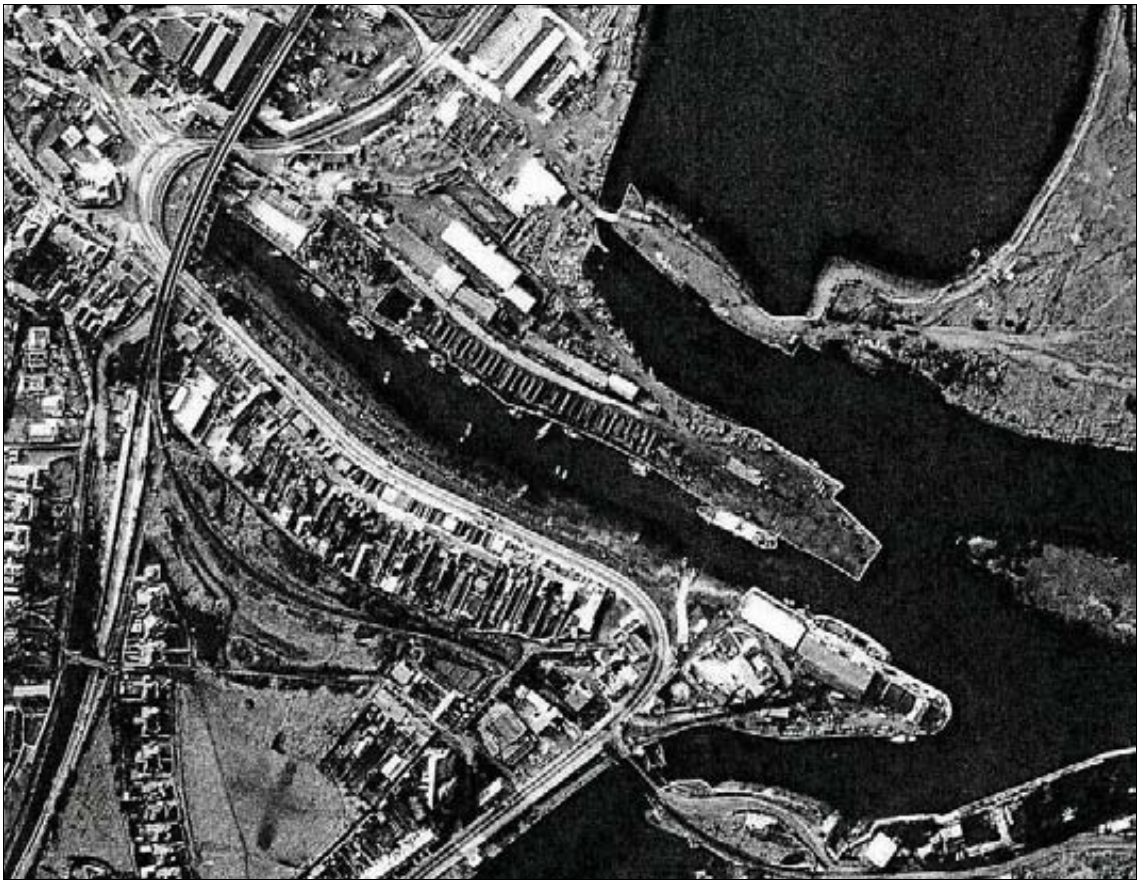


Hayle Harbour, 1942 Fig 16



Hayle Harbour, 1946 Fig 17

Hayle Harbour, 1960 Fig 18



Hayle Harbour, 1968 Fig 19

Hayle Harbour, 1968 (Fig 19)

This is the first image to show the in-filled slipways. The head of the Carnsew Channel, including the two easternmost slipways, has been reclaimed to a point adjacent to the sluice gate in the south-western corner of Carnsew Pool. From here, the edge of the channel has been re-defined on a north-west alignment, meeting the western side of South Quay approximately half way along its length and burying the associated slipway in the process. The linear block of buildings still survives but a new building has been constructed to the west.

3 AIMS AND OBJECTIVES

The approved method statement (NA 2010) defines the aims and objectives of the evaluation as follows:

- To establish the nature and extent of survival of the slipways and quay activity
- To draw together the historical and archaeological information about the site to inform an Environmental Impact Assessment
- To inform how groundworks and foundation design may be designed to mitigate damage to archaeological features
- To inform whether archaeological recording of extant and/or buried remains in required within future development
- To inform whether environmental sampling should be undertaken.

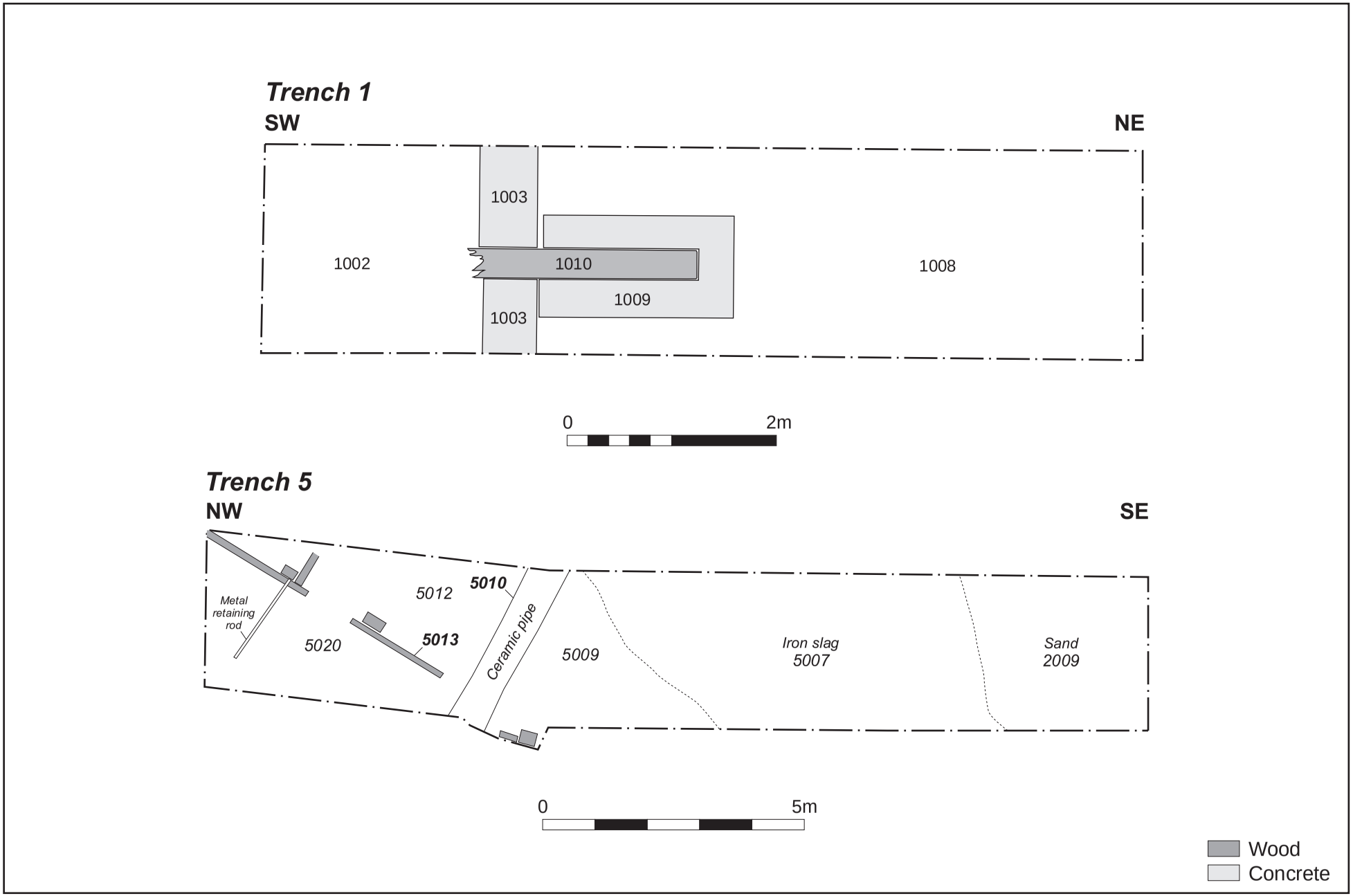
4 METHODOLOGY

Trenches 1-7 were positioned on the ground using a Leica System 1200 GPS (Fig 2 & 9). Trench locations had been approved by Cornwall Council's Historic Environment Planning Advice Officer (HEPAO), prior to the start of the evaluation, targeting key elements of the slipway. Trenches 3 and 4 however had to be moved slightly to avoid on-site constraints – a pile of shattered asbestos sheeting and a large immoveable concrete block respectively.

Overburden, including ubiquitous mounds of fly-tipped building material and soil, was removed with a tracked mechanical digger fitted with a 1.8m-wide toothless ditching bucket. Once the quayside and slipway fabric had been exposed in each trench, the extent of further excavation and recording was determined by the health and safety issues commensurate with the usual depth of excavation and the instability of the loose material through which they were cut. Accordingly, for the most part, trenches could not be entered and cleaning of exposed surfaces, hand excavation and detailed scaled drawings were not practicable (the exceptions being Trenches 4, 5 and 7). Where trenches could not be entered, film and digital photographs, measured sketches, detailed notes and levels related to the Ordnance Datum comprise the record.

Following the completion of the work on each trench they were backfilled with the up-cast material.

Scales 1:50, 1:100



Plans of trenches 1 and 5 Fig 20

5 THE EXCAVATED EVIDENCE

5.1 Trench 1

Trench 1 (8.50m x 1.8m; Fig 2, Fig 20) was aligned north-east to south-west, just south of the point where the existing granite wall of the quayside emerges from the consolidated in-fill material. The top of the wall [1003] was revealed *c* 0.55m below the existing ground level at *c* 4.0mOD (Fig 21). It was constructed from large, rectangular, evenly-coursed granite blocks overlain by a single course of 0.55m-wide concrete blocks – in the same manner as the section of wall to the north (Fig 22). Five courses of the wall were exposed to a depth of *c* 3m before the base of the trench began to flood. The in-fill material (1002) abutting the wall was largely comprised of brick and concrete rubble in a loam matrix. Other debris, including fragments of timber and sections of fishing net and rope, was also present.

Quay wall [1003], Trench 1, looking north-east Fig 21

The upper (concrete) course of the wall had a 0.30m-wide slot built into it housing a timber beam [1010], perhaps part of a former jetty. These slots were also observed at regular intervals along the upper edge of the exposed wall to the north. In the eastern, landward, end of the trench, the beam was tied into a 1mx1.90m rectangular concrete block [1009], set into a thick layer of dark grey ironworking debris and clinker (1008) lying *c* 0.80m below the ground surface (Fig 23). Similar deposits were observed in the landward sections of the other trenches and would appear to be part of the quay construction.

The existing quay wall north of Trench 1, looking north Fig 22

Timber beam [1010] tied into concrete base [1009] and passing through quay wall, Trench 1, looking west Fig 23

In Trench 1 this layer (together with the concrete block) was sealed by a 0.25m-thick deposit of reddish brown metalworking slag (1007) and further layers of made ground (1005/1006) culminating in a surface deposit of imported loose grey topsoil and building debris (1001).

5.2 Trench 2

Trench 2 (7m x 1.8m; Fig 2) was aligned north-east to south-west locate the quayside to the south of Trench 1. Here the top of the quayside wall [2004] was located at *c* 3.90mOD, *c* 1.5m below the level of the local ground level (which hereabouts comprised of fly-tipped 'mound' material). As observed in Trench 1, the upper course of the wall comprised of concrete blocks (Fig 24). These overlay a wall of more irregular-shaped, unevenly coursed granite blocks similar in appearance the quayside wall visible on the western side of the Carnsew Channel (Fig 25). They appeared to be bonded with a loose lime mortar.

Quay wall [2004], Trench 2, looking east Fig 24

The slots in the upper (concrete) course of the wall were also present here and, in the northern edge of the trench, an *in situ* timber beam [2005] could be seen projecting *c* 1m out from the face of the wall towards a substantial vertical post [2006] (Fig 26). The physical relationship between these two timbers, however, could not be ascertained.

The seaward face of the wall was exposed to a depth of *c* 2.50m where deposits of dark grey sandy mud (2008) were brought out in the machine bucket. This was overlain by the bulk in-fill deposit (2002), building debris and loam together with a large quantity of small ceramic tubes which are thought to be kiln furniture - this also lay to a depth of *c* 0.20m over the top of the wall.

Granite construction of Carnsew Quay, looking west Fig 25

Timber structure [2005/2006] built into quay wall, Trench 2, looking north-east Fig 26

Excavation in the eastern end of the trench ceased at a layer of compacted dark grey ashy/clinker (2008) which was overlain by a 0.20m-thick layer of crushed brick and concrete (2002) – perhaps a hardstanding post-dating the in-filling of the quay. This lay at *c* 4.45mOD and was overlain by up to 1m of fly-tipped mound material (2001) comprising building material and loam.

5.3 Trench 3

Trench 3 (7m x 1.8m; Fig 2) was aligned north-east to south-west to locate the quayside to the south of Trench 2. Its surveyed position lay 6m south-east of its pre-agreed location due to the presence of a pile of shattered asbestos sheeting. A timber revetment, rather than a stone wall, was duly located (Fig 27) *c* 0.90m below the existing ground level (4.10mOD), thus corroborating the evidence of photographs taken prior to the in-filling of the quay and slipway (Figs 12-13). The revetment was built using 70mm-thick timber planks retained behind vertical (pine?) posts, spaced at *c* 1.60m intervals and braced by cross-beams. The revetment was at least 4m deep and extended downwards, beyond the reach of the mechanical digger, into charcoal grey, gritty sand (3003). It was abutted by the in-fill of the quay, which here comprised concrete, bricks, granite blocks and miscellaneous detritus (3002).

Timber revetment [3004], Trench 3, looking east Fig 27

On the quayside itself a pale yellow sand (3008) was present *c* 1.10m beneath the present ground level. This was overlain by a 0.15m-thick layer of iron slag (3007) and 0.10m of clinker (3006), presumably used to consolidate the surface of the quayside. These were sealed beneath a 0.60m-thick deposit of rubble (3004), similar to the quay in-fill which, in turn, was overlain by a thin topsoil (3001) whose surface lay at *c*

4.90mOD.

5.4 Trench 4

Trench 4 (10m x 1.8m; Fig 2, 28) was aligned north-north-west to south-south-east to locate the south-eastern corner of the slipway. Its surveyed position reflects a repositioning 1.5m to the west of the pre-agreed location to avoid an immoveable concrete block. Quay walls or timbers were not located in this trench, despite its northern end being extended by 5.5m.

A layer of pale yellow sand (4005), similar to that identified in Trench 3 lay 1.30-1.40m below the current ground surface. In the centre of the trench it was overlain by a 60mm-thick layer of compacted iron slag (4003), again similar to the quayside stratigraphy observed in Trench 3. This layer, however, could conceivably have been the truncated surface of the slipway – if so, the projection for its timber revetment would lie to the east rather than the west (Fig 2).

A deposit of made-ground overlay this, typically 1.0m deep and comprising building rubble and loam (4002). A number of modern drains, an iron service duct and concrete foundation beams cut into this layer; probable remnants of industrial buildings that occupied the site in the post-war years.

The ground surface at the southern end of the trench was a 0.12m thick layer of tarmac hardstanding (4001) lying at 4.75mOD. At the northern end of the trench this gave way to topsoil.

Trench 4, looking south-east Fig 28

5.5 Trench 5

Trench 5 (18m x 1.8m; Fig 2, Fig 20) was aligned north-west to south-east to locate the south-western corner of the slipway. The top of a 6.5m-long section of timber revetment [5013] was aligned north-west to south-east in the northern end of the trench *c* 0.50m below the existing ground level (*c* 4.70mOD) (Fig 29). It was constructed in the same manner as that observed in Trench 3, however here, an iron tie-rod was connected to the back of one of the upright posts, presumably securing it to a stay located somewhere beyond the north-western corner of the trench. Abutting the post and extending into the slipway, was a timber plank whose function remains obscure. It may have been used to retain loose material during the in-filling process or be part of the shipbuilding scaffolding depicted on early photographs (Fig 12). To the south of this, the revetment was cut by a substantial service trench containing a ceramic drain.

Slipway timbers [5013] (foreground) and compacted iron-slag slip (5007), Trench 5, looking south-east Fig 29

Within the slipway the deeper parts of the trench exposed clean yellow sand (5009). Above this the base of the slipway was compacted iron slag (5007) overlying clay and siltstone (5008) (Fig 29, background). Typically only 60mm deep, the slag exhibited a marked north-west slope, falling 0.30m within the southern part of the trench (from 3.65-3.35mOD). At the southern end of the trench the sequence of slipway in-fill was evident; a 0.15m-thick later of loose slag and clinker (5006) was overlain by a 0.20m-thick layer of loam and building debris (5005) sealed by another thin deposit of clinker (5004). This was overlain with a 0.35m-thick layer of demolition rubble (5003) sealed by a formation layer of re-deposited natural clay and siltstone (5002) used to bed the existing tarmac surface of the quay (5001) which lay at *c* 4.70mOD.

The stratigraphy exposed in the north-west corner of the trench, beyond the slipway, comprised clean yellow sand (5020) overlain by very dark grey ashy sand (5019), re-deposited clay and siltstone (5018), loam and clinker (5016/17), crushed stone (5015) and topsoil (5014).

5.6 Trench 6

Trench 6 (25m x 1.8m; Fig 2) was aligned east north-east to west south-west across the projected width of the slipway to locate both of its sides and search for evidence of an apocryphal ship, buried within the in-fill. Timber quayside revetments [6004] and [6011] were duly revealed towards the west and east ends of the trench respectively (Figs 30-32) at depths of as little as 0.40m below the existing ground surface (at *c* 4.30mOD). They defined a slipway of some 14.80m width.

Timber revetment [6004], west side of slipway, Trench 6, looking north-west Fig 30

The revetments were constructed in the same manner as those observed in Trenches 3 and 5, and, as in the latter trench, an iron tie-rod (6014) was connected to one of the upright posts on the eastern side of the slipway (Fig 33). The base of the slipway appeared, as in Trench 5, to be formed from compacted iron slag (6006) (Fig 32; foreground). Here it survived *c* 2m below the top of the timber revetment at 2.40mOD, over a *c* 1m-deep deposit of clean pale yellow sand (6007). Below the sand were black silts (6013).

Timber revetment [6011], east side of slipway and compacted iron-slag slip (6006; foreground), Trench 6, looking south-east Fig 31

View of Trench 6, showing timbers and collapsed edges, looking east Fig 32

Iron tie-rod (6014), Trench 6 (east), looking north Fig 33

The quay in-fill hereabouts comprised brick rubble and the occasional cinder block suspended in a matrix of loam and yellow brown clay (6005). This was sealed by layers of crushed stone (6003) and road stone (6002), perhaps forming an earlier ground surface now buried beneath a *c* 0.40m-deep deposit of sandy soil (6001) whose surface lay at *c* 4.70-5.10mOD.

At the west end of the trench, a concrete beam [6012] aligned north-west to south-east was originally thought to be part of the neighbouring slipway wall but, upon investigation, was found to be only 0.10m deep. At the eastern end of the trench, to the east of the timber revetment, a layer of clean yellow sand (6010) was revealed *c* 1.20m below the existing ground level. This was overlain with a 0.40m-thick layer of crushed granite (6009) and *c* 0.80m of soil (6001).

5.7 Trench 7

Trench 7 (18m x 1.8m; Figs 2 and 34) was aligned north to south towards the south of the proposed development area and located to intercept the south-east corner of the middle slipway. The trench was excavated to a depth of up to 1.30m deep without encountering walls or revetments.

At the southern end of the trench the top of a deposit of mottled yellow/blue/brown clay and stone (7010), possibly an outcrop of *in situ* geology, was revealed 1.30m below the modern ground surface at *c* 3.40mOD (Fig 35). This was overlain by a series of layers of industrial debris commencing with a 0.10m-thick layer of compacted clinker (7009). Above lay another compact layer of stone, clinker and slag (7008), a lens of fine ash and charcoal (7007) and an orange-brown deposit of slag and stone (7005) sandwiched between fine layers of ash and clinker (7006) and (7004). Sealing this was a re-

Modern concrete bases and foundations in Trench 7, looking north-east Fig 34

Quay formation layers and modern overburden, Trench 7, looking west Fig 35

deposited geology layer (7003) similar to (7010). Crushed stone (7002) underlay the soil surface (7001) on the western side of the trench and a concrete hardstanding (7011) on the east (at *c* 4.8mOD).

The middle and northern portion of the trench was largely occupied by large concrete machine bases, most probably associated with the modern buildings constructed hereabouts in the 1960s (Fig 19, Fig 34; foreground).

6 CONCLUSIONS

A combination of desk-based assessment and trial trench evaluation has been used to establish, with some degree of accuracy, the character and extent of the quaysides and slipways lying within the proposed development area. Particularly informative results were achieved in fulfilment of the principal aim of the fieldwork: to locate and characterise the walls buried beneath the modern in-fill along the western edge of South Quay.

Cartographic and documentary evidence indicates that South Quay was constructed in the period 1817-1818 by Harvey and Co and that three slipways were eventually located at the head of the Carnsew Channel. The most westerly of these, alongside South Quay, was constructed at a relatively late date, first appearing on Ordnance Survey maps of 1907/8. Some debate exists as to whether this slipway was temporarily in-filled as it is not depicted on the Ordnance Survey map of 1936 (Fig 10) but is clearly rendered on that of 1938 (Fig 11) as well as appearing on photographs of the 1940s and 1960s (Figs 16-18). Whilst the evidence for this temporary in-filling remains equivocal, the slipway had definitely been permanently buried by 1968 (Fig 19).

Trenches 1-6 of the evaluation successfully located elements of the buried quayside and slipway, demonstrating that while its northern reaches were constructed in granite ashlar similar to the exposed fabric at the very end of the South Quay (observed in Trenches 1 and 2), a timber revetment was used further to the south (the change occurring somewhere between Trenches 2 and 3; see Fig 2). This change from granite blocks to less expensive timber probably reflects Harvey and Co's weakened financial position when the 'new' slipway was inserted in the first decade of the 20th century.

This timberwork observed in Trenches 3, 5 and 6, and clearly depicted on photographs of the early 19th century (Figs 12-14), comprised planks retained by vertical posts, braced with cross timbers and tied into the quayside with iron rods. In Trench 6 both sides of the *c* 15m-wide slipway were located together with a base comprised of compacted iron slag. The western side of the slipway was also located in Trench 5, together with an area of its base. The eastern revetment, however, was not located and, based on the excavated evidence, could exist either side of Trench 4 (Fig 2).

The material used to in-fill the channel and former slipway, deposited post-1960, largely comprised brick and concrete building rubble, probably deriving from the demolition of nearby industrial buildings. Of the apocryphal ship buried in the slipway, there was no trace. Local residents claim it lies to the south-west of the proposed development, in the former slipway beneath Jewson's builder's yard.

The southernmost trench, Trench 7, was located to evaluate the projected south-east corner of the middle slipway whose defining walls were, on the basis of photographic evidence, constructed in stone (Figs 13 and 14). The walls, however, were not present; instead concrete beams and probable machine bases were found which relate to industrial buildings built of the 1960s (Fig 19). As such the slipway fabric, if it survives, would appear to lie a short distance to the west of the trench.

For the most part the trenches were positioned too close to the edge of the quayside to pick up the buildings depicted by the historic maps of the period (Figs 6-11). Evidence for the construction of the quayside itself was, however, revealed in each of the trenches; clean sand was consistently observed at depth and the surface of the quay constructed over layers of clinker, slag, ash and stone.

The slipways adjacent to Carnsew Dock are part of a large number of slipways around Hayle Harbour including those at Coppertown and North Quay. These slipways were an essential part of a busy port and they supported the trading and fishing fleets that used the harbour. Whilst the wider mining landscape is a designated World Heritage Site, and the importance of transport is recognised in that designation, the shipbuilding industry is not included as an integral associated industry and the slipways' importance is more by association with the WHS than as a specific part of it.

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