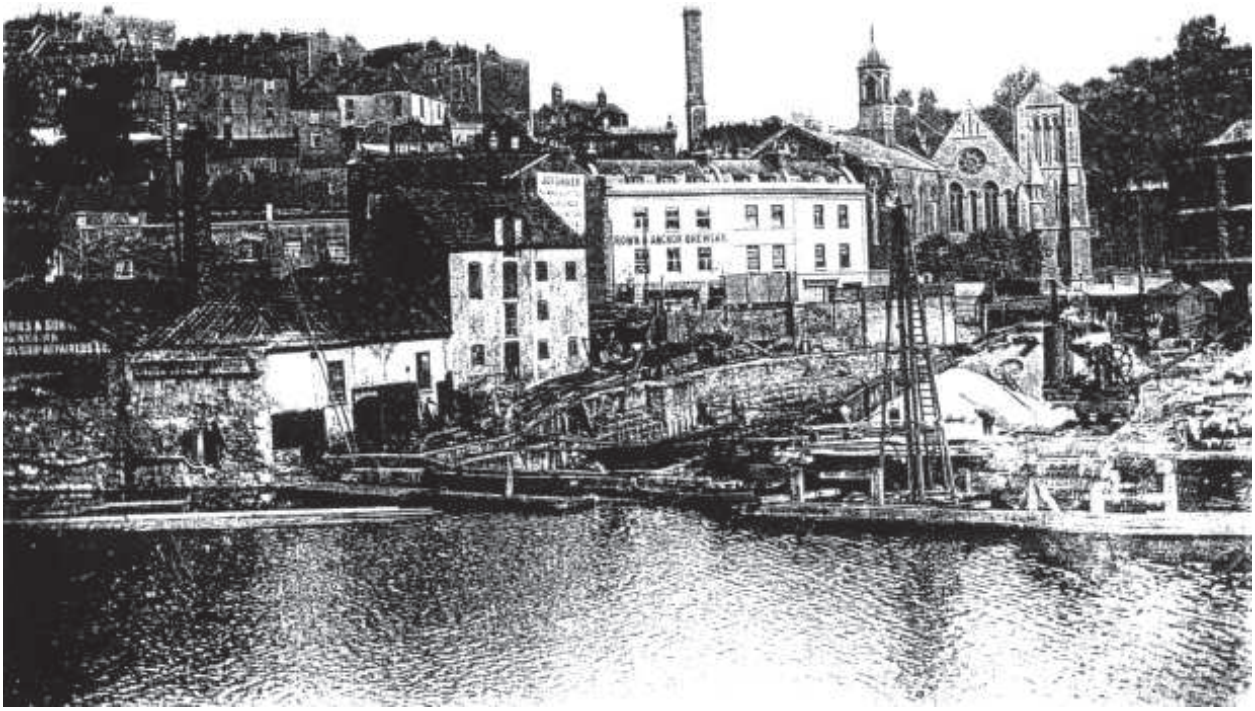

Plate 1 Photograph taken during the infilling of Limekiln Dock, 1903-1906, looking north
York Collection, Bristol City Museum and Art Gallery

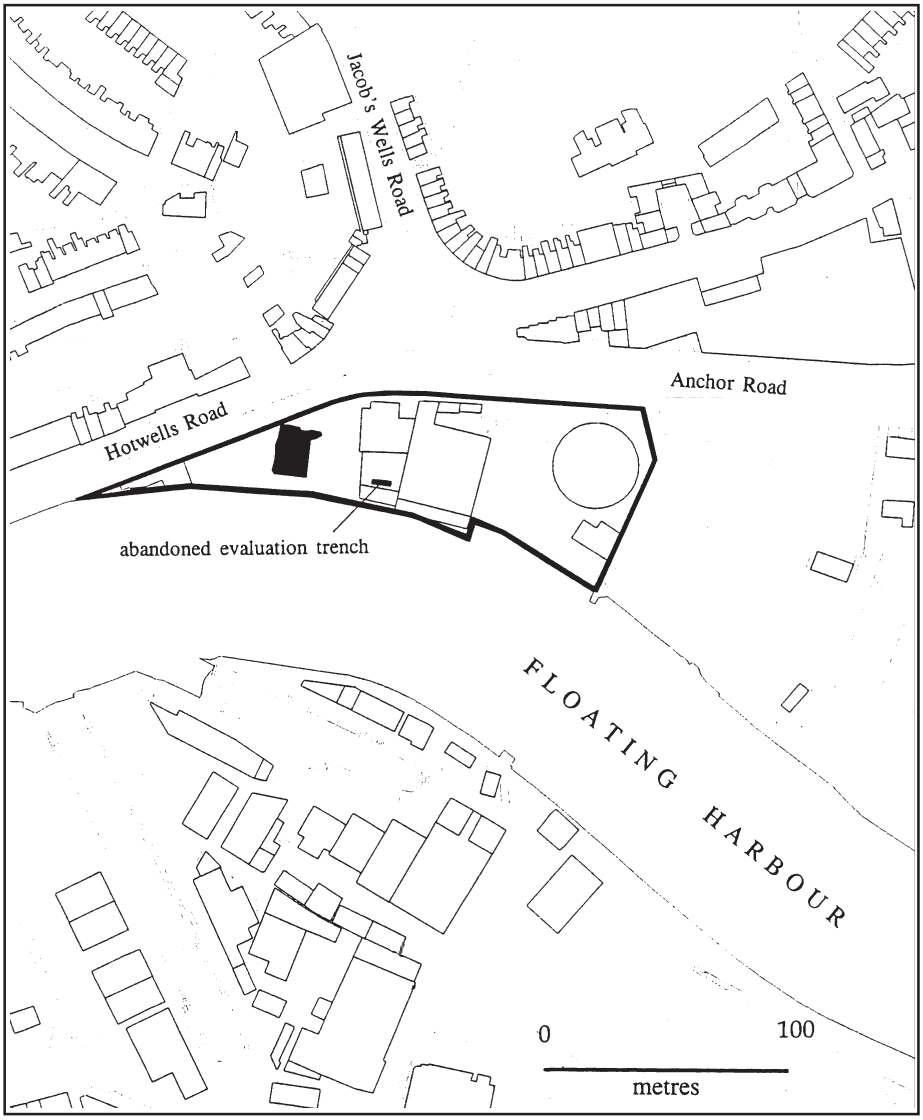

Fig 1 Site location, with excavation area blocked in. Site A1 outlined

Excavations at the Site of the Former Limekiln Dock, Hotwells Road, Harbourside, Bristol

Simon Cox and others

Introduction

An archaeological excavation of Site A1, Harbourside, Bristol (ST 57832 72537) (Fig 1) was undertaken by Bristol and Region Archaeological Services (BaRAS) at the request of Beaufort Western Ltd. This followed a desktop study and evaluation of the archaeological potential of the site, and forms part of a broad scheme of archaeological documentary research and fieldwork complementing the redevelopment of the Harbourside/Canon's Marsh area.

Until late 1998 the site was occupied by Graham's Timber Yard on the western side, formerly the site of a dry dock, Limekiln Dock, and on the eastern side by the remains of the Gas Ferry Lane gas works, formerly the site of a glasshouse.The site covers a triangular area of land (approximately 14,400 square metres) at the extreme western end of Canon's Marsh, Bristol, adjacent to the junction between Hotwells Road, Jacobs Wells Road and Anchor Road (Fig 1).The site is bordered to the north by the roundabout junction of Jacob's Wells and Hotwells Road, south by the Floating Harbour and east by Gas Ferry Lane. The site lies at approximately 10 m above Ordnance Datum (OD). The immediate underlying geology is Estuarine Alluvium overlying Carboniferous mudstone with coal bands and pale grey quartzitic sandstone.

The brief for the excavation was to expose and record the layout of the eastern side of the Limekiln Dock, and the adjacent dockside buildings identified by the desktop study as a mill and engine house.The work was undertaken between 5 January and 28 February 1999 by Bristol and Region Archaeological Services. Thanks are extended to the site staff Andrew King, Ally Kennen and Jens Samuel.The historical background was contributed by Peter Insole. The illustrations were produced by Davina Ware and Ann Linge.

The site archive is deposited at Bristol City Museum under accession number CMAG.1998.012.

Methodology

To expose the archaeology, the tarmacadam, concrete surfaces and overburden were removed by mechanical excavator. The archaeological features were subsequently cleaned by hand, recorded and levelled relative to Ordnance Survey datum. An evaluation trench to test for the survival of the glass works complex, located adjacent to the Brandon Shed, was abandoned owing to the hazardous nature of the made ground around the gas works. The trench had exposed a concrete surface at around 8m OD.

Historical Backgorund

The site formerly lay on the boundary of the new county of Bristol as defined in 1373, the eastern half within the city parish of St. Augustine's, the western half within the Clifton parish which was absorbed by the city in 1835. The boundary to the city and parishes in the medieval period followed the course of Woodwells Stream that flowed down Brandon Hill approximately where Jacobs Wells Road is today.

During the medieval period the site and the surrounding area would have been wet low lying land at the western end of St. Augustine's Marsh, otherwise known as Canon's Marsh, so called because the area formed part of the estate of St. Augustine's Abbey (now Bristol Cathedral). The study area would, at this time, have stood on the River Avon approximately 1km to the west of the medieval docks.

The Glasshouse Complex

During the 17th century the area of the site to the east of the parish boundary appears to have been developed for industrial purposes. A map dated 1693 by Captain Greenville Collins shows a glasshouse and several structures called limekilns in the vicinity of the site. The date of the glasshouse and limekilns is not known. An earlier map by Jacobus Millerd in 1673 does not extend far enough west to show the site but a perspective view by Millerd of the same date shows a large factory-like structure in the approximate area of the glasshouse shown on Collins' map.

Rocque's map of 1742 marks the position of the glasshouse with an adjoining building to the east and other buildings to the north and west (Fig 2). A survey of Canon's Marsh by James Hartley for the Dean and Chapter of Bristol Cathedral dated 1770 shows the same buildings as Rocque's map and lists them as offices of the Glasshouse, with the area between the glasshouse and the office to the north being used for coal and bottle yards. The largest building to the west

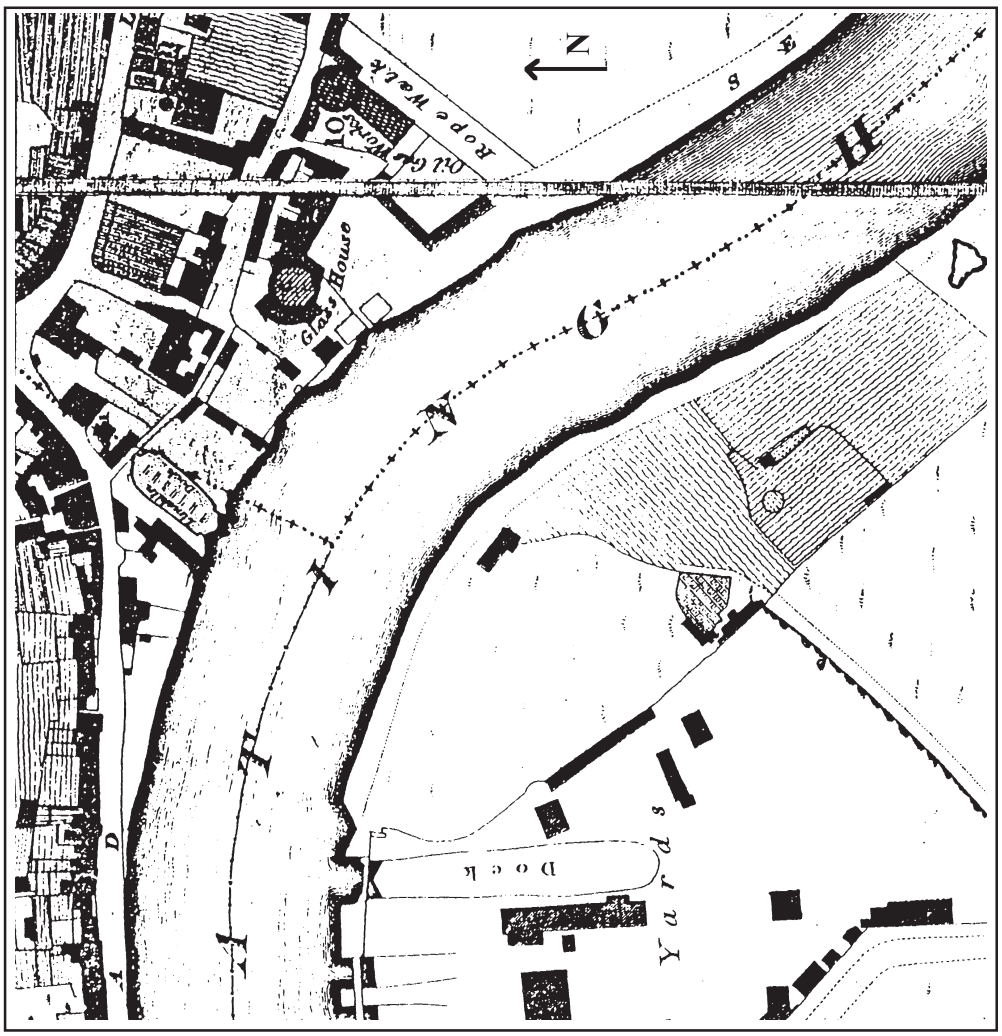

Fig 3 Plumley and Ashmead's 1828 map

Fig 2 Rocque's 1742 map

is recorded as being '*Glass House Offices and court*'. A limekiln is also shown on this 1770 survey towards the south eastern corner of the site. The area of the glasshouse complex is listed by the survey as being leased from the Dean and Chapter by John Nicholas.

Plumley and Ashmead's map of 1828 shows the glasshouse and similar surrounding buildings as the 18th century maps (Fig 3).

The glasshouse and associated offices survived until 1837 when the gas works to the east of Gas Ferry Lane were extended west, a gas tank being built over the area of the glass cone. A former engine house, retort house (both Grade II listed buildings) and a brick chimney survive from the gas works.

The Area of the Limekiln Dock

To the west of the glasshouse a mud-dock is said to have been formed from the pill where the Wood-Wells and Jacob-Wells streams flowed into the river. This mud-dock is reputed to date to 1626 although no primary evidence could be found to support this date. Neither Millerd's perspective view of 1673 nor Collin's map of 1693 mark a dock in the area of the site.

In 1676 the area of the site within the Clifton parish was purchased by the Society of Merchant Venturers. The earliest reference to Limekiln Dock is in a lease from the society to a shipwright, John Evans, held in the Society of Merchant Venturers archives. This document dated 11 October 1710 records the lease of:

> *'a house lately built by the said John Evans....and also all that piece of void ground on part whereof a dock lately made by him the said John Evans being near to the said messuage of tenement in the said parish of Clifton'.*

This document suggests that the Limekiln Dock dates to the early 18th century and was built by the shipwright John Evans. It is possible that a mud-dock pre-existed John Evans' construction and that the document is referring to the creation of a dry dock on the site. Rocque's map of 1742 marks the position of a dry dock on the site (Fig 2), and shows the parish boundary immediately to the east of the dock and two buildings, one to the north, the other to the west. Either of these structures could be the house built by John Evans.

Further records of leases held by the Society of Merchant Venturers record other owners through the 18th century. In 1712 the house and dock were leased to Edward Blandy and then in 1721 there was an assignment by John Blandy, presumably Edward's son, of the house and dock to Captain Joseph Osborne, a mariner. In 1780 the lease was taken over by Jeremiah Osborne, Joseph's son. A plan dated 1792 (Fig 4) by Benjamin Donne showing Richard Tombs' proposals for a Floating Harbour shows the Limekiln Dock but calls it Mr. Osbourn's Dock.

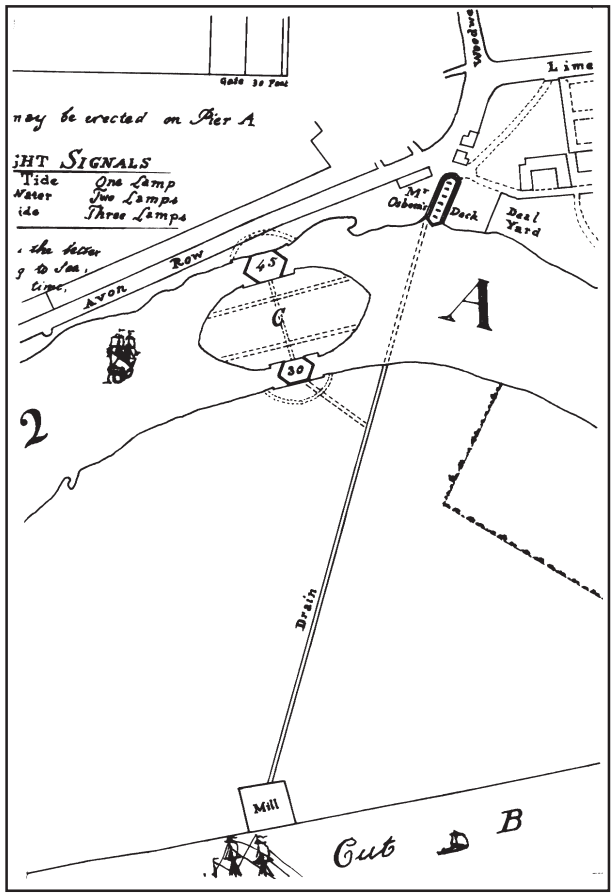

Fig 4 Tombs' 1792 proposal for a new floating harbour

A similar map of Jessop's original proposals for a Floating Harbour, dated 1802, calls the dock '*Osborne's Dock*' (Fig 5). From this plan we can see how small the Limekiln Dock is, compared to most of the other dry docks in the harbour at that time.

Despite being called '*Osborne's Dock*' in 1802 the lease of the house and dock had changed from the Osborne family to John Roach in 1794. Then in 1798 '*the Limekiln Dock, house and premises*' were leased to Robert Bush.

When the Floating Harbour was completed in 1809 the dock was being leased to Hilhouse and Company, one of Bristol's most prestigious ship building companies, who sought compensation for the fact that Limekiln Dock could no longer be used as a dry dock. However, reconstruction allowed it to continue as a dry dock through the 19th century.

Joseph Matthew's map of 1815 and Benjamin Donne's map of 1826 both show the dock. However,

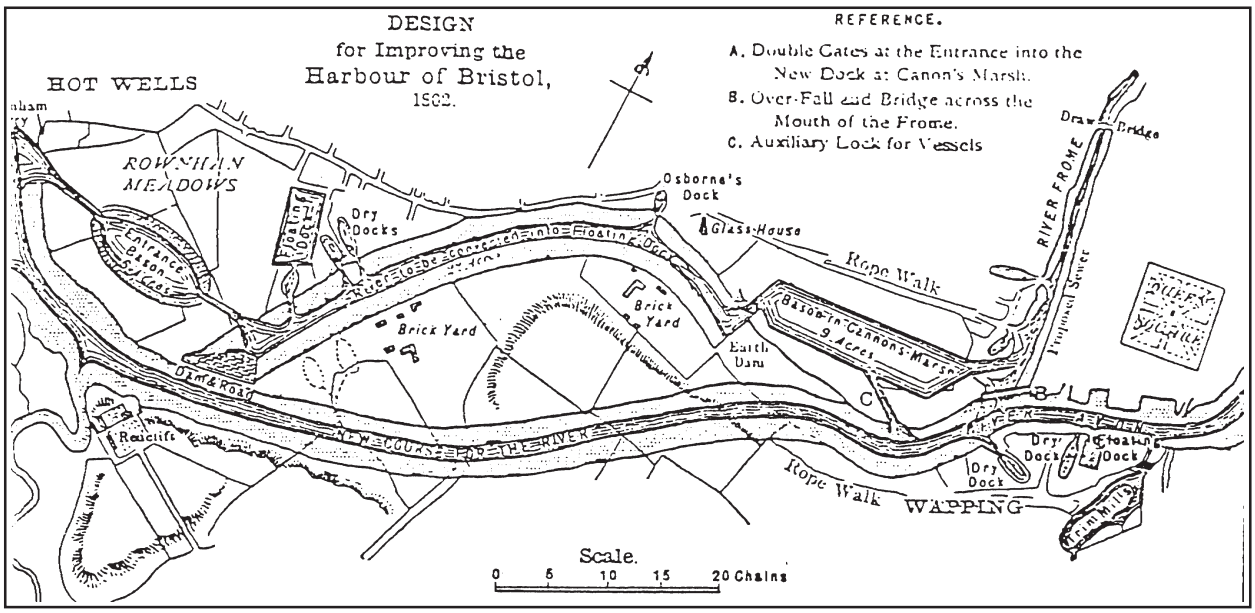

Fig 5 Jessop's original 1802 floating harbour proposal

Plate 2 O'Neill's 1822 view of the Limekiln Dock from the south
Braikenridge Collection, Bristol City Museum and Art Gallery

Plate 3 Rowbotham's 1826 watercolour view from the south
Brakenridge Collection, Bristol City Museum and Art Gallery

neither gives much detail of any surrounding structures, although Donne's plan does mark a coal yard to the west of the dock. A drawing by O'Neill (1822, Plate 2), and a watercolour by Rowbotham (1826, Plate 3), both depict two buildings to the west of the dock.

Plumley and Ashmead's plan of 1828 (Fig 3) shows several structures around the dock. The buildings to the extreme west of the site are probably associated with the coal yard shown on Donne's plan. A later plan of 1852 within the lease documents for the Limekiln Dock, when the Society of Merchant Venturers leased the property to Mr. Charles Hill, refers to these buildings as an Engine and Boiler house, Steam Kiln and '*Old Mill*' (Fig 6), also referred to as a 'Grist Mill'. The schedule refers to the:

> '*Steaming Kiln for bending plank, consisting of a square tube of American Pine bout 30 feet long and 2 feet square in the clear, with framing and binding of the ordinary construction, and a boiler and fire place for generating and conveying steam.*'

The plan shows the positions of the parish boundary markers between Clifton and St. Augustine's parishes.

Also contained in the documents are a letter and plan dated 1857 regarding the enlargement of the dock northwards towards the road (also Fig 6). The plan shows three buildings to the east of the dock on land held by the Cathedral but also leased to Charles Hill. These three buildings are shown on Plumley and Ashmead's map (Fig 3) and are from north to south; a cottage with garden, a warehouse and offices with saw-pits underneath and a smith's shop, nearest the harbour. It also indicates that the 'Old Mill' and engine house had been converted into one large warehouse, the former engine house containing a steam engine and pumps. To the north of the mill are the 'Pitch Pots'. All these buildings both east and west of the dock are indicative of an active dockyard. It is unlikely that Charles Hill ever extended the dock, so that it remained too small to accommodate the majority of 19th century ships.

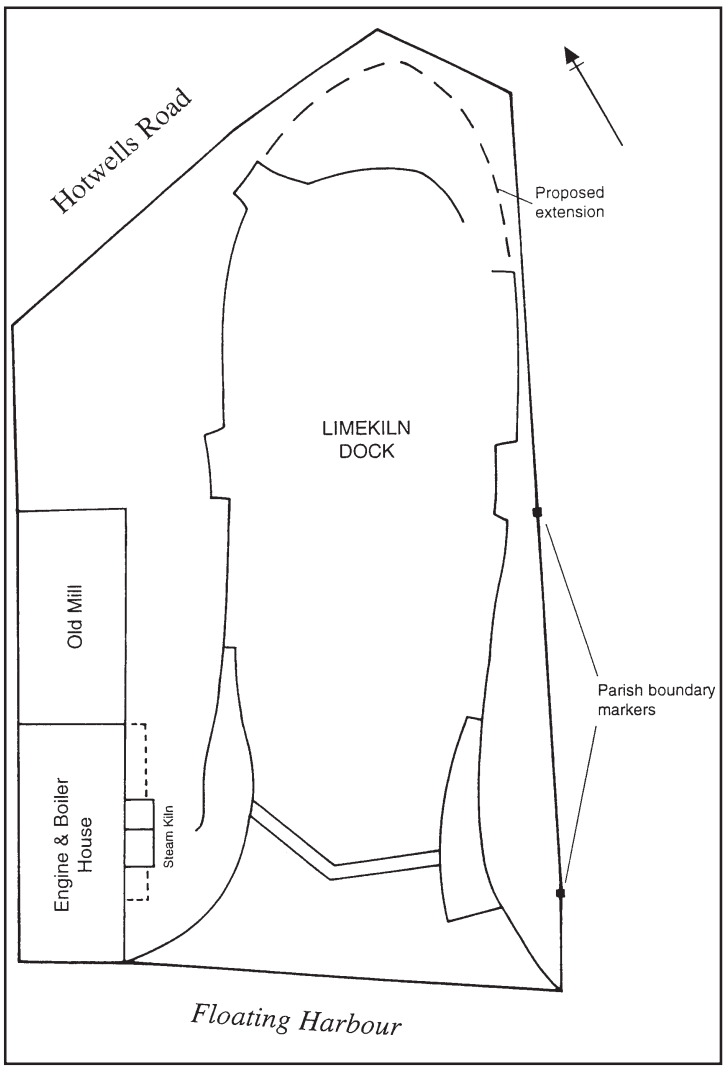

Fig 6 1852 plan of Limekiln Dock showing Charles Hill's 1857 proposed extension

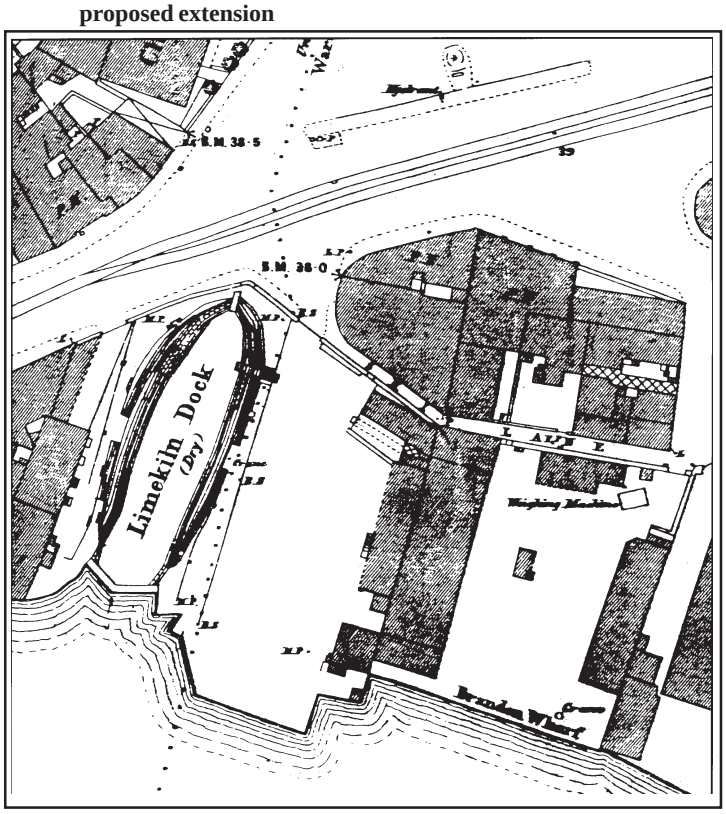

Fig 7 First edition OS map of 1883 showing the larger dock

This meant that, through lack of work, by the 1870s the gates were unworkable and dockyard activities ceased on the site for approximately ten years.

In 1882 Jefferies took over the dock, enlarged it, and fitted a new steel caisson. The first edition 25in OS map of 1883 (Fig 7) shows the larger dock and the same dockside buildings as Plumley and Ashmead's map. The 1883 OS map also shows the New Quay Iron Works, also owned by Jefferies & Sons, to the west of the dockyard buildings in the place of the coal yard, originally shown on Donne's plan.

In 1893 the dock was further lengthened towards Hotwells Road to the extent that:

> *'...the stem of a steamer could (within a foot) touch the inner edge of the street pavement, and the bow of a sailing vessel would overhang the pavement...horse-drawn tramcars had often been held-up until the jibboom had been released and hoisted up or the vessel drawn back against the caisson, before being able to pass.'*

An 1887 lithograph by Lavars, on display in Bristol Museum, depicts a perspective view of the Floating Harbour from the south, with a two masted sailing vessel in the dry dock as well as the dockside buildings. These buildings include a large double gabled building with a verandah on the east side of the dock, probably the cottage shown on the 1857 plan, and the building along the north east street frontage on Plumley and Ashmead's map and the 1883 OS map. In the early 20th century the Merchant Venturers sold the dock to the Great Western Railway company for £5,000 so that the Harbour Railway could be extended. This necessitated the infilling of the dock which took place between 1903-1906. A painting in Bristol Industrial Museum (Plate 4), dated 6 January 1903, shows a Russian Barquantine, the *Ines*, under repair in the dry dock. Clearly this remained an active dockyard right up until the extension of the Harbour Railway. A photograph taken from southern side of the harbour, during the infilling of the dock, shows the buildings to the west of the dock - the 'Old Mill' and the engine house - still standing (Plate 1). The roof tiles of the engine house are being carefully removed and stockpiled on the dockside, whilst the 'Steam Kiln' may be under demolition outside the engine house.

With the infilling of the dock a wharf was constructed along the harbourside that was the first example in Bristol of Mouchel-Hennebique reinforced concrete construction. The concrete plinth and supports that formed the wharf still survived at the time of the excavation and the entrance to the dock was still visible beneath the plinth.

After the construction of the Harbour Railway extension the area of the Limekiln Dock became a timber yard, remaining as such until late 1998.

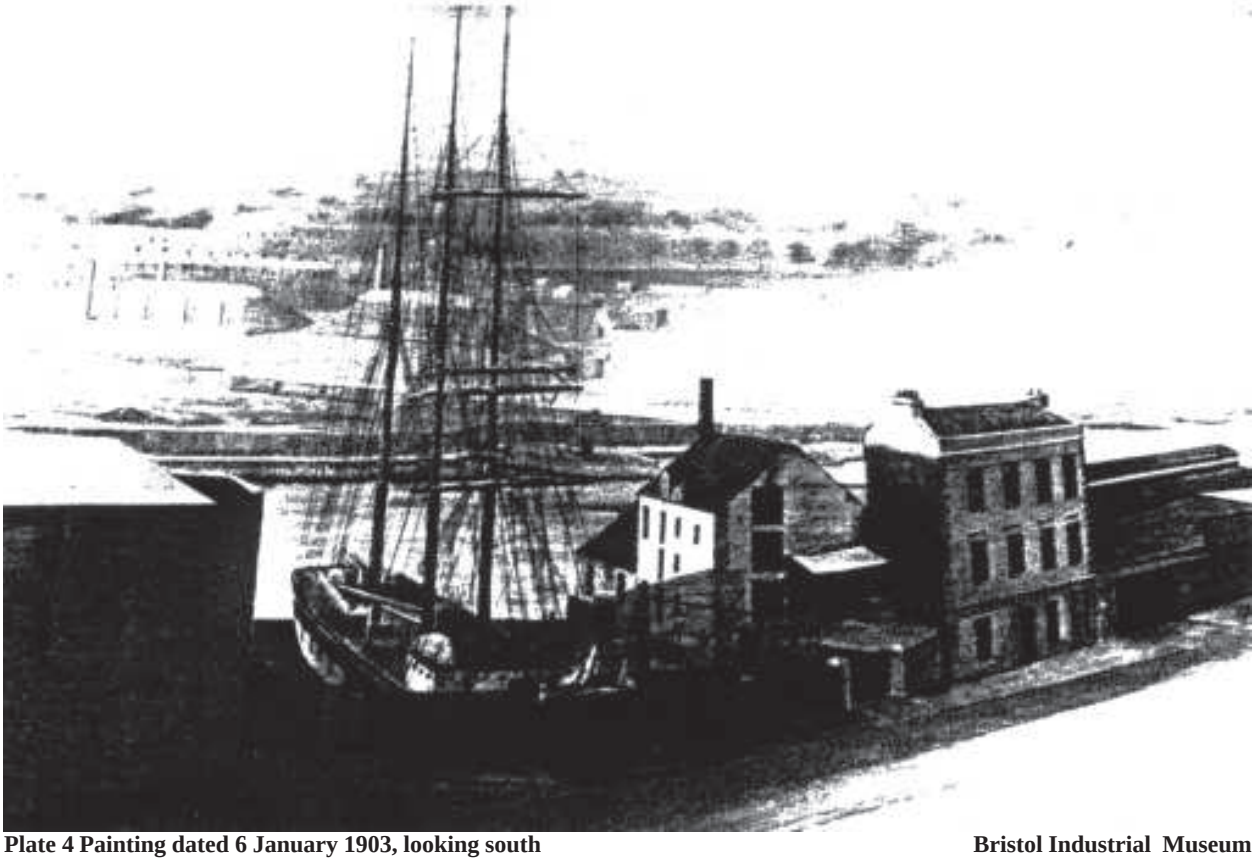

Plate 4 Painting dated 6 January 1903, looking south **Bristol Industrial Museum**

Archaeological Background

No archaeological fieldwork has taken place in the immediate vicinity of the site. However, similar dockside areas have been excavated in the Canon's Marsh area to the east and have revealed a large quantity of significant industrial archaeological remains a few of which are summarised below.

An evaluation on the site of the Harbourside Centre (Bristol Urban Archaeological Database (BUAD) No. 3300) revealed part of the Albert Dry Dock of 19th century date. An excavation beneath the former U-Shed (BUAD 464) revealed a stretch of a medieval river front wall. A watching brief carried out along Canon's Road (BUAD 3290) again revealed the wall of the medieval river front, containing late 13th to early 14th century pottery within its fabric, its return forming part of the original Anchor Lane, and also the 18th century Tombs' Dry Dock. An archaeological excavation on the site of New World Square (BUAD 3276) discovered a potentially medieval rhine, the remains of an 18th to 19th century rope manufacturers and a 19th century saw mill. A rectified photogrammetric survey and desktop study of the Canon's Marsh Gas Works were carried out in 1998 (BUAD 3339), together with a watching brief on the site of the demolished Governor House (BUAD 3309). The latter noted a borehole at ST 5798 7246 from which artefacts of medieval date were recovered from approximately -3.6m OD, indicating the possibility of a dock or palaeochannel. An excavation to the west of the assessment area at Poole's Wharf revealed 18th and 19th century structures associated with a deal yard.

All these pieces of archaeological fieldwork have revealed a similar sequence of post-medieval events with the marsh being drained and the ground surface raised in the 18th century by the dumping of over 1.5m of material in which later industrial features have been found.

Other archaeological projects carried out on the Bristol Docks include a photographic survey of the Albion Dock (BUAD 3344), which had also been owned by the Hilhouse/Hill ship building company, and a rapid appraisal of the Great Western Dock and harbour wall (BUAD 3316). The former noted that the dock walls were constructed in a series of galleries approximately 0.5m wide and 1.5m high, and the floor of the earlier part of the dock to the north was of pennant sandstone slabs. The latter noted a series of timber piles and wooden planks within the floating harbour, and a line of ten large wooden piles surviving to height of 0.3m above the harbour bed to the east of the dock entrance. Further to the east was a further pile and small roundwood stakes driven into the bed of the harbour at an angle of 60 degrees. To the east of these unfrogged bricks with signs of vitrification were recovered, possibly wasters from a brick making facility.

The Bristol Urban Archaeological Database (Fig 8) lists two sites within the area of the Limekiln Dock: The dock itself (BUAD 761M) and a kiln (BUAD 762M) shown in the 1822 drawing by O'Neill (M.2961) (Plate 2). This shows an approximately three-storey high circular building to the west of the landward end of Limekiln Dock.

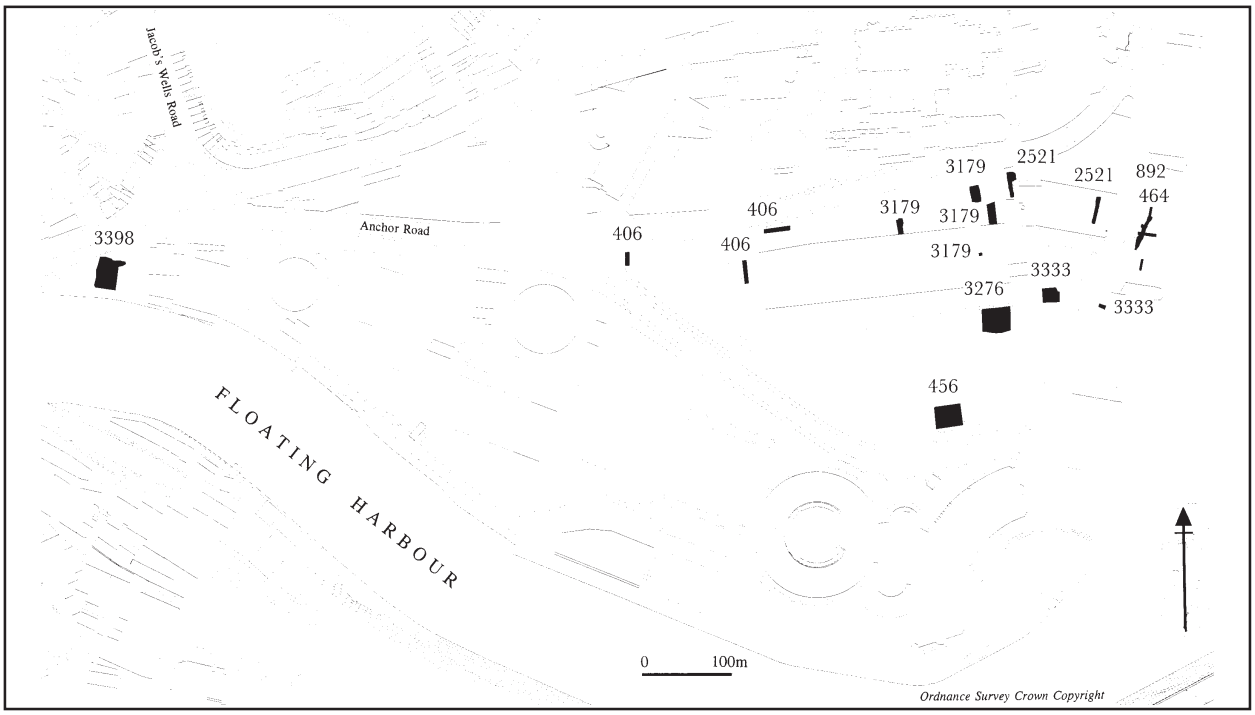

Fig 8 Location plan of Bristol Urban Archaeological Database sites

Summary of Chronology

The development of the site was broken down into a least six distinct phases, on the basis of both pottery, stratigraphic and structural evidence. These stretched from the late 17th century, when the site was probably a natural pill in use as a mud dock, through to the infilling of the dock in 1903.

Phase 1 Late 17th to mid 18th century
Phase 2 Mid to late 18th century
Phase 3 Early to mid 19th century
Phase 4 1850s to 1880s
Phase 5 1890s to 1903
Phase 6 1903 to 1906

The Excavation (Fig 9, Plate 5)

Phase 1 Late 17th to mid 18th century

Three sondages [trenches] (Figs 10, 11, 12) were opened up within the excavation area in order to expose the sequence of stratification both within the dockside buildings and on the dockside itself. Two were excavated in the area between the dock and the buildings to the west, with a further trench (Sondage 3) placed within the former engine house. Sondages 2 and 3 revealed deposits of natural river alluvium (163 & 251), sealed by further deposits of reworked alluvium (152, 250 & 249). Dating evidence from

Fig 9 Plan of excavation area, showing structural phases

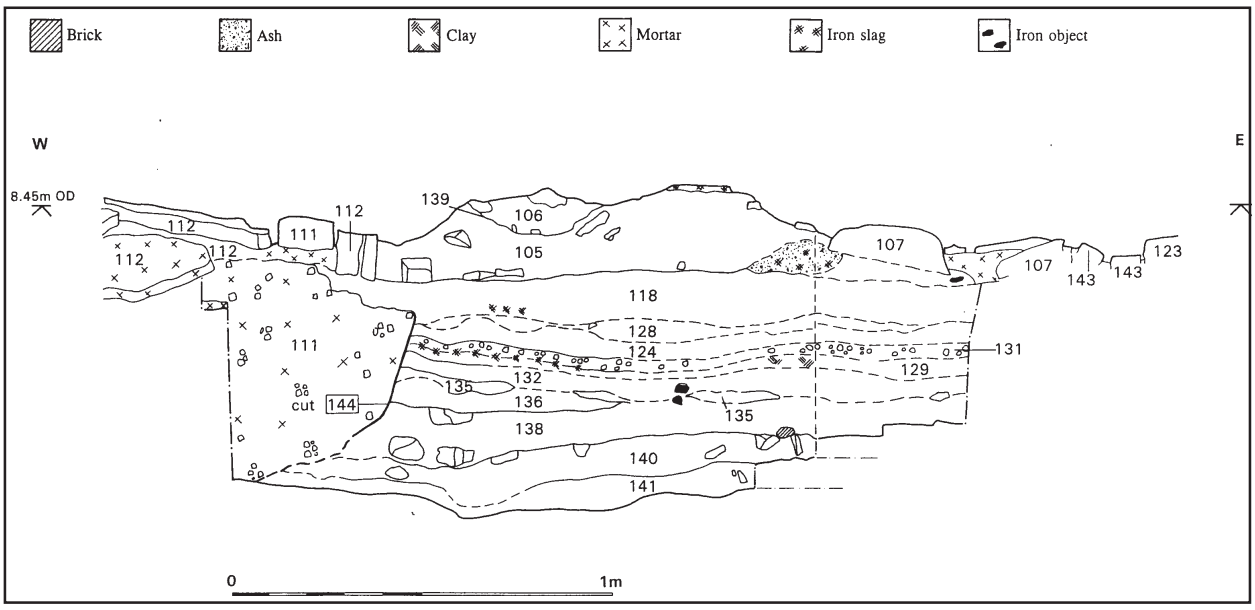

Fig 10 South facing section, Sondage 1

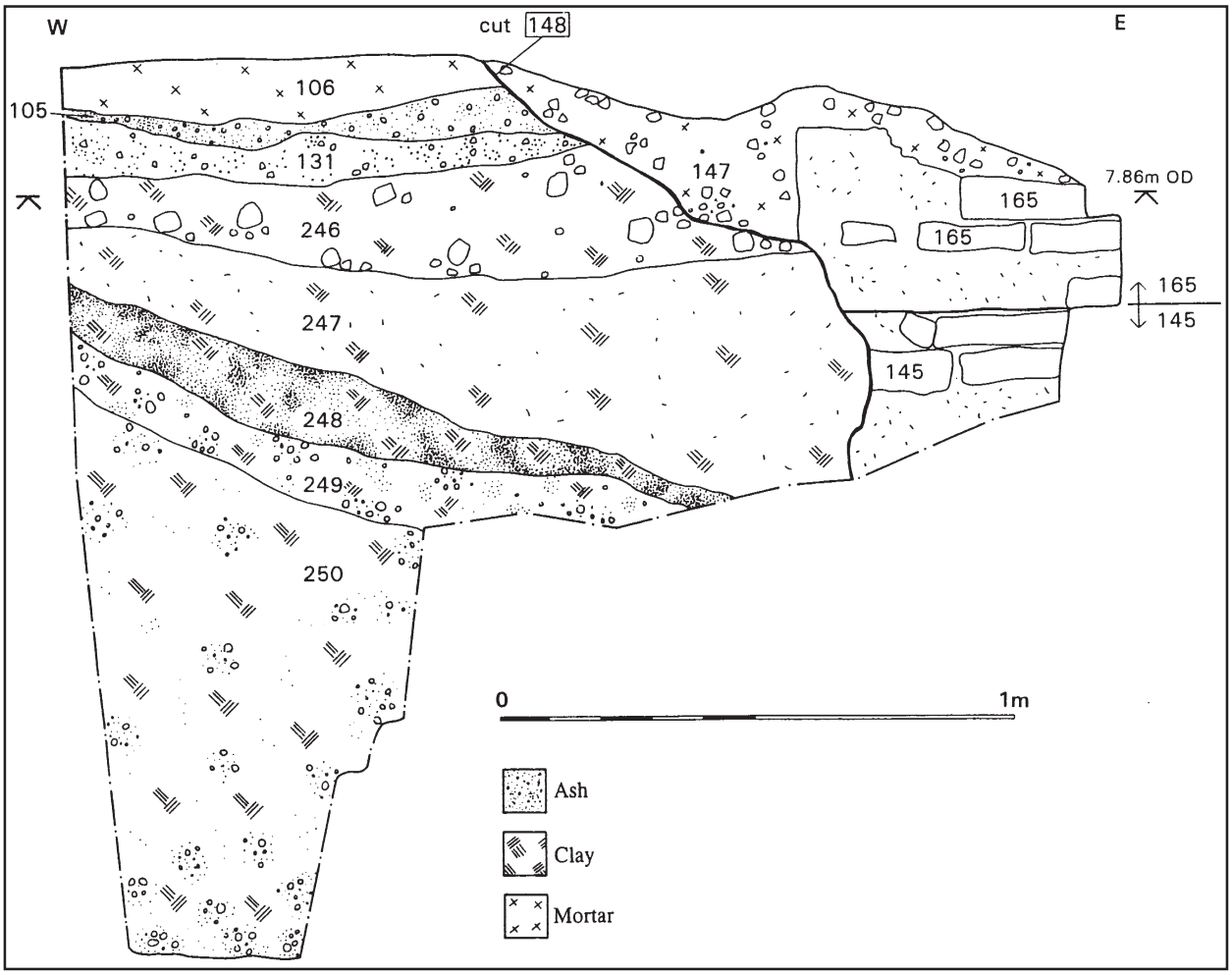

Fig 11 South facing section, Sondage 2

Sondage 2 suggested this periodic inundation was taking place in the late 17th to 18th century. Deposits (249 & 250), both brown silty clays containing significant gravel inclusions, sloped from west to east. They were sealed by a dark brown silty loam (248), which may have formed a brief soil horizon, also dating to the late 17th or early 18th century and sloping east to west. This was sealed by a more deliberate deep dumped deposit (247) of brown silty clay with lime fragments.

At the base of Sondage 1 lay a stiff brown clay (142) with mortar inclusions, possibly similar in nature to deposit (247) in Sondage 2. These deposits raised

the prevailing ground level to around 7.8m OD, and probably represent a deliberate landfill/levelling operation which may have been contemporary with the construction of the original dry dock. Sealing this was a possible occupation layer (141) of dark grey/brown silty clay, containing sherds of glass, pottery, iron slag and clay pipe of 18th century date.

Above layer (141) was a possible bedding deposit (140) of red/yellow clay and mortar, containing charcoal flecks and occasional angular grey pennant sandstone fragments. This formed the basis for a surface of angular grey and red pennant sandstone (138) within a matrix of grey/brown clay. It had been heavily disturbed, but may have been an original attempt to provide a stable surface along the early dockside. Sealing (138) was a layer of homogenous dark grey/brown silty clay (137) with occasional grey pennant fragments and charcoal flecks, with finds dating it to the early 18th century.

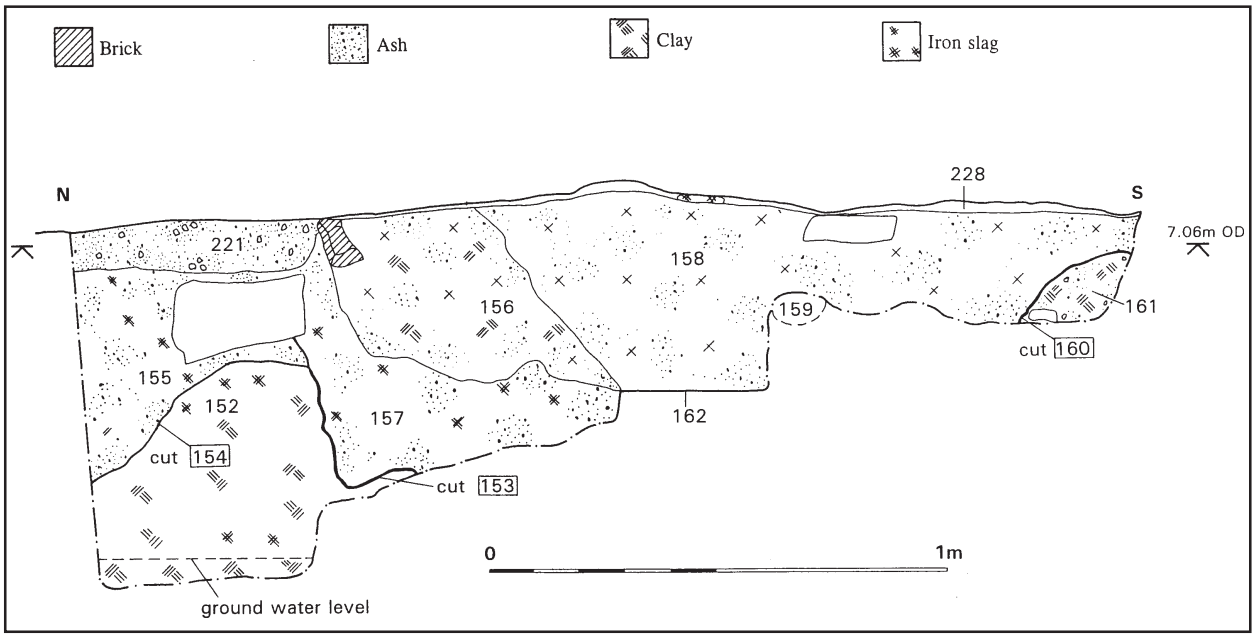

Fig 12 West facing section, Sondage 3

Plate 5 The excavation looking north

Phase 2 Mid to late 18th century
Sealing layer (137) in Sondage 1 was a friable red/yellow clay with occasional limestone pebbles and charcoal fragments, overlain by pockets of a friable black sandy clay (135). Above these lay a deposit of friable grey/brown silty clay (132), containing rare brick fragments and small angular pieces of grey pennant sandstone.

A similar layer (246) of brown silty clay, with inclusions of brick rubble and pennant stone, sealed dumped deposit (247) in Sondage 2. Again, these layers appear to relate to another phase of ground levelling activity.

The construction of the western walls of the 'Old Mill' (200), and engine house (202) (Fig 13), appear to pre-date the construction of the rest of these buildings. Wall (200) was constructed in irregular courses of roughly hewn grey pennant sandstone 700mm wide, bonded with a buff mortar containing frequent flecks of white lime. The eastern face was rendered with a thick coating of white lime mortar, and contained four slots in its upper courses for the insertion of timber floor joists for the ground floor. Traces of rotten wood still survived within the slots. Beneath this the wall face sloped considerably from west to east, probably to aid the stability of the building. Wall (202) appeared to be the southern continuation of (200), with no clear break in construction. However, wall (202) was narrower than (200), at 550mm wide, and although rendered in the same way the east face did not slope from west to east in the same fashion as (200).

Phase 3 Early to mid 19th century
Above (132) in Sondage 1 lay a thin layer of friable red/brown clay with occasional inclusions of red pennant sandstone, sealed by a thin spread of loose grey/yellow sand and gravel (131), which also occurred above (247) in Sondage 2. Another thin deposit (124) of friable dark greyish brown silty clay (124), containing occasional water worn pebbles, brick and tile fragments, overlay (131). A thin, patchy spread of friable grey/white lime mortar (128) sealed (124) and lay beneath a friable dark grey/brown clay (118) with small stone, brick and tile fragments. This sealed a construction cut (144) for a lightwell (111) on the east side of the 'Old Mill' basement, which was filled with hard grey mortar, brick and pennant stone.

The lightwell (111) formed one of three such rectangular projections to the east of wall (116), the eastern wall of the 'Old Mill' (Figs.14 & 15), along with (109) and (110). The 1883 OS 1:500 survey shows four such lightwells, the fourth lying to the north of the excavated area. Both (110) and (109) are visible on a photograph taken during the backfilling of the dock between 1903-1906 (Plate 1). All three structures were mainly pennant sandstone constructions, with brick repairs to the upper courses, and all abutted wall (116) to the west. (110) and (111) were of broadly similar dimensions, with angled openings, or embrasures, through wall (116) allowing light into the basement of the mill. Structure (109) was longer east-west, accommodating a set of stone steps (122) leading down into the basement. Some of the timber surface of the steps was preserved, as was some of the wooden window frame within lightwell (111). Part of an associated paved surface (112) survived between (110) and (111), for which (118) formed the bedding layer.

The eastern wall (116) of the mill was constructed from roughly hewn square blocks of green, grey and red pennant sandstone bonded with friable grey/white lime mortar, randomly coursed, and with regular embrasures for lightwells and access to the basement from the dockside. The wall continued at the base of each embrasure, was 670mm in width, and was keyed into a southern return wall (120) (Fig 16) of similar width and construction. Wall (120) abutted wall (200) to the west, which together with wall (116), and a grey pennant flagstone floor (201), formed the basement of the mill building. Drainage was provided by means of a west-east gully running along the southern edge of (201).

The east wall of the engine house (114) (Figs 14 & 15), and its southern continuation (236), seem likely to be contemporary with that of the mill (116), although Phase 4 alterations had removed the relationship between the two. It was keyed in with an internal east-west wall (207), which abutted wall (202) to the west. The walls were of similar width to that of the northern wall (120), and were again bonded with a friable grey lime mortar, with the exception of (207) which had a distinctive beige sandy mortar with large charcoal flecks. To the south of wall (207) was a break in wall (114) for the sliding door indicated in the various illustrations and photographs (Plates 1,2,3,4). The southern continuation (236) was truncated by the construction of the concrete decking (see above) between 1903-1906, which removed the southernmost 3-4 metres of the engine house.

To the west of, and abutting wall (200) at the northern limit of the excavation area lay an east-west wall (212), 460mm in width, possibly the southern return of a building shown on Ashmead & Plumley's 1828 map (Fig 3). This was constructed from roughly hewn

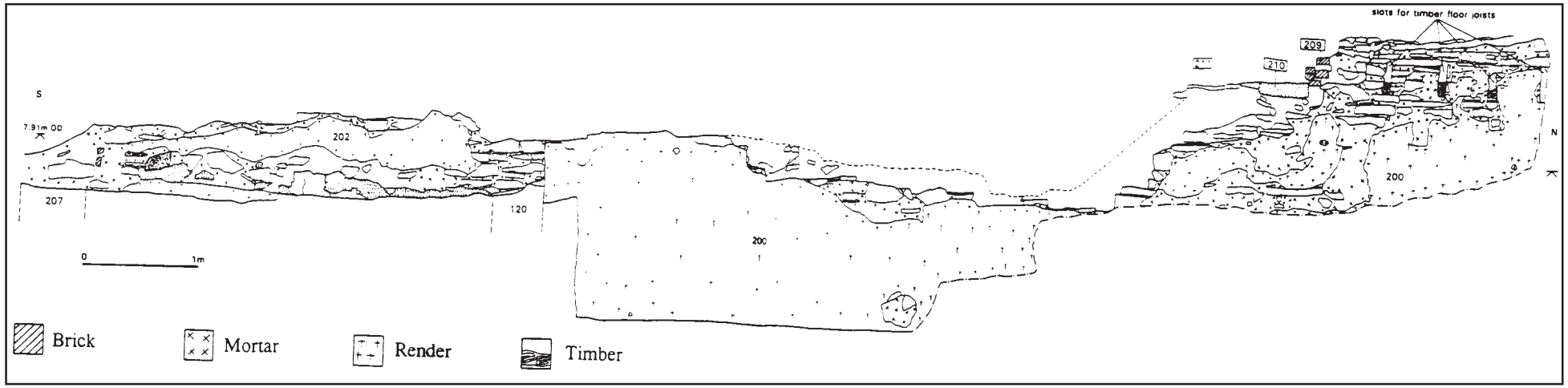

Fig 13 East facing elevation, walls (200/202)

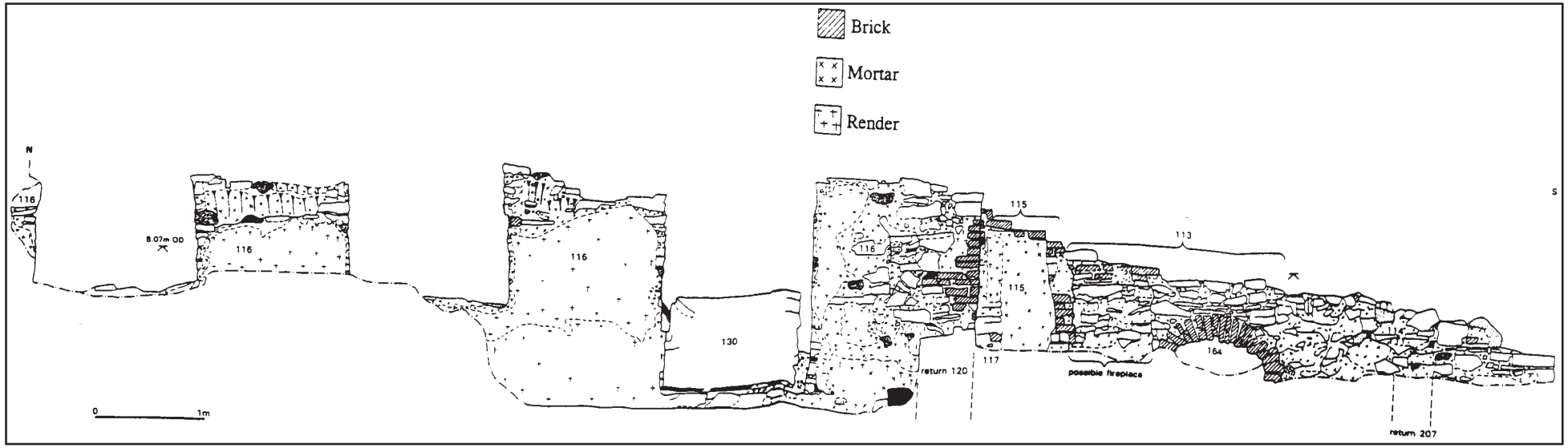

Fig 14 West facing elevation, walls (114/116)

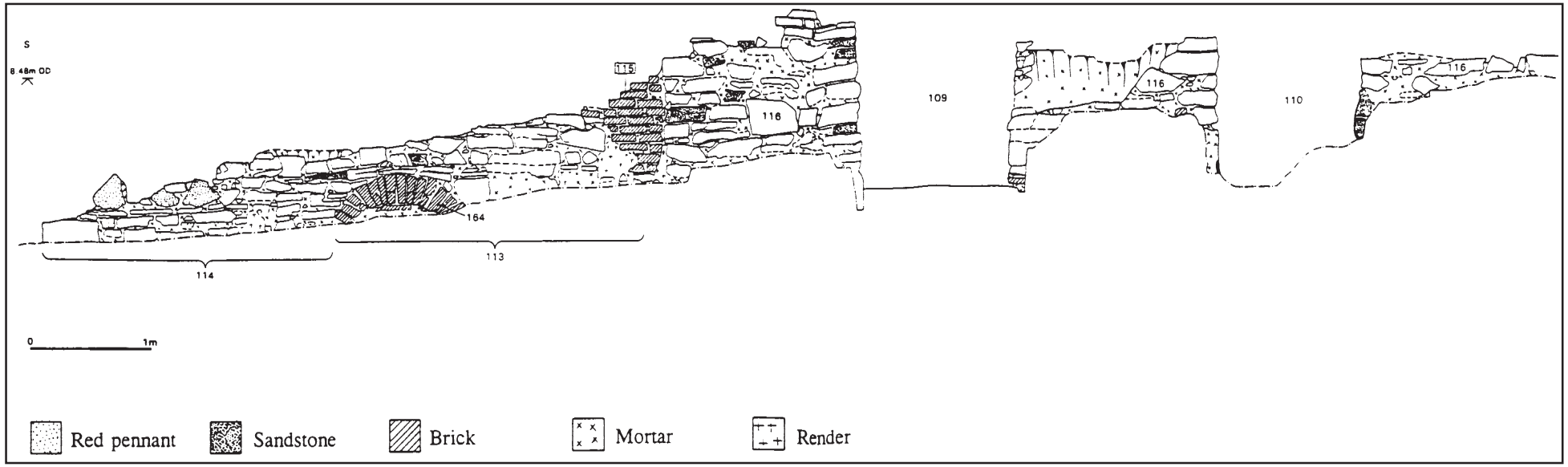

Fig 15 East facing elevation, walls (114/116)

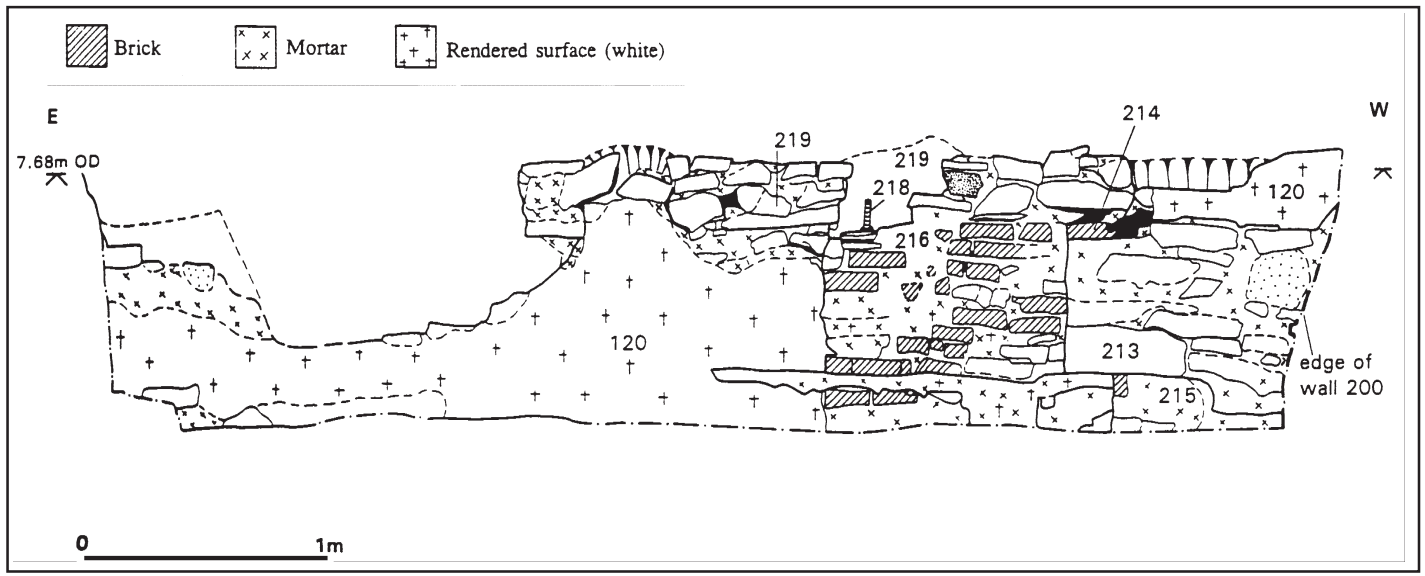

Fig 16 North facing elevation, wall (120)

grey and green pennant sandstone, with a hard grey/white lime mortar containing flecks of charcoal.

Phase 4 1850s to 1880s

Considerable modernisation of the dock was taking place during this Phase, as indicated by the documentary evidence, and it was at this time that the dock was largely refurbished. Much of the paved surface (112) appears to have been removed, prior to the construction of a new wall (107) between the dockside and the mill. Only the footings of this were evident in Sondage 1, sealing layer (118), although it was clearly visible on the photograph taken during the backfilling of the dock (Plate 1) and is indicated on the 1883 OS map (Fig 7). To the east of this a new cobbled drain (143), a cobbled surface and large coping stones (123) were laid, forming the western edge of the dock. The surface sloped down to drain (143), to carry rainwater away from the dry dock and down the slope into the floating harbour.

The coping stones of (123) were large square blocks of grey pennant sandstone, up to 700mm by 600mm by 260mm, and were bonded with a hard black mortar or cement. They formed the surface of the uppermost gallery along the western side of the dock. A large step (Plate 6) was set into the dock wall (123) at the northern end of the excavation area, and although very deep this was probably intended as an access point to the lower galleries. It may also have served a dual purpose, providing a slot for timbers to support the vessel within the dry dock.

A surface (105) of friable grey/black cindery material was laid between the dock and mill. This appeared to form the ground surface between the dock and mill for the rest of its working life, and exhibited signs of wear such as an apparent wheel rut (139). This had been repaired (106) with a deposit of firm yellow/grey sandy lime mortar and red clay, with inclusions of brick and stone rubble.

Other major alterations within this phase included the conversion of the mill and engine house into one large warehouse, and the construction of new buildings immediately to the west. The southern return (120) of wall (116) was partially demolished, as was the northern end of the engine house wall (114). New brick quoins were constructed for walls (116) and (114), and a new wall (113) with a possible fireplace and brick arch (164) on the east side of the engine house wall were constructed in association with a new vertical boiler. The base of the boiler (133) survived as three large slabs of grey pennant sandstone (Plate 7), placed on a bed of re-used iron sheets (134), presumably salvaged during repair work on a ship in the dry dock. The size of the iron sheets suggests a post-1850 date, as the technology to roll such large

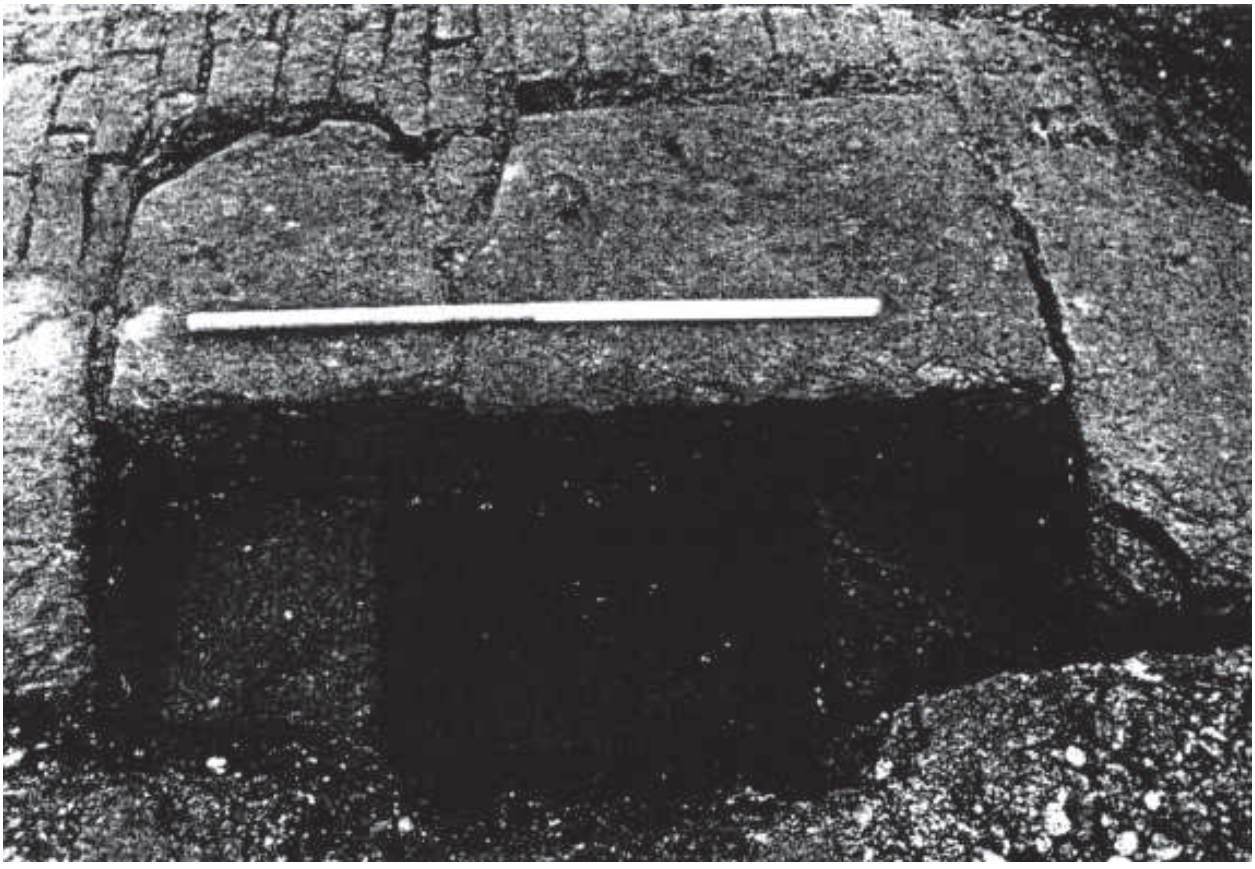

Plate 6 Step set into side of dock wall (123), looking west

sheets of metal was unlikely to have been available in the first half of the century. The small vent for the boiler is evident in Plate 1. A cut (154), for ground raising and subsequent insertion of the iron sheets, was revealed in Sondage 3. It was filled with a black silty ash, with frequent inclusions of iron slag (155). An unexcavated cut (168), to the east of arch (164), appeared to lead via a collapsed culvert (167) into a brick manhole (166), and from there down to the floating harbour.

An apparent doorway through wall (120) into the engine house from the mill basement was bricked up (216) during this phase, and vertical iron re-enforcing rods were incorporated within the blocking. Removal of the blocking revealed that the iron sheets (208 & 134) forming the floor surface of the engine house had been constructed above a large rubble dump, probably the reason for cut (154) to the south.

Expansion of the premises to the west was under way during this phase, with a new doorway being created through wall (200). A new brick door jamb (209) was inserted, just to the south of wall (212), with the lower courses of (200) re-used as the threshold (210). A floor surface (211), consisting of thin slabs of grey pennant sandstone and oolitic limestone, extended to the west. Many of these features had been truncated during the demolition of the buildings, although a possible water tank (203) survived to the south. Traces of a brick vaulted roof survived, and the interior was lined with a hard, black render. To the north and south the return walls (204) and (205) abutted the west face of wall (200), which formed the back wall of the tank. Together with wall (204) a wall to the south (206) may have been the base of the chimney shown on the early 20th century photograph (Plate 1).

Within the interior of the engine house was a brick built rectangular structure (235) with four square openings. Its function was unclear, although it may have been a base for a horizontal boiler, or perhaps an engine. This abutted wall (236) to the east, and had a south running return on its west side.

Phase 5 1890s to 1903

The entrance (109) into the basement of the mill from the dockside was blocked (130) during this phase, access presumably being gained now via the engine house, and began to silt up (121). It continued in use as a lightwell, as did (110) and (111), although these were also beginning to fill up with silty deposits (100-104) which were washing down from the dockside.

Within the engine house the internal division (207) may have been demolished prior to the insertion of a rectangular brick pit (224), possibly a base for an-

Plate 7 Boiler base (133) looking east

other engine or pump. A flat iron joist straddled the centre of the pit, with a short length of chain suspended from a hook beneath it, and an iron pipe passed beneath its east wall, through Sondage 3. This apparently passed below the east wall of the building and out into the dock through a new, slightly setback brick section of dock walling (165), lying within a brick lined conduit (145) in which two pipes were evident. The cut (148) and primary fill (147) for (145) were visible in Sondage 2, and the conduit was filled (146) with a mixed, loosely compacted black clayey silt. The section of new dock wall is visible in Plate 5, and may well have related to the pumping of the dock, although the pipe (159) was only 120mm in diameter and seems inadequate for such a function. The new section of dock walling does appear very deep in the photograph, which suggests a possible adit at the base of the dock. Structure (224) and pipe (159) may therefore relate to the drive mechanism for pumping the dock dry.

Pipe (159) lay within a foundation trench cut (153/161) revealed in Sondage 3. It was laid upon a brick base (162) and the trench was subsequently backfilled with three fills, the first a deposit of black ash (157) with frequent inclusions of large iron slag. Sealing this was a mixed brown silty clay (156) with inclusions of grey mortar, beneath a mixed black silty ash (158) which overlay (159). Sealing these layers and abutting the east wall of the engine house was a plastic dark brown silty clay (228), containing frequent mortar and charcoal fragments, occasional brick rubble and iron slag. This also abutted a layer of friable black crushed coal (221) to the west, which spread over the floor surface (208) of the northern part of the engine house. Above (221) lay a layer of corroded iron sheeting (227), encrusted with a hard grey mortar (226). As well as layer (221) the floor surface (208) was covered with a layer of crushed lime (220) with frequent charcoal fragments to the west, abutting wall (202).

To the south, a timber beam (225) running north-south overlay wall (207). It was not clear whether this was an original feature of wall (207), perhaps a floor joist, or whether it had been inserted following the demolition of the wall, perhaps in relation to some form of engine. To the east of this a spread of dark grey/black ashy mortar (223), upon a possible bedding layer (231) of brown gravel, covered the ground surface both within and outside the door into the engine house, slightly overlying feature (224). This appears to represent the latest floor surface in the engine house prior to its demolition in 1903. It sealed a thin black ashy silt (230), similar in nature to (221), which in turn overlay a possibly redeposited timber feature (232) of unknown origin.

Within the basement of the mill a small wall, or buttress (213) was built at the intersection of walls (200) and (120), presumably owing to structural defects caused by the partial demolition of the cross wall (120). A drain (214) ran north-south across the top of the buttress, and appeared to drain south into an opening through (120), beneath floor surface (208). This would indicate that (213) provided the base of a down pipe within the mill. Beneath (213) was a partially truncated brick and stone footing (215), possibly belonging to an earlier buttress in the same location. An attempt to repair wall (120), with a loose section of grey and green pennant sandstone bonded with grey/white mortar (219), also seems to have been made at this time.

To the west of the mill a number of deposits (245-240) appear to have been dumped above the floor surface (211) to raise the ground surface up to the remaining level of wall (212). The final deposit (240), a buff sandy mortar, may have been the bedding layer for a robbed flag floor surface in the area between walls (212) and (200).

Phase 6 1903 to 1906

A loose grey/white friable ashy mortar (233) sealing layer (223) and wall (207) represented part of the general sequence of demolition and backfilling of the dock, mill and engine house in the early 20th century. A loose black ashy silt (234) sealed wall (202) to the west, and a very similar deposit (237) filled the possible chimney structure (204/206). Filling the water tank (203) was another identical deposit (238). The rectangular brick structure (224) was filled with a loose grey/black mortar/coke deposit (239), very similar to the general landfill (119) that covered most of the excavation area. The tip lines within the landfill suggested that the eastern walls (116 & 114) of the two buildings were removed first, and the buildings then filled from the dockside - perhaps with surplus material from the infilling of the dock itself.

Discussion

The evidence from Phase 1 would seem to suggest periodic inundation on the site up until the late 17th or early 18th century. This is likely to be the case over many areas of Canon's Marsh, where a stable environment did not really exist until the creation of the Floating Harbour between 1804 and 1809. The evidence from Sondage 2 may be indicative of the use of a natural pill as a mud dock, with a soil hori-

zon (248) forming on the banks. The subsequent, apparently deliberate, ground raising at the end of the 17th century shows that this particular area was reclaimed at a relatively early stage in the development of the marsh, and this probably relates to the construction of the dry dock by John Evans. The exact nature of that dock, built by 1710, is unknown, as the enlargement of the dock in the late 19th century has almost certainly removed any evidence of its predecessor.

Evidence of the house built by Evans may come from the view of the dock illustrated in Plate 3. The tall building to the right of the dock, fronting onto Hotwells Road, is the only structure shown to the west of the dock on Rocque's 1742 plan (Fig 2). Stylistically, it appears to be a relatively early 18th century structure, although possibly modified by the time of the painting. It is certainly the strongest candidate for the house known to have been built by Evans before 1710.

Limited evidence, based on the bonding material, may exist to suggest that the western walls of the 'Old Mill', and perhaps the engine house, were built in Phase 2. No such structures are shown on Rocque's plan, and it can only be surmised that these walls may have been constructed between the mid 18th to early 19th century - perhaps initially as a boundary wall of the dockyard. However, it may simply be that different mortars were being used during the construction process, or even that there was an interruption of a few weeks, months or even years during the building work. The uncertainty about the future of the dockyard, caused by the creation of the Floating Harbour, could have put such a building project on hold. That Hilhouse & Co. received compensation for being unable to use the dock does suggest that the yard lay disused for some time.

Hilhouse & Co. were leasing the dockyard in 1809, and may have used some of the compensation they received in completing the construction of the mill and engine house. The mill is identified as a 'Grist Mill' on some of the leases, which suggests it may have been used for grinding corn and other agricultural produce. It seems likely that by the 1850s this has become a general warehouse for the dockyard, as indicated on Charles Hill's plan proposing to extend the dock in 1857, hence the term 'Old Mill'. The yard may therefore have been used temporarily for processing agricultural produce, whilst the dock itself lay idle in the early part of the 19th century.

The construction and function of the engine house is crucial in the history of the dock. Richard Tombs' proposal for the creation of a new floating harbour in 1792 (Fig 4) shows a new drain running south from the dock, beneath the floating harbour, across to the new cut. Clearly, the draining of the dock was something which needed consideration in the construction of the floating harbour, as it could no longer be emptied by simply opening the caisson at low tide. Later docks on the south side of the harbour, such as the Albion dry dock, were drained via adits leading from the base of the dock across to the new cut, as suggested by Tombs' plan. However, such a drain from the Limekiln dock would have proved a difficult and expensive engineering feat. Whilst a similar scheme may have been completed for Tombs' dock to the east, there is no evidence to suggest this ever took place at the Limekiln dock. The closure of the dockyard following the completion of the Floating Harbour is a strong indication that no such drain existed at this time. The only way to drain the dock now was by pumping it dry, which logically leads to the construction of a building to house the steam engine and pumps. According to the leases this was exactly the kind of machinery being used in the engine house by the 1850s.

By the time of Hill's proposal to extend the dock in 1857, the engine house and mill appear to have been converted into one large warehouse, which is borne out by the evidence for Phase 4. It seems unlikely that the dividing wall (120) between the mill and engine house was totally demolished, but a new opening was certainly made at the eastern end, with new brick quoins (115/117) for the eastern walls (114/116). At the same time a new floor surface, consisting of large sheets of iron ship's decking, was laid within the engine house. The size of these sheets also suggests they were rolled some time after 1850.

During Phase 4 the edge of the dock was refurbished with large pennant blocks (123), bonded with a hard black mortar or cement typical of the late 19th century. This is almost certainly the work carried out by Jefferies & Co. around 1882, and shown on the 1883 OS map (Fig 7). By this time the archaeological evidence suggests that the premises were expanding to the west of the mill and Engine house, into the area of the former coal yard. The new buildings formed part of Jefferies' New Quay Iron Works, which are also shown on the 1883 OS map.

Within the engine house a new vertical boiler (133) was inserted for powering the Steam Kiln shown on Hill's plan (Fig 6). This was used for steaming timbers, enabling them to be shaped for use in boat building and repair. A brick structure, (235), may have

formed the base for a new pump, engine or boiler for pumping the dock dry. This may have been modified or replaced in Phase 5 by the addition of another brick structure (224), with associated narrow pipe runs linking it to a new section of brick-built dock walling. Again the hard black mortar suggested a late-19th century date. The new section of dock wall does not appear on the 1883 OS map, but is visible as a deep inset feature in Plate 1. It cuts deep into the side of the dock, and a large pipe appears to run into it. There may have been an adit at the base of the dock, with large pipes capable of extracting the water at this point. The narrow pipe run (159) extending from structure (224) may have been associated with the production of steam for driving a pump set into the dockside.

The evidence for the dock's infilling and demolition of the mill and engine house in Phase 6 suggests the filling of the dock began first. This is supported by a close inspection of Plate 1, which reveals that the large spoil heap to the east is being used to fill the dock from that side. A section of high dock walling to the east appears to have been demolished to allow this to take place, and this was supported by trial trenching by Churngold Ltd. to find the eastern side of the dock wall. Further north the wall was found to survive fairly close to the surface, but in the area shown on the photograph it had been disturbed and only re-deposited coping stones were revealed. Following the filling of the dock, the eastern walls of the mill and engine house were demolished, and the basement and ground floor of the two buildings filled with material tipped from the dockside. This indicates that the levelling of the site progressed from east to west.

The photographic evidence in Plate 1 also proves that the construction of the Mouchel-Hennebique reinforced concrete decking was well under way before the dock had been filled. A piling rig can be seen in the foreground, as can several upstanding capstans of the new decking. The timescale for the infilling of the dock can therefore only be placed within the three years of 1903-1906, by which time the levelling for the Harbour Railway had been completed.

The Finds

Details of pottery finds, small finds and clay pipe, also presented in the report have not been included here

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