

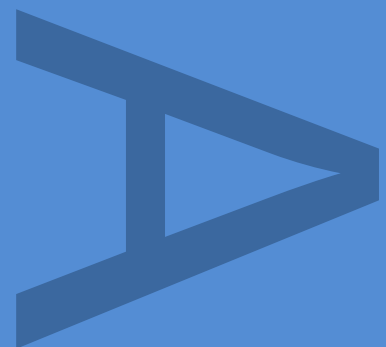
**MARY ROSE NEW MUSEUM
PORTSMOUTH HISTORIC
DOCKYARD
PORTSMOUTH
HAMPSHIRE**

**ASSESSMENT OF CONSTRUCTION
PHASE ARCHAEOLOGICAL
WATCHING BRIEF**

PCA REPORT NO: 11279

SITE CODE: PMRP08

AUGUST 2012



PRE-CONSTRUCT ARCHAEOLOGY

**CONSTRUCTION PHASE ARCHAEOLOGICAL WATCHING BRIEF AT THE MARY
ROSE NEW MUSEUM, PORTSMOUTH HISTORIC DOCKYARD, PORTSMOUTH,
HAMPSHIRE**

Site Code: PMRP08 (Phase 4)

Central National Grid Reference: SU 62850 00650

Local Planning Authority: Hampshire County Council

Accession Number: 2008/327

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Pre-Construct Archaeology Ltd. August 2012

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August 2012**

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DOCUMENT VERIFICATION

MARY ROSE NEW MUSEUM PHASE 4
PORTSMOUTH HISTORIC DOCKYARD
PORTSMOUTH
HAMPSHIRE

ARCHAEOLOGICAL WATCHING BRIEF

Quality Control

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1 ABSTRACT

- 1.1 This report details the results of an Archaeological Watching Brief undertaken by Pre-Construct Archaeology Limited on intrusive ground works during the construction of a new museum to house the preserved remains of Henry VIII's flagship, The Mary Rose within Dry Dock No. 3 at Portsmouth Historic Dockyard, Hampshire. The Dry Dock itself is a Scheduled Ancient Monument and a Grade I Listed Building.
- 1.2 The investigation, while concentrating on the dry dock, also included buried archaeological remains encountered within the immediate surrounding area. The principal aim was to further our understanding of the construction methods employed in the building of the dock, completed in 1803, as well as a wider understanding of the operation of the docks up until the modern era.
- 1.3 The archaeological investigation monitored and recorded elements of the construction of Dry Dock No. 3, which in broad terms included the following: staircases and chutes lining the dockside; elements of the dock's edges removed to accommodate the development; an investigation of the culvert system that original drained and flooded the dock and the monitoring of various linear trenches to install new drainage. The trench excavations revealed parts of the structure of Dry Dock No. 4, a number of disused Penstock valves and various dockside structures dating to the late 18th, 19th and early 20th centuries.
- 1.4 An addition small-scale watching brief was conducted within the environs of the Victory Arena during shallow trenching operations to install new services. No significant archaeological finds or features were uncovered in this area.
- 1.5 This investigation is designated as Phase 4 of a series of on-going watching briefs.

2 INTRODUCTION

- 2.1 The Mary Rose Trust have received Heritage Lottery funding to design and construct a new world-class museum and visitor centre to house the preserved remains of The Mary Rose, Henry VIII's ill-fated flag-ship which sank in 1545. The vessel was salvaged in 1982 and has since undergone an extensive programme of preservation while housed in a temporary structure (known alternatively as the Wemyss Building or the Mary Rose Ship Hall) within Dry Dock No. 3. The dry dock is itself a historically important structure, reflected by its designation as a Scheduled Ancient Monument, and was the focus of this investigation. The new museum will be built over the inner core of the existing Wemyss building, which will remain in use until the new building is completed.
- 2.2 This document is a report on the archaeological monitoring of a number of intrusive groundwork's undertaken as part of the construction of the new museum. These works include the installation of poured concrete foundation pads to support the steel frame of the new museum, which will have a severe localised impact upon the fabric of Dry Dock No. 3 and their immediate surroundings. An archaeological watching brief was required to monitor the works, and this formed part of the archaeological mitigation strategy for the project. Scheduled Monument Consent was granted by the Department of Culture Media and Sport (DCMS), under section 2 of the Ancient Monuments and Archaeological Areas Act 1979, for the construction of the new Mary Rose museum over and within the Scheduled Monument of Dry Dock No. 3 on 13 March 2009. This consent was granted subject to a number of conditions set out by English Heritage which must be adhered to. These conditions relate to the implementation of a number of mitigation measures for essential archaeological supervision and detailed recording before and during the proposed works. The conditions are contained within the Heritage Impact Assessment produced by Gifford¹.
- 2.3 The archaeological watching brief was conducted by Pre-Construct Archaeology Ltd, between 11th October 2010 and 27th April 2012. The project was commissioned by Gifford² on behalf of The Mary Rose Trust.
- 2.4 An additional small scale watching brief was undertaken within the environs of the Victory arena, on the eastern side of HMS Victory, Dry Dock No. 2. A long narrow and shallow trench was excavated to install a new lightning conductor and electric power cables. This work was conducted between 5th and 6th December 2011. While the work was a separate commission from BAE Systems limited and allocated its own site

¹ Moore, H. 2008.

² Since spring 2012 Gifford has been taken over by Ramboll UK.

code (PVPD11), this watching brief came under the same Scheduled Ancient Monument Consent³ as the Mary Rose works and is therefore included in this report.

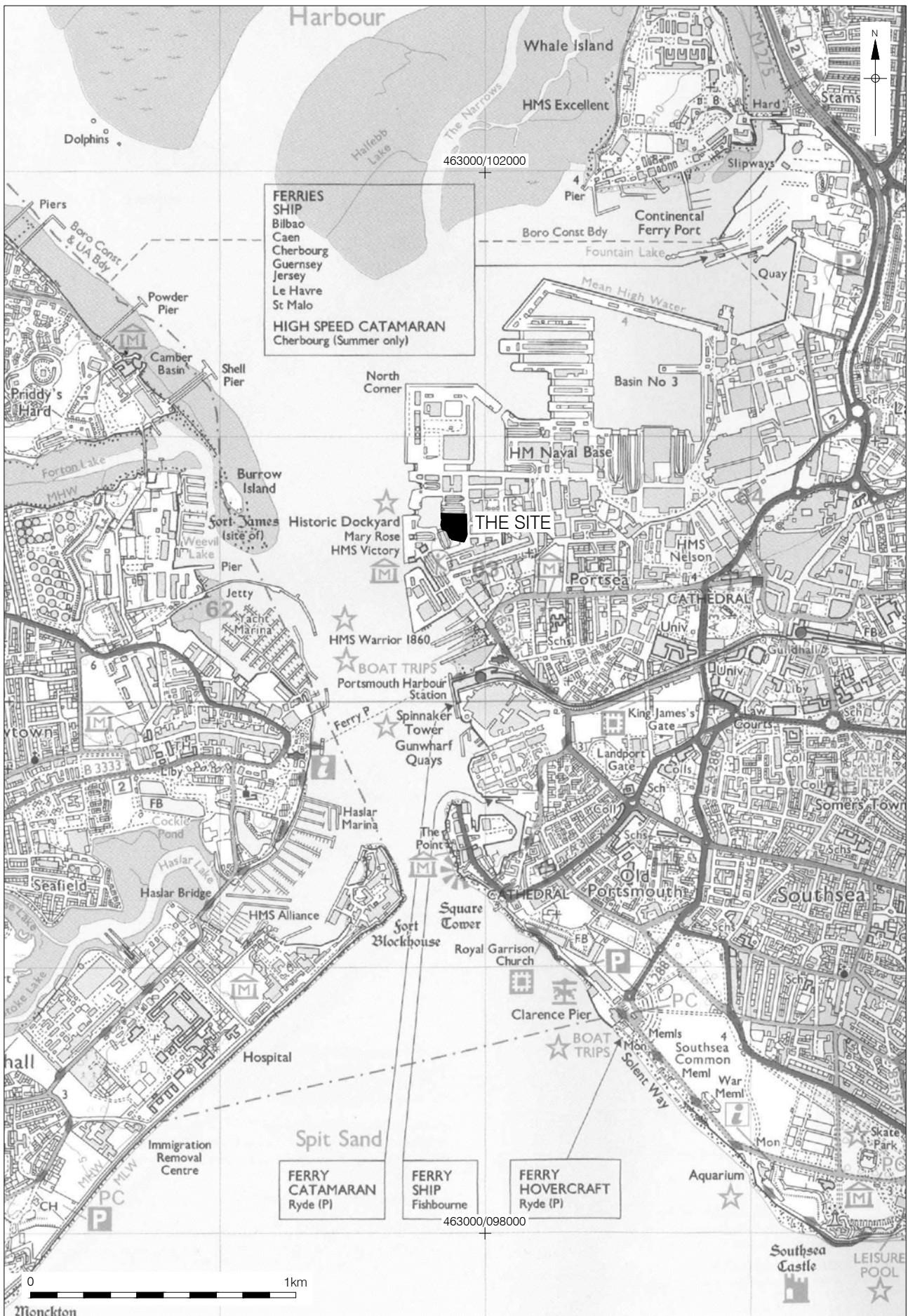
- 2.5 The site is situated within the western central section of the Historic Dockyard in Portsmouth and is bounded by Main Road to the east, by Basin No. 1 to the west, the public access area for HMS Victory to the south and Dock No. 4 to the north (Fig. 1). The area of the investigation was concentrated on the area around the perimeter of, and adjacent to, Dry Dock No. 3 within the Portsmouth Historic Dockyard.
- 2.6 The archaeological works were carried out in accordance with the Written Scheme of Investigation⁴ prepared for the site and follows English Heritage⁵ and IFA guidance papers⁶. The archaeological works were inspected and monitored by Helen Moore of Gifford and Dr Richard Massey of English Heritage.
- 2.7 The National Grid Reference of the site is SU 62850 00650.
- 2.8 This investigation (entitled 'Mary Rose Main Works') continued with the site code PMRP 08 but as Phase 4 of a series of on-going of watching briefs, details of which are given below in 3.4.5.
- 2.9 The principal contractor was Warings Construction limited based in Portsmouth and the principal sub-contractor, tasked with the groundwork's and dock stone removal, was Markline Construction limited of Dorset.
- 2.10 The watching brief was undertaken by Stuart Watson and the project was managed by Tim Bradley of Pre-Construct Archaeology Limited.

³ Consent given verbally by Dr Richard Massey, Scheduled Monument Inspector for English Heritage. Nov. 2011.

⁴ Bradley, T. & Moore, H. 2009.

⁵ English Heritage Guideline Papers (revised June 1998).

⁶ Institute of Field Archaeologists 1993. *Standards in Archaeological Practice*.



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Figure 1
 Site Location
 1:20,000 at A4

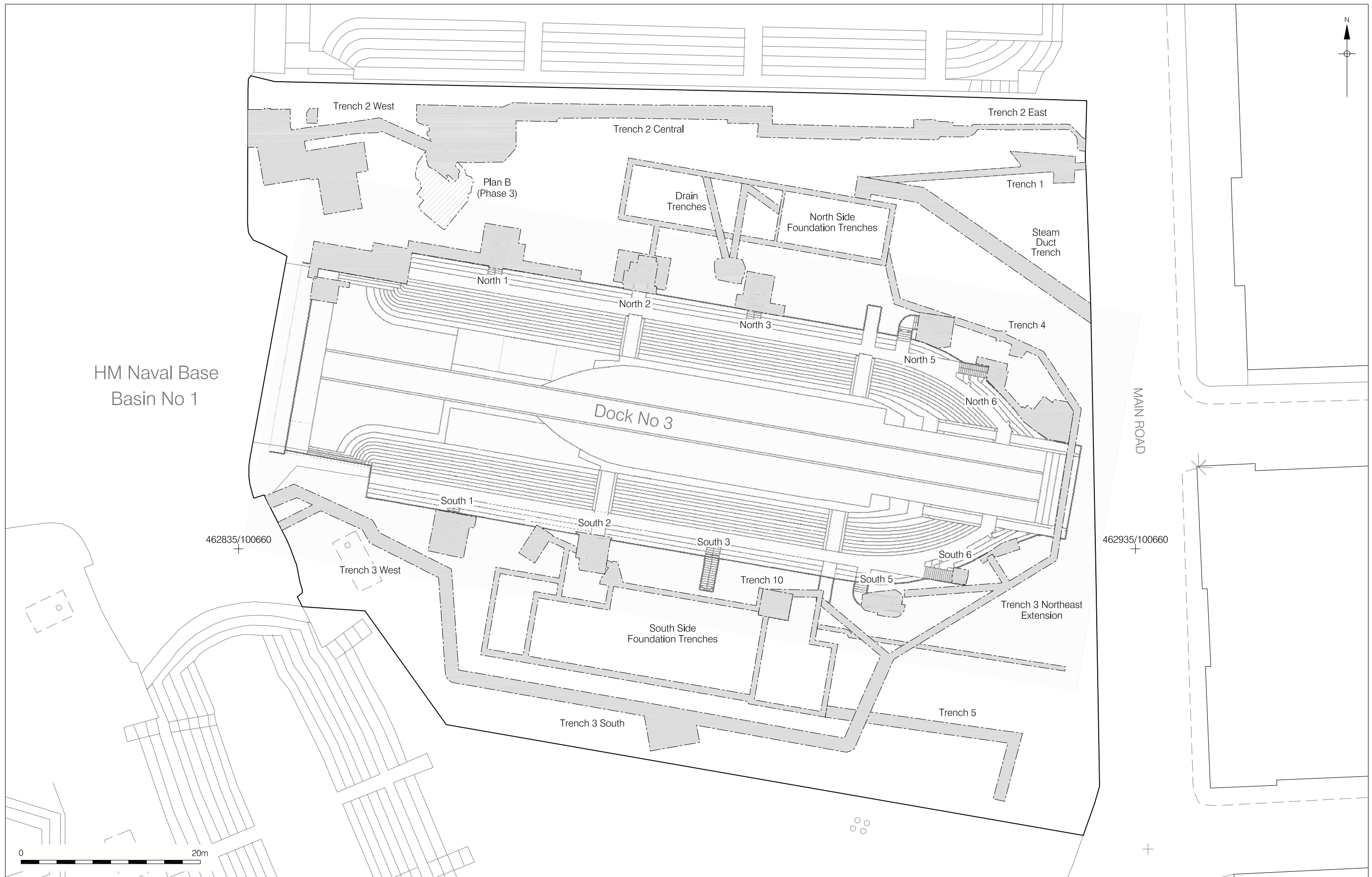


Figure 2
 Trench Locations
 1:400 at A3

3 PLANNING BACKGROUND

- 3.1 The development site falls under the jurisdiction of national, regional and local planning guidance. Dry Docks Nos. 1 to 6 and Basin No. 1, lie within the area designated as Portsmouth Historic Dockyard, a unique archaeological resource that has a nationally important status. The Dry Dock complex has been designated as a Scheduled Ancient Monument (SAM) under the Ancient Monuments and Archaeological Areas Act 1979. This act requires that permission must be obtained from the Department of Culture Media and Sport (DCMS) to undertake any works within the site of the SAM and English Heritage, as the guardians of the national heritage, must be consulted on, and approve all proposed works.
- 3.2 At the time of the initiation of this project *Archaeology and Planning* (PPG16, 1990) was the national policy which provided guidance to managing archaeology within the planning process, supported by regional and local plans which provides more detailed guidance specific to a particular area. *Planning and the Historic Environment* (PPG15, 1994) supported PPG16 and provided legislative guidance on the identification and protection of historic buildings, conservation areas and other elements of the historic environment. However, during the onset of this project the above national policies were superseded and replaced by PPS5, *Planning for the Historic Environment* in March 2010. This policy has itself now been superseded and is replaced by The National Planning Policy Framework (NPPF) adopted on March 27th 2012.
- 3.3 The Historic Dockyard at Portsmouth is part of Conservation Area 22 designated by Portsmouth City Council, and planning permission is required for certain types of development within the conservation area. Conservation Area Consent is required for the demolition of any buildings within the area, and with new national planning guidance implemented this year, a Heritage Statement is required to support this type of application. Portsmouth City Local Plan 2005 and the Hampshire County Council Structure Plan Saved Policies 2007 provide guidance specific to the local area, while retaining many of the points under the policy PPG16.
- 3.4 Designations Applied To This Site**
- 3.4.1 The dock structure forms part of the Scheduled Ancient Monument (SAM) comprising Basin No. 1, Dry Dock Nos. 1-6 and the associated masonry sea walls. The monument is scheduled as a single item in accordance with Section 2 of the Ancient Monuments and Archaeological Areas Act 1979 (AMAAA) (As Amended) County Monument No. 397 for the County of Hampshire.
- 3.4.2 The docks are also a Grade I Listed Building (number 476637).

3.4.3 The application site is located within Conservation Area 22, designated by Portsmouth City Council.

3.4.4 The site main works required a number of elements of archaeological mitigation as detailed in the Heritage Impact Assessment⁷, Enabling Works: Dry Dock Stone Removal⁸ and Scheduled Monument Consent. These works are as follows:

- English Heritage level II-III photographic and building survey of a section of the Dry Dock 3 culverts.
- Photographic recording of the 1924 dockside crane rails on the south side of the dock. The removal of a short curved section of crane rail in the north-east corner of the site was also monitored.
- Archaeological monitoring and recording during the controlled stone removal around the north, south and western sides of Dry Dock No. 3.
- Archaeological monitoring of Single Flight Auger Piling Operations.
- Archaeological monitoring of foundation trenches.
- Archaeological monitoring during the excavation of new drainage and service trenches.
- The requirement to monitor the removal of 4 dockside bollards was unnecessary as the bollards were not impacted upon by works and remain *in-situ*, incorporated into the landscaping scheme designed for the new museum.
- An additional watching brief (under site code PVPD11) was required within the environs of the Victory Arena, eastern side of HMS Victory berthed in Dry Dock No. 2. After consultation with Dr Richard Massey, Scheduled Monument Inspector for English Heritage, it was decided (by verbal instruction) to include this work under the same Scheduled Monument Consent as the Mary Rose works.

3.4.5 Three previous phases of archaeological work have been undertaken at this site under the same site code; Phase 1 undertaken in 2008⁹, Phase 2 conducted in 2009¹⁰ and Phase 3 undertaken in 2010¹¹. The results of these earlier works have been confirmed by, added to, and clarified by, this current study.

⁷ Moore, H. 2008.

⁸ Moore, H. 2009.

⁹ Sayer, K. 2009.

¹⁰ Humphrey, R. 2009.

¹¹ Watson, S. April 2011.

4 GEOLOGY AND TOPOGRAPHY

- 4.1 The geological information is based on a review of the British Geological Survey Map (Sheet 331, Portsmouth) and logs from a limited number of exploratory holes previously carried out on the site and within the area.

Geology	Thickness (m)
Made Ground	1.50 to 7.00
Recent Deposits – Alluvium	0.00 to 1.00
Bracklesham Group – Wittering Formation	6.00 to 10.00
Bagshot Sands	5.10 to 6.50
London Clay	>18.80

- 4.2 The Bracklesham Group was found to extend from -9.50 and -11.60mOD and comprised orange-brown silty sandy clay and grey slightly clayey sandy silt and grey sand with black pebbles.
- 4.3 The Bagshot Sands were described as a very dense orange-brown, pale brown and pale grey silty fine and medium sand and were encountered from -9.50 to -11.60mOD and extended to depths ranging from -14.80 to -17.90mOD.
- 4.4 The London Clay Formation was encountered at depths ranging from -14.80 to -17.90mOD and is described as very stiff silty clay with partings of sand. Below this depth shell fragments are present and discontinuous layers of siltstone.
- 4.5 The former dockside ground surface of stone cobbles, stone slabs, concrete slabs and tarmac have largely been removed during the enabling phase of the ground works, as has a large amount of the pipe work and machinery associated with the conservation of the Mary Rose. Much of the current ground surface is now made up of a temporary layer of Type 1 'crush' material laid by the contractors at an approximate average level of 4.00mOD.

5 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

- 5.1 The following summary is taken from the Written Scheme of Investigation¹². A comprehensive account of the archaeological and historical background of the study site can be found in the Desk Based Assessment prepared for the project¹³.
- 5.2 It is thought that the origins of Portsmouth town began at some point soon after the Domesday survey, as the Norman invasion and closer ties to the continent made Portsmouth the ideal place to establish a port and settlement.
- 5.3 The first mention of a dock in Portsmouth was in 1212. King John ordered a 'good and strong wall' to be constructed to protect the King's dock at Portsmouth together with storehouses to contain the accoutrements belonging to the king's ships and galleys. The dock at this stage was located just outside Portsmouth town in what is now known as Vernon Creek. The dock during this period apparently consisted of a small creek where a ship was hauled as far as possible at high water, and where a fence and mud bank were constructed when the tide was out to hold back the returning tide. This dock did not stand the test of time and eroded away. After twelve years it was filled in.
- 5.4 It was not until Henry VII's reign (1485 -1509) that another dock is recorded. In 1496 Henry VII's dry dock at Portsmouth became the first to be constructed in England. It was built on the site of the present Historic Dockyard where the King had purchased eight acres of land to build his dock and yard and was approximately where Dry Dock No. 2 is today.
- 5.5 When Henry VIII came to the throne in 1509 the navy was enlarged to counter the perceived threat from France and Spain, and as a consequence of this the dockyard was enlarged by nine acres, and fortified and new buildings were constructed. Henry VIII's flagship the Mary Rose was constructed in Portsmouth dockyard, begun in 1509.
- 5.6 Further expansion of the dockyard occurred during the first Dutch war of 1652-4.
- 5.7 Under Charles II in 1665 new fortifications were erected around the town and dockyard, which are described as an earthen rampart with a wooden palisade protected by a moat, and were completed by 1667.

¹² Bradley, T. with Moore, H. 2009.

¹³ Moore, H. and Wheeler, R. 2008.

5.8 The Dry Docks

- 5.8.1 As France became increasingly powerful in the 17th century, the dockyard at Portsmouth once again became important. In 1689 William III initiated a major building programme of major importance in military and civil engineering terms. The plan was designed by Edward Dummer, Surveyor to the Navy Board, and included the construction of a square non-tidal basin, (known as the Great Ship Basin and in the second half of the 19th-century Basin No. 1), and a dry dock which led from it later known as Dry Dock No. 5.
- 5.8.2 The Seven Years War between Britain and France (1756-63) highlighted changes needed to improve the efficiency of the dockyard and from 1761 the dockyard was re-organised and new buildings were constructed.
- 5.8.3 In 1793 England was at war with France again, and the Napoleonic wars continued until 1815. This stimulated further changes to the basin and the building of the dry docks we see today.
- 5.8.4 The group of historic docks arranged around Basin No. 1, Dry Docks Nos. 1 to 5, can be traced back to the late 17th century. Details of significant dates of the docks are listed below¹⁴.

Dock No.	Date opened	Date lengthened	Date closed	Current use
1	1801	–	1984	HMS <i>M33</i>
2	1802	–	1922	HMS <i>Victory</i>
3	1803	1858-60	1982	<i>Mary Rose</i>
4	1772	1859-60	1983	unused
5	1698	1850	1983	unused

- 5.8.5 Dry Dock No. 3 was constructed over four years starting in 1799 as part of the extension and improvements to Basin No. 1 undertaken in the late 18th/early 19th century. No significant details of the original construction have been located but it is likely that the dock was constructed in broadly the same fashion as Dry Dock No. 4, which was built some 30 years earlier in 1772. The head of Dry Dock No. 3 is in its

¹⁴ Information found at <http://www.portsmouthdockyard.org.uk/Page%2017.html> Accessed 11/11/11

original form, however the walls and gate area have undergone alteration over the years and these are listed below:

- 1858: The dock was extended by the replacement of the lock gates with a boat or floating caisson. This work involved the construction of granite buttresses; the original walls appear to be constructed of limestone, possibly Portland stone, and extension of the piled timber dock floor.
- Early 20th century: A series of one and two storey buildings were erected on both the southern and northern side of Dry Dock No. 3. All these buildings were demolished to make way for the new museum development.
- 1924: The upper altars of the south wall were in-filled with mass concrete to facilitate the construction of a platform to support a dockside rail mounted crane.
- 1934: The dock floor was reconstructed; this involved the removal of some of the timber decking and the casting of an *in-situ* concrete floor slab.
- 1982: After one hundred and eighty years in continuous service, the dock ceased to be operational, but was allocated a new role as the berth for the Mary Rose (Plates 1 & 2).
- 1983: The Mary Rose and associated support barge were placed in the dock. A number of brick and concrete plinths were constructed on the dock floor and altars to facilitate this. A lightweight roof structure, including a reinforced concrete ring beam at ground level, was also constructed to protect the ship as conservation work proceeded.
- 1989: A permanent concrete dam replaced the boat caisson dock gate.
- 2010: Construction begins on a new museum to house the Mary Rose. The outer skin of the Wemyss building and its temporary foundations are removed (the inner structure, housing the Mary Rose, remained in place until the new building is completed). To accommodate the foundations of the new building a substantial amount of the upper stone work of the dock is removed under archaeological supervision.

5.8.6 The culvert system running beneath and around Dry Dock No. 3 is an integral part of the docks and as such forms part of the Scheduled Ancient Monument. The system was designed to drain and flood the docks during docking operations, and to remove surface water drainage/leakage from the docks when they were 'dry'. Due to the various modifications and conditions within the historic dockyard this system is now only used to remove drainage.

5.9 Dock Construction

- 5.9.1 While this, and other investigations in the watching brief series, uncovered new information regarding the original construction of Dry Dock No. 3 some of the details, particularly the floor of the dock, are surmised from information gleaned from the records of Dry Dock No. 4.
- 5.9.2 The dock floor, sidewalls and entrance sill would be founded on a timber grillage with close-boarded planking over the grillage to support the masonry above. The planking would have been exposed in the floor of the dock to provide a working platform. The information on Dry Dock No. 4 indicates that the timber grillage would be supported on an arrangement of timber square section piles driven into the underlying London Clay and Bracklesham Sands.
- 5.9.3 Below the grillage the ground was excavated and backfilled with stone or a basic coarse aggregate concrete. The transverse timber elements of the grillage most probably acted as horizontal struts to resist inward sliding movement of the dock walls and in this regard they were important structural members.
- 5.9.4 The walls of the dock act as massive gravity retaining structures relying on their dead weight and propping action from the timbers, to resist sliding and overturning. The exposed faces of the walls are lined with Portland limestone and granite masonry to form the stepped altar profile. Typical details for Dry Dock No. 4 show the masonry supported by brickwork and backed with concrete for added mass and stability.
- 5.9.5 A later reinforced concrete structure, constructed in 1924, is present along the south wall of the dock supporting a dockside crane rail.
- 5.9.6 The dock floor was reconstructed in 1934; this involved the removal of some of the timber decking and the casting of an *in-situ* concrete floor slab over the whole of the dock floor.
- 5.9.7 A reinforced concrete dam was constructed in 1989 to seal the dock from the adjacent Basin No.1.
- 5.9.8 Various concrete structures to support the 1980s Wemyss building were removed from the base and edge of the dock to make way for the new museum.

6 ARCHAEOLOGICAL METHODOLOGY

6.1 The following represents a summary of the methodology employed during the fieldwork. The site was recorded as a watching brief and the archaeological work was sub-divided into the following areas (Figs. 2 & 3):

6.2 Stone removal around the edges of Dry Dock No. 3.

6.2.1 The removal of stone from Dry Dock No. 3 was necessary in certain locations to allow the casting of a concrete foundation pads which support the steel frame of the new museum building. This affected the northern, southern and eastern ends of the dock and involved the archaeological monitoring and recording of the following specific areas:

- **North 1:** a stone-built staircase, context number [116], located at the north-western end of Dry Dock No. 3.
- **North 2:** a stone-built chute, context number [100], located west of centre on the north side of Dry Dock No. 3.
- **North 3:** a stone-built staircase, context number [101], located centrally on the north side of Dry Dock No.3, and included the removal of short sections of the dock edge.
- **North 5:** a complex stone-built staircase, context number [102], located at the north-eastern end of Dry Dock No. 3. Here the staircase ran parallel with the dock before turning 90° and continuing down at right angles to the dock encased in an arched stone tunnel, parts of which had to be removed.
- **North 6:** a stone-built staircase, context number [109], located at the north-eastern end of Dry Dock No. 3.
- **South 1;** a stone-built staircase, context number [96], located at the south-west end of Dry Dock No. 3.
- **South 2:** a stone-built chute, context number [97], located west of centre on the south side of Dry Dock No. 3.
- **South 3:** a stone-built staircase, context number [98], located centrally on the south side of Dry Dock No. 3.
- **South 5:** a complex stone-built staircase, context number [148], located on the south-eastern side of Dry Dock No. 3, mirroring the staircase North 5 [102] mentioned above.

- **South 6:** a stone-built staircase, context number [149], located at the south-eastern end of Dry Dock No. 3.
- **Dock Edge Stones:** Masonry dockside edge stones were removed in the following areas; along the north-eastern side of Dry Dock No. 3, context [110]; along the south-eastern side, context [111]; and along the north western sides, contexts [117] and [118].
- At various locations around the dock side individual stones had to be removed to allow space for horizontal steel beams to pass to their vertical connections.

6.2.2 In accordance with the Scheduled Monument Consent, all the stones removed from the stairs and chutes of Dry Dock No. 3 were individually numbered. The numbering system for the most part remained consistent throughout, but there were variations, which are explained below. All the chutes and staircases were designated as structures 'North 1', 'South 2' etc , thus the stones from these structures were marked with the prefix N2, S2 etc followed by a sequential individual stone number; for example N2/01, S2/02, etc. Dock edge stones were marked with a north-east (NE) or south-east (SE) prefix followed, in most cases, by ED (Edge Dock), followed by a sequential individual stone number; thus NE/ED/01, SE/ED/02 etc. The exceptions were staircase North 1 and the north-west dock edge stones which were marked together as NWD (North-West Dock) 01, NWD02 etc. The numbers were marked on the surface of each stone by the contractors with a combination of permanent marker pen sealed with clear varnish or white oil based paint. It is hoped that both methods will stand the test of time.

6.2.3 All the stones, prior to lifting, were surveyed in 3D by a dedicated surveyor from Markline limited, the sub-contractors engaged to lift the stones. The stones were then carefully lifted and removed from site. During the early phases of work the stones were housed in the Chain Test Storehouse at Portsmouth Naval Base. However, this quickly reached capacity and storage was switched temporarily to Dry Dock No. 5.

6.2.4 At the time of writing it is believed that most the granite top stones will be taken to English Heritage offices at Fort Cumberland, Portsmouth, for long term storage. Some of the granite stones will be reused as seating within the landscaping scheme of the new museum (see Appendix 3). What the eventual fate of the remainder of the stone (mostly limestone) will be is still under discussion.

6.3 Dry Dock No. 3 culvert entrance

- 6.3.1 The culvert system used to fill or empty the Georgian dry docks at Portsmouth were built at the same time as the docks. The entrance into Dry Dock No. 3 culvert system is located at the base of the dock, in the extreme north-east corner. As part of the new museum works the culvert's entrance was sealed up with concrete for a thickness of 0.60m. To help bond the concrete to the culvert walls, twenty-six steel rods (0.40m long) were drilled into the masonry. Two small sump pumps were installed in a shallow recess cut into the dock floor, immediately in front of the entrance, to remove the ground water that currently exits via the culvert. The recess measured 2.70m north-south by 2.0m east-west and was cut to a depth of 0.25m into the modern concrete floor of the dock (photographic reference: D318/14), too shallow to impact on the original 19th century floor structure that lies below
- 6.3.2 As part of the mitigation and prior to being permanently sealed up, the culvert entrance was comprehensively recorded as an English Heritage level 2-3 photographic and building survey. A photographic record was also made inside the culvert tunnel to detail its construction (photographic reference: D305, films 307, 308) Because of the hazardous nature of entering the culvert a separate risk assessment was carried out and a specific Schedule of Works agreed between Warings limited as main contractor, Markline limited who provided safety equipment and trained safety personnel and Pre-Construct Archaeology limited whose staff entered the culvert.

6.4 20th-century dockside crane rails

- 6.4.1 Much of the upper levels of the Georgian stepped stone work of the south side of Dry Dock No. 3 had been in-filled and levelled off with concrete in 1924. This was to provide a platform to carry rail tracks for a dockside rail mounted crane. To construct the new Context Galleries for the museum the rail needed to be removed and the concrete needed to be cut away by diamond sawing. As part of the Scheduled Monument Consent a photographic record of the 1924 dockside crane rails was made and the concrete cutting monitored to insure none of the original 19th-century stonework was inadvertently damaged (photographic reference: D300, D304).
- 6.4.2 A section of 20th-century dockside crane rail, context [112], was also recorded in both TR1 and the Steam Duct Trench. In TR1 a length of the track was removed to accommodate a new concrete foundation for a sub-station and in the Steam Duct

Trench a short section of rail was removed to connect the trench with an existing manhole to the steam duct system (photographic reference: D307, D318).

6.5 Service Trench TR1

6.5.1 Trench 1 (TR1) was located in the north-eastern corner of the site and was a service trench linking the sub-station to the new museum. It measured approximately 13m east-west by 1.20m north-south and was excavated to a depth of 1.30m. Features exposed consisted of a possible 19th-century stone-built timber building foundation pad [113] and a section of 20th-century dockside crane railway [112].

6.7 The shallow service trenches on north and south sides of Dry Dock No. 3

6.7.1 A series of interconnected service trenches were excavated on both the north side and south side of Dry Dock No. 3. These were located within the footprint of the new museum's side buildings (the education block to the north and the entrance complex to the south) and were excavated to install drainage and the water supply. Most of the trenches were too shallow to reach any archaeological horizon, the majority having been excavated into the modern Type 1 crush layer put down during the enabling works (phase 3). However, one part of the north side trench system did reveal the north-western corner of a stone built structure [103], probably a 19th-timber building foundation pad, that had previously been exposed during the excavations around staircase N3, context number [101].

6.8 Service Trench TR2, north side Dry Dock No. 3

6.8.1 Trench 2 (TR2) was a 63m long by 1.50m deep service trench to install wide diameter plastic pipes to take away rain and storm water. At approximately 1.50m wide and 1.30m deep the trench was located on the site's northern boundary, parallel with Dry Dock No. 4, on the north side of Dry Dock No.3. The trench, aligned east-west, began at the western terminus of TR1, and extended the entire length of Dry Dock No. 4, until exiting out through a core-drilled opening in Basin No. 1's dock wall. Several large stone-built features were exposed during the excavation of this trench. These included; the remains of late 18th-century stairs and chutes originally serving Dry Dock No. 4 [122], [130], [131] and [134]; a section of the interior structure of the Dry Dock No. 4 wall [129]; two unidentified foundations [119a&b] and two 19th-timber building foundations pads [133] and [135]. Two sluice gate structures (Penstock valves) [132] and [137] where also uncovered. These were identical to a feature [37] exposed

during the enabling phase works conducted in 2010¹⁵. An examination of these features afforded the opportunity to reassess the original interpretation of [37] and resulted in a reinterpretation of its function. The excavation of the western terminus of Trench 2 revealed part of the 19th-century stone and brick foundation construction (contexts [123], [124], [125] and [127]) of the dockside edge as it faces out towards Basin No. 1.

6.9 Service trenches TR3, TR4, TR5 and Steam Duct Trench, south side Dry Dock No. 3

- 6.9.1 Trench 3 (TR3) is located on the south side of Dry Dock No. 3. It was excavated as a 65m long by 1.50 to 1.60m deep service trench to install wide-diameter plastic pipes to take away rain and storm water, exiting out through an existing opening in Basin No. 1's dock wall, originally made for a cast iron drain pipe installed in the early 20th century. The trench was machine excavated to approximately 1.50m wide and 1.50m deep and was aligned east-west. Several features were exposed during the excavation of the trench including; [138] a 20th-century iron ground support; [139] a 19th-century stone-built penstock valve; [140] a 19th-century stone-built gully and [142] a 19th-century brick-built sewer.
- 6.9.2 Trench 4 (TR4) was located on the north-east side of Dry Dock No. 3. Aligned north-west to south-east TR4 measured 25m long by 0.5m wide by 1.0m deep. Features exposed included [141], 19th-century timber building foundation pad and [143], a 19th/20th-century mooring ring set in granite and concrete.
- 6.9.3 The Steam Duct Trench (SDTR) was located on the north-east side of Dry Dock No. 3. It measured 1.80m wide by 0.90m deep by 33m long and was aligned north-west by south-east. Only modern archaeological features were revealed in this trench (Photographic ref; D.317/9,10. D.318/5-7); a section of 20th-century dockside railway [112] previously exposed in TR1.
- 6.9.3 Trench 5 (TR5) was located south-east of Dry Dock No. 3 and was excavated for water and power supplies to the new museum. It measured 1.10m wide by 1.30m deep, reducing to 0.9m wide by 0.60m deep at its eastern terminus. TR5 was 18m long on its east-west run before turning south-east for 16m to connect up with the existing water and power supply to the Victory Arena toilets. No archaeological features were encountered in this trench (Photographic ref; D.316/4-12).

¹⁵ Watson, S. April 2011, 7.9, & 8.11.

6.10 Single Flight Auger Piling Operations (Fig. 2)

- 6.10.1 Piling operations were undertaken at the study site during November 2010. The intention was to drill 60 pile positions around both sides of Dry Dock No. 3. Three piling auger bore diameters were used; 350mm, 450mm and 600mm. Depths of bore varied from the deepest at 23m (piles 59 and 3) to the shallowest at 13.9m (piles 8 and 9). Generally the average depth was between 15 to 17m.
- 6.10.2 A large number of the pile locations encountered obstructions and were either moved or abandoned to be replaced with concrete slab foundations. In some cases the pile positions were very close to the dock edge. On the north side piles 1, 28 and 30 all failed and it was concluded that the obstruction was probably caused by the sub-structure of the dock. Consequently these positions, along with their 'partner' positions on the south side (piles 2, 27 and 31), were all moved 1.0m north on the north side or 1.0m south on the south side to clear any obstruction and avoid damage to the dock.
- 6.10.3 On the south side piles 52, 55, 56, 57 and 58 failed at 1.0m down where they encountered the unbroken floor slab of the basements of the now demolished Trafalgar Building. These positions were abandoned and replaced with concrete slab foundations.
- 6.10.4 On the south side piles 35 and 36 failed at 1.5m down. The area was then excavated by machine and exposed the obstruction as an archaeological masonry feature allocated the context number [99]. This was interpreted as a 19th-century capstan foundation base. After recording the structure was removed by machine; the masonry was not retained.

6.11 Dockside furniture removal

- 6.11.1 In the initial planning for this phase of works it was envisaged that another four dockside bollards would require removal, in addition to those already removed during the enabling phase¹⁶. The four bollards were located on the north-west, south-west, north-east and south-east corners of Dry Dock No. 3. However, their removal proved to be unnecessary and the bollards remain *in-situ*, to be incorporated into the landscaping scheme of the new museum.

¹⁶ Watson, S. April 2011, figure 2, p.8.

6.12 Victory Arena, PVPD11 (See Appendix 4 for Figures)

- 6.12.1 From the 5th to the 6th December 2011, a small scale watching brief was undertaken within the environs of the Victory Arena, on the eastern side of HMS Victory, Dry Dock No. 2. The work consisted of monitoring a single trench (TR1) excavated to install a new lightning conductor and electric power cables. The trench was 48.50m long north-south by 0.20m wide east-west. The trench was between 0.18m deep at the northern end to 0.40m deep at the mid-southern end. Levels were estimated from topographic data obtained during a watching brief undertaken on the western side of HMS Victory¹⁷ which gave an average ground level spot height of 4.30mOD. No significant archaeological features were encountered.
- 6.13 On the Mary Rose main works site, all principal archaeological features were located and levelled using a combination of GPS and Total Station. Some features were located by triangulation and their levels estimated from topographic data indicated on various contractors' plans.
- 6.14 A comprehensive photographic record was made of all the principal features on site using 35mm color and black and white film stock and high resolution (12.2 MP) digital format photography. Certain parts of the investigation (the 20th-century crane rail for example) were only ever recorded photographically and where discussed in the text the photographic reference is given in parenthesis.
- 6.15 All archaeological deposits were recorded to recognized standards outlined in the Method Statement¹⁸.
- 6.16 All finds and samples recovered from the site were removed to Pre-Construct Archaeology's London office for processing. The completed archive and finds will be deposited with the appropriate repository, Hampshire Museums and Archives Service.

¹⁷ Watson, S. May 2011.

¹⁸ Bradley, T with Moore, H 2009

7 THE ARCHAEOLOGICAL SEQUENCE

- 7.1 This phase of the watching brief involved the stone removal from various integral elements of Dry Dock No. 3. These included stairs, chutes and dockside edging stones from the perimeter of the dock. This added to the knowledge of the construction of the dock gleaned from earlier investigations.
- 7.2 The investigation of the culvert allowed a comprehensive record of the feature to be made as well as confirming the fabric used in the tunnel, and its current condition, before being permanently sealed off.
- 7.3 The drainage trenches TR1, TR2, TR3 and TR4 uncovered previously unknown features, and clarified the function of exposed structures, found during this, and earlier phases of work.
- 7.4 Elements of the late 18th-century Dry Dock No. 4 were exposed and recorded.
- 7.5 A watching brief conducted in the Victory Arena, while under a separate site code (PVPD11), was covered by the Mary Rose Main Works Scheduled Monument Consent (SMC) and as such is included in this report. Only 20th-century (Phase 5) features were encountered in the single trench.
- 7.5 No features pre-dating the post-medieval period were uncovered during this phase of the investigation. To provide continuity with earlier work on the same site, the same phasing has been used; Phases 1 to 5. No Phase 1 (natural) features were exposed during this current study, but Phases 2 to 5 encompasses numerous archaeological deposits, the details of which are listed below.

7.6 PHASE 2: LATE 18TH CENTURY

Dock 4 stairs and chutes built in 1772

- 7.6.1 During the excavation of TR2, the remains of some of the stairs and chutes originally serving the south side of Dry Dock No. 4 were exposed. Dry Dock No. 4 was completed in 1772 (pre-dating Dry Dock No. 3 by some 30 years) thus the following features can be confidently dated to this phase.
- 7.6.2 The base of TR2 was composed of layer [126], a stiff mid yellow brown clayey silty sand with occasional small well rounded pebbles as inclusions. The layer was encountered at 1.48m below ground level at 1.78mOD and is interpreted as late 18th-century made ground of re-deposited natural clay-rich silt and sand.

- 7.6.3 Feature [122] was the partly demolished remains of a chute sloped down into the southern side of Dry Dock No. 4. Measuring 1.40m north-south by 3.20m east-west, [122] was constructed of granite and limestone masonry; the upper courses of this and the other stair and chute features had been truncated away in the 1920s when a dockside crane rail was installed. The rail itself was laid into a 0.20m thick concrete slab. The chute opening had been backfilled with concrete, presumably during the 1920s alterations. The structure was encountered at 0.20m below ground level and the top was recorded at between 3.62mOD and 3.05mOD (Fig. 17).
- 7.6.4 Feature [128] was the partly demolished remains of either a staircase or chute serving the southern side of Dry Dock No. 4. The opening into the dock had been backfilled with concrete, probably during the 1920s alterations, making identification of the exact function impossible. The structure measured 1.30m north-south (to the boundaries of TR2) by 3.90m east-west. In common with the other chutes and stairs to Dry Dock No. 4, it was constructed from smoothly dressed granite blocks (0.80m east-west by 0.70m north-south) and rough shaped limestone masonry, irregular in shape with no consistent measure. However, in this example, brickwork has been used in the foundations (a brick sample from this context had a spot date of 1750-1850; Appendix 2). Individual bricks measured 220mm by 100mm by 60mm, were unfroged and orange/red in colour. They were bonded with a hard pale grey cement mortar. The top of the feature was exposed at 0.34m below ground level, at 3.38mOD. After recording, the structure was removed (Fig. 17).
- 7.6.5 Feature [130] was the partly demolished remains of a staircase down into the southern side of Dry Dock No. 4 (one of the upper stair treads survived *in-situ*). Measuring 1.50m north-south (to the trench limit of excavation) by 3.36m east-west, [130] was constructed of granite and limestone masonry, with the granite forming the staircase itself, and the limestone used for the foundation sub-structure. However, directly below the granite stair tread, the sub-structure was observed to be constructed from unfroged orange-red brick measuring 230mm by 100mm by 60mm. The bricks were notably dense and heavy (a brick sample from this context had a spot date of 1750-1850; Appendix 2). The upper courses of the stairs had been horizontally truncated away in the 1920s and the stair-well had been backfilled with concrete at the same time. The structure was encountered at 0.30m below ground level and the top was recorded at 3.20mOD (Fig. 17).
- 7.6.6 Feature [131] was the partly demolished remains of a chute sloped down into the southern side of Dry Dock No. 4. Measuring 2.0m north-south by 3.80m east-west, [131] was constructed of granite and limestone masonry; the upper courses had been horizontally truncated away and the chute opening had been backfilled with modern

concrete, probably in the 1920s. The structure was encountered at 0.17m below ground level and the top was recorded at between 3.28mOD and 2.95mOD (Fig. 18).

- 7.6.7 Feature [134] was the partly demolished remains of a chute or staircase into the southern side of Dry Dock No. 4. Constructed from granite and limestone masonry the structure measured 2.95m north-south by 3.60m east-west and in common with other similar features, the upper courses had been horizontally truncated away and the opening down into the dock had been backfilled with concrete. Parts of the upper surface of [134] were overlain by modern concrete and the feature was adjacent to [132]. The structure was encountered at 0.32m below ground level and the top was recorded at between 3.12mOD and 2.75mOD (Fig. 18).
- 7.6.8 Between staircase [130] and staircase/chute [128], part of the inner face of Dry Dock No. 4's wall was exposed. This feature, [129], consisted of roughly dressed limestone masonry 0.50m wide east-west laid in a regular course at least 0.50m deep to the base limit of the trench at 2.50m OD, 1.20m below ground level. This was overlain by brickwork, which formed the upper parts of the wall. The brickwork was four courses deep (0.26m) by at least three courses wide (0.40m). The bricks were unfrogged, orange-red and measured 220mm by 100mm by 60mm. The courses were constructed in English bond laid in thin beds of hard grey mortar and date to 1772, the year of completion of Dry Dock No. 4. The top of the surviving brickwork was encountered at 0.44m below ground level at 3.26mOD. The uppermost brick course had been truncated away in the 1920s by a 0.30m thick layer of concrete and cement rubble topped by a 0.10m thick concrete slab, the top of which formed the current ground level at 3.70mOD (Fig. 17, Plate 8).

Penstock Valves¹⁹, north side

- 7.6.10 Structure [132] virtually abutted the eastern side of staircase [134], the two features are so close that it seems likely that both constructions are physically linked, and thus built at the same time. [132] was the well preserved remains of a Penstock valve (a sluice gate). It measured approximately 5m² and consisted of smoothed and dressed Portland limestone masonry supporting a central shaft, which in turn was supported by an outer platform of roughly shaped limestone slabs laid onto brickwork. The central shaft was rectangular in plan measuring 1.68m north-south by 2.10m east-west and was built from large smoothed masonry blocks. The walls of the shaft were

¹⁹ A Penstock valve is a type of sluice gate to control the flow of water; the term is inherited from watermill technology. In the case of the Penstocks referred to here, these are metal gates raised or lowered along grooves in a masonry built shaft operated from the surface by a simple screw mechanism. The gate when lowered is at right angles to the culvert below (c.9m below ground), thus shutting off the flow to the Dry Dock.

vertical and observed to continue down 2.40m to the limit of excavation, although the shaft is believed to extend down to c.10m. The top of the shaft had been backfilled with concrete in the early 20th century. Flanking the northern and southern sides of the shaft two rectangular recesses were formed in the masonry which housed upright iron fittings, a pair on each side, standing 350mm high. They were made from 70mm thick iron square bar column topped with a 200mm wide hexagonal head with a central square hole; best described as 'spoon' shaped. The southern pair still supported a horizontal bar inserted in the central square hole in the head.

- 7.6.11 Lining both the eastern and western sides of the shaft 60mm square profile iron bars were installed at 0.30m intervals, stretching the full width of the shaft. These are interpreted as permanently fixed ladder rungs.
- 7.6.12 On both the northern and southern sides of the shaft deeply incised vertical grooves were present opposite each other; 0.10m deep by 0.12m wide these were seen to continue down at least 2.40m to the limit of excavation, and are likely to continue to the base of the shaft. These are interpreted as the grooves to guide a sluice gate as it's raised or lowered to regulate water flow into a dry dock. The direction of the grooves and iron lugs (aligned north-south) would indicate that the culvert below was aligned east-west.
- 7.6.13 The solid masonry supporting the shaft extended squarely around it by approximately 1.0m²; the remaining area of the structure was constructed of roughly finished limestone slabs 0.12m thick supported on brickwork. The brickwork was observed to continue down at least seven brick courses (0.75m). The bricks, laid in English bond, were orange-red in colour, very dense, heavy and unfrogged. They measured 220mm by 100mm by 60mm and were bonded in a hard pale grey cement mortar (brick and mortar samples from this context had a spot date of 1750-1850; Appendix 2).
- 7.6.14 The Penstock structure [132] was encountered at 0.40m below ground level, with a highest level recorded at 2.96mOD.
- 7.6.15 The top of the Penstock valve [132] was covered by a modern concrete slab supporting a dockside crane rail that was installed in the 1920s. The shaft had been backfilled with a loose cement and gravel mix topped by a layer of concrete. It is believed that the Penstock valve served Dry Dock No. 4 from the 1770s and became redundant after the construction of Dry Dock No. 3 in 1803 (Fig. 18, Plates 5 & 8).
- 7.6.16 The south-western edges of [132] abutted [136]. This was a curvilinear gully structure built from limestone masonry. The interior of the gully was 0.47m wide by 0.43m deep while the exterior of the gully structure as exposed was 4.60m north-west to south-east by 2.20m north-east to south-west. The interior walls of the gully were of dressed and shaped limestone blocks 0.57m wide by 0.32m high, the inner face was tooled

with 45° striations incised into the stone. The base of the gully was formed by limestone slabs shaped to fit the curve. The gully channel was covered with roughly shaped rectangular limestone slabs c.1.00m north-east by 0.60m south-west (Fig. 18, Plate 8).

- 7.6.17 [136] is believed to be the north-eastern edge of a large structure found during the enabling phase (Phase 3) in 2010, when it was allocated the context number [35] as a gully system that surrounded shaft [34] (both features were covered by an overall structure number [37]). It was originally interpreted as a hydraulic power system. However, the shaft [34] was identical to [132] described above, and therefore has the same function. Thus [136/35] has now been reinterpreted as a Penstock valve.
- 7.6.18 The proposed route of Trench 2 would have taken it through the central shaft of [132]. Following consultation with Richard Massey, English Heritage Inspector of Scheduled Monuments, it was agreed with the contractors and client to divert the route of the trench, which now followed a line through the small gap where [132] abutted [136], but shifted to go more towards the slab and brick part of [132]. The trench cut through the south-western corner of [132] by a north-west/south-east distance of 2.80m, a width of 0.70m and a depth of 0.92m. The trench revealed the depth (0.75m+) and extent of the brickwork platform surrounding the Penstock shaft. Re-routing the trench enabled the majority of the Penstock valve and culvert structure to be preserved *in-situ*, protected by Terram geotechnical fabric covered by a deep layer of pea shingle (Plates 5 & 8).
- 7.6.19 A later-phase structure [133] lay adjacent to the east of the Penstock valve [132] and will be discussed below in Phase 3.
- 7.6.20 Towards the western end of Trench 2 was [137], the partial remains of another Penstock valve. Only the western side of the structure was exposed, and much of the upper surface had been truncated away. Enough of the structure survived to show that it was identical to [132] (Plate 5), the diagnostic elements being a distinctive pair of 'spoon' shaped iron lugs and a deep vertical groove in the east facing shaft wall (Fig. 19, Plate 6). The iron lugs had an iron bolt inserted, which may be an original fitting (a similar bolt was observed *in-situ* in the Penstock valve at the stern of HMS Victory; Plate 7). While the Penstock valve [132] described above controlled an east-west aligned culvert, the direction of the lugs and groove in [137], east-west, would indicate that the culvert that this valve served ran north-south (Fig. 19, Plate 6).

Penstock valve south side and other features

- 7.6.21 Much of the ground surface of the south-western edge of Dry Dock No. 3 has been re-made with modern 20th-century concrete, replacing the original 19th-century stone

masonry. The upper part of the concrete was stripped away by machine to a depth of approximately 0.10m to provide a level base for the landscaping of the development. During the ground stripping two features, [139] & [140], were revealed.

- 7.6.22 [139] was the remains of the shaft of a Penstock valve. It was only revealed through a small hole made by the point of a hydraulic breaker attached to a small tracked excavator. The hole was punched through a modern 20th-century brick and concrete capping, which was probably installed to seal off this feature when the dockside was remodelled in the 1920s following the permanent berthing of HMS Victory in Dry Dock No. 2. There was a very limited view of this feature through such a small hole (no more than 0.25m²), and photographing the interior of the feature was hampered by warm air rising from the shaft fogging the camera lens. What could be seen was that the north facing upper stone-work of the shaft was constructed from smoothed and dressed masonry blocks, with iron ladder rungs extending down to the base. The shaft was measured at 8.5m deep via a drop line. Running water could be discerned at the base which was the culvert flowing north-south. The construction appeared to be identical to the Penstock valve [132] exposed in TR2 on the north side of Dry Dock No. 3; the same pattern ladder rungs for example.
- 7.6.23 Structure [140] was a stone-built gully exposed during the excavation of TR3 at the western end of Dry Dock No. 3 (Fig. 21). The line of the trench was chosen to follow an earlier 20th-century trench that had been cut down through the dockside surface to install an iron waste water pipe, which exited through the dock wall into Basin No. 1. The new drainage trench utilised the same exit. As the trench was re-cut it was found to have previously truncated through the stone-built gully [140] which crossed the trench at an angle of circa 45°, aligned north-west by south-east (the trench ran directly east-west). The gully exited through a rectangular hole formed into the dockside stonework facing west into Basin No. 1, which suggests that the structure was built for drainage. The gully was seen to continue south-east back towards the general direction of the Penstock valve [139]. It was observed to be at least 8m long and is likely to extend further south-east. The structure was 0.60m wide north-east by south-west and 0.42m deep. The gully was capped by two layers of smoothed and dressed limestone slabs each 0.14m thick, the edges of which were incised with diagonal linear tool marks. The total thickness of the capping, including the mortar, measured 0.33m. This in turn was covered by a 0.17m thick layer of modern concrete, the top of which formed temporary ground level. The top of the gully was recorded at 3.15mOD. The floor of the gully was formed from irregular shaped limestone slabs (c.400mm²) laid in a random pattern. The floor of the gully sloped gradually down to the north-west (towards the exit hole) and was recorded where it was exposed at 2.39mOD. This gully was identical in form and fabric to gully

[35]/[136] on the north side of Dry Dock No. 3, first found during the Phase 3 investigation and subsequently re-exposed during this phase. In both cases these features are believed to be associated with near-by Penstock valves [139] and [34] (see discussion below).

Basin No. 1 dockside, Western terminus TR2

- 7.6.24 At the western terminus of TR2 an opening had to be made through the dock wall facing west into Basin No. 1 to allow the exit of the storm water pipe installed in the trench. To minimise damage to the dockside structure, the trench was cut down following the same line as an old cut for a service trench excavated in the early 20th century; the concrete backfill marking its east-west course on the surface. TR2 had to be deeper than the old service trench cut, which only extended down to 0.64m below ground level at 2.62mOD, the new trench eventually reaching down to 1.45m below ground level at 1.81mOD (Fig. 19, 20).
- 7.6.25 Part of the southern edge of TR2 was dug down against the inner face of some large granite masonry blocks [146], whose tops formed the ground surface. At the time of excavation (October 2011) it was believed that what was being revealed was part of the general construction of the dockside and was included under the context number [127]. It was only much later in the investigation (March 2012), after the dockside had been cleared of building materials and detritus, that it was realised that TR2 had in fact been cut down the edge of a discrete feature; a possible disused Penstock Valve, which was now re-numbered as [146] and [147]. The on-site records were altered accordingly.
- 7.6.26 The southern edge of TR2 was formed in part by large blocks of granite masonry [146] and [127] (Fig. 19, 20).
- 7.6.27 [127] formed part the general surface structure of the dockside and was composed of granite masonry blocks of various sizes; one example measuring 1.10m north-south by 0.75m east-west by 0.43m thick. The top (ground level) was recorded at 3.26mOD.
- 7.6.28 [146] is believed to be the upper surface stones of a disused Penstock valve. In plan the structure measured 4.10m north-south by 3.90m east-west and was built from large granite masonry blocks of various sizes (average 1.80m north-south by 1.20m east-west). The granite blocks surrounded a rectangular feature (1.60m east-west by 1.90m north-south), now backfilled with modern concrete, but thought to be sealing the central shaft of the Penstock valve. The top of [146] forms the current ground level recorded at 3.26mOD. In the section exposed in TR2 (Fig 20. Section 86) the granite surface stones were observed to be 0.43m thick. [146] abutted the western edge of a 1930s capstan and had the same general dimensions and appearance of

the still operational Penstock valve P11, which abutted the southern edge of the 20th-century capstan; the similarities between the two structures led to the current interpretation (see discussion below in 8.11.4) (Fig. 19).

- 7.6.29 Directly below the granite surface stones [146] and [127] was a 0.90m thick layer of limestone [123] composed of irregularly shaped crudely finished limestone blocks averaging 0.60m wide by 0.30m thick roughly laid in courses, giving a rubble-like appearance. The top of [123] was at 0.43m below ground level at 2.83mOD extending down to 1.91mOD. This feature is thought to be a general widespread foundation layer supporting the dock surface stones above (Fig. 19, 20).
- 7.6.30 Present within the mass of [123] was one large granite block [147]. Roughly shaped and crudely finished it was not fully exposed and only its height was recorded at 0.50m. The top of [147] lay at 0.83m below ground level, at 2.43mOD. Its western edge was in line with the western edge of the concrete filled central area visible on the surface of [146], thought to be sealing the shaft of the Penstock valve. [147] is therefore believed to be a stone from the below ground structure of the Penstock valve's central shaft; it is suspected that the rest of the structure is being masked by the slightly overhanging limestone rubble [123].
- 7.6.31 Set into the lower parts of [123] and running transversely across the trench was a north-south aligned squared iron bar feature [125]. This was a wrought iron structure embedded in the limestone of [123] 1.15m below ground level at 2.10mOD. The southern end of [125] comprised two parallel bars, each 111mm high by 20mm thick, joined to the north end single iron bar (of the same dimensions) by 'spoon' shaped flanges formed at the ends. These were fixed in position by two triangular iron wedges, set horizontally at opposing angles and driven through a rectangular hole cast in the 'spoon' head flanges. The joint appeared to lie within a narrow gap in the dockside foundations, between the sub-structure [123] and the foundations of a bollard. This feature is believed to have been installed as a ground tie, bracing the masonry entrance to Dry Dock No. 4 (Fig. 19, section 86).
- 7.6.32 Directly below [123] was brickwork [124]. This consisted of at least two courses of bricks (0.10m thick), the top of which was encountered at 1.35m below ground level at 1.91mOD. [124] was observed to continue further down to an unknown depth beyond the trench's base at 1.78mOD, 1.47m below ground level. Individual bricks measured 230mm by 100mm by 60mm and were unfrosted orange-red in colour and notably dense and heavy (a brick and mortar sample from this context had a spot-date of 1750-1850; Appendix 2). It is thought that the brickwork forms part of the lower foundation structure supporting the central shaft of the Penstock shaft [146]. Similar bricks have been observed being utilised in the same way, supporting the lower parts of Penstock valve [132] further east in Trench 2. Comparable bricks have

also been observed being used on the inner face of Dry Dock No. 4 [129], known to date to 1772. Thus this part of the dockside and the Penstock valve [146] appears to date the late 18th-century phase of construction.

7.6.33 Brickwork [124] had been cut down into the clayey silty sand layer [126], (discussed above in 7.6.2) which forms the base of Trench 2 at 1.78mOD, 1.48m below ground level (Fig. 19).

7.6.34 The western terminus of Trench 2 required an exit hole for the drainage pipe to be core-drilled through the limestone masonry of the dock wall for a distance of 0.60m. This resulted in a 0.35m diameter hole, whose centre was 1.225m below ground level at 2.035mOD, through which a steel pipe was inserted forming the outfall for storm water. The opening was covered with a metal hinged flap fixed to the dock wall and the drilled-out core was retained and stored in Dry Dock No. 5 (Fig. 20, S.94).

7.7 PHASE 3: 1799-1803 THE CONSTRUCTION OF DRY DOCK No. 3 (Plates 1 & 2)

7.7.1 The steel frame of the new museum will be supported on a number of cast concrete foundation pads flanking both edges of Dry Dock No. 3. Their location severely impacted on several staircases and chutes that provide accesses into the dock, as well as sections of the dockside edge. The stairs and chutes were all contemporary with the dock, thus built between 1799 and 1803. The majority of the dockside edges obviously dated to the same period, but some sections of the top edge had been replaced in the early 20th century with concrete, laid to accommodate dockside railway tracks.

North side dock 3; staircases, chutes and dockside edges

North 1 (Fig. 15, 16)

7.7.2 North 1 was the designation given to a stone built staircase, context number [116], located at the western end on the north side of Dry Dock No. 3. The structure's surface layer was built from a single course of dressed granite masonry; the layers below were roughly dressed Portland limestone masonry. The structure measured 4.60m north-south by 3.93m east-west on the surface. The level on the top surface was recorded at c.3.55mOD. Only the top course of stone was removed; to a depth of 0.44m below ground level, to 3.11mOD. All stones were marked with the prefix NWD, followed by sequential numbers starting at 01.

7.7.3 Later on in the construction programme the dock side stones that flanked the eastern and western sides of staircase [116] had to be removed to accommodate a new concrete ramp providing access to the western end of the new museum. The

impacted area, given the context number [118], measured 19.0m east-west by 1.20m north-south, and along with the staircase, formed part of the north-western edge of Dry Dock No. 3. The works only required the top course of stone to be removed. These were made from smoothed and dressed rectangular blocks of granite of various sizes laid in two parallel courses separated by a modern ferrous metal crane rail set in a thin band of concrete. On average they measured 0.60m north-south by 2.46m east west by 0.44m thick. The level on the top of [118] was estimated at 3.55mOD. In total 12 granite blocks were removed and stored on site and were marked up thus; NWD1 & 1A, NWD2 & 2A, NWD3 & 3A, NWD4 & 4A, NWD12 & 12A, NWD13 & 13A. Stones NWD14 & 14A and NWD15 & 15A were not removed as they proved to be inaccessible under the timber clad overhang of the new museum and remain *in-situ*.

- 7.7.4 Context number [117] was an area of dockside stones, just to the west of [118], which comprising the edge and part of the surface area of the north-west corner of Dry Dock No. 3. The area measured 11.0m east-west by 3.0m north-south. Originally it was thought that this area had to be reduced down to fit in with the new landscape ground level, but this proved not to be necessary and the area remains *in-situ*, incorporated into the new landscaping scheme. The level on this area was recorded at 3.34mOD.

North 2 (Fig. 7)

- 7.7.5 North 2 was the designation given to a stone built chute, [100], located west of centre on the north side of Dry Dock No. 3. The top layer of stone was a single course of smoothed and dressed granite masonry, while the layers below were roughly dressed Portland limestone masonry. The structure measured 4.0m north-south by 3.50m east-west on the surface. The level on the top surface was recorded at 3.81mOD. The chute's stone work was taken down by three courses to a depth of 1.04m below ground level, to 2.77mOD. All stones were marked with the prefix N2, followed by sequential numbers starting at 001 for the top layer, 101 for the second layer and 201 for the third.

North 3 (Fig. 8)

- 7.7.6 North 3 was a stone-built staircase, context number [101], located centrally on the north side of Dry Dock No. 3. The top layer of stone was a single course of smoothed and dressed granite masonry, with the exception of the south-western corner which had been replaced with a modern concrete block measuring 1.20m north-south by 0.78m east-west by 0.27m deep. The remains of an unidentified ferrous metal fitting was affixed to the inner face of the concrete. At the northern end of the staircase both sides of the flank walls had concrete repairs inserted into two of the granite stones. Cut off ferrous metal fittings present on the surface may be the remains of an original

hand-rail installed around the open staircase. Below the granite the remaining layers were of roughly dressed Portland limestone masonry. The structure measured 4.20m north-south by 3.10m east-west on the surface. The level on the top surface was recorded at 3.97mOD. The chute's stone work was taken down by three courses to a depth of 1.06m below ground level, to 2.91mOD. All stones were marked with the prefix N3, followed by sequential numbers starting at 001,101 for the second layer and 201 for the third.

- 7.7.7 Later on in the programme of works the final 1.0m of stone work at the northern end of the structure was further reduced down by another two courses to allow the excavation of a trench for one of the foundation ring beams.
- 7.7.8 Parts of the surface features abutting the dock edge were removed at the same time as the stairs above. This included the removal of part of an early 20th-century rail track on the eastern side of North 3 and an area of modern concrete removed from the western side of the staircase. In both cases the dock edges were left in place.

North 5 (Fig. 9)

- 7.7.9 North 5 was a stone-built staircase located at the north-eastern end of Dry Dock No. 3 and given the context number [102]. This was one of the two more complex staircase structures serving the dock (the second is mirrored on the south side as South 5 [148]). Here the staircase ran parallel (east-west) with Dry Dock No. 3 as an open structure before turning 90° and continuing south down into the dock. This section of the staircase was below ground, encased within an arched stone tunnel, which in turn was built into an enclosed curvilinear stairwell. The stairwell had previously been part exposed during the Phase 3 watching brief where it was given the context number [85]²⁰. The northern side of [102] was constructed from smoothed and dressed granite masonry (individual blocks measuring on average 1.35m long by 0.40m wide by 0.36m high) while the southern side and all subsequent lower course were built from Portland limestone masonry (individual blocks measuring on average 0.80m long by 0.40m wide by 0.24m high). That part of the structure visible on the surface measured 2.30m north-south by 3.90m east-west and continued down to at least 2.80m. The level on the top surface was recorded at 4.31mOD. The stone-built arch structure which encased the lower parts of the staircase was faced with dressed granite masonry blocks surfaced finished with regular parallel tool marks cut at 45°. The granite blocks were cut and fitted on a gradual curve to form a shallow arch, whilst at the same time sloping down and in on itself, before turning through 90° on a curve. At the top, the arch was held in place with a large wide keystone (stone no. NS/A/19). The granite facing of the arched tunnel was interleaved into a limestone

²⁰ Watson, S. April 2011, 7.6.9

substructure (which lay behind and in places above the granite) which continued on to form the curved stairwell structure [85]. The staircase, North 5, was dismantled down by four courses (c.1.20m below ground level at approximately 3.11mOD) which resulted in a large amount of stone being removed from this area; including the upper parts of staircase [102], upper parts of stairwell [85], as well as sections of the dock edge.

North 6 (Figs. 10, 11, 12)

- 7.7.10 North 6 was a stone-built staircase into Dry Dock No. 3, given the context number [109] and located on the north-eastern end of the dock. This structure did not require dismantling, but instead had a small (1.24m²) concrete foundation pad cast into the stairwell whose base was supported by the stair treads, beginning at six steps down. The original structure was protected from direct contact with the concrete by heavy gauge plastic sheeting and ply-wood shuttering. The top of the staircase was sealed over with metal alloy interlocking sheets (colloquially referred to as 'crinkly tin') before being covered by the concrete flooring of the new museum. The staircase measured c.2.00m north-south by 3.40m east-west. The level on the top surface was recorded at 4.54mOD (Fig. 11).
- 7.7.11 Connected to the southern side of staircase [109] was dock edge [110]. This was a stretch of the dock edge located at the north-eastern end of Dry Dock No. 3, extending 8.0m south-east / north-west by c.1.20m north-east by south-west. All of the edge stones were smoothed and dressed granite masonry (measuring on average 0.58m wide by 0.74 long by 0.34m deep), with some Portland limestone infilling directly behind (i.e. north-east of, away from the dock). The courses below, which were stepped out to form the altar steps inside the dry dock, were of Portland limestone masonry measuring on average 0.80m long by 0.34m high by c.0.50m wide. Only the 'seen' faces of the limestone masonry was smoothed and dressed; the remaining faces, being hidden from view, were roughly shaped. In total three courses of stone was removed from this area down to 1.08m below ground level; this to accommodate concrete foundation pads. The level on the top of [110] was recorded at 4.54mOD. The top edge stones were marked as NE/ED1, 2, etc while subsequent layers were numbered as NE/ED 201 etc (2nd layer) and NE/ED 301 etc (3rd layer). After recording the stones were removed and transferred to Dry Dock No. 5 for temporary storage (Fig. 11).
- 7.7.12 The entrance to the culvert system was located in the base of Dry Dock No. 3, in its north-west corner and was allocated the context number [108] (Fig. 10) Plates 9, 10, 11 & 12). As part of the new works, the entrance is to be permanently sealed up. Contemporary with the dry dock (late 18th/early 19th century), its original function was to drain or fill the dock via an interconnected network of underground tunnels that

culminated in a storage reservoir below the Block Mills Building. The culvert system, unused for decades, today does little more than drain away surface run-off water, or sea water from leaking dock gates. The entrance was a round topped rectangular opening in the dock wall 1.64m high by 0.92m wide. The opening was framed by the Portland limestone masonry that forms the inner face of the dock. The curved top of the opening was framed by a trio of fan shaped masonry, set into the ordinary coursing. The opening is protected by a pair of iron gates each one 1.54m high by 0.45m wide (total width 0.93m including a 30mm gap between the two) by 0.07m thick. The gates' frame was of open work square profile bar with a insert grid of round bar. The gates were simply hinged; at the top by a round bar inserted through a circular lug imbedded into the masonry; at the base by round bars inserted straight into drilled holes in the base. A small recess was noted on the front of the eastern gate, which may have been the space for a lock or handle. The gates, while heavily rusted, were in good condition. Surrounding the opening in the masonry were a regular series of drilled holes 190mm deep with a diameter of 50mm. These may be the scars of an earlier gate fixing; two of the holes were directly behind the line of the gates, indicating whatever was fixed here was earlier. Thus the current gates may be a later (late 19th century?) replacement.

7.7.13 The culvert tunnel extended north-west via two shallow dog-leg bends (the first at 3m in, the second at 7m) for a distance of c.9.0m, where it reached an abrupt halt at a solid iron sluice gate. This was the principal component of a Penstock valve; the gate isolated each section of the culvert system and the dry dock it served. At various locations around the dockyard, the opening mechanisms of the Penstock valves could be seen on the surface. The one applicable to Dry Dock No. 3 was located in the area north-west of the dock; this example controlled a three way connection. The interior of the tunnel was constructed entirely from Portland limestone masonry. While heavily encrusted with calcium concretions, the tunnel's stonework appeared to be sound and in good condition. The floor of the culvert was calculated at (minus) - 6.07mOD, approximately 9.37m below current ground level.

7.7.14 Context [144] was a continuation of the dock edge stone removal conducted under context number [110] on the north-eastern corner of Dry Dock No. 3. It comprised a small area of limestone masonry blocks (measuring 3m north-west by south-east) that had originally backed the granite dock edge stones of [110]. The stones were removed to allow trenching up against the interior inner face (i.e. that normally hidden below ground) of the dock walls. This was to allow a 0.30m diameter hole be core-drilled through the wall allowing a waste water pipe to pass through it. This was a continuation of drainage trench TR4. The individual stones were of various dimensions; on average measured 0.90m east-west by 0.45m north-south. A level of

4.58mOD was recorded on the top of [144], which formed the current ground level. The stones, numbered NE1001 to NE1005, were removed and stored off site (Fig. 11).

South side Dry Dock No. 3; staircases, chutes and dockside edges

South 1 (Fig. 4)

7.7.15 South 1 was the designation given to a stone built staircase, context number [96], located at the western end on the south side of Dry Dock No. 3. The structure's surface layer was built from a single course of dressed granite masonry; the layers below were roughly dressed Portland limestone masonry. The structure measured 4.70m north-south by 4.00m east-west. The level on the top surface was recorded at c.3.60mOD. Only the top course of stone was removed; to a depth of 0.46m below ground level, to 3.14mOD. All stones were marked with the prefix SHS, followed by sequential numbers starting at 1; for example SHS1, SHS2 etc. At the northern end of the staircase a modern ferrous rail track, parallel to the dock, had been inserted into the stone; this to carry a dockside rail mounted crane installed in the 1920s. The rail was supported over the void of the staircase by ferrous I-beam; recesses for which had been cut into the western and eastern inner faces of the stairwell. Various ferrous fixtures were located around the stairwell, but cut-off at ground level, probably indicating that at some time in the past the stairs had been fenced off. The open staircase was sealed over with metal alloy interlocking sheets (before being covered by the concrete flooring of the new museum).

South 2 (Fig. 5)

7.7.16 South 2 was a stone-built chute, context number [97], located west of centre on the south side of Dry Dock No. 3. Following the same pattern as other structure around the dock, the surface stone was a single course of smoothed and dressed granite masonry; layers below were roughly dressed Portland limestone masonry. The structure measured 3.90m north-south by 3.50m east-west. The level on the top surface was recorded at 3.86mOD. As discussed in [96] above, and in the same position, a modern ferrous rail track, parallel to the dock, had been inserted into the stone and supported over the void by ferrous I-beam; recesses for which had been cut into the inner faces of the chute. The chute's stonework was taken down one course to a depth of 0.40m below ground level, to 3.46mOD. All stones were marked with the prefix SHS, followed by sequential numbers starting at 1. The chute was sealed over with metal alloy interlocking sheets before being covered by the concrete flooring of the new museum.

South 3

7.7.17 South 3 was a stone-built staircase, context number [98], located centrally on the south side of Dry Dock No. 3. The upper layer was a single course of smoothed and dressed granite masonry, with the exceptions of the north-western corner and an area on the eastern side which had both been replaced with a modern concrete. Cut off ferrous metal fittings present on the surface may be the remains of an original hand-rail installed around the open staircase. Below the granite the remaining layers were of roughly dressed Portland limestone masonry. The structure measured 4.40m north-south by 3.06m east-west on the surface. The level on the top surface was recorded at 4.02mOD. Only the front southern end of the structure was disturbed with one course, to a depth of 0.36m below ground level, to 3.66mOD, being removed. All stones were marked with the prefix SHS followed by sequential numbers starting at 26 to 32.

South 5 (Fig. 9)

7.7.18 South 5 is a complex staircase structure allocated the context number [148]. Built as an integral part of Dry Dock No. 3, it thus dates to 1799-1803. It was located on the south-east side of Dry Dock No. 3, ran parallel on the surface (east-west) to the dock before turning 90° and continued downwards north-south into the dock where it was encased in a stone built tunnel. The majority of the structure was constructed from limestone masonry blocks of various sizes (one example measured 600mm by 400mm by 400mm). The limestone was smoothed and dressed and the exposed faces finished with closely spaced parallel 45° striations chiselled into the surface. The staircase treads were made from individual dressed blocks of granite all measuring 1500mm long by 190mm thick by 200mm wide. The limestone was bonded with a brittle pale yellowish gray lime mortar; while a very hard dark brown 'Roman' type cement mortar had been used as 'strap' or 'ribbon' pointing. The structure measured 5.40m east-west by 2.30m north-south and its top formed part of the ground surface recorded at 4.41mOD. The surface stones and the first three stair treads were numbered with the prefix S5, followed by individual stone numbers 01 to 15. One surface stone from the southern side (between S5.08 and S5.09) had been removed in the 1980s to accommodate water and PEG solution pipe-work serving the Mary Rose. One surface stone on the north-west side (S5.06) had been partly truncated away to accommodate the new museum building. The western edge of the back of the tunnel wall had been partly exposed during the Phase 3 works, where it was allocated the context number [86] and the face of the wall partly removed. Staircase South 5 [148] was almost a mirror image of the staircase North 5 [102] on the north side of Dry Dock No. 3; the difference being that all of the surface stone of [148] was

limestone as opposed to the partial use of granite on [102]. The structure was to remain *in-situ*, with the stair-well sealed over, eventually to be overlain by reclaimed granite setts as part of the landscaping scheme

South 6 (Fig. 13)

7.7.19 South 6 was a much truncated stone-built staircase given the context number [149], located on the south-east corner of Dry Dock No. 3. Only the granite stair treads survive; the northern edge, which would have encased the staircase, was removed earlier on in the works program where it was recorded as part of dock edge stones [111] (see below). The southern side was overlain and masked by a concrete slab laid in the early 20th century to support the railway tracks of a dockside crane. At the fifth step down a modern concrete foundation pad of the new museum had been cast onto the staircase. None of the stonework that surrounding the stairwell, that would have formed the ground surface appears to have survived *in-situ*. It is probable that they were removed in the 1920s. Two of the granite stair treads (which measured 1.10m long by 0.20m wide by 0.19m thick) were removed to allow for the installation of drainage pipes; marked as S6/01 and S6/02 they were removed from site and stored. The level on the top stair tread was estimated at 4.30mOD.

7.7.20 On the south side of Dry Dock No. 3, on its south-eastern corner, a section of the masonry dockside edge had to be removed to accommodate a concrete foundation pad for the development. The impacted area, given the context number [111], measured approximately 8.0m east-west (as far as stairs South 6 [149]) by c.1.30m north-south and extended down three masonry courses (1.02m deep). The upper course of masonry (forming the ground surface) was made from smoothed and dressed rectangular blocks of granite of various sizes; one example measured 0.74m north-south by 0.50m east-west by 0.36m deep. Below the granite the remaining courses were all of rectangular blocks of Portland limestone of various sizes; only the face of the stones were visible and measured on average 0.60m east-west by 0.32m deep. Many of the faces displayed 45° incised tool marks, probably from machine sawing. The limestone course was stepped out from the granite course by 0.50m to form the first a series of altar steps descending into the dock. The top of [111] formed the current ground level recorded at 4.40mOD.

7.8 PHASE 4: 19th CENTURY (Fig. 6)

7.8.1 Exposed in Trench 10 on the south side of Dry Dock No. 3, just to the east of staircase [98], was a stone-built foundation [99]. Built from roughly dressed and shaped blocks of Portland stone, individual stone blocks were of various sizes; on average they measured approximately 300mm square and 600mm by 800mm. The

bonding material was a friable pale grey mortar. As a whole, the feature measured 2.90m north-south as found by 2.20m east-west as found. Only the northern edge of [99] was exposed (approximately 2.70m from the southern edge of the dock); the western and southern sides lay beyond the limit of excavation; the eastern side had been truncated away at some time in the past, the eastern half of the upper stonework had also suffered giving the structure a 'stepped' look. In the presumed centre of the feature a 0.36m diameter circular hole had been formed into the stonework, which was observed to extend down at least 0.20m. Two pile positions (38 and 37) had been drilled just to the west of [99], c.2.0m from the centre of the structure, and had not encountered any obstruction and are believed to have narrowly missed the western side of [99]. However, this structure lay directly in the path of pile positions 35 and 36; hence its exposure. Thus after recording [99] was removed to clear the location. Feature [99] was exposed at 0.89m below ground level, at a high of 3.60mOD and a low of 3.25mOD. The structure is interpreted as a 19th-century capstan foundation

7.8.2 In Trench 1 on the north-east corner of the site, the southern side of the trench clipped the northern edge of a stone built feature [113]. Built from Portland stone the roughly dressed blocks varied in size but on average measured 300mm by 250mm, while the part of the structure that was exposed measured 2.20m east-west by 0.70m north-south, but continued beyond the limit of excavation. A modern brick D/C electrical inspection chamber was built over most of the top of [113], the remains of which was utilised as the base of the inspection chamber. The ground around [113] in Trench 1 had been heavily disturbed by multiple modern services bisecting the trench in this area. This feature was encountered at 1.25m below current ground level, at 2.97mOD. Only that part of its northern edge that projected into the trench (by 0.70m) was removed, the rest remains *in-situ*, although masked by the inspection chamber directly above. This structure is tentatively interpreted as a timber building foundation pad, although too little was exposed to be certain. If it was a foundation base, it probably related to Dry Dock No. 4 as it was located close to its southern edge (Fig. 6).

7.8.3 Exposed during the removal of staircase North 3 [101] and adjacent to its western edge was stone-built feature [103]. Constructed mostly from Portland stone blocks, but with some use of Granite blocks, the stones were various sizes, on average measuring 500mm north-south by 600mm east-west. The stones are roughly cut to shape and laid in an irregular pattern, some parts of it being in a rubble form. Some of the surface was covered in thick deposits of hard brown 'Roman cement' style mortar (dating it to the early to mid 19th century). In the central position was a square hole formed in the stonework, measuring 0.60m². The entire structure measured 2.70m

north-south by 3.40m east-west and was encountered at 0.30m below ground level at 3.63mOD. A mooring ring set in granite and surrounded by later modern concrete partly covered the eastern side of the structure. [103] is interpreted as a timber building foundation pad (Fig. 8).

- 7.8.4 The following were a series of 19th-century made ground deposits observed in various locations along the length of the foundation trenches cut on the north and south sides of Dry Dock No. 3. These foundation trenches, dug as linear rectangular grids, varied in depth from between 1.0m to 1.60m. The trenches were dug to install concrete ring beam foundations to support the service buildings flanking the main museum building.

North side foundation trenches (site of new education pavilion)

- 7.8.4.1 Deposit [104] was a 0.50m thick layer of mid grey brown clayey silt with lenses of yellow sand and moderate fragments of CBM as inclusions. The top of this deposit was recorded at 2.50mOD, 0.90m below ground level. This layer was in turn overlain by 0.90m thick layer of modern crush, the top of which formed the temporary ground level at c.3.40mOD.
- 7.8.4.2 Deposit [105] was a 0.70m thick layer of friable mid yellow brown sandy silt, with lenses of clay and occasional fragments of CBM. The top of this layer was encountered at 0.80m below ground level at 2.60mOD. Overlain by 0.80m thick layer of modern Type 1 crush, the top formed ground level at c.3.40mOD.

South side foundation trenches (site of new entrance pavilion)

- 7.8.4.3 Deposit [106] was a 0.30m thick layer of friable mid yellow brown sandy silt, with lenses of clay and occasional fragments of CBM. The top of this layer was encountered at 0.70m below ground level at 3.60mOD.
- 7.8.4.4 Deposit [107] was a 0.90m thick layer of friable mid yellow brown sandy silt, with lenses of clay and occasional fragments of CBM. The top of this layer was encountered at 0.70m below ground level at 3.60mOD. Both [106] and [107] were similar to [105] described above.

- 7.8.5 Exposed in the base of TR1 was layer [115]. This was is a 19th century made ground deposit composed of a soft mid yellow brown sandy silt with some clay and occasional fragments of CBM. It was 0.30m thick and the top was recorded at 3.10mOD. This deposit was overlain by Phase 5 20th-century layer [114].

- 7.8.6 Encountered in TR2 was layer [121]. This was a trench wide 19th-century made ground deposit observed in the base of trench. Composed of a loose mid grey brown silty sand with frequent fragments of CBM, the top was encountered at between 0.80m and 1.12m below ground level at between 3.20 and 2.68mOD. Layer [121] lay below Phase 5 layer [120] (Fig. 17).
- 7.8.7 Exposed during the excavation of TR2, structure [133] was found as part of a complex series of features [132], [134] and [136] all exposed adjacent to the southern edge of Dry Dock No. 4. Context [133] was a stone-built structure constructed from roughly shaped limestone blocks of various sizes; on average measuring 400mm by 700mm. The masonry was bonded with a hard yellow brown Portland cement mortar (a sample of which was spot dated to 1800-1950; Appendix 2). Originally built square, the surviving structure measured approximately 3.00m east-west by 3.40m north-south; the north-eastern corner had been truncated in the past; the western edge was partly masked by a rubble infill between this and context [132]. In the centre of the structure a square hole formed by the stonework measured 0.70m north-south by 0.70m east-west. This feature was encountered at c.0.90m below the surface at 2.91mOD. After recording the feature was removed by machine. It is believed that this structure was the remains of a stone foundation pad to support timber uprights to a large shed built over Dry Dock Nos. 3 and 4 in the early 19th century, one of a number identified on site. Because of its close proximity, [133] is thought to relate to Dry Dock No. 4 (Fig. 18, Plate 8).
- 7.8.8 Exposed in the western end of TR2 was stone-built structure [135]. The exposed surface was built from roughly shaped limestone blocks of various sizes; on average measuring 300mm by 500mm. The eastern side was built over a lower foundation of unfrogged orange/red brick laid in two parallel courses of stretchers aligned north-south. The brickwork was bonded with hard pale grey mortar. The masonry was bonded with hard brown 'Roman cement' type mortar. The structure was originally built as a square, but the surviving structure measured 2.80m east-west by 1.40m north-south; the entire southern side, effectively half the structure, had been truncated away in the 20th century by a service trench containing an iron water main pipe. Placed centrally was a square hole formed by the stonework measuring 0.60m². The highest level of [135] was recorded at 3.00mOD; the lowest at 2.75mOD. After recording, the feature was removed by machine. It is believed that this structure was the remains of a stone foundation pad to support timber uprights to a large shed built over Dry Docks Nos. 3 and 4 in the early 19th century, one of a number identified on site. This example is believed to relate to Dry Dock No. 4 (Fig. 19, Plate 8).
- 7.8.9 Exposed in the eastern end of drainage trench TR4, as it headed south back toward Dry Dock No. 3, a stone-built foundation structure [145] was encountered. This

consisted of roughly shaped limestone blocks approximately 400mm square laid to form a square structure 1.60m east-west by 1.60m north-south. Set within the central stone area was a rectangular slot aligned north-south (measuring 0.60m north-south by 0.30m east-west) supporting two parallel truncated vertical timber posts, which projected 0.25m above the surviving top layer of stone. [145] was encountered 0.22m below the surface at 4.36mOD (A mortar sample from this context had a spot date of 1780-1850). During its removal (the structure lay in the path of the new drainage) the stone structure was noted to be 1.00m thick and the lower parts of the timber posts could be examined *in-situ* prior to their removal. The timber posts were set in the recess with a 0.10m gap. A large nail was recovered from the gap. Post-removal the two timber posts were observed to be identical in size (although their relative lengths were different due to decay). They measured 1.52m long (southernmost post) and 1.48m long (northernmost post) and both were 0.30m east-west by 0.30m north-south. In both cases the end edges had been neatly chamfered. A bent iron pin had been inserted into the top of the southern post on its western face. Both examples were converted box heart and while the lower 2/3rds were in good condition, the upper parts were badly decayed. No joints, cuts or marks were observed. The very straight finish of the posts would indicate that the timber was machine sawn (thus no earlier than 19th century) and the species is believed to be a type of softwood, probably Spruce or Pine; the wood gave off a strong resinous smell when cut. The use of Spruce (*Picea*) is known from other contexts associated with the construction of Dry Dock No. 3; for example, contexts [78] and [82] were Spruce timber posts exposed during the Phase 3 investigation²¹ (Plate 21).

- 7.8.10 It is believed that this structure was the foundation remains of a timber shed that was built over Dry Dock No. 3 in the early 19th century (Plate 22) and removed at the end of that century. The two posts possibly formed one of the main vertical supports at the building's north-east corner. The structure itself lay no more than 0.50m from the north-east dock side. A number of similar structures have been found during this, and previous investigations, and have all been distinguished by a square hole in the centre of the feature, along with [145] these also include [103], [113], [133], [135], [141] and context [80] from the Phase 3 investigation²².
- 7.8.11 Exposed in the base of Trench 4 was a stone-built structure, [141], built from roughly shaped limestone blocks of various sizes; on average measuring 300mm by 250mm. The masonry was bonded with a friable yellowish grey sandy mortar. Constructed originally as a square, the surviving structure measured approximately 1.70m east-west by 1.70m north-south; the eastern side and the north-western corner had been

²¹ Watson, S. April 2011.

²² *ibid.*

truncated away in the past; the northern edge lay beyond the trench limit of excavation. Placed centrally was a square hole formed by the stonework measuring 0.30m north-south by 0.35m east-west. [141] was encountered 0.70m below the surface at 3.98mOD. After recording the feature was removed by machine. It is believed that this structure was the remains of a stone foundation pad to support timber uprights to a large shed built over Dry Dock Nos. 3 and 4 in the early 19th century, one of a number identified on site (Fig. 24. Plate 20).

7.8.12 Exposed in the base of Trench 3, opposite the newly constructed main door into the entrance pavilion of the new museum, was structure [142]. This was a very large brick-built feature that consisted of a large chamber structure, aligned east-west, with a smaller north-south aligned culvert structure entering the southern wall. The main chamber measured (note; all measurements are estimates as the structure was too deep to enter) c.2.30m wide north-south by 2.70m deep by at least 4.0m long east-west; the chamber continued westwards for an unknown distance. The brick walls extended vertically up c.1.90m before curving over to form an arched brick roof. Both walls and roof were observed to be two brick courses thick (0.24m). The chamber's eastern wall formed a terminus to the structure; during its subsequent demolition the feature was observed to end at the wall.

7.8.13 A culvert entered the chamber's southern wall c.0.72m west of the south-eastern corner. It was c.1.68m wide east-west by c.1.06m high and was formed by a semi-circular brick arch of two courses of headers laid on edge.

7.8.14 Both the culvert and chamber were constructed from orange/red unfrosted brick, well-fired and machine-made, measuring 203mm by 100mm by 60mm. The bricks were laid in English bond with a friable pale grey mortar (brick and mortar samples taken from this context had a spot date of 1800-1900). The northern and southern walls and the roof of the chamber were well finished with neat pointing; the eastern end wall was rougher in appearance with cruder pointing which may indicate later repairs. The top of the structure was 1.2m below ground level at c.3.45mOD. The base was not visible due to standing water. At some point in the near past both the culvert and chamber had been backfilled with loose rubble; accesses into the chamber at least had been gained by breaking a small hole through the roof and the rubble poured in; it's not known from where the culvert had been backfilled. The structure [142] is believed to be part of the main sewer system of the dockyard dating to the 19th century (Fig. 22, 23, Plates 16, 17 & 18).

7.8.15 Laying in the path of Trench 4 at its eastern end was [143]. This was an iron mooring ring, measuring 0.22m in diameter, set into a square granite block measuring 0.47m². This was one of a large number of mooring rings located around the dock complex and dated to the 19th century. The top of [143] formed part of the ground surface of

the dock recorded at 4.58mOD. At some time during the 20th century the ground surface surrounding the mooring ring was re-laid with concrete that had been impressed when wet to look like cobble setts. One section of the concrete had become bonded to the granite forming a 1.10m square surround to the original 19th-century core. After recording the feature was removed and stored off-site (Fig. 24).

7.8.16 At the eastern end of Trench 2 two associated stone features were exposed in the base of the trench. [119a] was the most easterly of the two, with [119b] 3.50m to the west. Encountered at 0.70m below ground level, at c.3.30mOD, [119a&b] were constructed from limestone slabs between 0.30m² and 0.50m². In the case of [119b] some brick was used and very hard dark yellow brown Portland cement. This material was spot-dated to 1800-1950 (Appendix 2) (Fig. 17).

7.9 PHASE 5: 20TH CENTURY

7.9.1 Lying 1.0m to the east of [122], was [120]. Initially thought to be a distinct stone-built feature, further examination revealed it to be a dump of stone, possibly from the dismantling of the chute [122] in the 20th century. It consisted of a single large rectangular limestone block (0.77m east-west by 0.50m north-south to L.O.E.), with a central square shallow recess, encountered at 1.10m below ground level at 2.70mOD. There was a 2.0m+ deep void to the north of the block, possibly a result of unconsolidated backfilling during the 1920s alterations (Fig. 17).

Dockside crane rails

7.9.2 Much of the upper levels of the Georgian stepped stonework of the south side of Dry Dock No. 3 had been in-filled and levelled off with concrete in 1924. This was to provide a platform to carry rail tracks for a dockside rail mounted crane. To construct the new Context Galleries for the museum the rail needed to be removed and the concrete needed to be cut away by diamond sawing. As part of the Scheduled Monument Consent a photographic record of the 1924 dockside crane rails (photo. refs: D300, D302, D304) was made and the concrete cutting monitored to insure none of the original 19th-century stonework was inadvertently damaged (Plates 13 & 15). Later on in the programme of works parts of the rail track, where it curved in east from the dockyard complex back to the edge of Dry Dock No. 3, was exposed at the south-east corner of the dock during the excavation of TR3. This section of the dockside rails remained *in-situ*, but overlain by the landscaping surface finishes (Plate 14). The rails were recorded photographically (photo ref: D320).

- 7.9.3 A section of 20th-century crane rail, context [112], was recorded on the north-east corner of the site (photo. ref: D307). Part of the track was removed to accommodate a new concrete foundation for a sub-station which was linked to the main site by the excavation of a service trench TR1. A small section of the same rail was also exposed in the eastern terminus of the Steam Duct trench (photo ref: D318) (Fig. 14).

Other phase 5 features

- 7.9.4 Exposed in TR1 layer [114] was a 20th-century made ground deposit found across the trench which was a sub-strata layer to modern concrete above. Composed of friable dark brown mixed silts and clays with frequent fragments of CBM, the layer was 0.60m thick. The top of the layer was recorded at 3.70mOD and the base at 3.10mOD. [114] overlay 19th-century Phase 4 features [115] and [113]. (Fig. 14).
- 7.9.5 The ground surface at the dock edge at the western terminus of TR3 was found to be a thick and extensive layer of modern concrete; it was surmised that the dock edge was remodelled in the 1920s when HMS Victory was berthed in Dry Dock No. 2 and a permanent concrete caisson replace the original dock gates. To provide an even bed to lay the new ground surfacing material (resin bonded gravel) the uneven concrete was reduced down by 0.10m. During this operation feature [138] was exposed. This was a flat ferrous metal beam (perhaps the top of an RSJ) 3.40m long east-west by 0.13m wide north-south. The western end was thought to continue to the dockside edge, 1.35m to the west. The top of [138] was estimated at 3.10mOD. This was interpreted as either a ground tie for the dock wall or reinforcing for the concreting of the dock edge in the early 20th century (Fig. 21).

Victory Arena, VVPD11 (See Appendix 4 for Figures)

- 7.9.6 During the watching brief in the Victory Arena only Phase 5 (20th century) features were encountered.
- 7.9.7 The excavation of a single trench (TR1) in the Victory Arena, parallel to the eastern side of HMS Victory revealed no significant finds or features. The majority of the trench was cut down into modern deposits of sandy gravel, overlain by 0.20m thick layer of modern tarmac. There were two exceptions, layer [1] and deposit [2]. Deposit [1] was a 0.15m thick (to base L.O.E.) layer of soft mid grey brown clayey silty sand with moderate very small well rounded pebbles and moderate fragments of ceramic building material as inclusions. The top of the layer was encountered at 0.20-0.25m below ground level, at between 4.10 and 4.05mOD. This is interpreted as a 19th/20th-century made ground deposit. This layer was sealed by a 0.20m thick layer of modern

tarmac (in some places this was laid onto a 0.10m thick layer of CBM rubble as a foundation) the top of which formed the current ground level estimated at 4.30mOD

- 7.9.8 Context [2] consisted of a deposit of granite cobble setts overlain by modern tarmac. The setts were shaped rectangular blocks of very hard blue-grey granite, probably imported into Portsmouth via sea from Aberdeen on the east coast of Scotland. Individual cobble stones measured 200mm by 100mm by 50mm and were consistent with other setts used throughout the dockyard. This deposit was localised to a short 1.0m central run of TR1. The top of [2] was encountered at 0.07m below ground level at 4.23mOD. An earlier investigation in the Victory Arena²³ established that the granite setts encountered there had been laid in the modern period. It is likely that these granite setts also date to the modern era. After archaeological recording, a plastic ducting for a power cable was laid in the base of trench TR1, overlain by copper lighting conductor strip. These were then backfilled with excavated spoil and sealed with concrete at the surface

²³ Watson, S. May 2011.

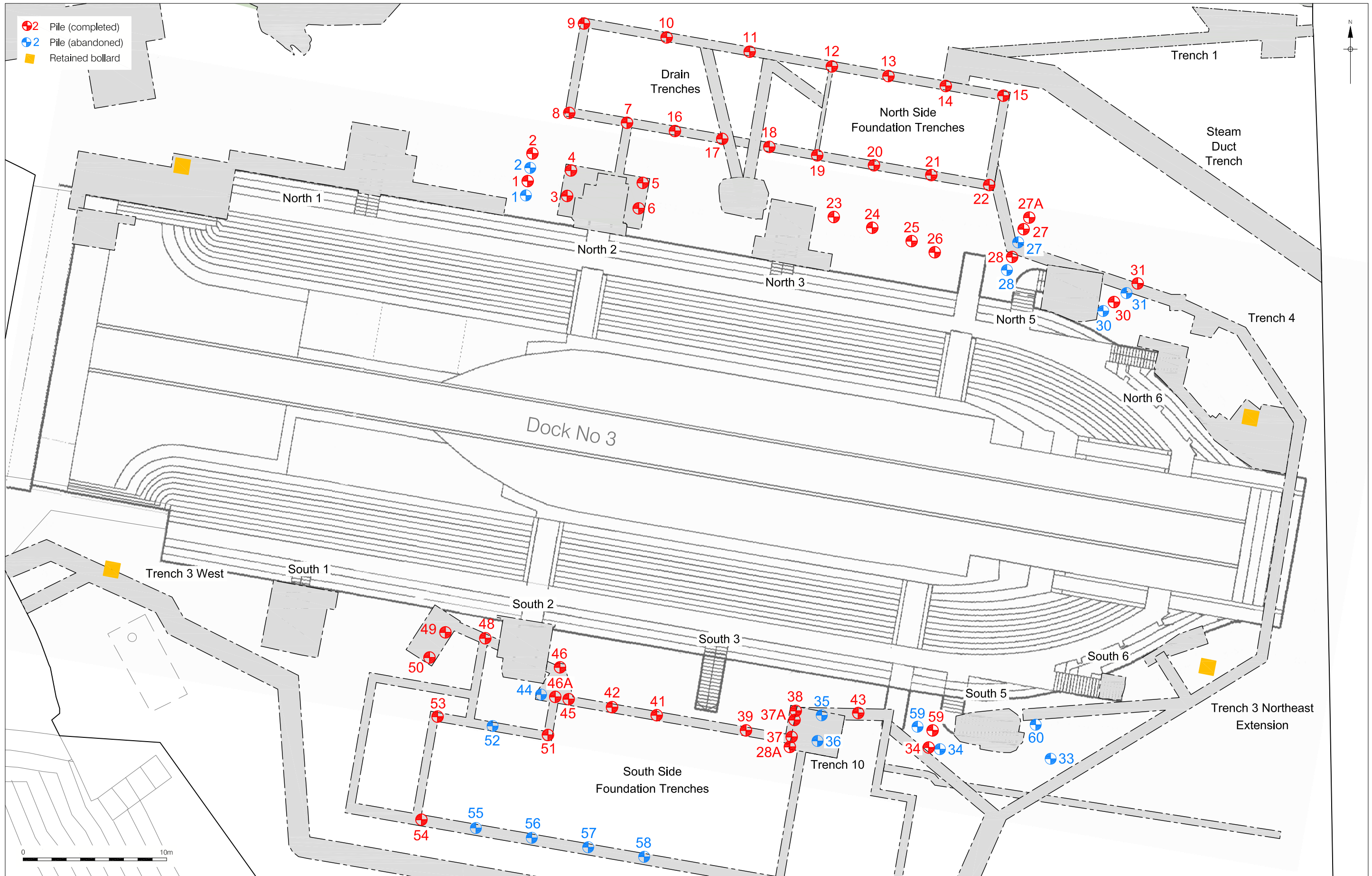
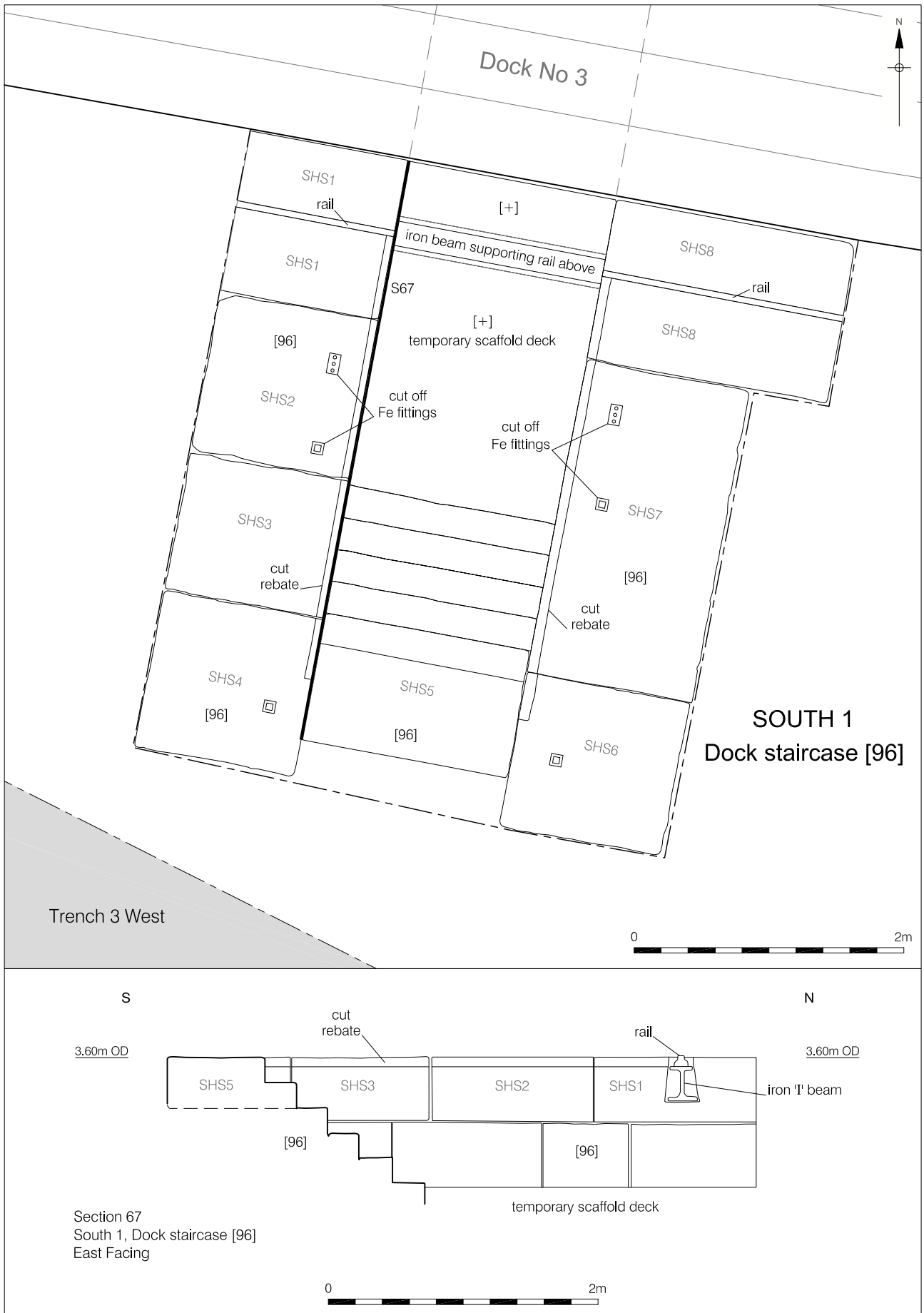


Figure 3
 Pile and retained bollard locations
 1:250 at A3



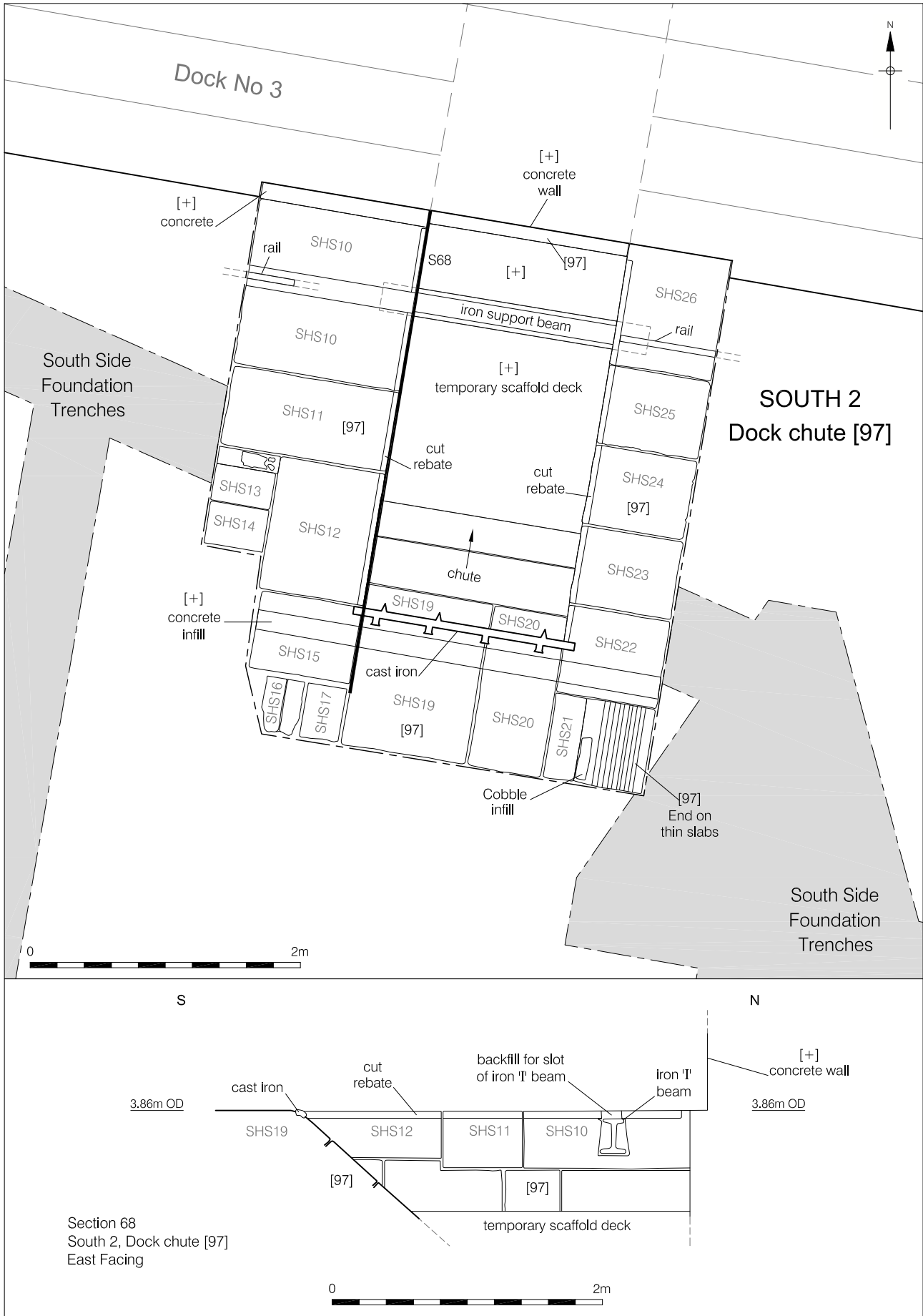
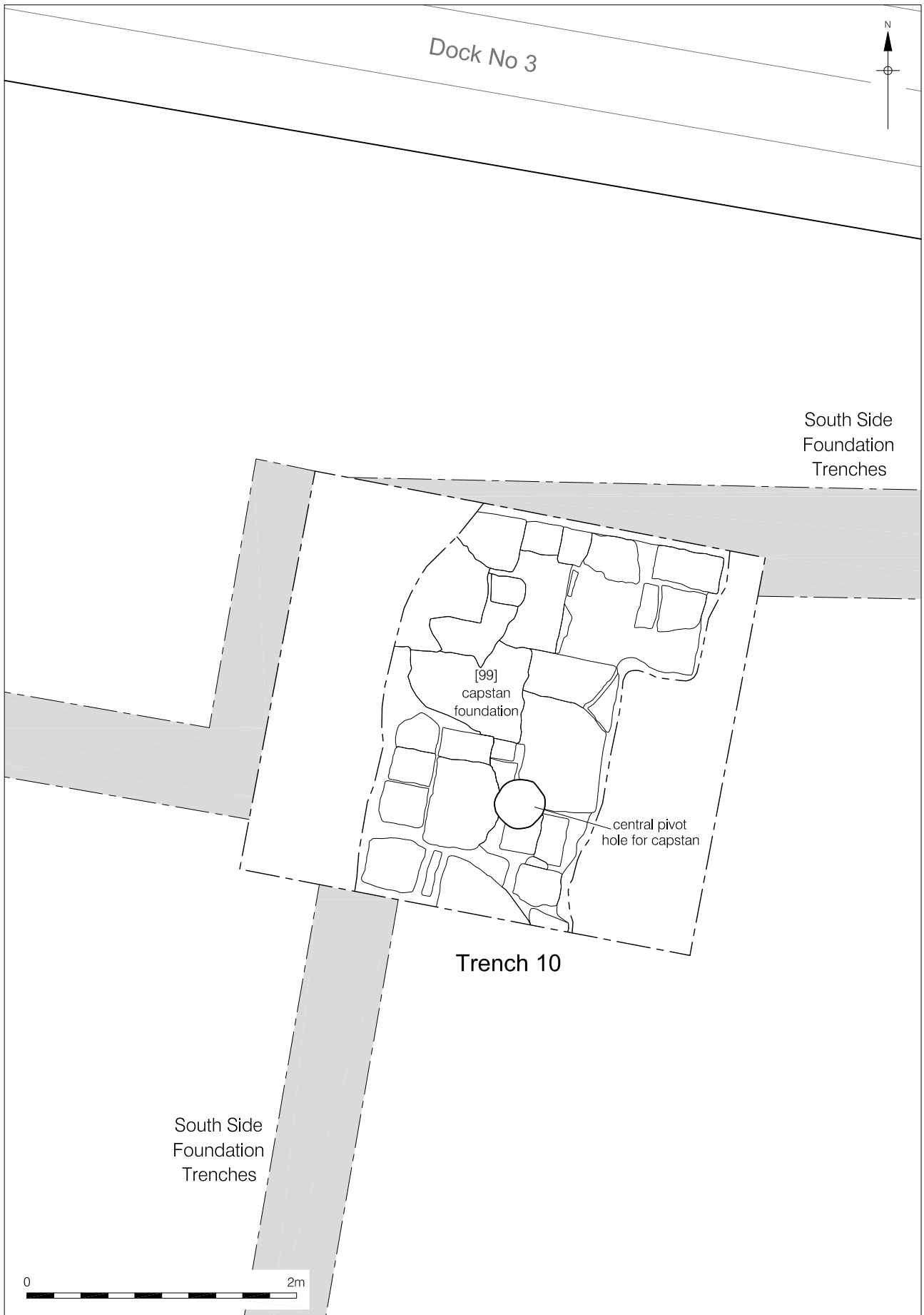
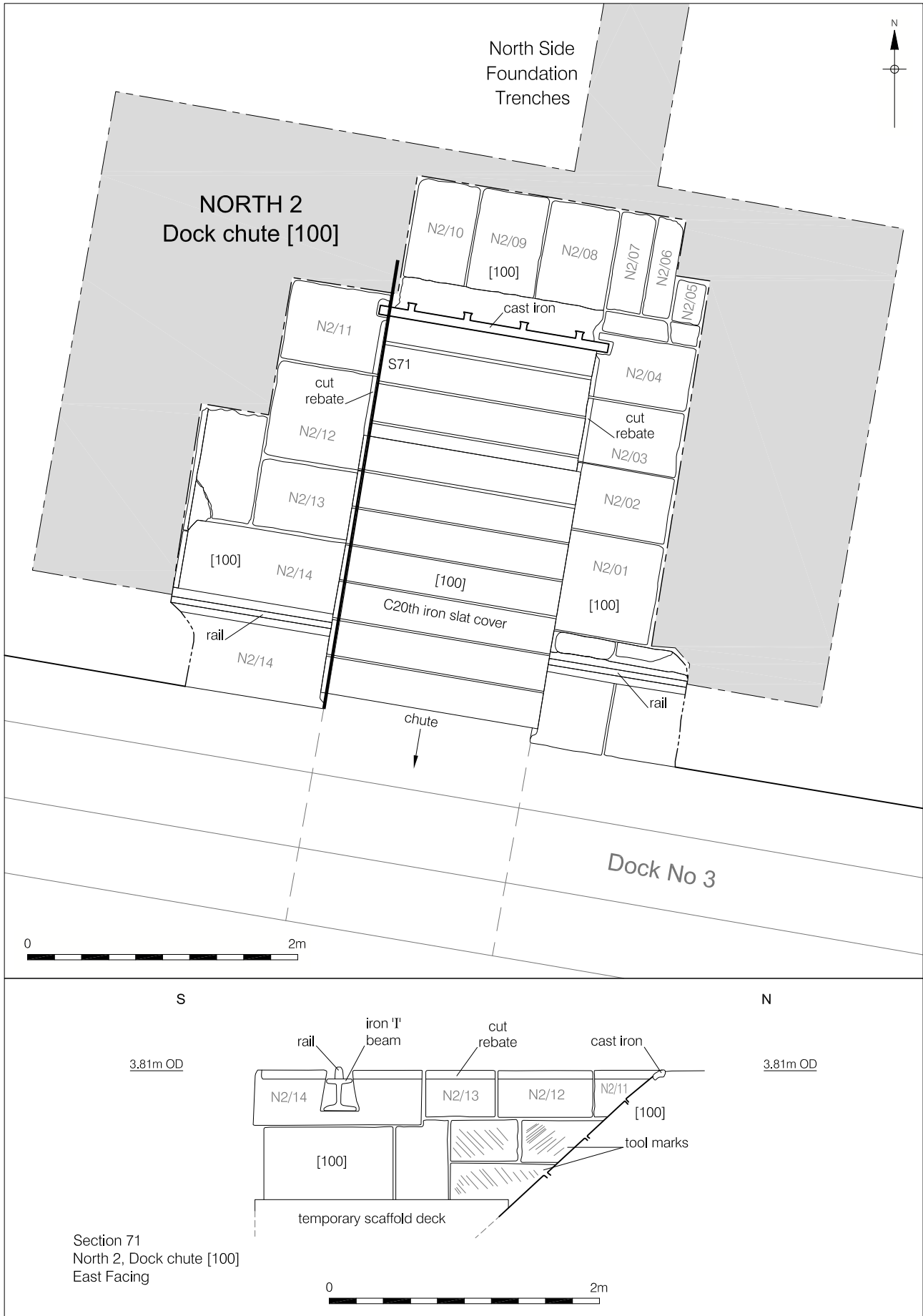
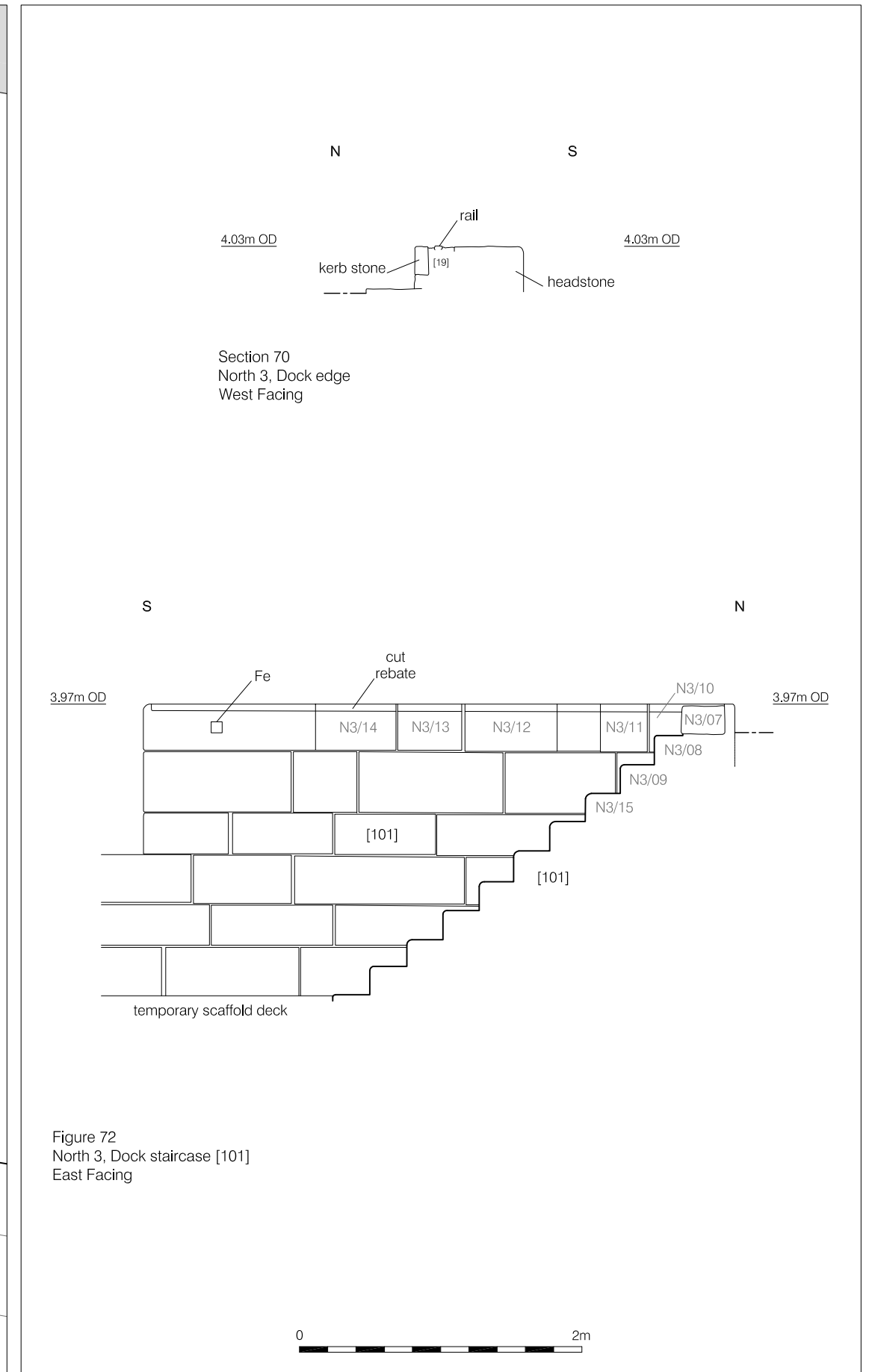
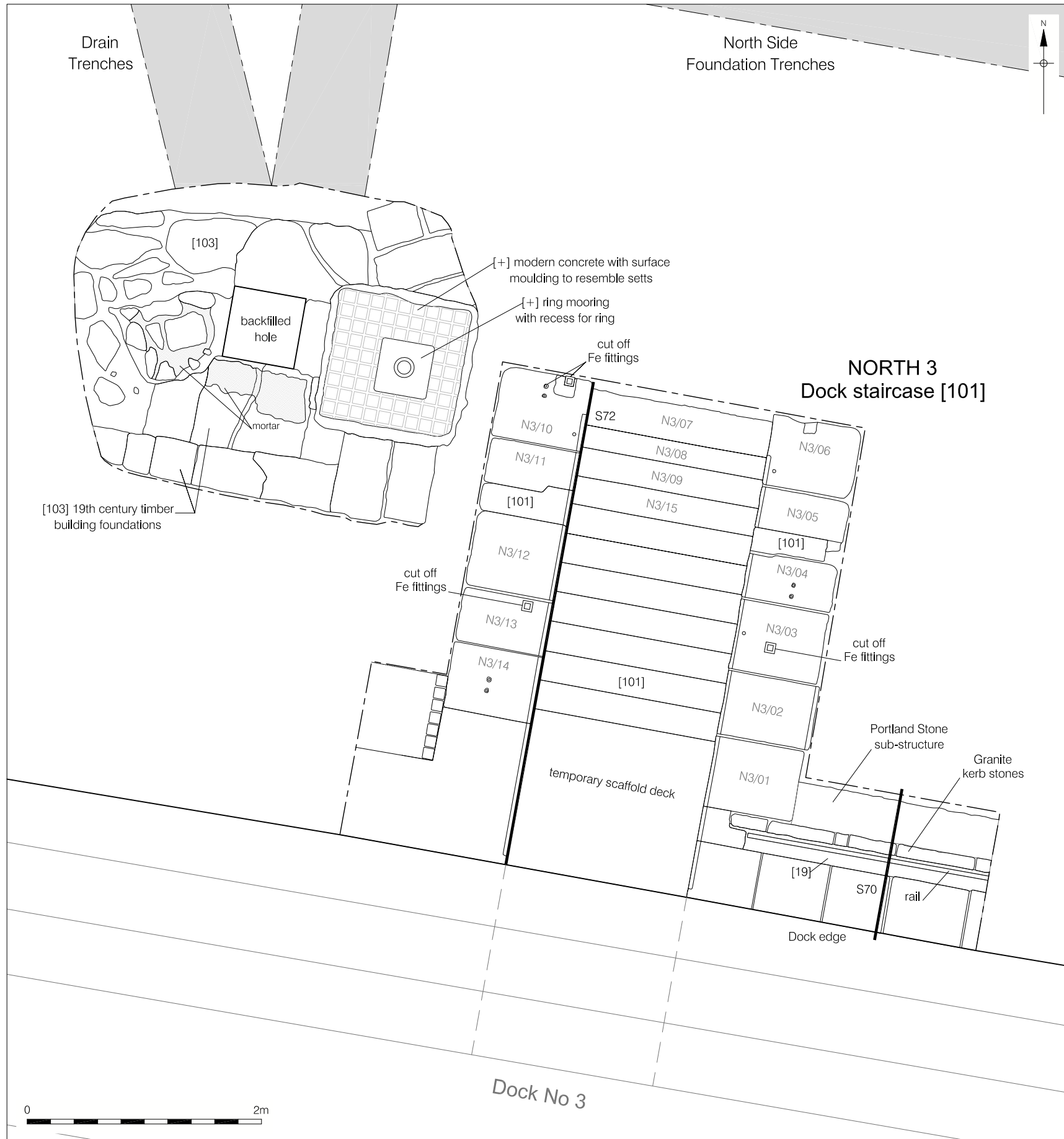
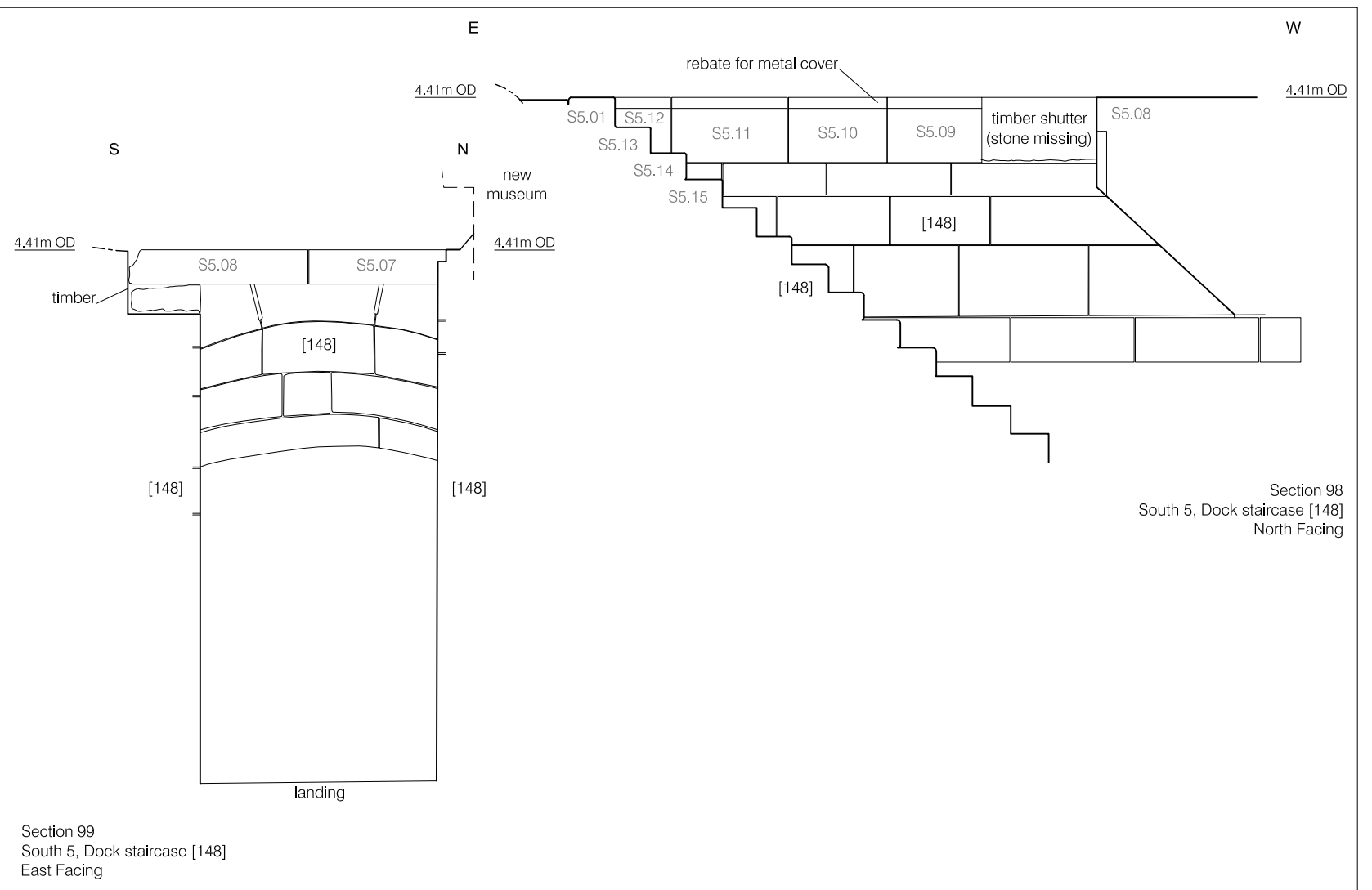
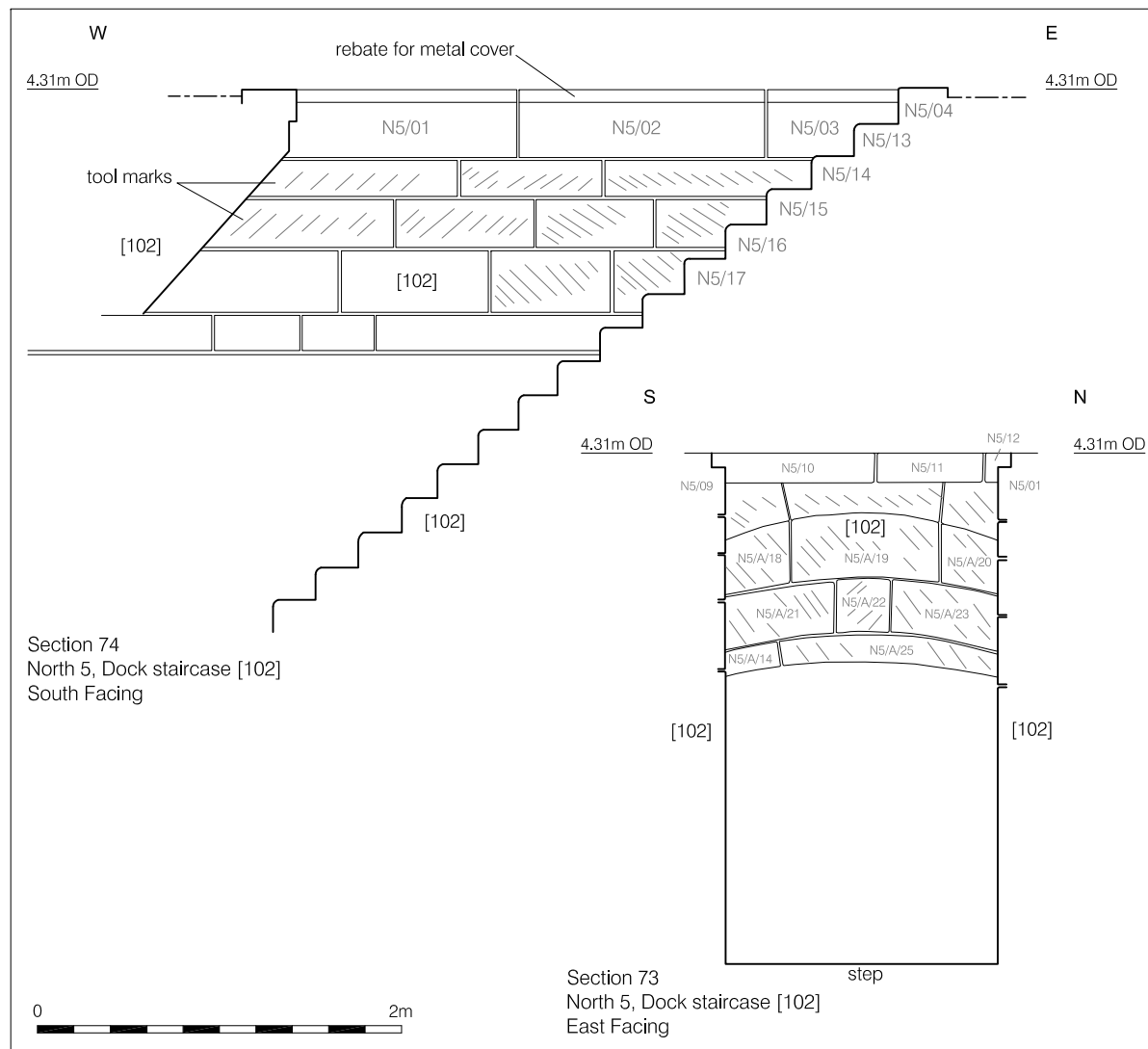
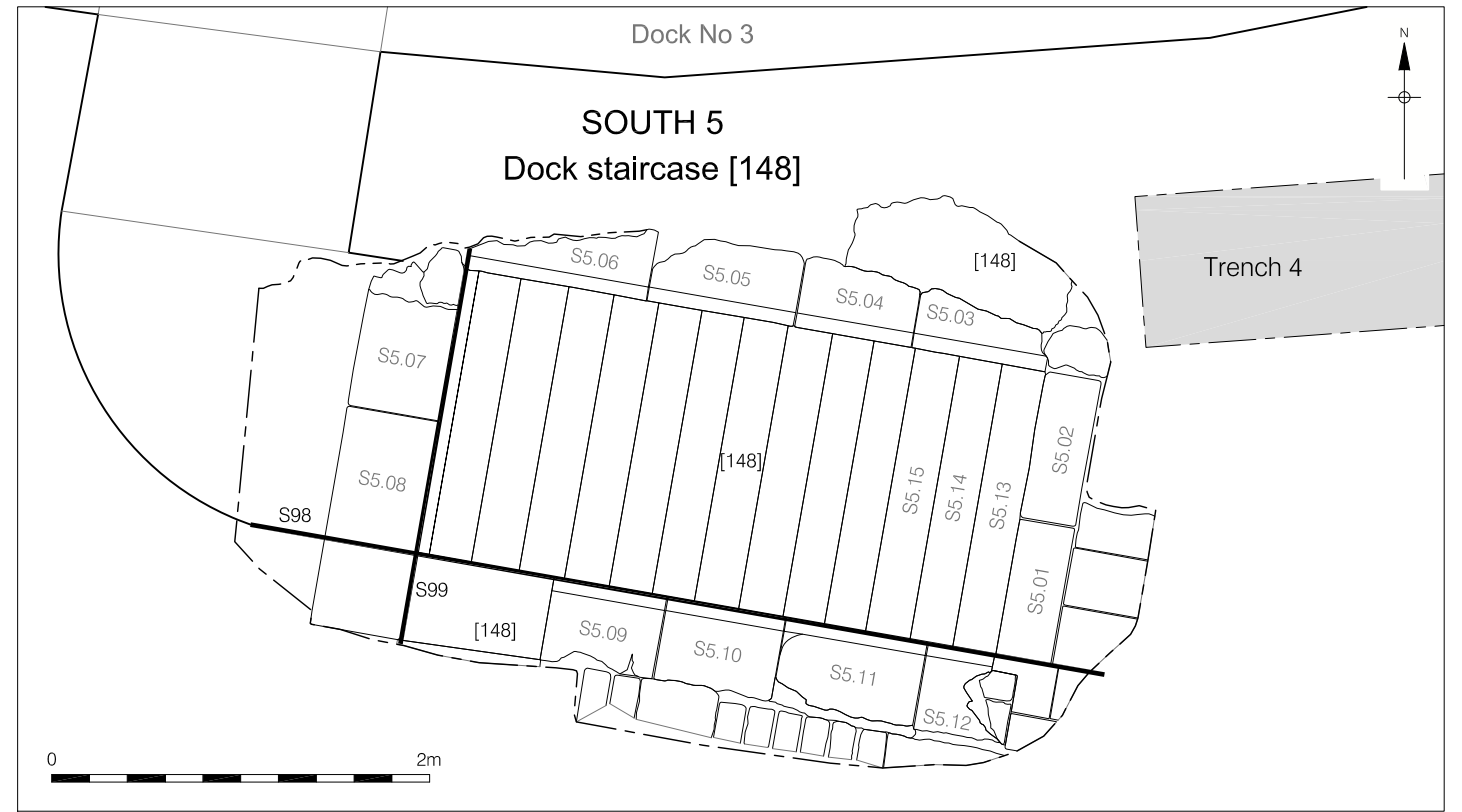
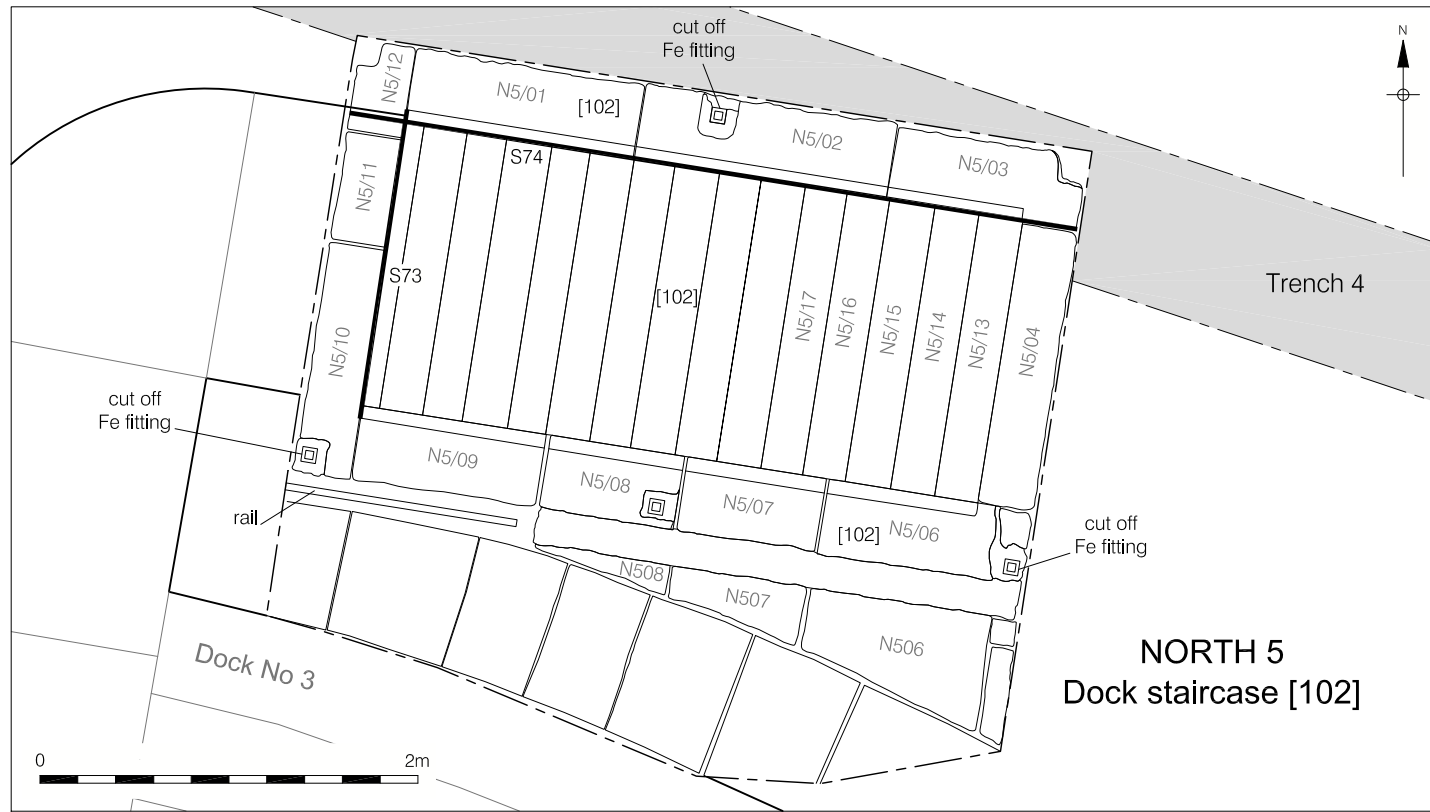


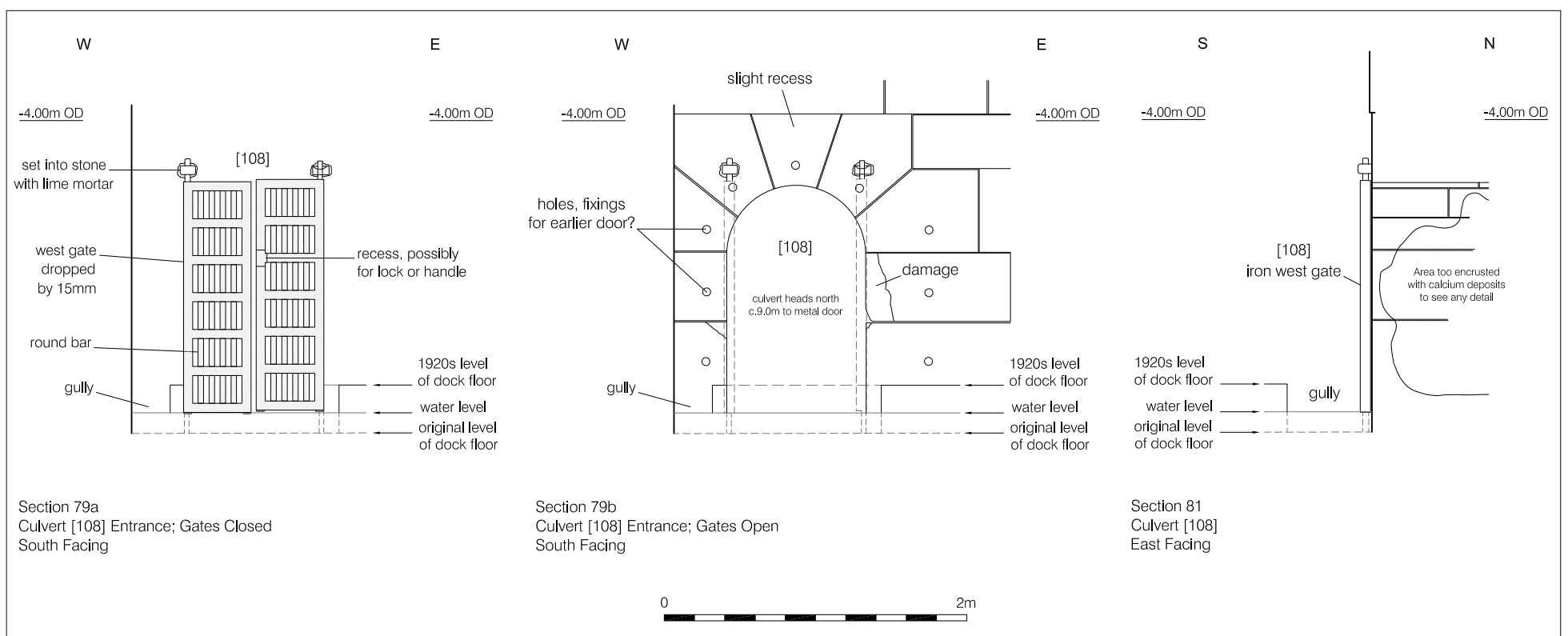
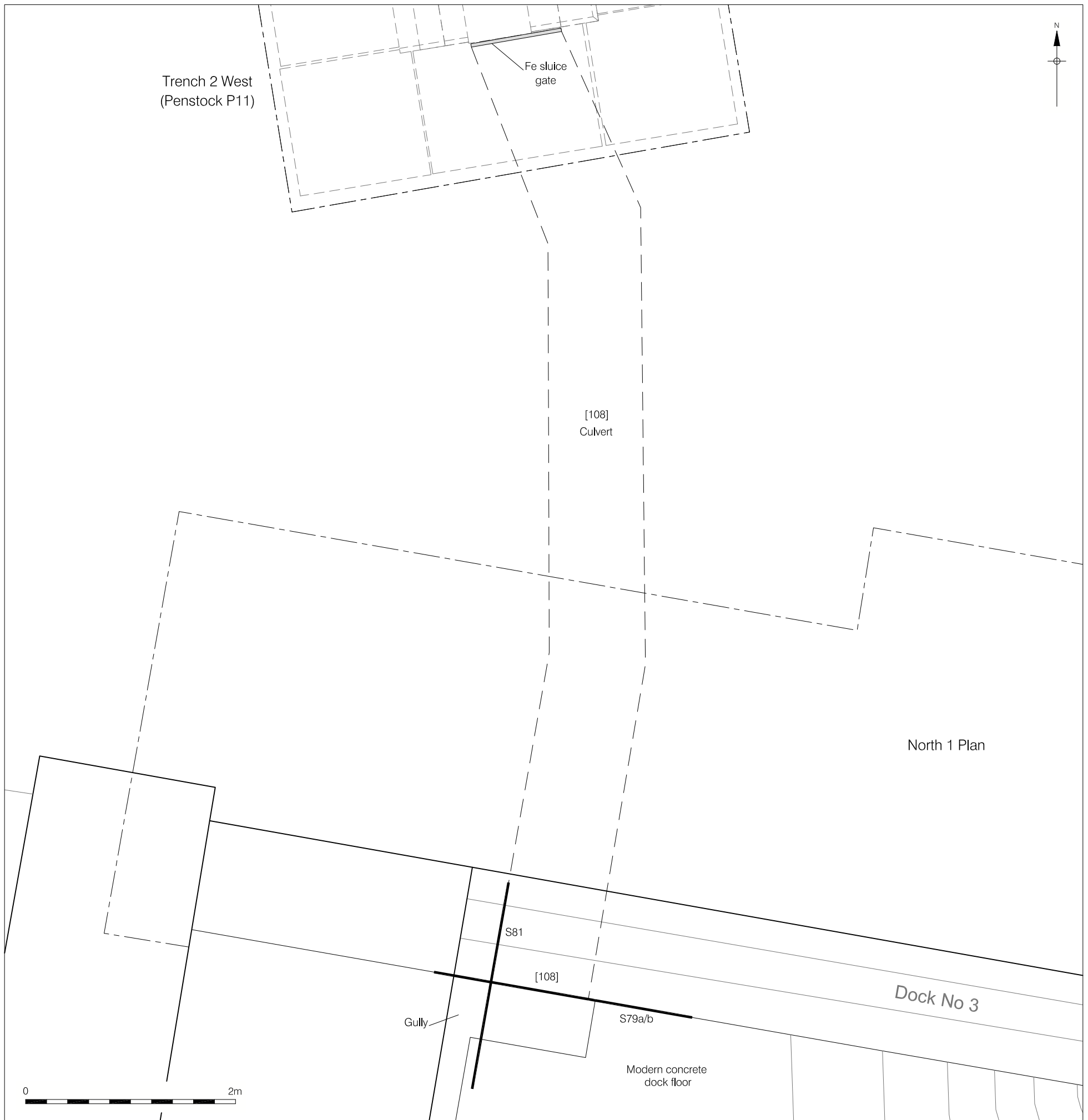
Figure 5
 South 2 Plan; Section 68
 1:40 at A4

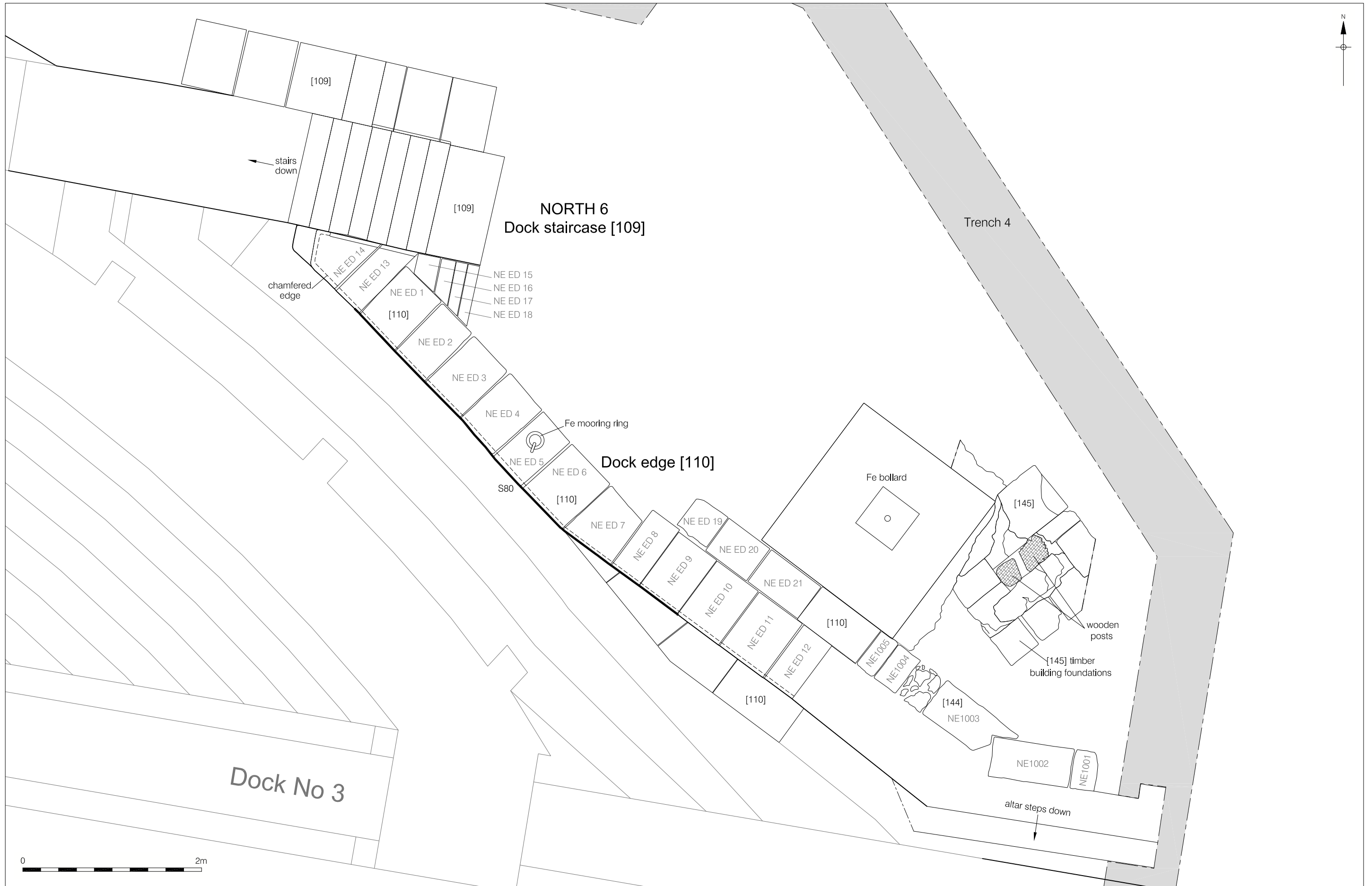


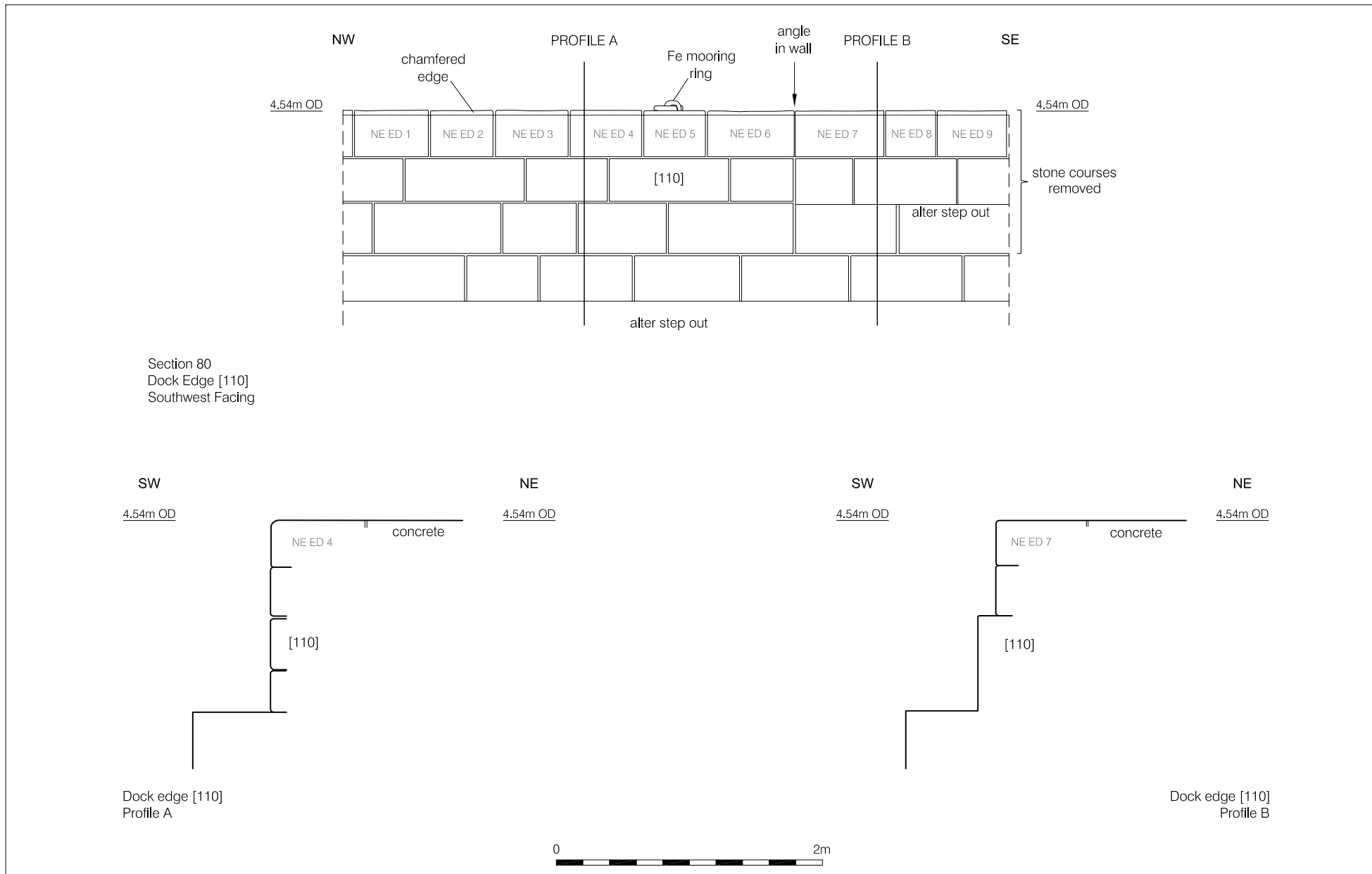












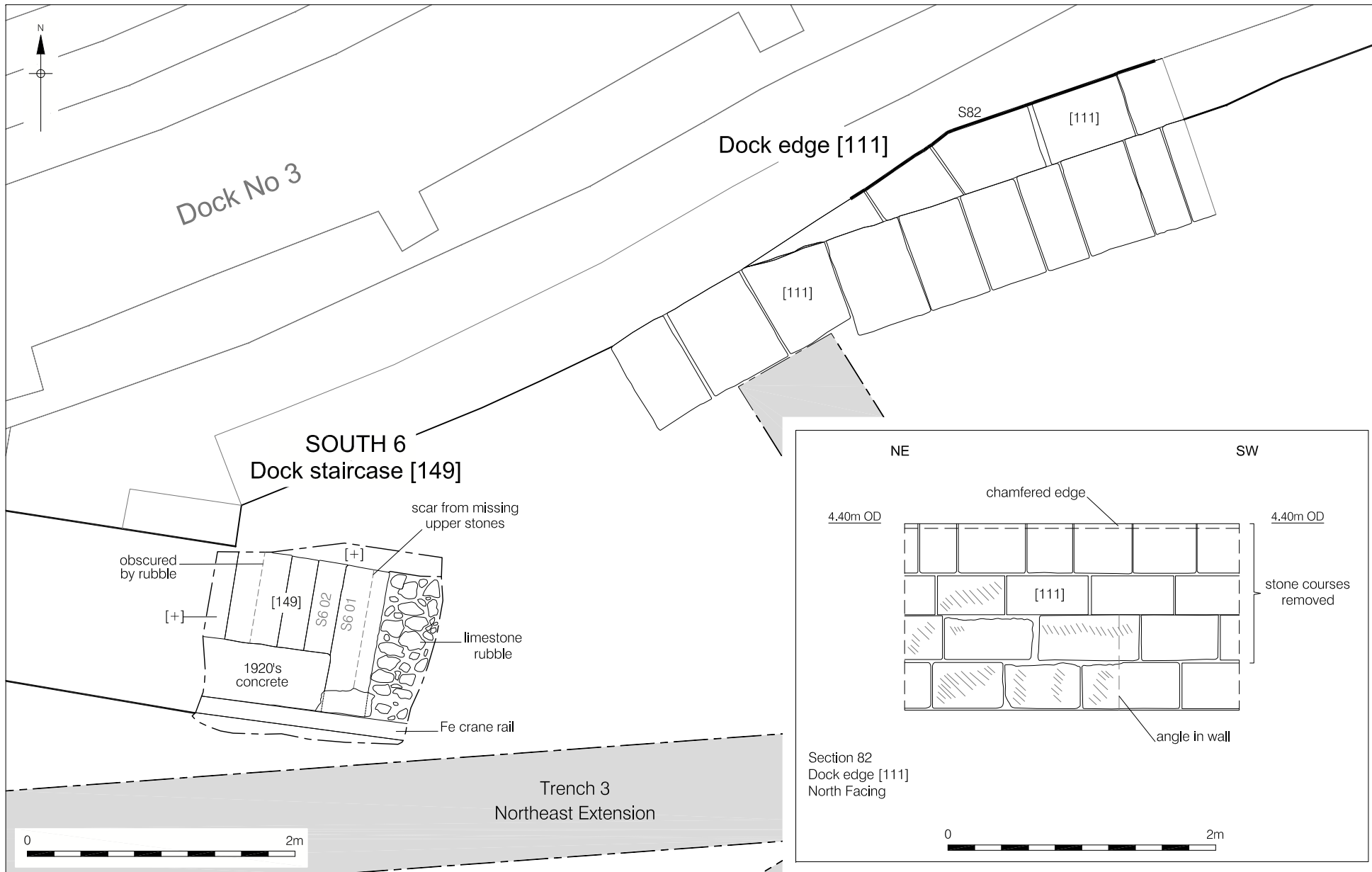
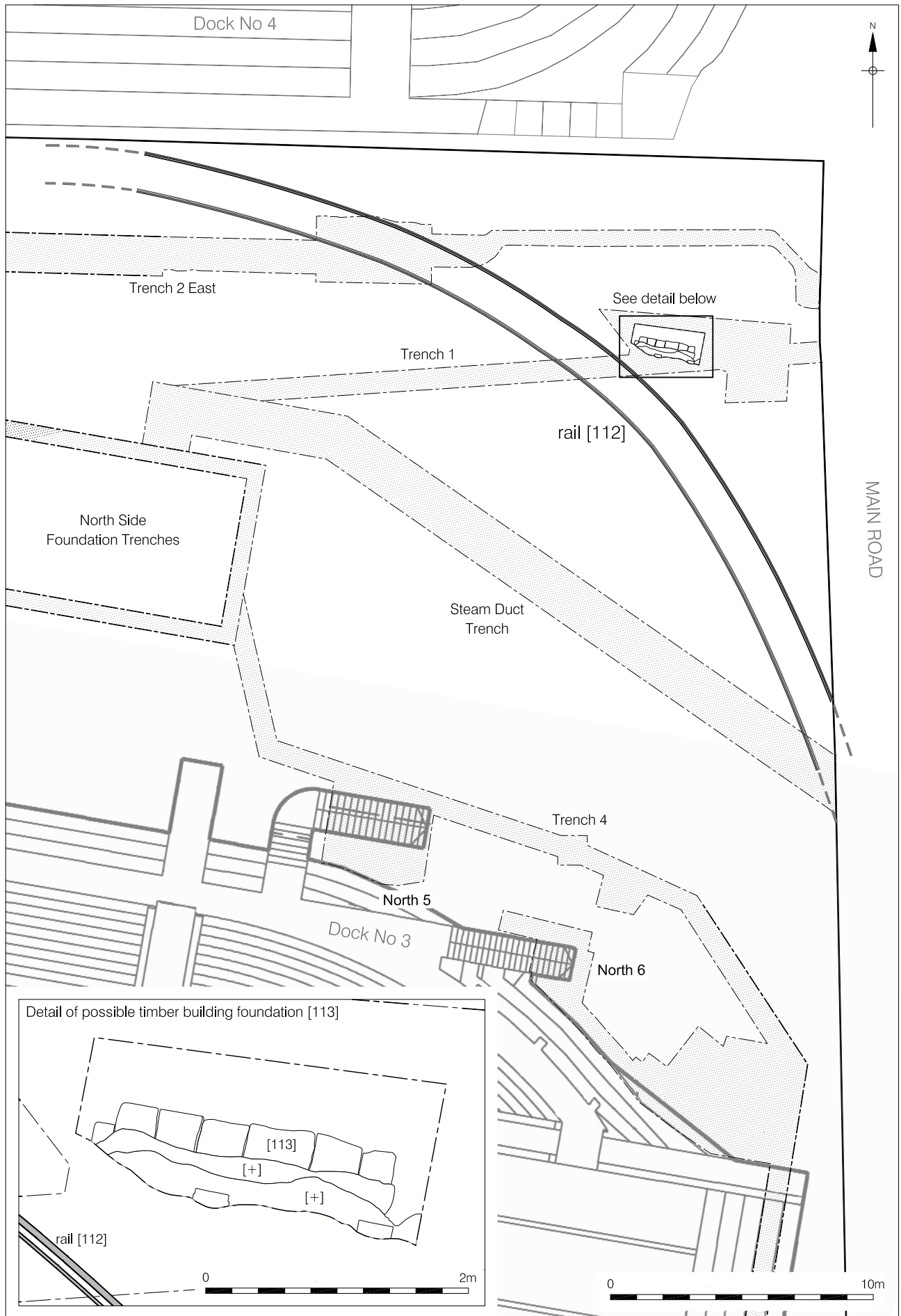
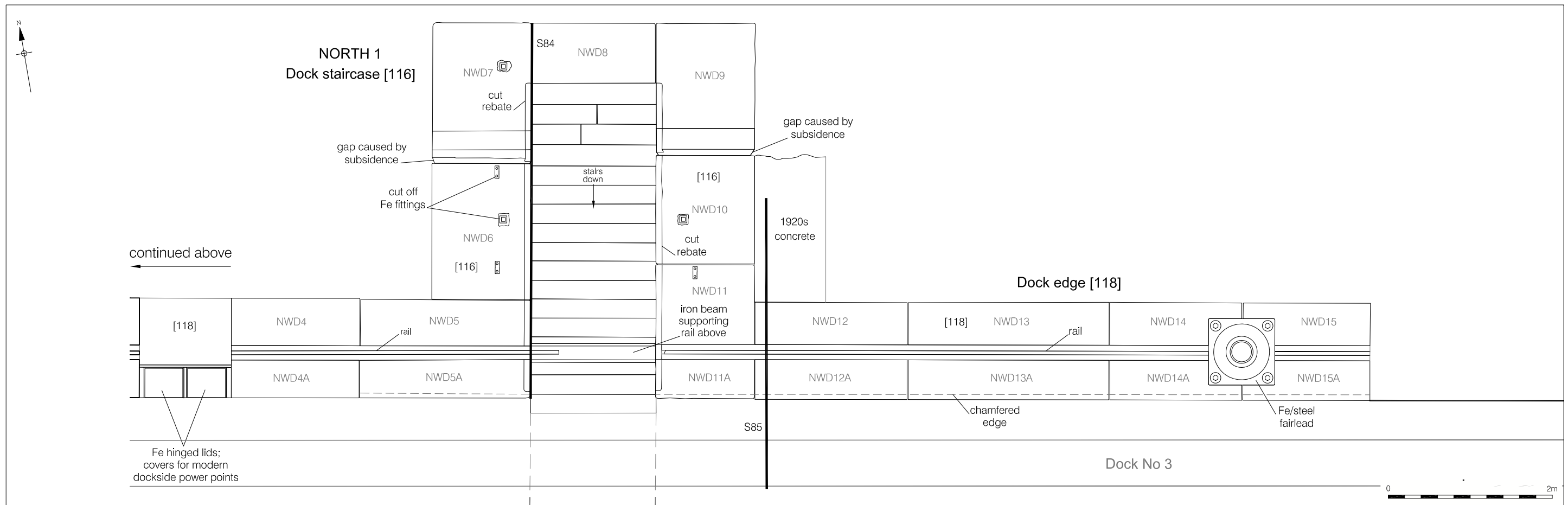
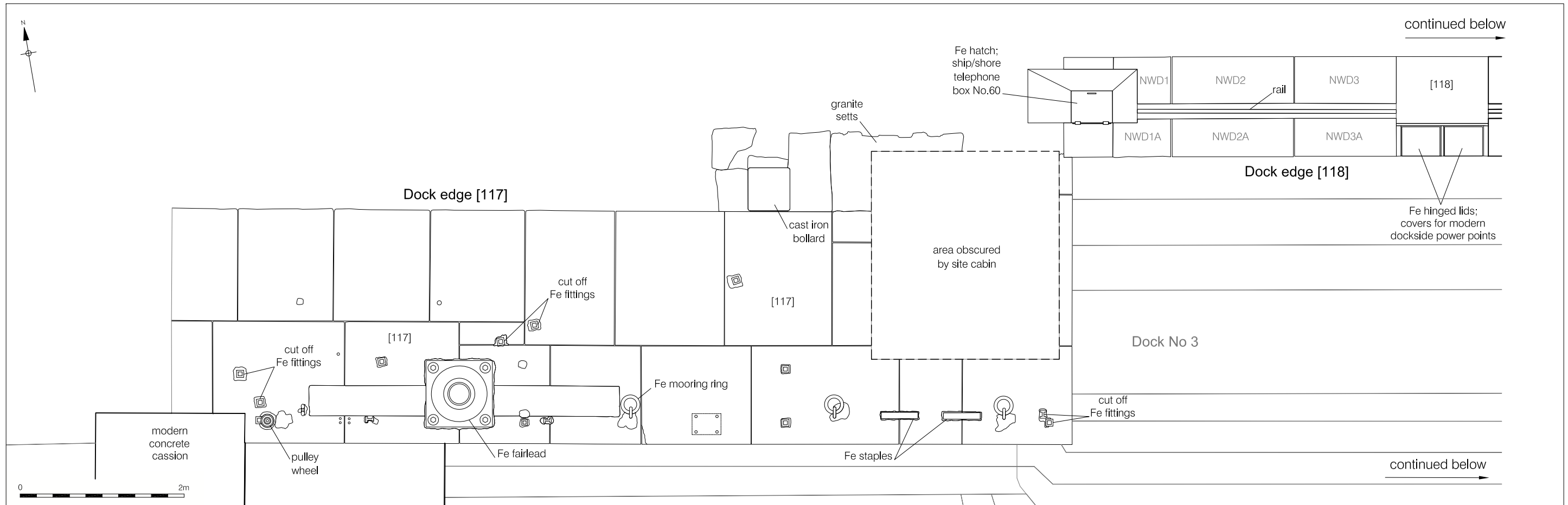


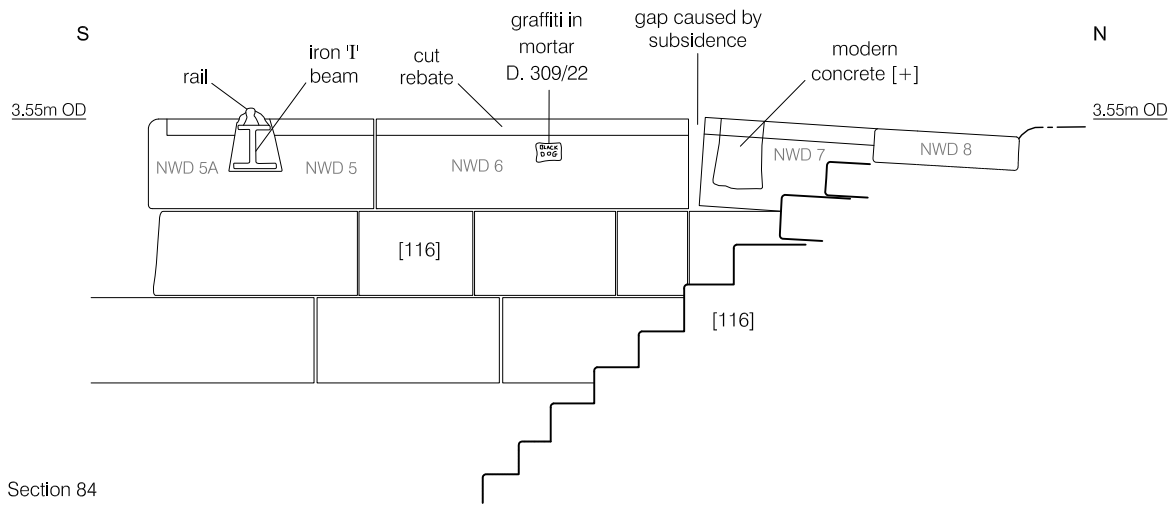
Figure 13
South 6: Staircase [149] and Sections 82
1:40 at A4



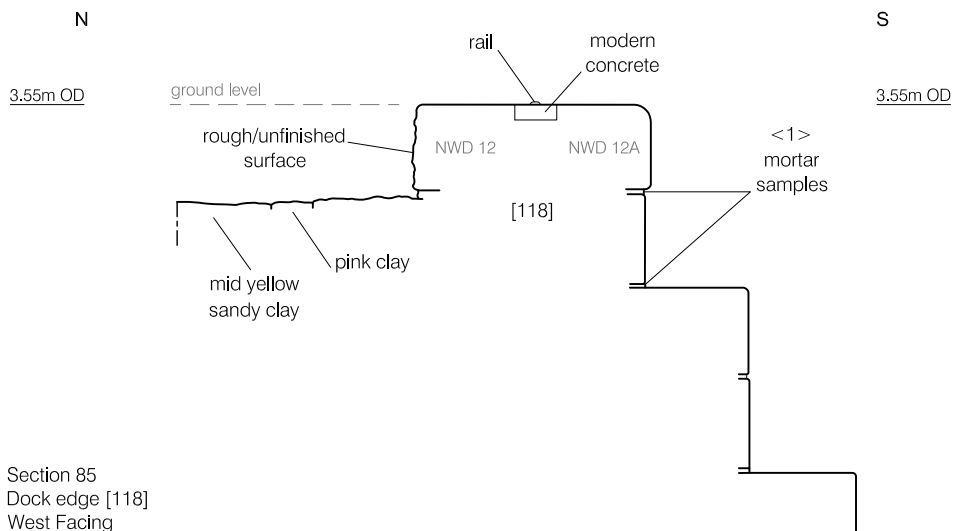
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Figure 14
 Plan of Rail [112] and possible timber building foundation [113]
 Main plan - 1:200, Detail - 1:40 at A4



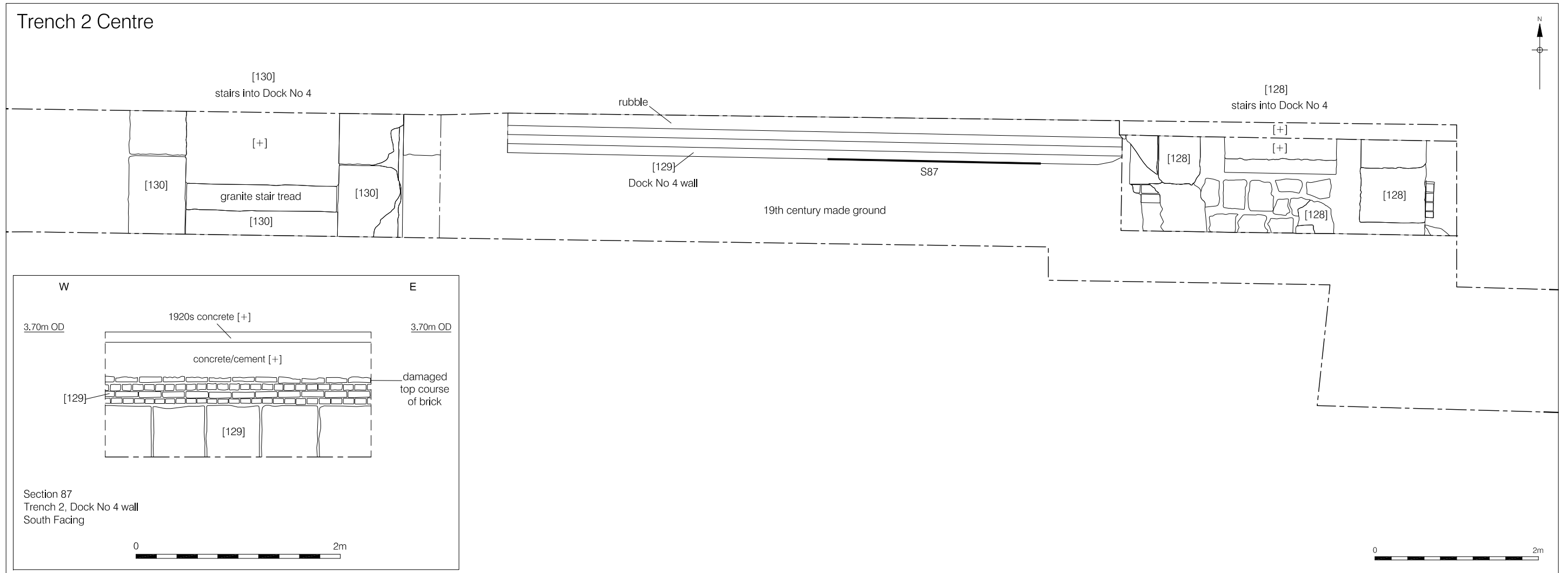
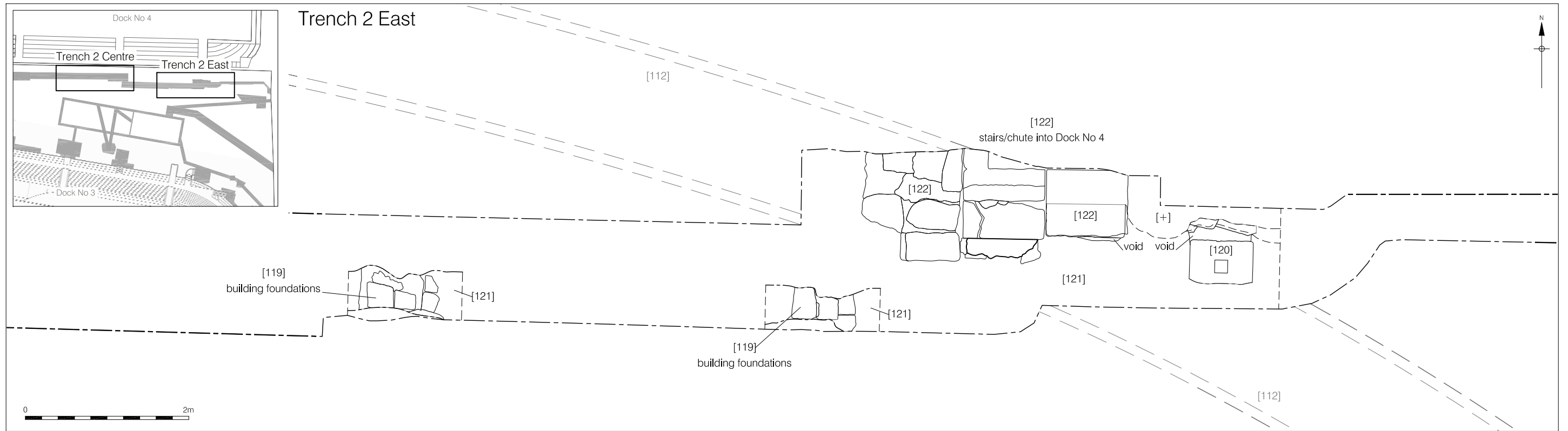


Section 84
North 1, Dock staircase [116]
East Facing



Section 85
Dock edge [118]
West Facing





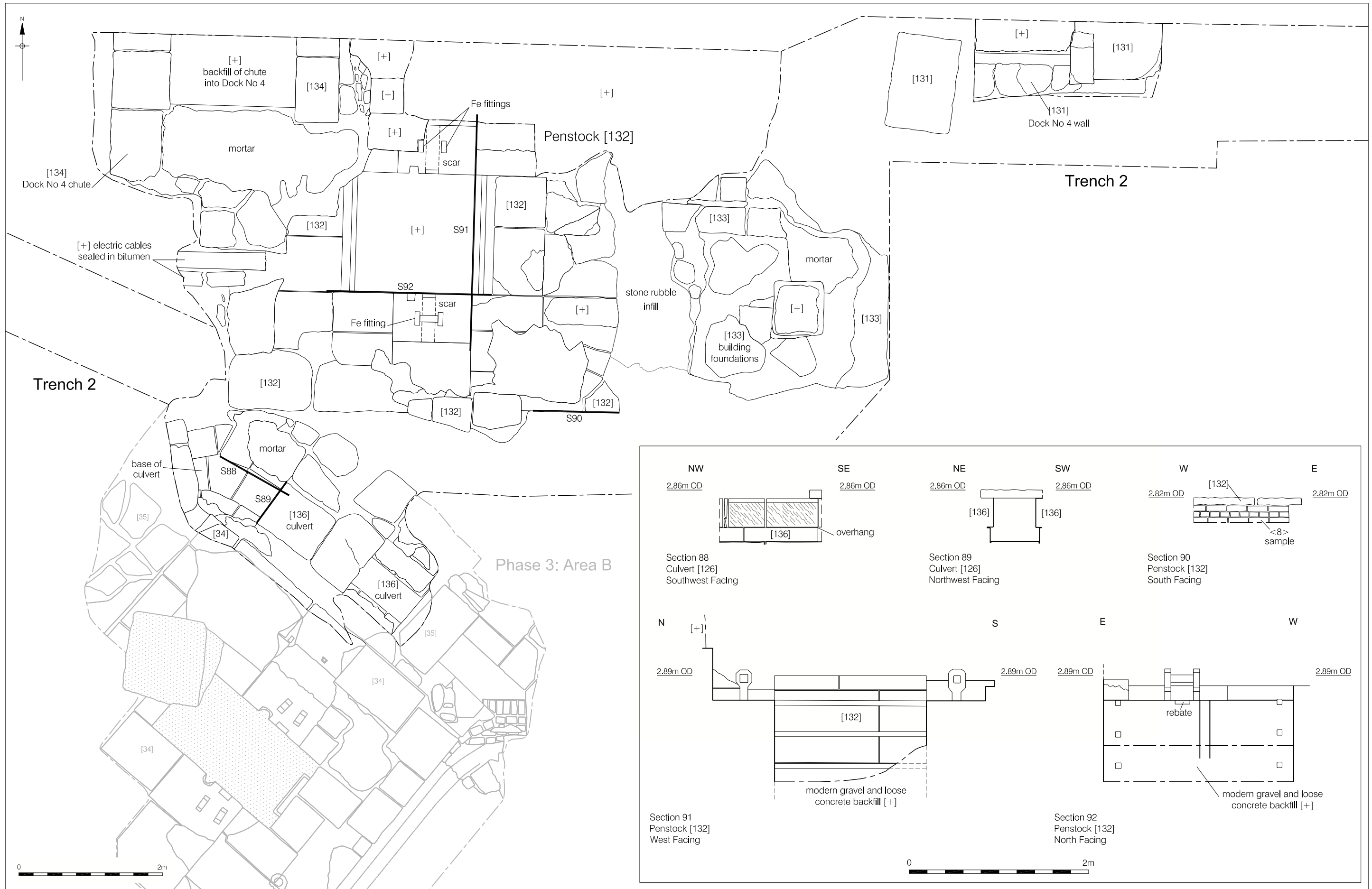
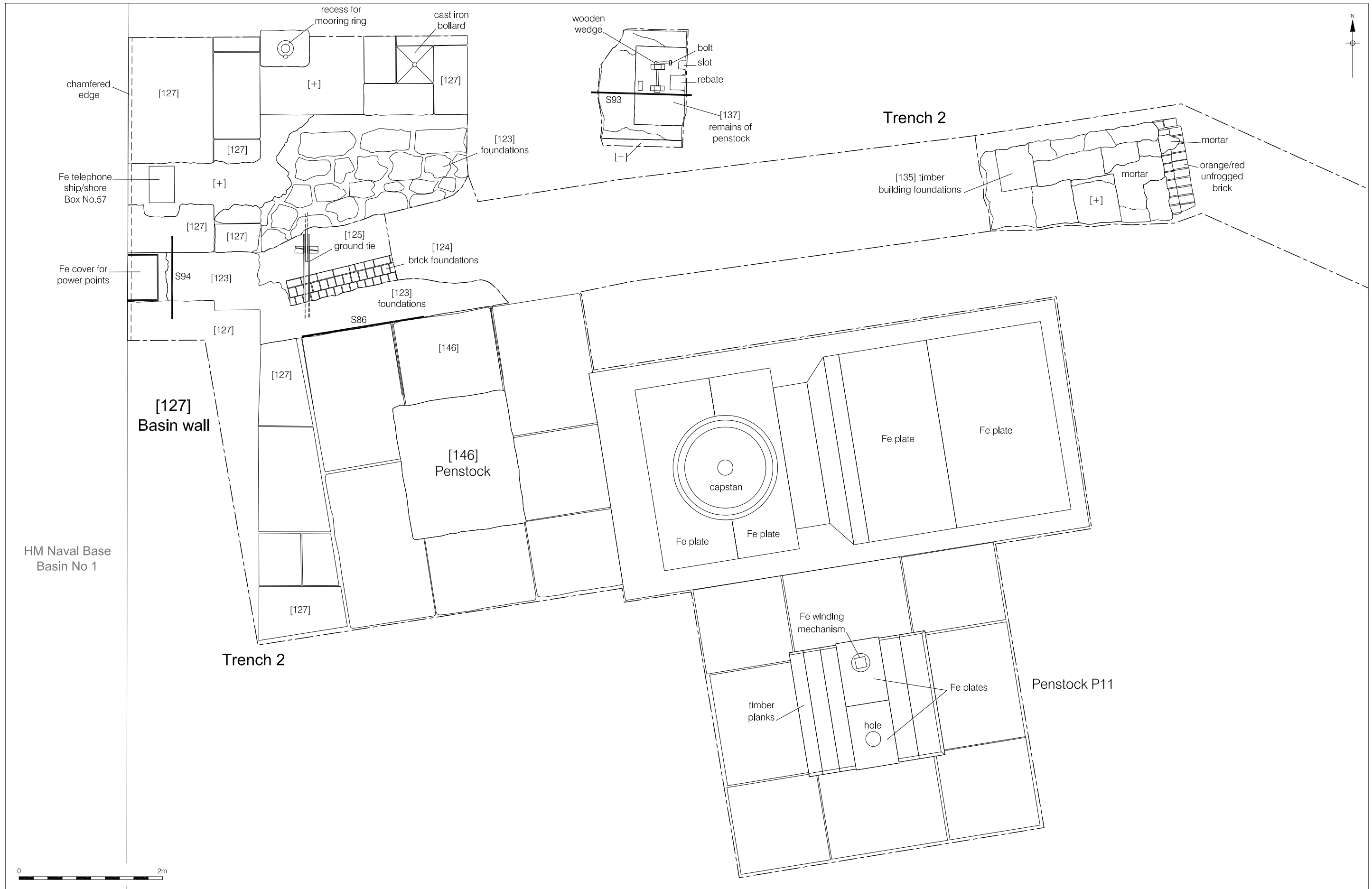
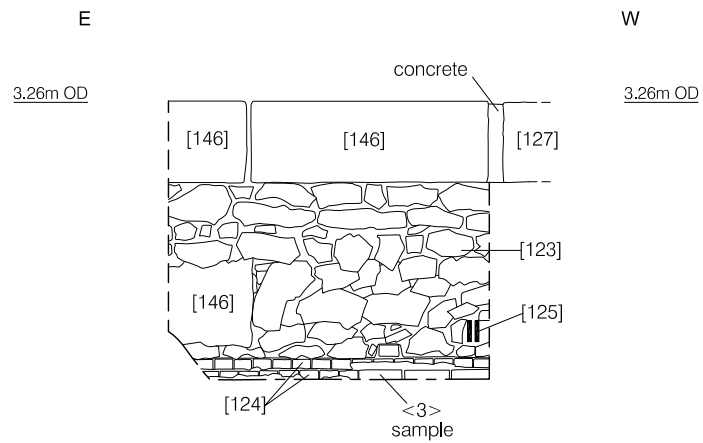
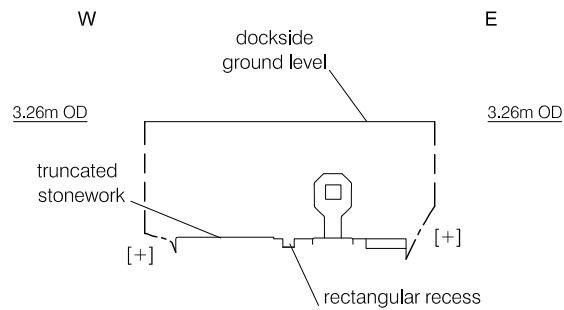


Figure 18
Trench 2 West Culvert, Chute and Dock Wall Plan; Sections 88-92
Plan -1:50, Sections 1:40 at A3

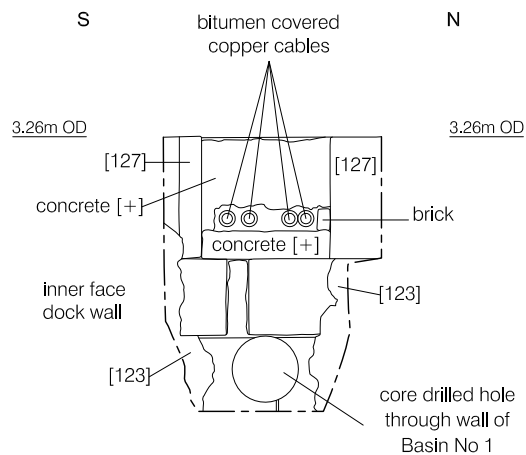




Section 86
Trench 2 West, Penstock [146] and foundations [123]
North Facing

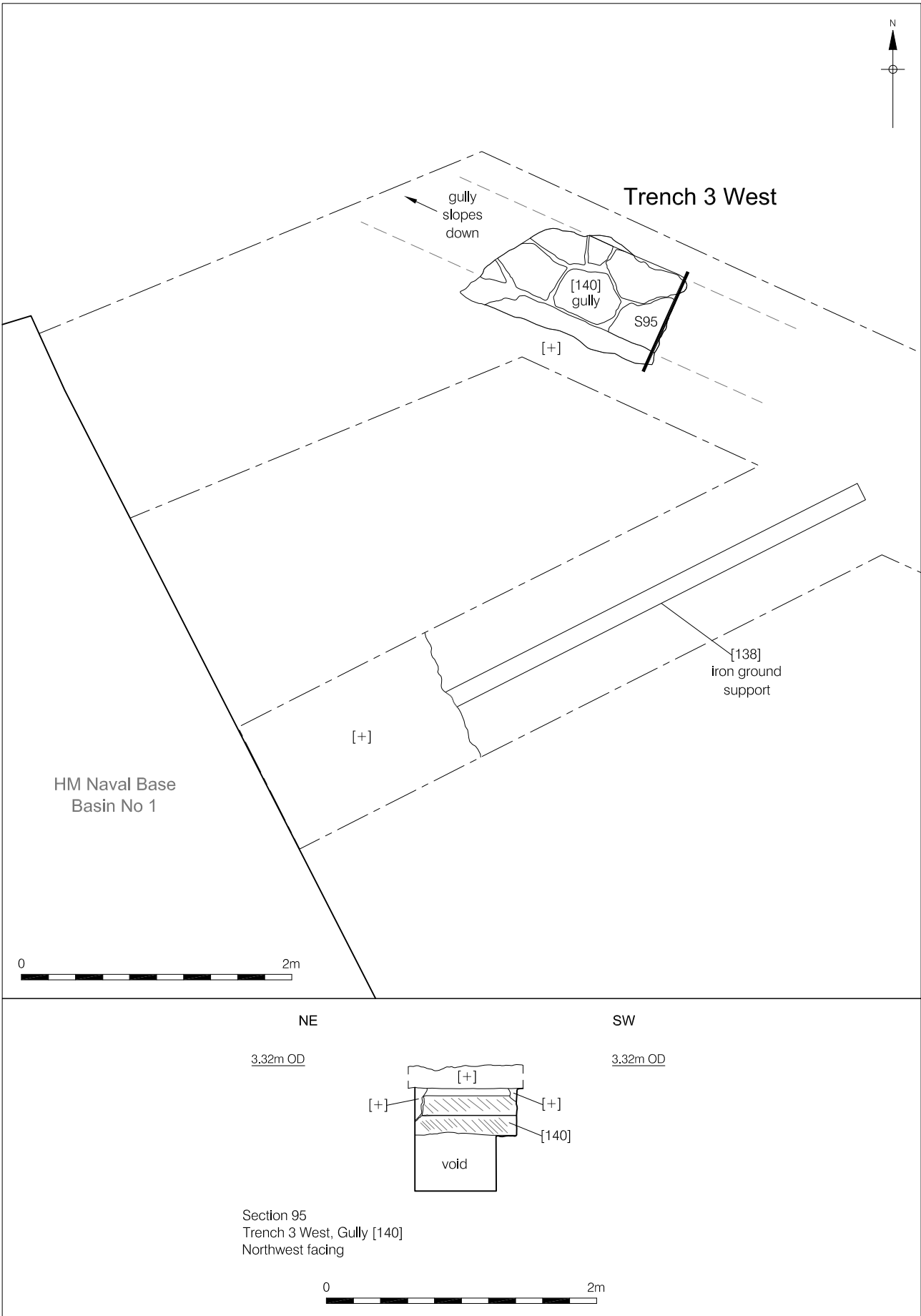


Section 93
Remains of penstock [137]
South Facing



Section 94
Trench 2 West, Basin wall [127]
East Facing





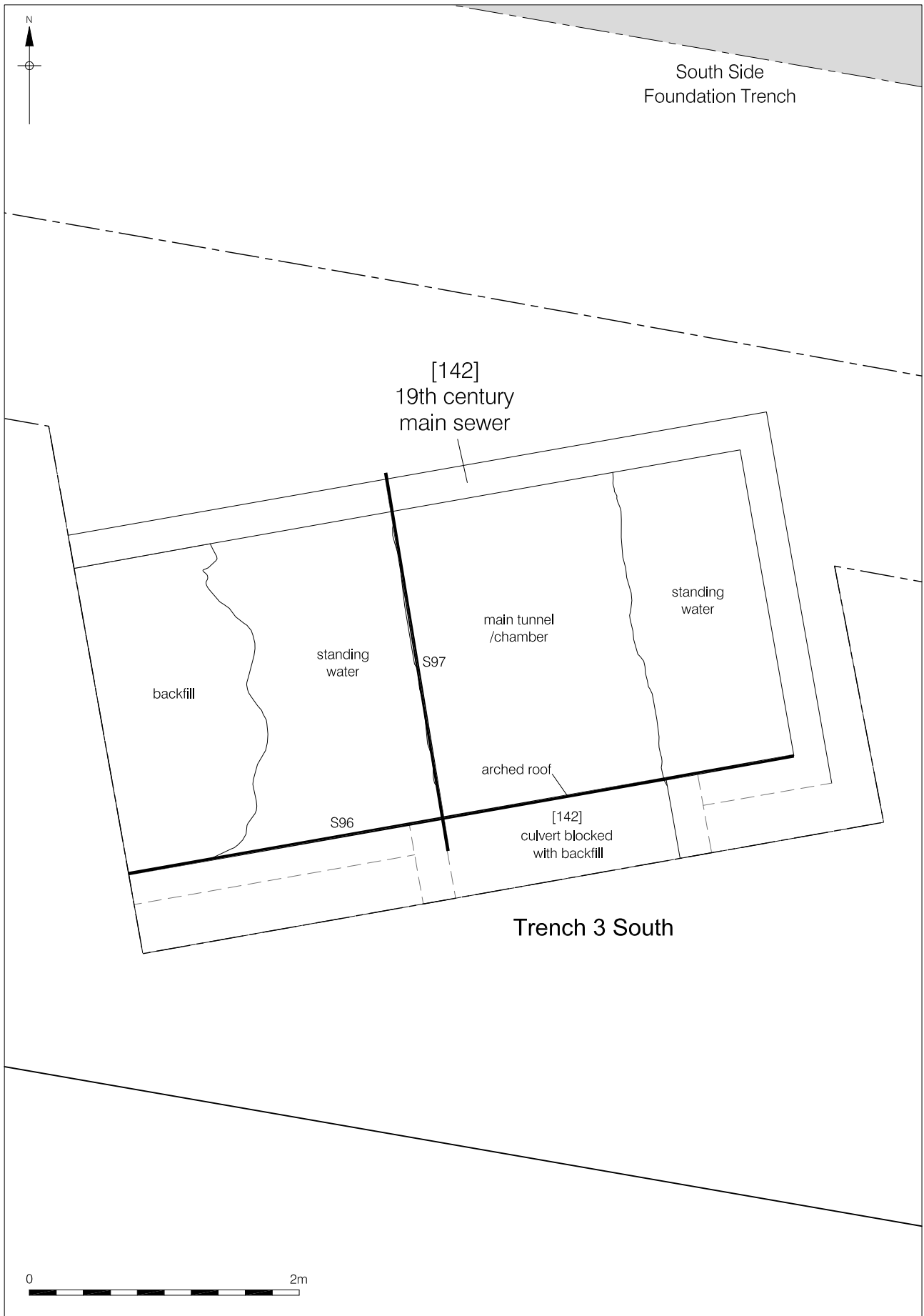
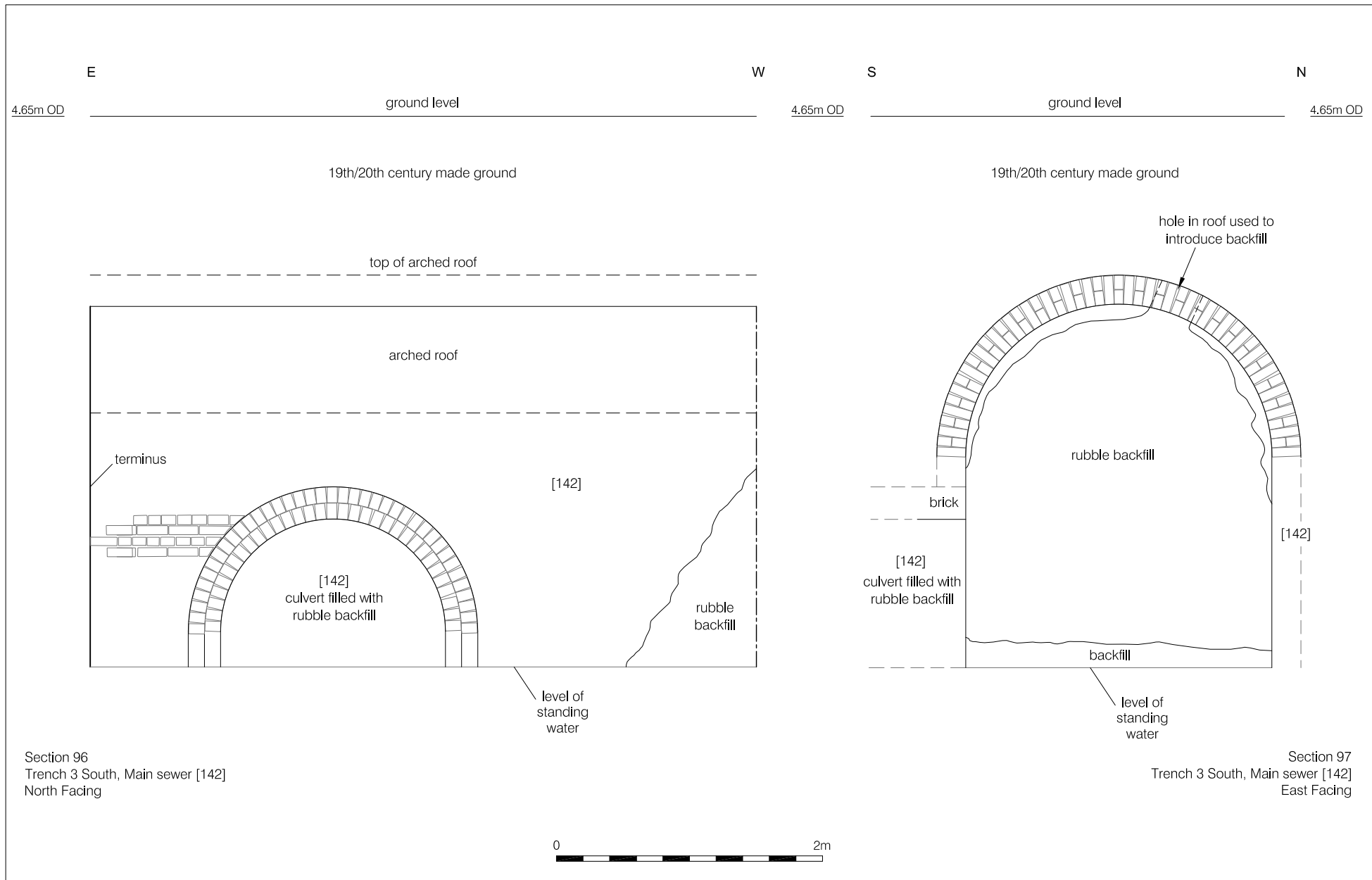


Figure 22
 Trench 3 South Plan
 1:40 at A4



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Figure 23
 Trench 3 South Sections 96 and 97
 1:40 at A4

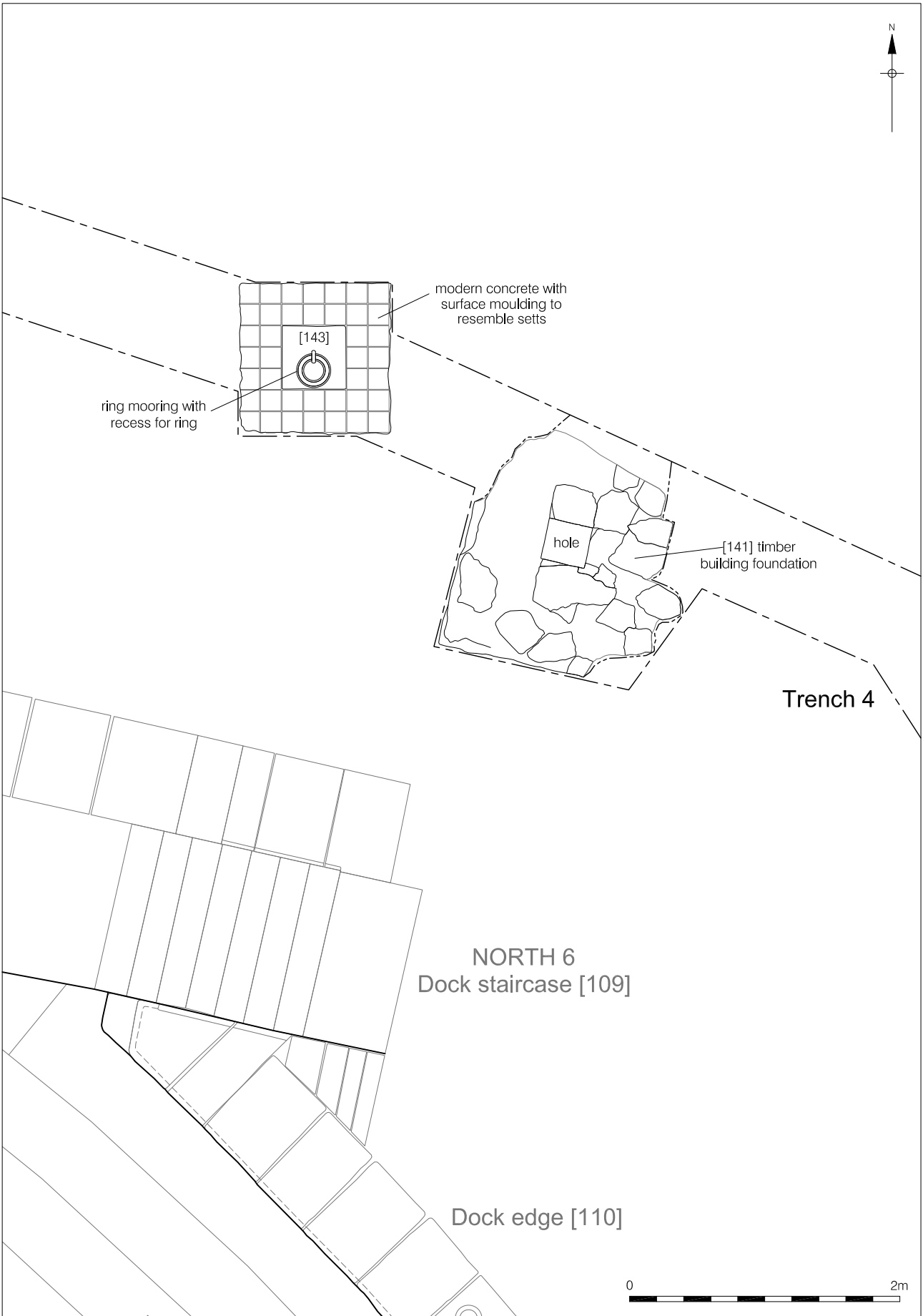


Figure 24
 Trench 4 Plan and North 6
 1:40 at A4

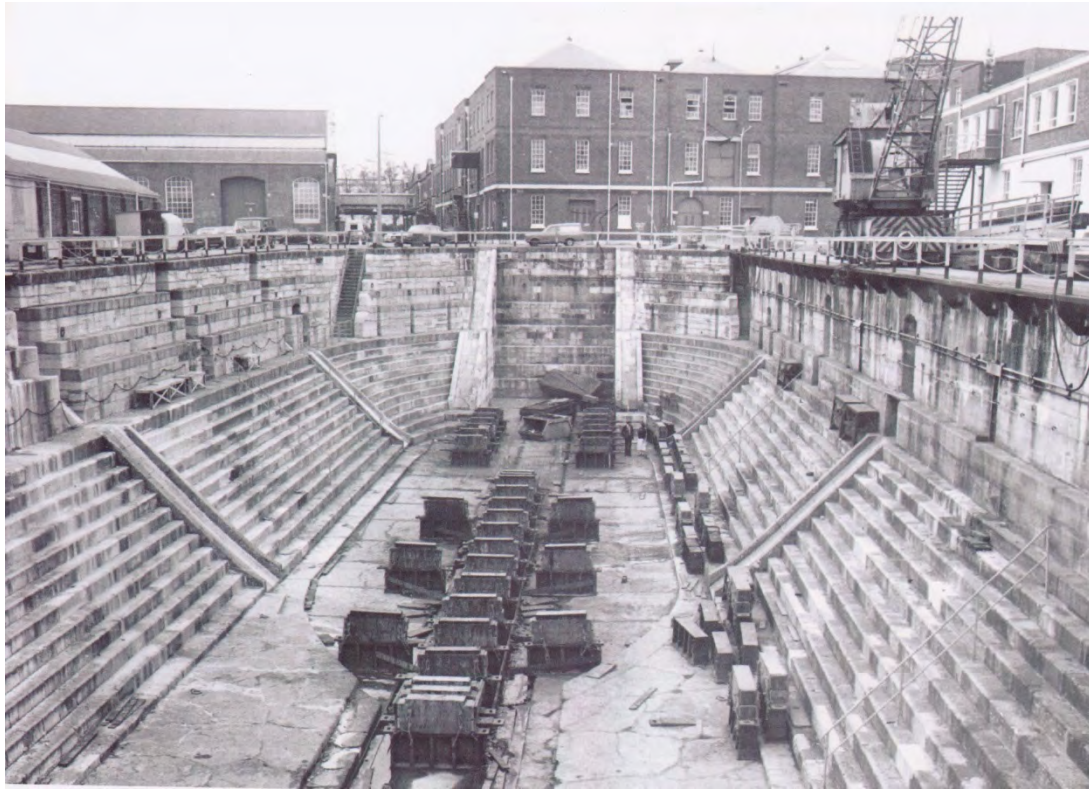


Plate 1. Dry Dock No. 3. East facing view taken in the early 1980s prior to berthing of the Mary Rose. Images courtesy of Mary Rose Trust.

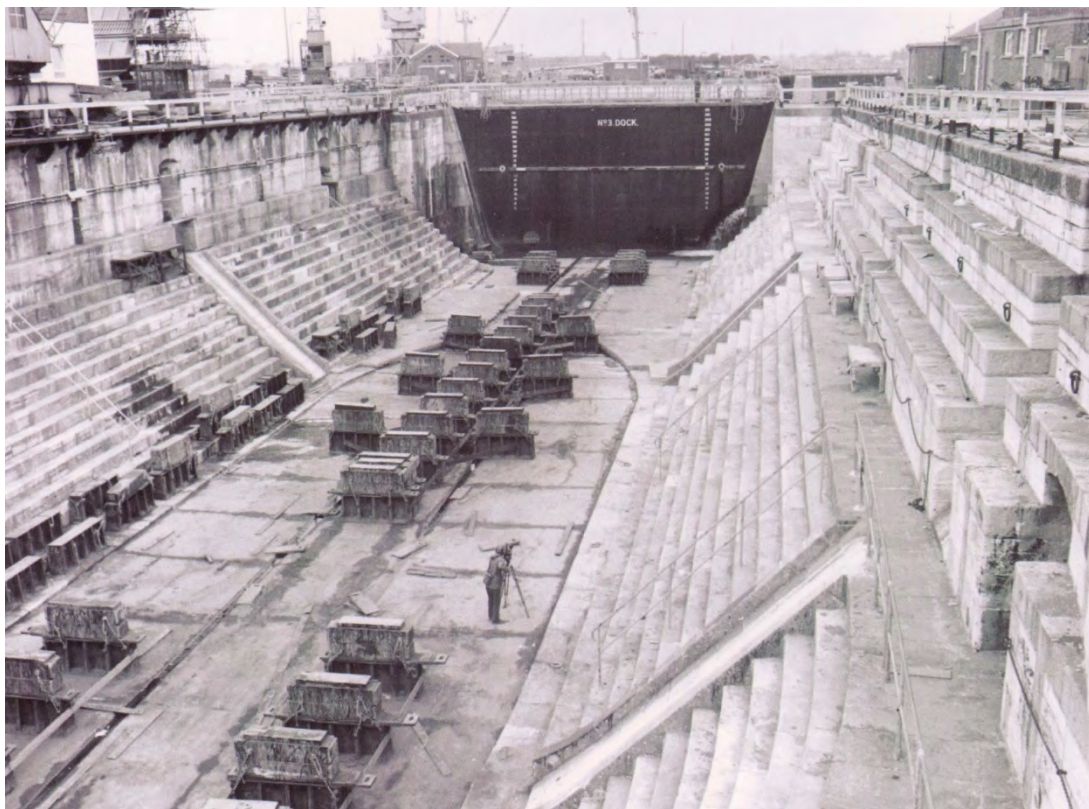


Plate 2. Dry Dock No. 3. West facing view taken in the early 1980s prior to berthing of the Mary Rose. Images courtesy of Mary Rose Trust.



Plate 3. D308/17. Penstock valve P11 opening gear on the surface. NW corner Dry Dock No. 3. Scale 1.0m looking NE.



Plate 4. Penstock valve [37], North side Dry Dock No. 3 found in January 2010 (PMRP08 Phase 3). Scale 0.5m looking NE. Compare with Plates 5, 6 & 7 below.



Plate 5. D.312/23. Penstock valve [132], North side Dry Dock No. 3, adjacent to Dry Dock No. 4. Scales 0.5m & 1.0m looking NNW.



Plate 6. D.313/41. Penstock valve [137], North side Dry Dock No. 3, adjacent to Dry Dock No. 4. Scale 0.5m looking W.



Plate 7. D.314/6. Operating Penstock valve located NW of HMS Victory. View looking south.



Plate 8. D312/40. Aerial view looking down on north side of Dry Dock No. 3, NW end, showing the principal features unearthed in this area. Scale is 1.0m looking west



Plate 9. D305/72. Entrance to culvert [108] in the base of the NW corner of Dry Dock No. 3. Cast iron gates closed. Scale is 0.5m looking N.



Plate 10. D305/61. 9.0m inside culvert [108]. On the right is the closed metal gate of Penstock valve P11 This isolates this section of the culvert from the rest of the system. Looking N.



Plate 11. D305/74. Entrance to culvert [108] in the base of the NW corner of Dry Dock No. 3. Cast iron gates open. The standing water is c. 0.20m deep. Scale is 0.5m looking N.



Plate 12. D305/85. Internal view of culvert [108], c. first 5m in. All of the culvert is built from Portland stone blocks as illustrated here. Looking N.



Plate 13. D300/96. 1920s outer facing dockside crane rail, south side Dry Dock No. 3. Scale 1m looking W.



Plate 14. D320/26. 1920s crane rails at SE end of Dry Dock No. 3. Scale is 0.50m looking W.



Plate 15. D304/19. 1920s inner facing dockside crane rail, inside the Weymes building, set into concrete along southern side of the dockside. Scale 0.5m looking E.



Plate 16. D316/41. [142] Sewer. Backfilled culvert in main southern wall. Looking S.



Plate 17. D 316/61. [142] Backfilled sewer at its western end. Note: material entered through hole in roof. Looking W.



Plate 18. D 316/66. [142] Demolition shows sewer roof in section. Looking W back towards HMS Victory.



Plate 19. Joseph Bazalgette's northern outfall sewer, London, c. 1860s. Compare with Plate 17 above.



Plate 20. D316/22. Stone foundation structure [141]. Scale 1.0m looking E. Compare this with [145] below.



Plate 21. D317/23. Stone foundation [145] with truncated timber posts in-situ. Scale 0.5m looking NE. Believed to be the foundations of a timber framed building constructed over Dry Dock No. 3 in the 1870s. Possible that [141] (above) is a similar feature?



Plate 22. Photograph taken 1872. Looking E towards Dry Docks Nos. 4 and 3 (3 on the right) showing timber sheds built over the docks. [145] may be corner foundation for posts supporting this structure.

8 ORIGINAL AND REVISED RESEARCH QUESTIONS

8.1 Original Research Objectives

8.1.1 The aims and objectives for the watching brief were set out in the Written Scheme of Investigation²⁴ prepared for the site. The following section aims to answer the research objectives posed by that document:

8.2 To record comprehensively any archaeological remains that may be impacted by the main works for the new museum.

8.2.1 The site was subdivided into areas of impact from the main construction works of the proposed Mary Rose New Museum. The areas were excavated using the methodology set out in Section 6 and this recorded significant hard deposits that constituted late 18th/early 19th-century, late 19th-century and early 20th-century features; these included redundant Penstock valves and gully systems that pre-date, or are contemporary with, the construction of Dry Dock No. 3, along with structural elements of the late 18th-century Dry Dock No. 4. Various late 19th-century foundation features and a large sewer system, that all post-date Dry Dock No. 3, were exposed and recorded. A record was also made of a 20th-century dockside crane rail. Soft deposits of 19th-century and modern made ground exposed during the excavations were also recorded.

8.2.2 The removal of dockside masonry located on either side of the dock was subject to a separate methodology outlined in Section 6 and was also subject to a separate written specification²⁵. These works were monitored by the attendant archaeologist and where required scaled plans and sections were produced to record elements surface elements of the dockside edges that were otherwise recorded by the main contractor Warings with a view to producing a 3D view of the exposed structure.

8.3 To survey the location of any archaeological features recorded within the areas affected by the works.

8.3.1 The location and OS datum heights of all significant archaeological features were surveyed by Total Station operated by either Markline or Warings surveyors and tied in to the OS national grid. Other heights on certain features were estimated from topographic data obtained from contractors' plans.

²⁴ Bradley, T with Moore, H. 2009

²⁵ Moore, H. 2009

8.4 To understand more fully the construction of the Dry Docks and the use of this area both prior to, during and after the construction of the Docks. This will add to the understanding of early engineering techniques in Dry Dock construction and ground conditions and inform any future works that may take place around the Dry Docks.

8.4.1 One of the principal aims of this investigation was to understand more fully the construction of the Dry Docks and the usage of the surrounding area. During this, the final construction phase, the focus of work moved away from its earlier concentration solely on Dry Dock No. 3 (although works continued to impact on the dock, primarily the dockside edges), to cover a wider area, principally the land on the north side of Dry Dock No. 3 encompassing the southern edges of Dry Dock No. 4, and the area of land to the south of Dry Dock No. 3 that included parts of the Victory Arena. During this current investigation the groundworks in these areas, the excavation of main drainage trenches and areas of ground reduction, exposed a number of significant masonry features that clarified some of the assumptions made during the Phase 3 works, where what had been interpreted as a hydraulic system could now be confidently ascribed as Penstock valves. Similarly other masonry features exposed at this time, previously interpreted as capstan foundations, can now be reassessed in the light of new information as likely to be the foundation pads for timber sheds built over the docks in the late 19th century (the details of these findings are discussed below). This current phase of works has afforded the opportunity for a clearer understanding of the construction and role of these structures.

8.4.4 The continuing discovery of various late 18th-/early-late19th-century features at the study site, surviving at relatively shallow depths, has demonstrated the high potential for post-medieval archaeological remains in the areas defined by the complex of dry docks at Portsmouth naval base and this fact should be taken into account during any future works that may take place in the area.

8.5 To record any remains of earlier dockyard buildings that pre-date the construction of the 19th-century Dry Dock.

8.5.1 No evidence was found for any 18th-century buildings that stood on this site, in particular no evidence of the 18th-century saw-houses whose foundations, it was hoped, would survive within the immediate vicinity of the study site. The original excavations to construct the dry docks complex, along with the deep culvert system, was an extensive undertaking and would inevitably have had a severe impact on any earlier surviving archaeological remains.

8.6 To determine the extent, condition, nature, character, quality and date of any archaeological remains present, and to establish the ecofactual and environmental potential of archaeological deposits and features.

8.6.1 As demonstrated by the results of this investigation, and insofar as the scope of the watching brief would allow, the extent, condition, nature, character, quality and date of the archaeological remains uncovered was successfully established and is detailed herein.

8.7 Revised Research Questions

8.7.1 The following additional research questions were suggested by the results of the investigation.

8.8 What is the historic significance of the dry docks at Portsmouth?

8.8.1 The origin of the dry docks at Portsmouth begins with Henry VII's order to build England's first dry dock in 1495. The 15th-century dry dock is thought to have been located within the area now occupied by Basin No. 1, possibly near Dry Dock No. 2, the home of the *Victory*²⁶. Their construction had become a matter of urgency as two big English men o' war, the *Regent* (c.1000 tons) and the *Sovereign* (c.800 tons) were in need of below the water-line repairs. Ships needing such repairs had, up until now, been hauled up above the shoreline by horsepower using block and tackle, but these newer, larger ships were too big to move in this way and without a dry dock any damage sustained below the water-line was irreparable²⁷. Without dry docks, ships of the 16th-century Royal Navy couldn't develop much beyond the size of the *Mary Rose* at c.500 tons; the limit that could be hauled above the high water mark. The ability to repair its bigger vessels led directly to the navy developing larger ships with their greater firepower. Thus by the start of the 17th century the Admiralty was able to commission the first Ship of the Line to be built with three gun decks, the 1200 ton *Prince Royal* launched in 1610 and mounting 56 guns²⁸. The development of dry docks was a significant factor in the development of the Royal Navy.

²⁶ Moore, H. and Wheeler, R. 2008, 2.1.17.

²⁷ Moorhouse, G. 2006, p11-12.

²⁸ Landström, B. 1961, p350-351.

8.9 During the investigation some of the construction methods used on the earlier Dry Dock No. 4 was revealed. How do these results compare with the construction of Dry Dock No. 3 built 30 years later?

8.9.1 The extensive use of brick as a foundation building material was observed in the construction of Dry Dock No. 4 built in 1772 as opposed to the foundations of the later Dry Dock No. 3 (1803) which was exclusively built from limestone. The bricks used are unusual, being oversized and noticeably dense and heavy, similar to modern engineering bricks. It is surmised that they may have been specially made for the dockyard, particularly as they were used in a wet environment that would need the moisture resistance capability of engineering bricks. It is not clear why there is a change of building material over the 30 years spanning the building of Dry Docks Nos. 4 and 3, but two ideas suggest themselves: that the bricks went out of use as an economic measure, specially made bricks proving to be too expensive, or that their durability was called in to question; even engineering type bricks were not as resilient to salty water as stone would be²⁹. It may have been a combination of these and other reasons that led to stone eventually becoming the preferred building material by the time Dry Dock No. 3 came to be built.

8.10 What is the nature of the large brick built structure, [142], exposed during the drainage trenching on the south side of Dock 3?

8.10.1 Structure [142] is believed to be part of the main sewer system of the dockyard dating to the 19th century (brick samples have been spot-dated to 1800-1900; Appendix 2). The main chamber of the structure is very large (2.70m high by 2.30m wide) which at first sight seemed overlarge for a sewer (Plates 16, 17 & 18). However, its size is comparable with the Victorian sewers built in London by Joseph Bazalgette in the 1860s (Plate 19). A smaller scale culvert entering the southern side of the main chamber would tend to confirm the interpretation.

8.10.2 The section of the sewer exposed had been backfilled at some time in the recent past, but it is not known why this section was rendered unusable, nor how much of the system survives. The sewer lay just beyond the southern side of the Trafalgar buildings footprint and may have become redundant when that building was constructed in the 1940-1950s. A latrine is known to have been built on the south side of Dry Dock No. 3 in the 1880s (removed by 1910)³⁰, its position would have been in approximately the same location as the sewer and the two may be related. If so, this would specifically relate it to the latter part of the 19th century.

²⁹ Hayward, K. Appendix 2: Building Material Assessment, Watson, S. April 2011.

³⁰ Moore, H. and Wheeler, R. 2008, figures 24 & 25, p27-28.

8.11 Have the results of this, the Phase 4 investigation, confirmed, contradicted or clarified the results of the Phase 3 investigation conducted in 2010?

8.11.1 During the 2010 Phase 3 investigation³¹ a large stone-built structure was exposed in Area B at the north-western end of Dry Dock No. 3. Given the overall structure number [37], this was a series of associated features including a large stone-built structure with a rectangular central shaft [34], surrounded by a stone-built culvert system [35].

8.11.2 The exact function of structure [37] was unclear at the time, the most plausible explanation being that it was part of a 19th-century dockside hydraulic system³². During this current investigation three similar structures were uncovered; [132], [137] and [139]. Initially these were ascribed the same interpretation; as parts of a hydraulic system, indeed they all exhibited the same distinctive features; 'spoon' shaped iron lugs; a central inspection chamber; iron ladder rungs and deeply incised grooves on the inside of the access chamber. But it was the presence of the two deep grooves carved into the sides of the inspection chamber which didn't seem to fit well with the idea of these being a hydraulic system; they were more reminiscent of some form of sliding gate mechanism, such as a sluice gate assembly. As a working theory this was, confirmed by examining the Penstock valve serving Dry Dock No. 2 (HMS Victory's berth) which revealed identical features and fittings; the same 'spoon' shaped iron lugs, the same deep vertical grooves (only now with its sluice gate in position); the same masonry form, etc. The Dry Dock No. 2 Penstock valve is the only example where the internal mechanism is still visible; all other surviving examples within the dockyard have been sealed over, including the functioning valve for Dry Dock No. 3. Therefore the function of features [34/37], [132] [137] and [139] can now be confidently interpreted as (redundant) Penstock valves (Plates 3, 4, 5, 6 & 7).

8.11.3 It is not known when or why the above Penstock valves went out of use. All of the examples uncovered had been backfilled and sealed over with modern concrete, which suggests they were taken out of use in the 20th century. It is known that the areas around Dry Docks Nos. 2, 3 and 4 underwent major alterations in the 1920s including the dry docking of HMS Victory and the construction of concrete foundations to support a dockside railway, and it seems that the valves were sealed over at this date. It is intriguing as to why at least four of the Penstock valves were no longer needed to operate the system as the dry docks were still in use up until the 1980s,

³¹ Watson, S. April 2011.

³² Watson, S. April 2011. 8.11

but it is likely that a culvert system over 180 years old would struggle to cope with filling and draining the docks and modern pumps were probably used instead.

- 8.11.5 It is also possible that the Penstock valves went out of use much earlier. There was a gap of about 30 years between the construction of Dry Dock No. 4 (1772) and Dry Dock No. 3 (1803). It is suggested that when Dry Dock No. 3 was built, its connection to the culvert system made part of the earlier Dry Dock No. 4 culvert system redundant, along with their attendant Penstock valves on the surface, thus either some or all of the Penstock valves [34/37], [132], [137] and [146] may have gone out of use as early as 1803. Further research could clarify this issue.
- 8.11.6 There may be the remains of more Penstock valves hidden below modern ground surfaces. It is suspected that another Penstock valve [146] is present just to the north-west of an existing Penstock valve P.11; the two structures abutting a large capstan situated on the north-west side of Dry Dock No. 3. Superficially at least, the dimensions and general appearance of [146] compares with the existing Penstock valve P11 (Plate 3), in particular the central concrete area that is believed to be sealing the opening to a central shaft. If [146] is, as is strongly suspected, another Penstock valve, this brings the total in this area to five. Why so many remains the subject of speculation, but what is obvious is that the culverts and their Penstock valves are part of a far more complicated system than is that currently understood.
- 8.11.7 The direction of the culverts below ground can be worked out from the position of the sluice gate grooves in the shaft of the Penstock; they're always at 90° to each other, the gates slide down to cut off the flow in the culvert. Thus the culvert controlled by Penstock valve [132] ran east-west, while that governed by [137] was aligned north-south. The culvert controlled by Penstock [34/37] appeared to be aligned north-east by south-west.
- 8.11.8 Adjacent to two of the Penstock valves were two stone-built gully systems; gully [140] (adjacent to Penstock [139]) and gully [136] (originally [35] when first exposed during Phase 3 and adjacent to Penstock [34]). In the assessment report of the Phase 3 works it was believed that the culvert's stone construction was unsuitable for water drainage³³. However, re-exposing the original gully [35/136] and the uncovering of a second [140], allowed for a re-assessment of these structures. It is now surmised that they are indeed water drainage gullies, a view reinforced in the case of [140]. Here the gully was built with an exit through the dock wall out into Basin No. 1, which would suggest a drainage system. It still remains unclear as to what exactly is being drained, but it's assumed that their close proximity to Penstock valves is significant; one suggested explanation is that they acted as overflow drainage for the Penstock

³³ Watson, S. April 2011.p.62, 8.11.12

valves; perhaps when the sluice gate was closed water from the culvert would well-up the shaft, overflowing via the gullies. However, this remains speculation at the moment and further research would be needed to clarify the exact function of these features.

8.11.9 On both the south and west sides of Dry Dock No. 3 and along the southern edge of Dry Dock No. 4, a number of similar stone-built foundation structures were exposed during this, and previous investigations. All were distinguished by a square / rectangular hole in the centre of the feature. These include [145], [103], [113], [133], [135], [141] and [80] from Phase 3. During the Phase 3 works, and up until the discovery of feature [145] in February 2012 of this phase, these structures were all interpreted as capstan foundations. However, when [145] was unearthed with *in-situ* vertical timber posts installed in the central rectangular hole, a different interpretation suggested itself. It is now postulated that the structure was likely to be the foundation pad of a timber building. It is known that timber sheds were built over Dry Docks Nos. 3 and 4 in the in the 1830s and removed at the end of the 19th century. The remains of posts supported by [145] may have formed one of the main vertical supports at the buildings north-east corner; structure [145] was located approximately 0.50m from the NE dock edge. Photographic evidence (Plate 22) shows the building erected over Dry Docks Nos. 3 and 4. Ships in dry dock could remain there for a considerable time and exposed to the weather parts of the vessel would deteriorate. Roofing over some of the docks to provide shelter was the solution, but as the 19th century drew to a close this became impractical as ships got larger and the sheds were removed at the end of the 19th century³⁴. The distinguishing feature of a rectangular hole was observed in [80] (Phase 3)³⁵, [103], [113], [133], [135], [141] (all Phase 4). These had similar dimensions to the hole observed in [145] and it is therefore concluded that all the above mentioned features share the same function; namely as stone foundation pads supporting the timber uprights of a wooden building. Compare these with features [99] and [40] (from Phase 3)³⁶. While superficially being similar limestone structures, they have a significant difference; a circular hole in the middle of the feature. This is believed to have supported a spindle around which a capstan rotated and consequently [99] and [40] are interpreted as capstan foundations.

8.11.10 The above list of potential timber building foundations can now be added to the single example, [33], identified during the Phase 3 works³⁷.

³⁴ Moore, H. and Wheeler, R. 2008, 2.1.55, p25.

³⁵ Watson, S. April 2011, figure 7, p40.

³⁶ Ibid, figure 5, p.38.

³⁷ Ibid, 7.9.8, p32.

9 IMPORTANCE OF THE RESULTS, FURTHER WORK AND PUBLICATION OUTLINE

9.1 Importance of the results

- 9.1.1 This current investigation was afforded the opportunity to continue the exploration of a Georgian naval dry dock system. This study is the final phase of a series of investigations begun in 2008 and their combined results offer a comprehensive insight into the workings of the dockyard environment throughout the late 18th, 19th and early 20th centuries.
- 9.1.2 Spread over a number of phases the results and interpretations have changed and evolved as new information has come to light. Inevitably some partly exposed features from earlier investigations have been only partly understood. During this current phase of work the true significance of some of the structures has only come to light as more examples have been found; the Penstock valves in particular. This current investigation has gone some way to clarify the unresolved issues from Phase 3 and as such has allowed for a better understanding of some of the dockyard functions.
- 9.1.3 The results of this investigation, while ostensibly focused on Dry Dock No. 3, has, due to the wider scale of works, tended to shift that focus away from the physical structure of the dock to include its immediate surroundings as well as exposing some parts of the original structure of Dry Dock No. 4. In some respects this report can be broadly seen as documenting the archaeological features in the landscape around the docks, while the earlier Phase 3 report can be seen as broadly documenting the dock itself.
- 9.1.4 The discovery and identification of at least six disused Penstock valves at the study site indicates that the culvert system serving the docks is a far more extensive and complex system than perhaps realised today. On its own, the construction of the dry docks was a monumental undertaking by the engineers and builders of the 19th century; how much more impressive is that same undertaking when the underground structures are also taken into consideration.

9.2 Further Work

- 9.2.1 The results of the archaeological investigation need to be placed in the context of the Naval Dockyard at Portsmouth, and an understanding of naval engineering and innovation at the turn of the 18th century. The methods of engineering, design and construction used in the other dry docks in the naval base in Portsmouth and potentially elsewhere in Britain should be compared with those used in Dry Dock No.

3. This may be augmented by the inclusion, where appropriate of three dimensional drawings of Dry Dock No.3 produced by Markline as part of the removal process.

9.2.2 As has been demonstrated by the number of disused Penstock valves unearthed during the investigation, the culvert system appears to be more extensive than has previously be assumed. Mapping the full extent of the culvert system would be a valid research topic, as would be addressing the question of when, and why, some of the Penstock valves went out of use and how they affected the function and usability of the dry docks.

9.2.3 The extent and survival of the dockyards 19th-century sewer system, of which only a small section was uncovered during this investigation, would benefit from further research.

9.2.4 The building materials assemblage contains a number of items of interest that require further research and comparison and should be included at the publication stage.

- The extensive use of brick in the construction of Dry Dock No. 4 in comparison with its total absence in Dry Dock No. 3 warrants further analysis. The bricks themselves are suspected of being specially made for the dockyard and analysis into the manufacture and supply of brick building materials for the dock would be a valid area of research along with the use of a standard group of stone types (granite; Purbeck limestone and Portland limestone) in naval construction.
- Material studies of in-house naval materials (mortar; stone, CBM) could be the subject of a stand-alone paper in a scientific or Industrial Archaeological Journal or a future research topic.

9.3 Publication outline

9.3.1 The results of this investigation are intended to be published in a suitable journal. The extent of the publication and the intended journal will be determined following consultation with Ramboll, English Heritage and the Mary Rose Trust.

10 CONTENTS OF THE ARCHIVE

10.1 PAPER AND PHOTOGRAPHIC ARCHIVE

Type	Media	Number
Records	Context sheets 96-149	54
	Plans	35
	Sections and elevations S67-S97	32
Photographs	Hi-Res Digital shots D300-D320	959
	Colour slides (35mm) 301-304	4
	Black and White prints (35mm) 301-304	4

10.2 BRICK AND MORTAR SAMPLES

Context	Sample Type	Amount	Comments	Provisional date
118	Mortar	1 bag	Dry Dock No. 3 side edge stones	1799-1803
119b	Mortar	1 bag	TR2 stone foundation	Late 18 th c?
124	Brick	x 1 brick	TR2 W end foundation	Late 18 th c
128	Mortar Brick	1 bag x 1 brick	TR2 chute/stair into Dry Dock No. 4	1772
130	Brick	x 1 brick	TR2 stair into Dry dock No. 4	1772
133	Mortar	1 bag	TR2 capstan base	19 th c
132	Brick	X2 bricks	TR2 Penstock valve	Late 18 th c
132	Mortar	1 bag	TR2 Penstock valve	Late 18 th c
142	Brick	X2 bricks	TR3 Sewer	19 th c.
145	Mortar/stone	1 bag	Truncated timber posts in stone foundation (1870s roof of Dry Dock No. 3?)	Late 19 th c
145	Timber	1 bag	Timber for species ID	Late 19 th c

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- 12.2 The author would like to thank Mark Roughley for the drawings, Tim Bradley, the project manager and Jon Butler, the post-excavation manager, who also undertook the editing of this present report. Gratitude is also extended to Dr Kevin Hayward who assessed the building materials.

APPENDIX 1: CONTEXT INDEX

Phase 4 works. Note: Context nos.1-32 relates to Phases 1 & 2, context nos. 32-95 relates to Phase 3.

Context	Trench/Area	Plan	Section	Type	Description	Date	Phase	Photo ref
96	South 1	96	67	Masonry	Staircase structure south-side Dry Dock No. 3	1799-1803	3	D300,301, 302
97	South 2	97	68	Masonry	Chute structure south-side Dry Dock No. 3	1799-1803	3	D300,301, 302
98	South 3	98	69	Masonry	Staircase structure south-side Dry Dock No. 3	1799-1803	3	D300,301, 302
99	South TR10	99	n/a	Masonry	Stone built structure, poss. capstan base	19 th c	4	D300,301, 302
100	North 2	100	71	Masonry	Chute structure north side Dry Dock No. 3	1799-1803	3	D300,301, 302, 303,304
101	North 3	101	70, 72	Masonry	Staircase structure north side Dry Dock 3	1799-1803	3	D300,301, 302
102	North 5	102	73, 74	Masonry	Staircase structure north side Dry Dock No. 3 = [85] OP102 from Phase III	1799-1803	3	D301, D302, 301, 302
103	West of North 5	103	n/a	Masonry	Stone structure. Poss. foundation for timber building. = [145]	19 th c	4	D301, 303, 304
104	N side foundation trenches	Developers plan	75	Layer	Made ground deposits-grey clayey silts	19 th c	4	D301
105	N side foundation trenches	Developers plan	76	Layer	Made ground deposits-yellow sandy silts	19 th c	4	D301

Context	Trench/Area	Plan	Section	Type	Description	Date	Phase	Photo ref
106	S side foundation trenches	Developers plan	77	Layer	Post-med made ground =[105]	19 th c	4	D301
107	S side foundation trenches	Developers plan	78	Layer	Post-med made ground =[105]	19 th c	4	D301
108	Base NW Dock 3	108	79a, 79b, 81	Masonry	Culvert entrance	1799-1803	3	D305, 307, 308
109	North 6	109/110	n/a	Masonry	Staircase NE corner N side Dry Dock No. 3	1799-1803	3	D305, 307, 308
110	NE corner, N side dock 3	109/110	80	Masonry	North side dock edge stones	1799-1803	3	D305, 307, 308
111	SE edge, S side dock 3	111	82	Masonry	South side dock edge stones	1799-1803	3	D305, 309, 310
112	NE corner of site	112	n/a	Structural	Dockside crane railway	20 th c	5	D307, D318
113	TR1	TR1/113	n/a	Masonry	Stone structure. Poss. foundation for timber building. = [145]	19 th c	4	D308
114	TR1	n/a	83	Layer	20 th c dump layer	20 th c	5	D308
115	TR1	TR1	83	Layer	19 th c made ground	19 th c	4	D308
116	N side dock 3	North 1	84	Masonry	Staircase into Dry Dock No. 3	1799-1803	3	D309
117	NW dock edge	117	n/a	Masonry	NW dock edge stones, Dry Dock No. 3	1799-1803	3	D309
118	NW dock edge	118	85	Masonry	NW dock edge stones, Dry Dock No. 3. Cont. from [117]	1799-1803	3	D309
119 a & b	TR2	119 a & b	n/a	Masonry	Stone foundation pads in TR2	19 th c	4	D310
120	TR2	120	n/a	Masonry	Dumped stone from Dry Dock No. 4?	20 th c event	5	D310
121	TR2	TR2, 119, 120	n/a	Layer	19 th c made ground deposit	19 th c	4	D310

Context	Trench/Area	Plan	Section	Type	Description	Date	Phase	Photo ref
122	TR2	122, TR2	n/a	Masonry	Remains of chute into Dry Dock No. 4	1772	2	D310
123	TR2 W end	TR2 W end	86	Masonry	Limestone sub-structure to [127] above	Late 18 th c	2	D310
124	TR2 W end	TR2 W end	86	Masonry	Brickwork supporting [123] above	Late 18 th c	2	D310
125	TR2 W end	TR2 W end	86, Drawing 1	Structural	Iron ground tie embedded within [123]	Late 18 th c	2	D310
126	TR2 W end	TR2 W end	86	Layer	Clay rich silty sand. Early made ground deposit	Late 18 th c	2	D310
127	TR2 W end	TR2 W end	86	Masonry	Granite surface masonry W end docks	Late 18 th c	2	D310
128	TR2	128	n/a	Masonry	Remains of chute/staircase into dock 4	1772	2	D311
129	TR2	129	87	Masonry	Inner wall of dock 4	1772	2	D311
130	TR2	130	n/a	Masonry	Remains of staircase into dock 4	1772	2	D311
131	TR2	131	n/a	Masonry	Remains of chute into dock 4	1772	2	D311
132	TR2	M/C 132	91, 92	Masonry	Remains of Penstock valve	Late 18 th c	2	D312
133	TR2	M/C 132	n/a	Masonry	Stone structure. Poss. foundation for timber building. = [145]	19 th c	4	D312
134	TR2	M/C 132	n/a	Masonry	Remains of chute/staircase into Dry Dock No. 4	1772	2	D312
135	TR2	135	n/a	Masonry	Stone structure. Poss. foundation for timber building. = [145]	19 th c	4	D312
136	TR2	M/C 132	88, 89	Masonry	Gully system-prob. = [35] from Phase 3 works	Late 18 th c	2	D312
137	N of TR2	137	93	Masonry	Remains of Penstock valve	Late 18 th c	2	D313
138	TR3(surface)	138	n/a	Structural	Fe. ground tie; poss. reinforcing associated with [139]	Early 20thc	5	D315
139	TR3	Sketch; co-ords. only	sketch	Masonry	Remains of Penstock valve	Late 18 th c	2?	D315
140	TR3	140	95	Masonry	Stone built gully/culvert associated with [139]. Similar to [35], [136]	Late 18 th c	2?	D315

Context	Trench/Area	Plan	Section	Type	Description	Date	Phase	Photo ref
141	TR4	141	n/a	Masonry	Stone structure. Poss. foundation for timber building. = [145]	19 th c	4	D316
142	TR3	143	96, 97	Masonry	V. large brick built sewer chamber with culvert leading off.	19 th c	4	D316
143	TR4	143	n/a	Masonry	Mooring ring set in granite block	19 th c	4	D316
144	N.E edge Dock 3	144	n/a	Masonry	Dock edge stone	1799-1803	3	D317
145	TR4/NE Dock 3	145	n/a	Masonry	Stone foundation with truncated vertical timber posts in-situ; timber roof foundation pad = [141].	19 th c (1820-30s)	4	D317
146	TR2 W end, NW Dock 3	145	86	Masonry	Possible disused penstock valve; unexcavated, but visible on the surface.	Late 18 th C	2	D310, D318, D319.
147	TR2 W end, NW Dock 3	n/a	86	Masonry	Single granite stone thought to be the outer wall of the shaft of penstock valve [146]	Late 18 th C	2	D310
148	South 5	148	98, 99	Masonry	90 ^o turning staircase, SE dock 3. W. part = [86] from phase 3. Mirrors [102] on N side.	1799-1803	3	D319
149	South 6	149	n/a	Masonry	Staircase at SE end dock; much truncated.	1799-1803	3	D320

Victory Arena; watching brief. PVPD11

Context	Trench/Area	Plan	Section	Type	Description	Date	Phase	Photo ref
1	TR1	TR1	3,4	Layer	19 th /20 th c made ground	Post-med	5	D1
2	TR1	TR1	2	Masonry	Granite cobble setts, prob. re-laid 20 th c	Post-med	5	D1

APPENDIX 2: MASONRY DATES

Dr Kevin Hayward

Key:

TA - White powdery mortar with moderate to frequent flecks of quartz (3-8mm) chalk inclusions and clinker

TB – Portland cement very hard dark yellow brown fine cement with elongate shell slithers up to 10mm long and 3mm across occasional Waterproof cement

TF – brown powdery mortar later than TA

Context	Fabric	Form	Size	Date range of material		Latest dated material		Spot date
118	3101	Two mortar types one replacing other (1) White hard Portland type mortar with chalk inclusions 1830-1950 comparable to [33] chute 2) Hard dark grey mortar probably later 19 th century	2	1830	1950	1830	1950	1830-1900
119B	3101	TB waterproof mortar	1	1800	1950	1800	1950	1800-1950
124	3033 3101	Fine red well made unfrogged brick with Type A mortar White powdery mortar with moderate to frequent flecks repointed in TF brown powdery mortar	2	1750	1900	1750	1900	1750-1850
128	PORTS 1 3101	New brick fabric red-brown with numerous angular 10mm brick inclusions (PORTS1) TA mortar	1	1750	1900	1750	1900	1750-1850
130	PORTS1 3101	New brick fabric red-brown with numerous angular 10mm brick inclusions (PORTS1) TA mortar	2	1750	1900	1750	1900	1750-1850
132	3101 PORTS1 3120	New brick fabric red-brown with numerous angular 10mm brick inclusions (PORTS1) TA mortar Purbeck limestone very fossiliferous shelly limestone all Upper Jurassic Isle of Purbeck	3	1750	1900	1750	1900	1750-1850

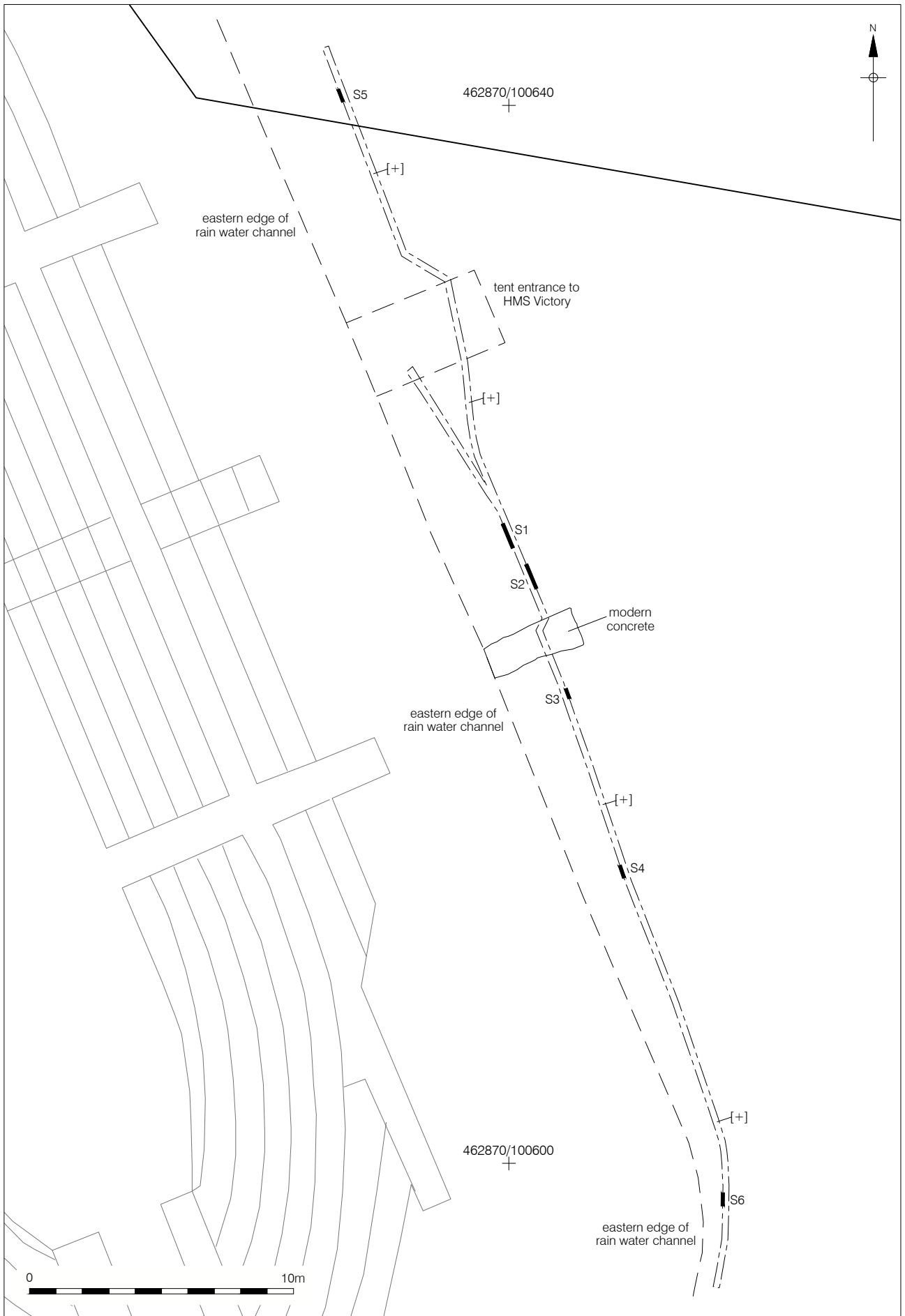
Context	Fabric	Form	Size	Date range of material		Latest dated material		Spot date
133	3101	TB waterproof mortar	1	1800	1950	1800	1950	1800-1950
142	3033 3101	Fine red well made unfrogged brick with Type A mortar White powdery mortar with moderate to frequent flecks	2	1750	1900	1750	1900	1800-1900
145	3101 3120	Purbeck limestone very fossiliferous shelly limestone all Upper Jurassic Isle of Purbeck TA mortar	1	1750	1900	1750	1850	1780-1850

APPENDIX 3: List of dock side stone re-used as seating

The following is a list of the dock stone numbers for re-use as seating. The methodology for permanently labelling the stones has been agreed between Camlins (landscape architects), Defence Estates, Gifford, Warings and English Heritage. Small copper labels stamped with individual numbers will be screwed and resin bonded to the stones. The following ten stones, all granite top stones, are being used in the new museum's landscaping scheme. Other dock side stones (most likely granite stair treads from the staircases into Dry Dock No. 3) are to be re-used at various locations around the dockyard, details to be confirmed.

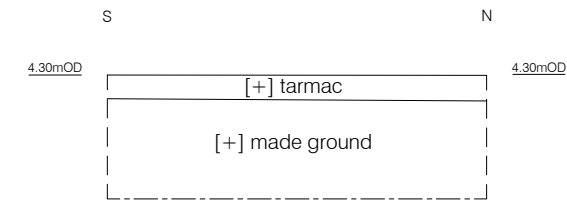
Ref. no.	Petrology	Original location	New location
NWD 4	Granite	North-west dock side, [118]	Mary Rose new museum landscape.
NWD 4A	Granite	North-west dock side, [118]	Mary Rose new museum landscape.
NWD 5	Granite	North-west dock side [116]	Mary Rose new museum landscape.
NWD 5A	Granite	North-west dock side [116]	Mary Rose new museum landscape.
NWD 13	Granite	North-west dock side, [118]	Mary Rose new museum landscape.
NWD 13A	Granite	North-west dock side, [118]	Mary Rose new museum landscape.
STN5	Granite	South-east dock side [111]? Number indistinct.	Mary Rose new museum landscape.
NWD	Granite	North-west dock side, number indistinct.	Mary Rose new museum landscape.
NWD	Granite	North-west dock side, number indistinct.	Mary Rose new museum landscape.
DOCK 3	Granite	Number lost.	Mary Rose new museum landscape.

APPENDIX 4: VICTORY ARENA FIGURES

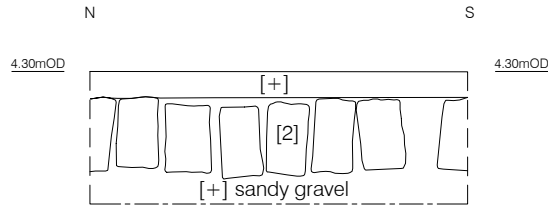


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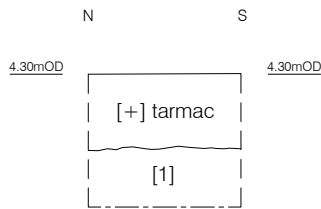
Figure 1
 Trench Location
 1:200 at A4



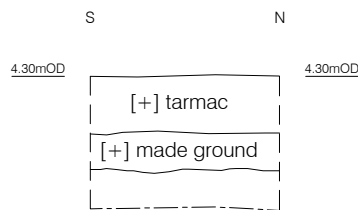
Section 1
East facing



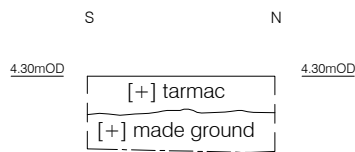
Section 2
West facing



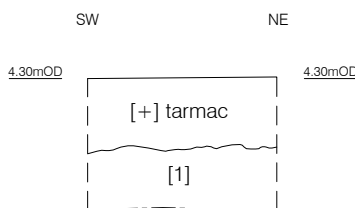
Section 3
West facing



Section 4
East facing



Section 5
East facing



Section 6
Southeast facing



APPENDIX 4: OASIS FORM

OASIS ID: preconst1-127378

Project details

Project name	Archaeological Watching Brief at the Mary Rose New Museum, Portsmouth Historic Dockyard, Portsmouth, Hampshire
Short description of the project	<p>An Archaeological Watching Brief undertaken by Pre-Construct Archaeology Limited on intrusive ground works during the construction of a new museum to house the The Mary Rose within Dry Dock No. 3 at Portsmouth Historic Dockyard, Hampshire. The Dry Dock itself is a Scheduled Ancient Monument, and a Grade I Listed Building. The investigation, while concentrating on the dry dock, also included buried archaeological remains encountered within the immediate surrounding area. The archaeological investigation monitored and recorded elements of the construction of Dry Dock No. 3, which in broad terms included the following: staircases and chutes lining the dockside; elements of the docks edges removed to accommodate the development; an investigation of the culvert system that originally drained and flooded the dock and the monitoring of various linear trenches to install new drainage. The trench excavations revealed parts of the structure of Dry Dock No.4, a number of disused Penstock valves and various dockside structures dating to the late 18th, 19th and early 20th centuries.</p> <p>An addition small-scale watching brief (under site code PVPD11, but under the same SM consent-thus in this report) was conducted within the environs of the Victory Arena during trenching operations to install new services, but no archaeological finds or features were encountered.</p> <p>The investigation is designated as Phase 4 of a series of on-going of watching briefs.</p>
Project dates	Start: 11-10-2010 End: 27-04-2012
Previous/future work	Yes / No
Any associated project reference	PMRP08 (phase 4) - Sitecode

codes

Any associated project reference codes PVPD11 - Sitecode

Type of project Recording project

Site status Scheduled Monument (SM)

Site status Listed Building

Current Land use Community Service 2 - Leisure and recreational buildings

Monument type FOUNDATIONS-PENSTOCK VALVE Post Medieval

Monument type FOUNDATIONS-CAPSTAN Post Medieval

Monument type FOUNDATIONS-TIMBER BUILDING SUPPORT Post Medieval

Monument type STRUCTURE-DOCK SIDE Post Medieval

Monument type STRUCTURE-DOCK CULVERT SYSTEM Post Medieval

Monument type FOUNDATIONS-PENSTOCK GULLY SYSTEM Post Medieval

Monument type STRUCTURE-SEWER Post Medieval

Significant Finds CBM Post Medieval

Significant Finds MORTAR Post Medieval

Investigation type 'Watching Brief'

Prompt Direction from Local Planning Authority - PPS

Project location

Country England

Site location HAMPSHIRE PORTSMOUTH PORTSMOUTH Mary Rose Museum, Historic Dockyard, H.M. Naval Base, Portsmouth, Hampshire

Study area 6750.60 Square metres

Site coordinates SU 6285 0065 50.8014316401 -1.108021656270 50 48 05 N 001 06

28 W Point

Height OD / Depth Min: 0m Max: 0m

Project creators

Name of Organisation Pre-Construct Archaeology Limited

Project brief originator Gifford

Project design originator Helen Moore

Project director/manager Tim Bradley

Project supervisor Stuart Watson

Type of sponsor/funding body Trust

Name of sponsor/funding body The Mary Rose Trust

Project archives

Physical Archive recipient Hampshire Museums and Archives Service

Physical Contents 'Ceramics', 'Industrial'

Digital Archive recipient Hampshire Museums and Archives Service

Digital Contents 'Ceramics', 'Industrial'

Digital Media available 'Images raster / digital photography'

Paper Archive recipient Hampshire Museums and Archives Service

Paper Contents 'Ceramics','Industrial'

Paper Media 'Context
available sheet','Matrices','Photograph','Plan','Report','Section','Survey
,','Unpublished Text'

**Project
bibliography 1**

Grey literature (unpublished document/manuscript)

Publication type

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Portsmouth Historic Dockyard, Portsmouth, Hampshire

Author(s)/Editor(s) Watson, S.

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